Mystery of the Evil Digits: Impact of Reliable Communication Network on Women's Economic Participation in Pakistan

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Motivation

- Women in developing countries such as Pakistan face mobility challenges

- One of the reasons for this is security issue

- As a result women are restricted in terms of economic participation

- Sufficient returns from economic activities requiring travel

- Can cell phones improve mobility and hence economic participation?

This Paper

- Using data on a natural experiment from Pakistan, I provide estimates for impact of cell phone network quality on

    - Economic participation of women

    - Substitution across sectors

    - Mobility and income

Identification Strategy

- Network quality can be endogenous

- Computerized assignment of digits that determine network quality

- 4th digit of the phone number can be used for identifying these

- Lines characterized as Good or Bad based on performance data

- Limit on number of sim-card per cnic and cumbersome cancellation process

Identification Strategy

"To meet the emerging demand for cell phone service, the Pakistan Telecommunication Authority (PTA) started issuing multiple NDCs to the different mobile operators. From the subscribers point of view, having multiple NDCs for a mobile company is not a good practice as it can create a large disparity in service quality across NDCs."

Proportion of Cell Phone Users with a Good Number by Provider and User Gender
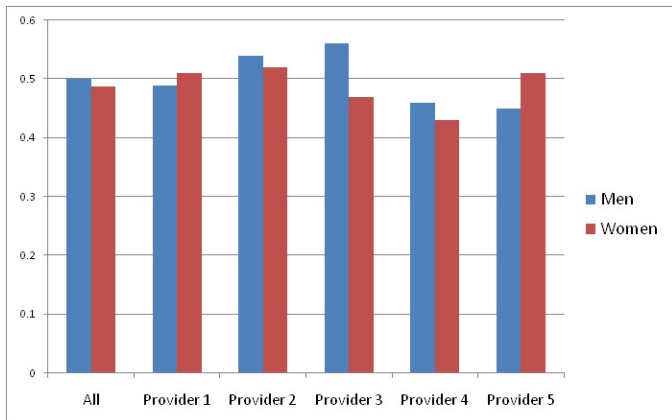
Data Sources

- The main data source here is from the Pakistan Social and Living Standard Measurement 2011-12

- I worked closely with the Pakistan Bureau of Statistics to introduce a new module

- New module collected data on:
  - Individual level phone ownership, usage, purpose of usage,
  - Service quality
  - Mobility of women
  - Security of women as perceived by men
  - Household decision making questions
  - Retrospective data on key economic variables of interest

Estimation

- Three different specifications adopted
- First is to use "Bad Number" as independent variable

$$Y_i = \alpha_0 + \alpha_1 BadNumber_i + \alpha_2 X_j + \epsilon_j \tag{1}$$

- Second is to use network quality as independent variable and "Bad Number" as IV

$$Drop_i = \alpha_0 + \alpha_1 BadNumber_i + \alpha_2 X_j + \epsilon_j \tag{2}$$

$$Y_i = \alpha_0 + \alpha_1 Quality_i + \alpha_2 X_j + \epsilon_j \tag{3}$$

- Third is to use a difference in difference approach based on retrospective information

$$Y_{it} = \beta_0 + \beta_1 Post_t + \beta_2 BadNumber_i + \beta_3 (Post * BadNumber)_{it} + \epsilon_{it} \tag{4}$$

Estimation

- Controls include individual level variables such as education, parental education, household size, age, married, cell phone coverage as measured by total number of available bars on the phone, household landownership, distance from market and district fixed effects as well as cell phone network fixed effects

- All analysis split by rural, urban and big city sample as the survey stratified on these

- Clustering at PSU level

Results for Economic Participation

	(Women)			(Men)		
	(Rural)	(Urban)	(Big City)	(Rural)	(Urban)	(Big City)
Probit	-0.07***	-0.12***	-0.13***	0.04*	0.07*	0.08
	(0.01)	(0.05)	(0.03)	(0.03)	(0.05)	(0.11)
IV	-0.03**	-0.06***	-0.07***	-0.01	-0.01	-0.02
	(0.005)	(0.02)	(0.003)	(0.15)	(0.17)	(0.15)
Diff-in Diff	-0.04**	-0.09***	-0.11**	-0.05	-0.04	-0.10
	(0.024)	(0.01)	(0.04)	(0.20)	(0.17)	(0.09)

$* * * p < 0.01, * * p < 0.05, * p < 0.1$

Results for Sectoral Change

	(Women)			(Men)		
	(Rural)	(Urban)	(Big City)	(Rural)	(Urban)	(Big City)
Probit	-0.33***	-0.38***	-0.42***	0.17*	0.12*	0.09
	(0.02)	(0.11)	(0.20)	(0.14)	(0.08)	(0.15)
IV	-0.11***	-0.13***	-0.16***	-0.13	-0.05	-0.04
	(0.03)	(0.05)	(0.06)	(0.14)	(0.11)	(0.06)
Diff-in Diff	-0.28**	-0.29***	-0.31**	0.06	0.03	0.05
	(0.024)	(0.01)	(0.04)	(0.20)	(0.17)	(0.09)

$***p < 0.01, **p < 0.05, *p < 0.1$

Results for Mobility

	(Ability to Travel to Market)			(Women Use Cell Phone to Contact Home)		
	(Rural)	(Urban)	(Big City)	(Rural)	(Urban)	(Big City)
Probit	-0.27***	-0.31**	-0.38***	-0.23***	-0.33***	0.42***
	(0.12)	(0.17)	(0.08)	(0.04)	(0.14)	(0.19)
IV	-0.05***	-0.06***	-0.08***	-0.05***	-0.07***	-0.10***
	(0.01)	(0.005)	(0.03)	(0.02)	(0.006)	(0.04)
Diff-in Diff	-0.25***	-0.27***	-0.35**	-0.26*	-0.34***	-0.38***
	(0.10)	(0.09)	(0.17)	(0.16)	(0.14)	(0.13)

$***p < 0.01, **p < 0.05, *p < 0.1$

Results for Womens Type of Cell Phone Usage

	(Women Use Cell Phone to Call Home for Pick-up)			(Women use Cell Phone to Call Home when Late)		
	(Rural)	(Urban)	(Big City)	(Rural)	(Urban)	(Big City)
Probit	-0.24***	-0.33**	-0.45***	-0.18**	-0.28***	-0.37***
	(0.08)	(0.06)	(0.21)	(0.05)	(0.08)	(0.13)
IV	-0.03**	-0.08**	-0.12***	-0.03**	-0.06***	-0.13***
	(0.001)	(0.005)	(0.009)	(0.006)	(0.01)	(0.05)
Diff-in Diff	-0.18**	-0.28***	-0.38**	-0.15*	-0.26***	-0.33***
	(0.11)	(0.06)	(0.07)	(0.006)	(0.05)	(0.12)

$***p < 0.01, **p < 0.05, *p < 0.1$

Results for Male Household Members Security Perception for Mobility of Women

	(Father)			(Husband)		
	(Rural)	(Urban)	(Big City)	(Rural)	(Urban)	(Big City)
Probit	-0.17***	-0.25***	-0.31***	-0.10***	-0.29***	-0.41***
	(0.03)	(0.07)	(0.11)	(0.04)	(0.05)	(0.08)
IV	-0.02**	-0.05**	-0.09***	-0.01**	-0.07***	-0.11***
	(0.001)	(0.005)	(0.009)	(0.006)	(0.01)	(0.05)
Diff-in Diff	-0.09**	-0.29***	-0.36**	-0.11*	-0.34***	-0.39***
	(0.01)	(0.12)	(0.18)	(0.14)	(0.04)	(0.19)

$* * * p < 0.01, * * p < 0.05, * p < 0.1$

Results for Log of Annual Income

	(Women)			(Men)		
	(Rural)	(Urban)	(Big City)	(Rural)	(Urban)	(Big City)
Probit	-0.15***	-0.24***	-0.31***	0.06*	0.08	0.07
	(0.06)	(0.09)	(0.13)	(0.04)	(0.12)	(0.15)
IV	-0.04***	-0.08***	-0.07***	-0.03*	-0.05	0.01
	(0.01)	(0.03)	(0.03)	(0.02)	(0.16)	(0.19)
Diff-in Diff	-0.08***	-0.21***	-0.24***	-0.04	0.02	0.05
	(0.03)	(0.08)	(0.07)	(0.14)	(0.17)	(0.24)

$* * * p < 0.01, * * p < 0.05, * p < 0.1$

Other Findings and Robustness

- Impacts are stronger for secondary earners

- Strongest impact on younger women particularly those in age range 30-35 yrs

- Tested using Conley Bounds approach

Conclusion and Policy Implication

- Paper provides evidence that access to a reliable communication network can improve economic opportunities for women

- Communication networks have a stronger impact when other types of infrastructure are well developed as shown by results from urban and big city samples

- RCT in progress with some women randomly assigned to receiving a good phone number