



SCHOOL OF ECONOMICS AND MANAGEMENT

Bachelor's Programme in Economy & Society

The Kenyan Experience of Mobile Money and Financial Inclusion

Analyzing mobile money and financial inclusion on national, province and county-levels in

Kenya

By

Oscar Ramfors, os6314ra-s@student.lu.se

Abstract:

Since Kenya established mobile money in 2007, the amount of usage and diffusion surged. At the same time, financial inclusion has established itself as a topic of great research and importance for policymakers. Kenya is being viewed as one of the top performers on a national level when it comes to mobile money, as M-Pesa was one of the pioneers of introducing MM. As previous literature mainly focuses on national-level data, this thesis uses both national, province, and county-level data to establish how Kenya has developed its MM and FI not only from a national perspective. The main aim is to establish if there are differences in MM diffusion and FI levels between regions within Kenya and what implications this has on these regions. By using a quantitative approach with a multi-level analysis from descriptive statistics, the method allows to establish trends in the data to unveil differences on a regional basis. The main outcome of this thesis is that there are large differences in MM and FI depending on whether you look at national or subnational data. Counties and provinces with higher diffusion of MM also register higher levels of FI. At the same time, these counties also tend to have higher financial health and lower poverty headcount while also accumulating a higher degree of GCP per capita. The Central+Nairobi province has the highest amount of combined MM and FI, and counties in close proximity tend to showcase higher levels of both MM and FI but also GCP per capita. These findings implicate the importance of MM, and could hopefully be useful for policymakers in, but also outside of Kenya in future actions to enhance MM and FI.

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List of Abbreviations

ATM	Automated Teller Machine
CBK	Central Bank of Kenya
CRA	Commission of Revenue Allocation
DOI	Diffusion of Innovations Theory
FI	Financial Inclusion
FSD	Financial Sector Deepening Kenya
GCP	Gross County Product
GDP	Gross Domestic Product
GPII	Global Partnership for Financial Inclusion
GPP	Gross Provincial Product
GSMA	Global System for Mobile Communications Association
ICT	Information and Communication Technology
IMF	International Monetary Fund
KCA	Kenyan Communications Act
KNBS	Kenyan National Bureau of Statistics
KSH	Kenyan Shilling
MM	Mobile Money
SSA	Sub-Saharan Africa
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme

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1. Introduction

In recent decades, increased emphasis and discussion have surrounded financial inclusion (FI) and what its main drivers could be. The Global Partnership for Financial Inclusion (GPII) was developed in 2011 at the G20 summit in Cannes. During this summit, they developed a framework that would promote FI and boiled it down to three important indicators. The first indicator was “access to financial services”, the second one was “usage of financial services” and the third one was “quality of the products and the service deliveries” (GPII, 2016). Thus, with more emphasis on FI and its implications, innovative drivers of inclusion such as mobile money (MM) are being recognized for their contributions.

Because of the increased emphasis from the G20 summit, the concept of FI has been gaining more interest. According to Sanderson et al. (2018), FI is broadly explained as financially involving the most exposed and least financially active people in society. Hence, they should be able to attain reliable financial services at a fair price. FI has emerged as one of the most important parts of economic growth, and it could lead to increased consumption, a higher degree of savings, and further investment by individuals and businesses (Perez-Saiz et al., 2019). Despite the increase in research and emphasis about FI, there are large differences between countries but also between specific regions within countries (Klapper & Demirgüç-Kunt, 2013). Applying this to Kenya, access to financial services on the national level has increased in recent decades. In 2006, access to formal financial services was at 26,7%, and between this point and 2021, that number had increased to 83,7% (Statista, 2021). With this being an impressive number on the average access to financial services, this does not show any differences between provinces and counties in Kenya. Looking at data from the FinAccess Household County Survey in 2021, there are still large differences between regions, with the highest number of financial access being Nairobi with 95% and West Pokot with 57,7% (CBK, 2021). Hence, with Kenya being viewed as a successful country in diffusing MM and improving FI, there are still unanswered questions as to why some regions do not experience the same level of inclusion as others. Thus, a multi-level analysis will suit the purpose of investigating these differences.

The largest MM service in Kenya is called M-Pesa and has taken the African and particularly Kenya’s economy by storm and has in a relatively short amount of time established itself as the most prominent MM service and one of the biggest fintech companies in Africa

(Vodafone, 2022). Safaricom, which is one of Vodafone's partners in Kenya, established M-Pesa in March 2007 and has since then expanded the service to other countries around the continent, according to Vodafone. M-Pesa has 160,000 agents spread around Kenya who are responsible for facilitating deposits and the creation of new MM accounts. Furthermore, agents facilitate customers' need to get virtual money from their phones in exchange for cash or vice versa. From here, Vodafone states that customers begin their journey with M-Pesa and can now send money to other connected users while being able to use it to buy goods and services, pay taxes, school fees, and utility bills. Customers can also build credit scores by using M-Pesa which could enable them to use banking services for savings and loans through the application of M-Shwari.

Investigating Kenya suits as a great example because M-Pesa was the first MM service that became heavily adopted, and subsequent MM innovation has been based on M-Pesa's success (UNCDF, 2022). Undeniably, there should be an upside in promoting MM and diffusing its usage to further enhance FI in all 47 counties in Kenya. According to research by the UNDP (2022), countries with high integration of MM can experience economic growth and ultimately decrease their poverty rate by 2,6%. The performance of businesses is also important for people to increase their economic conditions and contribute to financial development. UNDP states that 98% of business owners in Kenya argue that they use M-Pesa as it is fast, safe, and allows them to conduct business online. On top of this, 95% of Kenyan business owners using M-Pesa state that at least 50% of their transactions are done through M-Pesa.

1.1 Research Question

Thus, having been introduced to the topic of what will be analyzed during this thesis, the research question will be the following:

How has mobile money and financial inclusion developed in Kenya on a national, provincial, and county-level between 2007 and 2021?

1.2 Aim and Scope

This thesis aims to investigate how MM has played a role in providing a platform for effective payments that contribute to FI from a country, province, and county perspective.

Recent decades discussions have centered around MM's ability to create FI on a national level. However, this thesis aims to take it two steps further, and based on the new county-level data in Kenya find why certain inequalities appear (CBK, 2022). Furthermore, understanding why factors of MM are important in promoting FI could hopefully be important for policymakers both in Kenya but also in other developing countries around the world that have not enhanced MM to a large degree.

Looking at how MM has affected the overall economy in Kenya has been done in the past (Suri & Jack, 2016; Kikulwe et al., 2013; Lashitew et al., 2019). However, investigating MM at the county-level has not been widely done yet and could provide valuable insight into how MM has established itself in different counties. FI in Kenya has since the launch of M-Pesa in 2007 increased and reached high levels, but there are still regional differences around Kenya especially in the adoption of MM and FI (Wambuyu, 2017). From looking at the aggregated data on a national level you can draw some conclusions but doing that will inevitably reject differences based on where you live in the country. As differences in FI could be huge depending on where you live, it should be analyzed whether regions with a higher diffusion of MM have seen higher levels of FI.

The scope of the thesis will be from 2007 and the introduction of M-Pesa until the year they conducted the FinAccess Household County Survey in 2021 (CBK, 2022). This is to capture the development throughout the years and finish with the results they have reached county-wise in 2021. When investigating Kenya on a national level and not using data specific to counties, the scope covers yearly development which is important to paint a picture understanding the overall development. Looking at the province data, the aim is to analyze different provinces individually to contrast the findings with national and county results. Using provinces is important for the analysis because the majority of data that has been collected over the years during FinAccess studies has been done on provinces and not individually on each of the 47 counties. Hence, comparing the development of certain variables on a provincial basis will be important to show differences within Kenya over time.

1.3 Outline of the Thesis

The remainder of the paper will be organized as follows. Section 2 will go into some background about Kenya's MM and FI to give the reader a good foundation to continue reading the thesis. Section 3 consists of both the literature review and the theoretical

approach connected to the subjects of FI and MM. Previous research and theories will be provided to get the reader comfortable with what other authors' literature is discussing about the topic. Section 4 will be about the method and data collection. The method section outlines the approach of this thesis, in carrying out a multi-level analysis of MM and FI using nation, province, and county-level data, but also motivates why a descriptive analysis will be the quantitative approach. The second section will establish why this data is being used and establish its reliability, representativity, and validity. Section 5 will analyze and discuss the results of the analysis. This part is divided into three parts, where they will analyze MM and FI on the national, provincial, and county-level. After showing the main results, a discussion will also be held about why these findings are relevant and how they tie into or differ from the existing literature and theories. Section 6 will be the final part of the project and will provide the main conclusions. Implications will cover how and to whom these findings are valuable, and future research will indicate what upcoming studies could improve and continue to build on from this one. Section 7 provides the reference list where all citations that have been used throughout the paper will be available. Artificial Intelligence tools will only be used to improve language throughout the thesis.

2. Background

In the year 1998, the Kenyan Communications Act (KCA) was developed from the formerly monopoly regime by a decision from the Kenyan parliament (Omwansa, 2009). This created a regulatory environment where private actors in the market could establish new innovative applications using mobile phones. One of the key frameworks that enabled MM services to get developed was the Kenya ICT policy which was introduced in 2006 (Omwansa, 2009). It was introduced to further promote electronic payments and it enabled the formation of M-Pesa in 2007. Vodafone was the initiator of M-Pesa, however, they partnered up with Faulu which is a microfinance institution, and also the Commercial Bank of Kenya which enabled them to get the banking infrastructure needed (Omwansa, 2009). With the introduction of M-Pesa, they were about to go on a FI journey that other countries in Sub-Saharan Africa (SSA) could not compete with. In 2006, the year before MM services were introduced in Kenya, mobile cellular subscriptions were at a level of 19,88 per 100 inhabitants, and by the year 2009, that number had increased to 47,97 (Statista, 2023). The use of mobile phones was increasing exponentially, and the penetration of mobile phones allowed for new innovative features to be formed. At the same time, the share of people who

were using bank services amounted to only 14% and had only reached 20,5% in 2009 (FinAccess survey, 2021). Hence, the increasing amount of mobile phones and the low number of banked citizens enabled other actors to tap into the market to find other ways to make Kenyan people go from being financially excluded to becoming included (Rosengard, 2016; Addisu et al., 2019).

MM services such as M-Pesa have a significant impact on how people in developing countries can become included in the financial landscape and increase the usage of financial services (Donovan, 2012). According to Murray (2023), there are three important ways in which MM supports FI. Firstly, it helps banks and lenders base decisions on giving out loans to people who do not previously have an available financial history by looking at MM payments data. Secondly, from having a decentralized network they can offer a wide range of financial products to their customers, making the service they provide efficient to use. Thirdly, as there are 51 million M-Pesa users spread between 7 different countries in Africa, they can connect and promote the degree of people having access to banking services such as receiving credit and claiming remittances. Conceptually, remittances are payments that are usually being sent from migrants abroad to boost the financial health of people back in their home country and are an important source of income for poor people (Mwangi & Mwenda, 2015).

FI in Kenya has been a topic of investigation for policymakers in Kenya since the beginning of this decade. Before the introduction of MM in Kenya, microfinance institutions were the way Kenya tried to increase FI, however closer to the launch of MM in Kenya, policymakers started to focus on private sector financial service initiatives (Johnson & Arnold, 2012). A key problem was gaps in the provision of accessible services that every citizen regardless of social class could use, the authors say. They continue to explain that high barriers to entry and large apparent gaps in the market would start to be improved with the introduction of MM services that could better reach the financially excluded. The Kenyan government has been integral in promoting FI through new technologies such as MM. According to Ntwiga (2016), the recent positive trends in FI in Kenya can be traced back to more inclusive services such as MM. Whilst there is increased use of MM services, the author explains that other financial services such as usage of banks and microfinance institutions are decreasing at the same time. Most certainly, this would be a consequence of people switching their current bank account to using MM services due to efficiency.

Kenya's provinces that will be looked at in the analysis are Coast, North Eastern, Eastern, Central+Nairobi, Rift Valley, Western, and Nyanza. These provinces consist of different numbers of counties and from Figure 1 it is visible to see where the counties are situated, and which belongs to what province.

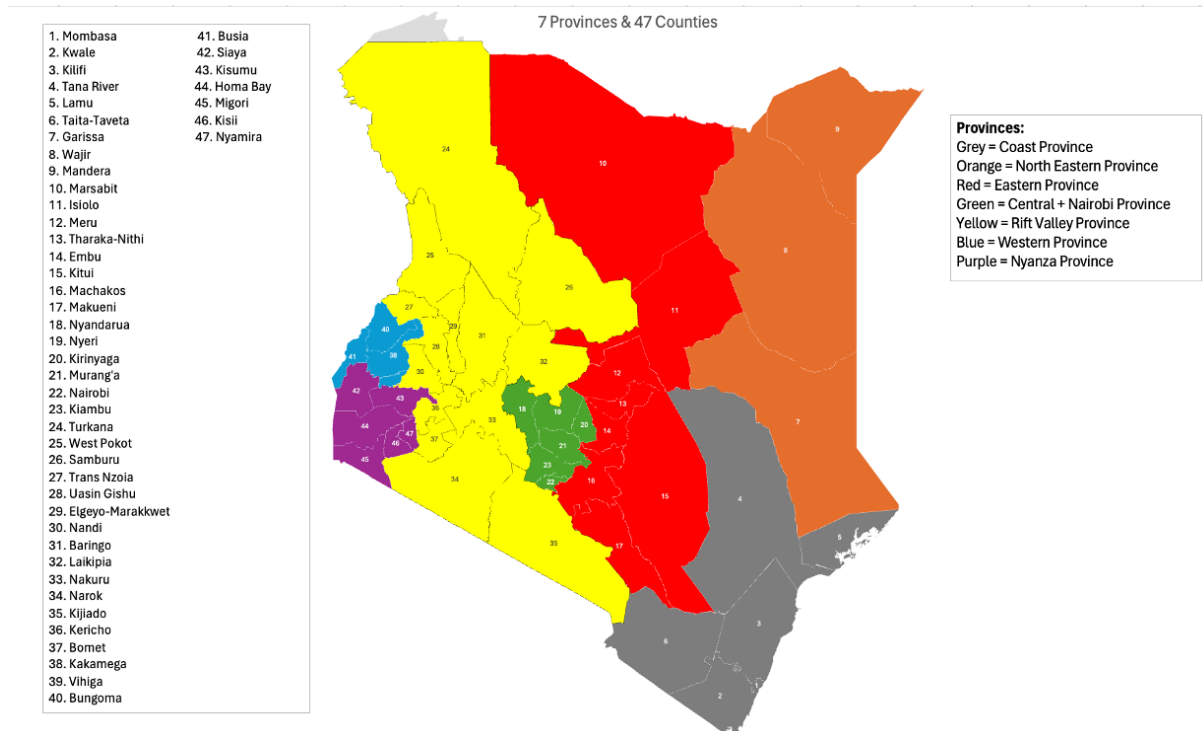


Figure 1. Kenyan 47 Counties and 7 Provinces Displayed on the same map (CBK, 2022)

3. Theory

3.1 Literature Review

3.1.1 Kenya's Regional Financial Development

The subject of investigating and analyzing the 47 different regions in Kenya has not been done to a large extent. Throughout the years 2006, 2009, 2013, 2016, 2019, and 2021 the CBK together with the KNBS and FSD Kenya conducted a national survey called the FinAccess Survey. During the year 2021, they decided to expand the study by including individual county-levels for the year 2021. Earlier surveys than 2021 only include certain provincial comparisons which could be one explanation for the lack of research on county differences. However, some studies are trying to analyze differences between regions. For

instance, Mose (2020) investigates regional differences in Kenya between 2014 and 2017. Throughout this paper, the author looks at descriptive statistics to find what variables are the most effective in promoting economic growth. Consequently, the author suggests that during these years in Kenya, the most important parts that would contribute to economic development would be public investment levels, electricity infrastructure, government consumption, human capital stock, and the quality of governance and institutions. Mose says that to develop all different regions, these are the main areas in which policymakers should focus their resources to reach economic progression.

At the same time, Ramada-Sarasola (2012) investigated the effect that MM services have on regional economic growth partly in Kenya. The author says that it is difficult to point out the exact effects that MM is providing certain regions with, as many different factors play into that. However, she continues to say that if there is one country where the transactions are sufficient to state that there are positive outcomes of MM, it is Kenya. MM is expected to increase regional trade because of increased transaction volumes due to the simplicity of transferring funds, the author says. Ramada-Sarasola pushes on the fact that there is not sufficient data to determine the specific regional and county effects of MM. However, as the FinAccess 2021 County Survey allows for this kind of data, a study like this one could build on what she has already done. What Ramada-Sarasola says about regional development through MM is reminiscent of the results of Tembo & Okoro (2021). They state that MM has a positive impact on trans-regional trade and that MM has increased remittances between regions. Tembo and Okoro also concluded that MM is positive for regional development and interconnectedness, which could then be applied to regions in Kenya. If MM is established as important from a cross-country border perspective, MM should serve as an important catalyst between the 47 regions in Kenya as well.

3.1.2 Mobile Money Urban vs Rural

Generally, MM is more prominent in urban areas, and in 2017, 80% of rural people in Kenya were financially excluded (Cook, 2017). However, many scholars believe that MM has a positive effect on both urban and rural people. According to Kikulwe et al. (2014), rural people in Kenya have experienced increased household income, decreased financial risk, and higher liquidity because agricultural businesses use MM due to its effectiveness. Kikulwe also brings up the domestic remittances that rural people can attain in a more efficient way than before by using MM, which has allowed them to transfer through their phones. Claiming

remittances directly to the phone in rural areas also helps business owners who use MM to commercialize their products in a better way. Kikulwe states that people who are using MM to conduct business have higher profits than people who are not. Hence, MM can help rural people who own small businesses to access the market with fewer constraints, which can lift rural society out of poverty and promote development. At the same time, MM is providing urban citizens in Kenya with FI by introducing savings features that correlate better with their usage patterns (Kim, 2020). The author states that poor urban people living in Nairobi used to not have a bank account but have now been able to store their money in their phones through MM services as it is more convenient and safe.

3.1.3 Mobile Money and Poverty Reduction

Poverty reduction is one of the key benefits of MM which has been established by several authors (Suri & Jack, 2016; Macharia, 2013; Mawussi et al., 2023). In the paper by Mawussi et al. (2023), they conclude that there is a positive and statistically significant effect of MM on poverty reduction. Their findings correlate with earlier authors' findings that the biggest impact that MM has is on rural people, women, and illiterate people. At the same time, urban society, and especially men with high education did not get as affected by MM. Mawussi et al. suggest that to further decrease poverty in developing countries, policymakers should put more emphasis on MM. To make this as quick as possible, the authors propose that they should target people who have the highest direct effect by MM to make them catch up and create a more equal society. Asongo & Roux (2023) agree with the statements of Mawussi et al. However, they further state that MM decreases the income inequalities by allowing people the use of financial services. They also state that poverty levels do not explicitly decrease, however, the severity of poverty can be mitigated by giving more people access to the usage of MM.

3.1.4 Mobile Money and GDP growth

Remittances have become a larger percentage of the GDP in Kenya. 3,4% of Kenya's GDP was personally received remittances in 2021 (World Bank, 2023). According to GSMA (2022), the average cost of using MM to do an international remittance was 2,77 cents while the cost of an average remittance was above 6 cents. Hence, MM has been one of the key components in influencing GDP growth as remittances have increased. Furthermore, an increase of 10 percentage points in MM usage can represent an increase in GDP between

0,4% and 1% (Storchi et al., 2023). They also show that if MM gets broader diffusion, it will affect GDP even more positively than it already does. It is also important that people use MM to make person-to-person payments, send international remittances, and pay bills instead of only using it to withdraw cash and buy mobile airtime, to boost the economy. Storchi et al. continue to say that network effects are an important part of MM's effect on GDP because if more people use it, it will have a larger effect on the economy. Attracting more users could also make policymakers and the government realize MM's potential to the overall economy and enable people to use it through government services as well. Lastly, Storchi et al. state that the GDP in East Africa between 2013 and 2022 gained 5,9% by having MM, as opposed to if they did not which shows the importance of prioritizing it.

3.1.5 Mobile Money's Impact on Financial Inclusion in Kenya

As previously mentioned, the consensus on MM's impact on FI has been positive. Research is being done on a lot of different topics surrounding MM particularly M-Pesa and FI in Kenya. Ndung'u (2018) suggests that providing a platform for previously unbanked and excluded people has been an easy way to get them financially included and intensify the applicability of different M-Pesa services. He also argues that some of the biggest reasons for financial exclusion were large differences in income together with highly asymmetrical flows of income. On top of this, he states that the formerly large distance between unbanked citizens and the actual bank also played a crucial role in keeping poor and rural inhabitants excluded. Ndung'u explains that with the M-Pesa service, a lot of people have been able to get out of poverty due to being able to handle transactions and banking matters comfortably through their phones.

In the paper by Morawczynski (2009), she is conducting an ethnographic study about the impact of M-Pesa on Kenyan citizens using an interview format. Throughout the paper, she highlights the effects that M-Pesa has had on people not being financially included and now using M-Pesa. She points at factors such as its effect on financial management with a large focus on financial stress but also on sustaining social networks. While pointing to many good features, it is also useful to understand what the drawbacks were connected to M-Pesa's launch. In her paper, she mentions problems with M-Pesa being perceived as a service for the better off. Another problem is that M-Pesa could put pressure on family members and social connections to send money which could lead to decreased adoption due to social pressure.

Two important papers investigate MM's effect on the Kenyan economy and contribute with thoughtful discussions about its impact. The first one by Mbiti and Weil (2016) gives an extensive analysis of the role that M-Pesa has played in FI but also of the broader economic effects on the Kenyan economy. One of the key points that it presents is the rapid adoption that M-Pesa has gained, it also looks at the simplification of transferring funds and the role it has played that has caused Kenya to see more frequent and larger remittances. Consequently, that enables a higher degree of savings for individuals and promotes business expansion. Mbiti and Weil also conclude that there is a lack of quantitative studies on the societal effects of M-Pesa, which is what this thesis's connection to FI is doing. The second paper by Jack and Suri (2011) discusses the impact on financial transactions but on a household level. They are looking at the socio-economic impacts regarding FI, remittance patterns, savings behavior, and the wide economic effect it has on households. Jack and Suri also show that the rapid adoption of mobile phones has been a key enabler for the increased usage of MM. They also point out the fact that mobile phones were the key to reaching the financially excluded who could not use services like bank branches. The paper explains well how M-Pesa has affected financial behavior positively, whilst at the same time promoting economic development.

3.1.6 Financial Inclusion's Impact on Economic Growth in Kenya

Looking at FI's impact on GDP per capita is a research area that is scarcely investigated. However, Juile (2013) examines if there is a positive correlation between FI and GDP growth in Kenya. When conducting the analysis, he examines different FI indicators such as branch networks and the access and usage of MM such as M-Pesa, and tries to see if they correlate with GDP growth. By doing a multiple regression analysis, the author concludes that branch networks and MM have a strong and weak positive correlation with GDP growth respectively. While these show a positive correlation with GDP growth, ATMs are negatively correlated with GDP growth, as per Julie. Hence, the author is implying that policymakers should focus resources on positive access points rather than spending on access to negatively associated access points such as ATMs.

Another study that investigates the impact of FI on economic growth is the paper by Azimi (2022). The author takes a general approach rather than looking into a specific country and tries to understand how and if FI could be a valid way to increase economic growth. By integrating different variables on FI and GDP growth, the study finds a long-term positive

relationship between FI and economic growth worldwide. It is concluded that FI moves in tandem with economic growth and they are cointegrated to the extent that both affect each other. Hence, FI is stated as an effective tool for fostering economic growth globally.

3.2 Theoretical Approach

3.2.1 Financial Inclusion Theory

As previously mentioned, there have been a lot of studies on cross-country analyses of FI and even on specific national levels since the Cannes G20 Summit in 2011. However, while there has been a lot of literature on the subject, the theoretical approach has been forgotten and neglected (Ozili, 2020). There are conflicting discussions about what FI is contributing towards, but there is at the same time a willingness to agree that it has a positive impact. For instance, (Bhandari, 2018; Swamy, 2014) suggests that FI is helping mainly poor people and women in society, while other authors suggest that the overall economic landscape and the financial markets are the winners of FI (Ozili, 2018; Mehrotra & Yetman, 2015). However, while the main focus lies on accessing poor people as that is the most urgent, other groups in society such as rural people would benefit from getting included (Ozili, 2020). Ozili continues to explain that there is also a debate between policymakers and researchers on who should deliver financial services. Some suggest that it should be the government while some argue for banks and fintech startups or a combination thereof (Ozili, 2020). One of the suggestions that Ozili is proposing is the “Collaborative Intervention Theory of Financial Inclusion” (Ozili, 2020, p.101). This theory is based on the idea that if you want to reach FI, you will need your public and private sectors to collaborate to increase the level of FI. Looking at the real-life example of Kenya, this theory ties in well with how they established M-Pesa through the collaboration of Vodafone (private) and the CBK (public). Ozili (2020) states that theoretically, FI needs to be a combination of FI beneficiary, FI delivery, and FI funding to make policymakers understand the importance of FI. Using FI as a theoretical framework to show that a developing country like Kenya has succeeded by using FI as a theoretical target could be valuable for other developing countries.

3.2.2 Diffusions of Innovations Theory

To understand why innovations succeed, the “diffusion of innovations theory” (DOI) could help in explaining MM’s diffusion geographically in Kenya. It can also help establish if

counties and provinces with higher early MM adoption have accumulated higher FI levels over time. The first publication in written format of this theory was by E.M Rogers (1962) and has since been studied and researched a lot (Dearing & Cox, 2018). Theoretically, the concept of DOI explains how and why certain innovations succeed in different cultures (Rogers, Singhal & Quinlan, 2009). One of the key concepts that the authors introduce is how innovations are spreading, and what steps a new user goes through. There are five decision steps when evaluating an innovation as an adopter, (Sahin, 2006). These steps are knowledge, persuasion, decision, implementation, and confirmation, says Sahin. During the knowledge stage, the adopter gets to know about the innovation, what it is, and how it is functioning. The second stage, which is the persuasion stage, is when the adopter determines their view of the innovation and what they think about it, but it does not mean that the person either wants it or rejects it. That is done in the third step which is the decision stage, where individuals will decide whether to adopt the innovation or not. In the fourth step which is the implementation stage, the user starts to operate with the innovation. During this stage, people decide if they want to continue to use the innovation or stop using it. Lastly, people who are using the innovation will seek confirmation from other people to confirm that the individual made the right decision. This process was developed by Rogers (2003) and could be implemented in the case of diffusion as an explanation for differences in the uptake of MM in Kenya's different provinces.

According to Sahin (2006), Rogers also created five thresholds for adopters depending on when in the process of the innovation you start using it. These are called innovators, early adopters, early majority, late majority, and laggards. Innovators are not risk-averse and act as gatekeepers, introducing innovations to people not familiar with them and representing 2,5% of society. Early adopters are the most respected in the social system and people usually come to them to establish if an innovation is good or not, and these represent 13,5% of individuals. Early majority is represented by 34% of the population, and this group wants to adopt innovations before their peers do it. Late majority is also 34% of society, and this group can be restrained by innovations while still adopting them due to their peers having it. Lastly, laggards account for 16% and are the most risk-averse. They base their decisions on knowing if the innovation works and if it is a success. While looking at Kenya, these societal differences could be one of the explanations for the differences in the diffusion of MM innovations.

3.2.3 Network Effect Theory

Network effect theory can be tied to the diffusion of innovations theory because it is about getting as many people to use the innovation as possible. Network effect theory was introduced by Robert Metcalfe in 1980 when he created Metcalfe's Law which states that the value of a communications system is dependent upon the square of users (Metcalfe, 2013). This theory has been further studied and is commonly called network externalities or demand-side economies of scale. According to Katz & Shapiro (1994), they state that if one user has a membership in a service, this person will be positively affected by the fact that another user decides to join the network. Based on these assumptions of the theory, products and services that are being used by a large network of people usually also tend to be positively associated with the general public, hence leading to a stronger attraction of new users. A perfect example of such a product could be MM services and this theory could be tied to the adoption rate of MM services around different regions in Kenya. With more MM agents being available due to a larger network of MM users, that could be a positive externality related to this theory, which will be further studied in the latter part of the paper.

3.2.4 Growth Theory and Spillover Effects

The neoclassical growth theory states that through looking at the total output that an economy is producing and combining that with the level of technology that they have reached, you should be able to establish a steady economic growth rate, (Banerjee & Duflo, 2005). Theoretically, this area of study connects with the Solow-Swan model which is a part of the neoclassical growth model (Corporate Finance Institute, n.d). This framework does not explicitly tie in perfectly with the research, but it focuses on important parts like how technological progress affects economic growth, which MM has done in Kenya. It also focuses on capital accumulation which MM facilitates as well. Factors such as capital, level of technology, and labor affect GDP growth according to this theory, hence, when looking regionally within Kenya, the amount of MM usage and their economic development can be connected to this theory.

In research about FI, growth theories on MM have not been widely used. However, one of the effects of improving technology in certain areas with the aim of increased economic growth is spillover effects in other parts of the country (Pelletier et al., 2019). A spillover effect is when one economic event in a certain region, which could have both positive and negative

outcomes, will spread to other parts of the economy (Barkema et al., 2021). Theoretically, spillover effects in the case of FI and technology improvements are seen to be having a positive impact on the spatial spillover effects, (Li et al., 2022; Zhu et al., 2018). The neoclassical growth theory states that when technology improves, there should be long-term economic growth in this region. At the same time, the spillover theory says that if one region experiences this, other regions can be positively affected. Hence, this will be studied between regions in Kenya to understand if the development of MM and FI has gained them long-term growth and if that has had any spillover effects on other regions.

3.3 Connecting Theory and Literature

Theory-wise, financial inclusion theory will be connected to the overall increase in FI and MM in the analysis. Diffusion of innovations will be used when analyzing for uneven uptake of MM in different provinces and counties. Furthermore, network effects will connect high MM usage and its benefits in certain regions. Growth theory will be a foundation that emphasizes economic growth from technological advancements, while spillover effects will connect with results showing that regions benefit from proximity to successful regions in FI and MM. As for the literature, all subsections will be used as methods to confirm the importance of MM and FI. Using these together with the methods presented in the next part will hopefully give a rich analysis, discussion, and results.

4. Method and Data

4.1 Research Method

The suggested research approach will be a multi-level analysis using a quantitative research method which means analyzing and investigating different kinds of data to reach a conclusion (Watson, 2015). Using a quantitative approach will provide the opportunity to look at differences in MM adoption and FI by analyzing data and contrasting different regions against each other. Hence, descriptive statistics will be used to present and analyze the main findings from the datasets. Descriptive statistics is a good way of displaying data and it works well if you want to show trends in datasets (Nick, 2007). As this project will be analyzing trends in different regions within Kenya as well as on a national level, descriptive statistics suit it well. The decision to use a descriptive analysis instead of a regression is because the

purpose is to look at trends and patterns over time for the data on many different counties and provinces in Kenya. While a regression analysis could be useful to show the relationship between certain variables, it would not fit the objective of identifying outliers in the same visually comprehensible way as a descriptive analysis. While there are many upsides to using descriptive statistics to visualize and analyze data for this type of project there are also limitations. One limitation is that it is used to present data in a comprehensible way, hence, if you have any complex data, it should not be included as it can cover your main findings (Murphy, 2021). Doing this, you would miss out on the main benefits of using it which is why numbers on correlation and growth trends will be shown in corresponding tables instead.

Throughout the analysis, the method will be to investigate Kenya in three different layers. The first part investigates the effect that MM has had in Kenya on a national level to capture the overall trends. Furthermore, the second part of the analysis will look at the 7 different provinces to get a more zoomed-in perspective over time, rather than just looking nationally. Lastly, 47 different counties in Kenya will be analyzed to paint a picture of the differences on a subnational level which not many researchers have done yet. Using a method of investigating national, province, and county-level data on different periods will allow for contrasting the overall development since MM's introduction in 2007 with county-level data from 2021. Differences on county-level will be explained by looking at province data over time, and national data should be a result thereof.

Kenya's 7 provinces were abolished and replaced in 2010 by the already existing counties (Parliament of Kenya, n.d). However, dividing the counties into provinces will give a dimension that would not be possible by only looking at county data, which is a time-series analysis. County data is only available for the year 2021, hence province data will complement county data in explaining differences within Kenya over time. National-level data will be shown mainly on a yearly basis from around the introduction of MM in 2007 until the year of county analysis in 2021. Establishing an understanding of how MM and FI in Kenya have been developing over different periods nationally and by province will serve as a good contrast in explaining the development before concentrating on counties. Applying a subnational perspective to an already quite well-researched topic on MM and FI could give new conceivable insights about Kenya. According to Snyder (2001), researching on a subnational level will give you more observations which will enable the paper to establish more solid comparisons. Also, looking at subnational data will contrast the national data by

giving more detailed and focused insights about large economic influencers such as MM. Carlino & Defina (2006) agree with Snyder and state that using cross-country analysis instead to compare certain factors could be inaccurate as they have different political, social, and legal landscapes. However, looking at a regional approach within a country is a good way to abolish those factors, says Carlino & Defina.

4.1.1 Correlation and Standard Deviation

As correlation on its own does not explain causality, it will be used with caution when evaluating relationships. The best way of doing it will be to create a scatter plot of the X and Y variables, and connect it to a table showing correlation (Feinstein & Thomas, 2002). To interpret the results, Feinstein & Thomas states that a perfectly positive correlation has a score of +1, perfectly negative correlation -1, and 0 if there is no linear relationship at all. Every result in between is based on the expectation before doing the calculation, hence, assigning wording such as strong, moderate and weak correlation is based on your pre calculation expectation, they state. When calculating correlation in this thesis, this formula will be used:

$$\text{Correl}(X, Y) = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\sqrt{\Sigma(x-\bar{x})^2 \Sigma(y-\bar{y})^2}}$$

Where:

Σ = Summation

\bar{x} = Sample mean of variable X

\bar{y} = Sample mean of variable Y

Standard deviation is a useful measurement when you want to establish how accurately the mean is describing your data and how scattered data points are from the mean (Lee et al., 2015). The standard deviation will be used when looking at results from counties and how they differ from each other. If standard deviation is quite low and close to the mean, it will allow for an analysis of outliers both above and below the mean to capture why they have succeeded or not. This thesis calculates standard deviation like this:

$$\text{Standard Deviation} = \sqrt{\frac{\Sigma(x-\bar{x})^2}{(n-1)}}$$

Where:

Σ = Summation

\bar{x} = Sample mean

n = Sample size

4.2 Data Collection

Throughout this quantitative thesis, the use of secondary data resources in the form of datasets and data from national surveys will be prominent and incorporated to conduct the analyses. Utilizing secondary data analysis is a highly practiced method in quantitative studies and uses data already collected by primary resources, according to (Bryman et al., 2021). Data that will be used to conduct this analysis at the county-level has been collected from the Kenyan National Bureau of Statistics. During their most recent FinAccess Household County Survey (CBK, 2022) they provide detailed microdata on each of the 47 regions in Kenya. This survey is the first time that they have collected data on a subnational level for all their 47 regions independently. Hence, this specific data could be used to analyze differences between counties in depth as well as contrast it with the results of national-level analyses. Furthermore, to get the province data that show regional differences over time, FinAccess household surveys from 2009, 2013, 2016, 2019, and 2021 will be used (FSD 2009; FSD, 2013; FSD, 2016; CBK, 2019; KNBS, 2021). On top of this the CRA together with UNDP in 2022, released county data which will give additional specific data on each county to study the development in GCP per capita for instance (CRA, 2022).

Quantitative research methods allow for a longitudinal study, and this thesis will investigate variables from a longer perspective to probe for trends and similarities throughout the datasets. The data that will be used when looking at Kenya on a national level will be from the World Bank Global Findex Database (World Bank, 2021) and the IMF Financial Access Survey (IMF, 2024) where they present detailed microdata on FI indicators connected heavily to MM. Combining these datasets gives a lot of information about MM and FI development that will be necessary to do the analysis section.

These datasets on the national and subnational levels are the most optimal as they present detailed microdata in both cases. The IMF Financial Access Survey covers 99% of the adult population in its data while the World Bank Findex bases its result on over 128,000 respondents worldwide, hence a combination of these datasets for Kenya gives the coverage

needed. For the subnational county-level data, it is collected from official government institutions, and it covers over 30,000 households spread between all 47 counties so it is assumed that this data is representable as well. These datasets are well-grounded and fit the objective of analyzing the research question and will be of good use. There are some gaps in the data when looking at provinces which will be a limitation. Gaps that could limit the amount of information are especially for the North Eastern province. This is because, during the 2013 FinAccess Survey, it was not safe to conduct surveys in this province (FSD, 2013). Another limitation is that GCP per capita only stretches back to 2013, which will not allow me to look at GCP per capita growth since the introduction of MM.

To get Gross County Product (GCP) per capita and Gross Provincial Product (GPP), which is the economic performance of every county and province, own calculations will be done as only GCP is available. This will be needed as counties and provinces in Kenya have large differences in population, and only looking at GCP and GPP will not be representative and could give skewed results in the end. The same goes for the urban population which will be calculated in percentages instead of actual numbers of urban people in each county. From Table 1, you will be able to see how they are calculated and how other important variables are defined.

Table 1. *Definitions of Variables (CBK, 2022; Zikhali, 2023)*

Variables	Measurement
Financial Inclusion	FI in this thesis is measured as being formally included. This implies that this person is using financial services that are regulated by a government agency as their highest form of financial service usage.
Mobile Money	MM in this thesis is if you have an account either through a formal mobile banking service like KCB M-Pesa or through a provider which is not regulated by the government like Safaricom M-Pesa.
Gross County Product per capita	GCP per capita is calculated by dividing the GCP by the 2019 population census for each county.
Gross Province Product per capita	GPP per capita is calculated by combining the GCP per capita of each of the counties

	within a certain province to get the total.
Financial Health	This is a measurement of the ability to invest, manage day to day money for essentials, and coping with risks like emergencies.
Poverty Headcount	The amount of people living under the poverty threshold, which was 81.3 KSH per day per capita in 2015 (2.15\$).
Urbanization ratio	Urban population in each county divided by the total population of the county.

5. Analysis

5.1 Results

The following analysis is focused on the development of FI and MM over time, particularly since the introduction of MM in Kenya in 2007. Key components such as per capita income on national, province and county-level are looked at to see if the development is following the same trends over time. The following subsections will be divided into three sections with each section covering either national analysis, provincial analysis, or county analysis. Hence, the main purpose of the analysis is to answer how MM has developed in relation to FI from three angles, and further see if connected variables are following similar patterns while contrasting it on all scopes. Afterward, the analysis will be discussed during the discussion part, connecting it to previous literature and theories.

5.1.1 Kenya National-Level Analysis

Through the period 2007 and 2021, a lot has happened in the Kenyan market for FI with a large support from the innovation of MM services. To see the macro trends of MM services before investigating on a more regional basis, national data can show how the country on average has performed since the introduction of M-Pesa in 2007 on both MM and FI development. Since the year before MM's launch in 2006, MM and FI have followed very similar paths, which is seen in Figure 2. While FI began on a higher level, it can be seen that the adoption speed of MM has caught up and is at similar levels in 2021.

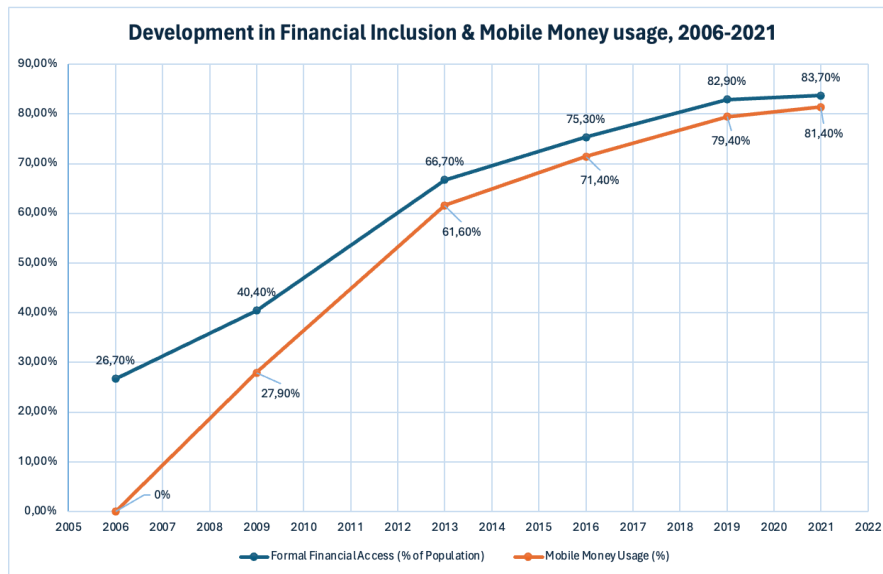


Figure 2. National Development in FI and MM in Kenya 2006-2021 (FSD, 2009; FSD, 2013; FSD, 2016; CBK, 2019; KNBS, 2021)

From Figure 3, you can see that the number of registered MM accounts per 1,000 adults has skyrocketed from 62 per 1,000 in 2007 to over 2000 per 1,000 adults. It is possible to have 2 M-Pesa accounts at the same time, hence the high number in recent years (Safaricom, 2024), and there are many different MM operators within Kenya. Furthermore, we can also see from Figure 3 that GDP per capita has been increasing in a stable trend and almost doubled in the years between 2007 and 2021. Hence, on a national level, there seem to be similar trends of increased MM usage as well as increased GDP per capita.

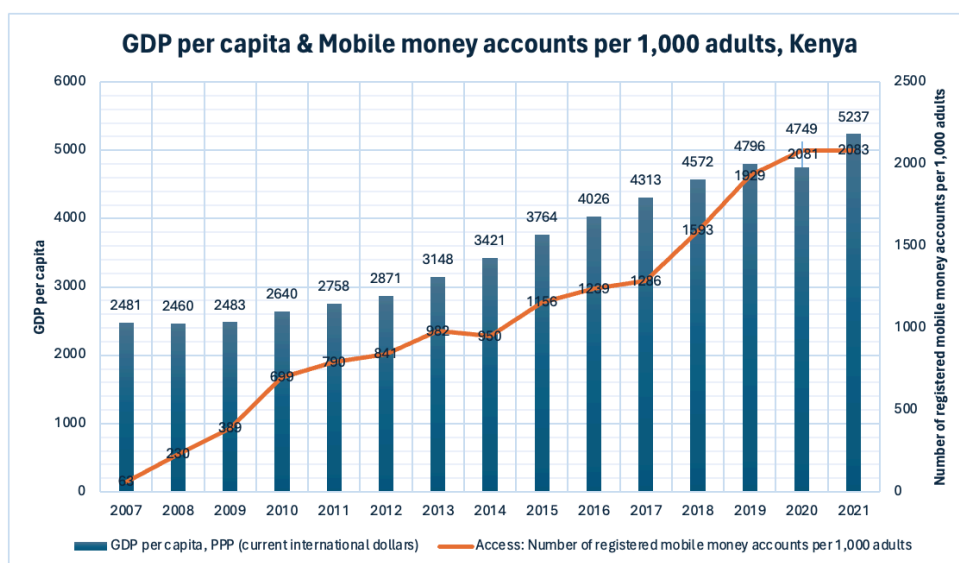


Figure 3. Relationship of GDP per capita & MM accounts in Kenya, (IMF, 2024)

So why has MM become such an important and widely used application? Looking at Figure 4a, the penetration of MM outlets since the introduction of MM has been increasing a lot more than bank branches. Bank branches have been quite stagnant in their spread with only 3,6 bank branches per 100,000 adults in 2007 and 4,6 bank branches in 2021. At the same time, MM outlets have increased from 7,4 outlets per 100,000 adults in 2007 and reached 913,4 in the year 2021. Having this kind of access is no doubt a catalyst for the increased usage of MM, as the bank branches are far less accessible to the public. At the same time, we can also see from Figure 4b that the amount of Automated Teller Machines (ATMs) was only 4,7 in 2007 and 7 in 2021, which is not a lot compared to MM outlets where you have the same ability to exchange virtual money into cash.

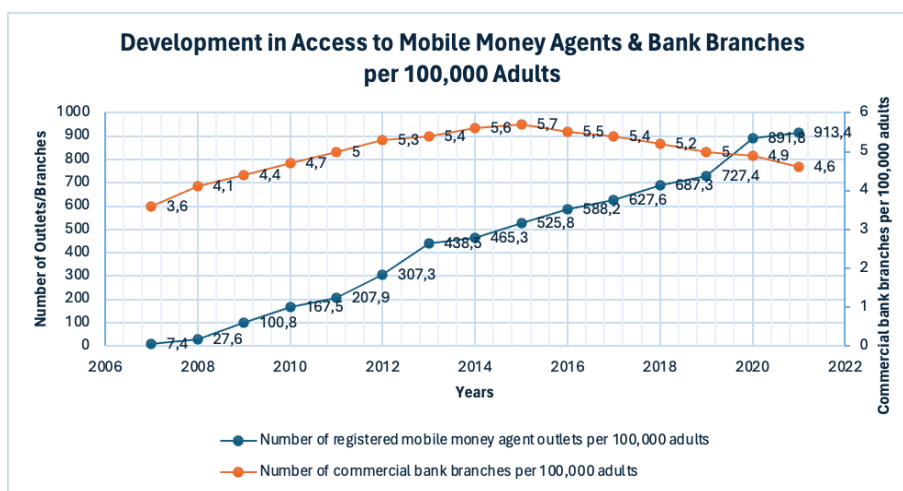


Figure 4a. Access to MM agents & Bank Branches in Kenya, (IMF, 2024)

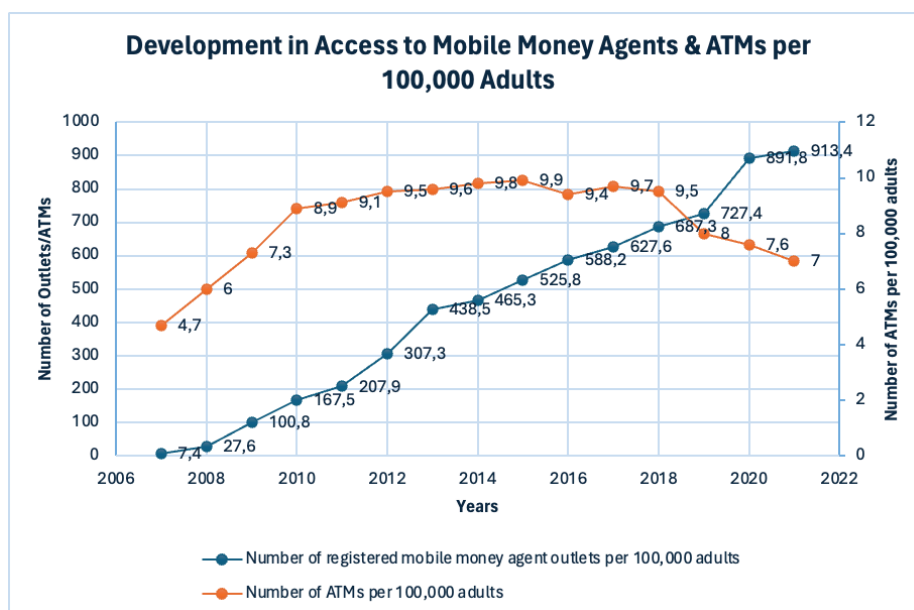


Figure 4b. Access to MM agents & ATMs in Kenya, (IMF, 2024)

Furthermore, to be able to use MM, you need a phone to access its wide range of services. From Figure 5, we can see that mobile phone penetration has increased a lot during the reference year. In 2007 it was at 30, but in 2021 it had increased to 123 mobile phone subscriptions, which means that there are more phone subscriptions in Kenya than there are people. At the same time, we can see that the number of MM transactions per 1,000 adults has also increased from only being at 255 in 2007 to reaching a level of 66,318 thousand in 2021. This means that with the increase in mobile phone penetration, the average MM transactions per person and year have increased from only 0,255 transactions in 2007 to 66,317 in 2021. Hence, the upward trend in the use of MM shown by the increased number of transactions, compared with the positive trajectory of mobile phone subscriptions points to the fact of higher use of MM with larger amounts of phone subscriptions over time.

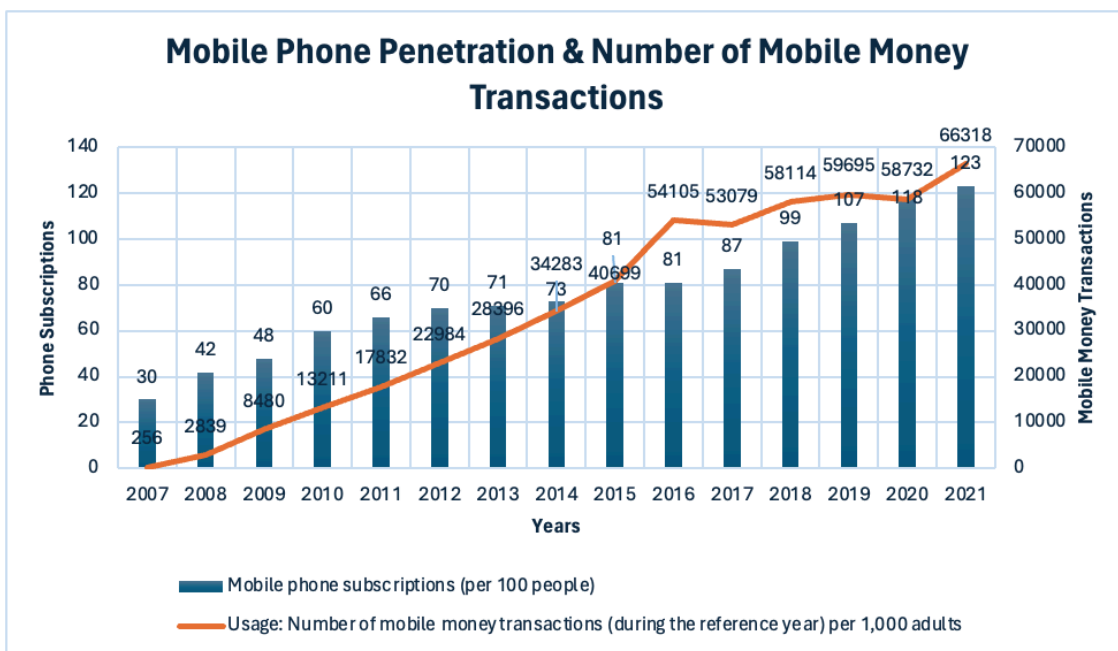


Figure 5. Development Mobile Phone Subscriptions & MM Transactions in Kenya, (IMF, 2024)

Connecting this to Figure 5, we can see that the relationship between the number of registered MM accounts and the remittance inflow as part of GDP is positive from Figure 6. As MM is a key component in making monetary transactions easier for the public, the increase in remittances as a share of GDP is not surprising. With more people being connected to MM

services, it enhances the opportunity to send money to people who are not connected to commercial bank accounts, which could be one reason for the expansion in the share of GDP. Connecting people who are living in rural villages with the opportunity to receive money from relatives who have migrated to earn more money in a different place could be key to poverty reduction. Hence, the number of MM accounts is important in facilitating more remittances, which could be a factor to improve economic growth as can be seen from its increased portion of the GDP.

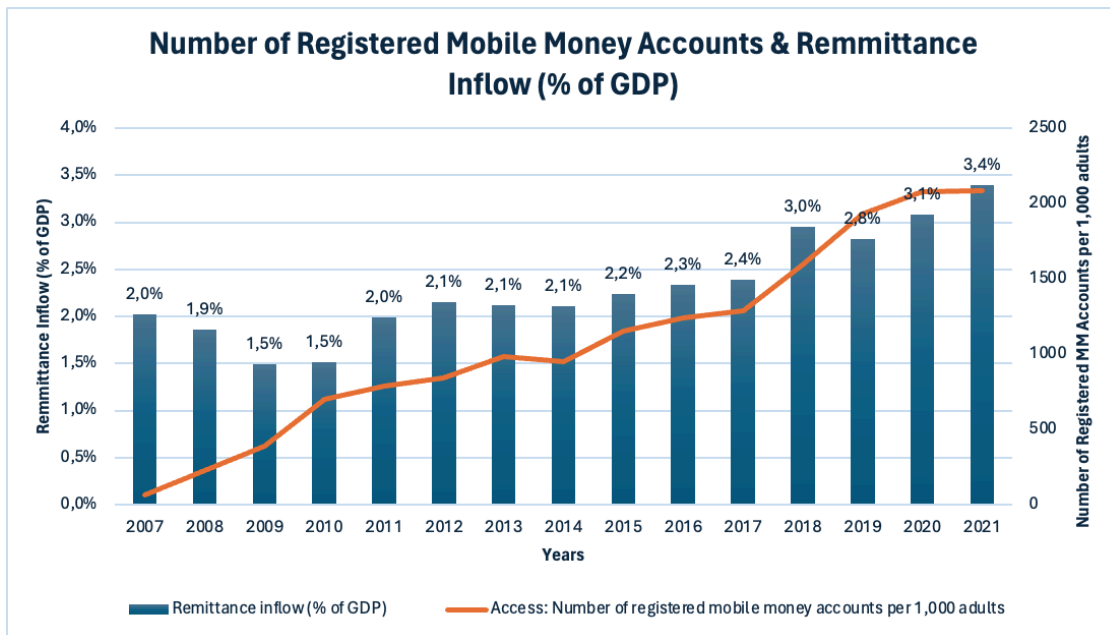


Figure 6. Relationship between MM accounts & Remittances in Kenya (IMF, 2024; World Bank, 2023b)

While it is visible that MM accounts and transactions have increased during the period, it can also be determined from Figure 7 that formal FI has been increasing a lot during the period. During the years in which the FinAccess Survey has been conducted, you can see a clear pattern of increasing FI while at the same time increasing numbers of GDP per capita. Figure 7 shows that while holding other things constant we can see that FI is following the same patterns as GDP per capita and developing upwards in parallel. It is not possible to conclude a direct effect of increased GDP per capita from higher FI as there are many factors determining GDP per capita. However, with more people having access to financial services through increased usage of MM, a development backward in GDP per capita would not have been anticipated due to a higher number of actors on the market.

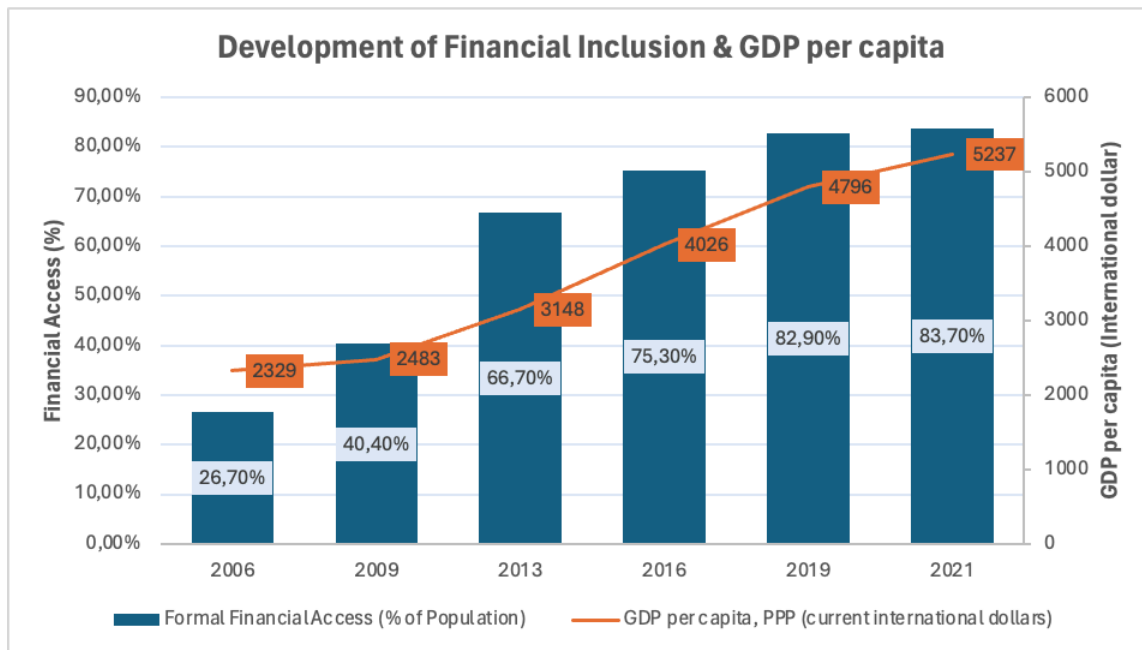


Figure 7. Trend of FI & GDP per capita in Kenya (FSD, 2009; FSD, 2013; FSD, 2016; CBK, 2019; KNBS, 2021; World Bank, 2023a)

Furthermore, looking at the 3 most heavily used financial services through the years since the introduction of MM services in Figure 8 (excluding informal financial services, as the target is to get everybody formally included) a lot has happened. While insurance services have increased in usage during the period, only 23,7% of the population is using it in 2021. Bank usage has increased overall in Kenya from 14% in 2006 up to 44,1% in 2021, which is a big increase but compared to MM usage it is barely comparable. With zero users in 2006 before the introduction of M-Pesa in 2007, it has increased gradually over the period and reached 81,4% in 2021. Citizens in Kenya often use multiple financial services, but the importance of MM compared to other financial services can be seen in Figure 8. Nationally, it can be determined that the importance of MM has played a large role in getting people to use financial services. Figure 8 is a great example of the diffusion that MM has had on a nationwide level compared to important services like bank usage and insurance. While it is not possible to determine that these would be the usage of banks and insurance if MM did not exist, it gives you an indication of the FI level in such a scenario.

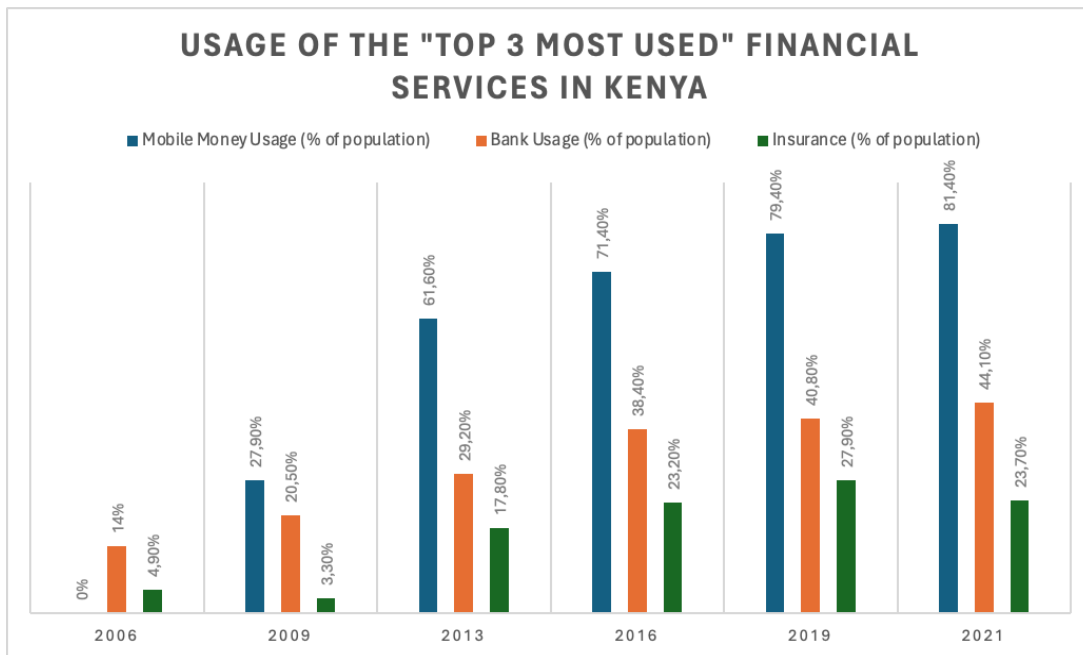


Figure 8. *Top 3 Most Used Financial Services in Kenya, (FSD, 2009; FSD, 2013; FSD, 2016; CBK, 2019; KNBS, 2021; IMF, 2024)*

5.1.2 Kenya Province-Level Analysis

Zooming into province-level data, we can determine whether there are any differences in FI and MM usage depending on where you live and how that is affecting you financially. From creating 7 different provinces based on how they were formed before provinces were abolished in 2010, it is interesting to see how different provinces have evolved since the introduction of MM and see if there are contrasts from looking nationally. As can be seen from Figure 9, provinces have followed quite similar patterns of growth in FI. You can determine that provinces with high FI in 2009 such as the Central+Nairobi province, have higher levels of FI in 2021 as well. However, if we are looking at the North Eastern province, we can see that it had a similar level of FI as Western and Nyanza in 2009, but looking at the growth until 2016, the North Eastern region got outperformed and only accumulated 24,6% contrasted to 69,8% and 71,1% for Western and Nyanza respectively. The largest increase in FI seems to be happening when provinces reach approximately 25%, jumping to approximately 70-80%. This interesting development could be an effect of network externalities with more people using MM for instance.

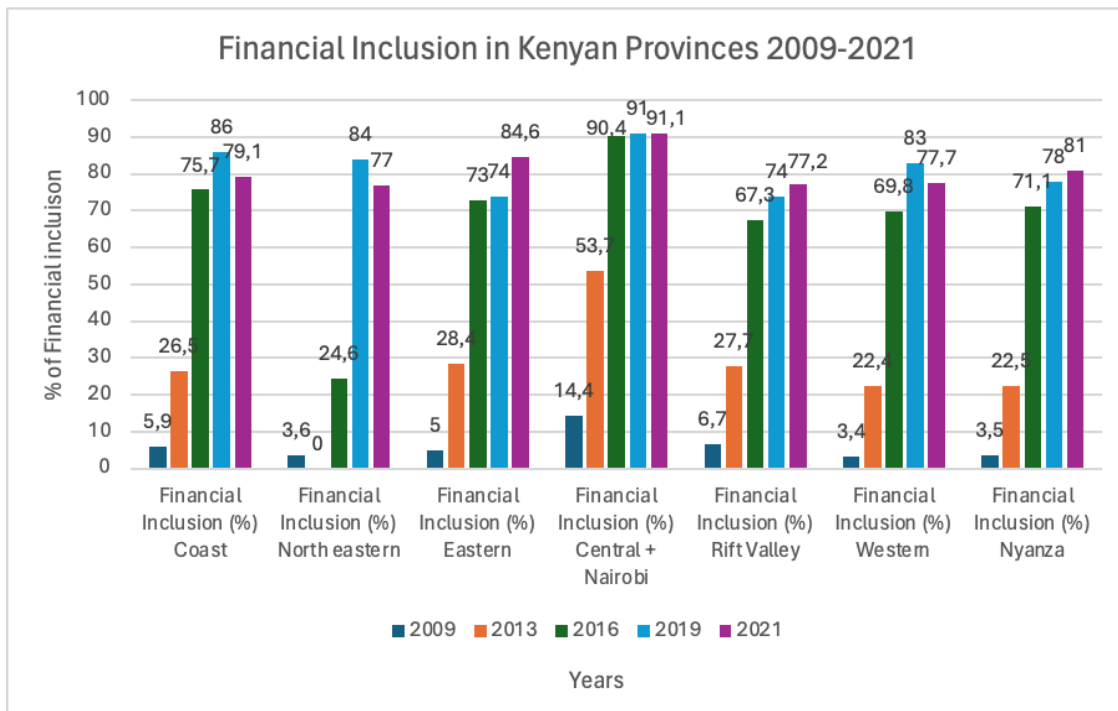


Figure 9. *Financial Inclusion Development Provinces Kenya, (FSD, 2009; FSD, 2013; FSD, 2016; CBK, 2019; KNBS, 2021)*

Two years after the introduction of M-Pesa in 2009, the usage of MM services had reached a higher level in certain regions than in others as can be seen in Figure 10a. The amount of MM used in the North Eastern province of Kenya had only reached a level of 8% in 2009 which is extremely scarce compared to the other regions. For instance, the Central+Nairobi province had a level of 48,7% usage of MM services in 2009. At the same time, the North Eastern region had 3,6% in FI while Central+Nairobi had 14,4%. Interestingly, early adopters of MM in 2009 such as Central+Nairobi seem to have a high degree of FI in 2021. Opposite this, laggards such as North Eastern province had low MM in 2009 and experienced lower FI in 2021. At the same time, it can be seen from Figure 10b that while the North Eastern region had considerably lower MM usage than any other region in 2009 it has almost caught up and converged with the average MM usage and FI in 2021 which were 78,9% and 81,1% respectively. However, Central+Nairobi is scoring a lot better in both MM usage and FI both in 2009 and 2021. By looking at the differences between 2009 and 2021, numbers are more scattered in 2009 than it was in 2021. The standard deviation in 2009 for MM usage and FI respectively was 12,5 and 3,9. Interestingly, in 2021 that number was 4,6 and 5,2, which means that MM has converged but FI has diverged between the provinces.

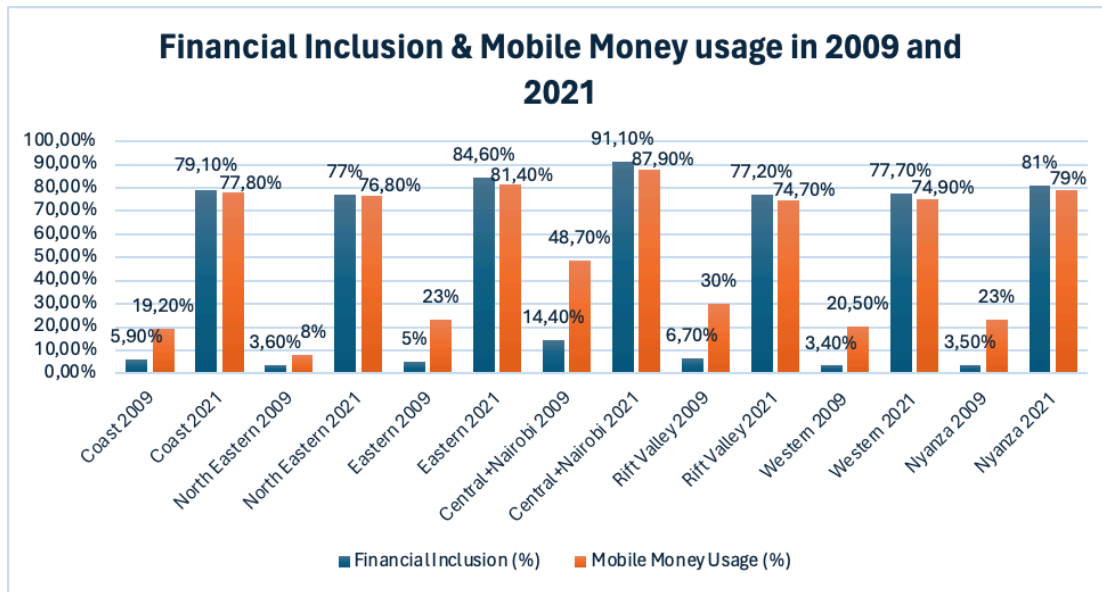


Figure 10a. Level of FI and MM in each Kenyan province for the year of 2009 and 2021, (FSD, 2009; CBK, 2022)

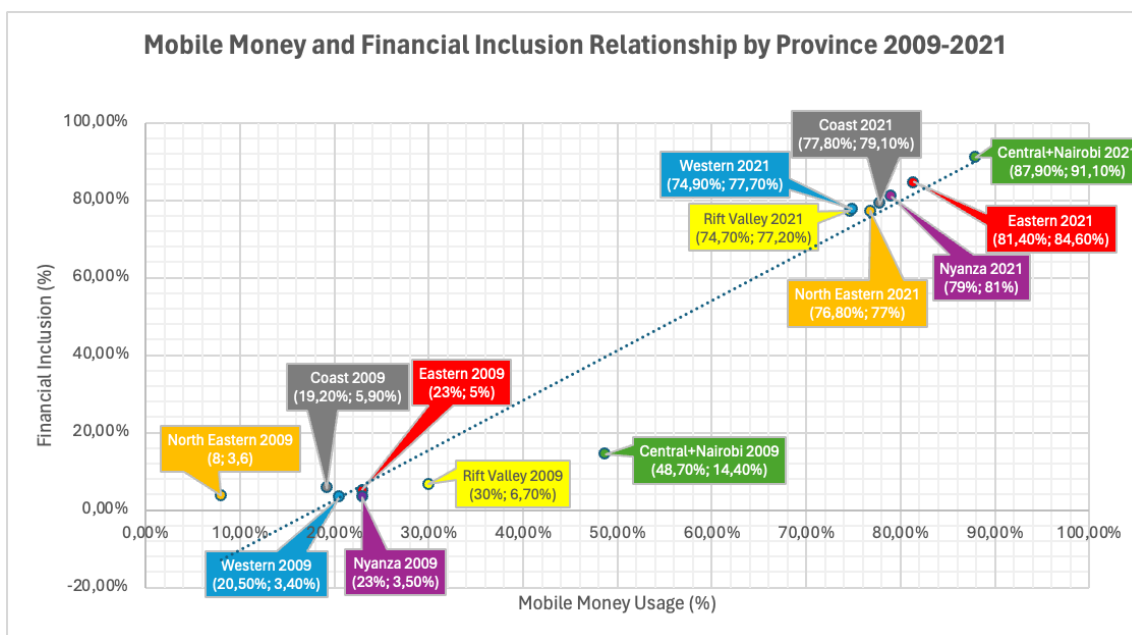


Figure 10b. Relationship and development between FI & MM in 2009 contrasted to 2021, (FSD, 2009; CBK, 2022)

Through the same period between 2009 and 2021, it can be seen from Figure 11 that there are declining numbers of urbanization in most provinces. The province that has experienced the highest growth in urbanization is North Eastern. That is interesting as they also had the joint lowest urbanization and the lowest MM diffusion in 2009. However, during the same period, they have experienced large growth in MM usage and FI. Hence, the province with the largest increase in urbanization also has the largest increase in MM usage. Five out of seven

provinces showed a declining rate in urban population, a possible explanation for this can be connected to Figures 4a & 4b and the increase in MM agents and access points. This might indicate that services such as MM agents have enabled access in rural places, which decreases the incentive for urban living. At the same time, Central+Nairobi has the highest urbanization while also registering the highest numbers of MM and FI in Figure 10b.

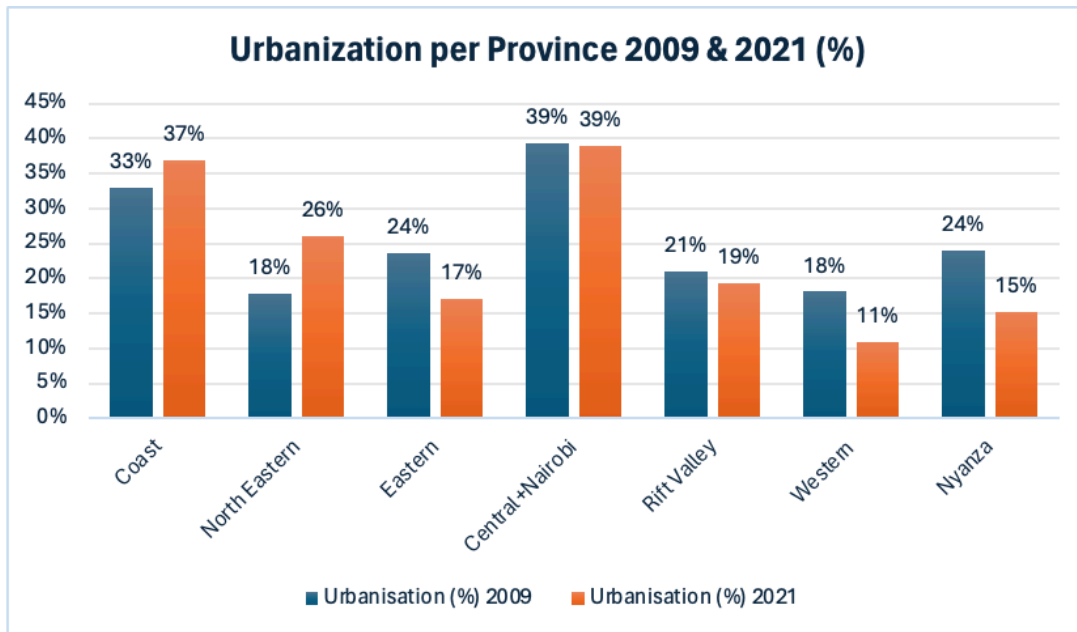


Figure 11. *Urbanization by Province (CRA, 2022; CBK, 2022)*

From Figure 12 it is possible to see the trends in FI and Gross Province Product per capita (GPP) during the measurement years of 2013, 2016, 2019, and 2021. By investigating the development in both variables, we can see that while FI is increasing, GPP per capita is following the same trend. In every province, GPP per capita has been developing positively. The introduction of MM and the increase in financial access could be a factor in promoting better living standards in these provinces. Looking at Table 2, the largest yearly growth in GPP per capita is found in Rift Valley and the North Eastern province which both increased by 7,5% throughout this period. At the same time, the biggest increase in FI during this period was in Nyanza which grew 29,9% yearly during these years. However, the largest growth in MM usage among the provinces was in the North Eastern region where MM usage increased by 20,7% yearly. Throughout this period, North Eastern had the outstanding highest growth in MM usage, one of the highest growth in FI, and almost the highest growth in GPP per capita. Despite this, it is impossible to neglect the fact that the 2021 GPP per capita of 67,685 KSH is almost 50% lower than the second lowest which was Western with 119,294

KSH. This is evidence towards the research question that despite showing impressive numbers on national level, impressive growth figures in overall GDP per capita and FI can overshadow large disparities such as this one.

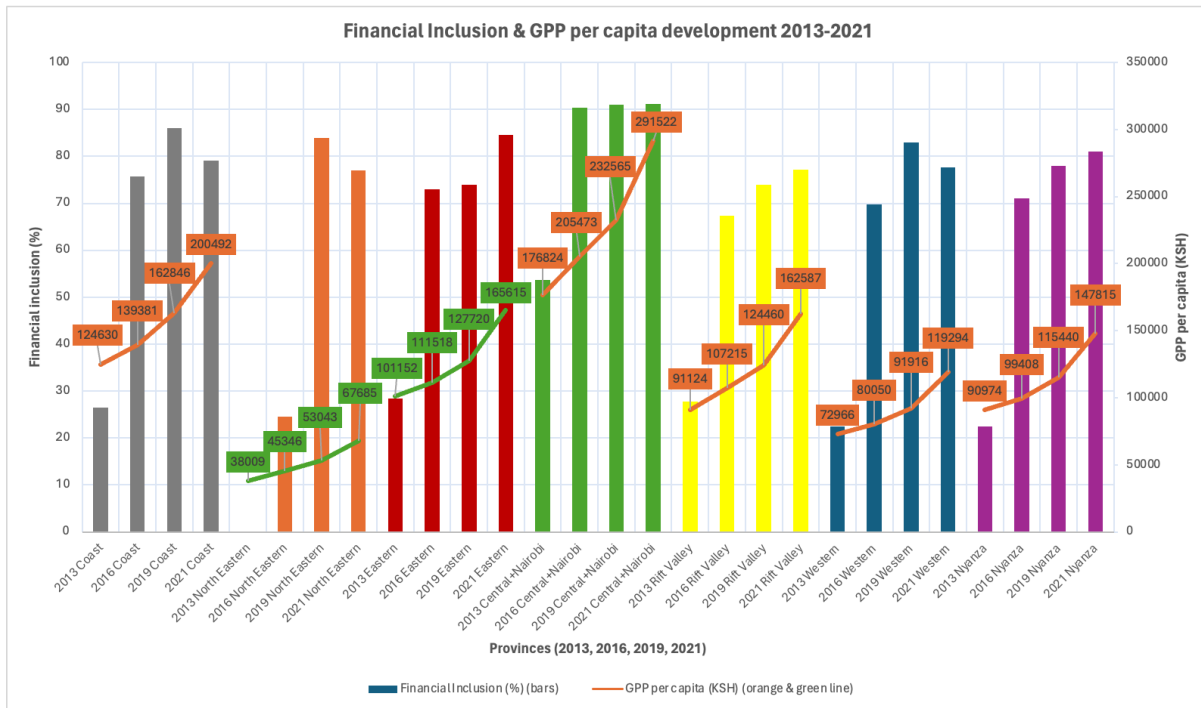


Figure 12. Relationship between GDP per capita & FI on a province basis (KNBS, 2021a; FSD, 2013; FSD, 2016; CBK, 2019; KNBS, 2021b; CBK, 2022)

Table 2. Table showing the average yearly growth of GDP, FI and MM for each Province in Kenya, (KNBS, 2021a; FSD, 2013; FSD, 2016; CBK, 2019; KNBS, 2021b; CBK, 2022)

Province	GDP growth 2013-2021 (%)	Financial Inclusion growth 2009-2021 (%)	MM usage growth 2009-2021 (%)
Coast	6,1%	24,1%	12,4%
North Eastern	7,5%	29,1%	20,7%
Eastern	6,4%	26,6%	11,1%
Central + Nairobi	6,4%	16,6%	5%
Rift Valley	7,5%	22,6%	7,9%

Western	6,3%	29,8%	11,4%
Nyanza	6,3%	29,9%	10,8%

5.1.3 Kenya County-Level Analysis 2021

Zooming in even more on Kenya, it is now possible to understand the differences on a regional level based on data from 2021. Having analyzed the development on both national and provincial levels, it is now time to look at Kenya's 47 counties. Analyzing the counties with the highest and lowest FI is done to unveil contrasts that cannot be seen by looking nationally. As can be seen from Figure 13, the bottom percentile and the top percentile consist of 5 counties each. The county with the lowest FI is West Pokot with 57,7 % while the county with the highest FI is Nairobi with 95%, which already unveils large contrasts. Throughout the 47 regions, the mean FI is 81,01% which shows that West Pokot is way below the average while Nairobi is way above. The standard deviation is 8,86 percentage points which suggests that regions are scattered around the mean but not to a large degree. Thus, as most counties rank closer to the mean it should be interesting to analyze the top 5 and the bottom 5 counties to reveal their differences.

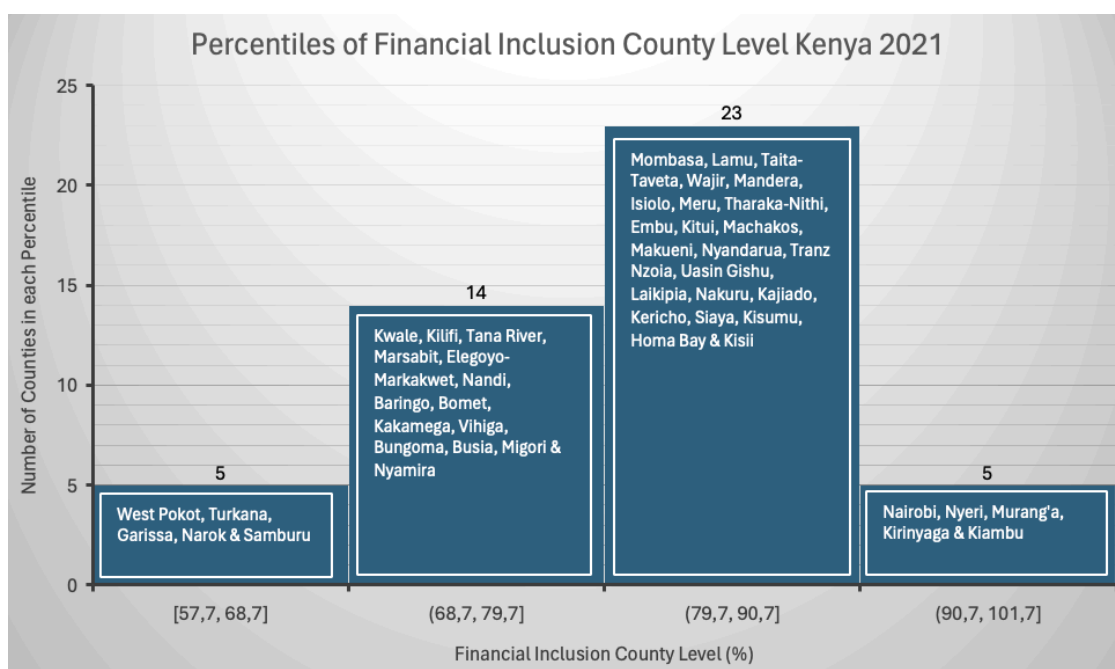


Figure 13. FI on a county-level, divided into percentiles showing highest and lowest counties, (CBK, 2022)

Table 3. Mean, Standard Deviation, Min and Max in terms of county FI, (CBK, 2022)

Statistics	Financial Inclusion
Mean	81,01
Standard Deviation	8,86
Min	57,7
Max	95

What can be seen from Figure 14 is that counties with a low number of MM registered low numbers of FI. At the same time, counties with the highest amount of MM usage also display the highest level of FI. West Pokot has the lowest FI while accounting for the lowest MM usage. The opposite goes for Nairobi, it has the highest share of FI while having the highest share of MM. Hence, while it is not possible to praise MM entirely for high levels of FI, it can be stated that at least for Kenya it is true that having a higher share of MM usage in a county will come with higher FI. Thus, contrasting Figure 8 and the national average in MM of 81,4% with 55% in West Pokot reinforces the argument of differences depending on what perspective you analyze.

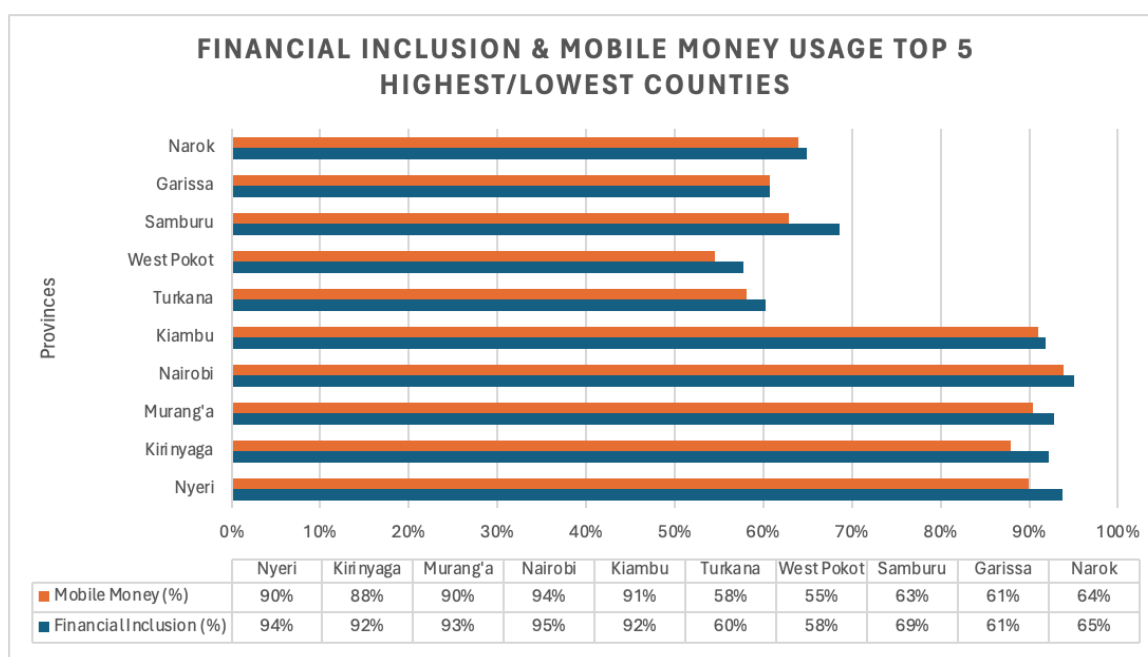


Figure 14. FI and MM usage for “least” and “highest” counties in Kenya, (CBK, 2022)

Looking at access, both MM agents and bank branches per 100,000 adults allow people to access their finances. However, similar to Figures 4a & 4b, there are disparities here as well. From analyzing Figure 15, counties established with the highest FI in Figure 13 have an advantage in access to bank branches. Nairobi is the county with the highest access to bank branches and registers 12,8 bank branches per 100,000 inhabitants. On the other hand, Turkana and West Pokot with the least amount of FI also have the least amount of access to bank branches per 100,000 inhabitants with 0,7 branches respectively. Similarly, counties with low FI also show weak numbers in access to MM agents which strengthens the argument of MM as key in developing FI. Samburu only registers 23 MM agents per 100,000 inhabitants while Nairobi has 1341. Hence, MM agents per 100,000 inhabitants show even lower numbers for counties with low FI and even higher for some counties with high FI compared to Figures 4a & 4b.

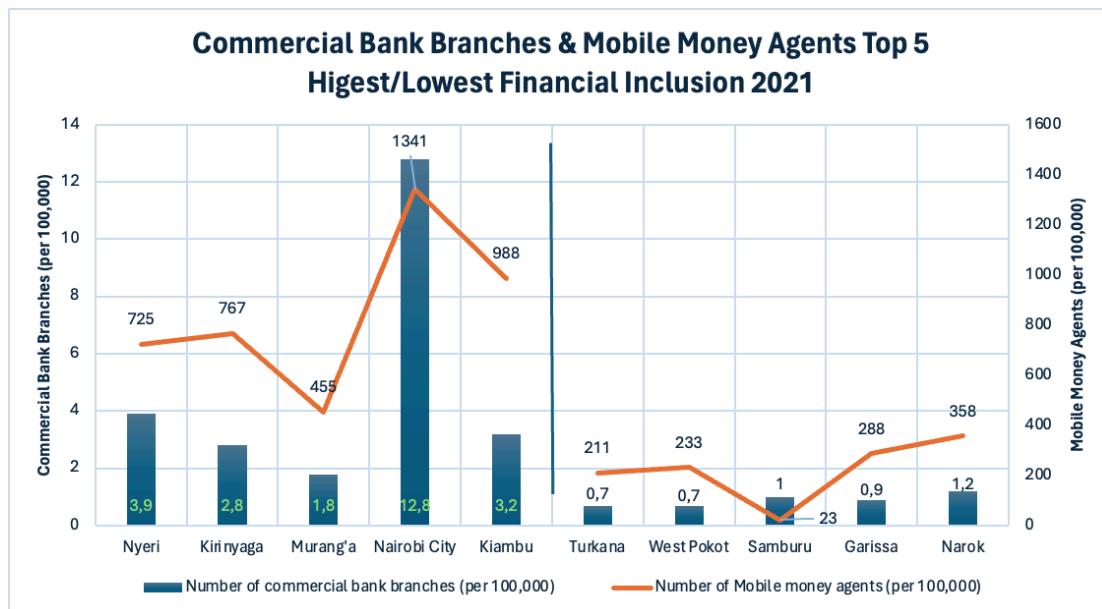


Figure 15. Bank Branches & MM agents in counties with highest and lowest FI, (CBK, 2022)

These counties also experience large differences in financially healthy adults and poverty headcount, visible in Figure 16. Counties with the highest MM usage have higher financial health and lower poverty headcounts. Conversely, counties with the lowest FI and MM usage have the lowest figures for financial health while showing that they also have the highest amount of poverty headcount. Hence, there is a tendency that counties that use mobile money to a larger extent also have a higher amount of financial health and lower poverty headcount.

It cannot be determined to be solely from MM usage, however, increasing access and usage of MM should not impair financial health and poverty headcount according to Figure 16.

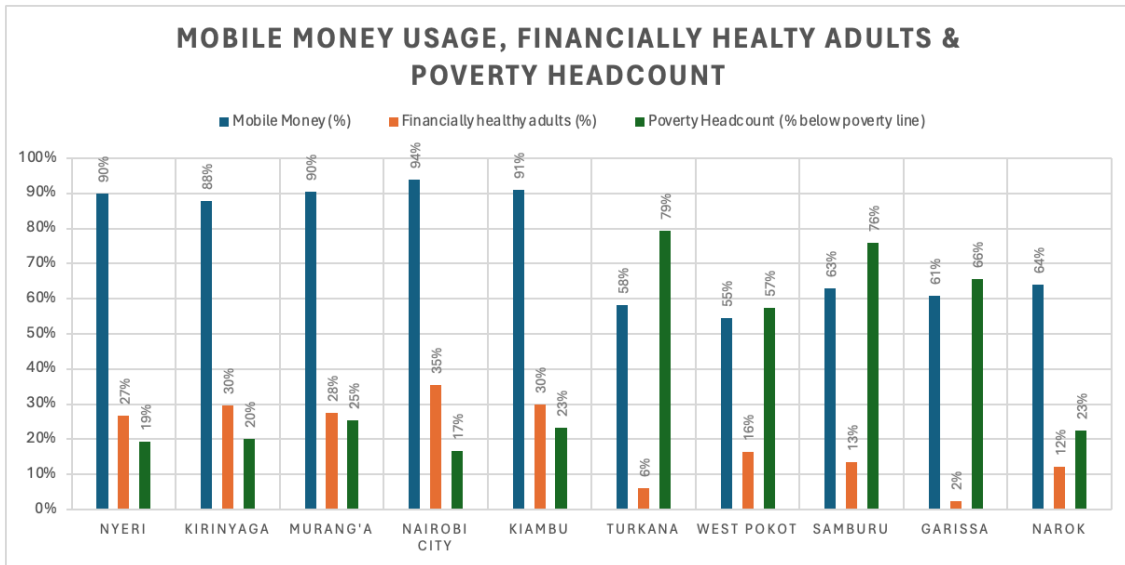


Figure 16. MM usage, Financial Health and Poverty Headcount in top vs bottom FI counties, (CBK, 2022)

On a county-level, having higher rates of FI and MM does seem to imply better access to financial access points with reduced poverty headcount and improved financial health. However, do high FI and MM relate in any way to the GCP per capita? Looking at Figure 17, there is an upward trend in the relationship between FI and GCP per capita for the 47 counties in 2021. Thus, most regions follow the trend of high FI and high GCP per capita and vice versa apart from some outliers. However, Nairobi for instance has a high amount of FI at 95% and has 606,818 KSH per capita which is the highest. On the other hand, Garissa only has 61% FI with 75,000 KSH per capita, and evidently, counties with low FI tend to display low GCP per capita as well. At the same time, Wajir which has 87% in FI but the lowest GCP per capita of 62,500 KSH does not follow the trend. This is not surprising as GCP per capita is not only a product of FI, however, the upward trendline indicates the importance of FI and the technological progress of MM in relation to economic growth.

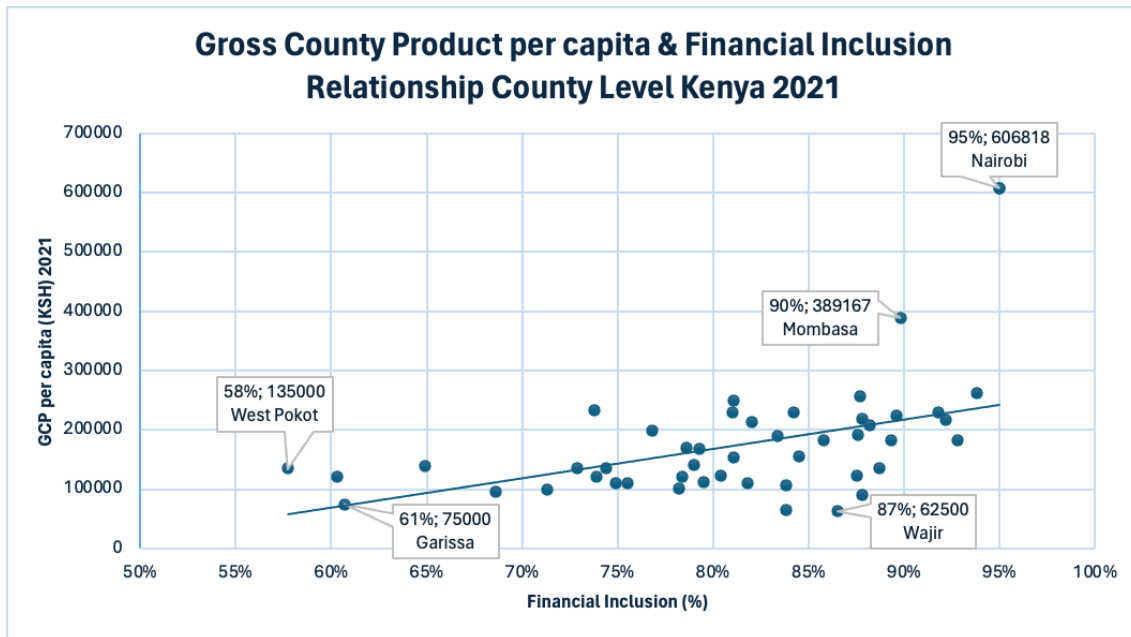


Figure 17. Relationship between GCP per capita and FI in all 47 Counties in Kenya, (CBK, 2022)

The correlation coefficient for the relationship between GCP per capita 2021 and FI in Table 4 is 0,483 which shows a moderate positive correlation compared to the expected outcome. Hence, FI and GCP per capita do have a positive relationship, it is however not convincingly strong. Some regions have higher GCP per capita compared to their low FI than expected which makes them outliers in Figure 17. However, based on the correlation and the upward slope of the trendline, the general outcome is that counties with higher FI tend to have higher GCP per capita as well.

Table 4. Correlation Table of FI and GCP per capita for all 47 counties in Kenya 2021, (CBK, 2022)

Variable	Financial Inclusion (%)	GCP per capita (KSH) 2021
Financial Inclusion (%)	1	0,483
GCP per capita (KSH) 2021	0,483	1

In Figure 18, FI and MM have been plotted county-wise as an average between the two variables into the actual map of Kenya for the year 2021. The county with the highest average

marked in red is Nairobi with a score of 94%. Interestingly, counties close to Nairobi seem to have a higher amount of FI and MM which indicates that there could be a spillover effect from being close to the capital and the county with the highest combined FI and MM. From Figure 13 together with Figure 1, we can see that all of these counties are part of Central+Nairobi province. Thus, this corresponds well with Figure 18 as these counties in Central+Nairobi have the highest FI and MM averages. While there are other counties with high scores, the top performers are based close to Nairobi. Hence, Figure 18 confirms the question about large differences in national, province, and county data.

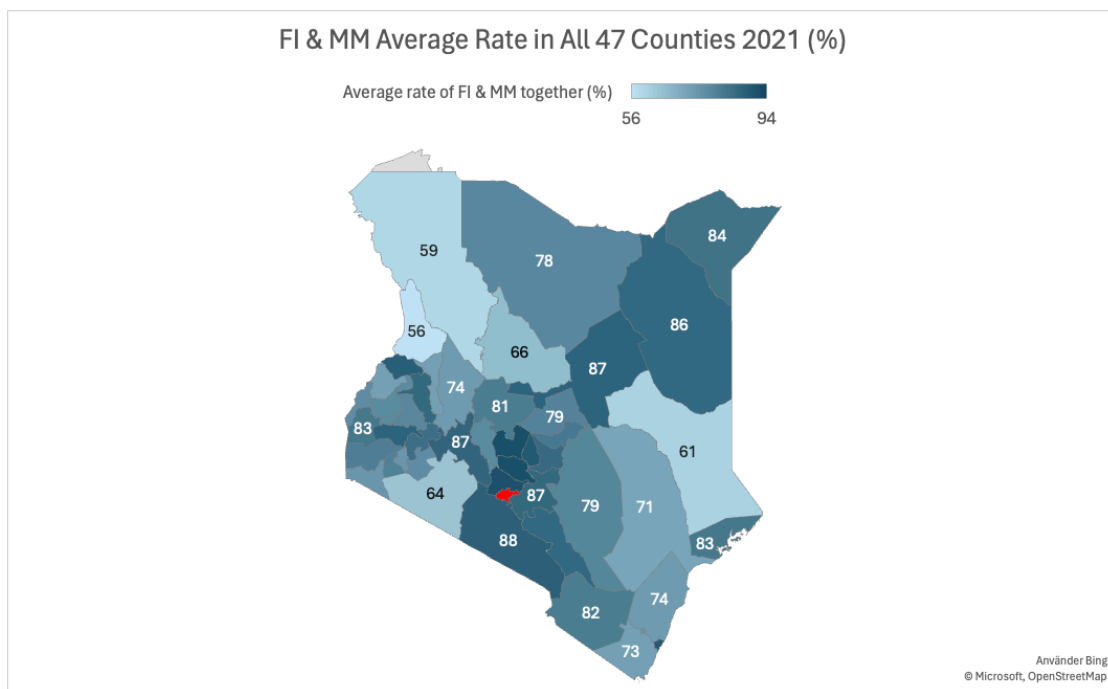


Figure 18. Compiled average of MM and FI portrayed on a Map of all 47 counties in Kenya, (CBK, 2022)

Lastly, from Figure 19, regions that are situated in close vicinity to the capital tend to also have a higher amount of GCP per capita. While it is not the sole reason for economic prosperity, this promotes the understanding of the importance of FI and MM and why MM is integral in development research. As explained in Figure 16, there are some outliers and anomalies that can be seen from looking at the two maps as well. However, counties within or closer to the Central+Nairobi province can be seen to have a higher amount of GCP per capita while also having high figures of FI and MM.

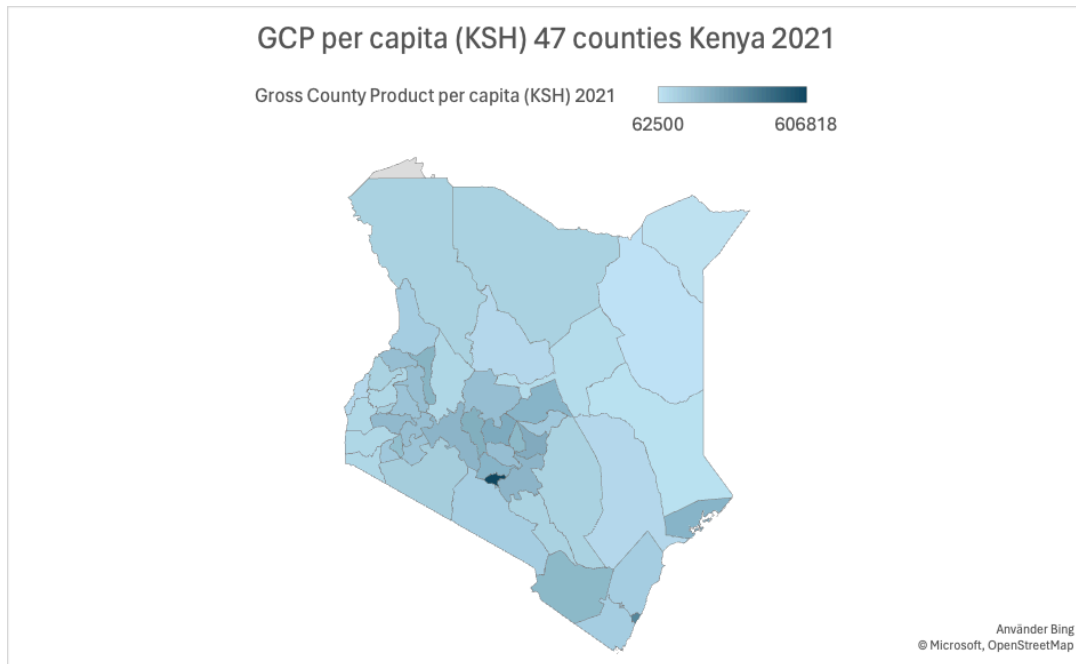


Figure 19. *GCP per capita shown respectively on Map of all 47 counties in Kenya, (CBK, 2022)*

5.2 Discussion

From analyzing the results, there are similarities but also differences depending on if you look at national, province, or county data for Kenya. Peeling off a layer at a time lets one understand the dynamics of the overall development. Nonetheless, starting at the national level, MM usage has increased a lot during the period between 2007 and 2021 and so has FI. From looking at Figure 2, these variables follow similar patterns, and they show a large increase over the period. This corresponds well with what Ndung'u (2018) is saying, which is that MM will lead to a higher degree of FI on the national level. Figure 3 indicates that GDP per capita in Kenya follows the same patterns as mobile money accounts per 1000 adults have done since 2007. As FI is seen to be influenced highly by the increased use of MM, this result is in line with what Julie (2013) says. Julie states that MM applications such as M-Pesa are contributing to a higher GDP growth, which can also be seen in Figure 7. This is also in line with the growth theories stated by Banerjee & Duflo (2005), which states that with increased use and development of technology, consistent economic growth should be increasing. Storchi et al., (2023) state that MM use will increase GDP per capita growth by 5,9%, however, the findings in this paper would point to a higher increase nationally which is a bit contradicting. Understanding the sole effect of MM on GDP per capita is difficult as many variables affect it, nonetheless, the large adoption of MM accounts and the upward

trend in GDP growth together with the GPP per capita growth in Table 2 point to MM's importance.

A key aspect of MM and FI is access, and as can be seen from Figures 4a and 4b there is a growing reliance on access from MM agents. Both bank branches and ATMs per 100,000 adults show low numbers compared to the access that MM users have to MM agents. Hence, access to MM agents has become more and more important to increase FI since the introduction of M-Pesa in 2007, which the trend shows. Ndung'u (2018) also pointed out the importance of improved access, with bank branches being situated far away it leads to people remaining excluded due to a lack of accessibility.

Another key aspect of the increase in MM, and an enabler for the innovations to diffuse nationally, has been the growing penetration of mobile phones in Kenya. From Figure 5, it can be seen that with the growing number of mobile phones, the rate of MM transactions has followed the same pattern. Jack and Suri (2011) argue the same in their paper, pointing at the importance of mobile phone penetration for the increase in MM and a decrease in financial exclusion. A key aspect of this is remittances which can enable formerly excluded people to receive money more easily from relatives far away. In the literature, remittances both increase trade between regions but also allow rural people to get money through MM and commercialize their businesses (Tembo & Okoro, 2021; Kikulwe et al., 2014). A key aspect of the increased remittances has also been that MM decreased the average cost of remittance, this has led to increased remittances and economic growth which is also the result of Figure 6 (GSMA, 2022). Figure 8 shows the rapid adoption that MM services have had throughout the period. MM has increased in a far more extensive manner than the second and third most used financial services in bank usage and insurance services which is in line with the findings of Ntwiga (2016). Furthermore, this also correlates well with what Mbiti and Weil (2016) say about the rapid adoption of MM in Kenya, where they suggest that this comes from the efficiency of transferring funds in an easier way than previously available. Thus, from a national perspective since M-Pesa's launch, there have been positive trends in MM which have been accompanied by similar patterns in FI and economic growth. However, province-level results are going to portray some similarities but also some differences.

Province-level data suggest that the overall FI development in Kenya has followed similar patterns, but some provinces have lagged. The North Eastern province started in 2009 with a low level of FI and until 2016 it continued to be below the average adoption. One of the key

reasons for this could be the low level of MM's relationship with FI, as can be seen in Figure 9. On the other hand, the Central+Nairobi region is showing a higher level of FI in 2009 than any other province which corresponds well with them having the highest level of FI in 2021 as well. This ties in well with the diffusion of innovations theory, with North Eastern being a laggard and Central+Nairobi being innovators/early adopters (Sahin, 2006). Provinces with higher adoption should have gone through the five decision steps explained by Sahin faster than provinces with lower adoption. Figure 10a shows that the high adoption of MM in 2009 in most cases means high FI in 2021. Most importantly, the standard deviation in Figure 10b has decreased in MM usage between 2009 and 2021 with North Eastern showing impressive progress by catching up in both MM and FI. Central+Nairobi also registered the highest relationship between MM and FI in both 2009 and 2021, according to Figure 10b. These results are in line with (Ndungu, 2018; Morawczynski, 2009; Mbiti & Weil, 2016; Jack & Suri, 2011) which all state the importance of MM to FI. What can be concluded is that provinces with higher amounts of MM seem to have a higher amount of FI.

The relationship between MM and FI has become more equal in 2021 than in 2009 thanks to the large increase in MM usage in provinces like the North Eastern. Furthermore, the economic growth in the form of GPP per capita has been following the same path as FI. From Figure 12, it is clear to see that with higher levels of FI in each province, the GPP also tends to be improving year by year. While the effect on GPP cannot solely be determined to originate from an increase in FI, it can be determined that they follow the same trend which indicates that provinces should prioritize increasing their FI to improve their economic well-being. This ties into what Azimi (2022) says, which is that FI and GDP per capita move in tandem. Urbanization does not seem to have any major effects from MM or FI. Provinces like North Eastern increased their urbanization from 2009 until 2021 while provinces like Western and Nyanza decreased theirs. All regions have shown high numbers of MM and FI growth whilst experiencing different patterns of urbanization. Hence, this indicates that MM has a positive effect on FI regardless of whether you live in an urban or rural location, which is in line with (Cook, 2017; Kikulwe et al., 2014; Kim, 2020). Table 2 together with Figure 12 emphasizes the importance of looking at province data to spot differences. While the North Eastern province has impressively grown 7,5% in GPP per capita on a yearly average between 2009 and 2021 and improved FI and MM growth by 29,1% and 20,7% respectively, it has still almost 50% less GPP per capita than the second lowest province in 2021. Meanwhile, this does not contradict Azimi (2022), it shows that looking at long-term

economic growth proves that FI has been highly influential. However, some provinces still have low levels of GPP per capita despite impressive growth in MM and FI. By zooming in on provinces, the main results were that MM has been important but there are large differences in their respective diffusion. Not surprisingly, low usage of MM is most prominent in provinces with lower levels of FI and GPP per capita.

From looking at the county data, results show some differences compared to looking at national and province-level data. The normal distribution in Figure 13 shows that 5 counties qualify for the high FI percentile while there are 5 that qualify for low. Furthermore, Table 3 states that the mean FI is 81,01% and that the standard deviation is 8,86 percentage points, which is not very high. Hence, comparing differences between the top 5 and the bottom 5 counties shows some interesting differences instead of incorporating all 47. Figure 14 describes that counties with lower MM also have much lower FI than counties with high MM. Theoretically, this ties in quite well with what Katz and Shapiro (1994) state about network externalities as a higher degree of usage should benefit their development.

Access-wise, counties with high FI have much higher access to both MM agents and commercial bank branches, as can be seen in Figure 15. On a county-level, this confirms what Ndung'u (2018) states about being close and having the ability to interact with financial access points to improve FI. Figure 16 describes the relationship of high MM use with financial health and poverty headcount. Counties with the highest FI and largest amount of MM usage tend to have higher financial health but lower poverty headcount, and the opposite goes for counties with low MM usage. This confirms the statements of (Mawussi et al., 2023; Asongo & Roux, 2023) who suggest that MM is an important tool for decreasing poverty headcount. Hence, a key factor in decreasing poverty headcount and increasing financial health in certain regions seems to be that you achieve higher levels of MM.

Generally, throughout counties, there is a positive relationship between counties with higher FI and their GCP level which can be seen from Figure 17. Most counties show that higher FI is associated with a higher amount of GCP per capita. However, there are some outliers. Nairobi follows the trend of having high GCP per capita with high FI while Garissa has low FI and GCP per capita. Counties like West Pokot and Wajir on the other hand are not following this trend. West Pokot has a reasonably high GCP per capita but the lowest FI, while Wajir has quite a high FI but the lowest GCP per capita. The overall correlation and trend are however modestly positive between FI and GCP per capita as seen in Table 4,

which is in line with the findings of Julie (2013). As the expectation beforehand was that it would be a bit higher due to FI's importance to economic growth (Azimi, 2022), these results can only be determined to be modestly positively correlated. Thus, FI is indeed important for economic growth, but this correlation can not prove causation which means that other variables can impact it as well. Lastly, the compounded average of FI and MM can be seen in Figure 18. The results indicate that the closer you are situated to the capital Nairobi, you are more likely to have a higher amount of compounded FI and MM. As Nairobi has the highest FI and MM, this is theoretically in line with the spillover effects (Li et al., 2022; Zhu et al., 2018). Interestingly, these counties also seem to show a higher amount of GCP per capita as can be seen in Figure 19 which correlates well with the spillover effect theories presented by (Pelletier et al., 2019). What can be seen from looking at county-level data is that there are large differences between counties in Kenya, and it provides insights into the importance of MM that nation-level data cannot. Evidently, MM and FI are important for economic performance in each county which will create differences between provinces.

6. Conclusion

The purpose of this study was to contribute to existing knowledge about MM as an important tool for increasing FI by doing a multi-level analysis showing trends in subnational data within Kenya contrasted with national data. As stated explicitly, national data was presented to examine the impact of MM since the introduction of M-Pesa and how the overall FI and its determinants have performed. Province data was incorporated to show trends in regional MM and FI data over time to exhibit differences between regions within Kenya. County data from 2021 was examined to establish the results on specific regions to portray the irregularities in MM adoption and thus unequal levels of FI. Hence, improving on a topic that has previously been dominated by national analyses by showing regional differences, which has been successful.

Nationally, the established results and trends have shown the increasing importance of MM in Kenya. MM and FI are following the same trends over time, similar to the case of GDP per capita. Also emphasizing the importance of access in the shape of increased use and availability of MM agents, a higher degree of mobile phone penetration, and the efficiency of remittances has contributed to establishing MM as important for FI. While it is not possible to

establish MM as a sole contributor to growth nationally in FI, it can be determined by analyzing national data that both MM and FI have increased in tandem since its introduction.

Province-level data showed that while FI growth has been positive since 2009, there are large differences between their development. Irregularities in the adoption rate of MM in 2009 display that provinces with slower adoption rates tend to have a lower amount of FI in 2021. However, the relationship between MM and FI was much higher in 2021 compared to 2009 where they had huge differences in both MM and FI. GPP per capita and FI are also following similar trends, and the province with the highest MM growth also shows among the highest in both FI growth and GPP growth. Hence, while provinces are displaying similar trends, there are still large differences in development through the years.

Analyzing counties, they display even larger differences than on the province-level. Counties with the lowest amount of MM usage display the least amount of FI as well. A big factor in this is the contrasting access to financial services that they have available. Counties with high FI and MM have much higher access to bank branches and MM agents. Thus, higher MM usage is also associated with much higher financial health and much lower poverty headcount. It can also be seen that individual counties with higher FI also tend to have higher GCP per capita, apart from some outliers. Lastly, when compiled into an average MM and FI, counties closer to the Central+Nairobi region do generally score higher results, with this also being true for GCP per capita.

These results confirm the research question that MM has contributed to FI in Kenya differently, depending on whether you look at national, province, or county-level data. Overall, however, based on the findings MM should be seen as a key instrument that should be enhanced when promoting FI. As research has not been done on a subnational level on MM in Kenya largely before, this thesis contributes to the relevant debate of increasing FI with innovative solutions such as MM. Furthermore, it can hopefully be of importance to policymakers in both Kenya and other developing countries when implementing new frameworks for establishing MM and increasing FI and hopefully make them introduce a model where the whole country experiences more equal FI levels.

6.1 Limitations & Future Research

The main limitations of this study would be that some data on the province-level was not available, particularly for the North Eastern province which could have improved some

graphs. Another limitation could be the fact of only looking at Kenya. As every country has its own culture and challenges, frameworks for MM and FI might need to be developed independently to make sure that the process of MM and FI suits their needs. The fact that financial access data only has been released once is also a limitation, as it would have been interesting to look at county experience over a longer period to see the exact effects of MM implementation.

Tying that to future research, a good approach would be to conduct a similar study but wait for the next financial access survey on a county-level to see how they are developing. Conducting the same analysis as has been done in this together with a regression analysis from data at the national, province, and county-level could also be a path to go in future research. That would enable the author to pinpoint what exact factors of MM that have impacted FI to the highest degree which could be of importance for policymakers. Lastly, as Kenya generally has reached a high level of FI as of writing, upcoming research could also investigate if future levels of MM increase or decrease and explore if this has any effect on FI levels in the future. Continuing to research on the topic of MM and FI will hopefully create a more equal society where we all feel included.

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