INTERNATIONAL MONETARY FUND

Taxing Mobile Money: Theory and Evidence

Michael Barczay, Shafik Hebous, Fayçal Sawadogo, and Jean-François Wen

WP/25/255

2025
DEC

WORKING PAPER

 WP/25/255

IMF Working Paper
Fiscal Affairs Department

Taxing Mobile Money: Theory and Evidence

Prepared by
Michael Barczay*, Shafik Hebous*, Fayçal Sawadogo*, and Jean-François Wen*

Authorized for distribution by Mario Mansour
December 2025

ABSTRACT: Mobile money has become a central digital alternative to traditional banking in developing countries, yet several African governments have introduced taxes on mobile money transactions. We develop a model that characterizes how such taxes affect payment choices and generate excess burden. The model predicts that taxation reduces mobile money use, with elasticities shaped by access to substitutes and transaction costs: banked users substitute into formal alternatives, while unbanked users face higher effective costs, making the tax regressive. Taxation also induces substitution into cash, raising informality. We empirically test these predictions using cross-country survey data and novel transaction-level data from Cameroon, the Central African Republic, and Mali. Results show sharp declines in mobile money usage, with stronger responses among the banked. Unbanked and rural users bear a disproportionate burden. We use the empirical estimates to gauge the excess burden of the tax, which we quantify at 35% of revenue—highlighting its significant efficiency cost alongside its regressive impact.

RECOMMENDED CITATION: Barczay, M., Hebous, S., Sawadogo, F., and Wen, J-F. (2025). Taxing Mobile Money: Theory and Evidence. IMF Working Paper WP/25/255

JEL Classification Numbers:	H27, O16, G20, E42
Keywords:	Mobile Money Tax; Financial Inclusion; Transaction Taxes
Author's E-Mail Address:	mbarczay@imf.org, shebous@imf.org, fsawadogo@imf.org, jwen@imf.org

* We thank seminar and conference participants at the International Monetary Fund (IMF); Goethe University Frankfurt (Workshop on Digital Money and Taxation); the Bank of Italy conference, "The interplay between tax and financial regulations in a new digital environment" (Rome); the Centre for Business Taxation, University of Oxford; and the International Institute of Public Finance (IIPF) Annual Congress (Nairobi) for helpful comments. We gratefully acknowledge project-related financial support from the Government of Japan for this analytical work. We are grateful to the mobile operator for providing the data.

Contents

1 Introduction

Mobile money has transformed payments and broadened financial access across low- and middle-income countries, especially in Africa. By enabling transfers without a formal bank account, it has extended basic services—including peer-to-peer (P2P) transfers, wage payments, and utility bill payments—to millions of previously unbanked individuals. The technology is simple—basic, non-internet-enabled phones suffice—and its rapid diffusion has made mobile money a central pillar of financial inclusion and the digitalization of payments in developing economies.[1]

The observability of mobile money has also made it an attractive base for taxation. Following Kenya's 2013 adoption of a mobile money tax, at least fifteen Sub-Saharan African countries had introduced similar levies by 2024.[2] Proponents highlight its revenue potential and ease of collection, while critics emphasize efficiency losses, risks to financial inclusion, and potential regressivity, particularly where formal banking is scarce.[3]

This paper develops a comprehensive theoretical framework for analyzing mobile money taxation. The model embeds mobile money into the portfolio of transfer modes alongside cash and bank transfers, incorporates mode-specific transaction costs, and delivers a unified set of testable propositions. In particular, the framework shows that: (i) taxing mobile money unambiguously reduces its use; (ii) whether this reduction is more pronounced for banked or unbanked users is theoretically ambiguous: banked individuals respond more elastically, since they have an untaxed substitute (substitution effect), whereas unbanked users face a larger average-cost effect that can drive the net benefit of a transfer below its transaction cost, reducing the likelihood of a mobile money transaction; (iii) the tax is regressive since it increases transaction costs disproportionately for unbanked users; (iv) it triggers substitution into cash, thereby increasing informality; and (v) it generates deadweight loss, since, at the margin, the increase in users' transaction costs exceeds the increase in tax revenue. These mechanisms provide a coherent basis for assessing the implications of mobile money taxes.

Next, we test key predictions of the model using two complementary empirical strategies. First, we exploit staggered adoption across countries, using survey data—the IMF Financial Access Survey and the World Bank's Global Findex Database—to assess whether mobile money taxation reduces use at the country level across African economies. Both surveys consistently show that

[1] See, for example, Ahmad et al. (2020), Aker and Mbiti (2010), and Suri (2017).

[2] Policy interest has persisted: Mali implemented a mobile-money tax effective March 5, 2025, and Senegal's National Assembly adopted legislation in September 2025 to tax mobile-money transfers.

[3] For a policy discussion, see Hearson et al. (2024).

the tax lowers the number of active mobile money accounts and the likelihood of using mobile money. The Global Findex also allows us to explore heterogeneous responses: reductions are weaker among lower-income and unbanked individuals, consistent with their limited access to formal banking. We also find suggestive evidence of substitution into cash.

Second, we move beyond establishing external validity and general response patterns from cross-country surveys by providing country-specific evidence using novel transaction-level data from a mobile operator. We analyze data from Cameroon and the Central African Republic (CAR)—which introduced mobile money taxes in January 2022 and April 2024, respectively—and from Mali, which did not introduce such a tax during our sample period and serves as a control. Unlike surveys, these microdata track individual mobile money users over time and reveal detailed margins of adjustment—transaction values, counts, and types. To construct the control group, we apply propensity score matching to pair treated users in Cameroon and CAR with comparable users in Mali, based on observed characteristics, including age, gender, and mobile money usage patterns.

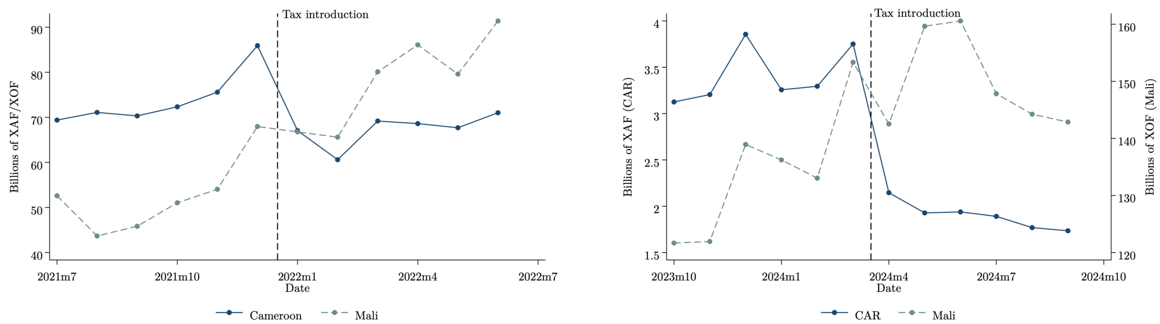
Aggregated transaction-level data provide suggestive graphical evidence of a negative impact of the tax (Figure 1). Causal estimates based on propensity score matching—with users from Mali serving as controls—indicate that the average monthly value of taxed transactions declines by 40% in Cameroon and 47% in CAR, and the number of transactions declines by 33% and 51%, respectively, relative to Mali. Reductions on both margins are strongest among banked users, consistent with the substitution channel, whereas lower-income and rural users are less responsive and therefore experience higher effective taxation due to weaker access to formal bank accounts.

Taken together, the theoretical and empirical evidence indicates that mobile money taxes are inefficient and regressive, undermining financial inclusion while raising little revenue. Our estimates imply an excess burden of approximately 33% of mobile-money tax revenue.

Our work relates to three strands of the literature. First, it connects to the literature on mobile money, which has mainly emphasized financial inclusion (for instance, Batista and Vicente, 2025; Lee et al., 2021).[4] Seminal studies of M-Pesa in Kenya by Jack et al. (2013) and Jack and Suri (2014) highlight the role of mobile money in risk sharing and consumption smoothing. Brunnermeier et al. (2023) analyze policies that promote competition among providers. The interaction between mobile money and taxation has received less attention, though it is growing: Apeti and Edoh (2023), for

[4]See Aron (2018) for a comprehensive review. Beyond mobile money and digital payment methods, related work has examined digital money more broadly, including implications for taxation (Agrawal and Hebous, 2025) and privacy (Ahnert et al., 2025).

Figure 1: *Aggregate Mobile-Money Transactions around the Introduction of the Tax in Our Sample*



Cameroon *Central African Republic*

Notes: Data are aggregated from all user-level transactions in our sample. In both panels, Mali did not have a mobile-money tax in place.

example, use cross-country data to show that mobile money adoption raises overall tax revenue. We contribute by developing a theoretical framework that clarifies how mobile money taxes affect payment choices and ultimately financial inclusion, and by providing new micro-level evidence on heterogeneous user responses.

Second, mobile money taxes are closely related to financial transaction taxes (FTTs), which have been widely studied in developed countries. FTTs are generally found to reduce transaction volumes, with elasticities varying across settings (including, currency transactions versus securities) and depending critically on the availability of untaxed substitutes. For example, Cai et al. (2020) show that China's stamp duty on stock trading shifted activity into untaxed instruments.[5] Our results suggest that mobile money taxes, as a form of transaction taxes in developing economies, likewise reduce usage, with elasticities again shaped by the availability of untaxed alternatives.

Finally, we contribute to the literature on taxation of the telecommunications sector. This work focuses on capturing sectoral rents in minimally distortive ways. Matheson and Petit (2021), for example, argue that rents should ideally be taxed through spectrum auctions, license fees, or rent-based tax designs akin to those in the extractive sector. By contrast, excises on handsets or inputs are seen as inferior because they hinder network access. Our study shows that mobile money taxes, when passed onto consumers, likewise deviate from the goal of rent taxation: rather than extracting rents from providers, they impose costs directly on users.

[5] Estimated elasticities of transaction volumes with respect to transaction costs range from –0.4 to –2.6 (see, for example, Table 6 in Matheson, 2012). Other work examines how FTTs affect market information (Cipriani et al., 2022) and volatility, with mixed findings ranging from reductions (Jones & Seguin, 1997; Umlauf, 1993) to no effect (Colliard & Hoffmann, 2017) or even increases (Deng et al., 2018).

The paper proceeds as follows. Section 2 develops the theoretical framework, deriving predictions about usage, incidence, and efficiency effects of mobile money taxation. Section 3 presents cross-country survey evidence, exploiting staggered adoption to test the model's key predictions. Section 4 turns to transaction-level data from Cameroon and CAR, with Mali as a matched control, to provide micro-level evidence on user responses. The final section concludes.

2 Model

2.1 Setting

We consider an environment in which transfers can be executed through three channels: cash, bank accounts, and mobile money.[6] A central feature of this framework is a transaction cost, incurred in addition to the amount of the transfer itself, which varies across channels and depends on the specific context of the transfer. Transaction costs may be pecuniary (including fees) or non-pecuniary, and are shaped by factors such as the distance between sender and recipient, the recipient's access to a bank account, whether sender and recipient use the same mobile money provider, and the size of the transfer (which may determine the fee schedule).

The sender chooses the channel that minimizes transaction costs, conditional on the circumstances of the transfer.[7] For tractability, transfer size is treated as exogenous and normalized to one.[8] While we analyze a representative transfer, the optimization problem is identical if multiple transfers occur within a period. The focus is on the choice of transfer method rather than the motives for remittance.

A tax on mobile money alters this choice margin. In the baseline model, the tax induces substitution between mobile money and alternative channels (cash or bank transfers). To capture the possibility that the tax also reduces the overall volume of transfers, we extend the framework by incorporating a random utility component. In this extension, if the minimum-cost transfer channel yields utility below zero, the transfer is not undertaken. This introduces an extensive-margin response (a reduction in transfer incidence) in addition to the substitution effect across channels.

[6] Other media for transferring money exist, such as money transfer operators and post offices. The important feature captured by the model is the presence of substitutes for cash, one of which is taxed and the other is not.

[7] If the sender cares about the recipient, the latter's transaction cost could be regarded as part of the sender's own cost.

[8] Since the mobile money transfer tax that we consider is proportional to the size of the transfer, the tax is neutral with respect to size.

2.2 Theoretical Framework

Let the circumstances of the transfer be described by a random variable $\omega \in \Omega$. Given ω, the transaction cost per unit of transfer (e.g., per dollar) is $M(\omega)$ for mobile money and $B(\omega)$ for a bank transfer. Hence, under the distribution of circumstances on Ω, the pair (M, B) is a random vector with joint density $f_{M,B}(m, b)$ on the support $(0, \infty)^2$. We assume that the joint and marginal densities are well-defined and integrable.

The transaction cost of a cash transfer is assumed to be independent of circumstances and fixed at a finite value $c > 0$. We suppose c is high relative to typical realizations of b and m (in a sense to be specified later), reflecting the notion that cash is a relatively costly method of transfer due to its inconveniences—consistent with the idea that financial exclusion is expensive.

Let t denote the tax per unit of transfer.[9] The tax is incorporated into the transaction cost of mobile money, so the effective cost is $M(\omega) + t$. We assume that t is small and that $c - t > 0$.

We consider two environments: (i) the sender does not have a bank account, and hence cannot make bank transfers; and (ii) the sender does have a bank account. After establishing the expected transaction cost in each case, we endogenize the sender's decision to open a bank account. Throughout, we assume that the sender holds a mobile money account and that cash is always available as an option. Define $W(\omega)$ and $Z(\omega)$ as the tax-inclusive transaction cost of the least-cost transfer when the individual does not, or does, have a bank account, respectively, given the circumstances ω. For notational convenience we write W and Z. These are random variables induced by the distributions of M and B:

$$W = \min\{M + t,\, c\}, \quad Z = \min\{M + t,\, B,\, c\}. \tag{1}$$

For realizations of Z, Table 1 reports the six possible orderings of c, m, and b, together with their values and probabilities of occurrence. Figure 2 illustrates the six mutually exclusive regions in the (m, b) space. An analogous but simpler partition can be constructed for W.

The expected transaction costs are denoted $\mathbb{E}[W]$ and $\mathbb{E}[Z]$. Because access to a bank account expands the feasible set of transfer methods, $\mathbb{E}[Z] \leq \mathbb{E}[W]$, with strict inequality whenever bank transfers are least-cost with positive probability. Thus,

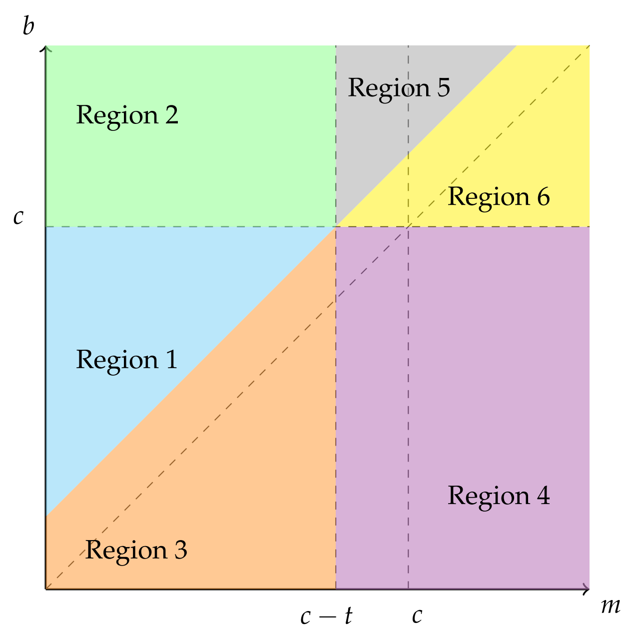
$$\Delta \equiv \mathbb{E}[W] - \mathbb{E}[Z] > 0. \tag{2}$$

[9] If the pass-through of the statutory tax rate to consumers is less than 100 percent, t can be interpreted as the portion of the tax borne by consumers.

Table 1: *Six Regions in (m, b) Space, Values of Z, Defining Inequalities, and Probabilities.*

Region	Value of Z	Inequality	Probability Expression
1	$Z = m + t$	$m + t < b < c$	$P_1 = \int_0^{c-t} \int_{m+t}^{c} f_{M,B}(m, b)\, db\, dm$
2	$Z = m + t$	$m + t < c < b$	$P_2 = \int_0^{c-t} \int_{c}^{\infty} f_{M,B}(m, b)\, db\, dm$
3	$Z = b$	$b < m + t < c$	$P_3 = \int_0^{c-t} \int_{0}^{m+t} f_{M,B}(m, b)\, db\, dm$
4	$Z = b$	$b < c < m + t$	$P_4 = \int_{c-t}^{\infty} \int_{0}^{c} f_{M,B}(m, b)\, db\, dm$
5	$Z = c$	$c < m + t < b$	$P_5 = \int_{c-t}^{\infty} \int_{m+t}^{\infty} f_{M,B}(m, b)\, db\, dm$
6	$Z = c$	$c < b < m + t$	$P_6 = \int_{c-t}^{\infty} \int_{c}^{m+t} f_{M,B}(m, b)\, db\, dm$

Figure 2: *Partition of the (m, b) Space for $Z = \min(M + t, B, c)$*



Note: The (m, b) space is partitioned into six regions for $Z = \min(M + t,\ B,\ c)$, with dashed lines at $m = c$, $b = c$, $m = c - t$, and $m = b$. Each region corresponds to a different ordering of $m + t$, b, and c.

Finally, suppose that holding a bank account entails a fixed cost ϕ, distributed across individuals according to cdf $G(\phi)$. In equilibrium the marginal individual is indifferent when $\phi = \Delta$, so the share of banked individuals is $G(\Delta)$. The expectations $\mathbb{E}[W]$ and $\mathbb{E}[Z]$ are therefore central to the distributional analysis of the tax: they represent the average transaction costs borne by unbanked and banked individuals, respectively.

2.3 Behavioral Responses and Probabilities

The effects of the tax on mobile money usage—i.e., predictions of the model about behavioral responses—are analyzed in terms of the probabilities that mobile money will be the least-cost medium. Let the probabilities that the minimum transaction cost is attained at $M + t$ for an unbanked and banked individual be given as follows:

$$P_W \equiv \mathbb{P}(W = M + t) = \mathbb{P}(M + t < c), \tag{3}$$

$$P_Z \equiv \mathbb{P}(Z = M + t) = \mathbb{P}(M + t < \min(B, c)). \tag{4}$$

A lower probability of using mobile money as a result of the tax is to be interpreted as a decrease in the share of mobile money transfers, as individuals switch to the alternative transfer media. If the total number of transfers is fixed, then a decline in mobile money's share implies a decline in the volume of mobile money transfers.

This completes the description of the basic model. The objects of analytical interest are $d\Delta/dt$ and the behavioral responses dP_W/dt and dP_Z/dt. The latter can also be converted into elasticities.

2.4 Expected Transaction Costs

Express W as a function of the tax rate and observe that it is a truncated linear function:

$$W(t) = \min(M + t, c) \Rightarrow W(t) = \begin{cases} M + t & \text{if } M + t < c \\ c & \text{otherwise} \end{cases} \tag{5}$$

Similarly, for Z we have

$$Z(t) = \begin{cases} M + t & \text{if } M + t < \min(B, c) \\ \min(B, c) & \text{otherwise} \end{cases} \tag{6}$$

Proposition 1. *The gap between the expected (tax-inclusive) transaction cost of transfers by an unbanked, versus banked, individual increases with the tax. That is,*

$$\frac{d}{dt}\Delta(t) = \mathbb{P}(B \leq M + t < c) > 0.$$

Corollary 1. *The tax increases the proportion of the population with bank accounts.*

Proofs are provided in Appendix A. The intuition is straightforward: a bank account provides an additional substitute for mobile money. Hence, raising the mobile money tax widens the transaction-cost gap between banked and unbanked individuals, encouraging more people to adopt bank accounts.

Thus, the tax is regressive. Those without bank accounts—the financially excluded in the narrow sense of an absence of financial intermediation—bear a disproportionate burden from the mobile money tax, but the tax also incentivizes them to obtain a bank account.

2.5 Probability of Mobile Money Transfers

A comparison of (3) and (4) makes clear that the probability that mobile money is the least-cost medium is lower when the individual has a bank account, i.e., $P_Z < P_W$.

Recall that

$$P_W(t) = \mathbb{P}(W = M + t) = \mathbb{P}(M + t < c) = \mathbb{P}(M < c - t) = \int_0^{c-t} \int_0^{\infty} f_{M,B}(m, b)\, db\, dm, \quad (7)$$

and hence

$$\frac{d}{dt} P_W(t) = -f_M(c - t) \; < 0, \quad (8)$$

where $f_M(m) = \int_0^{\infty} f_{M,B}(m, b)\, db$ is the marginal density function for M.

For P_Z, mobile money is the least-cost medium in two cases: (i) $m + t < b < c$ and (ii) $m + t < c < b$ (corresponding to Regions 1 and 2 in Figure 2). The first implies $b \in (m + t, c)$ and $m \in (0, c - t)$, while the second implies $b \in (c, \infty)$ and $m \in (0, c - t)$. Thus,

$$P_Z(t) = \int_0^{c-t} \int_{m+t}^{\infty} f_{M,B}(m, b)\, db\, dm. \quad (9)$$

Differentiating gives

$$\frac{d}{dt} P_Z(t) = -\int_0^{c-t} f_{M,B}(m, m + t)\, dm - \int_c^{\infty} f_{M,B}(c - t, b)\, db \; < 0. \quad (10)$$

Both $dP_W(t)/dt$ and $dP_Z(t)/dt$ are negative, but the question is which has the greater magnitude. A direct comparison shows that for small t, and when the cash cost c lies in the upper tail of the distribution, $dP_Z(t)/dt < dP_W(t)/dt$. In words, banked individuals are relatively more responsive to the tax in terms of reducing mobile money usage. Moreover, because $P_Z < P_W$, the proportional reduction in mobile money transfers is also greater for banked individuals.

Proposition 2. *If the tax rate is small and the transaction cost of cash transfers is relatively high (so that c is in the upper tail of the distribution of transaction costs, i.e., $\int_0^c f_{M,B}(b,b)\,db > \int_0^c f_{M,B}(c,b)\,db$), then the magnitude of the response to the tax on mobile money transfers is proportionately larger (a more negative response) for banked individuals than that for unbanked individuals.*

Proof is provided in Appendix A. The condition in the proposition is sufficient but not necessary. The intuition is that a bank account provides an additional substitute for mobile money. The cost of cash transfers matters because it affects the initial proportion of transfers undertaken with mobile money, out of which substitution occurs when the tax is imposed.

2.6 Efficiency

The economic cost of the tax can be computed as the difference between the increase in the expected transaction cost, inclusive of the tax, and the increase in expected tax revenues arising from a marginal increase in the tax rate.

From (A.2), the change in the expected transaction cost of a banked individual is

$$\frac{d}{dt}\mathbb{E}[Z(t)] = \mathbb{P}(M + t < \min(B, c)) = P_Z(t). \tag{11}$$

The expected tax revenue from a banked individual, ER, is given by the product of the tax rate t and the probability that mobile money is used for the transfer, P_Z:

$$ER(t) = t\,P_Z(t), \tag{12}$$

and hence $\frac{d}{dt}[ER(t)] = P_Z(t) + t\frac{d}{dt}P_Z(t)$. Thus, for banked individuals, the efficiency cost or excess burden (EB) of the tax is

$$\text{EB}(Z) = \frac{d}{dt}\big(\mathbb{E}[Z(t)] - ER(t)\big) = -t\,\frac{d}{dt}P_Z(t) > 0. \tag{13}$$

Similarly, for unbanked individuals, it is

$$\text{EB}(W) = -t\,\frac{d}{dt}P_W(t) > 0. \tag{14}$$

Proposition 3. *The mobile money tax creates economic inefficiency. The size of the excess burden equals the product of the tax rate and its effect on the incidence of mobile money transfers.*

The proof follows directly from the above expressions together with the signs of the derivatives in (8) and (10). The efficiency cost reflects the resource cost of individuals switching away from mobile money transfers as a result of the tax, which causes revenues to increase by less than the cost to taxpayers. Thus, while the tax mobilizes revenues, it generates economic losses.

2.7 Informality

Informality is closely associated with the use of cash for transactions. Cash is relatively expensive due to risks and inconveniences (e.g., carrying and storing cash and the risk of theft), and it facilitates avoidance of electronic traceability (e.g., for tax evasion). We study the impact of the tax on cash use by computing $\frac{d}{dt}\mathbb{P}(Z = c)$ for banked individuals and $\frac{d}{dt}\mathbb{P}(W = c)$ for unbanked individuals.

Proposition 4. *The mobile money tax increases the use of cash for transfers.*

Proof is provided in Appendix A.3. Thus, the tax raises revenue from informal mobile-money transactions but also pushes more activity back into the cash economy, where informality is harder to detect.[10]

2.8 Average Cost Effect of the Tax

In the baseline model, the transfer always occurs and the margin of interest is the method. Here we extend it to allow the tax to reduce the overall number of transfers (the extensive margin). Specifically, we associate each potential transfer with a utility draw U (net of the transfer amount but before transaction costs) from a distribution with density $f_U(u)$, that is independent of (M, B) and supported on $(0, \infty)$. The transfer is executed if and only if the utility exceeds the least-cost transaction cost: $U \geq Z$ (banked) or $U \geq W$ (unbanked). Let $P_Z^U(t) = \mathbb{P}(U \geq Z)$ and $P_W^U(t) = \mathbb{P}(U \geq W)$ denote the incidence of transfers.

[10]While not explicit in the model, mobile money generates transaction records that aid enforcement and measurement; a tax-induced shift from mobile money to cash erodes this information and hinders formalization.

Proposition 5. *The reduction in the incidence of transfers induced by the tax (the average-cost effect) is relatively larger for individuals without bank accounts:*

$$\left|\tfrac{d}{dt}P_W^U(t)\right| > \left|\tfrac{d}{dt}P_Z^U(t)\right|.$$

Proof is provided in Appendix A.4. Intuitively, banked individuals have an additional substitute (bank transfers), so the set of realizations under which mobile money is least-cost is smaller. As a result, their transfer incidence declines less sharply with the tax. Because the reduction in transfers carries a direct utility cost—and is more severe for the unbanked—this average-cost effect further reinforces the regressive and inefficient nature of the tax.

In the extended framework, the tax's effect on the volume of mobile money transfers operates through two probabilities: (i) that mobile money is the least-cost method (substitution effect) and (ii) that the net utility of the transfer exceeds the transaction cost (average-cost effect). Both probabilities fall with the tax, so mobile money transfers decline. However, the relative size of the decline in mobile money transfers between banked and unbanked individuals is ambiguous: the unbanked exhibit a smaller substitution effect but a larger average-cost effect compared to the banked. Finally, because the tax leaves unaffected the cost of bank and cash transfers, the average cost effect is neutral for bank and cash transfers. Hence, cash usage increases unambiguously due to the substitution effect away from mobile money.[11]

The propositions above span multiple behavioral margins, but no single dataset captures them all. We therefore combine two empirical approaches. Cross-country survey evidence, while coarse, assesses whether the model's key patterns hold systematically across African economies (Proposition 2). Transaction-level data from Cameroon and the CAR provide micro-level validation by tracing individual users' responses. Taken together, these sources allow us to confront the model with data, focusing on Proposition 2 and using the estimates to gauge the implications for Propositions 3 and 5. We also offer preliminary evidence consistent with Proposition 4, leaving full-fledged, direct tests of substitution into bank transfers or cash for future research.

3 Evidence from Cross-Country Surveys

Cross-country evidence provides a natural starting point for testing Proposition 2, in particular the key qualitative prediction that mobile money usage declines following the introduction of a

[11] See Appendix A.5 for details on the extension of the model to a utility framework.

mobile money tax. Such evidence allows us to assess whether the response is systematic across countries, thus establishing broad external validity before turning to transaction-level data that trace heterogeneous user responses in detail.

We draw on two sources to construct outcome variables. The first is the IMF Financial Access Survey, which provides *annual country-level* information on the number of registered and active mobile money accounts in African countries from 2004 to 2023. The second is the World Bank's Findex database, which surveys 127,602 individuals across African countries[12] in four waves (2011, 2014, 2017, and 2021–2022).[13] Respondents report whether they used mobile money in the past year. Although the Findex is structured as repeated cross-sections rather than a panel, it allows us to examine heterogeneity across individuals—particularly by income level and access to banking services—thus complementing the aggregate IMF evidence. It remains, however, less detailed than the country-specific transaction data analyzed later.

Our treatment variable equals one if country c has a mobile money tax in place at time t. We compile the timing and location of tax introductions from national budget laws, identifying 15 adopting countries.[14] We therefore exploit the staggered introduction of mobile money taxes across Africa to estimate their causal effect on mobile money usage.

Empirical Strategy

A standard two-way fixed effects estimator implicitly assumes homogeneous treatment effects across countries and adoption cohorts, comparing already-treated units to later-treated ones. In staggered adoption settings, as in our setting with mobile money taxes, these assumptions can produce biased estimates. We therefore rely on estimators that explicitly allow for treatment effect heterogeneity.

For the IMF panel, where the unit of observation is the country-year, we apply the estimator of Callaway and Sant'Anna (2021), which is well suited to panel structures. This approach constructs cohort- and period-specific average treatment effects and aggregates them into event-study coefficients, thereby allowing heterogeneity in both treatment timing and effects.

By contrast, the Findex data consist of repeated cross-sections of individuals, with treatment varying only at the country-year level. Here, we use the imputation-based estimator of Borusyak

[12]Except Djibouti, Egypt, Guinea-Bissau, Seychelles, and Zimbabwe; see Appendix B for further details.
[13]The most recent wave was fielded in both 2021 and 2022; see Appendix B.2 for details.
[14]See Table B.1 in the Appendix for exact adoption dates. The countries are Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Côte d'Ivoire, Ghana, Kenya, Nigeria, Republic of Congo, Tanzania, Uganda, Zambia, and Zimbabwe.

et al. (2024), which is particularly suited for repeated cross-sections, where the same individuals are not tracked over time. This method first models untreated outcomes using never-treated and not-yet-treated units, then imputes counterfactuals for treated units by predicting what their outcomes would have been absent treatment. Treatment effects are obtained as the difference between observed and imputed outcomes.

In all specifications, we control for a country's GDP per capita in constant 2015 USD to capture baseline development levels at the time of tax introduction. Because the parallel trends assumption may depend on financial sector availability, we also control for the number of ATMs as a proxy for financial service penetration. In the Findex regressions, we additionally include individual-level controls for age, education, gender, and income quintile. Standard errors are clustered at the country level, the level at which treatment is assigned.

These specifications form the basis for the results presented in the next subsection.

Results

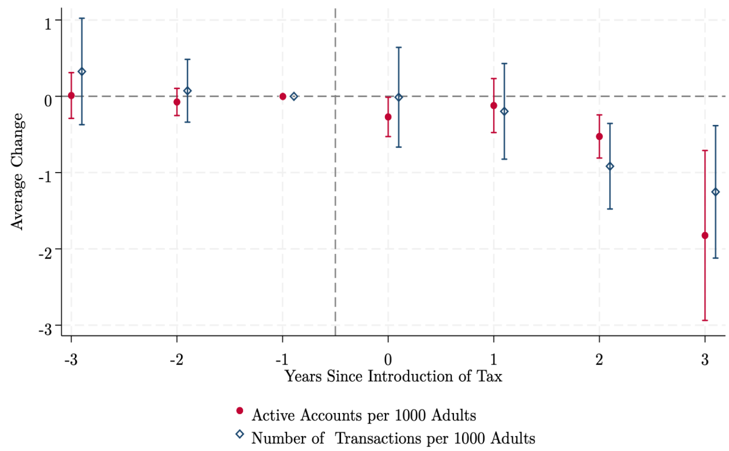
Figure 3 shows that mobile money taxation has a significant negative effect on both the number of active accounts per 1,000 adults and the number of transactions per 1,000 adults. These declines materialize with a lag: they become statistically significant in the second year after the tax is introduced and persist into the third year. By the second year, the number of active accounts per 1,000 adults is about 20% lower while the number of transactions per 1,000 adults is over 10% lower, relative to the counterfactual without the tax.

Estimates in Table 2 indicate that the introduction of a mobile money tax also reduces the probability that individuals report using mobile money in the previous year. The average treatment effect is around a 8 percentage points reduction—relative to a pre-treatment mean of about 22%. The decline is robust to adding individual-level controls and to alternative estimators.

As predicted by Proposition 2, Figure 4 shows a stronger decline in mobile money use among individuals with bank accounts—those with outside options—and a weaker effect among the unbanked. Banked users reduce their probability of using mobile money by about 20 percentage points. By income quintile, responses are larger for higher-income groups, who are more likely to adjust behavior. Middle-income and poorest households show little adjustment and therefore are more likely to bear the incidence of the tax.

Finally, consistent with Proposition 4, we find suggestive evidence of substitution toward cash using the Findex database: the probability of actively withdrawing cash from a bank account

Figure 3: *Event Study Estimates with Data from the IMF Financial Access Survey*



Notes: This figure plots the dynamic response of active mobile money accounts and number of transactions per 1,000 adults following the introduction of a mobile money tax, estimated using the method of Callaway and Sant'Anna (2021). The sample includes all African countries with available data that had adopted mobile money, covering the period from the year of first introduction through 2022. The treatment group consists of 15 countries that implemented a mobile money tax in different years. Controls include $log(GDPperCapita_{ct})$ and $log(NumberATM_{ct})$. All outcome variables are measured in logs. Data sources: IMF Financial Access Survey (outcomes and number of ATMs), World Development Indicators (Gross Domestic Product per capita), and manually collected data (tax introduction dates). Confidence intervals are reported at the 90% level.

Table 2: *Effects of Mobile Money Taxes on the Probability of Using Mobile Money*

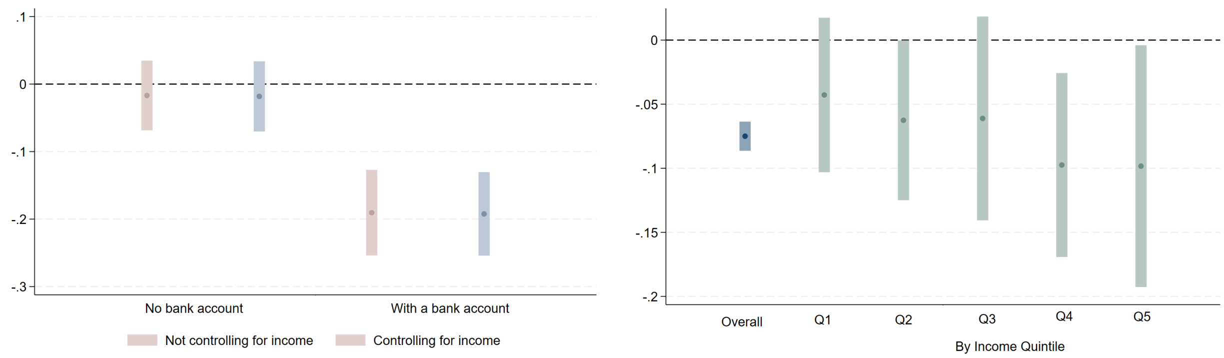
	(1) TWFE	(2) TWFE	(3) BJS Estimator	(4) BJS Estimator
Mobile Money Tax	-0.089**	-0.082**	-0.080*	-0.075***
	(0.037)	(0.038)	(0.047)	(0.007)
Controls	No	Yes	No	Yes
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	87,823	87,823	85,938	85,938
Mean (Pretreat.)	0.215	0.215	0.215	0.215

Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table reports the effects of mobile money taxes on individual mobile money usage using two-way fixed effects (TWFE) in columns (1) and (2) and the estimator of Borusyak et al. (2024) in columns (3) and (4). The dependent variable is a dummy equal to one if the respondent used mobile money in the past year, constructed from the World Bank Findex Database. The sample covers all African countries with available data that had adopted mobile money, from the year of first introduction through 2022. The treatment group consists of 15 countries that implemented a mobile money tax in different years. Columns (1) and (3) report estimates without controls, while columns (2) and (4) add controls for age, age squared, education, gender, and income quintile.

Figure 4: *Heterogeneous Responses to Mobile Money Taxes*



(a) *Response by Income Quintile* **(b)** *Response by Bank Availability*

Notes: This figure reports the effects of mobile money taxes on individual usage, where the dependent variable is a dummy equal to one if the respondent used mobile money in the past year, constructed from the World Bank Findex Database. Panel **(a)** distinguishes between individuals with and without a bank account. Panel **(b)** shows heterogeneous responses by income quintile (within countries), estimated on subsamples using the method of Borusyak et al. (2024). The sample covers all African countries with available data that had adopted mobile money, from the year of first introduction through 2022. The treatment group consists of 15 countries that implemented a mobile money tax in different years. All specifications include individual-level controls for age, age squared, education, gender, and income quintile. Confidence intervals are reported at the 90% level.

rises by about 5 percentage points following the introduction of a mobile money tax (Table 3).[15] Returning to cash is counterproductive to formalization efforts that can leverage information.

Taken together, these findings lend support to Propositions 2 and 4 and clarify the theoretical ambiguity in Proposition 5, suggesting that the substitution effect—away from mobile money—dominates. The IMF survey shows systematic cross-country declines in mobile money accounts, while the Findex data show how these declines are distributed across households and how substitution toward cash occurs. These patterns suggest broad external validity. We next analyze transaction-level data for Cameroon and CAR, which allow us to examine the magnitude of transactions and to exploit a different identification strategy.

[15] In Table 3, we do not restrict the sample to countries with mobile money services, because cash withdrawals are available in all African countries. The benchmark sample therefore includes all African countries covered by the Findex database.

Table 3: *Effects of Mobile Money Taxes on the Probability of Cash Withdrawals from Bank Accounts*

	(1)	(2)	(3)	(4)	(5)
Mobile Money Tax	0.274***	0.044**	0.051***	0.254***	0.004
	(0.006)	(0.020)	(0.014)	(0.014)	(0.014)
Controls	No	No	Yes	No	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	No	Yes
N Observations	24,779	24,779	24,779	18,640	18,640
Mean (Pretreat.)	0.398	0.398	0.398	0.431	0.431

Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents estimates of the effects of mobile money taxes on active cash withdrawals from bank accounts, estimated using the estimator of Borusyak et al. (2024). The dependent variable is a dummy equal to one if the respondent reported withdrawing cash from a bank account in the past year, constructed from the World Bank Findex database. The sample covers all African countries with available data. The treatment group consists of 15 countries that implemented a mobile money tax in different years. Column (1) reports estimates without controls, while column (2) includes controls for age, age squared, education, gender, and income quintile.

4 Micro-Evidence from Transaction Data

4.1 Background

Cameroon

On January 1, 2022, Cameroon introduced the *mobile money (electronic money transfer) tax* under its Finance Law (Law No. 2021/026, Section 228). The tax is levied at 0.2% of the amount transferred and on the amount withdrawn via any traceable electronic or mobile money platform (including mobile operators). It applies thus to both sending transfers and withdrawals; therefore, if funds are transferred and later withdrawn, the combined rate is effectively 0.4% ("cashout"). It excludes bank transfers, deposits into e-wallets/virtual wallets, payments to registered merchants, and transfers for paying taxes, customs, or duties. The tax is calculated on the actual transaction amount, not including operator fees or VAT.[16] The measure followed rapid growth in mobile money in Cameroon, where registered and active accounts grew dramatically between 2015 and 2020, and transaction values reached close to 50% of GDP. Because the tax was enacted quickly and

[16] On January 1, 2025, Cameroon introduced a 4 XAF flat fee per mobile money transaction, in addition to the existing proportional tax. This charge now also applies to banks, credit institutions, and microfinance entities, which were previously exempt.

took effect without a long anticipation period—combined with visible public reaction (including the widely used hashtag #EndMobileMoneyTax)—it provides a particularly suitable setting for studying behavioral responses.

The introduction of the tax in January 2022 did not alter the pre-existing fee structure for transfers, which remained at 1% of the transaction value for amounts between 50 and 6,500 XAF, followed by a progressive schedule ranging from 50 to 500 XAF for transactions between 6,501 and 1,000,000 XAF. However, the application of a 0.2% tax on the transaction value substantially increased total transaction costs (in terms of operator fees plus tax)—by approximately 20% at the lower end and up to 400% at the upper end of the fee schedule. For example, in the sixth bracket (50,001–80,000 XAF), the tax amounted to 100–160 XAF, effectively doubling the original fee of 100 XAF. Similarly, in the highest bracket (500,001–1,000,000 XAF), the tax ranged from 1,000 to 2,000 XAF, representing two to four times the original fee of 500 XAF. For cash withdrawals (cash-outs), fees were generally higher than for transfers but were slightly reduced in two brackets following the tax's introduction—from 180 to 175 XAF in the second bracket (6,500–10,000 XAF) and from 1,350 to 1,300 XAF in the sixth (corresponding to 50,001–80,000 XAF). Despite these minor adjustments, the overall cost of transactions for withdrawals increased by 4% to 28%, depending on transaction size.

Central African Republic (CAR)

The CAR introduced a tax on mobile money transactions in April 2024. The measure applies to peer-to-peer transfers and cash withdrawals—as in Cameroon. The tax rate is 1% of the value of each transaction. As in Cameroon, deposits into accounts and payments to registered merchants are exempt. The adoption of this tax occurred against the backdrop of rapid expansion of mobile money as an alternative to the weak formal banking sector. Public debate prior to its introduction was limited, although civil society groups voiced concerns after implementation about the regressive nature of the measure.

In CAR, transfer fees of the operator remained unchanged and untaxed, implying that total transaction costs increased mechanically by the amount of the tax. The tax ranged from 10 to 20 XAF in the lowest bracket (1,000–2,000 XAF) and from 2,500 to 5,000 XAF in the highest (250,005–500,000 XAF). In contrast, withdrawal fees, which ranged from 30 XAF to 5,000 XAF before the tax, were not revised but simply compounded by the tax amount. As a result, total transaction costs rose from 40 XAF to 10,000 XAF, corresponding to increases of 33% to 100%, depending on transaction value.

Mali

As no mobile money tax was in place during our sample period, Mali serves as a control country in our research design.[17] It is a Francophone country with relatively high mobile money penetration, whose usage patterns—peer-to-peer transfers, withdrawals, merchant payments—closely resemble those in Cameroon and CAR. See subsection 4.5.

4.2 Transaction Data

We use anonymized transaction-level data from a major mobile money operator covering Cameroon, CAR, and Mali. In each country, the dataset contains a random sample of approximately 20% of all users. For each user, we observe key demographics—including age, gender, and registration location—as well as the full universe of their transactions: July 2021–June 2022 for Cameroon, October 2023–September 2024 for CAR, and both periods for Mali. This design provides a balanced six-month window before and after the introduction of mobile money taxes in Cameroon and CAR, with Mali serving as a contemporaneous untreated benchmark.

Transactions are classified by type. Transfers between users (*P2P transfers*) account for about 27% of the total transaction volume in both Cameroon and CAR. *Cash-out withdrawals* and *cash-in deposits* are each above 30% of the volume, while *merchant payments (called "Merchpay")* represent only 1–2.6%. Appendix B.3 provides detailed transaction categories and descriptive statistics. This granularity allows us to analyze both the volume and value of transactions across categories and to assess how taxation affects substitution among them.

On average, the monthly transaction value per user is $141,310.23$ XAF in Cameroon (approximately 252 USD[18]), $181,989.17$ XAF in CAR, and $201,477.93$ XOF and $383,830.36$ XOF in Mali (for the periods 07/2021–06/2022 and 10/2023–09/2024, respectively). See Tables 4 and 5 for details. These amounts compare to average annual per capita expenditures of $1,118,128.58$ XAF for Cameroon (around $93,177.38$ XAF per month) and around $723,900.18$ XOF for Mali (corresponding to $60,325.02$ XOF per month)[19]. The ratio of transaction value to monthly expenditures is high but

[17] Mali introduced a tax of 1% on mobile money withdrawals, effective on March 5, 2025.

[18] Using an exchange rate of 1 USD = 559.08 XAF as of October 1, 2025.

[19] We use data from the *Cinquième Enquête Camerounaise sur les Ménages (ECAM 5)* for Cameroon and the *Enquête Harmonisée sur les Conditions de Vie des Ménages 2018–2019 (WAEMU2019)* for Mali to construct these measures of per capita expenditures. A comparable measure is unfortunately not available for CAR. More information on the construction is provided below.

sensible, since incoming and outgoing P2P transactions are counted twice. The number of transactions per user is slightly higher in Cameroon (13.93) than in CAR (12.11), with Mali exceeding both treated countries. The average monthly number of transactions in Mali increases from 15.5 in the first sample period to 22.58 in the second, reflecting the strong growth of mobile money use in the untreated country. Additional descriptive statistics are reported in Appendix B.3.

Table 4: *Summary Statistics of Treated Countries*

	Cameroon				CAR			
	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Individual characteristics								
Age	36.73	12.22	15.00	80.00	35.96	10.93	16.00	80.00
Female	0.39	0.49	0.00	1.00	0.29	0.45	0.00	1.00
Access to Banks	0.32	0.17	0.00	0.48	0.24	0.08	0.00	0.27
Urban	0.73	0.44	0.00	1.00	0.90	0.30	0.00	1.00
Yearly Expenditures (scaled)	1,118,128.58	380,706.56	322,239.88	1,466,898.12	.	.	.	.
Mobile money use								
Transaction Volume (untaxed)	17,689.67	458,654.79	0.00	123,161,256.00	67,995.49	300,939.96	0.00	19,013,566.00
Transaction Volume (taxed)	123,620.56	1,855,855.52	0.00	1,209,192,704.00	113,993.68	467,967.01	0.00	17,547,916.00
Number of Transactions (untaxed)	7.74	20.02	0.00	3,510.00	6.95	13.08	0.00	527.00
Number of Transactions (taxed)	6.19	9.78	0.00	1,277.00	5.16	9.49	0.00	622.00

Notes: This table presents selected summary statistics for the two treated countries, Cameroon and CAR. The dataset is a balanced panel of $N = 574{,}845$ users in Cameroon and $N = 54{,}441$ users in CAR. For CAR, the estimation covers 12 months (October 2023–September 2024), and for Cameroon, 11 months (August 2021–June 2022). July 2021 is excluded from the estimation to avoid potential bias due to extraordinary mobile money use around Eid al-Adha. Individual characteristics on bank-account access and expenditures are drawn from household surveys and are therefore time-invariant. Expenditures are scaled using FAO adult-equivalence scales to convert household totals into adult per capita values.

Table 5: *Summary Statistics of Control Countries*

	Mali (control for Cameroon, 07/2021 - 06/2022)				Mali (control for CAR, 10/2023 - 09/2024)			
	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Individual characteristics								
Age	38.39	12.29	16.00	80.00	38.23	12.48	17.00	79.00
Female	0.11	0.31	0.00	1.00	0.12	0.32	0.00	1.00
Access to Banks	0.31	0.17	0.06	0.51	0.30	0.17	0.06	0.51
Urban	0.49	0.50	0.00	1.00	0.47	0.50	0.00	1.00
Yearly Expenditures (scaled)	723,900.18	276,646.14	398,322.31	1,060,834.12	718,035.49	274,766.19	398,322.31	1,060,834.12
Mobile money use								
Transaction Volume (untaxed)	85,252.31	303,443.27	0.00	14,469,752.00	171,986.47	623,457.93	0.00	19,695,640.00
Transaction Volume (taxed)	116,255.62	393,077.97	0.00	14,648,901.00	211,843.89	664,203.79	0.00	18,648,888.00
Number of Transactions (untaxed)	9.25	20.50	0.00	3,321.00	13.14	30.47	0.00	4,818.00
Number of Transactions (taxed)	5.80	10.68	0.00	573.00	9.44	16.48	0.00	925.00

Notes: This table presents selected summary statistics for the control country (Mali). The table is split into two periods: when Mali serves as the control for Cameroon and when it serves as the control for CAR. The dataset is a balanced panel of $N = 459{,}384$ users in the first period and $N = 633{,}477$ users in the second. Individual characteristics on bank-account access and expenditures are drawn from household surveys and are therefore time-invariant. Expenditures are scaled by equivalence scales to convert household totals to per capita values.

4.3 Household Survey Data

We complement the operator data with household survey data from Cameroon and Mali to compare changes in mobile money use across regions with different levels of access to banks and to construct effective tax rates using expenditure data (see subsection 4.5 and section 5). For Cameroon, we use the *Cinquième Enquête Camerounaise sur les Ménages (ECAM 5)*, and for Mali, the *Enquête Harmonisée sur les Conditions de Vie des Ménages 2018–2019 (WAEMU2019)*. We cannot conduct the heterogeneity analysis for CAR because usage is concentrated in the capital city, Bangui; therefore, we do not use CAR survey data.

From each survey, we derive two key regional variables: *consumption* and *bank availability*. Consumption is proxied by total monthly household expenditures, scaled using the FAO adult-equivalence scale to account for household composition.[20] Bank availability is defined as the share of household heads in a region who report having an account with a financial institution (commercial bank, microfinance institution, or caisse rurale), using the survey sampling weights. Appendix B.4 reports further details. We match users in the transaction data to regional characteristics from the household surveys based on their registration location.[21]

4.4 Within-Country Identification

In both Cameroon and CAR, merchant payments and some other minor transaction types are exempt from the mobile money tax. We begin with a difference-in-differences specification that compares taxed transactions (P2P transfers and cash-out withdrawals) with untaxed ones (merchant payments and the other untaxed types), within each country. This analysis provides an initial assessment of how the tax affected the number and value of transactions.

We aggregate the data into a monthly panel and trace the evolution of taxed and untaxed transactions before and after the introduction of the tax. This design captures the dynamic response of mobile money usage for up to six months post-tax. A potential concern is that users may reduce both taxed and untaxed transactions, leading to downward-biased estimates.[22] We therefore view this specification as a preliminary—yet informative—step in assessing behavioral responses before turning to cross-country comparisons, as described in the next section.

[20] We use reported household expenditures and convert them into per-adult-equivalent measures.

[21] We rely on a fuzzy-matching algorithm because town names vary in spelling. Towns that cannot be matched automatically are manually assigned to their respective region.

[22] Users may also substitute from taxed to untaxed transactions, but it is less clear how, for example, P2P transfers could be systematically replaced by merchant payments. The more relevant concern is that exempt transactions may follow different underlying trends.

Formally, we estimate the following event-study specification:

$$y_{i,j,t} = \sum_{k=-6}^{5} \beta_k \tau_{j,t}^{k} + \mu_i + \lambda_t + \varepsilon_{i,j,t}, \tag{15}$$

where $y_{i,j,t}$ is the outcome variable (aggregate transaction values in the main text or the number of transactions in the appendix) of user i for transaction type j in month t. $\tau_{j,t}^{k}$ are event-time dummies equal to one if month t is k months relative to the tax introduction and transaction type j is taxed (P2P or cash-out). μ_i and λ_t denote individual and time fixed effects, respectively.[23]

Because taxed and untaxed transactions may exhibit distinct but constant pre-trends, we follow Goodman-Bacon (2021) and detrend each transaction type by its pre-treatment slope. This improves the comparability of post-treatment dynamics and enhances the interpretability of event-study plots.[24]

Results from estimating Equation 15 show that, prior to the tax, taxed and untaxed transactions follow parallel trends without systematic deviations (Figure 5). After the tax, both Cameroon and CAR exhibit persistent and significant declines in the monthly values of taxed transactions. In Cameroon, the drop is around 50,000 XAF relative to untaxed transactions, equivalent to about 40% of the pre-treatment mean of 125,347.5 XAF. In CAR, the decline is similar in magnitude, corresponding to 36% of its pre-treatment level of 113,993.2 XAF. Results from using the number of transactions are in line with those based on transaction values: the tax reduces the number of transactions by roughly 10% in Cameroon and about 8.5% in CAR (Appendix Figure B.4).

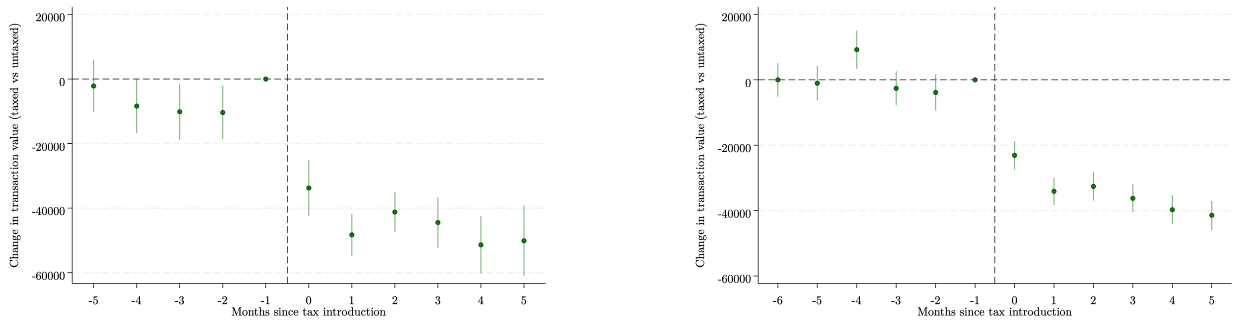
4.5 Identification Based on Matching with Mali

Our second identification strategy compares transaction dynamics in Cameroon with those in Mali, and in CAR with those in Mali. This approach addresses concerns about potential violations of the Stable Unit Treatment Value Assumption (SUTVA) that limit causal interpretation in the within-country analysis. The idea is to compare taxed transaction types of users in a country with a mobile money tax to users with similar individual characteristics and comparable patterns of mobile money use in a country that does not have a mobile money tax. This contrasts with the previous analysis, which compared taxed and untaxed transactions within the same country.

[23] For the estimation, we aggregate up all taxed transaction and untaxed transaction types, respectively, and therefore run the estimation with two transaction types.

[24] Specifically, we construct the detrended outcome for the TWFE model as follows: (i) for each transaction type j, compute the average monthly pre-treatment change, $\Delta \bar{y}_{t,j} = \frac{1}{T_{\text{pre}}} \sum_{t \in \mathcal{T}_{\text{pre}}} \Delta y_{t,j}$; and (ii) construct the detrended series, $\tilde{y}_{t,j} = y_{t,j} - (t+6) \times \Delta \bar{y}_{t,j}$.

Figure 5: *Within-Country Dynamics of Mobile Money Volume*



Cameroon *CAR*

Note: The vertical axis shows the estimated β_k from Equation 15: The event-time difference-in-differences for taxed vs. untaxed transactions, relative to the pre-tax month. The vertical dashed line marks the introduction of the mobile money tax. Values are total monthly amounts per user, in XAF. Confidence bands are shown at the 99% level and are constructed from bootstrapped standard errors. Pre-tax total monthly transaction value per user for taxed transactions is 125,347.5 XAF in Cameroon and 113,993.2 XAF in CAR. A reduction of 40,000 XAF corresponds to reductions of about 32% in Cameroon and 35% in CAR, relative to these pre-tax levels.

Mali provides a particularly suitable control for both Cameroon and CAR. The three francophone countries share many structural characteristics: all are classified as low- or lower-middle-income economies, dominated by agriculture, and use CFA francs (XOF in Mali; XAF in Cameroon and CAR), pegged at a fixed rate to the euro and guaranteed by France.[25] Moreover, mobile money was already central to financial intermediation in all three countries prior to the tax.[26]

To ensure comparability, we employ a matching procedure that pairs users in Cameroon and CAR with users in Mali who share similar observed characteristics. The procedure has three steps. First, for Cameroon, in the benchmark analysis, we restrict the sample to users residing in majority-Muslim regions to mitigate concerns that behavioral responses may partly reflect seasonal effects around the Christmas holidays, which coincided with the tax introduction.[27] After this restriction, we retain 25 of the 69 regions, covering roughly 54% of the original sample. In the Appendix, we also present results without this restriction.

Second, we implement a propensity-score matching procedure to construct comparable samples between treatment and control countries. Specifically, we estimate a logit model where the

[25] CFA historically denotes *Communauté Financière Africaine* in West Africa (XOF) and *Coopération Financière en Afrique Centrale* in Central Africa (XAF). The official exchange rate is €1 = 655.957 CFA francs. The two CFA currencies (XOF and XAF) maintain parity through their common peg to the euro.

[26] According to the mobile money prevalence index—developed by GSMA (2025)—Mali and Cameroon rank at the high end, while CAR is in the medium range.

[27] This restriction can only be applied to Cameroon, as CAR does not contain Muslim-majority regions. For CAR, we therefore omit this step.

dependent variable equals one for users in Cameroon or CAR and zero for users in Mali, using the following covariates: gender, age, urban versus rural location, and mobile money usage patterns. We measure mobile money usage by the average monthly transaction value of taxed transactions prior to the tax. For Cameroon, we compute the average transaction value including January 2022, since this allows for better balancing of the matched sample. We also include transformations and interactions of these variables. Using the estimated parameters, we generate individual propensity scores.

Finally, we match treated users to users in Mali with similar scores using the nearest-neighbor procedure, ensuring that post-treatment comparisons reflect individuals with closely aligned observable characteristics. Figure B.5 in the Appendix shows substantial overlap of the scores between treated and control users.

Building on this matching, we estimate the following event-study specification:

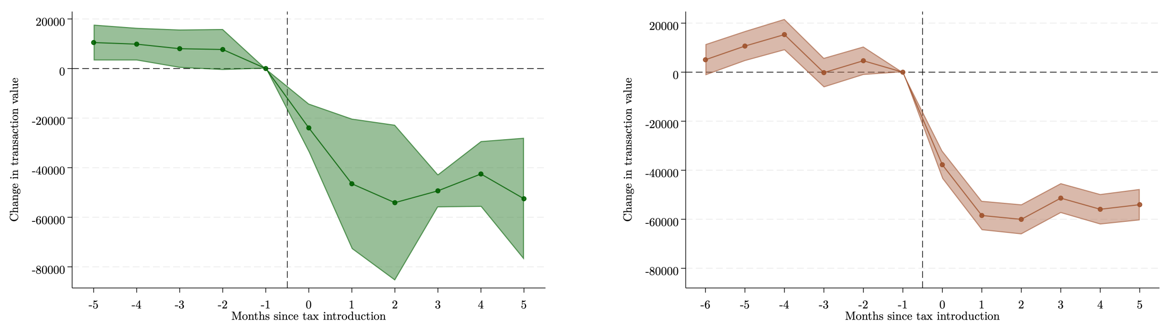
$$y_{i,c,t} = \sum_{k=-6}^{5} \beta_k \, \tau_{c,t}^{k} + \mu_i + \lambda_t + \varepsilon_{i,c,t}, \tag{16}$$

where $y_{i,c,t}$ is the outcome (aggregate values or number of transactions) of user i in country c and month t. $\tau_{c,t}^{k}$ are event-time dummies equal to one if user i resides in a treated country ($c \in \{\text{Cameroon, CAR}\}$) and month t is k months relative to the tax introduction ($k = 0$ denotes the month of implementation). For Mali, which always serves as the untreated control, the dummies are set to zero. μ_i and λ_t denote user and month fixed effects, respectively. The specification is estimated separately for Cameroon–Mali and CAR–Mali matched samples and focuses on transactions that are taxed in the treated countries. Appendix Figure B.6 illustrates the importance of our identification approach as the countries were not generally on parallel trends prior to the introduction of the tax. The focus on comparable regions and users is important to identify the causal effect of mobile money taxes.

Benchmark Results from Matching with Mali

Figure 6 presents the main results from estimating Equation 16. In both countries, mobile money usage declines sharply and persistently after the tax. In Cameroon (left panel), the total monthly transaction value per user falls by more than 50,000 XAF, while the drop in CAR is slightly larger in absolute terms (right panel). Relative to pre-tax means, these declines correspond to 40% and 47%, respectively. The somewhat stronger response in CAR is consistent with its higher tax rate. Separate

Figure 6: *Effects of Mobile Money Tax on Transaction Value*



Cameroon *Central African Republic*

Notes: The vertical axis shows the estimated β_k from Equation (16): The event-time difference-in-differences for taxed transactions in Cameroon or CAR vs. the same transactions in Mali (based on propensity-score matching), relative to the pre-tax month. The vertical dashed line marks the introduction of the mobile money tax. Standard errors are heteroskedasticity-consistent. Confidence bands are shown at the 99% level. Pre-tax average values of taxed transactions are 125,347.5 XAF in Cameroon (i.e., a reduction of 50,000 XAF corresponds to 40%) and 113,993.2 XAF in CAR (i.e., a reduction of 54,000 XAF corresponds to 47%).

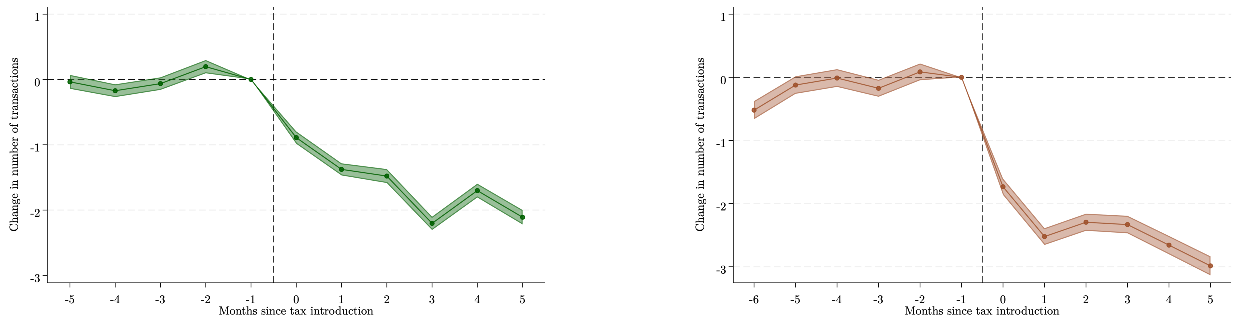
estimates for P2P transfers and cash-outs show that both decline due to the tax (Appendix Figure B.7). Untaxed transactions—merchant payments and cash-in deposits—either exhibit different pre-trends or do not show a significant response to the tax (Appendix Figure B.8). Overall, the results from both identification strategies point to relatively large negative effects of the mobile money tax.

Figure 7 examines the number of monthly taxed transactions. Both Cameroon and CAR track Mali closely before the tax, but diverge sharply afterward. Percentage declines in transaction counts mirror those in volumes: 33% in Cameroon and 51% in CAR. This suggests that users cut back across the board, reducing both large and small transactions rather than adjusting transaction size selectively.

Heterogeneity

We next examine whether the tax affected different segments of the population differently, directly addressing both Proposition 2 and Proposition 5. We restrict the analysis to Cameroon because in CAR, users are overwhelmingly concentrated in Bangui (87% of users), which makes it infeasible to split the sample into meaningful subsamples. By contrast, the Cameroonian data cover both urban and rural areas, the capital and secondary cities, as well as regions with high versus low bank penetration.

Figure 7: *Effects of Mobile Money Tax on Number of Transactions*



Cameroon *Central African Republic*

Notes: The vertical axis shows the estimated β_k from Equation (16): The event-time difference-in-differences in the number of taxed transactions in Cameroon or CAR vs. the same transactions in Mali (based on propensity-score matching), relative to the pre-tax month. The vertical dashed line marks the introduction of the mobile money tax. Standard errors are heteroskedasticity-consistent. Confidence bands are shown at the 99% level. Pre-treatment means were 6.2 transactions (Cameroon; i.e., a reduction of 2 transactions corresponds to about 33%) and 5.77 transactions (CAR; i.e., a reduction of 2.9 transactions corresponds to about 51%) per user per month.

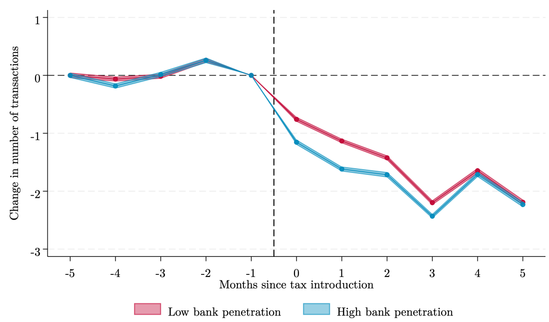
We reestimate the model on two sets of subsamples. First, we contrast regions with different levels of banking access by comparing users in the bottom quartile of bank penetration with those in the top quartile. Second, we split the sample into urban and rural regions. The first heterogeneity split substantially reduces the sample size and limits our ability to employ the matching approach. Instead, we use a similar approach to the within-country analysis.[28]

Figure 8 shows that heterogeneity plays a central role in shaping the responses to the mobile money tax—whether we look at the number of transactions (left panels) or the monthly value of transactions (right panels). The decline in mobile money use is markedly larger in regions with greater banking access (upper panels), consistent with the idea that households with outside options are more likely to substitute away from mobile money. By contrast, in low-bank-penetration regions, the effect is weaker and often statistically insignificant, indicating limited elasticity and few substitution possibilities. Similarly, reductions are stronger in urban than in rural areas (lower panels), where alternative financial services are more widely available and mobile money demand is more elastic with respect to taxation. Taken together, these findings support Propositions 2 and 5, highlighting that the tax burden falls disproportionately on users in financially less developed and rural areas, who face few viable substitutes. In relation to Proposition 5, this evidence suggests that

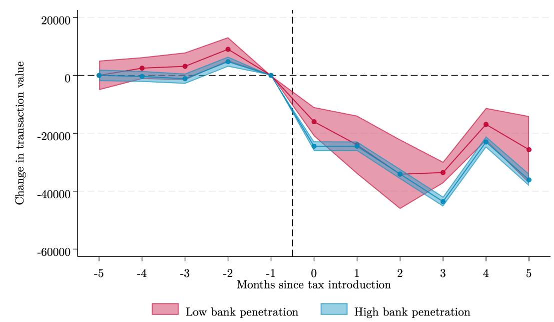
[28]Following Goodman-Bacon (2021), we detrend each subsample's outcome series by its pre-treatment slope. This helps ensure flat pre-trends and enables a cleaner graphical comparison of responses across subsamples.

the *substitution* effect outweighs the average cost effect.

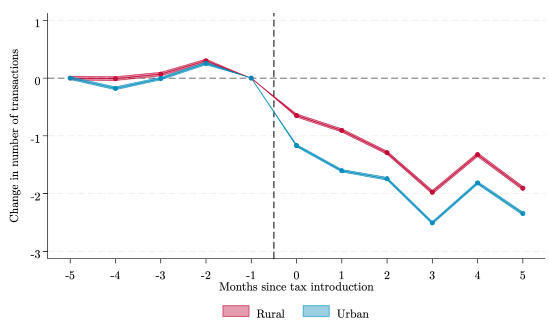
Figure 8: *Heterogeneous Effects: Users in Regions with Low vs. High Bank Penetration*



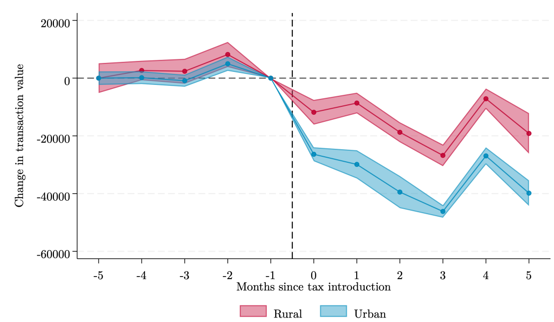
Number of Transactions



Values of Transactions



Number of Transactions



Values of Transactions

Note: The upper panels plot the dynamics of mobile money use around the introduction of mobile money taxes (vertical dashed line) for users in regions with low versus high bank penetration. Bank penetration is measured as the regional share of households with a bank account, and the sample is split at the 25th and 75th percentiles. The lower panels split the sample into users in urban and rural regions. Confidence bands are shown at the 95% level, with bootstrapped standard errors.

Price Elasticity

The data allow the calculation of a price elasticity of mobile money transactions. For each observed mobile money transaction, we compute the pre-tax and post-tax consumer price. In Cameroon, the tax resulted in an average increase of 19.45% in the cost to the consumer for making a taxable transaction.[29] Although the proportional tax rate of 0.2% appears small, it is in fact large relative to operator fees. Dividing the 40% decline in the *average monthly transaction value per user for taxed*

[29] In Cameroon, only P2P transactions and withdrawals from a mobile money account are charged a fee. For P2P transactions, either the sender or the receiver pays the fee. We assume the sender pays it and compute, for all transactions prior to January 1, 2022, the difference between the fee only and the fee including the tax. Computing the cost increase using all transactions through the end of the sample does not change the results.

transactions after the tax by the 19.45% tax-inclusive price increase yields an estimated short-term price elasticity of about -2.1 in Cameroon; that is, a 10% increase in the tax-inclusive consumer price—operator fee plus the mobile money tax—is associated with about a 21% decline in the average monthly transaction value per user for taxed transactions. In CAR, there is no operator fee for transfers (only withdrawals entail a fee), so the pre-tax consumer price for a transfer is zero; the 1% levy raises the price from 0 to a positive amount, making the percentage change undefined. We therefore do not report a comparable elasticity for transfers.

5 Implications for Policy and Welfare

We now turn to the implications of the empirical evidence for welfare in terms of costs and distributional consequences of mobile money taxation.

5.1 Calculation of Excess Burden (*EB*)

To assess the welfare implications of the tax, we provide a back-of-the-envelope calculation of its excess burden for Cameroon. This exercise quantifies the efficiency cost of mobile money taxation, building directly on Proposition 3 and informed by the empirical results presented in the previous section.

In our framework, the *EB* equals the product of the tax rate and the fall in the taxable base (the value of taxed transactions) $EB = \tau \times \Delta B$. The total value of taxable transactions observed in our sample over the six months before the tax was 444,653 million XAF.[30] A predicted 40% reduction due to the tax leads to a drop of 177,861 million XAF. Because the sample represents 20% of the customer base, this figure is scaled fivefold to 889,306 million XAF. Adjusting for the operator's approximately 50% market share, the estimated economy-wide decline in taxable mobile money transactions becomes 1,778,612 million XAF. Applying the 0.2% statutory rate per taxed operation, $EB = 0.002 \times 1{,}778{,}612 \;=\; 3{,}557$ million XAF over six months; or 7,114 million XAF annualized.[31]

For context, we compare this *EB* to mobile money tax revenue collected over the same horizon, based on official statistics, and obtain

$$\frac{EB}{Revenue} \;=\; \approx\; 0.35 \;\; \text{(i.e., about 35\% of mobile money tax revenue).}$$

[30]Transfers and withdrawals by their recipients are treated as distinct transactions in the data.

[31]This calculation assumes the 20% sample is representative, the operator's market share is 50% across periods, and the 40% decline applies uniformly across the taxable base.

Whether such an inefficient and regressive tax can be tolerated on low-state-capacity grounds ultimately depends on the social marginal value of public funds (λ). A necessary condition for desirability is that $\lambda \geq 1 + \text{EB}/R$. With $\text{EB}/R \approx 0.35$, this implies $\lambda \gtrsim 1.35$. Accounting for additional losses from a shift to cash (informality) equal to s percent of revenue and a distributional penalty of d percent (if inequality carries any positive social cost) raises this threshold to

$$\lambda \geq 1 + 0.35 + s + d.$$

Both s and d lie outside the primitives of our model; for example, if each equals 15%, the social marginal value of public funds must be at least 1.65 to justify the tax. Existing estimates for African countries place the marginal cost of public funds around 1.1–1.2,[32] and, under the usual normalization equating this with the social marginal value of public funds, our threshold (> 1.35) exceeds these typical values.

5.2 Mobile Money Tax Incidence and Distributional Effects

Guided by the estimated responses and household expenditure information, we assess the effective mobile money tax rate across groups, defined as the share of mobile money taxes in total household expenditures.[33] Table 6 reports the results. Overall, users in rural and low-bank-penetration areas face higher effective tax rates. Before behavioral adjustment, effective tax rates equal 0.47% in low-bank areas versus 0.22% in high-bank areas, and 0.31% for rural versus 0.26% for urban users. After accounting for behavioral responses, these differences persist, with the effective rates falling to 0.37% (low-bank) versus 0.16% (high-bank), and to 0.24% (rural) versus 0.18% (urban). Urban users generate nearly 80% of total revenue due to larger transaction volumes, but their stronger adjustment shifts the burden modestly toward rural areas (the rural share rises from 20% to 22%).

In sum, the evidence suggests that the tax is regressive: poorer users and those in financially less developed regions bear higher effective rates despite contributing less in absolute terms.

[32] The median reported by Auriol and Warlters (2012) is 1.17.

[33] Data do not exist for calculating the effect of the tax on the average tax-inclusive transaction cost of banked versus unbanked individuals, as per the measure of regressivity in Proposition 5.

Table 6: *Effective Tax Rates and Revenue by Group*

	Bank Penetration		**Location**	
	Low	High	Rural	Urban
Pre-treatment Volume (CFA)	119,449	134,515	94,848	138,795
Monthly Expenditures (CFA)	50,983	122,242	60,541	105,001
Response in Volume (%)	–21.4	–26.8	–20.6	–29.5
Tax Rate	0.2%	0.2%	0.2%	0.2%
Eff. Tax Rate (no response)	0.469%	0.220%	0.313%	0.264%
Eff. Tax Rate (with response)	0.368%	0.161%	0.250%	0.189%
Share of Tax Revenue (with resp.)	25.8%	26.6%	22%	78%

Notes: This table reports effective mobile money tax rates and revenue shares for Cameroon. The effective rate is defined as taxes paid relative to household expenditures, $\tau^{eff}_{i,t,MM} = \frac{\tau_{t,MM} \times MM_{i,t}}{E_{i,t}}$, where $\tau_{t,MM}$ is the statutory tax, $MM_{i,t}$ is taxed transaction volume, and $E_{i,t}$ is household expenditure. "No response" assumes pre-treatment volumes, while "With response" adjusts for the estimated 6-month post-treatment decline. Bank penetration is measured at the regional level (bottom vs. top quartile), and the rural/urban split follows the operator's classification. Note that the share of tax revenue coming from low and high bank penetration do not add up to 100%. Instead, the remaining 47.6.5% in terms of tax revenue stem from users with intermediate levels of tax revenue (between the 25^{th} and 75^{th} percentile of bank penetration).

6 Conclusion

This paper developed a comprehensive theoretical framework for mobile money taxation, encompassing the main behavioral margins of users: reductions in usage, substitution across transaction types, and reversion to cash. The model links these behavioral responses to incidence and efficiency, showing how elasticities differ sharply across user groups depending on their access to substitutes such as cash and bank accounts. This provides a unified lens for evaluating the welfare consequences of taxing digital financial services in developing countries.

Empirically, we relied on two complementary sources of evidence focusing on margins of mobile money use. First, cross-country survey data established broad external validity, documenting systematic declines in mobile money usage following tax adoption across African economies. Second, transaction-level data from Cameroon and CAR—two countries that introduced mobile money taxes—allowed us to trace individual-level behavioral responses.

The findings are consistent across both types of data: mobile money taxes sharply reduce usage—with an elasticity around -2—and, with limited substitution options for unbanked and rural individuals, these groups disproportionately bear the tax burden, making the tax regressive. The tax is inefficient, with the excess burden reaching about one third of revenue collected. Suggestive evidence also indicates that reductions in mobile money use are accompanied by a shift back toward cash, reinforcing the view that the tax undermines both financial inclusion and formality.

Taken together, these results show that mobile money taxation (on transaction value) is a poor policy instrument: inefficient and regressive. It also encourages a shift toward cash, compromising formality efforts by eroding transaction information that could otherwise be used to enforce other taxes and measure economic activity. Our estimates cover the first six months after commencement of the tax; future work can examine longer-run responses. Finally, our theoretical model yields additional testable predictions—for instance, regarding adjustments in bank transactions—that we leave for empirical analysis once suitable data become available.

References

Agrawal, D. R., and Hebous, S. (2025). Tax Policy in the Era of Digital Money and the Metaverse, Mimeo.

Ahmad, A. H., Green, C., and Jiang, F. (2020). Mobile Money, Financial Inclusion and Development: A Review with Reference to African Experience. *Journal of Economic Surveys*, *34*(4), 753–792.

Ahnert, T., Hoffmann, P., and Monnet, C. (2025). Payments and Privacy in the Digital Economy. *Journal of Financial Economics*, *169*, 104050.

Aker, J. C., and Mbiti, I. M. (2010). Mobile phones and economic development in africa. *Journal of Economic Perspectives*, *24*(3), 207–232.

Apeti, A. E., and Edoh, E. D. (2023). Tax Revenue and Mobile Money in Developing Countries. *Journal of Development Economics*, *161*, 103014.

Aron, J. (2018). Mobile Money and the Economy: A Review of the Evidence. *World Bank Research Observer*, *33*(2), 135–188.

Auriol, E., and Warlters, M. (2012). The marginal cost of public funds and tax reform in africa. *Journal of Development Economics*, *97*(1), 58–72.

Batista, C., and Vicente, P. C. (2025). Is Mobile Money Changing Rural Africa? Evidence from a Field Experiment. *Review of Economics and Statistics*, *107*(3), 835–844.

Borusyak, K., Jaravel, X., and Spiess, J. (2024). Revisiting Event-Study Designs: Robust and Efficient Estimation. *Review of Economic Studies*, *91*(6), 3253–3285.

Brunnermeier, M., Limodio, N., and Spadavecchia, L. (2023). Mobile Money, Interoperability, and Financial Inclusion, NBER Working Paper No. 31696.

Cai, J., He, J., Jiang, W., and Xiong, W. (2020). The Whack-a-Mole Game: Tobin Taxes and Trading Frenzy. *The Review of Financial Studies*, *34*(12), 5723–5755.

Callaway, B., and Sant'Anna, P. H. (2021). Difference-in-Differences with Multiple Time Periods. *Journal of Econometrics*, *225*(2), 200–230.

Cipriani, M., Guarino, A., and Uthemann, A. (2022). Financial Transaction Taxes and the Informational Efficiency of Financial Markets: A Structural Estimation. *Journal of Financial Economics*, *146*(3), 1044–1072.

Colliard, J.-E., and Hoffmann, P. (2017). Financial Transaction Taxes, Market Composition, and Liquidity. *Journal of Finance*, *72*(6), 2685–2716.

Deng, Y., Liu, X., and Wei, S.-J. (2018). One Fundamental and Two Taxes: When Does a Tobin Tax Reduce Financial Price Volatility? *Journal of Financial Economics*, *130*(3), 663–692.

Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*, *225*(2), 254–277.

GSMA. (2025). The State of the Industry Report on Mobile Money 2025. GSM Association. https://www.gsma.com/sotir/wp-content/uploads/2025/04/The-State-of-the-Industry-Report-2025_English.pdf

Hearson, M., Mader, P., Abounabhan, M., Carreras, M., Diouf, A., Lees, A., et al. (2024). Taxing mobile money in africa: Risk and reward (Report). Institute of Development Studies and Partner Organisations.

Jack, W., Ray, A., and Suri, T. (2013). Transaction Networks: Evidence from Mobile Money in Kenya. *American Economic Review*, *103*(3), 356–361.

Jack, W., and Suri, T. (2014). Risk Sharing and Transactions Costs: Evidence from Kenya's Mobile Money Revolution. *American Economic Review*, *104*(1), 183–223.

Jones, C. M., and Seguin, P. J. (1997). Transaction Costs and Price Volatility: Evidence from Commission Deregulation. *American Economic Review*, *87*(4), 728–737.

Lee, J. N., Morduch, J., Ravindran, S., Shonchoy, A., and Zaman, H. (2021). Poverty and migration in the digital age: Experimental evidence on mobile banking in bangladesh. *American Economic Journal: Applied Economics*, *13*(1), 38–71. https://doi.org/10.1257/app.20190067

Matheson, T. (2012). Security Transaction Taxes: Issues and Evidence. *International Tax and Public Finance*, *19*(6), 884–912.

Matheson, T., and Petit, P. (2021). Taxing Telecommunications in Developing Countries. *International Tax and Public Finance*, *28*(1), 248–280.

Suri, T. (2017). Mobile Money. *Annual Review of Economics*, *9*, 497–520.

Umlauf, S. R. (1993). Transaction taxes and the behavior of the Swedish stock market. *Journal of Financial Economics*, *33*(2), 227–240.

A Appendix: Proofs

A.1 Proof of Proposition 1 and Corollary

In taking derivatives of expectations under the regularity conditions assumed for the density function, boundary events like $M + t = c$ occur with measure zero and differentiation can be passed under the integral sign (see Theorem 2.27 in Folland (1999)). Let $1_{\{\ \}}$ be an indicator function equal to 1 in the set specified in brackets and zero elsewhere.

For $W(t)$:

$$\frac{d}{dt}\mathbb{E}[W(t)] = \mathbb{E}\left[\frac{d}{dt}W(t)\right] = \mathbb{E}\left[1_{\{M+t<c\}} \cdot 1 + \{1\}_{\{M+t\geq c\}} \cdot 0\right] = \mathbb{P}(M+t<c). \tag{A.1}$$

For $Z(t)$:

$$\frac{d}{dt}\mathbb{E}[Z(t)] = \mathbb{E}\left[\frac{d}{dt}Z(t)\right] = \mathbb{E}\left[1_{\{M+t<\min(B,c)\}} \cdot 1\right] = \mathbb{P}(M+t<\min(B,c)). \tag{A.2}$$

Using (A.1) and (A.2) and the definition of Δ in (2) gives

$$\frac{d}{dt}\Delta(t) = \mathbb{P}(M+t<c) - \mathbb{P}(M+t<\min(B,c)). \tag{A.3}$$

The second term on the right-hand side of (A.3) can be written more explicitly as

$$\mathbb{P}(M+t<\min(B,c)) = \mathbb{P}(M+t<B \text{ and } M+t<c). \tag{A.4}$$

Thus,

$$\frac{d}{dt}\Delta(t) = \mathbb{P}(M+t<c) - \mathbb{P}(M+t<c \text{ and } M+t<B), \tag{A.5}$$

$$= \mathbb{P}(M+t<c \text{ and } M+t\geq B), \tag{A.6}$$

$$= \mathbb{P}(B\leq M+t<c). \tag{A.7}$$

Finally, since $\phi^* = \Delta$ and Δ increases with the tax, the proportion of the population with bank accounts increases, $dG(\phi^*(t))/dt > 0$. □

A.2 Proof of Proposition 2

From (8),

$$\frac{d}{dt}P_W(t) = -\int_0^\infty f_{M,B}(c-t,b)\,db.$$

Rewriting,

$$\frac{d}{dt}P_W(t) = -\int_0^c f_{M,B}(c-t,b)\,db - \int_c^\infty f_{M,B}(c-t,b)\,db.$$

From (10),

$$\frac{d}{dt}P_Z(t) = -\int_0^{c-t} f_{M,B}(m,m+t)\,dm - \int_c^\infty f_{M,B}(c-t,b)\,db.$$

The second terms in both expressions are identical and cancel in the comparison. For small t, the first term in $\frac{d}{dt}P_Z(t)$ integrates along the diagonal $(M,B) = (b,b)$, while the first term in $\frac{d}{dt}P_W(t)$ integrates along the vertical line $(M,B) = (c,b)$.

If c lies in the upper tail of the distribution, then the density along $(M,B) = (c,b)$ will typically be lower than along the diagonal $(M,B) = (b,b)$ for $b \in (0,c)$. Hence,

$$\int_0^c f_{M,B}(b,b)\,db > \int_0^c f_{M,B}(c,b)\,db,$$

implying that

$$\left|\frac{d}{dt}P_Z(t)\right| > \left|\frac{d}{dt}P_W(t)\right|.$$

Moreover, since $P_Z < P_W$,

$$\left|\frac{dP_Z/dt}{P_Z}\right| > \left|\frac{dP_W/dt}{P_W}\right|.$$

□

A.3 Proof of Proposition 4

For banked individuals, cash dominates when $b \in (c, \infty)$ and $m \in (c-t, \infty)$. Thus,

$$\mathbb{P}(Z = c) = \int_{c-t}^\infty \int_c^\infty f_{M,B}(m,b)\,db\,dm.$$

Differentiating yields

$$\frac{d}{dt}\mathbb{P}(Z = c) = \int_c^\infty f_{M,B}(c-t,b)\,db \; > \; 0.$$

For unbanked individuals,

$$\mathbb{P}(W = c) = \int_{c-t}^{\infty} f_M(m)\, dm,$$

and hence

$$\frac{d}{dt}\,\mathbb{P}(W = c) = f_M(c - t) \;>\; 0.$$

□

A.4 Proofs for the Average-Cost Effect

Define the survival function by $S_U(x) = \mathbb{P}(U \geq x)$. Using this, we can rewrite the transfer-incidence probabilities as

$$P_Z^U(t) = \iint \Big[\mathbf{1}_{\{m+t<\min(b,c)\}}\, S_U(m+t) + \mathbf{1}_{\{b<\min(m+t,c)\}}\, S_U(b) + \mathbf{1}_{\{c<\min(m+t,b)\}}\, S_U(c)\Big] f_{M,B}(m,b)\, \mathrm{d}b\, \mathrm{d}m, \tag{A.8}$$

$$P_W^U(t) = \int \Big[\mathbf{1}_{\{m+t<c\}} S_U(m+t) + \mathbf{1}_{\{c<m+t\}} S_U(c)\Big] f_M(m)\, dm.$$

Differentiating under the integral sign (the boundary sets have measure zero) and using the derivative $S'_U(x) = -f_U(x)$ gives

$$\frac{d}{dt} P_Z^U(t) = -\,\mathbb{E}\Big[f_U(M+t) \cdot \mathbf{1}_{\{M+t<\min(B,c)\}}\Big],$$

$$\frac{d}{dt} P_W^U(t) = -\,\mathbb{E}\big[f_U(M+t) \cdot \mathbf{1}_{\{M+t<c\}}\big].$$

The key difference is in the indicator functions. For the banked case, the set over which the expectation is taken requires $M + t < \min(B, c)$, which is strictly smaller than the set $M + t < c$ relevant in the unbanked case. Since both expectations multiply the same nonnegative density $f_U(M + t)$, the derivative for the banked case must be closer to zero.

Thus,

$$\left|\tfrac{d}{dt} P_W^U(t)\right| \;>\; \left|\tfrac{d}{dt} P_Z^U(t)\right|,$$

so the reduction in transfers is larger for unbanked individuals. □

A.5 Expected Utility Model

Our main results were presented with a basic model that focused on the effect of the tax on expected transaction costs. The average cost effect was, however, based on extending the model to an expected utility framework. We show that the propositions on incidence and welfare are robust to this modification of the model.

For a banked individual, the incidence of mobile money transfers (paralleling the concept of P_Z developed in the basic version of the model) can be written as

$$\tilde{P}_Z(Z = M + t) = \int_{m+t}^{\infty} \int_{0}^{c-t} \int_{m+t}^{\infty} f_{M,B}(m, b) f_U(u)\, db\, dm\, du. \tag{A.9}$$

Then,

$$\begin{aligned} \frac{d}{dt}\tilde{P}_Z(Z = M + t) = &- \int_{0}^{c-t} \int_{m+t}^{\infty} f_U(m + t) f_{M,B}(m, b)\, db\, dm \\ &- \int_{0}^{c-t} S(m + t) f_{M,B}(m, m + t)\, dm \\ &- \int_{c}^{\infty} S(c) f_{M,B}(c - t, b)\, db, \end{aligned} \tag{A.10}$$

where the first term on the right-hand side is the average cost effect, the second is the substitution away from mobile money toward banking, and the third is the switch to cash (over the range where cash is cheaper than banking).

Expected utility and tax revenues can be expressed using the probabilities of each transfer method being least-cost and the likelihood (via the survival function) that utility exceeds the transaction cost. For expected utility, the success probability of a transfer is multiplied by its net utility. Social welfare is the sum of expected utility and expected tax revenues.

Differentiating the social welfare function yields the change in welfare arising from the tax,

$$\frac{d}{dt}\mathrm{SW}_Z(t) = t\frac{d}{dt}\tilde{P}_Z(Z = M + t) < 0. \tag{A.11}$$

Equation (A.11) closely resembles Equation (13) of the basic model.[34] In both cases the excess burden is the product of the tax rate and the fall in mobile money transfers, but in the extended model an average cost effect contributes to the decline, on top of the substitution effect. The calculation is analogous for unbanked individuals and hence for the aggregate population.

[34]Equation (A.11) can be expressed in terms of excess burden by multiplying the fall in welfare by -1.

B Appendix: Mobile Money Adoption and Taxes and Cross-Country Surveys

B.1 Details about mobile money adoption and tax introduction years, and countries included in the analysis

Table B.1: *List of countries included in the analysis and Mobile Money adoption and taxation introduction years*

Country	MM adoption year	Tax introduction year	WB Findex			IMF FAS	
			Cash (unrestricted)	Cash (restricted)	MM usage model	Active account model	# transactions model
Morocco	2013		x	x	x		x
Angola	2014		x	x	x	x	x
Burundi	2010		x	x	x		
Benin	2010	2022	x	x	x	x	x
Burkina Faso	2012	2020	x	x	x	x	x
Botswana	2011		x	x	x	x	x
Central African Republic	2016	2024			x	x	x
Côte d'Ivoire	2008	2018	x	x	x	x	x
Cameroon	2010	2022	x	x	x	x	x
Democratic Republic of the Congo	2012	2018	x		x	x	
Republic of the Congo	2011	2019	x	x	x	x	x
Comoros	2019		x	x	x	x	x
Djibouti	2020						
Egypt	2013					x	x
Ethiopia	2015		x	x	x		
Gabon	2012		x	x	x		
Ghana	2009	2022	x	x	x	x	x
Guinea	2012		x	x	x	x	x
Gambia	2016		x	x	x	x	x
Guinea-Bissau	2010					x	x
Kenya	2007	2013	x	x	x		x
Liberia	2011		x	x	x	x	x
Lesotho	2012		x	x	x	x	x
Madagascar	2010		x	x	x	x	x
Mali	2010	2025	x	x	x	x	x
Mozambique	2011		x	x	x		x
Mauritania	2013		x	x	x	x	x
Mauritius	2019		x	x	x	x	x
Malawi	2012		x	x	x	x	x
Namibia	2010		x	x	x	x	x
Niger	2010		x	x	x	x	x
Nigeria	2011	2021	x	x	x		x
Rwanda	2009		x	x	x	x	x
Sudan	2014		x	x	x	x	x
Senegal	2010		x	x	x	x	x
Sierra Leone	2012		x	x	x	x	x
Somalia	2009		x	x	x		
South Sudan	2019		x	x	x		
Eswatini	2011		x	x	x	x	x
Seychelles	2015					x	x
Chad	2012	2022	x	x	x	x	x
Togo	2013		x	x	x	x	x
Tunisia	2012		x	x	x		x
Tanzania	2008	2013	x	x	x	x	x
Uganda	2009	2013	x	x	x		x
South Africa	2009		x	x	x	x	x
Zambia	2009	2024	x	x	x	x	x
Zimbabwe	2011	2014				x	x

Notes: This table reports the years of adoption of mobile money and introduction of mobile money taxes in African countries included in the sample. The following columns highlight countries included in each analysis presented in the paper.

B.2 Summary Statistics for Cross-country Mobile Money Surveys

IMF Financial Access Survey

Data for this analysis comes from the IMF Financial Access Survey IMF (2024). We use data from the World Bank Development Indicators (World Bank, 2025b) for the various control variables.

World Bank Findex Database

Data for this analysis comes from the IMF Financial Access Survey World Bank (2025a).

Table B.2: *Summary Statistics by Country, IMF Financial Access Survey*

Country	**Mean**			
	Number of ATMs	GDP per Capita	Active Accounts	Number of Transactions
Angola	17.76	2648.70	11.43	1575.42
Benin	3.96	1133.70	674.85	104571.89
Burkina Faso	4.47	706.61	581.89	85078.76
Botswana	35.23	6573.67	850.90	31242.07
Central African Republic	1.32	382.11	0.67	0.85
Côte d'Ivoire	6.77	2026.49	701.51	38910.30
Cameroon	3.77	1390.75	201.83	18210.27
Democratic Republic of the Congo	1.10	462.01	78.27	11826.70
Republic of the Congo	9.52	2079.27	238.41	6915.02
Comoros	5.97	1492.70	216.44	4446.71
Egypt	24.76	3776.77	119.25	6078.54
Ethiopia	9.13	843.65		641.58
Gabon	12.24	6938.26	19.91	
Ghana	10.44	1894.96	628.97	126230.15
Guinea	2.22	877.63	220.34	49329.73
Gambia	8.23	705.65	101.82	43529.95
Guinea-Bissau	5.91	711.76	883.12	20517.79
Kenya	8.12	1518.95		40463.05
Liberia	2.84	662.11	275.11	37291.79
Lesotho	13.73	1041.85	490.81	36561.84
Morocco	28.90	3321.58		312.34
Madagascar	2.43	445.87	98.27	15604.77
Mali	4.47	879.97	318.74	42204.83
Mozambique	9.85	605.74		41402.21
Mauritania	11.90	1536.81	49.18	1541.11
Mauritius	41.67	10545.60	165.57	3568.84
Malawi	4.49	547.38	339.14	44011.44
Namibia	61.50	4279.88	699.20	4650.21
Niger	1.75	529.99	27.09	2108.91
Nigeria	14.54	2448.33	228.23	18695.01
Rwanda	4.64	809.01	495.52	80750.85
Sudan	5.34	1259.34	64.92	211.02
Senegal	6.09	1371.45	765.47	83908.99
Sierra Leone	1.34	1095.48	312.80	21483.95
South Sudan	0.96		147.87	39986.06
Eswatini	35.09	3532.93	580.96	23180.59
Seychelles	78.30	17107.91	3.30	1311.85
Chad	1.31	920.27	10.54	8.22
Togo	6.04	821.60	406.23	25455.01
Tunisia	34.51	3976.34		192.57
Tanzania	5.42	951.83	788.52	59684.25
Uganda	4.08	873.12	885.10	53697.89
South Africa	55.47	5899.94	63.33	180.91
Zambia	8.83	1271.60	363.43	55988.40
Zimbabwe	5.48	1361.04	588.93	221698.40
Total	14.31	2232.05	409.04	42137.13

Notes: This table summarizes average numbers of the main outcome and control variables for each of the countries in the sample. Data covers years where either of the main outcome variables are available. *Number of ATMs* is relative to 100,000 adults in the country. *GDP per Capita* is measured in constant 2015 USD. The *Number of Active Accounts* and the *Number of Transactions* are relative to 1,000 adults. Empty cells indicate that no data is available for that country.

Table B.3: *Summary Statistics by Country, World Bank Findex Database*

Country	Mean					
	Mobile Money	Female	Age	Primary or less	Secondary	Tertiary
Angola	0.00	0.41	34.67	0.60	0.40	0.00
Benin	0.14	0.48	33.41	0.62	0.34	0.04
Botswana	0.29	0.55	37.19	0.26	0.61	0.13
Burkina Faso	0.30	0.42	33.44	0.60	0.38	0.03
Burundi	0.06	0.48	33.92	0.81	0.19	0.00
Cameroon	0.18	0.51	32.99	0.40	0.58	0.02
Central African Rep.	0.15	0.52	33.72	0.57	0.23	0.20
Chad	0.20	0.40	32.51	0.64	0.35	0.01
Comoros, Union of the	0.07	0.43	35.46	0.45	0.41	0.14
Congo, Dem. Rep. of the	0.23	0.45	33.09	0.12	0.65	0.22
Congo, Rep. of	0.23	0.47	36.13	0.28	0.69	0.03
Côte d'Ivoire	0.39	0.40	35.12	0.52	0.45	0.03
Eswatini, Kingdom of	0.75	0.40	36.74	0.26	0.61	0.12
Ethiopia, The Federal Dem. Rep. of	0.03	0.55	33.63	0.67	0.30	0.03
Gabon	0.45	0.49	35.31	0.28	0.62	0.10
Gambia, The	0.08	0.48	34.06	0.53	0.43	0.04
Ghana	0.22	0.49	34.17	0.37	0.56	0.07
Guinea	0.19	0.49	35.13	0.65	0.23	0.13
Kenya	0.70	0.50	32.21	0.31	0.63	0.06
Lesotho, Kingdom of	0.52	0.48	41.67	0.50	0.43	0.07
Liberia	0.26	0.49	33.06	0.44	0.50	0.06
Madagascar, Rep. of	0.08	0.54	36.40	0.66	0.33	0.01
Malawi	0.21	0.55	33.85	0.58	0.41	0.01
Mali	0.20	0.45	34.83	0.75	0.22	0.03
Mauritania, Islamic Rep. of	0.16	0.41	36.05	0.42	0.49	0.09
Mauritius	0.19	0.51	46.83	0.23	0.52	0.25
Morocco	0.03	0.45	42.15	0.63	0.25	0.12
Mozambique, Rep. of	0.44	0.48	33.46	0.54	0.46	0.00
Namibia	0.32	0.58	34.59	0.28	0.62	0.10
Niger	0.07	0.43	33.57	0.81	0.18	0.00
Nigeria	0.13	0.46	33.21	0.21	0.75	0.04
Rwanda	0.19	0.52	35.19	0.70	0.30	0.00
Senegal	0.22	0.48	36.29	0.60	0.37	0.03
Sierra Leone	0.11	0.49	35.18	0.63	0.34	0.03
Somalia	0.47	0.46	34.51	0.74	0.18	0.09
South Africa	0.26	0.51	37.38	0.20	0.68	0.12
South Sudan, Rep. of	0.03	0.39	33.91	0.79	0.20	0.02
Sudan	0.04	0.37	37.29	0.28	0.38	0.34
Swaziland	0.30	0.49	33.36	0.18	0.65	0.17
Tanzania, United Rep. of	0.40	0.48	35.23	0.65	0.33	0.02
Togo	0.25	0.45	33.22	0.45	0.50	0.05
Tunisia	0.03	0.49	42.20	0.39	0.46	0.15
Uganda	0.42	0.49	32.10	0.43	0.56	0.01
Zambia	0.24	0.49	32.20	0.28	0.62	0.10
Zimbabwe	0.37	0.57	37.02	0.25	0.69	0.06

Notes: This table reports the average values of the main outcome and control variables for each country in the sample. The data correspond to the years and countries included in the main estimation sample. The income quintile variable is omitted, as it captures within-country income rank and its mean is therefore uninformative. *Mobile Money* denotes the probability of making any transaction using mobile money. *Female* equals 1 if the respondent is female. *Primary or less*, *Secondary*, and *Tertiary* indicate the probability of having completed each of the respective education levels.

Table B.4: *Overview of Transactions Types: Cameroon*

Transaction Type	**Volume** (monthly, in mn. XAF)	**Number of Transactions** (monthly)	**SD** (yearly, thousands)	**Share** (volume, in %)	**Share** (number, in %)
Bank to Wallet (B2W)	540.5	1,960	717.8	0.6	0.1
Cash In	3,706.3	603	12,601	4.2	0.0
Cash Out	39,327.9	443,660	279.5	45.0	31.6
Send to Other Network (GIMAC Out)	211.7	13,440	95.8	0.2	1.0
Merchant Payment	5,524.2	219,295	203.9	6.3	15.6
Correction Operation	1.9	67	76.0	0.0	0.0
P2P	36,909.8	332,202	2,530.7	42.2	23.6
P2P Non-Reg (unregistered user)	70.9	12,066	29.8	0.1	0.9
Recharge / Top Up (airtime/telco bundle)	1,054.4	380,293	4.7	1.2	27.1
Wallet Deletion (WLLTDELSTL)	1.3	129	70.1	0.0	0.0

Table B.5: *Overview of Transactions Types: Central African Republic*

Transaction Type	**Volume** (monthly, in mn. XAF)	**Number of Transactions** (monthly)	**SD** (yearly, thousands)	**Share** (volume, in %)	**Share** (number, in %)
Bank to Wallet (B2W)	127.4	1,721	106.2	1.4	0.3
Cash In	2,918.8	123,717	42.3	31.9	18.0
Cash Out	2,970.2	153,246	53.7	32.4	22.3
Salary Payment	247.3	2,499	121.1	2.7	0.4
Merchant Payment	224.3	65,758	21.2	2.4	9.6
Operator Transfer	1.1	16	110.3	0.0	0.0
P2P	2,529	139,254	44.1	27.6	20.3
P2P Non-Reg (unregistered user)	2.1	247	13.9	0.0	0.0
Recharge / Top Up (airtime/telco bundle)	58.0	190,574	0.7	0.6	27.7
Rollback (transaction annulled)	5.3	8,968	3.7	0.1	1.3
Correction Operation	75.4	1,146	106.4	0.8	0.2

B.3 Summary Statistics for Transaction Data

Table B.6: *Overview of Transactions Types: Mali (07/2021 - 06/2022)*

Transaction Type	**Volume** (monthly, in mn. XOF)	**Number of Transactions** (monthly)	**SD** (yearly, thousands)	**Share** (volume, in %)	**Share** (number, in %)
Bank to Wallet (B2W)	883.6	2,814	602.1	0.8	0.2
Wallet to Bank (W2B)	114.6	488	528.2	0.1	0.0
Bill Payment	1,448.7	69,985	40.8	1.3	5.1
Cash In	37,722.2	313,993	393.1	32.6	22.9
Cash Out	33,446.6	304,351	333.7	28.9	22.2
Intl. Transfer In	2,792.1	29,433	258.8	2.4	2.1
Intl. Transfer Out	2,415.6	7,783	954.0	2.1	0.6
Merchant Payment	655.6	7,396	427.8	0.6	0.5
Other Operations	1,316.0	115,871	120.9	1.1	8.5
P2P	31,950.0	320,454	327.2	27.6	23.4
Salary Payment	954.8	11,871	239.8	0.8	0.9
Recharge / Top Up (airtime/telco bundle)	1,242.0	170,586	48.0	1.1	12.4
Online Payment	868.8	15,802	258.5	0.8	1.2

Table B.7: *Overview of Transactions Types: Mali (10/2023 - 09/2024)*

Transaction Type	**Volume** (monthly, in mn. CFA)	**Number of Transactions** (monthly)	**SD** (yearly, thousands)	**Share** (volume, in %)	**Share** (number, in %)
Bank to Wallet (B2W)	751.6	1,993	709.9	0.3	0.1
Wallet to Bank (W2B)	78.4	276	590.2	0.0	0.0
Bill Payment	311.0	20,664	28.8	0.1	1.0
Cash In	80,482.5	461,306	579.5	31.7	21.9
Cash Out	77,738.7	477,854	495.9	30.6	22.7
Intl. Transfer In	2,869.0	19,764	345.8	1.1	0.9
Intl. Transfer Out	1,837.5	4,557	1,215.7	0.7	0.2
Merchant Payment	1,547.3	21,357	418.2	0.6	1.0
Other Operations	19,685.8	285,896	360.0	7.7	13.6
P2P	63,420.4	546,123	391.3	25.0	25.9
Salary Payment	599.9	5,833	320.5	0.2	0.3
Recharge / Top Up (airtime/telco bundle)	1,504.0	220,067	57.7	0.6	10.5
Online Payment	3,268.8	38,901	343.8	1.3	1.8

B.4 Summary Statistics for Household Surveys

Household Survey Cameroon and Mali

We make use of the 5^{th} wave of the Household Survey of Cameroon (Cinquième Enquête Camerounaise Auprès des Ménages, ECAM5, INS (2024)) to create statistics at the department (département) level. We then merge this information with the individual-level transaction data. ECAM5 is the 5^{th} wave of a nationally representative survey collected for poverty analysis. In each wave, around 10,000–12,000 households are interviewed; the 5^{th} wave surveyed a total of 10,546 households. In addition to individual questions the survey also collects household questions, and information at the community level, usually provided by the community head.

We produce a set of statistics at the department level. For all statistics, survey weights are applied to obtain representative estimates. ECAM5 is formally representative at the regional level, which is a broader geographical unit than the department. Although representativeness at the department level cannot be guaranteed, the large number of observations in each department provides sufficient variation between key variables. Figure provides a graphical representation of the main variables.

Individual-level variables

- **Bank account:** We use individual-level data to assess the fraction of households in a given department whose household head has an account with a commercial bank, a postal account, a microfinance institution, a "caisse rurale," or a prepaid card. We select all household heads and compute a weighted average at the department level using survey weights. Mobile money accounts are explicitly excluded from this definition. Throughout the analysis, this *Bank account* variable is used as a proxy for bank availability or bank penetration.

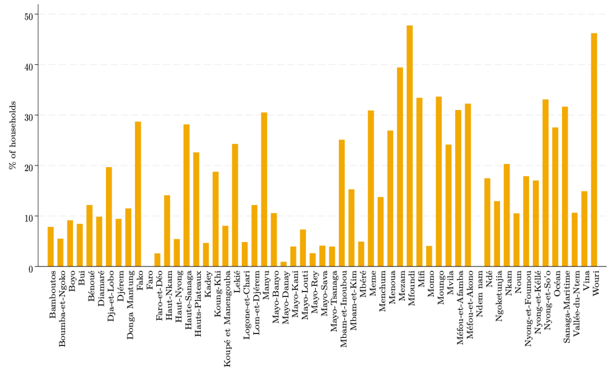
- **Muslim:** To facilitate comparisons across regions with similar patterns of religious festivities, we construct a variable measuring the share of respondents in each region who self-identify as Muslim in the survey.

Household-level variables

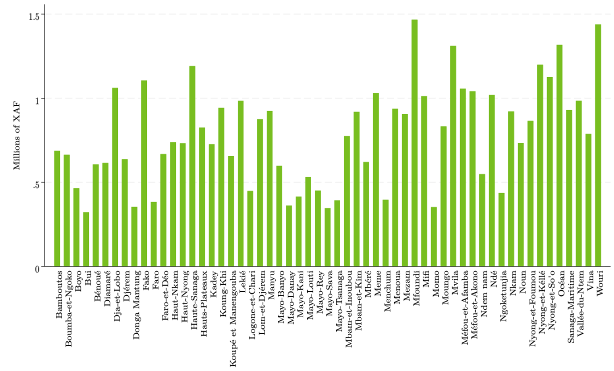
- **Household expenditures:** We construct a scaled household expenditure variable. Total yearly household expenditures are divided by the FAO adult-equivalent scale. This measure is highly correlated with the welfare indicator provided by the survey and serves as our preferred proxy for household welfare.

Figure B.1 plots these two main variables for each dṕartement in Cameroon.

Figure B.1: *Overview of Department-Level Consumption and Bank Access, Cameroon*



(a) *Access to Banks*



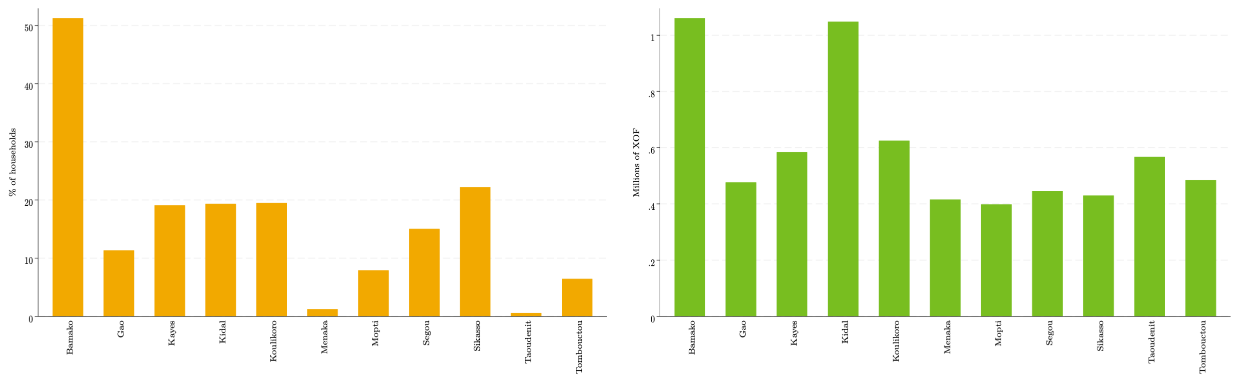
(b) *Consumption*

Notes: Access to banks includes accounts at commercial banks, rural banks, microfinance institutions, and prepaid cards. Household consumption is total yearly expenditures, scaled by FAO adult. equivalent. Source: 5^{th} Cameroon Household Survey (ECAM5).

We also construct household measures of consumption and bank access for Mali, though we only use the level of consumption in the analysis. For this, we rely on Mali Harmonized Household Survey (2018-2019) (Enquête Harmonisée sur le Conditions de Vie des Ménages 2018-2019 - Mali, INSTAT (2022)). Similar to ECAM5, this survey is nationally representative of the geopolitical zones (at both the urban and rural level). The 2018-2019 wave covers around 6,600 households and is structured similarly to the ECAM5 with some variables relating to individuals, some to households, and some to the community. We construct consumption and bank availability variables in the exact same manner as for Cameroon to ensure cross-country comparability. Figure B.2 plots the two main variables across the different subnational geographic units.

Finally, our identification procedure makes use of the regional heterogeneity in the population identifying as Mulsim. Figure B.3 plots fraction of the population identifying as muslim in each region for Cameroon and Mali.

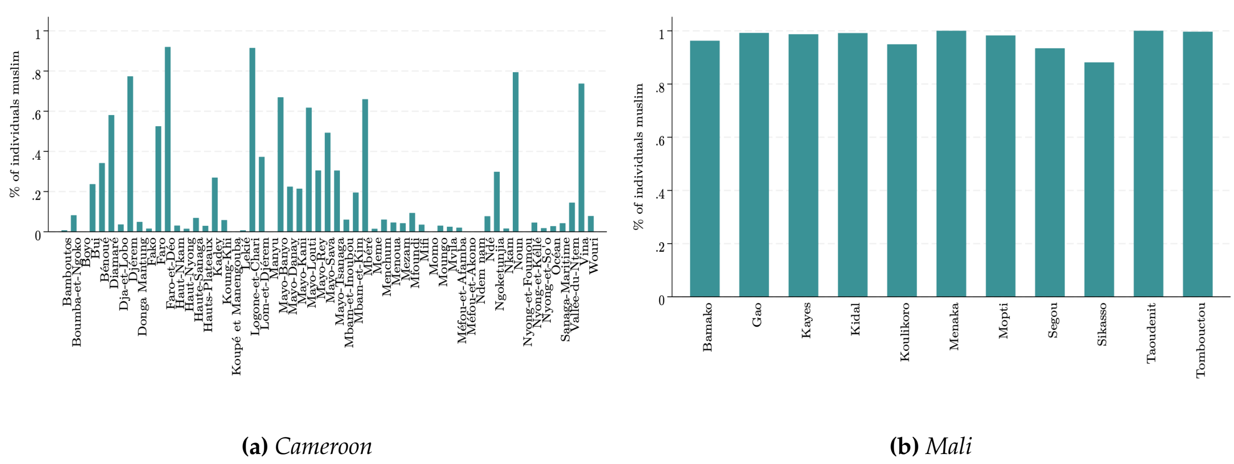
Figure B.2: *Overview of Department-Level Consumption and Bank Access*



(a) *Access to Banks* **(b)** *Consumption*

Notes: Access to banks includes accounts at commercial banks, rural banks, microfinance institutions, and prepaid cards. Household consumption is total yearly expenditures, scaled by FAO adult. equivalent. Source: 2018-2019 Mali Harmonized Household Survey (EHCVM).

Figure B.3: *Fraction of the Population Identifying as Muslim, Cameroon and Mali*

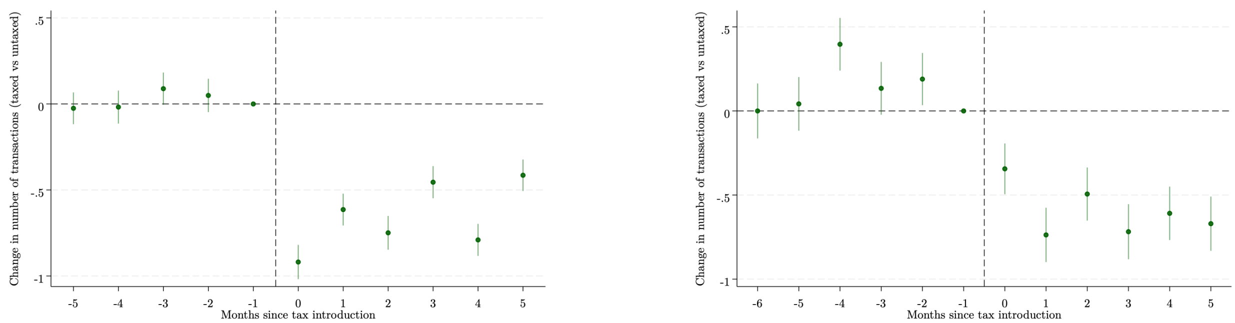


(a) *Cameroon* **(b)** *Mali*

B.5 Additional Results and Robustness

Within-Country Analysis of Number of Transactions

Figure B.4: *Within-Country Dynamics of the Number of Transactions of Mobile Money*



Cameroon *CAR*

Note: The vertical axis shows the estimated β_k from Equation 15: the event-time difference-in-differences for the number of taxed vs. untaxed transactions, relative to the pre-tax month. The vertical dashed line marks the introduction of the mobile money tax. Confidence bands are shown at the 99% level and are constructed from bootstrapped standard errors.

Matching Histograms

We match each individual in Mali to a counterpart in Cameroon and in CAR using nearest-neighbor matching. Figure B.5 shows the histograms of the propensity scores, which indicate substantial overlap. The patterns suggest that individuals in Cameroon, CAR, and Mali face similar probabilities of being treated.

Cameroon: Estimation Including All Regions and without Matching

Figure B.6 shows results from estimating Equation 16 in the main text when all regions are included. In the benchmark specification, only 25 of the 69 regions are retained to address potential concerns about seasonal variation in mobile money use around the Christmas holiday.

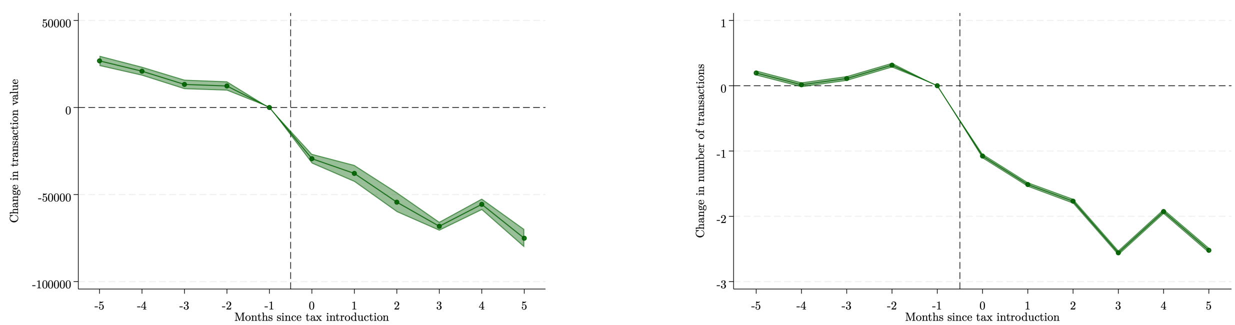
Estimation by Transaction Type – Identification by Matching with Mali

Figure B.5: *Predicted Propensity Scores for Mali and Cameroon)*

(a) *Cameroon* **(b)** *CAR*

Note: Predicted propensity scores for the Mali–Cameroon (left) and Mali–CAR (right) samples, estimated from a logit model of the treatment indicator on gender, age, residence type (urban vs. rural), pre-treatment mobile money usage, and selected interactions and transformations.

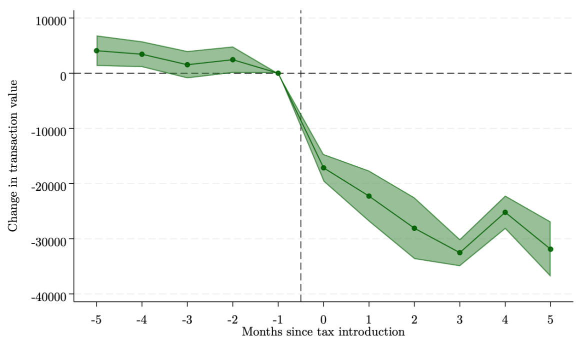
Figure B.6: *Cameroon: Effects of Mobile Money Tax on Volume and Number of Transactions (Without Excluding Any Region and Without Matching)*



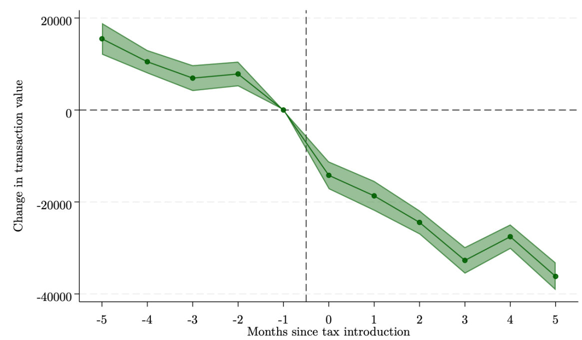
Transaction Value *Number of Transactions*

Note: This figure plots the dynamics of mobile money use around the introduction of mobile money taxes (indicated by the vertical dashed line) in Cameroon. In this figure, we neither exclude any regions, nor match users based on individual characteristics. We use heteroskedasticity-consistent standard errors. Confidence bands are constructed at the 99%-level.

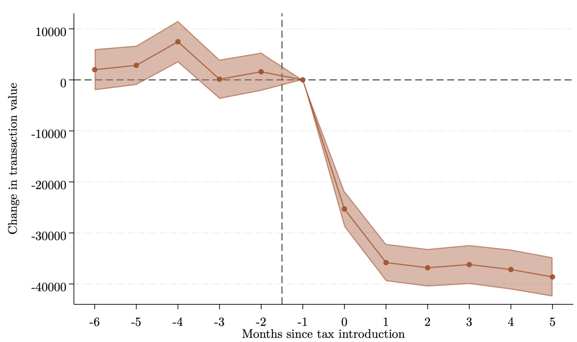
Figure B.7: *Disaggregated Effects of Mobile Money Tax on Taxed Transaction Types*



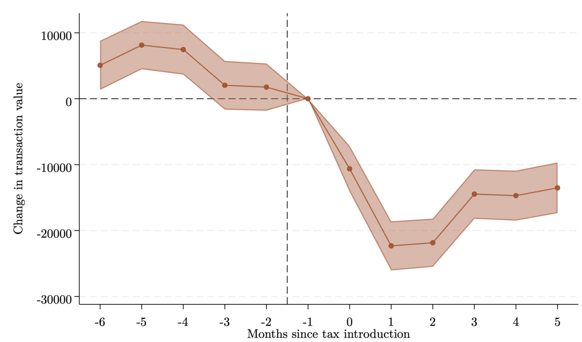
(a) *Cameroon: P2P*



(b) *Cameroon: Cash Out*



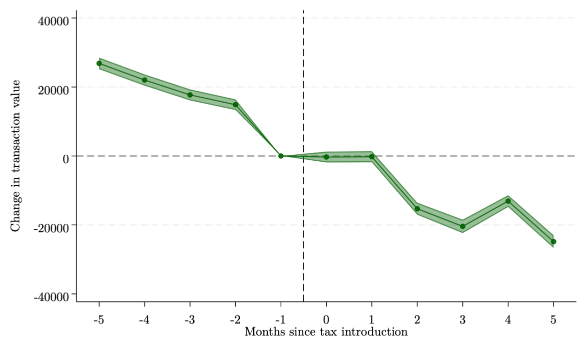
(c) *CAR: P2P*



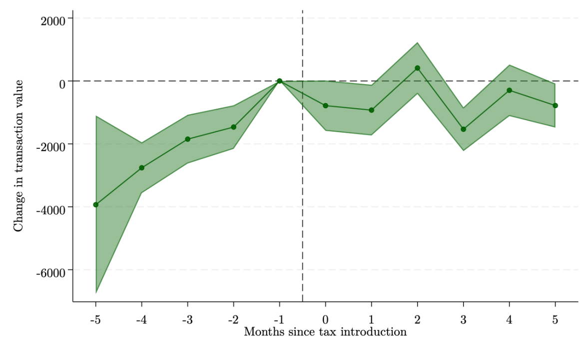
(d) *CAR: Cash Out*

Notes: The vertical axis shows the estimated β_k from Equation (16): The event-time difference-in-differences for taxed transactions in Cameroon or CAR vs. the same transactions in Mali (based on propensity-score matching), relative to the pre-tax month. The vertical dashed line marks the introduction of the mobile money tax. Standard errors are heteroskedasticity-consistent. Confidence bands are shown at the 99% level.

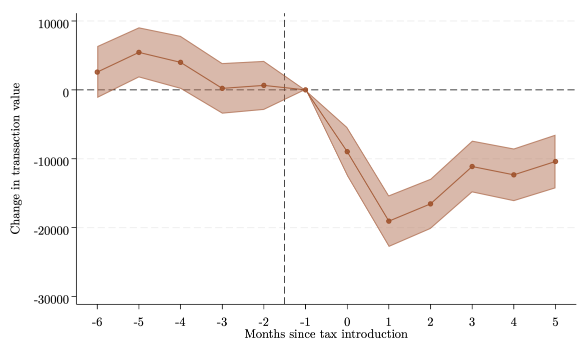
Figure B.8: *Disaggregated Effects of Mobile Money Tax on Untaxed Transaction Types*



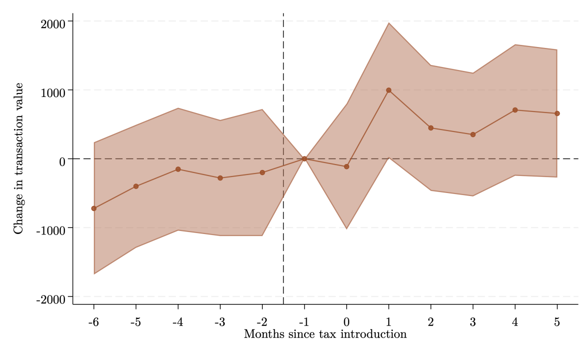
(a) *Cameroon: Cash In*



(b) *Cameroon: Merchant Payments*



(c) *CAR: Cash In*



(d) *CAR: Merchant Payments*

Notes: The vertical axis shows the estimated β_k from Equation (16): The event-time difference-in-differences for taxed transactions in Cameroon or CAR vs. the same transactions in Mali (based on propensity-score matching), relative to the pre-tax month. The vertical dashed line marks the introduction of the mobile money tax. Standard errors are heteroskedasticity-consistent. Confidence bands are shown at the 99% level.

References for Appendix

Folland, G. B. (1999). Real analysis: Modern techniques and their applications (2nd). John Wiley & Sons.

IMF. (2024). Financial access survey [data retrieved from IMF Financial Access Survey, https://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C].

INS. (2024). Fifth Cameroon Household Survey (ECAM5) [Information: https://ins-cameroun.cm/statistique/resultats-de-la-5eme-enquete-camerounaise-aupres-des-menages-ecam5-communique-de-presse/].

INSTAT. (2022). Enquête Harmonisée sur le Conditions de Vie des Ménages 2018-2019 [World Bank, Development Data Group. Information: https://doi.org/10.48529/90E9-4E91].

World Bank. (2025a). Findex database [data retrieved from World Bank Findex Database, https://www.worldbank.org/en/publication/globalfindex].

World Bank. (2025b). World development indicators [data retrieved from World Bank Development Indicators, https://databank.worldbank.org/source/world-development-indicators].

PUBLICATIONS

Taxing Mobile Money: Theory and Evidence
Working Paper No. WP/2025/255