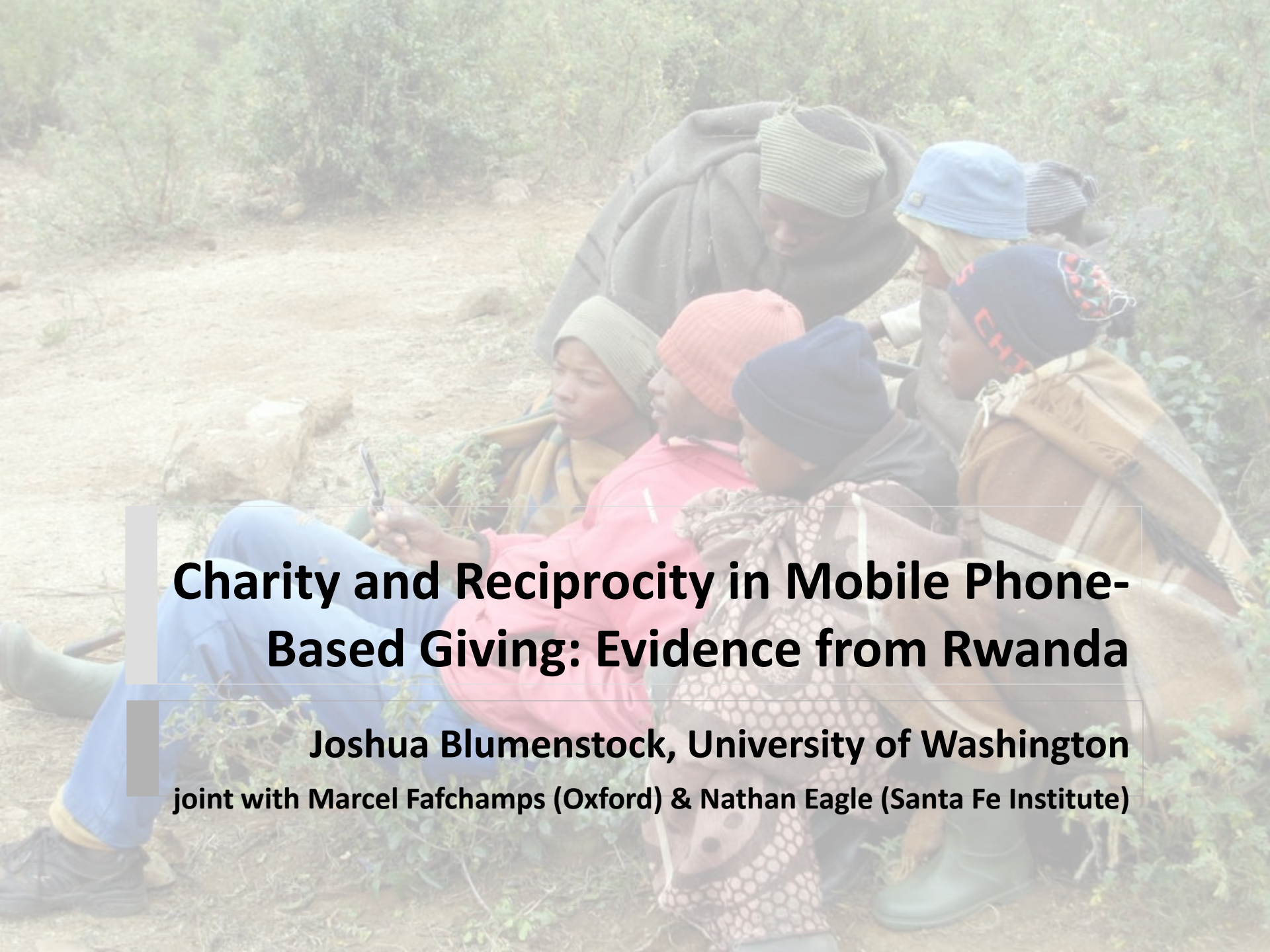


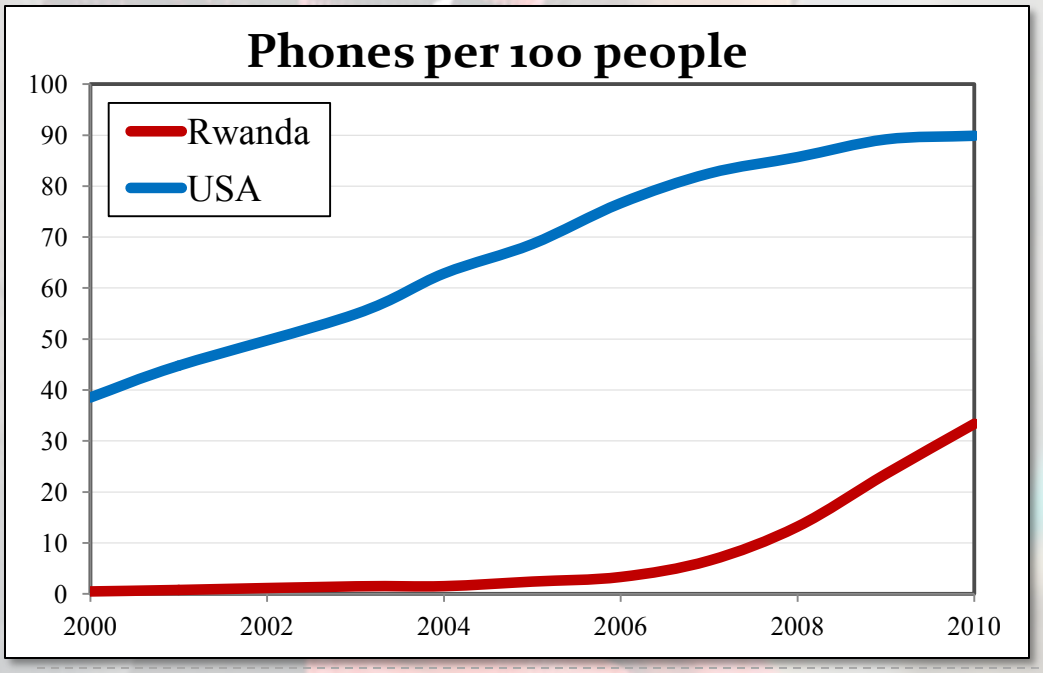
Charity and Reciprocity in Mobile Phone-Based Giving: Evidence from Rwanda

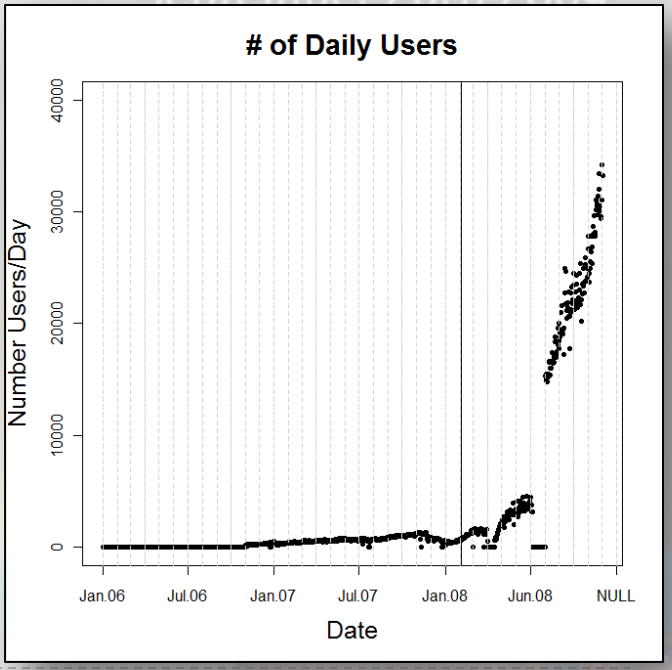
Joshua Blumenstock, University of Washington

joint with Marcel Fafchamps (Oxford) & Nathan Eagle (Santa Fe Institute)

Context

- The "Mobile Phone Revolution"
  - **3.5 billion** subscribers in developing countries
  - **Mobile Money:** $200 million sent ***per day*** *in* Kenya
  - **1.7 billion** "unbanked" phone owners





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Background

- Limited evidence on economic impacts of mobile phones
  - Published work focused on prices and markets
    - Jensen (2007), Aker (2010), Klonner and Nolen (2008)
  - Small set of unpublished studies explore other services
    - Risk sharing and remittances (Jack & Suri, 2012)
    - Household decision-making (Aker et al, 2012)
    - Communication between counter insurgents and citizens (Shapiro & Weidemann, 2012)
    - Migration (Aker et al, 2012)
    - Handful of others…
  - Several ongoing RCT-based studies
    - Understand determinants of adoption and use
    - Impact of Mobile-based products and services
      - Savings, payments, insurance, m-Health, monitoring,

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This Talk: Takeaways

- Understanding the role and importance of phone-based transfers in Rwanda

1. Empirical evidence on Mobile Money precursor
   - Observe entire universe mobile phone activity in Rwanda
   - Vast disparities in use and access to technology
2. Used for intra-national remittances and *risk sharing*
   - Cf. Jack & Suri (2012)
   - Vs, "traditional" methods:
     - **Distance**: Udry (1994), Fafchamps & Gubert (2007), Kurosaki & Fafchamps (2002)
     - **Covariate vs. idiosyncratic shocks**: Townsend(1995), de Vreyer(2010), Gine & Yang (2009)
3. Provides insight into *motives* for risk sharing
   - Cf. Leider et al. (2009), Ligon & Schechter (2011), Cabral (2011)

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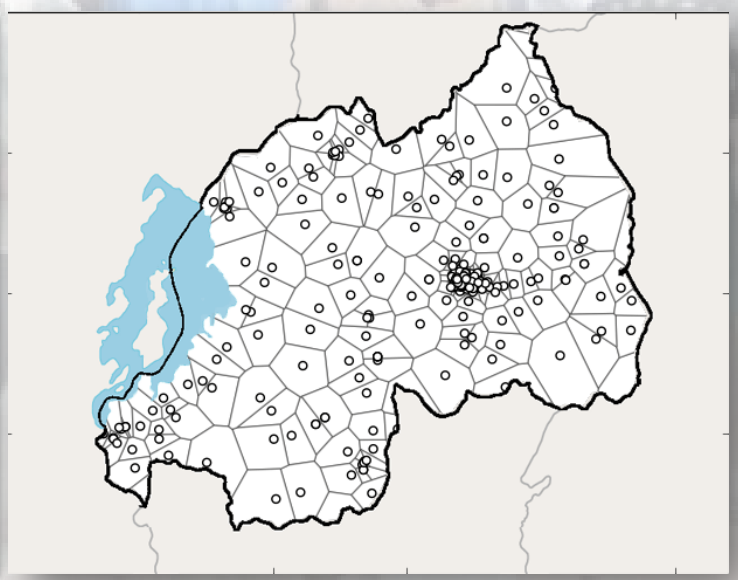
Data: Anonymous Phone Usage

- Records from of **all phone-based activity**, 2005-2009
  - 10 terabytes of data
  - 1.4 millions individuals, 4 years
  - Every call, SMS, …, and "*Mobile Money" transaction*

Panel A: Aggregate traffic	
Number of phone calls	~10 billion
Number of unique users	~1 million
Number of "Mobile Money" transfers	~10 million
Number of "Mobile Money" dyads	~1 million
Panel B: Basics of MM use	
Transactions per subscriber	6.05
Average distance per transaction (km)	13.51
Average transaction value (RWF)	223.58



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Data: Demographics

- Some info can be inferred
- Phone surveys to fill in gaps
  - 2,200 phone interviews (Rwanda)
  - ~80 questions, 20-30 minutes (Details)
  - Derive "wealth index" for each subscriber

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Demographics of phone access & use

	(1) All	(2) Men	(3) Women	(4) "Rich"	(5) "Poor"	(6) MvW	(7) RvP
Panel A: Domestic and International Calls							
Activation date	1/12/08	1/29/08	12/26/07	07/08/06	02/05/08	-	-
Days of activity	770.3	743.4	823.8	994.6	548.1	0.38	0.0001
Avg. call length	31.7	29.7	35.7	39.8	28.4	0.014	0.0001
Calls per day	6.25	6.32	6.09	8.42	6.47	0.82	0.26
Net calls per day (out-in)	0.087	0.31	-0.37	0.76	-0.31	0.02	0.29
Int'l calls per day	0.084	0.071	0.11	0.13	0.066	0.11	0.065
Net int'l calls (out-in)	-0.014	-0.0018	-0.038	-0.031	-0.028	0.031	0.89
Panel B: Social Network Structure							
Degree	734	772.6	657.2	1240.7	498.8	0.56	0.037
In-degree	488.2	488.5	487.6	721.5	369.1	0.99	0.02
Out-degree	433	475.9	347.7	798.1	280.8	0.43	0.1
Daily degree	3.78	3.87	3.61	5.08	3.77	0.63	0.17
Net daily degree (out-in)	0.00027	-0.17	0.34	-0.47	0.41	0.15	0.19
Clustering	0.063	0.065	0.058	0.056	0.057	0.067	0.88
Betweenness	2.72	2.74	2.69	2.61	2.77	0.27	0.0033
Panel C: Other Behaviors							
Credit used per day	163.5	176.2	138.2	246.9	138.9	0.17	0.025
Max. recharge value	2756.3	2775.1	2718.9	3816.1	2228.5	0.89	0.013
Avg. districts per day	1.36	1.37	1.34	1.51	1.47	0.8	0.81
Avg. districts contacted	1.21	1.2	1.22	1.4	1.28	0.81	0.48
Me2U transfers per day	0.044	0.041	0.05	0.037	0.083	0.43	0.012
Net Me2U transfers per day	0.00038	0.0066	-0.012	0.0082	-0.012	0.011	0.14
N	901	645	256	180	180	-	-

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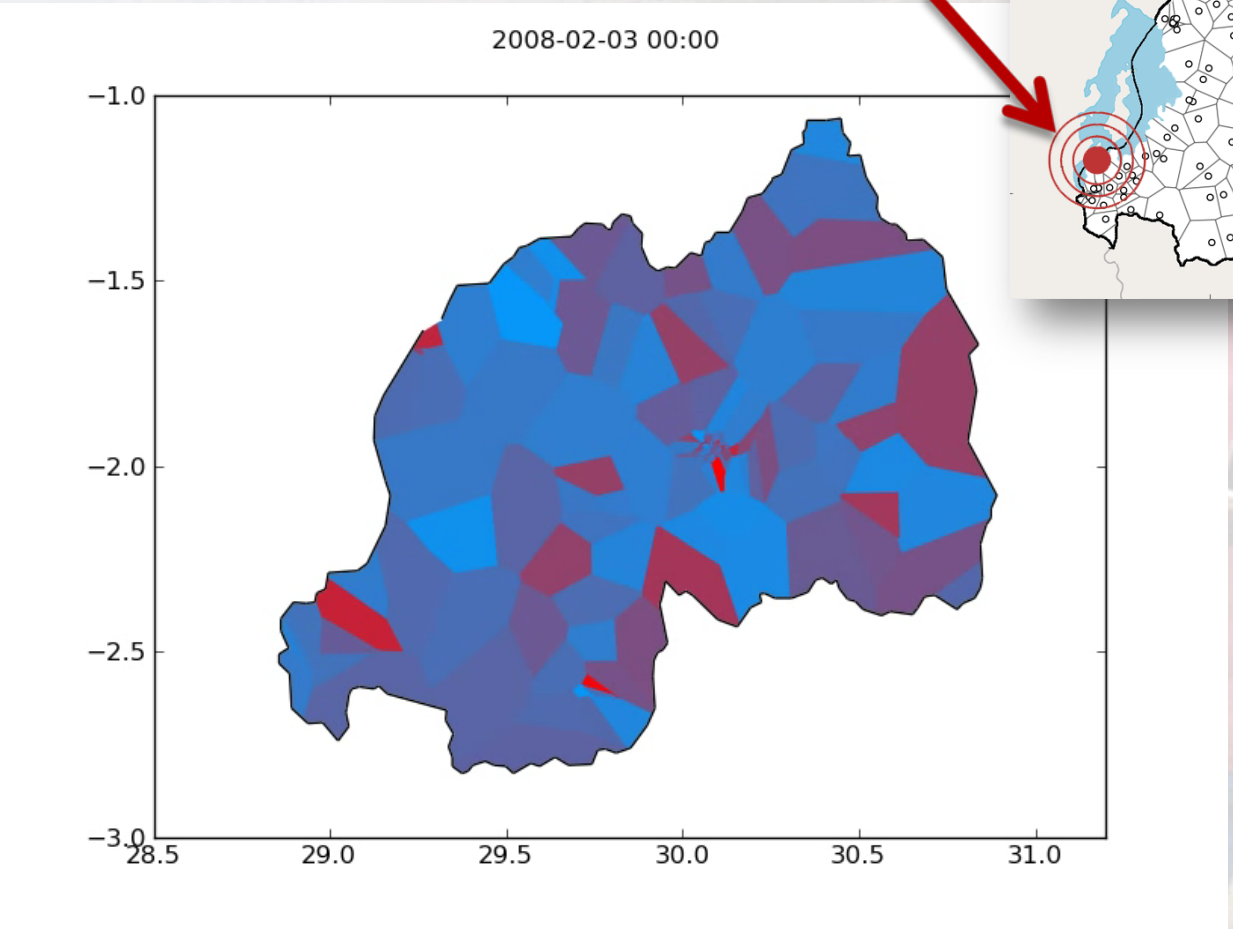
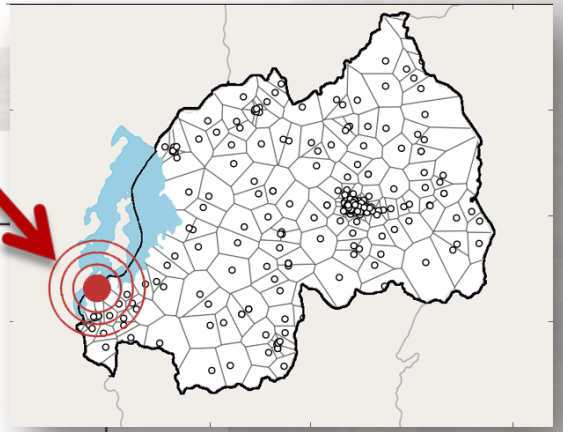
Motivating Observation: Transfers and Disasters

Lake Kivu Earthquake





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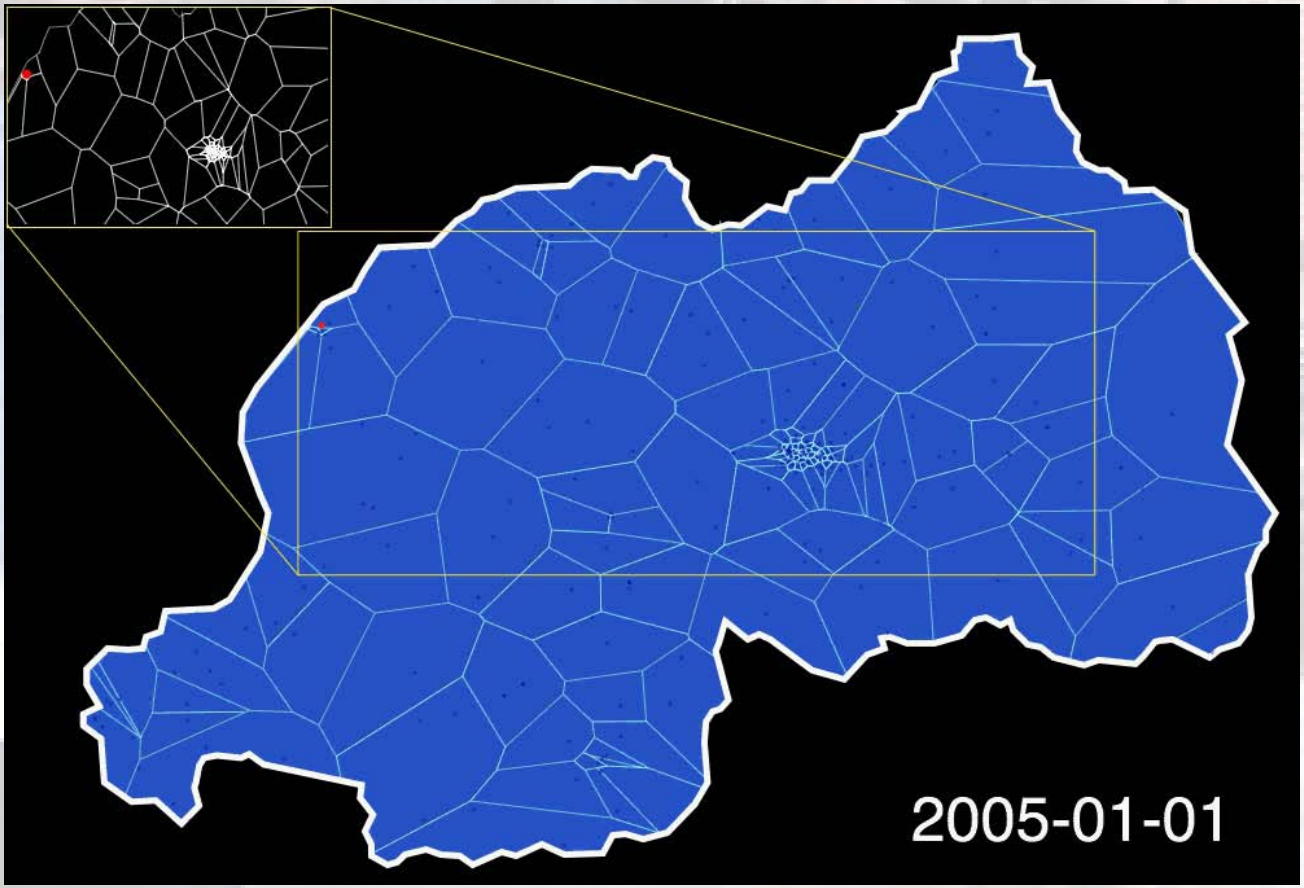
Identifying affected individuals

- Measuring location of individual *i* on day *t*
  - Only have intermittent, approximate location



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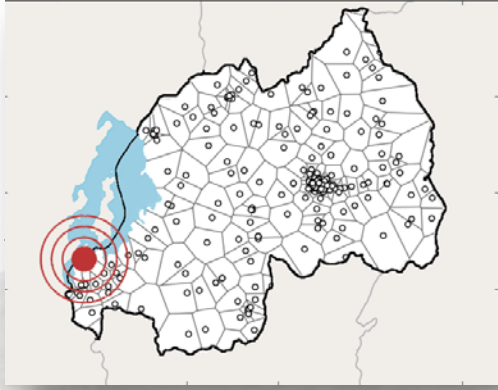
Measuring the earthquake's impact



Empirical questions

1. How much is sent?

$$\tau_{rt} = \alpha_1 + \gamma_1 Shock_{rt} + \theta_t + \pi_r + \varepsilon_{rt}$$

2. Who benefits?

$$\tau_{irt} = \alpha_4 + \delta_4 (R_i * Shock_{irt}) + \phi_4 NearEpicenter_{irt} + \theta_t + \pi_i + \varepsilon_{irt}$$

3. Why is it sent?

- Charity: $U_{it} = u_i(x_{it} + \tau_{ijt}) + \gamma u_j(x_{jt} - \tau_{ijt})$
- Reciprocity: $U_{it} = \underbrace{u_i(x_{it} + \tau_{ijt}) + \gamma u_j(x_{jt} - \tau_{ijt})}_{\text{single period utility}} + \underbrace{E \sum_{s=t+1}^{\infty} \delta^{s-t} [u_i(x_{is} + \tau_{ijs}) + \gamma u_j(x_{js} - \tau_{ijs})]}_{\text{continuation value of relationship}}$
- Details

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Results: How much is sent?

	(1) District	(2) Cell Tower	(3) Subscriber	(4) Dyad
Earthquake Shock	14169***	2832***	9.48***	11.92***
	(1951.30)	(177.02)	(0.74)	(0.59)
Near epicenter			1.256***	1.073***
			(0.187)	(0.39)
Day Dummies	Yes	Yes	Yes	Yes
Fixed Effects	District	Tower	Subscriber	Dyad
Unconditional mean	19006.940	2436.192	5.900	3.692
Unconditional mean (earthquake region)	6355.942	1245.27	3.770	3.190
N	1800	16020	6619440	10566000
R^2	0.904	0.630	0.052	0.056

Notes: Outcome is gross airtime received by affected district/tower/subscriber.
"Earthquake shock" takes value 1 for people near epicenter of the day of the earthquake.
"Near epicenter" is defined as towers 20 miles of the epicenter. Results hold with "near epicenter" re-defined anywhere in interval 10– 50 miles.

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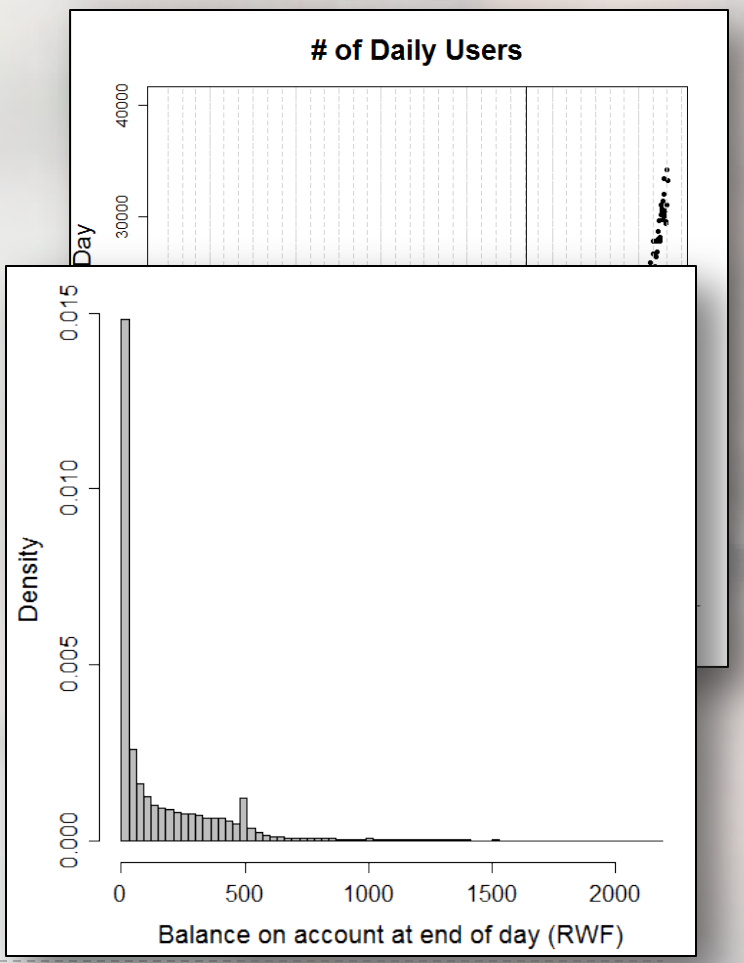
Results: How much is sent?

- Total effect is small: 42,000 RWF = $84 USD
  - (Much larger effect on calls: $2,400 USD)
- Consider growth of network
  - 400-fold increase in # users since 2/2008
  - **$25,000 - $33,000** projected today
  - $11 million projected in Kenya
- What benefit?
  - Avg balance = $0.10
  - 32% of users had < $0.01 on account



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Results: Who Benefits?

- Heterogeneity
  - The wealthy receive more (but are not more likely to send)
  - As do individuals with more contacts, connections to Kigali
  - Transfers occur between "reciprocal" pairs (details)
    - *Normally:* *i* is **less likely** to send to *j* if *j* sent to *i* in past
    - *After quake*: *i* is **more** likely to send to *j*

Partial	Interpretation	Predicted: Charity	Predicted: Reciprocity	Actual (γ_4)
$\partial\tau_{ij} / \partial x_i$	Wealth of *i* (recipient)	Negative	Positive	Positive
$\partial\tau_{ij} / \partial T_{ijt}$	Past *j* to *i* transfers	Positive	Negative	Negative
$\partial\tau_{ij} / \partial D_{ij}$	Geographic distance	--	Negative	Negative
$\partial\tau_{ij} / \partial x_j$	Wealth of *j* (sender)	Positive	--	--
$\partial\tau_{ij} / \partial S_{ij}$	Social proximity of *i* and *j*	Positive	Positive	Positive

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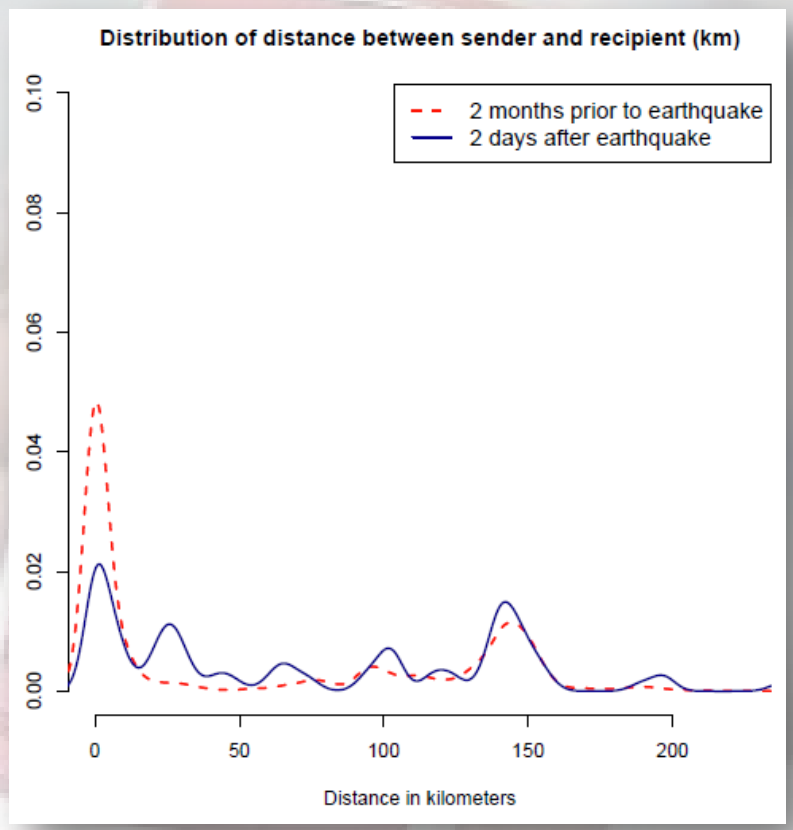
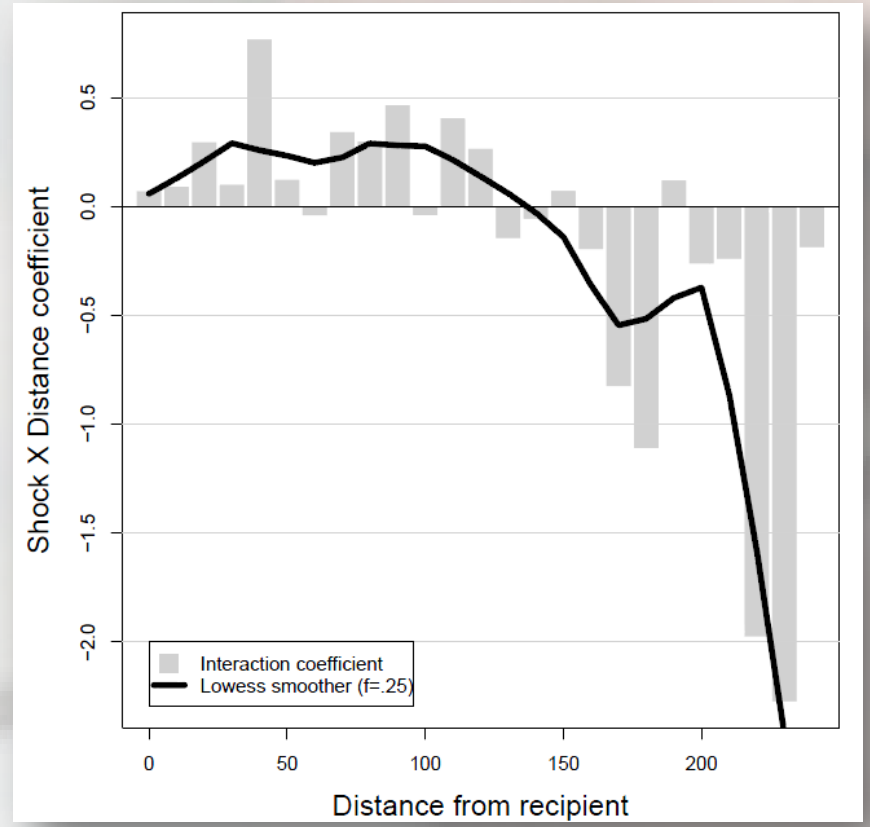
Results: Sending money over distance

- Transfers come from 20km-120km away
- Rwandans have limited alternatives for transfer (details)





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Summary

- Empirical results
  - Mobile Money sent in response to shocks
  - Benefits are heterogeneous
  - Transfers more consistent with *reciprocity* (not *charity*)

- Results in context
  - Early evidence of how and why Mobile Money (MM) can be used to for risk sharing
  - But no direct evidence on welfare effects (cf. Jack & Suri)

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Policy Implications

1. Immediately after launch – and while still very rudimentary – transfers used for risk sharing
   - Good news: long distances, covariate shocks
   - Bad news: Benefits accrue to the "elite"
2. Understand existing disparities in deciding how to target/subsidize expansion of network
3. Leverage novel forms of data in policy design and evaluation
   - Use phones to identify people victims in need, transmit MM
   - "Digital footprints" to measure poverty, labor mobility, migration, …
   - Other opportunities abound!

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The end.
Supplemental slides follow