E-Payment Technology and Business Finance: An RCT with Mobile Money

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Conference on Payments and Market Infrastructure in Emerging Economies

Ravindra Ramrattan

1983-2013

Finance and Development

- Large literature on finance-development linkages.

- Most existing research concentrates on the role of institutions, e.g. access to financial institutions (primarily banks), enforcement institutions, and property rights.

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- **Focus: An SMS based FinTech product, called *Mobile Money*.**

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- **This research: The role of technology.**

- **Focus: An SMS based FinTech product, called *Mobile Money*.**

- A technology that allows safe and fast transfer of liquidity using Mobile Phone text messages:
  - Access to money transfer service: P2P, P2B, B2B
  - Access to saving & loan services

Our FinTech Focus, *M-Pesa*

- In Kenyan context: *M-Pesa* is the main product in the market, launched (in 2007) and operated by Safaricom.

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- In Kenyan context: *M-Pesa* is the main product in the market, launched (in 2007) and operated by Safaricom.
- In 2011 70% of Kenyan HHs had M-Pesa accounts.
- In 2013 total volume of M-Pesa transactions $\approx$ 40% Kenyan GDP.

Literature and Our Research

- M-Money Literature: Household's Adoption/Usage
  - Jack, Ray and Suri (2013, AER), Mbiti and Weil (2013), Jack and Suri (2014, AER), and Suri and Jack (2016, Science)

Literature and Our Research

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- What we do: Business Adoption/Usage of M-Money as a Payment Tool
  - ▸ Motivation: Business adoption of M-Money has not been as fast as HHs.
    - ★ Evidence from FinAccess 2014 (Kenya): only 1/3 of a representative sample of SMEs utilize M-Money for P2B and B2B purposes.
    - ★ Beck, Pamuk, Ramrattan and Uras (2018, JDE): use survey data in a dynamic macro model and identify an economically important interaction between trade credit and use of electronic payment instruments to pay suppliers.

- This Paper: design the first field experiment with SMEs on this topic and make use of a detailed survey to understand the determinants of adoption and usage of M-Money as a payment method by SMEs.

- In particular, could M-Pesa raise access to finance for SMEs?

Lipa Na M-Pesa: A Payment tool tailored for SMEs

- A technologically advanced M-Pesa product specifically designed to minimize frictions at retail transactions.

  Launched in 2014; we designed our research to take advantage the novelty of this product in the market.

- **Benefits over Cash:**
  - ▸ Avoidance of theft and other monetary transaction frictions.
- **Costs over Cash:**
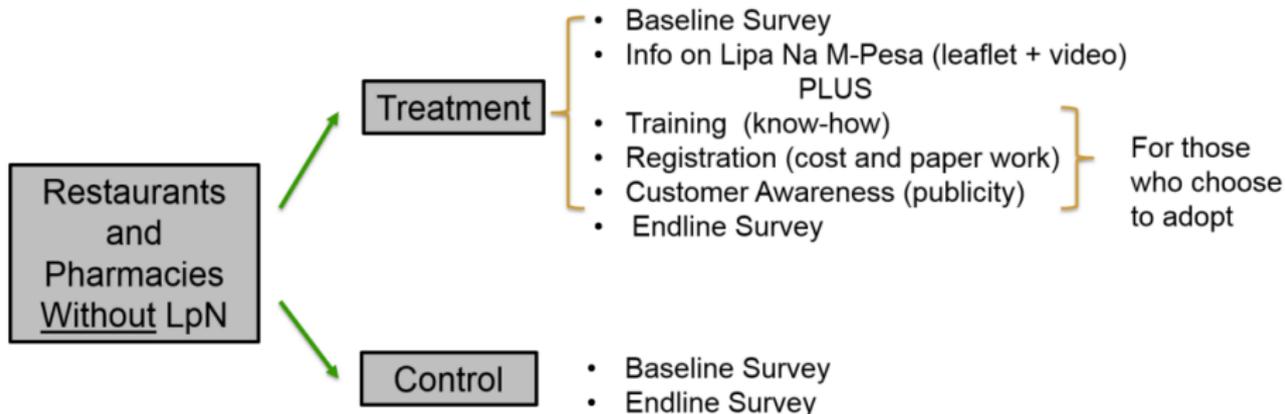 - ▸ With cash, settlement is immediate. So, "trust" could be an issue.

- **Benefits over standard M-Money Products (such as M-Pesa):**
  - ▸ Free of charge for customers.
  - ▸ (Almost) un-limited m-money storage capacity for the business.
  - ▸ Easy access to a record-keeping technology.
  - ▸ Business pays 1% per transaction, but this is lower than marginal electronic transfer fees for the range of transactions that concern SMEs.
- **An additional benefit or a cost over standard M-Money:**
  - ▸ Transactions get recorded as "business activity" and become transparent to Safaricom.

Research Design

Restaurants and Pharmacies **Without** LpN

Treatment
- Baseline Survey
- Info on Lipa Na M-Pesa (leaflet + video)
  PLUS
- Training (know-how)
- Registration (cost and paper work)
- Customer Awareness (publicity)
- Endline Survey

For those who choose to adopt

Control
- Baseline Survey
- Endline Survey

Sampling and Randomization

- Study Location: Peripheries of Central Nairobi

- Eligibility criteria to enter our sample:
  - to have at least one employee,
  - at least 50 meters of distance to the closest business in the sample,
  - no Lipa Na M-Pesa account.

- Baseline sample of 1222 firms: 669 restaurants and 553 pharmacies.

- In each sector, randomization was stratified by number of employees and geographic location:
  - Out of 669 restaurants 331 assigned to treatment.
  - Out of 553 pharmacies 279 assigned to treatment.

Treatment: Do small adoption costs matter?

- **Component I:** Information
    1. Leaflet on cost and benefits of Lipa Na M-Pesa over Cash and M-Pesa
    2. Video with role-model Lipa Na users

- **Component II:** Reduced Effort Cost of Lipa Na M-Pesa Adoption
    1. Registration paperwork
    2. Upon completion of the application process, delivery of SIM+Till # to the business
    3. Training of the business owner

- **Component III:** Customer Awareness
    1. Advertisement material, including a poster with the Till-number and a poster on explaining the steps how a customer can pay via Lipa Na M-Pesa
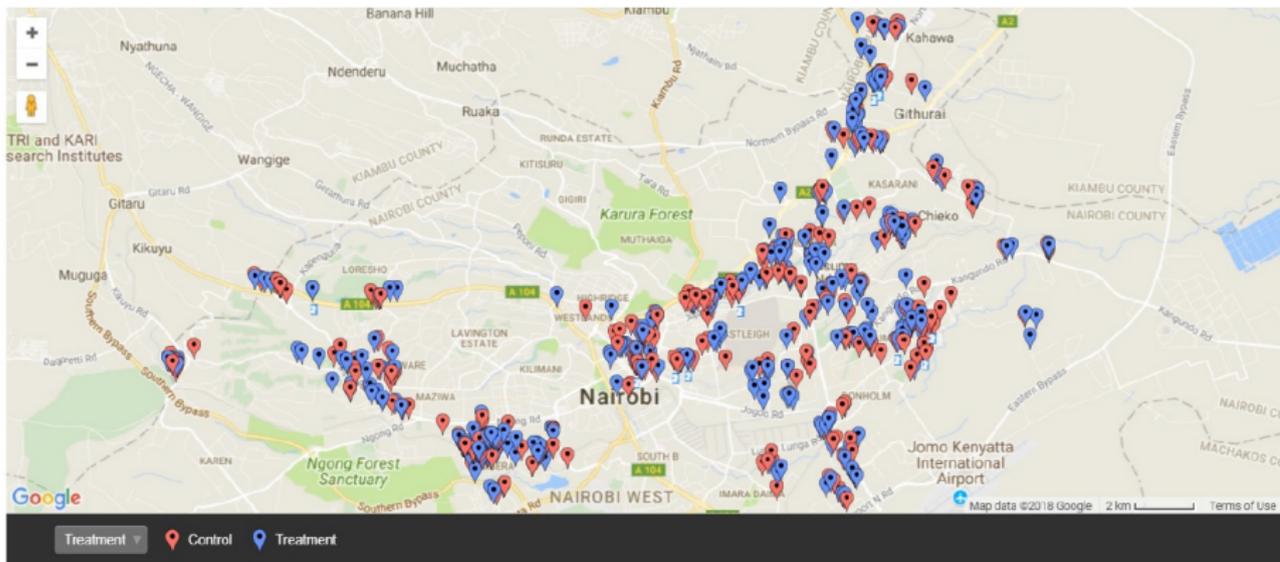
- We implement all components in every treated business.

Timeline
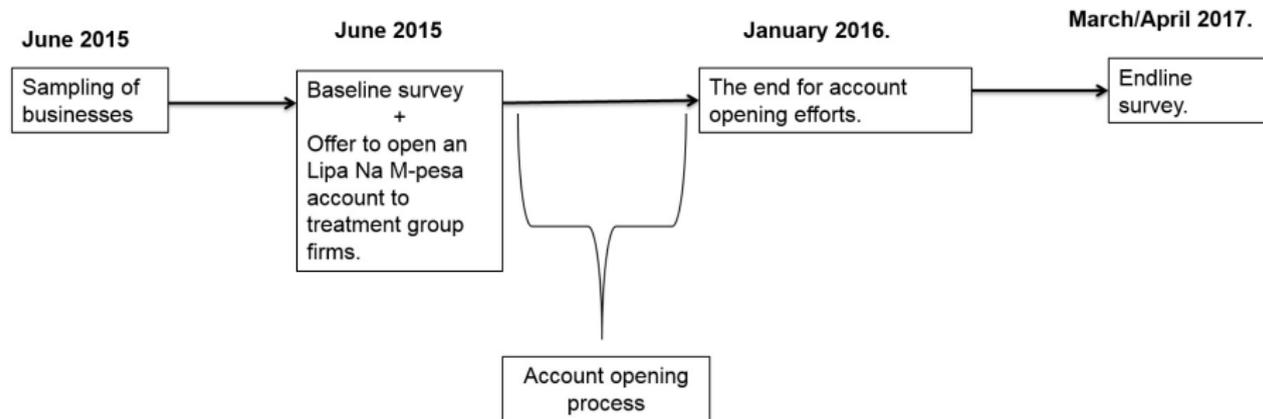
Distribution of Restaurants

Figure 3: Geographic distribution of restaurants at baseline

Distribution of Pharmacies

Figure 4: Geographic distribution of pharmacies at baseline

Sample Balance and Descriptive Statistics

	All (1)	Control (2)	Treatment (3)	Diff. (4)
Use Mobile Money for business purposes (Yes=1; No=0)	0.51	0.49	0.53	-0.04
Use Mobile Money to receive payments (Yes=1; No=0)	0.33	0.30	0.36	-0.05*
Use Mobile Money to store money (Yes=1; No=0)	0.18	0.18	0.17	0.01
Use Mobile Money to pay bills (Yes=1; No=0)	0.32	0.32	0.32	0.01
Use Mobile Money to pay salaries (Yes=1; No=0)	0.06	0.05	0.06	-0.02
Use Mobile Money to pay inputs (Yes=1; No=0)	0.38	0.37	0.38	-0.01
Share of Mobile Money customers	0.02	0.02	0.02	0.00
Awareness of Lipa Na M-Pesa and Reasons for not Having an Account				
The business is aware of Lipa Na M-Pesa (Yes=1; No=0)	0.95	0.95	0.96	-0.00
The business has Lipa Na M-Pesa (Yes=1; No=0)	0.09	0.07	0.10	-0.03
The business does not see the benefits of Lipa Na M-Pesa (Yes=1; No=0)	0.26	0.27	0.25	0.02
The cost of opening a Lipa Na M-Pesa account is too high (Yes=1; No=0)	0.11	0.11	0.11	-0.00
The transaction fees via Lipa Na M-pesa are too high (Yes=1; No=0)	0.16	0.16	0.16	-0.00
The business owner does not have time to open an account (Yes=1; No=0)	0.12	0.12	0.11	0.01
Lipa Na M-Pesa Would not increase sales (Yes=1; No=0)	0.08	0.07	0.08	-0.01
The business woner does not trust the mobile money provider (Yes=1; No=0)	0.02	0.02	0.03	-0.00
Lipa Na M-Pesa is too complex to use (Yes=1; No=0)	0.10	0.09	0.11	-0.02
Business Size				
Monthly Sales, in 1000 Ksh. (log-winsorized 5%)	5.04	5.00	5.07	-0.06
Monthly Profits, in 1000 Ksh. (log-winsorized 5%)	3.85	3.81	3.89	-0.08
Number of Employees (log)	1.44	1.44	1.44	-0.00
Investment and Access to Finance				
Investment in the past 6 months (Yes=1; No=0)	0.29	0.30	0.28	0.02
Bank loan in the past 12 months (Yes=1; No=0)	0.10	0.09	0.11	-0.02
Informal loan in the past 12 months (Yes=1; No=0)	0.04	0.03	0.04	-0.00
Mobile loan in the past 12 months (Yes=1; No=0)	0.10	0.10	0.11	-0.01
Informality				
The business has a business license (Yes=1; No=0)	0.72	0.72	0.72	0.00

Preference to Adopt Regs (Full Sample of Treated)

LHS: Willingness to Adopt; RHS: Baseline Characteristics

	Variable		
Past M-Poney Exposure	Use of M-Pesa for business purposes	0.142***	(0.044)
Theft	Theft and Safety Index	0.028	(0.024)
Business Sophistication	Business license	0.043	(0.054)
	Financial Sophistication Ind.	0.021	(0.020)
	Saving at a bank or MFI	-0.030	(0.048)
	Sales on credit to customers	0.058	(0.042)
	# of Employees	0.053	(0.069)
Transparency Concern	Not shared sales	-0.133*	(0.068)
Trust	Trust in first time	-0.025	(0.025)
	Trust in customers	0.017	(0.035)
	Trust in courts	-0.044*	(0.026)
	Trust in mob. mon. comp.	0.041	(0.035)
Behavioral Factors	# of digits remembered	0.030*	(0.017)
	Present bias	0.024	(0.072)
	Future bias	-0.023	(0.054)
Enumerator and district FE		Yes	
Observations		493	
R-squared		0.284	

Small adoption costs seem to matter

- Those who declared willingness to adopt listed in the baseline the
  following as (important) reasons for not having adopted before our
  experimental intervention:

1. Not having enough time to sign up for an account
2. Not seeing enough benefits
3. Too complex to use

- **Seemingly small information and registration barriers, which we
  reduced in the field, appear to have prevented the businesses to sign
  up for this efficient technology a-priori to our study.**
    - Bertrand, Mullainathan and Shafir (2004, AER)

Attrition at Endline - 16 Months After

Baseline characteristics	(1) coef	(2) se	(3) coef	(4) se
Assigned Treatment	-0.012	(0.031)	-0.010	(0.031)
Pharmacy	-0.018	(0.031)	-0.145***	(0.044)
Have Lipa Na M-pesa account			-0.129***	(0.049)
Saving in mob. mon. account			-0.032	(0.062)
% of utility exp. via pers. mob.			-0.029	(0.038)
% of input exp. via pers. mob.			-0.002	(0.022)
Paying wages via mpesa			0.036	(0.034)
Internal theft			-0.007	(0.044)
External theft			-0.117**	(0.053)
Feeling safe			0.001	(0.009)
Saving at a pers. bank acc.			-0.059	(0.036)
Saving at a bus. bank acc.			0.014	(0.040)
Saving at a microf. inst.			0.030	(0.124)
Bank loan			0.004	(0.058)
Mobile loan			-0.100*	(0.052)
Business records			-0.102	(0.074)
Present bias			-0.050	(0.050)
Future bias			-0.069	(0.044)
# of digits remembered			-0.007	(0.012)
Trust in first time			0.030	(0.020)
Trust in customers			0.028	(0.027)
Trust in courts			0.027	(0.018)
Trust in mob. mon. comp.			-0.033	(0.024)
# of Employees			-0.136***	(0.036)
Constant	0.304***	(0.028)	0.677***	(0.174)
Observations	870		855	
R-squared	0.001		0.075	

Actual Adoption and Usage - ITT

- Conducted the end-line survey **16 months after** the baseline treatment.

Table: Adoption and Usage - Intention to Treat

	(1)	(2)
	Opened LPN (0/1)	Used LPN (0/1)
Treatment	0.07**	0.08**
	(0.03)	(0.03)
Control Gr Mean	0.23	0.21
Control Gr StDev	0.42	0.40
N	619	618

	(3)	(4)
	Received payment via LPN (0/1)	LPN sales, log(1+x)
Treatment	0.08**	0.27**
	(0.03)	(0.11)
Control Gr Mean	0.20	0.63
Control Gr StDev	0.40	1.43
N	618	618

RHS: Baseline sales, not reporting sales in baseline, LPN in baseline, stratification controls.

Actual Adoption and Usage - ITT with Sample Split

Table: Adoption and Usage - Intention to Treat with Transparency Sample Split

	(1) Opened LPN (0/1)	(2) Used LPN (0/1)	(3) Received payment via LPN (0/1)	(4) LPN sales, log(1+x)
Panel A: Transparent firms: shared sales figures in the baseline				
Treatment	0.08** (0.04)	0.09** (0.04)	0.09** (0.04)	0.32** (0.12)
N	488	487	487	487
Panel B: Non-transparent firms: did not share sales figures in the baseline				
Treatment	0.01 (0.08)	0.02 (0.07)	0.02 (0.07)	0.02 (0.24)
N	131	131	131	131

RHS: Baseline sales, not reporting sales in baseline, LPN in baseline, stratification controls.

Outcome Effects: Safety & Uses of Finance

- **Safety:** Less cash kept in the store.

- **Finance:** With Lipa Na M-Pesa transactions become transparent as business activity to Safaricom (also a co-provider of mobile loans).

  This could solve potential moral hazard & enforcement problems and alleviate financing constraints for the type of businesses in our sample (relatively small and limited uses of formal sources of finance).

  With regular M-Pesa (and also cash) this is not possible, because of absence of business transaction traceability.

Safety - Intention to Treat

Table: Safety - Intention to Treat

	Feeling safe
Treatment	0.24*
	(0.14)
Control Mean	6.88
Control StDev	1.84
N	619

RHS: Baseline value of outcome, baseline sales, not reporting sales in baseline, LPN in baseline, stratification controls.

TOT: About 10% increase in perceived safety

Safety - Sample Split

Table: Safety - Intention to Treat with Theft Experience Sample Split

	(1)	(2)
	Theft in Baseline	No Theft in Baseline
	Feeling safe	Feeling Safe
Treatment	1.16***	0.17
	(0.47)	(0.15)
Control Mean	6.36	6.96
Control StDev	1.95	1.82
N	75	543

RHS: Baseline value of outcome, baseline sales, not reporting sales in baseline, LPN in baseline, stratification controls.

Access to Finance - ITT

Table: Access to Finance - Intention to Treat

	(1)	(2)	(3)	(4)
Panel A: External finance (Formal)				
	Mobile loans (Yes/No)	Mobile loans (ln(Amount))	Bank loans (Yes/No)	Bank loans (ln(Amount))
Treatment	0.06**	0.47**	0.01	0.07
	(0.03)	(0.23)	(0.02)	(0.25)
Control Gr Mean	0.10	0.74	0.08	0.84
Control Gr StDev	0.30	2.35	0.26	2.86
N	612	581	609	580
Panel B: External finance (Informal)				
	Trade credit (Yes/No)	Trade credit (ln(Amount))	Informal Loan (Yes/No)	Informal Loan (ln(Amount))
Treatment	-0.03	-0.46	0.01	-0.02
	(0.04)	(0.38)	(0.02)	(0.10)
Control Gr Mean	0.35	3.17	0.05	0.15
Control Gr StDev	0.48	4.71	0.22	1.12
N	619	555	576	575

RHS: Baseline value of outcome, baseline sales, not reporting sales in baseline, LPN in baseline, stratification controls.

TOT: About 150% increase in the mobile loan take-up induced by our treatment

Access to Finance - Heterogeneous Treatment Effects

Table: Access to Finance - Intention to Treat with HTE

	(1)	(2)	(3)	(4)
Panel A: External finance (Formal)				
	Mobile loans (Yes/No)	Mobile loans (ln(Amount))	Bank loans (Yes/No)	Bank loans (ln(Amount))
Treatment	0.04	0.38	0.01	0.08
	(0.03)	(0.23)	(0.02)	(0.26)
Small x Treated	0.28***	1.86**	-0.01	-0.27
	(0.11)	(0.92)	(0.11)	(0.91)
Control Gr Mean	0.10	0.74	0.08	0.84
Control Gr StDev	0.30	2.35	0.26	2.86
N	612	581	609	580
Panel B: External finance (Informal)				
	Trade credit (Yes/No)	Trade credit (ln(Amount))	Informal Loan (Yes/No)	Informal Loan (ln(Amount))
Treatment	-0.04	-0.53	0.00	-0.08
	(0.04)	(0.39)	(0.02)	(0.09)
Small x Treated	0.12	1.48	0.18*	1.03
	(0.16)	(1.60)	(0.10)	(0.69)
Control Gr Mean	0.35	3.17	0.05	0.15
Control Gr StDev	0.48	4.71	0.22	1.12
N	619	555	576	575

A firm is classified as small in a respective sector if in the baseline it has # Employees<Median(# Employees).
Among those in the endline, 27 small firms were assigned to treatment and 36 to control in the baseline intervention.
RHS vector includes also "Small" dummy as an additional control variable.

Sales - ITT and HTE

Table: Sales - Intention to Treat with HTE

	(1)	(2)	(3)	(4)	(5)	(6)
	ln(Sales)	ln(Sales)	Sales Volatility	Sales Volatility	Sales Volatility [robust]	Sales Volatility [robust]
Treatment	-0.03	-0.02	0.00	0.001	0.000	0.002
	(0.07)	(0.08)	(0.052)	(0.05)	(0.004)	(0.004)
Small x Treated		0.14		-0.040**		-0.039*
		(0.35)		(0.020)		(0.020)
Control Gr Mean	4.90	4.90	0.72	0.72	1.062	1.062
Control Gr StDev	0.95	0.95	0.59	0.59	0.043	0.043
N	539	539	436	436	515	515

RHS vector includes also "Small" dummy as an additional control variable.

Sales Volatility = $ln(Sales_{max}) - ln(Sales_{min})$ over the last 12 months.

HTE on small firms' ln(sales) is significant when no "Small" on RHS.

HTE robustness on small firms' sales-volatility completes missing values.

Concluding Remarks

- Small situational barriers are important to prevent the adoption of efficient (payment) technologies.
    - Bertrand, Mullainathan and Shafir (2004, AER)

- Past exposure to mobile money matter for willingness to adopt.
    - Bortolotti, Camera and Casari (2016, JMCB), Arifovic, Duffy and Jiang (2017)

- Financial Transparency concerns are related to non-adoption.

- After 16 months adopters continue to use the technology,
  feel safer,
  use more m-loans, and (for small firms) financially better connected,
  have smoother production (for smaller businesses).
    - complements Jack and Suri (2014, AER), who show M-Pesa smooths consumption among low-income households.

M-Pesa & Lipa Na M-Pesa Transfer Fee Comparison
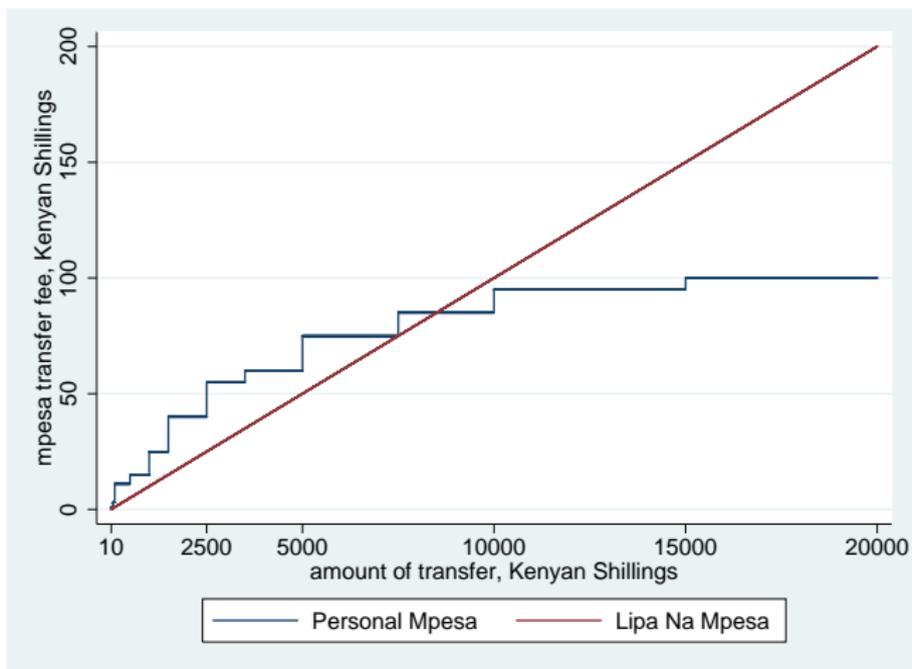
Cut-off at 8500 KSh ≈ 98 USD as of 2014.

Adoption

- **Pharmacies** (194 treatment and 194 control in end-line):
  50 of 194 treated pharmacies have a Lipa Na account in end-line.
  29 of 194 control pharmacies have a Lipa Na account in end-line.

- **Restaurants** (239 treatment and 237 control in end-line):
  54 of 239 treated pharmacies have a Lipa Na account in end-line.
  51 of 237 control pharmacies have a Lipa Na account in end-line.