

## **Effects of Payment Technologies on the Transaction Demand for Cash Among Urban Households in Zamfara State, Nigeria**

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### **Abstract**

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This paper examines the effect of the use of the various payment channels on the amount of cash held for transactions among urban households in Zamfara state, Nigeria. Using a sample of 300 respondents purposely selected using the non-probability sampling technique of purposive sampling and structured questionnaire used to solicit information from the chosen respondents and the data analysed with the use of multinomial logistic regression analysis techniques. The study finds that the demand for cash for transaction function purpose has very much decreased with the use of variety of payments channels to the households. The significant factors were found to be age, sex, occupation as well as the frequency in the use of the debit cards from 1-14 days. The demand for cash moderately increased in response to the significant determinants of demand for cash as the frequency of the use of the debit cards between 1-14 days as well as the possession and use of mobile phone for transaction purpose. In comparison to the reference category, the demand for cash, moderately reduced in relation to the possession of debit cards, mobile phones for transaction purposes as well as the frequency in the use of the debit cards between 1-14days are the key determinants of the demand for cash and are all found to have a significant negative relationship with the demand for cash. The study recommends further mobilization of the people of the state on the need to make use of the payments technologies in carrying out their daily transactions which could reduce the cost of printing currency in the country and reduce the risks associated with the cost of handling cash.

**Keywords:** *Payments Technology, Demand for Cash, Urban, Households*

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### **Background to the Study**

The demand for money (the desire to hold money as cash or in the form of liquid assets) plays a vital role in the formulation and the efficiency of monetary policy in an economy. There has been keen interest in researches on the determinants of the demand for money because of its importance in the understanding of macroeconomics and monetary policy (Dunne and Kasakende, 2016). The increased research on the determinants of the demand for money and its stability could be attributed to the significance of monetary policy in the attainments of price stability and attainment of the growth level of the economy. The instability in the demand for money functions can be attributed to the recent developments in the financial systems in terms of technological development, the various organizational reforms that have taken place in the financial system that could be generally referred to as financial innovation (Dunne and Kasakende, 2016). The financial system in recent times have experienced an upsurge in the use of the automated teller machines, electronic funds transfer, the use of the points of sales, the internet-based transaction. The availability and the ease of use of these instruments have the tendency of making citizens to switch in the use of these alternatives than the use of cash and thus could affect the efficiency in the use of the monetary policy to stabilize the economy. The use of these payments technology has prompted researchers, academics as well as policy makers to undertake empirical studies on the effects of the payments of technologies on the demand for money in different countries of the world. Studies such as Mlabo and Msosa, 2020, Alih, sarmidi, shaari and Said (2018), Mwejje and Lakuma, 2019. Similarly studies on the effects of financial innovations on the demand for money in Nigeria includes, such as Gbadebo & Okunrinboye, 2009; Matthew et al., 2010), Fatai, Zakariyya, Samuel and Mudashiru (2014). To the best of knowledge of the authors of this study no study is conducted to examine the effects of the adoption and the use of the payment's technologies on the demand for money at the state level in the North western region of Nigeria. This study therefore, fills in the identified gap by examining the effects of the payment's technology on the demand for money in Zamfara state, North Western Nigeria using the multinomial regression analysis method. The paper is structured as follows; following these introductions is the theoretical framework upon which the study is based, section three of the paper is the review of empirical literature, section four is the methodology used for the study, section five presents the results and discuss the finding of the study, lastly the final sections concludes the paper, makes recommendation and offers suggestions for future research.

### **Theoretical Framework**

This study is hinged on the Baumol (1952) and Tobin (1969) inventory theory of demand for money. They develop a model of demand for money in which money has been viewed as an inventory held for transaction purposes. Despite the fact that there are other substitutes for money that offer higher yields than money, the transaction cost of changing those assets to cash justifies holding money (Sriram, 1999). They formulate the inventory theoretical approach to transaction demand for money by analysing the advantages and disadvantages of holding money. The cost of holding money is the interest rate foregone and the advantage of holding money is that it is more liquid than other assets like stocks and bonds.

The theory postulates that agents receive income in a certain period say monthly, expenses on the other hands are incurred at a constant rate between the period income is received and the next period during which another income will be received. The economic agent can decide to either keep his income in liquid form, that is, in cash, or save his entire income in the interest-bearing assets such as stocks, bonds, etc. The agent faces a trade-off between the cost of holding money in cash in terms of the interest foregone and the cost of transactions to be incurred in converting the interest-bearing assets into cash(c). Therefore, the optimal decision for the economic agent is to hold part of his income as money and another portion in interest bearing assets. Therefore, the inventory theory postulates that the average money demand is given as  $M_d/P = \sqrt{cy/2r}$ . Where,  $M_d$  is the demand for money,  $c$  is the brokerage fees, the cost of converting interest-bearing assets into cash,  $r$  is the nominal interest rate,  $p$  is the price level and  $y$  is the income level. Therefore, the theory contends that there is a positive relationship between the income level and demand for money, and an inverse relationship between the level of nominal interest rate earned on alternative assets and demand for money. The theory also postulates a positive relationship between the transaction cost of changing interest-bearing assets to cash and the demand for money. Therefore, if the cost of transaction declines with the introduction of financial innovations such as the use of Automated Teller Machines and online banking, more wealth is likely to be held in the form of interest yielding instrument than holding cash.

### **Review of Literature**

Mlabo and Msosa (2020) evaluates the effects of payment technology on the demand for money in some African countries using the panel data and applying the generalized methods of moments techniques for estimation of the data from 1995 to 2014, the study finds that the number of automated teller machines transactions and mobile subscriptions as payments technologies have a significant negative relationship with the demand for money. Shiva and Durai (2017) examined the effect of the use of the debit and credit cards on the demand for currency and seignorage in India, using the autoregressive distributed lags (Bounds test) approach to co-integration using the monthly time series data set from 2005:4 to 2014:9; the study finds that the use of the debit cards is positively related to the demand for money, whereas the use of credit cards has a significant negative relationships with the demand for money.

Aliha, Sarmidi and Said (2018), examines the effects of payments technology on the demand for money in Australia using the dynamic ordinary least squares and the fully modified ordinary least squares methods of estimations, the study finds a significant negative relationship between the total payments subscriptions as a proxy for payments technology and the demand for money in Australia. Nakamya (2014) also assess the effects of automated teller machines transaction and electronic funds transfer on the demand for money in Uganda, the study finds a significant positive relationship between the automated teller machines transactions as well the electronic funds transfer and the demand for money. Alih, Sarmidi, Shaari and Said (2018) used the autoregressive distributed lags model approach to co-integration to examine the effects of payments technology on the demand for money in Malaysia using payment channels that includes mobile banking, internet banking, the study

finds that the retail payments instrument has a significant positive relationship with the demand for money.

Rinaldi (2001) analysed the alternative payments system effect on the demand for money in Belgium between 1969 and 1999 with the use of the technique of the Johansen (1988) co-integration approach, the study finds a significant negative relationship between the use of automated teller machines (ATM) and the demand for money in the study periods. Lukman and Yunusa (2013) investigated the effect of alternative payments system on the demand for currency and monetary policy in Nigeria using the monthly time series data between 2008 and 2010. The results of the analysis using the vector error correction model (VECM) indicates that internet base money and mobile money have a significant negative relationship with the demand for currency; in other words, they act as a substitute to currency. Similarly, Safdar and Khan (2014) investigated the effects of the use of the payments technologies on the demand for money in Pakistan using such variables as the number of automated teller machines and debit cards, the study finds that the number of automated teller machines (ATM) and the debit cards leads to the reduction in the demand for cash. Mawejje and Lakuma (2019) also investigate the effect of financial innovation (measured as mobile money) on demand for money in Uganda using monthly time series dataset for the period from 2009:3 to 2016:8 by applying vector error correction model and structural vector autoregressive methods, and find a significant positive effect of mobile money on the demand for money.

Similarly, a number of studies that makes use of case studies at micro level were also conducted across the different countries of the world, some which are reviewed as follows;

Santiago and Fransisco (2012) examines the effect of the ATM withdrawals and the debit cash transactions at the points of sales on the demand for currency, the study use the 3 stages least squares and Generalised Methods of Moments estimation techniques, the study indicates a significant positive relationship between the use of the ATM and demand for currency, while a significant negative relation is found between the use of the points of sales and the demand for currency. Fatai, Zakariyya, Samuel and Mudashiru (2014) examines the effect of payments technology on the demand for cash in Isolo local government area of Lagos state, Nigeria using cross sectional data and using the test of the difference between two means, the study finds a significant difference exist between card holders and non - card holders in their demand for cash.

### **Methodology**

This section of the paper explains the methods of the data collection, the variable measurement, models' specifications as well as the methods of the analysis of the data.

### **Source of Data**

The data for this study is collected with the use of structured questionnaire designed to elicit information from the respondents, total number of 300 respondents were asked to fill in the questionnaires and return it. The respondents were selected based on purposive sampling techniques of the form of non- probability sampling method.

## Variable Measurement

This section explains how each of the variables included in the econometrics model is measured in the study. The variables are measured as follows:

**Table 1:** Variables used in the Multinomial Logistic Regression Analysis

Serial Number	Variable Name	Label Name	Codes used
1.	Cash Demand for Transaction	Cashddtrn	1=very much increased 2= Moderately increased 3= Indifferent 4= Moderately Decrease 5= Very Much decreased
2.	Age	Age	1= 50-60 Years 2= 40-50 Years 3= 30-40 Years 4=20-30 Years
3.	Sex	Sex	1= Male 2= Female
4.	Occupation	Occupation	1=Government Employee 2= Private Sector Employee 3= Self Employed
5.	Income	Income(N)	1= N50000 and above 2=N25000-50000 3= N10000-25000 4= Below N10,000
6.	Debit card Possession	DebP	1= Yes 2= No
7.	Frequency of the use of Debit card	Debfreq	1= Daily 2= 1-2 days 3= 2-5 days 4= fortnightly 5= Monthly 6= Never used it
8.	Mobile phone possession	MobPP	1= Yes 2= No
9.	Frequency of use of mobile phones for Transaction purposes	Mobppfreq	1= Daily 2= 1-2 days 3= 2-5 days 4= fortnightly 5= Monthly 6= Never used it
10.	Type of Bank Account	Acttype	1= Saving 2= Current 3= Fixed deposits
11.	Education	Education	1= post graduate 2= Degree/Hnd 3= Diploma/NCE 4= Secondary 5= Primary

### Models Specification

The model used in the estimation of the relationship between the dependent variable and the predictor variables is expressed in the following form;

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \mu$$

Where:

Y = Response to demand for cash among respondents

X<sub>1</sub> = Age of the respondents

X<sub>2</sub> = Sex of the respondent

X<sub>3</sub> = Occupation of the respondent

X<sub>4</sub> = Income of the respondents

X<sub>5</sub> = Debit card possession

X<sub>6</sub> = Frequency of the use of debit card

X<sub>7</sub> = Possession of Mobile Phone

X<sub>8</sub> = Frequency of the use of mobile phone for transaction purposes

X<sub>9</sub> = Account type

X<sub>10</sub> = Level of education

### Methods of Data Analysis

The method of data analysis used for this study is the use of the multinomial logistic regression technique. The technique is applied when there is more than two responses to the dependent variable. In the case of this study there are five responses to the transactions demand for cash as the dependent variable. A reference category is chosen and the remaining equations are estimated (i.e the non- reference category). The equations estimated are the logit functions of the non- reference category relative to the reference category. The present study has five categories as the responses to the dependent variable as follows:

1. Very much decreased
2. Moderately decreased
3. No Change in the amount held
4. Moderately increased
5. Very much increased.

Very much increased is the reference category chosen for the study and the multinomial logistic regression equation, with four logistic functions estimated are:

$$Y(VMD/VMI) = \alpha_1 + \beta_{11} X_1 + \dots + \beta_{110} X_{10}$$

$$Y(MI/VMI) = \alpha_2 + \beta_{12} X_1 + \dots + \beta_{210} X_{10}$$

$$Y(NC/VMI) = \alpha_3 + \beta_{13} X_1 + \dots + \beta_{310} X_{10}$$

$$Y(MD/VMI) = \alpha_4 + \beta_{14} X_1 + \dots + \beta_{410} X_{10}$$

Prior to the estimation of the logistic regression estimates for the logit functions, a test for multicollinearity is conducted to ensure that there is no collinearity among the independent variables include in the model. Multicollinearity can be detected with the use of either



variance inflation factor, which gives an index that shows how much variance is associated with the collinearity among the dependent variable included in the model.

A post estimation test is also conducted to determine the goodness of fit of the model, parameter significance test as well as the adequacy of the estimated models.

### Results

This section of the paper presents the results of the analysis, which is the results for the test for the presence of multicollinearity as well the regression estimates of the logistic function relative to the reference category.

**Table 2:** Test Results for Multicollinearity

Variables	Collinearity Indicators	
	Tolerance Values	Variance Inflation Factor
Age	0.964	1.037
Sex	0.877	1.140
Occupation	0.879	1.137
Education	0.980	1.020
Possession of Debit card (DebP)	0.974	1.027
Frequency of the use of cards	0.876	1.138
Mobile phone possession	0.912	1.096
Frequency of the use of mobile phone for financial transactions	0.899	1.112
Income	0.786	1.272

Table 2 presents the test results for multicollinearity, the tolerance values and the variance inflation factors for all the independent variables, with the type of bank account used as the reference independent variable in the conduct of the test. The results indicate that all the independent variables have a value of the variance inflation factor greater than 1, which is an indication that the independent variables are not linearly correlated.

**Table 3:** Multinomial logistic Regression Estimates of the Parameters

Variables	Very much Decreased			Very much increased			No change			Moderately Decreased		
	C	D.F	P value	C	D. F	P value	C	D.F	P value	C	D. F	P value
Intercept	17.56	1	0.86	33.22	1	0.931	22.74	1	0.978	19.65	1	0.969
Age	-0.656	1	<b>0.054</b>	2.34	1	0.165	0.987	1	0.076	0.559	1	0.667
Sex	0.532	1	<b>0.046</b>	-0.876	1	0.327	0.663	1	0.671	0.534	1	0.876
Occupation	-1.43	1	<b>0.078</b>	--2.43	1	0.421	0.231	1	0.042	0.233	1	0.230
Education	0.63	1	0.674	-6.88	1	0.317	0.342	1	0.897	0.984	1	0.311
DebP =1	43.13	1	<b>0.000</b>	8.132	1	<b>0.000</b>	0.651	1	0.465	0	0	-
DebP=2	0	-	-	0	-	-	0	0	0.234	-0.631	1	<b>0.001</b>
Debfreq1	-10.65	1	<b>0.000</b>	-5.99	1	<b>0.000</b>	-0.442	1	<b>0.023</b>	-0.342	1	<b>0.000</b>
Debfreq2	-13.76	1	<b>0.000</b>	-3.87	1	<b>0.000</b>	-0.287	1	<b>0.000</b>	-0.117	1	<b>0.000</b>
Debfreq3	-9.63	1	<b>0.001</b>	-2.53	1	<b>0.000</b>	-0.763	1	<b>0.000</b>	-0.354	1	0.432
Debfreq4	-11.34	1	<b>0.004</b>	-6.88	1	<b>0.000</b>	-0.423	1	<b>0.001</b>	-0.116	1	0.772
Debfreq5	0.326	1	0.774	-3.55	1	0.561	-0.987	1	0.892	0	0	-
Debfreq6	0	1	-	0	0	0.352	0	0	-	0.679	1	0.011
MobPP1	12.76	1	0.654	-32.12	1	<b>0.00</b>	-2.54	1	<b>0.000</b>	0	0	-
MobPP2	0	-	-	0	0	-	0	0	0.342	-0.25	1	<b>0.000</b>
Mobppfreq1	24.14	1	0.345	-12.56	1	<b>0.000</b>	-2.652	1	<b>0.000</b>	-0.345	1	<b>0.000</b>
Mobppfreq2	23.41	1	0.125	-16.99	1	<b>0.000</b>	0.885	1	0.234	0.756	1	0.23
Mobppferq3	-8.42	1	0.786	-9.54	1	0.113	0.452	1	0.634	0.236	1	0.453
Mobppfreq4	-11.34	1	0.456	-10.22	1	0.142	0.966	1	0.251	0.451	1	0.119
Mobppfreq5	10.55	1	0.614	-9.45	1	0.123	0.342	1	0.760	0	0	-
Mobppferq6	0	-	-	0	1	-	0	0	-	0.668	1	0.23
Acttype1	4.78	1	0.761	-12.76	1	0.162	0.554	1	<b>0.000</b>	0.445	0	0.981
Acttype2	7.22	1	0.546	-56.12	1	0.231	0.322	1	0.876	0.239	1	0.113
Acttype3	0	1	-	0	0	-	0	0	-	0.236	1	0.331
Income1	-2.54	1	0.998	-23.43	1	0.345	0.883	1	0.892	0.885	1	0.123
Income2	-7.64	1	0.665	-17.87	1	0.342	0.231	1	0.354	0	0	-
Income3	0	1	-	-18.96	0	0.234	0	0	-	19.65	1	0.969

The estimated parameter values, the degrees of freedom, as well as the p-values are presented in Table 3. The p-values indicates the level of significance of each of the explanatory variable on the dependent variable. The interpretation of the various categories of the dependent variable is made in reference to the category chosen for reference purpose as in this study is the “Very much increased” is the reference category used for the estimation.

The results in Table 3, shows that the first category explains the factors that are associated with the very much decreased demand for cash among the respondents. The estimated results show that the demand for cash very much decreased among the respondents due to factors such as the age, sex, occupation, possession of debit cards as well the frequency in the use of debit cards from 1-14 days, are found to have significant effect in reducing the demand for cash among the respondents. The possession of mobile phones, the account types, frequency of the use of the mobile phones for transaction purposes as well as income were found not to be statistically influencing the very much decreased demand for cash among the respondents.

Referring to the “Moderately demand for cash” category, the factors that are found to have significant impact on the reduction of the demand for cash are the possession of debit cards



and mobile phones, as well as the frequency in the use of the debit cards from 1-15 days as well as the frequency in the use of mobile phones for transaction purpose from 1- 5 days. The respondents with the reference as “very much increased” in the use of debit cards and mobile phones for transaction purposes are significantly determined by factors such as the frequency in the use of the debit cards and mobile phones for transaction purposes. The results in table has clearly shown that against the reference category of “Very much increased” the demand for cash among the selected respondents were higher for the “Very much decreased and “moderately decreased” demand for cash were higher with the usage of debit cards and mobile phones for transaction purposes.

### Post Estimation Tests

An estimated model needs to be tested for a good ness of fit, the value of  $r^2$  the Pseudo-  $R^2$  in the case of logistic regression as well as the test for good ness of fit of the estimated models. The results are presented in Table 3

**Table 4:** Post -Estimation Tests Results

Good ness of Fit Test			
Statistic	Chi square Values	Degrees of Freedom	Percentage of level of Significance
Pearson	1532.223	1119	0.253
Pseudo R- Squared			
Cox and Snell			0.34
Model Fitting Information			
Model	Model Fitting Method	Likelihood Ratio Tests	
	-2loglikelihood	Chi-square	Level of significance
Intercept only	1.342E3		
Final model	701.351	132.03	0.021

The results for the post estimation test are presented in Table 3, the results for the test for the fit ness of the model, using the Cox and Snell statistic indicated that the model fits the data, as the level of significance for the test is greater than 0.05, there by rejecting the null hypothesis that the data does not fit the model used for the estimation. The value of the pseudo  $R^2$  which is the same as  $R^2$  in a linear regression analysis, indicates that about 34 percent variations in the dependent variable categories are explained by the independent variables that are included in the estimated models. Similarly, a test for the model information fit is conducted using - 2loglikelihood ratio to find out if the model fitted is better than the null model, the test is conducted using the chi-square values, the value of the chi-square is the difference between the final model and the null model, and the model is considered fit if the level of significance of the test is less than 0.05, the results of the test in table 3 indicates that the model fits the data well.

### Conclusion and Recommendations

This paper investigated the effect of the use of debit cards and mobile phones for financial transactions among urban households in Zamfara state North Westen Nigeria. Using a sample of 300 purposively selected respondents and using the multinomial logistic regression method of analysis.

The multinomial logistic regression result indicates that the use of the debit cards as well as the use of the mobile phones for transaction purposes have significantly led to the reduction of the demand for cash among the respondents in the area of the study, with the frequency in the use of the two channels of payments between day 1 and 15 days been statistically significant. The results of the study further vindicate that other factors that leads to the reduction in the use of cash among the selected respondents are the age as well as the occupation of d the respondents. Generally, we can conclude that the use of the payment's technology leads to the reduction in the demand for cash among the users of such technologies. The results of the multinomial regression analysis is in tandem with similar studies such as Mlabo and Msosa(2020) for African countries, Aliha et al( 2018) as well as Fatai (2014) for Nigeria. The finding of the study is however, contradictory to the findings of other studies such as Shiva and Durai (2017) for India, Bakamya (2014) as well as Aliha et al (2018); Lukman and Yinisa (2013) that finds a significant positive relationship between the use of payments technologies and the demand for cash. The findings of the study indicate that the use of the payment's technology can significantly reduce the demand for cash holdings among the residents of the country, thereby reducing the demand for the monetary authorities to print more currency in the country.

The findings of the study have the following policy implications; firstly, the study can be beneficial to the monetary authorities, since the continuous use of the payments technologies leads to the reduction in the demand for currency, thereby reducing the cost of minting currency in the country. Another policy implication of the study is that the use of payments technology can be encouraged as it reduces the risk of theft and other risks that are likely to be associated with the handling of cash in the country; thereby reducing pressure on the part of security personnel to in handling cases that are related to armed robbery and thefts.

Based on the findings of the study; it recommends the following: there is the need for the government and the monetary authorizes to continue to mobilize the general public on the need to make use of the available payment's technologies in the country through its available channels of communication. There should also be call for the network service providers to reduce the cost of charges for transfer of funds and any other financial transactions made using the electronic payments channels to encourage more users of such payment's technologies. The monetary authorities should continue to use the financial innovation instruments in reducing the demand for cash, rather than increase in the interest rate which could negatively affect the real sector of the Study.

### **Suggestions for Further Research**

Future studies on the effects of payments on the demand for cash could be conducted in the rural areas of the state, to ascertain the effects of the payment's technology on the demand for cash in the rural area. Similarly, other techniques of data analysis such as mediation analysis could be conducted to find out if the area of residence of the respondents (urban, semi- urban, rural) mediates the adoption of payments technology and the demand for cash. Similar studies can be conducted with regards to other payments technologies such as the points of sales and the internet banking effects on the demand for cash among the respondents.

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