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► **To cite this version:**

Tarna Silue. E-money, Financial Inclusion and Mobile Money Tax in Sub-Saharan African Mobile Networks. 2021. hal-03281898

**HAL Id: hal-03281898**

**<https://uca.hal.science/hal-03281898v1>**

Preprint submitted on 8 Jul 2021

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# E-money, Financial Inclusion and Mobile Money Tax in Sub-Saharan African Mobile Networks

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*Études et Documents* n°22

July 2021

To cite this document:

Silue T. (2021) "E-money, Financial Inclusion and Mobile Money Tax in Sub-Saharan African Mobile Networks", *Études et Documents*, n°22, CERDI.

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This work was supported by the LABEX IDGM+ (ANR-10-LABX-14-01) within the program “Investissements d’Avenir” operated by the French National Research Agency (ANR).

*Études et Documents* are available online at: <https://cerdi.uca.fr/etudes-et-documents/>

Director of Publication: Grégoire Rota-Graziosi

Editor: Catherine Araujo-Bonjean

Publisher: Aurélie Goumy

ISSN: 2114 - 7957

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## **Abstract**

E-money and financial inclusion are both development challenges for developing countries, the former contributing to improving tax mobilization and the latter to achieving particular sustainable development objectives. However, one of the central financial inclusion and e-money services providers is mobile network operators using mobile money. The latter is subject to numerous taxes that can affect their operations. The paper studies the incidence of the new mobile money excise duty in the mobile networks sector on the adoption of electronic money and the advancement of financial inclusion through digital services in sub-Saharan countries. It appears that the introduction of the tax leads to an increase in user fees, which has a positive impact on demand for cash, and it is only in the presence of the latter that MM reduces the demand for cash for studied countries. In addition, the study assumes that tax administrations in these countries would raise more revenue without this excise because the tax is not conducive to the full adoption of e-money.

## **Keywords**

Cash, Financial Inclusion, Mobile Money, Excise Duties, Tax Incidence

## **JEL Codes**

O33, C22, H22

# 1 Introduction

Given the spectacular development of mobile money in Africa over the past decade, some countries have begun to tax mobile money operations to increase revenue mobilization. In this context, Ivorian<sup>1</sup> Mobile Network Operators (MNOs) subscribers received messages on February 25, 2019, notifying them of changes in the mobile money services fee schedule. Operators specified in these messages that this new schedule was due to increased activity-related costs following the introduction of a tax on mobile financial transactions. Indeed, the 2019 new tax annex institutes a further 7.2 percent turnover tax for undertakings issuing electronic money.

Côte d'Ivoire is not the only country that taxes mobile money. According to GSMA (2019), mobile money taxation is growing fast in sub-Saharan Africa. In Kenya and Tanzania, governments put an excise duty directly on mobile money transactions. On the other hand, Uganda taxes both all mobile money transactions in addition to operators' turnover<sup>2</sup>. However, these taxes in the e-money sector in these countries have led to increased mobile money tariffs.

These notable events lead to critical issues as tax revenues and financial inclusion is real economic challenges for these countries. Then, why are MNOs shifting the tax burden to consumers? Would answers be found in previous governments interventions in this area? What is Government's interest in tax undertakings issuing electronic money? Is this interest important than financial inclusion? Does not the tax slow down mobile

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<sup>1</sup> The mobile operators that communicated their new tariffs by that date were Orange, and Moov Côte d'Ivoire.

<sup>2</sup> The payers of the transactions tax are the consumers and those of turnover tax are MNOs.

financial inclusion in developing countries?

In doing so, while the government's measures concern undertakings issuing electronic money, this paper will take an interest in MNOs for specific reasons. First, this institutional sector is generally described as a value-added sector. Indeed, the mobile network industry in developing countries underwent a great wave of liberalization last year because of government regulations. In the past, this market was served by a public monopolist because of high fixed costs, except that the incumbent monopolist's inefficiency and technological change required government interventions. These interventions consisted of setting up incentive and liberalization reforms. The opening to competition has led to a transition from a monopolistic to an oligopolistic structure. However, following economic intuition, this theoretically imperfect competition should facilitate explicit or implicit collusion between operators, which should generally lead to high prices and thus a higher capital return than that needed to encourage operators in the sector to invest. Therefore, States mainly use taxation to capture the maximum of this value-added. Nevertheless, unlike sectors such as mining, which generate an exogenous value-added, the mobile communications sector generates an endogenous value-added that decreases with government connections and pro-competitive policies (Faccio and Zingales, 2017). This reduces the taxable base in terms of value-added.

The second reason is the central involvement of the industry in the process of the financial inclusion process in developing countries. The MNOs provide microfinance and transfer services to the population and especially to people excluded from the formal financial system. For example, M-Pesa, a microfinance and money transfer system launched by the Vodafone group in Kenya and Tanzania.

Therefore, for these two reasons, it should be noted that governments have to make a very interesting arbitrage in the mobile network sector. On the one hand, the government wants to mobilize more public resources to restrict competition and increase tax revenues based on industry value-added. On the other hand, consumers want more financial services at lower costs. This could involve a higher degree of competition and a decrease of tax revenues specific to value-added.

From an economic theory point of view, the discussion on the subject remains unfinished to this day. Therefore, in addition to theoretical work, empirical evidence is also needed to sustain public policy dialogue in Sub-Saharan African countries.

Thus, this article is of both academic and political interest. From an academic point of view, the paper constitutes an empirical resource on evaluating the impact of tax measures in the mobile network sector. At the political level, it provides empirical evidence constituting a decision aid enabling governments to understand tax interventions' impact better and achieve efficient public policies.

From the mobile money market, I study how in Sub-Saharan African countries government uses regulation and tax in the mobile network industry knowing the real economic stake of financial inclusion. According to theories of cash demand, I realize an empirical analysis to bring some answers to this issue. Indeed, the inclusive financial services provided by MNOs are leading to the growing adoption of electronic money at the expense of cash. That said, the analysis provided below is based on two assumptions, which are set out as follows.

First, I suppose we have an oligopolistic mobile network market that is the leading digital financial services provider in these countries. This observation can be explained by

the government's desire to ensure the best possible protection of consumer funds. Indeed, with a reduced number of suppliers, the costs of control are lower. The regulation of mobile money in many sub-Saharan African countries guides consumer protection rules. However, another explanation for this choice, which favors firms, maybe the existence of political connections. Based on Peltzman's (1976) work, which underlines that regulation is the outcome of the pressure of multiple constituencies, Faccio and Zingales (2017) find that government's rules appear to be tilted more in favor of MNOs when these firms are more politically connected.

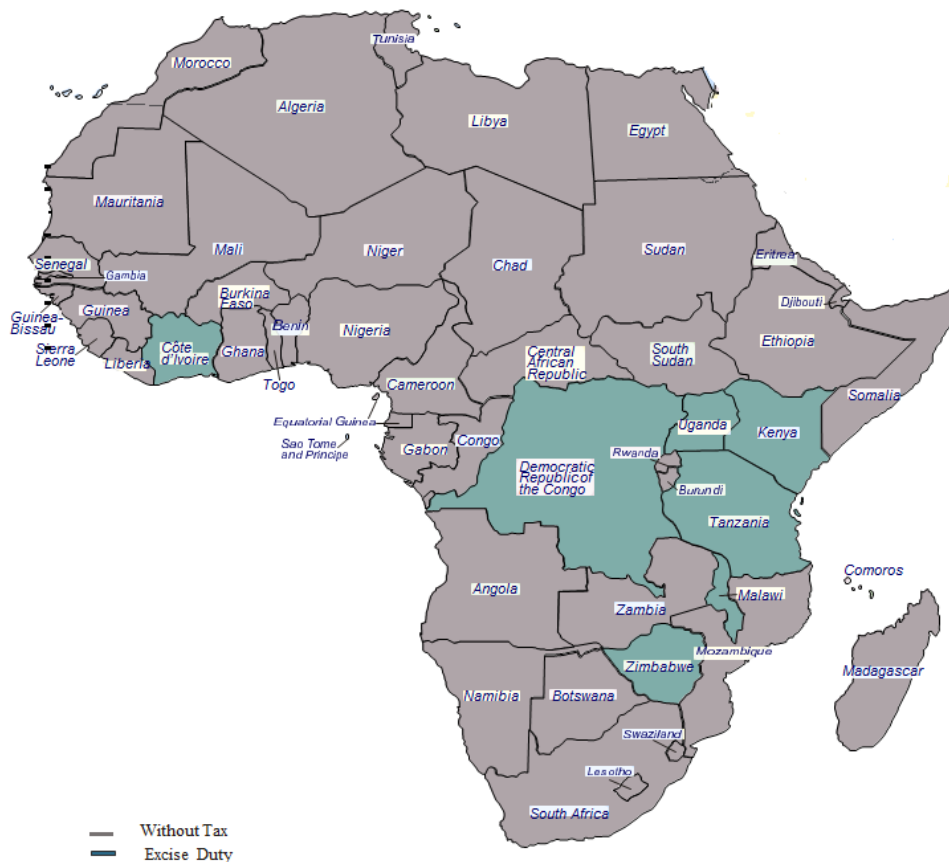
The second hypothesis is that taxes on mobile money considerably reduce the capacity of the industry to invest in the activity because states generally tax consumption than production. Of the thirty-seven countries in sub-Saharan Africa with mobile money, seven have recently started to tax mobile money services. In doing so, three of these seven countries have chosen to introduce excise duties on mobile money operator's revenues, while four have chosen excise duties on the transaction. Ghana is also considering introducing a tax aimed at operators rather than subscribers. Nevertheless, excise duties remain imperfect substitutes for the states to tax mobile money activities that escape direct taxation in these countries.

Thus, the aim of these excise duties is not to reduce negative externalities by making consumers bear a social cost according to the Pigouvian logic. Instead of raising revenue through these excise duties, governments aim to help finance public expenditure while changing consumer behavior as little as possible. This is illustrated by tax rates that are very lower compared to excise duties on goods such as tobacco, fuel, or alcohol in those countries. However, mobile sector-specific taxes have indeed become as prevalent as in the extractive industries leading to a high tax burden for operators. For Matheson and



Petit (2020), taxes on the mobile network sector have become a source of considerable uncertainty and compliance costs over the past decade. From Rota-Graziosi and Sawadogo (2020), it appears that the tax burden of an MNO is relatively higher than that of a gold mining firm in some African countries. The instrument of comparison used by the latter is an Average Effective Tax Rate (AETR) designed to take into account both general and sector-specific taxes. In such a context, the new tax on mobile money may run counter to the objective assigned to it by governments.

**Figure 1: African Countries with Tax on Mobile Money Activities**



Source: Author

The rest of the paper is as follows. Section 2 reviews the taxes applied to operators in sub-Saharan countries, focusing on those that are mobile-specific. It also compares tax rates between the countries. Section 3 then provides characteristics of mobile money services users. This is done by identifying common trends across the sub-Saharan African countries covered by the Research ICT Africa Survey (RIAS) in 2012. Section 4 makes a detailed description of the dataset used for empirical analysis, exposes the econometric strategy, and presents the results. Section 5 discusses policy implications. Section 7 concludes the study.

## **2 Telecom Taxation Regimes**

Telecom tax regimes in developing countries have changed significantly over the last few years. However, major tax provisions are similar across sub-Saharan countries, with differences only in the rate level. The tax burden includes both consumers and MNOs. In doing so, some taxes are borne by networks through a fall in their profits, while others may be passed through to consumers through higher prices, or there may be a combination of the two. It depended on the country, market conditions, and MNOs' strategies.

Table 1 summarizes certain tax provisions specific to MNOs while including requirements relating to mobile money. The countries covered are from sub-Saharan Africa with the most significant flows in mobile money activity. As for provisions, they include corporate income tax (CIT), value-added tax (VAT), call and mobile money excise. However, substantial regulatory charges specific to the sector, such as spectrum and interconnection fees, have not been introduced.

CIT is a tax provision of countries' general taxation system. MNOs are subjugated to it and the indirect tax based on their turnovers. CIT rates vary from 20 percent in Madagascar to 40 percent in Zambia. All countries except Kenya and Zambia practice uniform rates<sup>3</sup>. Kenya differentiates the rate according to the tax residence that leads residents to pay 30 percent while non-residents have a rate of 37.5 percent. Zambia has opted for a progressive tax based on the level of turnover. Therefore, a Zambian firm with a profit of up to 250 million kwacha gives 35 percent of its profit, and a firm with a profit exceeding 250 million kwacha<sup>4</sup> provides 40 percent.

As far as VAT is concerned, it is an indirect tax recovered on the final consumption of goods and services. This tax is collected and remitted to governments by collectors, including MNOs. Nevertheless, Table 1 shows the VAT rates incurred by operators that are not deductible. VAT rates vary from 15 percent in Zimbabwe to 20 percent in Madagascar.

In addition to the taxes as mentioned above, governments apply ad valorem excises to mobile services provided to subscribers. In my analysis, I present the excise duties levied on calls and mobile money. In terms of calls, tax charges on cell phone airtime. The rate differs from one country to another, with 3 percent in Côte d'Ivoire and 17.5 percent in Zambia. Some countries such as DRC, Malawi, and Rwanda have all chosen to tax this service at 10 percent.

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<sup>3</sup> However, the elements used to determine the taxable base differ from one country to another.

<sup>4</sup> Kwacha is the official currency of Zambia.

Table 1: **Taxes on mobile services in eleven countries**

	<b>CIT</b>	<b>Non deductible VAT</b>	<b>Excise Duties</b>		
			Call <i>Ad valorem charge on cell phone airtime</i>	Mobile Money <i>Ad valorem charge on mobile money operator's revenues</i> <i>Ad valorem charge on mobile money transactions</i>	
	<i>CIT is based on computed taxable telecoms operator's profits</i>	<i>VAT charge on telecom products and/or services</i>			
<b>DRC</b>	35%	16%	10%	3%	-
<b>Côte d'Ivoire</b>	30%	18%	3%	7.2%	-
<b>Kenya</b>	Residents: 30% Non Residents: 37.5%	16%	10%	-	12%
<b>Madagascar</b>	20%	20%	10%	-	-
<b>Malawi</b>	30%	16.5%	10%	-	1%
<b>Namibia</b>	32%	15%	-	-	-
<b>Rwanda</b>	30%	18%	10%	-	-
<b>Tanzania</b>	30%	18%	17%	-	10%
<b>Uganda</b>	30%	18%	12%	10%	0.5%
<b>Zambia</b>	Profit up to k 250 million: 35% Profit exceeding K 250 million: 40%	16%	17.5%	-	-
<b>Zimbabwe</b>	27.75%	15%	10%	-	2%

Source: Author

Then comes the excise tax on mobile money. This tax was introduced in countries very recently, and it is the legitimacy of this tax that the paper is dealing with. Some countries, namely Côte d'Ivoire and DRC<sup>5</sup>, have decided to apply the tax on the profit generated by the activity. In doing so, the tax burden is generally transferred to consumers through an increase in tariffs. Ndung'u (2019) shows that the M-Pesa tariffs for most

<sup>5</sup> DRC withdrew the tax in 2018.

transfers and withdraws ranges have increased since introducing the excise tax on financial services in 2013 and update in 2018. Kenya, Malawi, Tanzania, and Zimbabwe have chosen to tax transactions directly at 12 percent, 1 percent, 10 percent, and 2 percent, respectively.

Note in Kenya that this tax was first introduced in 2013 at a rate of 10 percent. It then increased to 12 percent in 2018. Finally, we have Uganda, which taxes both business profits and transactions. In 2013, the Ugandan Government only introduced a 10 percent tax on operators' revenues. If I expected a decrease in demand, the latter has not been disrupted and increased government revenues. Under these conditions, the State introduced in July 2018, in addition to the operators' revenues tax, a 1 percent tax on the value of deposits, withdrawals, payments, and transfers. However, this new tax has harmed the demand, as the measure does not meet the criteria of neutrality and fairness. In October 2018, Government reduced the tax to 0.5 percent and restricted it to withdrawals.

### **3 Mobile Money Users**

This part's idea is to design the profile of mobile money users. This will allow us to judge the impact of tax following the user category and discuss its legitimacy in the rest of the paper. To do so, I used RIAS Household and Business micro-data in 2011-2012. Using the frequency of use and transaction amounts, we will see which households or informal businesses use mobile money the most. The data cover 12 countries in sub-Saharan, including countries such as Kenya, Uganda, and Tanzania.

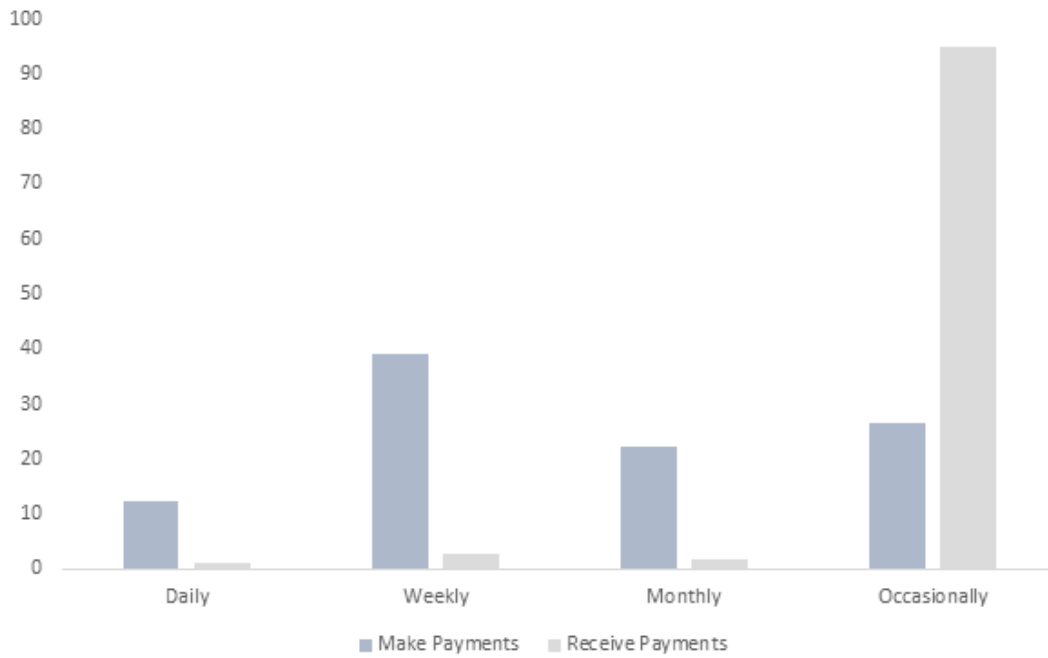
Thus, initially, the focus will be on the general frequency of service use in the

countries surveyed. In the questionnaire submitted to the individuals, there is a question asking them how often they use mobile money. Figures 2 and 3 show the respective frequencies of Businesses and Households.

We note that businesses generally use mobile money services weekly, while nearly 48 percent of households have a monthly use. This makes the business the most regular user of the services, although it should be noted that a part makes occasional use. Indeed, cash is still the most used mean of sending and receiving money from businesses. This reflects their low voluntary rate of bank penetration and their relatively low use of digital technology.

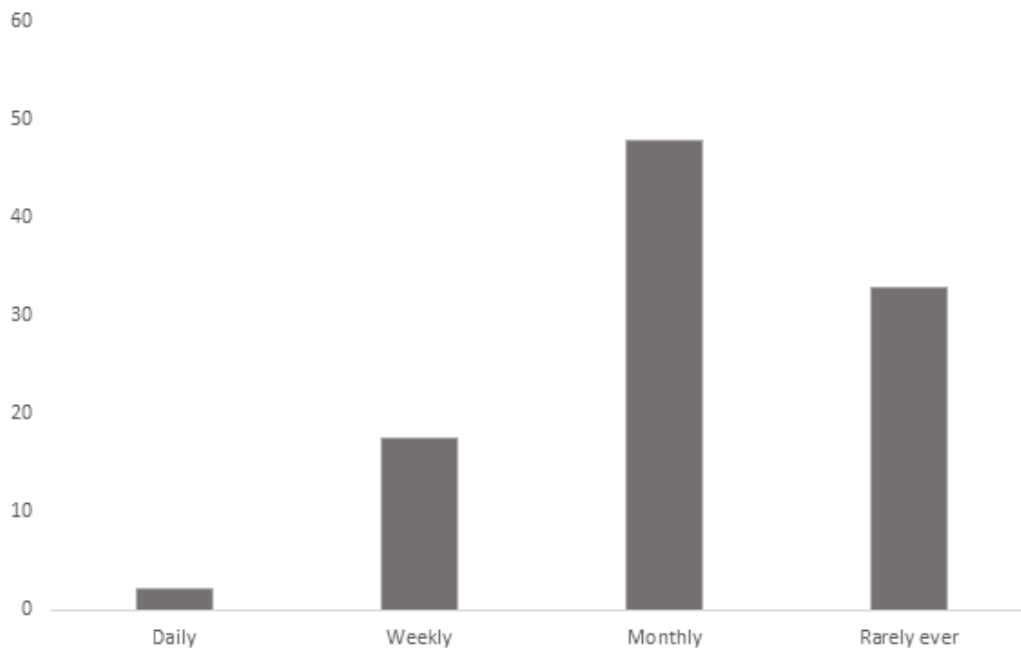
In doing so, businesses behind this regular use of mobile money are mainly grocery and retail shops. As for households, which have a rather monthly use, I note that women remain the most active compared to men. They make more frequent use of mobile money services than men do. The reasons given by women to justify this level of use are the saved time and the service's low cost. It should be noted that women include populations traditionally excluded from the formal financial system, including displaced persons and the rural poor. Women's use generally consists of receiving money and airtime top-up.

**Figure 2: Business usage frequency of mobile money**



Source: Author

**Figure 3: How often household send or receive mobile money**

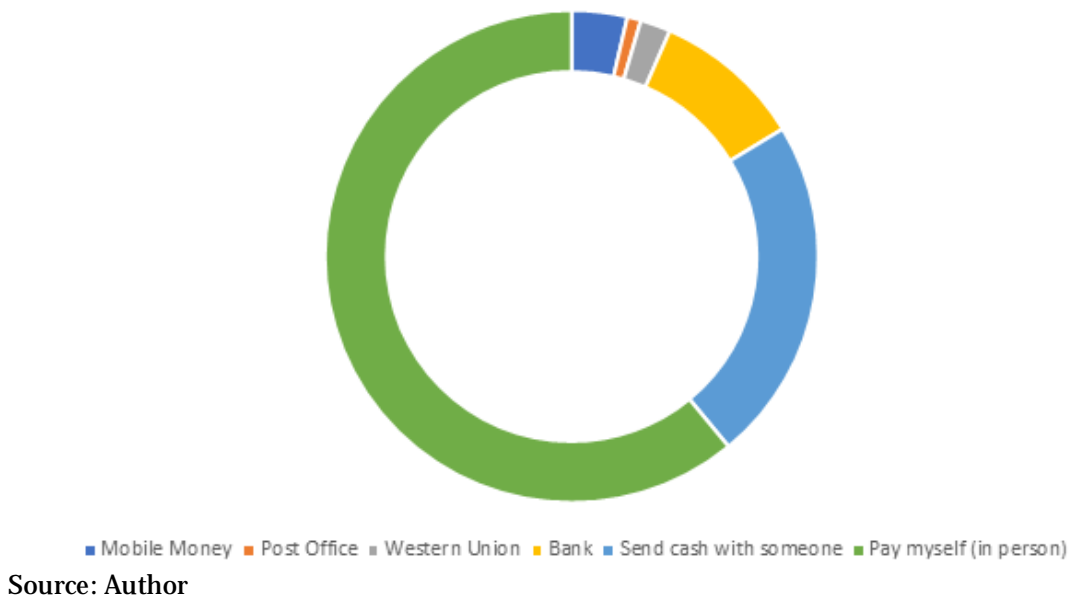


Source: Author

Thus, while it is clear from the above that the frequent users of mobile money are businesses, it cannot be said that the MNO profits are due to the use of these businesses. A business with regular use with meager amounts cannot be qualified as the primary user of the service compared to a household with a monthly usage with relatively very high amounts. Therefore, I am interested in the value aspect in my analysis to precisely identify the service's primary users in addition to the volume aspect.

In the process, businesses essentially use mobile money to pay some of their suppliers who ask for it and receive their customers' payments who offer it to them for large amounts. In the area covered by the survey, the amounts sent to settle a business payment could be five times the received amounts for commercial purposes.

**Figure 4: Most used means of sending and receiving money**





As far as the households are concerned, the majority affirms that the amounts received and sent are approximately identical. However, these amounts are almost ten times lower than those of the businesses are. This is intuitive because businesses have more resources, and then business operations are about settling deals. The business's operations with the associated amounts are essentially carried out by retail shops, while those of the households come from the women.

This section shows two main categories of users of mobile money services, namely individuals and informal businesses. Of these two categories, the main users are informal businesses headed by shops. The latter has regular use with large transactions. In the following section, the question will be to assess the impact of excise duty on the global usage of these two categories basing on the demand for cash.

## **4 Empirical Evidence**

### **4.1 Data**

Empirical estimates were performed based on an unbalanced panel of 10 African countries with monthly periods from 2000 to 2019. To measure the cash demand, we use the monetary aggregate labeled as M1. This aggregate includes paper money and coin currency in circulation and demand deposits. It was recovered in the Monetary and Financial Statistics (MFS) of the International Monetary Fund. Then, we compute two ratios basing on the monetary aggregate. The first one is the cash demand per capita obtained by dividing the monetary aggregate by the total population. The second ratio, named GDP held in cash, is the share of cash in the national wealth.

**Table 2: Sample Countries**

Democratic Republic of Congo	Rwanda
Côte d'Ivoire	Tanzania
Kenya	Uganda
Madagascar	Zambia
Namibia	Zimbabwe

**Table 3 : Summary Statistics**

Variable	Mean	Median	Std. Dev.	Min	Max
log(cash demand per capita)	2,424	3.99483	1.970609	0	24.68153
log(GDP held in cash)	2,424	0.228091	0.8431748	0	18.00898
Tax	2,772	0.2164502	0.4118989	0	1
log(MM per capita)	2,209	0.7871296	1.290591	0	4.231333
log(MM in GDP)	2,209	0.0053876	0.0116441	0	0.0533466
Tax * log(MM per capita)	2,209	0.3225698	1.040569	0	4.231333
Tax * log(MM in GDP)	2,209	0.0033097	0.011002	0	0.0533466
GDP per capita	2,519	1221.347	1343.132	276.0559	6274.753
ATM	1,812	8.63278	14.69333	0.0402514	72.44603
Informal	2,604	21.87766	8.165745	2.860718	38.81841
Short-term R	2,148	12.55442	21.56222	2.433333	203.375
Internet	2,519	8.298291	10.19132	0.0059021	51
Unemployment	2,651	5.800363	5.544267	0.599	23.352
MM agents	2,364	136.5539	256.3248	0	1540.9

Concerning the mobile money tax, we use a dummy variable that takes the value one from the month the tax was applied in the country and zero otherwise. Then, the use of MM services is captured by the value of MM transactions collected on the Financial Access Survey (FAS).

The other variables GDP per capita, number of ATM (Attanasio et al. 2002), agricultural

value added as proxy for informality level and the short-term nominal interest rate that rate paid by commercial or similar banks for demand, time, or savings deposits (Tobin, 1956).

## 4.2 Model Specification

In this part, we conduct an empirical analysis that highlights the causal effect of MM tax on cash demand. Our main objective is to analyze the impact of MM on cash demand in the presence of tax on MM transactions. To do this, the study seeks to present the direct impact of the tax on the demand for cash separately and then the contributions according to whether countries have implemented a tax or not.

The economic literature proposes different alternatives to model the demand for cash. In his general theory, Keynes indicated that the preference for liquidity in the economy stems from three motives: the transaction motive, the precautionary motive, and the speculation motive. Therefore, by looking at the economic inputs that define these motives, we end up with a demand for cash as a function of income or gross domestic product, the interest rate, and inflation (Steven, 2003). Keynes's vision has been criticized and improved over time by the monetarist movement, led by Friedman, and by the brilliant works of Baumol (1952) and Tobin (1956). For our part, we model the demand for cash in our developing countries as a function of the level of economic activity, the level of informality, and the interest rate. We obtain the following specification:

$$CD_{it} = \alpha_0 + \alpha_1 GDP_{it} + \alpha_2 ATM_{it} + \alpha_3 Informal_{it} + \alpha_4 R_{it} + \epsilon_{it} \quad (1)$$

where  $CD_{it}$  is the level of cash in circulation in country  $i$  in month  $t$ ,  $GDP$  is gross domestic product per capita,  $ATM$  is the number of ATMs per 100,000 adults,  $Informal$  is the value

added of the agricultural sector, and  $R$  is the nominal short-term interest rate, the rate paid by commercial or similar banks for demand, time, or savings deposits. Two complementary models are derived from equation (1) to study the impact of the tax and the impact of MM as a digital financial service respectively:

$$CD_{it} = \alpha_0 + \alpha_1 Tax_{it} + \alpha_2 GDP_{it} + \alpha_3 ATM_{it} + \alpha_4 Informal_{it} + \alpha_5 R_{it} + \epsilon_{it} \quad (2)$$

$$CD_{it} = \alpha_0 + \alpha_1 Tax_{it} + \alpha_2 MM_{it} + \alpha_3 (Tax_{it} * MM_{it}) + \alpha_4 GDP_{it} + \alpha_5 ATM_{it} + \alpha_6 Informal_{it} + \alpha_7 R_{it} + \epsilon_{it} \quad (3)$$

where  $Tax$  corresponds to the presence of the tax and  $MM$  the value of the mobile money transactions.

Thus, following Le et al. (2020), we estimate our models using the robust standard errors proposed by Driscoll and Kraay (1998) to correct for cross-sectional dependence (SCC) and temporal dependence due to the very large temporal size of the database. To do so, we used the xtscv program produced by Hoechle (2007), which produces the standard Driscoll and Kraay (1998) errors for linear panel models since they are not only consistent with heteroskedasticity but also robust to very general forms of cross-sectional and temporal dependence. In addition, the program used has the particularity of working well with both balanced and unbalanced panels. The method is therefore suitable for our panel with missing values. In doing so, to account for the specificities of the countries studied, Driscoll and Kraay's (1998) standard errors for coefficients are estimated by fixed effects (within).

### 4.3 Results

Results obtained from the estimation of cash demand equations 1, 2, and 3 using Hoecle's (2007) procedure are reported in Table 4. The estimate of the basic model indicates that GDP per capita has a significant negative impact on the demand for cash. Indeed, a considerable proportion of the population in these countries derives its income from the agricultural sector, which has a relatively small contribution to the construction of GDP compared to the private and public sectors. Thus, an increase in GDP per capita, benefiting largely the employees of public and private companies who have a better knowledge of finance than those working in the agricultural sector, will lead to greater access to credit cards, debit cards, and all other cashless payment instruments. Second, there is the negative impact of the short-term nominal interest rate (Baumol 1952; Tirol 1956) and the positive impact of the informal sector (Amromin and Chakravorti 2009; Chen et al. 2017) on demand for cash.

The second phase of our empirical analysis consisted of introducing into the basic model the variable tax, a dummy variable taking the value 1 when there is a tax on MM transactions and 0 when there is no tax. We note that the tax on MM leads to an increase in the demand for cash. With the increase in MM user fees induced by the tax, individuals and legal entities will prefer to use cash. It should be noted that cash remains the most widely used monetary instrument in these economies, even in the presence of MM. Under these conditions, the tax will discourage the adoption of electronic money through MM and lead individuals to return to cash, which does not incur costs. The tax introduction leads to a 21.1 percent increase in the per capita demand for cash and an 11.9 percent

increase in the GDP held in the countries studied.

**Table 2: Currency demand estimations**

	log(cash demand per capita)			log(GDP held in cash)		
Tax	0.211*** (0.0735)	1.749** (0.706)		0.119*** (0.0316)	1.201*** (0.375)	
log(MM per capita)		0.170*** (0.0573)			0.0782*** (0.0279)	
Tax * log(MM per capita)		-0.526** (0.221)			-0.342*** (0.113)	
GDP per capita	-0.00355*** (0.000592)	-0.00372*** (0.000615)	-0.00421*** (0.000695)	-0.00168*** (0.000262)	-0.00178*** (0.000281)	-0.00199*** (0.000329)
ATM	0.00755 (0.0104)	0.00963 (0.0107)	0.00954 (0.0123)	0.0190*** (0.00469)	0.0201*** (0.00491)	0.0200*** (0.00603)
Informal	0.0809*** (0.0100)	0.0761*** (0.0103)	0.0979*** (0.0136)	0.0520*** (0.00616)	0.0493*** (0.00612)	0.0605*** (0.00728)
Short-term R	-0.0419** (0.0179)	-0.0418** (0.0179)	-0.0428** (0.0190)	-0.0253 (0.0160)	-0.0253 (0.0160)	-0.0263 (0.0171)
constant	7.994*** (0.782)	8.275*** (0.829)	8.767*** (1.084)	1.674*** (0.371)	1.832*** (0.408)	1.975*** (0.555)
<i>Observations</i>	1408	1408	1245	1408	1408	1245
<i>Countries</i>	10	10	10	10	10	10
<i>R-squared (within)</i>	0.2511	0.2529	0.2946	0.1400	0.1416	0.1611

Standard errors in parentheses, \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

We then turn our attention to MM. First, we can see that MM has a significant positive impact on the demand for cash. This is because MM is mainly used to transfer cash from one individual to another (P2P) in these countries. The bill payment and microfinance aspects are still underdeveloped. An increase in the value of MM transactions leads to a beta percent increase in the demand for cash per capita and a beta percent increase in the demand for cash in GDP. Thus, in the presence of a tax, MM hurts the demand for cash. With the presence of tax, individuals will primarily turn to the use of cash with hand-to-hand remittances, as the transfer of cash becomes costly with MM. The use of MM will be

more concerned with payments and microfinance, activities that necessarily require the use of electronic money. In this context, an increase in the number of transactions recorded in the MM account will increase electronic money and a decrease in the demand for cash for transactions.

#### **4.4 Sensitivity**

At this stage of our analysis, our results are subjected to a sensitivity exercise. The exercise consists of adding variables to the model to see if the coefficients of our variables of interest are influenced. The test set is done by adding the percentage of the population using the internet, total unemployment as a percentage of the labor force, and the number of registered MM agencies per 100,000 adults. None of the added variables are significant. The coefficients of our variables of interest are not affected by these additions, as they retain their significance and signs. We can interpret such results as proof of the excellent specification of our model, which would not suffer from the omission of determining variables.

**Table 3: Sensitivity of the variables of interest**

	log(cash demand per capita)			log(GDP held in cash)		
Tax	1.504** (0.687)	2.019*** (0.639)	1.419* (0.771)	1.003*** (0.375)	1.321*** (0.347)	1.066*** (0.403)
log(MM per capita)	0.233*** (0.0825)	0.136** (0.0547)	0.252*** (0.0808)	0.129*** (0.0378)	0.0630** (0.0246)	0.116*** (0.0427)
Tax * log(MM per capita)	-0.457** (0.210)	-0.558*** (0.200)	-0.396 (0.247)	-0.287*** (0.110)	-0.356*** (0.105)	-0.287** (0.125)
GDP per capita	-0.00401*** (0.000727)	-0.00396*** (0.000692)	-0.00403*** (0.000772)	-0.00183*** (0.000339)	-0.00188*** (0.000333)	-0.00190*** (0.000366)
ATM	0.0149 (0.0119)	0.00897 (0.0121)	0.00381 (0.0155)	0.0243*** (0.00539)	0.0197*** (0.00600)	0.0172** (0.00757)
Informal	0.0925*** (0.0132)	0.0865*** (0.0176)	0.0914*** (0.0148)	0.0561*** (0.00665)	0.0554*** (0.00942)	0.0581*** (0.00785)
Short-term R	-0.0433** (0.0190)	-0.0445** (0.0194)	-0.0435** (0.0192)	-0.0266 (0.0171)	-0.0270 (0.0173)	-0.0266 (0.0172)
Internet	-0.0173 (0.0138)			-0.0140** (0.00653)		
Unemployment		0.139 (0.0978)			0.0620 (0.0529)	
MM agents			-0.000681 (0.000419)			-0.000315 (0.000221)
constant	8.659*** (1.076)	7.860*** (1.147)	8.849*** (1.111)	1.888*** (0.540)	1.571*** (0.565)	1.984*** (0.565)
<i>Observations</i>	1245	1245	1211	1245	1245	1211
<i>Countries</i>	10	10	10	10	10	10
<i>R-squared (within)</i>	0.2970	0.3029	0.3022	0.1654	0.1655	0.1656

Standard errors in parentheses, \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## 4.5 Robustness

To test the robustness of the results obtained, we change the variables of interest by close proxies. Indeed, in the reference equations, we use the value of MM transactions per capita. For robustness, we use the value of MM transactions relative to GDP instead. This leads us to have a new cross variable between the tax variable and the value of MM transactions relative to GDP.

The significances and signs of the tax coefficients, the MM, and the cross variable are not influenced by these manipulations.



However, the magnitude of the coefficients is not. Indeed, the positive impact of the tax on the demand for cash is reduced by the manipulations. The impact of the MM in the presence of the tax increases drastically from 0.33 to 28 percent for cash demand per capita and from 0.34 to 20 percent for cash demand in GDP. This can be explained by the fact that the ratio of MM transactions to GDP is very low relative to the variables measuring cash demand.

Table 4: Robustness Tests

	log(cash demand per capita)				log(GDP held in cash)			
Tax	0.779*** (0.231)	0.791*** (0.239)	0.905*** (0.230)	0.856*** (0.255)	0.540*** (0.130)	0.558*** (0.139)	0.595*** (0.131)	0.589*** (0.147)
log(MM in GDP)	18.22** (7.531)	20.64** (9.139)	17.02** (7.111)	25.12** (10.57)	12.38*** (3.370)	16.01*** (4.004)	11.85*** (3.133)	18.54*** (5.830)
Tax * log(MM in GDP)	-28.71*** (10.57)	-29.56*** (11.34)	-28.77*** (9.865)	-30.50*** (11.69)	-20.28*** (4.957)	-21.54*** (5.478)	-20.30*** (4.735)	-22.30*** (5.850)
GDP per capita	-0.00416*** (0.000687)	-0.00407*** (0.000728)	-0.00392*** (0.000681)	-0.00406*** (0.000777)	-0.00200*** (0.000326)	-0.00187*** (0.000342)	-0.00190*** (0.000330)	-0.00189*** (0.000365)
ATM	0.0154 (0.0120)	0.0182 (0.0123)	0.0136 (0.0118)	0.0141 (0.0137)	0.0228*** (0.00570)	0.0269*** (0.00530)	0.0220*** (0.00575)	0.0210*** (0.00646)
Informal	0.0921*** (0.0119)	0.0897*** (0.0109)	0.0801*** (0.0165)	0.0877*** (0.0128)	0.0581*** (0.00680)	0.0545*** (0.00585)	0.0528*** (0.00910)	0.0548*** (0.00728)
Short-term R	-0.0424** (0.0190)	-0.0426** (0.0190)	-0.0445** (0.0194)	-0.0428** (0.0192)	-0.0264 (0.0171)	-0.0265 (0.0171)	-0.0273 (0.0174)	-0.0267 (0.0172)
Internet		-0.00651 (0.0113)				-0.00974* (0.00530)		
Unemployment			0.154 (0.0980)				0.0681 (0.0530)	
MM agents				-0.000462 (0.000397)				-0.000335 (0.000221)
constant	8.863*** (1.029)	8.812*** (1.040)	7.898*** (1.103)	8.979*** (1.068)	2.054*** (0.536)	1.978*** (0.531)	1.629*** (0.550)	2.050*** (0.544)
Observations	1245	1245	1245	1211	1245	1245	1245	1211
Countries	10	10	10	10	10	10	10	10
R-squared(within)	0.2904	0.2909	0.3011	0.2964	0.1614	0.1639	0.1669	0.1661

Standard errors in parentheses, \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## 5 Discussions

In this part, we discuss the legitimacy of the tax basing on empirical results. The reflection is related to the implications in terms of financial inclusion and the adoption of electronic money.

To obtain and retain a large customer base, MNOs are adopting various business strategies to differentiate themselves from one another. Although these strategies are of several types, only those related to the tariff are analyzed in this study. The pricing strategy is the only one that is directly implemented through taxes. Thus, concerning the mobile money activity, MNOs practice non-linear pricing by proposing a set of amount-price pairs that each amount of a transaction corresponds to a price (Ndung'u 2019). In these conditions, low-preference consumers derive no surplus from the exchange at the optimum, in contrast to high-preference consumers who enjoy an information rent. Moreover, the greater the preference for large amounts in a group, the greater its surplus (Carlton and Perloff 2015).

When the State decides to introduce an excise duty, consumer prices are expected to increase. However, prices will not be allowed to vary by this amount for low-preference consumers, their initial level taking up the entire surplus. Under these conditions, MNOs will bear the tax in its entirety so that the tariff applied to this category remains unchanged. Concerning high-preference consumers, MNOs networks bear part of the tax cost to ensure that the principles of non-linear pricing are respected. This being the case, high-preference consumers bear the other part of the tax and change their consumption behavior following the tax introduction. To generalize, the greater the preference for large amounts in a category, the greater the cost of the tax that the group will bear.

In Section 2, it was noted that informal businesses preferred particular large relative amounts. By way of deduction, these businesses would bear the majority of the tax. The latter's reaction would simply be to reduce their level of use of this service to use cash, which is still the means most used by these businesses in the current presence of mobile money. Our empirical analysis corroborates this fact to the extent that the demand for cash increases following the implementation of the tax. From a tax point of view, this reaction by businesses is undesirable. In fact, within these informal businesses, medium-sized firms escape the general taxation system by using cash. Electronic money would enable the tax authorities to identify them and subjugate them to tax by means of electronic payments. With a view, therefore, to optimizing tax mobilization, it would be preferable not to tax transactions or the turnovers linked to these services to encourage a total switch from cash to electronic money by everyone and subsequently to catch the fraudsters who have hitherto managed to evade the tax authorities. In addition, MM is a particular service that generates positives externalities with its social gain that is higher than its private gain. Therefore, the excise is not objectively appropriate since the service does not cause negative externalities.

As far as individuals are concerned, the issue at stake is their full financial inclusion by encouraging them to use mobile money services. Our empirical results indicate that although in the presence of the tax, MM leads to a reduction in the demand for cash, the positive direct impact of the tax on the demand for cash is relatively much higher. Thus, although the cost of the tax borne by individuals is relatively low, individuals will reduce their level of use. The process of inclusion of these individuals in developing countries will be undermined. The tax, therefore, appears cumbersome under these conditions as well.

## **6 Conclusion**

This paper investigates the impact of mobile money taxation on adopting electronic money and financial inclusion in sub-Saharan countries. Based on survey data, two categories of mobile money service users are identified, namely households and businesses. However, businesses are the primary users in terms of frequency of use and value of transaction amounts. Then, based on empirical analysis, it appears that tax has a positive impact on demand for cash, and it is only in the presence of the latter that MM reduces the demand for cash. In doing so, we note that there is a good chance that informal businesses will essentially bear the tax.

The findings underline the embarrassing nature of this new tax. To begin with, as far as tax mobilization is concerned, the tax does not make it possible to track down fraudsters who evade the tax authorities by using cash. Indeed, with the tax, the opportunity cost of using electronic money becomes high. Then the tax, by increasing the fees for the use of mobile money, slows down the process of financial inclusion. Governments would benefit from removing this new tax for fiscal revenues supported by more attractive alternatives.

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