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*Contribution to WTIM-10 session 2*

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English

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**TITLE:** Mobile Phones and Economic Development in Africa

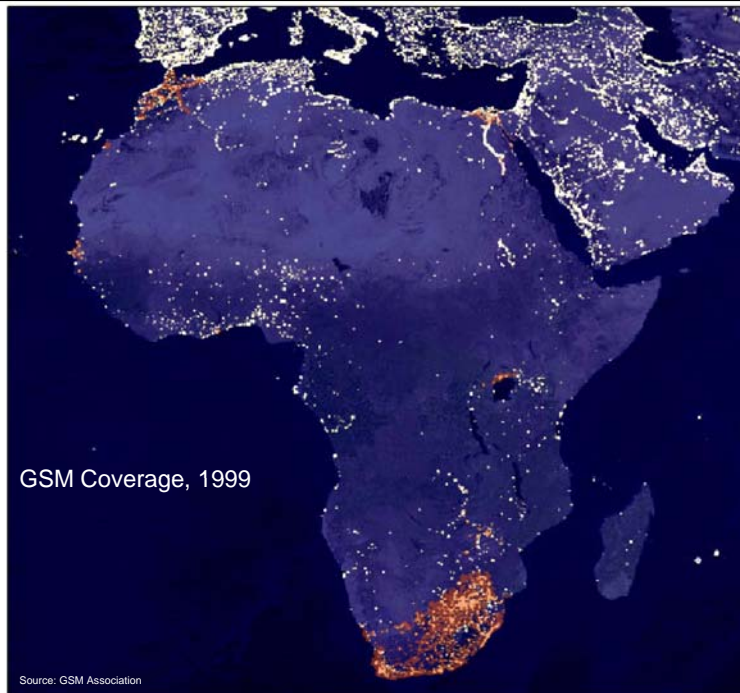
## Mobile Phones and Economic Development in Africa

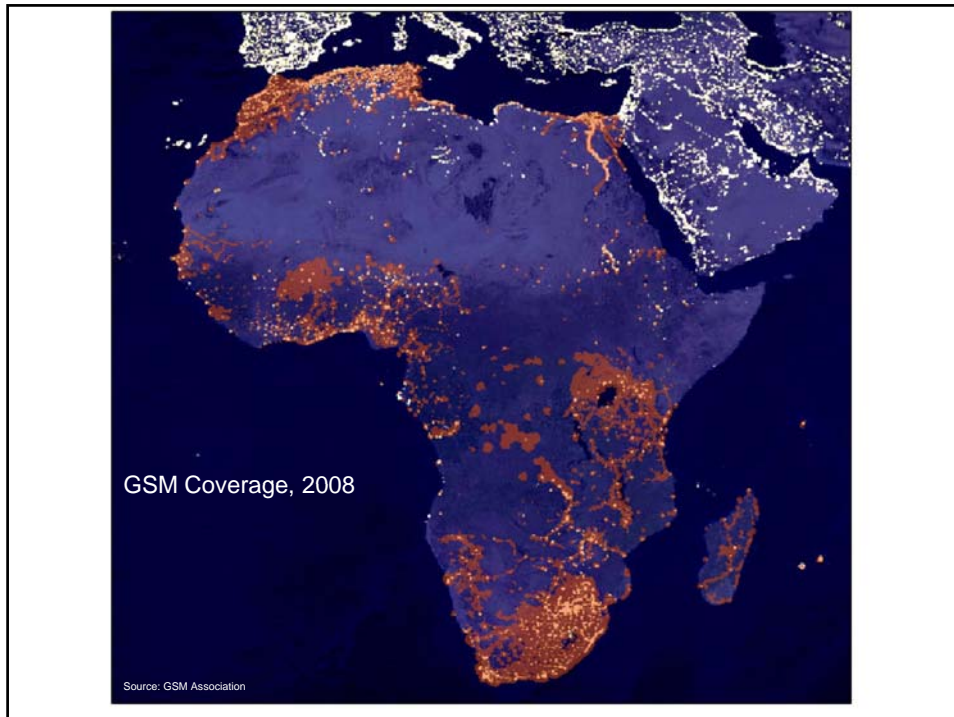


Isaac M. Mbiti

MIT and Southern Methodist University

[Draws on joint research with Jenny Aker (Tufts) and David Weil (Brown)]





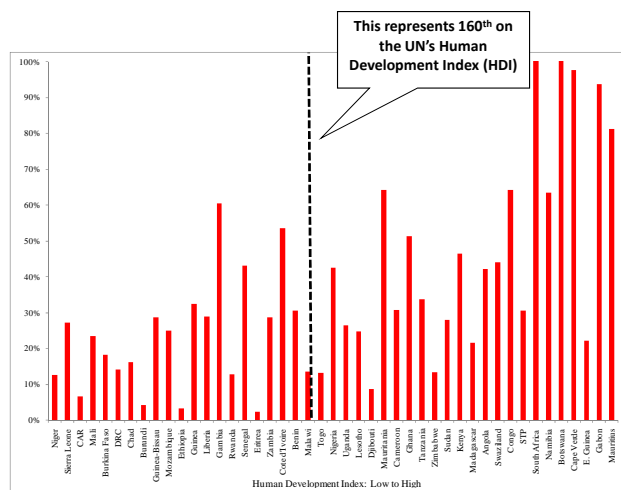
## Questions

- With the dramatic rise of mobile phones in Africa:
  - What is the impact of :
    - Mobile phones
    - Mobile Phone services
  - What methods, data and collaboration are needed to produce evidence?
    - Empirical approach will differ across the two broad categories of research questions

## Who is Adopting Phones? How Many Users?

- Mobile subscriptions in Africa grew from 15 million in 2000 to 331 million in 2008 (World Bank/ITU)
  - Data sources: subscription numbers from carriers
  - This data does not capture actual **users**
    - 2009 Finaccess survey shows that:
      - 30 % of Kenyans share phones
      - 11% of Kenyans have multiple SIM cards
  - Require nationally representative survey data to accurately capture usage
    - DHS data
    - LSMS type surveys

## Mobile Phone Subscribers as a Percentage of the Population in 2008



Source: Wireless Intelligence, UNDP

HDI=74

HDI=179

## Who Adopts and Why?

Table 2: Adoption and Use of Mobile Phones and M-Pesa

	Own Mobile Phone	
	2006	2009
<b>Wealth</b>		
Not poor	42.0%	64.6%
Poor	7.0%	21.6%
<b>Gender</b>		
Female	23.0%	41.6%
Male	32.4%	53.9%
<b>Residence</b>		
Rural	16.8%	35.9%
Urban	49.2%	73.7%
<b>Education</b>		
Less than primary	8.9%	22.8%
At least primary school	41.1%	65.0%
<b>Age</b>		
Under 55	29.3%	50.9%
Over 55	14.5%	27.7%
<b>Financial Access</b>		
No Bank account	18.2%	33.9%
Bank account	72.7%	86.3%
Sample Size	4,418	6,598

Data from 2006 and 2009 Finaccess surveys

## Research on Adoption/Coverage

- Macro-Level evidence
  - Determinants of Mobile phone coverage/adoption across countries or geographic regions
  - Buys et al (2009) focus mainly on **coverage**
  - **No studies on usage across countries or regions**
- Micro-level evidence
  - **No studies in economics**

## Research on Adoption/Coverage: Macro Level

- Goal: link regional or spatial factors such as population density, access to roads, topology to cell phone adoption, usage, coverage etc (similar to Buys et al. (2009) methodology)
  - **Data Problems:**
    - Not usually disaggregated enough
      - Cannot match the different data sets
    - Not available (i.e. do not exist)
    - Restricted
  - Statistical methodology issues
    - How to appropriate model adoption at micro-level?

## Research on Adoption/Coverage: Micro-Level

- Goal: uncover the determinants of “demand” for mobile phones
  - **Data Problems:**
    - This research requires survey data
      - Often not available or non-existent
  - Statistical methods?
    - How to appropriate model adoption at micro-level?

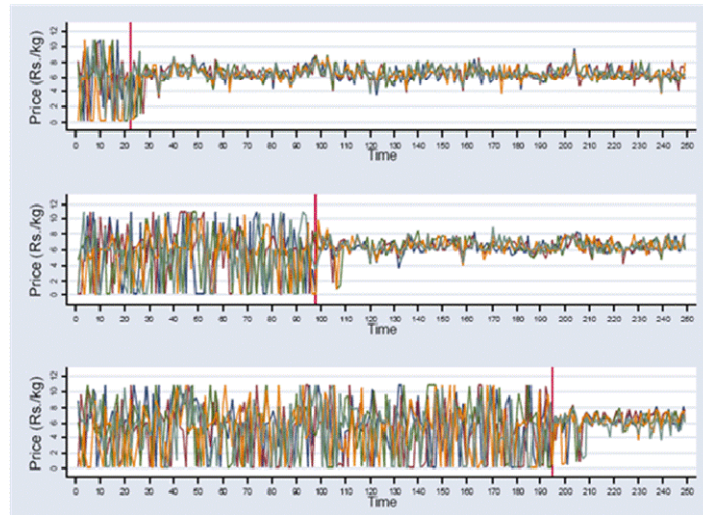
### **Mobile Phones: Channels of Impact**

- Mobile phones can reduce search costs, increase information and improve market efficiency
- Mobile phones can improve coordination, increase firm productivity and improve supply chain management
- Mobile phones can generate employment
- Mobile phones can improve communication among social networks and reduce risk

### **Mobile Phones and search costs: Summary of empirical evidence**

- Focuses on agricultural markets and labor markets
  - Fisheries in India (Jensen 2007)
  - Grain markets in Niger (Aker 2008)
  - Farmer participation in Uganda (Muto 2009)
  - Labor markets in South Africa (Klonner and Nolen 2009)
  - Labor markets in Malawi (Batzilis et al 2010)

## Mobile Phones and Fish Price Dispersion (Jensen 2007)



### Empirical Set-up

- Exploit the timing of the roll-out of mobile phone network to estimate the impact of mobile phones
- Requirements:
  - Evolution of the mobile phone network over time
    - GPS coordinates required to match this to other data
  - Evolution of outcome data e.g. prices, employment at relevant unit of analysis
    - Prices at regional level (e.g. fish market level),
    - Employment at individual level
    - GPS coordinates required to match this to coverage data
  - Other attributes/characteristics
    - Demographic information, other communication avenues, other facilities/infrastructure,



## Mobile Phones and Firm Productivity

- Mobile phones can improve coordination, increase firm productivity and improve supply chain management
  - No conclusive evidence
  - Possible Data source is World Bank Enterprise Survey
  - Problems:
    - no spatial distribution of firms or GPS data
      - Cannot take advantage of changes in mobile coverage

## Firms and Mobile Phones

Table 2: Firm Level Descriptive Statistics

	Kenya	Tanzania	Uganda
Mobile Phone Use	91%	83%	93%
Landline Use	N/A	77%	N/A
Both Mobile and Landline	N/A	69%	N/A
Days without phone service	35.83	50	18
Average Hours without phone service (per interruption)	37.06	11	30
No. of Days to get Landline Phone Service	98.82	23	33
Bribe requested for landline phone service (%)	55%	19%	18%
Amount of Bribe (USD)	117.66	108.16	43.50
Sample Size	278	276	300

Source 2003 World Bank Enterprise Surveys

## **Mobile Phones and Employment and Social Networks**

- Mobile phones can generate employment
  - Related to the labor market research
- Mobile phones can improve communication among social networks and reduce risk
  - Current on-going research by Fafchamps et al.
  - Map social networks using data from phone company
  - Link location of individuals in phone data (from tower location) to other data in the vicinity.
  - Can examine how social networks enable individuals to cope with shocks such as drought.

## **Mobile Phone-Based Services and Development Projects- Examples**

- Mobile banking (M-PESA, Zap, G-Cash)
- Market information systems (Esoko Ghana, IMAC Niger)
- Health information systems (Satellife Mozambique)
- Early warning (Lake Victoria project, *Ushahidi*)
- Governance (PVT hotlines, voter education Mozambique)
- Literacy (Niger, Senegal)

## **Mobile Money: M-Pesa in Kenya**

- Rapid uptake (over 8.5 million users as of Sept 2009)
- As of Sept 2009 cumulative value of transfer was \$3.7 Billion transferred (10% of GDP)
  - In Sept 2009 alone 1% of GDP was transferred
- Most popular money transfer method
  - 67% of senders use this (2009 Finaccess survey)
- Transitioning from a simple person-to-person transfer tool to a payment system
- International M-Pesa services (UK to Kenya)

## **Mobile Money: M-Pesa in Kenya**

- What is the impact?
  - No conclusive evidence- mostly suggestive and qualitative
- Could impact remittances:
  - Change pattern and amount of remittances
  - Implications for risk sharing and “efficiency” of social networks
- Macroeconomic effects?
  - Could this change the velocity of money?
  - As the system expands could it pose systemic risks?
- Could impact efficiency of firms?
  - Enables firms to better send and receive payments
  - Reduces transactions costs perhaps facilitating trade

### **Mobile Money: M-Pesa in Kenya**

- 2.2% of users account for 36% of transactions
- “More money to rural areas”?
  - Majority of transfers are within urban areas
- Touted as “banking the unbanked”
  - Probability of adoption is higher for the wealthier, better education and those with bank accounts.
  - Average balance on M-pesa accounts is \$3
  - Not clear whether M-Pesa will lead to an extension of the reach of banks and financial services
  - Not clear whether M-pesa will lead to increases in savings

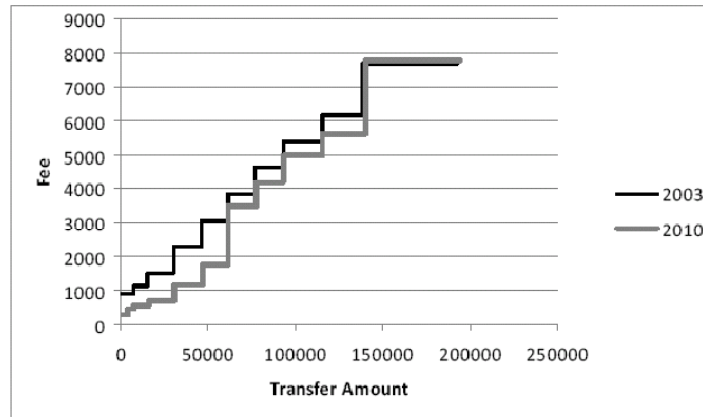
### **Approaches**

- Mbiti and Weil (2010) combine survey data, and scant administrative data
- Constraints (for Mbiti and Weil):
  - Data: administrative data is not shared
  - Survey data was not designed solely for M-pesa evaluation
    - Survey data lacks information on M-pesa access
- Suri and Jack (on-going) panel (longitudinal) survey data combined with access to administrative data.
  - Constraints: lack of pre-M-Pesa data

## Effect of M-Pesa on Prices of Competition

Figure 5: Changes in Prices at Money Transfer Companies

Panel A: Moneygram Fees in 2003 and 2009



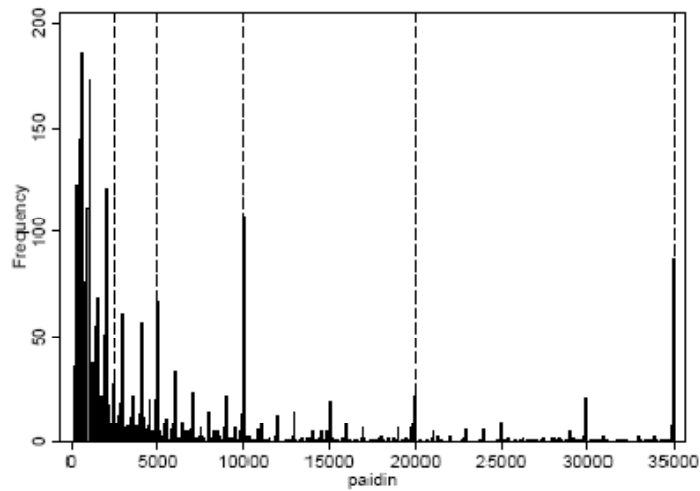
Source: Mbiti and Weil 2010

## Prices

- Mbiti and Weil (2010) show that competitive pressure from M-Pesa accounts for about 60% of the drop in prices in the Kenyan domestic transfer market
  - Data: Prices of competitors pre-M-pesa and post-M-pesa

## Distributions of Withdrawals:

Panel A: Homa Bay



Source: Mbiti and Weil 2010

## A Way Forward

- More rigorous research needed to assess the developmental potential of mobile phones
- Increased access to Mobile phone administrative data
  - Coverage of mobile phone network and services/applications (e.g. M-Pesa network)
  - Provision of disaggregated data such as users at a tower
  - Anonymous customer level data
    - Phone records
    - M-Pesa records
    - Linked across users

## A Way Forward

- Administrative data needs to be complemented with survey data
  - Survey data can capture economic and social outcomes
    - Employment, poverty, education attainment, migration,
  - GPS coordinates/location to match across different data sources
  - Important to have consistent measures over time.
    - Economists exploit the “time” and “Space” dimension in analysis
      - Important to have spatial and temporal variation in data
- Mobile phone services/ development projects can be evaluated using prospective randomization methods

## A Way Forward

- Existing Marco-evidence is debatable
  - Lack of consistent mobile phone data across countries and across time
    - Users, prices, telecommunication structure, timing of new entrants or granting of new licenses
  - Lack of economic outcome data
    - Data is often imputed rather than collected
  - The potential for releasing disaggregate data at tower location is probably greater than the potential for more aggregate macro level data
    - Disaggregated data allows researchers to use better statistical methods