A Look at the Effects of Early Adoption of M-Shwari on Healthcare Expenditure In Kenya

Breille Duncan

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Abstract

Background: M-Shwari is an online service that allows users to save money in online accounts, starting with a minimum of 1 KSH. This makes it more accessible to those who do not have enough funds to start other forms of savings that require higher minimum deposits. Previous studies have shown that access to savings accounts increases a household's ability to handle health expenses and illness when compared to those without savings.

Methods: Using data from the Kenyan Financial Diaries we look at the healthcare expenses of households that held savings accounts with M-Shwari, those that held other forms of formal savings accounts, and those who held no savings accounts. We first compare the amount spent on healthcare between other formal modes of savings or lack thereof using the Mann-Whitney U Test, letting H_0 be that the medians are the same and H_1 be that they are difference. Then, with those who saved with M-Shwari, we compared the amount spent on healhcare before and after the first recorded use of M-Shwari with the paired samples t-test. Finally, we compare the square root of the GDP per capita to the healthcare spending per capita to determine if there are any future changes to a relationship between the two.

Results: When comparing the healthcare expenses, the difference between those with formal savings not with M-Shwari and those without savings gave a $p = 0.06$, those saving with M-Shwari and those with no savings produced $p = 0.04$, and the difference between saving with M-Shwari and saving not with M-Shwari was $p = 0.45$. In the event study, the paired samples t-test produced a value of $p = .14$. For both tests, significance was decided at the $p < 0.1$ level. The linear regression showed an $R^2 = 0.99$ and $p = 2 * 10^{-6}$ when comparing the square root of the GDP per capita and the healthcare spending per capita.

Conclusion: M-Shwari does not seem to directly affect the healthcare spending of households, and any possible effects seen in the first tests can possibly be attributed to other forms of savings the households have. More research should be done to investigate the effects of M-Shwari on GDP per capita and income.

Keywords: M-Shwari, Savings, Healthcare

1 Introduction

In developing nations, such as Kenya, large portions of the population are sometimes excluded from services facilitating financial growth. This in turn leads to these groups being kept from making progress in terms of quality of life. The ability to save money can take unnecessary stress off of a family's finances during periods of unexpected expenses, as well as allow families to make larger purchases than they would be able to otherwise. Medical expenses are an area where avoiding large unexpected expenses can be difficult, and having the money to spend on them is important. Safaricom, a mobile provider in Kenya, and the Commercial Bank of Africa launched a mobile banking platform, M-Shwari, that allows people to save without using a physical bank. This paper will focus on how, if at all, M-Shwari affected the way households spend money on healthcare.

1.1 Structure

This paper begins with providing information about savings, the development of M-Shwari, and the state of healthcare in Kenya in Section 2. Then we discuss the statistical tests used and their results in Sections 3 and 4. The paper finishes with Section 5 discussing the possible implications of these results and suggestions for future research.

2 Background

2.1 M-PESA and M-Shwari

2.1.1 M-PESA

In early 2007 Safaricom launched a mobile money transfer service that was a major success. M-PESA, which allows users to send and receive money through their phone, was very quickly adopted by over two-thirds of the population [3]. While being primarily a money

transferring service, many people also use M-PESA as a way of saving money [5]. The ability to save, in this case, is important not only to put away money to spend later but to also avoid carrying cash in dangerous situations. Beyond this M-PESA has had a large effect on economic growth, with it being estimated that almost 200,000 households were lifted out of extreme poverty [8]. With its success Safaricom also launched other services such as mKopa, which allows people to use M-PESA to slowly pay off larger purchases, Linda Jamii, a health insurance provider, and M-Shwari, which allows users to deposit money into a savings account and take out loans. This final service is the focus of this paper.

2.1.2 M-Shwari

In 2012, a few years after M-PESA's launch, Safaricom and the Commercial Bank of Africa added M-Shwari to their offered services. M-Shwari allows users to create a mobile savings account using M-Pesa and to take out loans. It is often remarked that M-Shwari is more accessible than traditional methods to those who are un- and under-banked, either due to lack of finances or transportation [3]. Since it is a mobile service, users are able to use M-PESA funds to transfer into savings, eliminating the need to go to a physical bank. This works so well largely due to the success of M-PESA. M-Shwari also provides more accessible loans with its unique credit scoring system that allows some users to take out loans after depositing just 1 KSH. These loans have been shown to help households handle financial shocks from healthcare and other expenses [2]. The savings accounts through M-Shwari require very little to start saving with a 1 ksh balance minimum that they can collect interest on [3], which can have many benefits that will be outlined in Section 2.2. Despite M-Shwari being set up to be inclusive of those generally excluded from other forms of savings and credit, there is evidence that it is not as successful as hoped. A study of the 2016 Kenyan FinAccess Household Survey revealed that M-Shwari is not reaching the

portions of the populations that would benefit the most, primarily the un- and under-served and those below the poverty line [6]. This result is important when discussing the results from this paper in Section 4, as it provides insight about how M-Shwari is used.

2.2 Saving

The ability to save can be beneficial to families; however, there are barriers for those living on little to no money. Opening savings accounts can mean fees and minimum balances that are unaffordable for some portions of the population. When these barriers are removed people are more willing to save, and this can improve the well-being of the family.

A 2008 study provided communities with different methods of savings, ranging from as simple as a box and journal to record amounts put in and taken out of the box to group savings accounts used specifically for health products [4]. In this study, being offered these different savings methods lead to most respondents putting money into savings after a 6 month period. Some methods were used more, like the savings box without a padlock was used more than the savings box with one. Some methods had larger affects on what money was spent on. Interestingly, the health savings accounts offered had the highest level of adoption of the four options, with 97% of people offered making deposits into it. These accounts also made it more likely that households could handle unexpected health expenses, as did the savings box that was not locked [4].

2.3 Healthcare

One of the damaging effects of poverty is lack of access to healthcare. A lack of healthcare can worsen a family's situation by preventing them from working or causing other hardships. In 2013, the Kenyan Household Health Expenditure Survey (KHHES) was used to determine how many households experienced catastrophic healthcare expenses, defined as

when over 40% of non food-related expenses were in healthcare. Overall, about 4.5% of households experienced this level of healthcare spending, and it was significantly higher at lower income levels with 15.7% of the poorest households having catastrophic expenses [1]. The same survey was able to provide insight about how often households go without healthcare due to the financial strain. According to the data from the survey, 3.2% of households in Kenya were unable to meet their healthcare needs due to the cost of services and not having money to pay for them [7]. This is especially true for inpatient care, meaning more serious healthcare concerns are going ignored due to money. As we saw in Section 2.2, savings can reduce the pressure put on households by healthcare expenses and could reduce the number of households unable to afford proper healthcare.

3 Data and Methods

3.1 Comparison Between Groups

The data used to compare the effects on healthcare spending of different methods of savings comes from the Kenyan Financial Diaries, specifically the data set that consists of all recorded transactions of households involved. In all of the tests, we focused specifically on households that had at least one recorded health expense, excluding those for spiritual and traditional healers. These were excluded to keep the focus on expenses for doctor's visits, hospital stays, and medicine. For this test, the compared groups consist of households that have recorded savings transactions with M-Shwari ($n_1 = 26$), a random selection of households with recorded transactions with formal savings accounts that does not include M-Shwari ($n_2 = 30$), and a random selection of households that do not have any recorded savings transactions ($n_3 = 30$). Note that, in the group containing households that have savings accounts with M-Shwari, these households may also have formal savings accounts with organizations other than M-Shwari. Out of the 27 households using M-Shwari for

savings fourteen have other types of formal savings account.

To compare the different groups we chose to use the Mann-Whitney U test because the data lacked a normal distribution, and because one group was smaller than 30 households. The Mann-Whitney U test is a nonparametric test that compares the medians of groups to determine how similar the samples are. The null hyporthesis, H_0, is that the medians are the same and the alternative hypothesis, H_1, is that they are different. If the null hypothesis is rejected, this means that there is a difference in how much households were spending on healthcare. To use the Mann-Whitney U test, first we rank the data points from smallest to largest, and let R_i be the sum of the ranks in the sample. Then calculate U for each set using

$$U_i = R_i - \frac{n_1(n_1+1)}{2}.$$

Let the smallest of the two U_i values be the U for the set. From here we get the z-value from

$$z = \frac{U - \frac{n_1 n_2}{2}}{\sqrt{\frac{n_1 n_2 (n_1+n_2+1)}{12}}},$$

and then use this to calculate our p-value. We will consider the result significant when $p < 0.1$ In Table 1 the results of the Mann-Whitney U test are listed.

Compared Groups	U	z	p
M-Shwari vs No Savings	285.5	-1.71	.04
Other Savings vs No Savings	346	1.53	.06
M-Shwari vs Other Savings	381.5	-.013	.45

Table 1: Results of Mann-Whitney U Test

3.2 Event study of M-Shwari's Effect on Healthcare

Using the same transaction data from the Kenyan Financial Diaries as the previous tests, we then look specifically at the effects of M-Shwari on the households that use it. The first healthcare transaction recorded in the Kenyan Financial Diaries was September 9th, 2012 and the first recorded use of M-Shwari is December 9th, 2012. For the 23 out of 26 households that used M-Shwari, the healthcare expenses from September 9th, 2012 to December 8th, 2012 were compared to the expenses from December 9th, 2012 to March 31st, 2012. These intervals were decided due to the data available to us, as well as keeping the time intervals similar to properly compare them. Three households were excluded due to not having any healthcare expenses during the time frame tested, despite later having healthcare expenses.

The expenses from before and after the first recorded use of M-Shwari were compared using the paired samples t-test. To get the t-score, we use

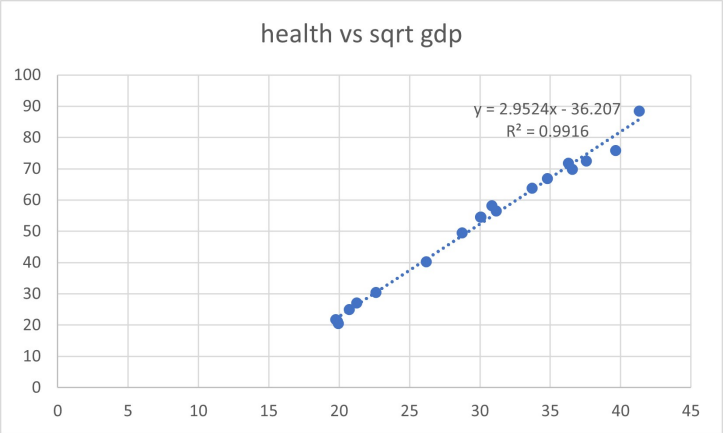
$$t = \frac{(\sum D)/n}{\sqrt{\frac{\sum D^2 - \frac{(\sum D)^2}{n}}{(n-1)(n)}}},$$

where $\sum D$ is the sum of the differences between household spending before and after December 9th per household and $\sum D^2$ is the sum of the differences squared per household. We can then use the t-score to find the p-value, which we will say is significant when $p < 0.1$. The results of this test were $t = 1.11$, with 22 degrees of freedom giving us $p = 0.14$.

3.3 Healthcare Spending Over Time

Because of the limitations of the data in both number of households and time of the survey, we also decided to look at any long term effects on healthcare expenses. To do so, we preformed a linear regression of healthcare expenses against the square root of the GDP per capita. Both the GDP per capita and healthcare expenses per capita were provided by The World Bank, and these were recorded annually. The data used in the regression was

from the years 2000 to 2018.



4 Results

In the tests comparing the healthcare expenses between different methods of saving, we see in Table 1 that there were significant differences between the amount spent on healthcare when comparing both groups that saved to households without formal savings. When both groups with savings were compared, it was shown that there is not a significant difference in the amount spent on healthcare during the time recorded by the survey. These results, as well as previous studies, show that savings allow families to spend more on healthcare, and M-Shwari savings are likely no different. This means that M-Shwari could allow families to save that otherwise couldn't and be able to reap the same benefits.

When taking a closer look at the effect M-Shwari had on healthcare expenses we can see in Section 3.2 that, using the paired t-test, there was not a significant difference between the months before M-Shwari was used and the first few months after. While looking at the results of this test, however, it is important to note the limitations it had, most importantly the lack of data which prevented us from taking data over longer periods of time.

Looking at the linear regression, we see that the values $R^2 = 0.9916$, which describes how accurately the model describes the relationship, and $p = .000002$, which describes the

probability that the slope is zero, were calculated. This shows that almost all changes in healthcare expenditures per capita are related to changes in the square root of the GDP per capita, and it is very unlikely that the slope is anything but what calculated. This suggests that the driving force in the increasing amount of money spent on healthcare is the increase in GDP.

5 Discussion

Savings accounts have been shown to reduce the strain of unexpected expenses on families, and allow them to have more money to spend on their well being. With money being a barrier to access to healthcare, it is obvious that the ability to save directly affects the ability to receive healthcare. M-Shwari attempts to offer accessible savings accounts, and if successful could reduce the fiancial strain of healthcare on families. However, we saw in Section 2.1.2 that there was evidence that M-Shwari is not yet reaching those who are un- and under-served by banks, and users are primarily above the poverty line and have other bank accounts.

When looking at the results, especially the significant difference in healthcare spending between those who had M-Shwari savings accounts and those who have no savings, as well as between those with other formal savings accounts and no savings, it is clear that those with savings are spending more on healthcare. Whether M-Shwari is allowing more people to spend more on healthcare or if those who have the money to afford healthcare are more likely to use M-Shwari depends on the user demographic data. The test looking at the amount spent on healthcare before and after M-Shwari was used does not show any evidence that M-Shwari increased healthcare spending on its own, so it is possible that the results from the first test have more to do with the users than the service. However, these two possibilities are not mutually exclusive, and which is more relevant can change over

time.

5.1 Future Research

The limitations on the data available means there is the possibility for future research on this subject. With access to more data, looking at the difference in healthcare spending before and after a household begins using M-Shwari can be done more thoroughly. It could also be worthwhile to look at how M-Shwari affects healthcare spending for those in specific income demographics, such as the effects on those in extreme poverty.

5.2 Acknowledgements

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