

Back to bank:
Digital payments, deposits' substitution & credit

L. Spadavecchia
Bocconi & ION Group

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Bank of Uganda

Conference on Markets and Intermediaries

October 1, 2024

“Big picture” question of my agenda:

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What specific frictions and constraints prevent the development of financial markets in LMICs?

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What specific frictions and constraints prevent the development of financial markets in LMICs?

Can policy affect these, if so how?

Mobile Money



Mobile Money



- ✓ Widespread: >55% adults
\$ 3.5 billion daily

Mobile Money



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- ✓ Beyond payments: risk-sharing,
savings, remittances

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- ✗ Less on regulation

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Digital Money Tax

Local [Stories](#)

Kenya's mobile-money growth hits 16-year low following government tax move

DOUGH RISING
Kenyans return to cash as taxes raised on digital payments

ADENJALE AGBETLOYE | January 23, 2024 1:38 PM

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Mobile money agents threaten shutdown over "unbearable" double taxation

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'Mobile money taxation needs evidence-based research' — Prof Peter Quartey

"It's a lazy tax": Why African governments' obsession with mobile money could backfire

The Inquirer Theiner/PhotoStock

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The Investor's Business Journal

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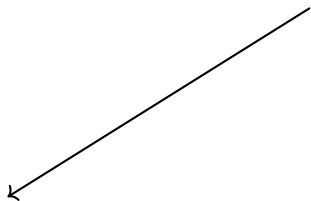
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- ✓ Formalizing informal economy
- X Easy tax, but who is burdened?
- X Competition w/ traditional banks?

Research Question

Do digital currencies disintermediate banks?

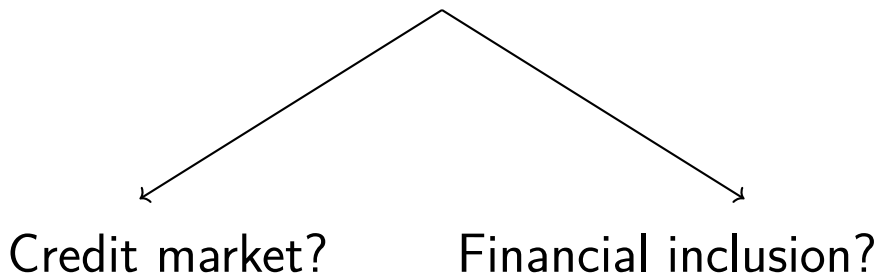
Research Question

Do digital currencies disintermediate
banks?



Credit market?

Do digital currencies disintermediate banks?



This Paper

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- 1 Toy model of currency substitution:

This Paper

- ① Toy model of currency substitution:
Tradeoff between convenience of storage & transaction cost

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Liquidity shock to banks \implies Change in credit provision

Mobile Money, Banks & Cash - simplify Ugandan market

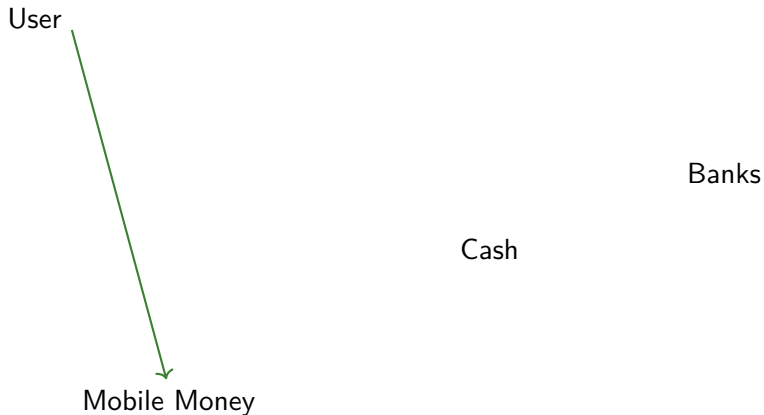
User

Banks

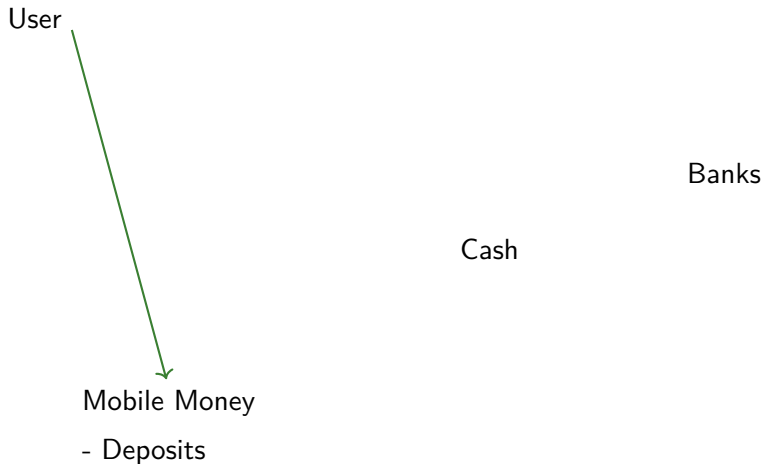
Cash

Mobile Money

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User



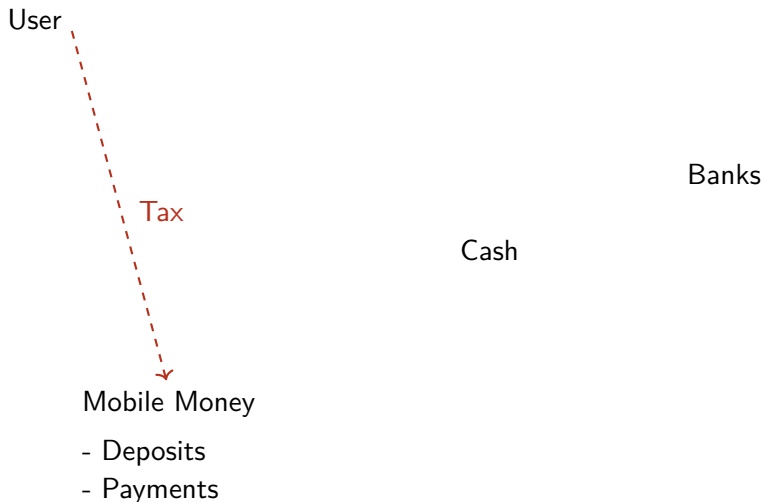
Mobile Money

- Deposits
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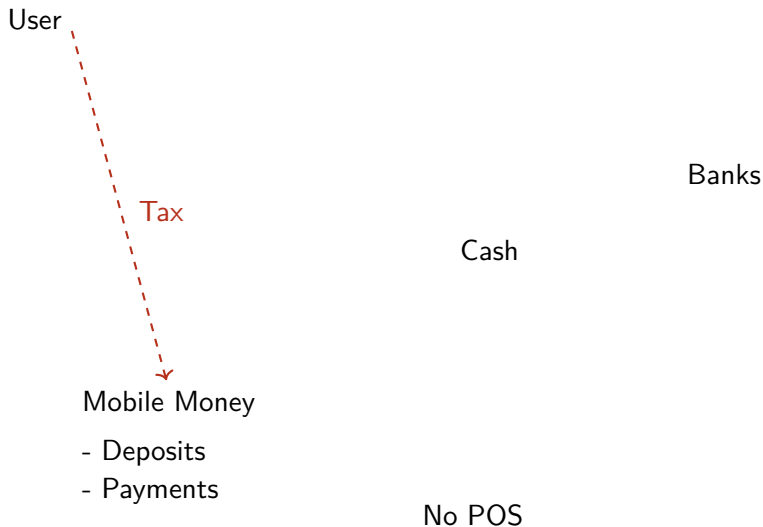
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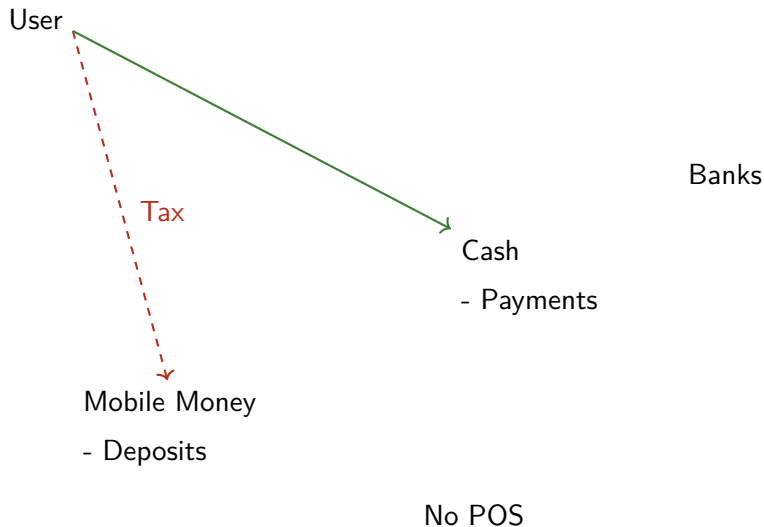
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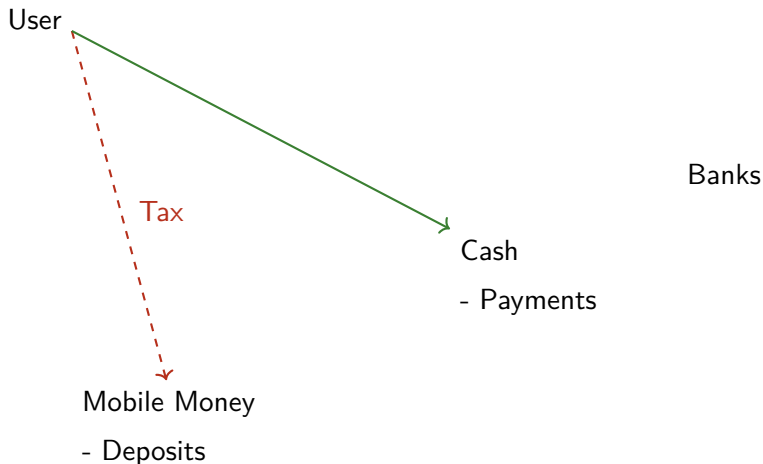
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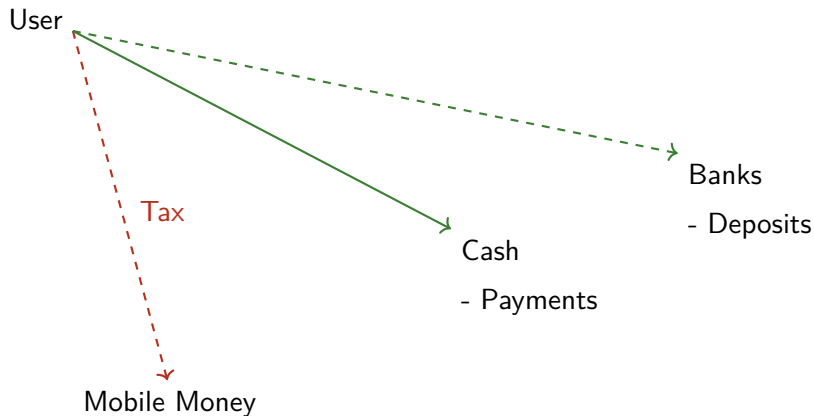


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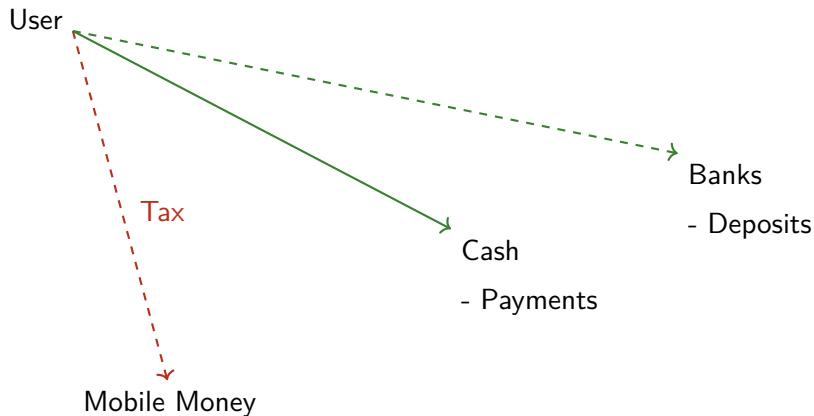
Not safe to keep the money under the mattress

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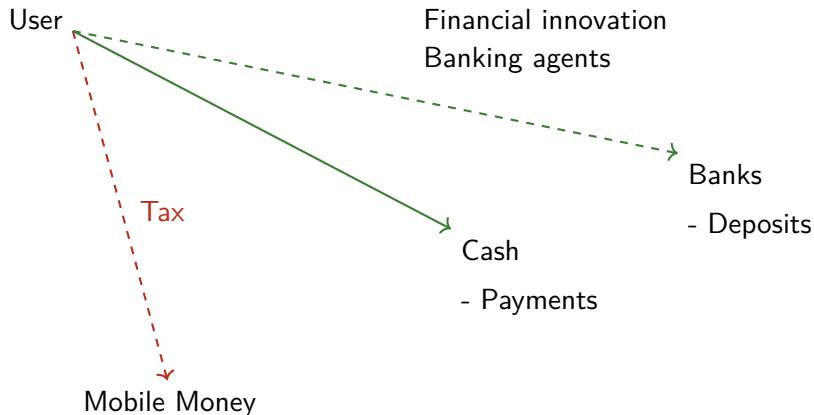
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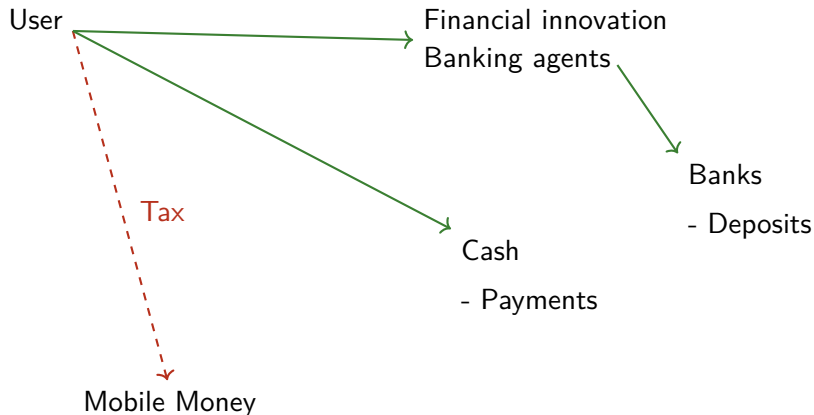
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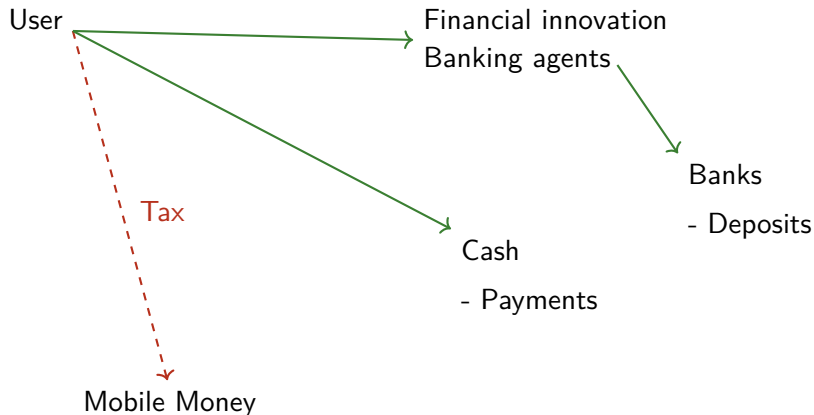
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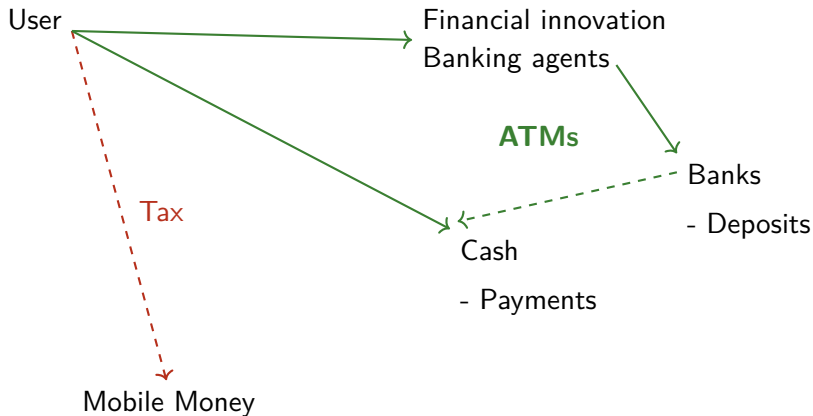
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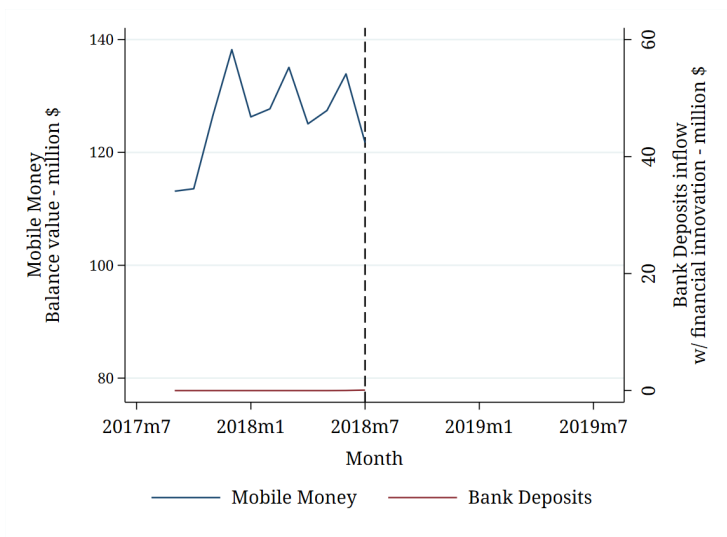
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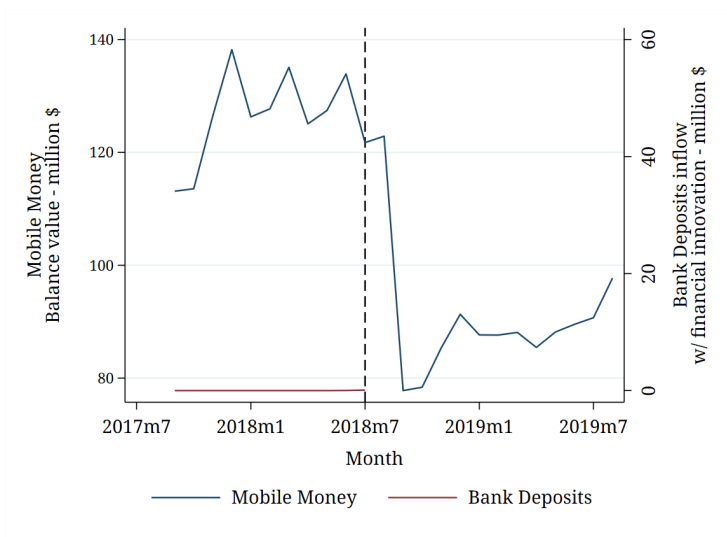
Paper in 1 picture

Mobile Money, new deposits & the Tax



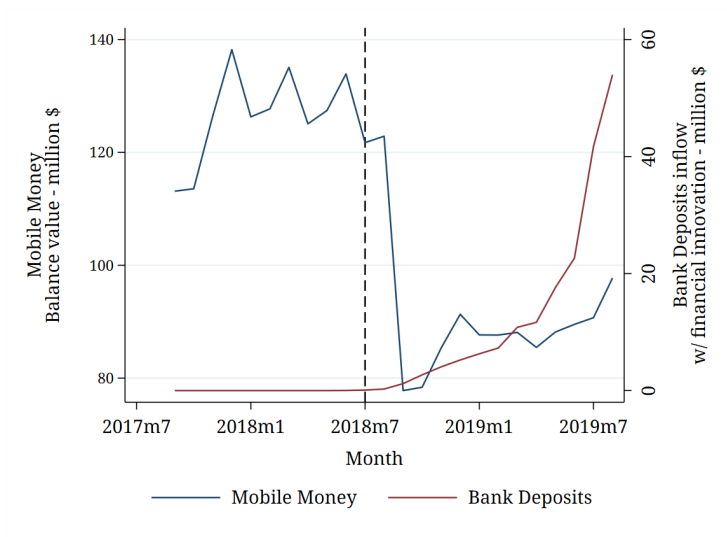
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Mobile Money, bank deposits inflow & the Tax



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⇒ Our contribution: empirical evidence

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⇒ Our contribution: administrative individual level data & effects of widely discussed policy

A Roadmap

1. Data & Identification

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2. Empirical Analysis

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2. Empirical Analysis

- First stage: Mobile Money vs Bank Deposits & Cash

A Roadmap

1. Data & Identification

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- First stage: Mobile Money vs Bank Deposits & Cash
- Second stage: Credit Market

Data & Identification

Mobile Money Transactions

- 2 billion transactions in 2018
- 20 million users \implies

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Data

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Ugandan National Panel Survey

- 3'000 households

Data

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New banking technology - monthly

- deposits at district level (136 districts)

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Banks' balance sheets - monthly/quarterly

- 26 banks

Data

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Ugandan National Panel Survey

- 3'000 households

New banking technology - monthly

- deposits at district level (136 districts)

Banks' balance sheets - monthly/quarterly

- 26 banks

Credit registry - monthly

- 2 million loans
- borrower: location, demographics, credit history

Identification

Time variation: (unexpected) Mobile Money Tax Unexpected Tax

⇒ induces shift in technology

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Geographical variation: presence of ATMs

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⇒ Districts in the top quartile of ATM density
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⇒ Banks' in the top quartile of ATM market share
⇒ Bank-lending channel: Khwaja & Mian (2008)

Empirical Analysis

Mobile Money Tax:
↑ cost of Mobile Money

Mechanism

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↑ cost of Mobile Money
↓ Mobile Money

Mechanism

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Triggers shift in technology

↑ adoption of bank-related innovation

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Liquidity shock, but ...

deposits' turnover ↑

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Liquidity shock, but ...

deposits' turnover ↑

⇒ loan maturity ↓

Empirical specification

Event study specification + DiD

Empirical specification

Event study specification + DiD

$$\log Y_{it} = \alpha_i + \alpha_t + \sum_{\tau=1, \tau \neq 5}^T \beta_{\tau} \text{Month}_{\tau} \times \mathbf{I}[\text{High ATM density}]_i + \epsilon_{it}$$

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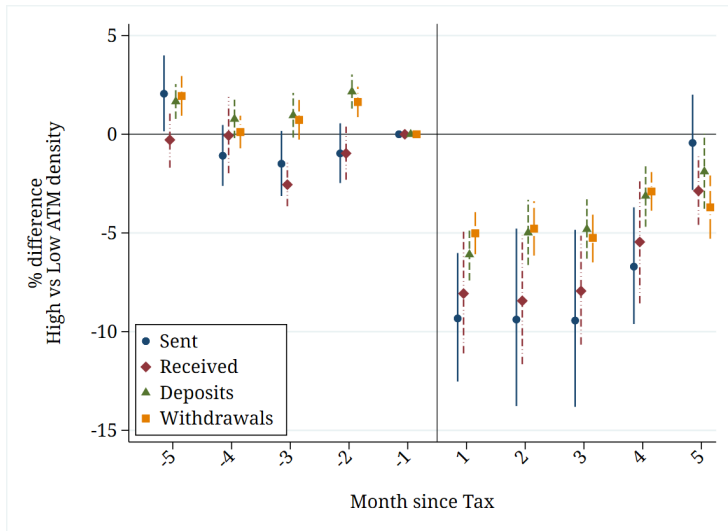
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Robustness: include $\text{Post Tax}_t \times \mathbf{X}_i$ to rule out concurrent mechanisms

Mobile Money ↓

Mobile Money usage: individual level

Figure 1: Effect of Tax on Mobile Money usage



Mobile Money usage: individual level

Table 1: Mobile Money usage: (log) value

	Sent	Received	Deposits	Withdrawals
	(1)	(2)	(3)	(4)
Post tax dummy	-0.103***	-0.117***	-0.040***	-0.060***
× High ATM density _d	(0.017)	(0.014)	(0.008)	(0.005)
User FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Users	285044	450730	1171380	1382856
Adj. R sq.	0.438	0.349	0.407	0.448

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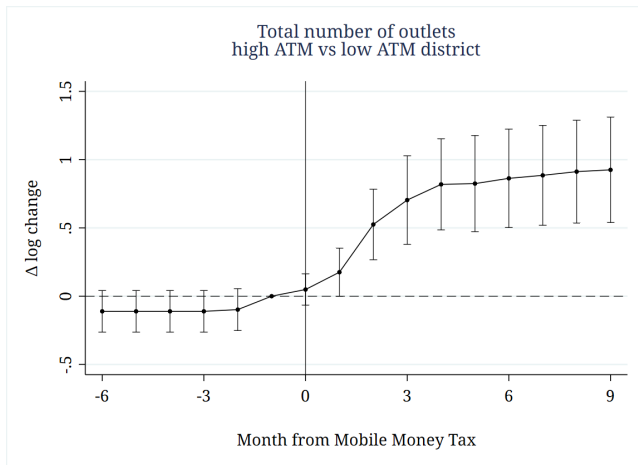
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Similar results: using Rasul & Bassi (2017, AEJ:AE) on survey data

Adoption of bank-related technology ↑

Adoption of new bank-related technology: district level

Figure 2: Technology adoption: number of banking agents

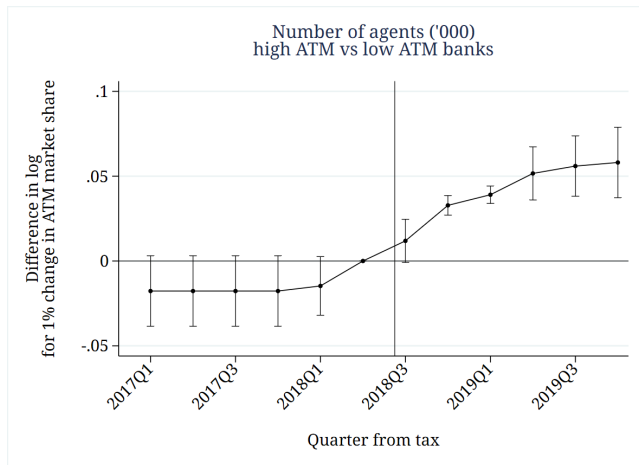


High ATM districts: on avg from 2 to 120 agents

Low ATM districts: on avg from 0.1 to 8 agents

Adoption of new bank-related technology: bank level

Figure 3: Technology adoption: number of banking agents



High ATM banks: on avg from 2 to 2200 agents

Low ATM banks: on avg from 0.5 to 75 agents

Deposits ↑

Deposits' inflow: district level

Table 2: Inflow of deposits through new technology

	Volume		Value	
	Δ Log (1)	Δ Pr > median (2)	Δ Log (3)	Δ Pr > median (4)
Tax dummy _t × High ATM density _c	2.327*** (0.391)	0.412*** (0.068)	7.866*** (1.307)	0.396*** (0.069)
Time FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Obs.	1840	1840	1840	1840
Adj. R sq.	0.637	0.509	0.621	0.507
Mean Dep. Var.	0.892	0.131	3.951	0.143

Deposits' inflow: district level

Table 2: Inflow of deposits through new technology

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Robustness: why different measures? See Chen & Roth (2024, QJE)

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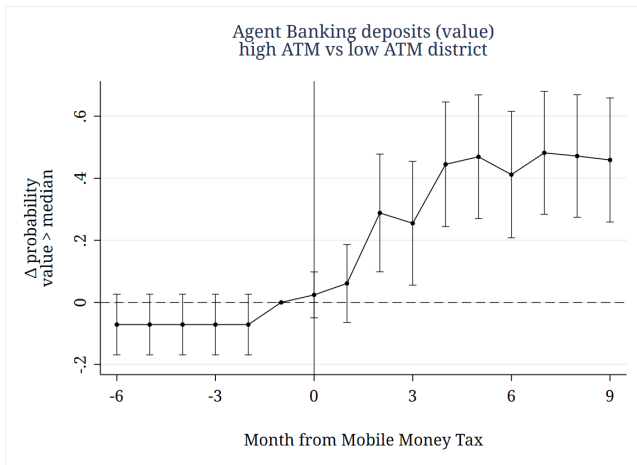
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Robustness: why different measures? See Chen & Roth (2024, QJE)

Technology shift & Network effects: results in line with Crouzet et al. (2023, QJE)

Deposits' inflow: district level

Figure 4: Inflow of bank deposits



High ATM: on avg from 571\$ to 1.1 million\$

Low ATM: on avg from 8\$ to 34'000\$

Volume of transactions

Deposits' stock: bank level

Table: Bank deposits stock (log)

	Bank owned deposits	Time deposits	Savings deposits	Demand deposits	Cash stored
	(1)	(2)	(3)	(4)	(5)
Post Tax \times I[ATM Market share]	-0.039 (0.199)	-0.109 (0.155)	0.104 (0.068)		
Bank FE	Yes	Yes	Yes		
Time FE	Yes	Yes	Yes		
Obs.	831	831	831		
Adj. R sq.	0.442	0.949	0.997		
Mean Dep. Var.	1.848	31.439	30.504		

Deposits: bank level

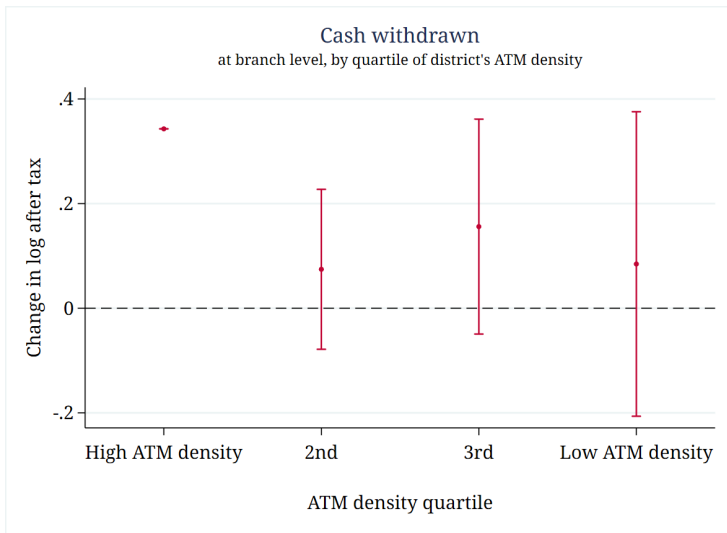
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Post Tax \times I[ATM Market share]	-0.039 (0.199)	-0.109 (0.155)	0.104 (0.068)	0.131*** (0.044)	0.191** (0.071)
Bank FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Obs.	831	831	831	831	831
Adj. R sq.	0.442	0.949	0.997	0.992	0.984
Mean Dep. Var.	1.848	31.439	30.504	60.233	5.874

Cash ↑ & ATM withdrawals ↑

Demand for cash: district level

Figure 5: % change in cash withdrawn by ATM density quartile

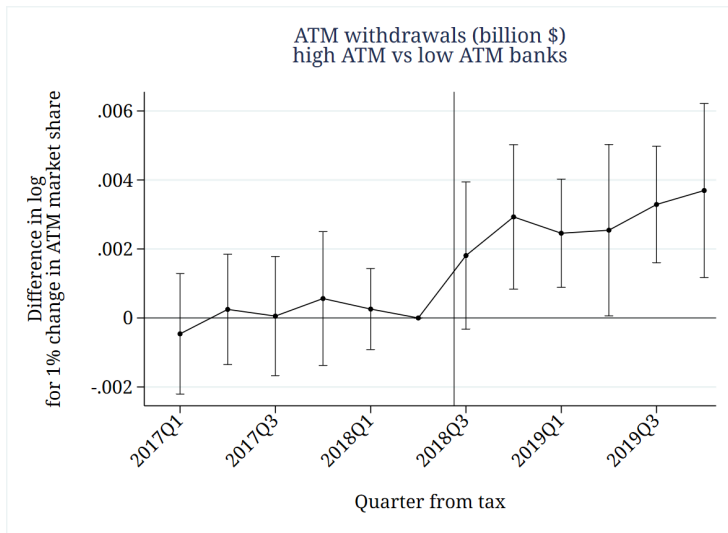


ATM withdrawals: bank level

Table 3: ATM withdrawals & Technology adoption

	ATM withdrawals	
	Log (1)	Log (2)
Post Tax \times I[ATM Market share]	0.029** (0.012)	
Post Tax \times Market share of urban ATMs		0.003*** (0.000)
Bank FE	Yes	Yes
Time FE	Yes	Yes
Obs.	263	263
Adj. R sq.	0.984	0.992
Mean Dep. Var.	0.025	0.025

ATM withdrawals: bank level



What have we shown sofar

Mobile Money Tax induces:

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Banks experience:

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Banks experience:

- ↑ inflow of money

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⇒ higher turnover of cash: ↑ demand deposits' stock

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⇒ Credit market?

4. Credit registry

Khawja & Mian (2008) for estimating **bank lending channel**:
control for (1) district×time FE, (2) bank FE

$$Y_{bdt} = \alpha_b + \alpha_{dt} + \text{Post Tax}_t \times \mathbf{I}[\text{ATM market share}]_b + \epsilon_{bdt}$$

Outcome

- 1 Term of repayment (log)
- 2 Total amount and number (log)
- 3 Interest rate

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Banks' change liquidity management

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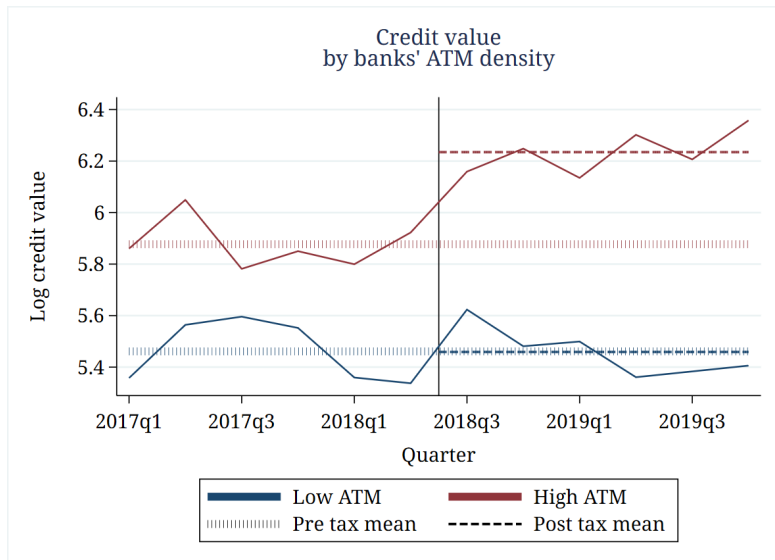
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Banks' change liquidity management \implies **transfer of rent from high to low risk borrowers**

Increase in loans

Figure 6: Loans over time (log million \$)



Credit length

Outcome: log term of repayment (in days)

- ↓ to all borrowers

	w/ Credit history		w/o Credit History	
	Low risk (1)	High risk (2)	Low risk (3)	High risk (4)
Tax dummy _{qy} × I [ATM share] _b	-0.459** (0.180)	-0.155** (0.110)	-0.455** (0.195)	-0.162** (0.068)
Bank FE	Yes	Yes	Yes	Yes
District-Time FE	Yes	Yes	Yes	Yes
N. of banks	26	22	26	21
Adj. R sq.	0.923	0.719	0.907	0.691
Mean Dep. Var. (days)	1084.820	860.557	1219.507	853.978

Credit amount

Outcome: **log** amount lent

- ↑ credit to non-risky known borrowers
- ↓ credit to risky unknown borrowers

	w/ Credit history		w/o Credit History	
	Low risk (1)	High risk (2)	Low risk (3)	High risk (4)
Tax dummy _{qy} × I [ATM share] _b	0.152** (0.063)	-0.027 (0.037)	-0.023 (0.026)	-0.043*** (0.013)
Bank FE	Yes	Yes	Yes	Yes
District-Time FE	Yes	Yes	Yes	Yes
N. of banks	26	22	26	21
Adj. R sq.	0.372	0.329	0.357	0.141
Mean Dep. Var.	0.251	0.059	0.189	0.034

Number of loans

Credit cost

Outcome: interest rate

- ↑ credit to risky borrowers

	w/ Credit history		w/o Credit History	
	Low risk (1)	High risk (2)	Low risk (3)	High risk (4)
Tax dummy _{qy} × I[ATM share] _b	0.681 (4.063)	5.130** (1.905)	-2.966 (2.004)	3.588*** (0.699)
Bank FE	Yes	Yes	Yes	Yes
District-Time FE	Yes	Yes	Yes	Yes
N. of banks	26	22	26	21
Adj. R sq.	0.892	0.725	0.831	0.750
Mean Dep. Var.	22.690	26.240	23.460	26.964

Concluding remarks

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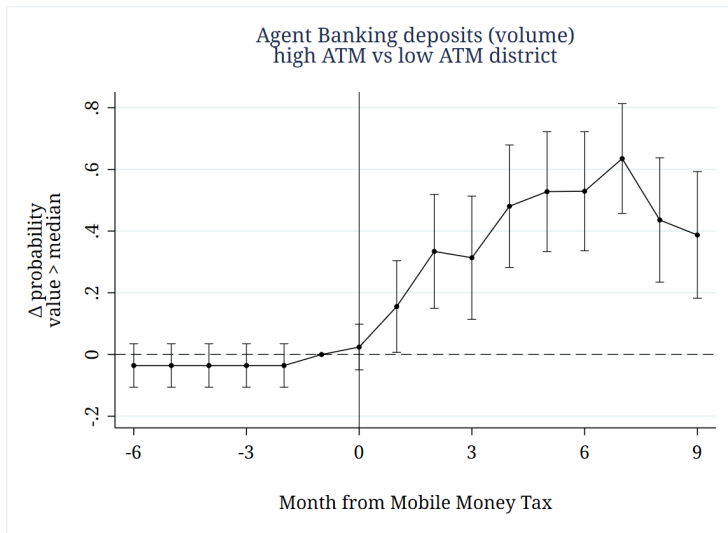
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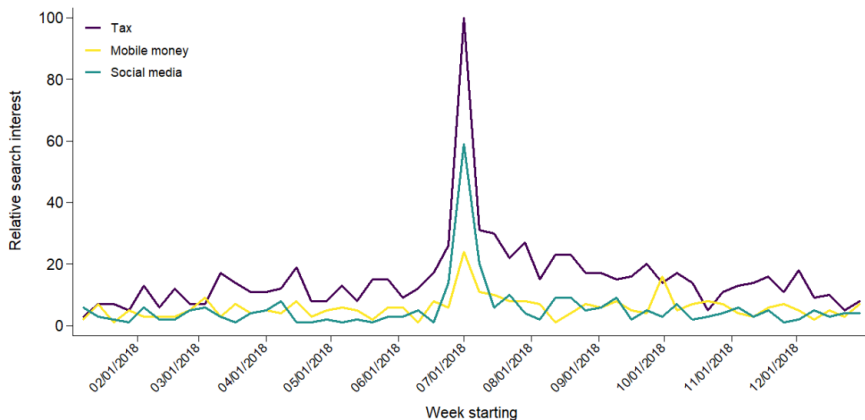
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3. Contribution to limited literature on regulation of fin. institutions & payment systems in LMICs

Appendix

Deposits: district level



Was the tax unexpected?



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How does Mobile Money work?

Telecom
company

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How does Mobile Money work?

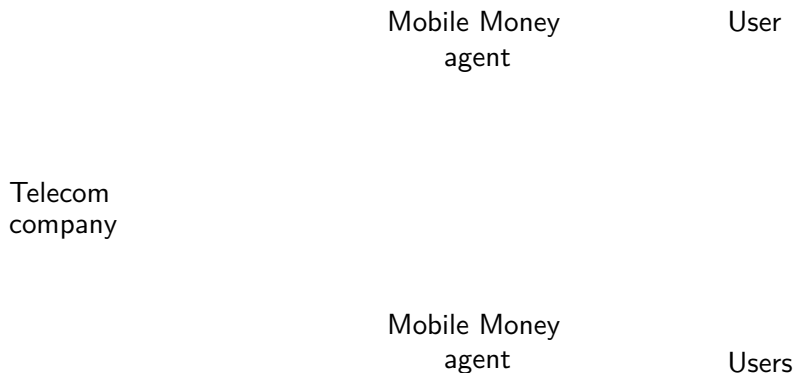
Mobile Money
agent

Telecom
company

Mobile Money
agent

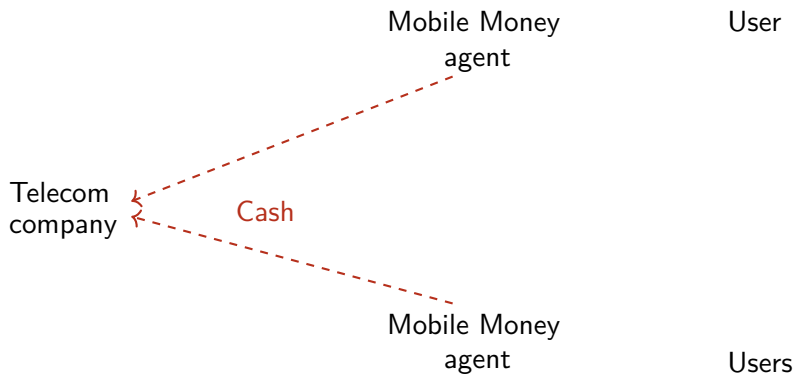
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How does Mobile Money work?



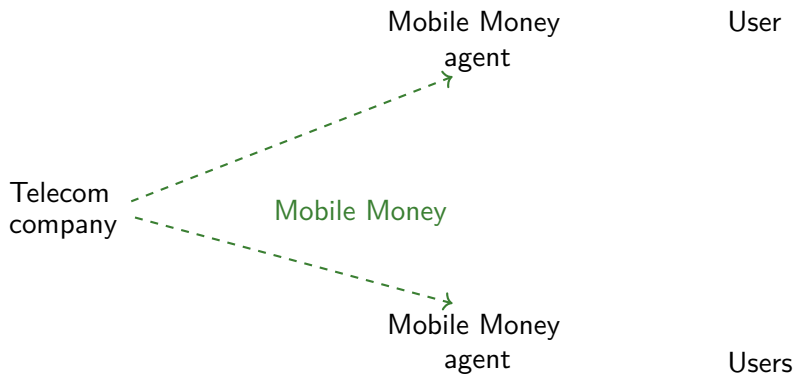
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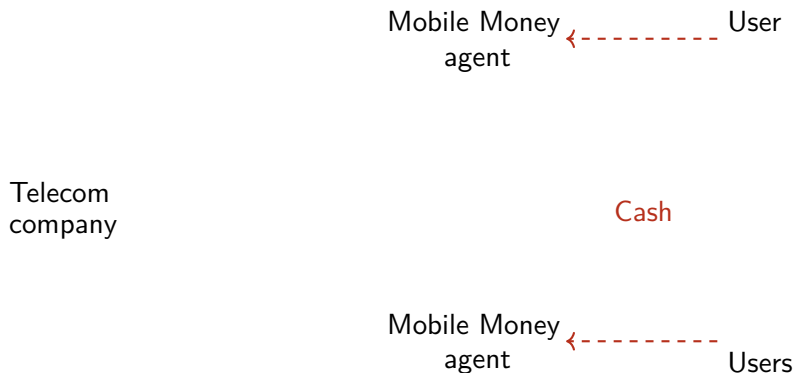
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How does Mobile Money work?



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How does Mobile Money work?

Mobile Money agent -----> User

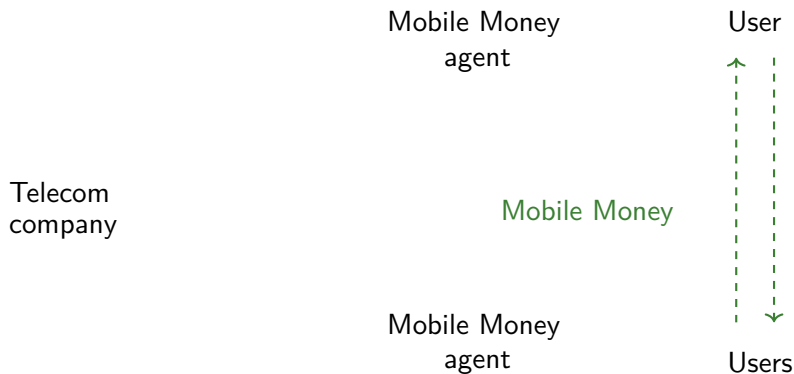
Telecom company

Mobile Money

Mobile Money agent -----> Users

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How does Mobile Money work?



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Mobile Money

- Active users: 58% population
- Total value of all types of transactions: 56% of GDP
- Total value of P2P: 12.5% of GDP
- P2P: 1.92\$ average amount sent daily
- P2P: 82% within the district, 18% cross-district
- Median fee: 0.5% for P2P, 2.5% for withdrawal

Loans (to individuals):

- Maturity: average 645 days
- Annual Rate: average 27%
- Amount: average 1960\$

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