Mobile Money: Digital Monetary Systems and the Kenyan Economy

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Research Question: How has M-PESA aided in the Economic Development of Kenya?

Thesis: Digital Monetary Systems, such as M-PESA in Kenya, have influenced the Kenyan economy by reducing barriers to entry in many marketplaces, has helped provide stability to citizens, and has helped reduce corruption in the government and related institutions

Introduction

How often do you pull out your wallet? Now how often do you pull out your phone? How often do you shop online or use your laptop to manage your bank account? How is technology affecting our conduct with money? According to many economists, about 8% of the world's currency is physical, with the rest being digital.[1] In an increasingly more technologically dependent society, we are seeing tasks that were normally thought to be physical actions, which require physical tools, be relegated to the digital realm, moving resources being used from natural to digital. This new societal structure has been thought by many through internet of things (IoT), System integration and Smart Homes, but is just beginning to gain momentum in the field of Finance and Economics. In a world where 6 billion people have access to smartphones, it is now easier to manage finances and keep track of expenses.[2] In 2007, Safaricom released M-PESA in Kenya,[3] a mobile payment system that would allow users to send and receive money, pay bills, and receive money from large groups of people, such as tenants in a building, and even buy items from retail stores. 10 years later, the system has 18 million users, and there were 6 billion transactions over the course of 2016.[4] However, how has M-PESA aided in the economic development of Kenya? While not one of the main reasons for the conception

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1 Ed Grabianowski, "Forms of Currency: Electronic," *How Stuff Works*, September 2, 2003, accessed September 4, 2017, http://money.howstuffworks.com/currency6.htm.

2 UN News Network, "Deputy UN chief calls for urgent action to tackle global sanitation crisis", *UN News Centre*, March 21, 2013, accessed September 4, 2017, http://www.un.org/apps/news/story.asp?NewsID=44452#.WcKmeMh96uV.

3 Kieron Monks, "M-PESA: Kenya's mobile money success story turns 10", *CNN*, February 24, 2017, accessed September 19, 2017, http://www.cnn.com/2017/02/21/africa/mpesa-10th-anniversary/index.html.

4 Ibid.

and development of M-PESA, M-PESA has helped aided in the economic development of Kenya. Over the course of this essay, I will introduce what a digital monetary system is, as well as explain developmental economic theory. Additionally, I will be looking at how it has benefited three different stakeholders in the economy: the consumers, the businesses, and the government. For the consumers, it has helped develop an essential institution in order for the economy to function: financial institutions. This has allowed them to be relieved from poverty and provide stability. For the businesses, it has allowed for more competition thanks to reduced barriers to entry and accessibility of necessary technologies, allowing for an increase in competition. Finally, it has aided in the reduction of corruption, which has allowed for higher tax revenues.

Introduction of Digital Monetary Systems and How They Work

Digital Monetary Systems are a new form of financial management and transaction medium. These systems are commonly used in tandem with a smartphone, but some feature the ability to be used on other devices such as laptops and tablets, hence the digital title. Today, there are many examples of Digital Monetary Systems, like PayPal and Amazon Top Up, which convert physical cash to digital data, which can then be used in the digital space. However, all these systems have different protocols and features, allowing them to be unique and competitive in the market. Since the main subject of this essay is focusing on Kenya's M-PESA, we will be explaining how this system works. M-PESA uses the SIM card of the user as the authentication system. It begins with a SIM toolkit application: an application connected to the SIM card of the

user.[5] This means that users aren't required to get a certain phone like an iPhone, but can use even older phones like the Nokia 3310. When a user opens an M-PESA account, it becomes connected with the user's phone number, which acts like an account number. Users can then add money to their accounts by going to vendors, which will convert the cash you have into digital data, which appears as the same amount in your M-PESA account.[6] This cash is then stored in M-PESA float accounts. These are simply bank accounts owned by SafariCom, the cellular provider who owns M-PESA. When a user wants to withdraw money from their account, they can withdraw from vendors or Automatic Teller Machines (ATM's), which takes the money out of the SafariCom bank accounts and gives the cash to you. M-PESA is used most frequently in the form of transactions. In order to do this, users access the SIM toolkit application, and use the "Lipa Na M-PESA" (Swahili for "Pay with M-PESA") feature. This allows them to input the number displayed on the register in order to pay for the items they have bought, as shown down below:

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5 Aleeda Fazal, interview with Khalid Talakshi, September 19, 2017.

6 Ibid.

Figure 1 Sample "Lipa Na MPESA" Sign

Essentially, M-PESA is just a better version of a bank card. Just like a bank card, you are limited to how much funds are in your account, but unlike a bank card, you don't require a card or an account, which can take weeks or months.[7] It is also accessible, since mobile phones are widely used across Kenya, and adoption has been fast.[8]

When dealing with these systems, there needs to be security features implemented so your money is safe in the system. To begin, your money is not converted to a digital account, but is merely represented in your account. The money in your account is backed by physical cash in a bank. This means that if there is an imbalance, the information is available for you. M-PESA uses servers to store user information. In order to protect this information, there is encryption, which is math meant to change plaintext data (phone numbers, transaction data, etc.) to

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7 Tavneet Suri and Billy Jack, "Reaching the Poor: Mobile Banking and Financial Inclusion," *Slate*, February 27, 2017, accessed November 23, 2017, http://www.slate.com/blogs/future_tense/2012/02/27/m_pesa_ict4d_and_mobile_banking_for_the_poor_.html.

8 William Jack and Tavneet Suri, "Mobile Money: The Economics of M-PESA," *National Bureau of Economic Research*, January 2011, accessed November 23, 2017, http://www.nber.org/papers/w16721.pdf.

ciphertext data, making it unreadable without the key. For security reasons, it is not public information on what type of encryption is used on the M-PESA servers. A common type is RSA AES encryption, and is commonly used on servers like these, which uses public and private keys to encrypt and decrypt the data. The system also uses security certificates on machines making financial transaction in order to authenticate the security and validity of the machine and user making transactions. On the consumer side, there are other features that help secure their account. They have a PIN number which is required to perform any transaction using M-PESA. After every transaction, a confirmation message is sent to the phone, to confirm the transaction has gone through. It also allows the user to keep records of all their transactions, acting as a balance of payments. There is also a secret word assigned to you when you register and is asked for when doing any support issues with Safaricom. Finally, users can change their secret word and PIN when necessary free of charge.

In summary, there are 3 components to Digital Monetary Systems: the user's device/interface/account, the server and the recipient's device/interface/account. The user is forced to authenticate the transaction through a PIN and/or other authentication steps, the server encrypts the transaction and does security checks against the certificates of the user and recipient, then carries out the transaction, and finally the recipient receives the amount in the transaction, and the server then sends a corresponding message to the user and the recipient to confirm the transaction. This is the foundation of most digital monetary systems, with each providing unique features and its own take on the interface, whether it's a SIM application, a mobile application, or a web application. However, if the essential features outlined above don't make transactions equally or more convenient or provide some feature that otherwise would not be possible when using cash or card.

Economic Development Theory

Developmental economics is a new branch of economics, formed mainly due to the important issue of individual rights and freedoms. Essentially, Developmental Economics is all about the provision of essential services such as education, healthcare, and maintenance of law and order.[9] If a country is well to do, then it is considered a developed country. This may include low poverty levels, increased education, higher accessibility to healthcare and low crime rates. On the other hand, a country could be considered developing if it suffers from lack of education, low accessibility to healthcare, high amounts of crime and corruption, and high levels of poverty.[10]

There are many ways for a country to develop more. These are known as sources of economic growth. They include Natural Factors, which is the improvement of factors of production, Human Capital Factors, which is the improvement in quantity or quality of human capital, Physical Capital/Technological Factors, which is increasing production or output per worker, and institutional factors, which is improving institutions such as banks and legal systems. An improvement to any of these factors will result in Economic growth, which can lead to higher incomes, improved quality of life, and higher government revenues.[11] However, it could also lead to income inequality, pollution, and lack of sustainability.

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9 Jocelyn Blink and Ian Dorto, *Oxford IB Diploma Programme Economics: Second Edition* (Oxford: Oxford University Press, 2012), 330.

10 Ibid., 336.

11 Ibid., 332-335.

In Kenya, we see that they suffer from many of the problems outlined above. For this essay, we will look at improving technological factors and institutional factors directly. This will help us improve human capital and physical capital indirectly. Our goal is to determine how M-PESA has improved these factors and how this has benefited businesses, consumers, and governments.

Businesses: Barriers to Entry and Competition

In order for businesses to enter any market, there are some requirements that they must achieve before they can go forward. These are known as Barriers to Entry, and they exist for every business in every market. When barriers to entry are high, this causes a monopoly, a market structure where one business owns 100% of the market share.[12] This can be detrimental to consumers, as a lack of competition can lead to high prices due to no alternatives. One such barrier is point of sales (POS). POS are systems which allow the consumer to pay for goods and services. These include cash registers and credit/debit machines. These however, come at a cost to the business. Many credit/debit machines take a percentage of your sale as a fee, usually 2.5-3%, as well as a flat fee per transaction.[13] There are also fees for charge backs, which can add up. Cash registers come at an up-front cost, but limit consumers to only pay cash. For small businesses, these can be not only high costs, but also long-term liabilities. Cash is a highly favoured medium for transactions, due to its anonymity. This has allowed it to be used in tax

12 Ibid.

13 Amad Ebrahimi, "The Complete Guide to Credit Card Processing Rates & Fees," *Merchant Maverick*, November 15, 2017, accessed November 23, 2017, https://www.merchantmaverick.com/the-complete-guide-to-credit-card-processing-rates-and-fees/.

evasion, theft, and even drug dealings.[14] However, the use of M-PESA has helped many businesses to be competitive by offering M-PESA transactions. M-PESA operates on a fixed cost model, so while higher amounts of transfers come at a higher cost, it is still less than the percentage fee of many debit/credit machines. It also doesn't require the business to buy a debit/credit machine, as this system is all done through SIM. This has allowed for smaller business not only to compete with bigger businesses but has allowed for more accessibility to customers. As you can see from the following graph, the number of active users has increased to 12 million since its implementation in 2007. This means that 12 million Kenyans use M-PESA daily, a large client base which many businesses would like to utilize. (insert graph)

In an interview with Aleeda Fazal, one of the engineers who worked on M-PESA, she says "You can now pay ANYWHERE with M-PESA. It has made consumer transactions so much easier and has increased business opportunities for the 'Wananchi' (small business provider)."[15]

So how has it affected business? Well to see, we can look at gross domestic product (GDP). GDP is a measure of economic growth, which tells us how much output is being produced within a countries borders.[16] This is an important detail because M-PESA only operates within Kenya, so any company can use it as long as it operates in Kenya. If we look at the graph below, we can see a general trend upward thanks to new businesses producing goods and

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14 Kenneth Rogoff, The Curse of Cash, (Princeton: Princeton University Press, 2016), 8-9.

15 Aleeda Fazal, interview with Khalid Talakshi, September 19, 2017.

16 Jocelyn Blink and Ian Dorto, *Oxford IB Diploma Programme Economics: Second Edition* (Oxford: Oxford University Press, 2012), 160-161.

services. M-PESA has provided businesses with these opportunities to connect with a larger consumer bases and has allowed for growth and development.

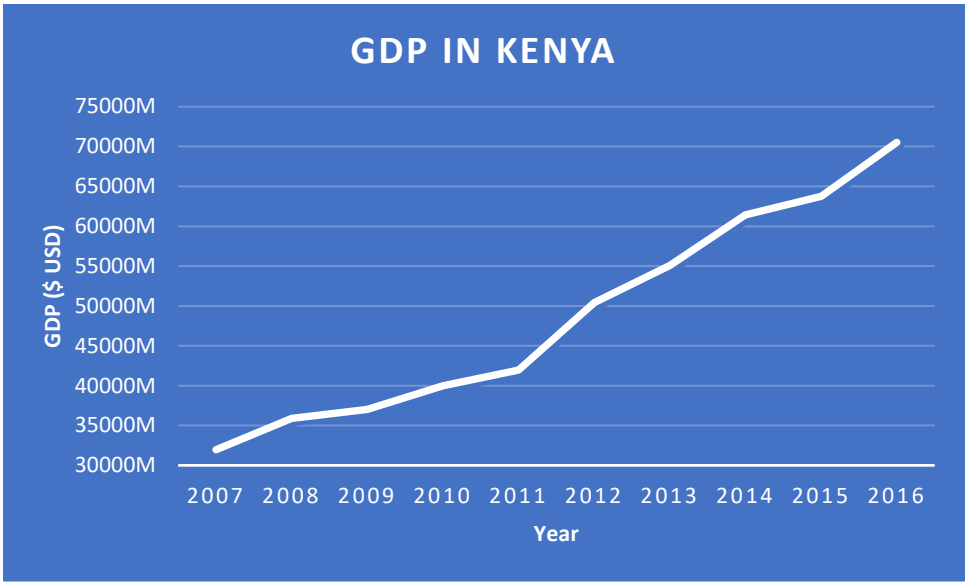

Figure 2: GDP per Capita in Kenya, 2007-2016

Overall, we have seen the economy expand and output increase, meaning that Kenya's economy is developing. Business adoption of M-PESA has not only expanded markets, but the economy as a whole. Not only has it benefited businesses, but also consumers by helping them reduce poverty and improve stability.

Consumers: Stability and Poverty Alleviation

On the consumer side of Kenya, there is massive poverty. According to UNICEF, 46% of Kenya's population live below the poverty line. This means that they spend less then $1.25 per day.[17] One of the reasons for this extreme poverty is lack of financial monitoring. Due to a

17 UNICEF, "Kenya at a Glance," *UNICEF*, accessed November 22, 2017, https://www.unicef.org/kenya/overview_4616.html.

lack of banking in Kenya, many people rely on cash alone. This lack of institutional banking hinders economic growth. This institution is essential to developing the economy, and it is where M-PESA comes in. M-PESA operates as a "branchless bank," which uses agents and ATM machines to deposit and withdraw cash.[18] According to the Kenyan Government, however, M-PESA is not considered a banking institution as it doesn't loan out money, it doesn't generate interest, and the money always remains in control of the user through a float backed account.[19] M-PESA is acting as a replacement for the lack of banking services available in the country. M-PESA has also been cited as bringing 2% of people out of poverty.[20] This can be seen in agent density, which is the number of M-PESA agents, who facilitate deposits and withdrawals, within a square kilometer. Since its conception in 2007, agent density has increased, and as such the users per agent has decreased. This is beneficial to the system as higher amounts of users per agents can result in issues such as fraud and not enough cash on hand to give.[21] According to an MIT study, areas where agent density was 6 agents or more saw a per capita increase of 18.5%

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18 Gunnar Camner, Caroline Pulver, and Emil Sjöblom "What makes a Successful Mobile Money Implementation? Learnings from M-PESA in Kenya and Tanzania," *GSM Association*, March 16, 2009, accessed November 23, 2017, https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2012/03/What-makes-a-successful-mobile-money-implementation.pdf.

19 Aleeda Fazal, interview with Khalid Talakshi, September 19, 2017

20 Rob Matheson, "Study: Mobile-money services lift Kenyans out of poverty," *MIT News*, December 8, 2016, accessed September 25, 2017, http://news.mit.edu/2016/mobile-money-kenyans-out-poverty-1208.

21 Alliance for Financial Inclusion "Case Study 1: The Central Bank of Kenya's treatment of M-Pesa" *Alliance for Financial Inclusion*, February 2, 2010, accessed November 23, 2017, https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2013/09/enablingmobilemoneytransfer92.pdf.

.[22] M-PESA has also helped many rural farmers take up business in urban centers. If a farmer can sell his Furthermore, M-PESA allows users to monitor their spending. With Cash, this has to be done manually, so it either becomes incorrect or never gets done. With M-PESA, users can see their money going out and coming in. This allows for some basic financial literacy, a key component of poverty reduction. According to a 2006 survey, 38% of Kenyans did not use any form of financial services.[23] This tells us that M-PESA helped improve financial literacy, reducing the percentage of Kenyans who were excluded from Financial services. From 2008 to 2011, we saw an increase in the number of unbanked users by 54%.[24] Similarly, we saw an increase in users who lived on less than $1.25 per day from less than 20% to 72%.[25] This has allowed more citizens to cope with risk. With high levels of access to M-PESA, in cases of emergencies more people could get help faster. One such example was during the droughts in Kenya. M-PESA allowed the government to send money to users, which helped induce demand for products of necessity.[26] It is important to note that these stats are from outside of Nairobi, the capital and main hub of Kenya. This is interesting because these are the areas with the most

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22 Matheson, "Study: Mobile-money services lift Kenyans out of poverty," http://news.mit.edu/2016/mobile-money-kenyans-out-poverty-1208.

23 Alliance for Financial Inclusion, "Case Study 1: The Central Bank of Kenya's treatment of M-Pesa" https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2013/09/enablingmobilemoneytransfer92.pdf.

24 Tavneet Suri and Billy Jack, "Reaching the Poor: Mobile Banking and Financial Inclusion," *Slate*, February 27, 2012, accessed November 24, 2017, http://www.slate.com/blogs/future_tense/2012/02/27/m_pesa_ict4d_and_mobile_banking_for_the_poor_.html.

25 Ibid.

26 Ibid.

poverty, and M-PESA has encouraged many rural citizens to take up business in the urban centers such as Nairobi and Mombasa, as stated above in the business section.

So how has this actually influenced economic development? We can look at one indicator to see change: GDP per capita. GDP per capita is an indicator of standard of living, which can show us how the citizens of a country are fairing. If a GDP per capita is increasing, it means that either the population is decreasing, or the GDP is increasing. On the following graph, you can see the change in GDP from 2007, which is the year of Inception and Implementation of M-PESA, to 2016. This data was collected from the world bank.[27]

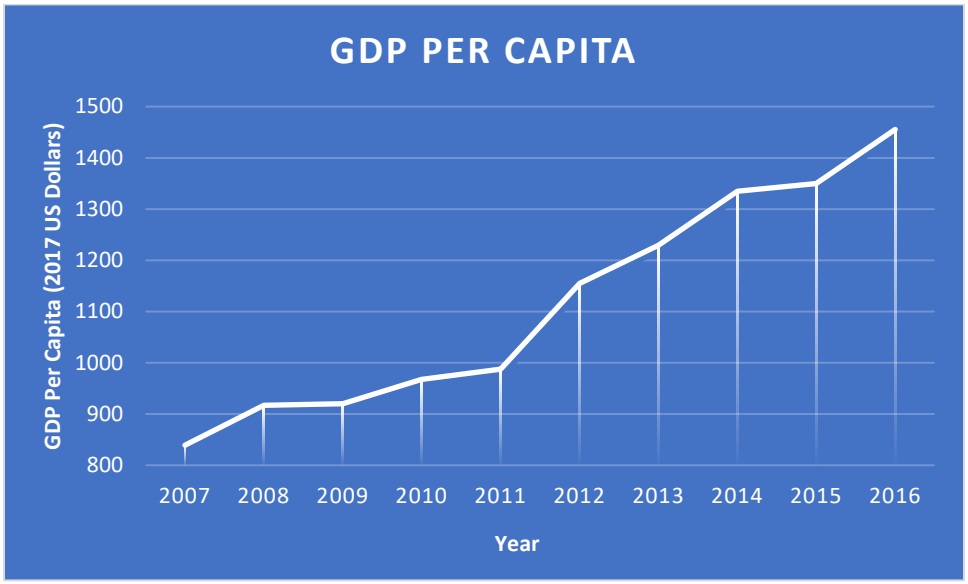

Figure 3: GDP per Capita in Kenya, 2007-2016

As you can see, there has been a steady increase in GDP per capita since 2007, which means that the average income per citizen has increased, which is a benefit of Economic

27 World Bank, "GDP per Capita – Kenya," *World Bank*, accessed November 21, 2017, https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?end=2016&locations=KE&start=2007.

Development. M-PESA has allowed for better financial management, and thus has allowed for higher levels of GDP per capita. The final way we can see how M-PESA has helped Economic Development in Kenya is through the reduced corruption levels and improved institutions on the government level.

Governments: Reduction in Corruption

Governments are a necessity when it comes to providing public goods and services such as healthcare and education. However, a corrupt government can prevent the sufficient growth and development. M-PESA has been able to reduce corruption thanks to accountability and access to information. In order to understand how this is possible, we must understand how cash plays a role in corruption.

Cash has many benefits over other forms of currencies, such as debit cards, credit cards, or M-PESA. For one it is anonymous. A cash transaction is hard to trace because there is no digital signature or path. This has made it appealing for illicit dealings such as tax evasions and bribes. According to Kenneth Rogoff, tax evasion comes with the problem of equity:

> When some people don't pay taxes owed on their true incomes, it means other people – for example, law abiding citizens with identical pre-tax incomes – have to pay more. By the same token, if some firms use cash payments to get around unfair competitive advantage ad of course degrade the environment.[28]

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28 Kenneth Rogoff, The Curse of Cash, (Princeton: Princeton University Press, 2016), 59.

This problem also causes another issue: less government revenue. Since taxes are one of the ways which the government uses to collect revenue, less taxes means less revenue, which means less public goods and services, as well as less grants and loans. Public goods and services such as education and healthcare are essential to economic growth and development, and a lack of revenue hinders it. As for bribery, cash allows for easy transfer, as well as a lack of paper trail. This means that it can be untraced to the briber and is very hard to prove that an official was bribed. Kenneth Rogoff writes about this in his book again. In it he notes that corruption is not limited to developing countries but is more prevalent in these nations.[29] It also says that it is hard to rid corruption from a society,[30] which is important for Kenya. Kenya is a bribe culture, and many police officers often cause troubles just to collect bribes. One such example is on the bridge between Mombasa island and mainland Kenya, where officers stop cars to ask for papers, and if you don't have papers, you either had to get someone to bring them for you while you wait, or bribe them. The bribe culture is so strong that there is a word for it: "Kitu Kidogo," which means "small matter". This bribery causes corruption, which means less confidence in the economy and the government. All these issues are caused by cash, so a reduction in cash made transfers would theoretically mean a reduction in corruption. This is where M-PESA comes in as a digital monetary system.

Digital monetary systems, like M-PESA reduces the amount of cash being exchanged thanks to its convenience, safety, and access. It also comes with one important detail to prevent corruption: information. In order to keep track of all transactions, all the transactions are logged

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29 Ibid., 71.

30 Ibid., 72.

and attached with a user account. This includes information about who sends you money (or who you sent money to), as well as the amount and the date on which you sent it. This information is key because it will be mirrored on the phones of corrupt officials. As such, this information needs to be explained, and thus, corruption becomes harder.

So how can we see this reduction in corruption? To begin, tax evasion will be reduced thanks to all this information. As such, we should see an increase in tax revenue. We can see that there is an increase in tax revenue from 2007 to 2015 below:

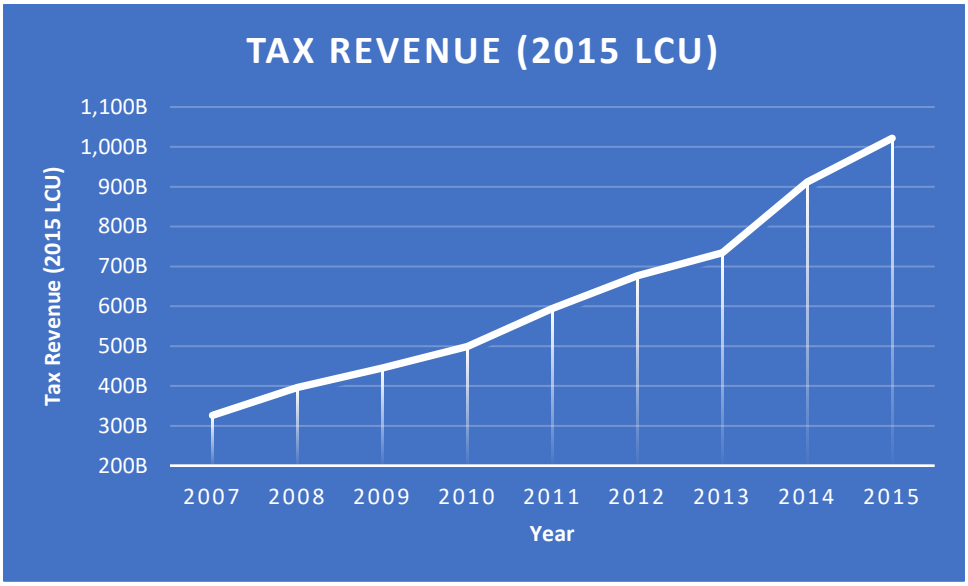

Figure 4: Tax Revenue in Kenya, 2007-2015

This higher level of tax revenue mean that there is more capital for the government to improve institutions such as education and healthcare. Anecdotal evidence has shown us that there is also a reduction in bribery involving the police. According to an article in *Business Daily Africa*, 63 officers were fired on charges of bribery in October of 2015.[31] Many officers were unable to

31 Fred Munkinda, "Top cops sacked over M-Pesa bribery," *Business Daily Africa*, October 15, 2015, accessed November 28, 2017,

explain the large amounts of money in their accounts, leading to this mass exodus. However, this has not stopped bribes being payed in cash, but it has caused a reduction in corrupt cops. Overall, M-PESA has reduced corruption because of more information.

Conclusion: To the Future

Over the course of this essay, we explored the how digital monetary systems have aided in the economic development of Kenya. We saw that it has reduced barriers to entry and increased competition on the business side. This has allowed for better goods and services to be provided to the consumer and has encouraged rural farmers to take up business in the urban centers. On the consumer side, stability has been provided and poverty has been reduced among many citizens. M-PESA has provided services to many citizens at an affordable cost, thus allowing for an increase in financial management services. Finally, there has been a reduction in corruption thanks to access to information on the government side. Information has allowed for the government to determine where corruption is, and M-PESA has reduced the amount of cash transactions, from which many of these problems stem. We can see how this has aided with GDP increases, GDP per capita increases, and an increase in tax revenue. All these are factors which help grow the economy, thus helping it develop it.

However, economic development doesn't stop at there. It is important for a government to actively be involved in the economy and help develop it by investing in improvements to institutions and infrastructure. These investments will allow citizens to break out of the poverty cycle. Education allows for skills to be fostered, which will make citizens relevant in the

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http://www.businessdailyafrica.com/economy/Top-cops-sacked-over-M-Pesa-bribery/3946234-2915564-51sx6b/index.html.

economy. Healthcare helps improve the quality of human capital, thus allowing for more efficient production. Finally, infrastructure connects all the stakeholders of an economy together, while reducing unemployment because building projects need workers to build them. M-PESA has allowed for output to be increased, which has increased the tax revenue the government can receive, but the government needs to invest this. Kenya is the hub for East Africa, and will play a major role in the development of the rest of Africa. Looking to the future, Kenya's level of poverty and corruption should be their focus for fixing. It is important that the government fulfils its roles in providing stability, creating competition, and ensuring an equal distribution of goods and services, for without this, a developing economy will remain in a state of underdevelopment. With the help of technology, Kenya is leapfrogging in its development and becoming more and more stable, with services such as UBER being widely adopted as well. Kenya's outlook for the future is bright, and with the help of M-PESA, we should see a continuing trend of economic development for years to come.

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