Access to Water, Women's Work and Child Outcomes

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Women's work and development

It is widely believed that greater participation by women in market based activities produces desirable development outcomes

Yet:

- In many poor countries women's off-farm labor force participation remains low.
- Women are busy with domestic & childcare activities
- Rural women also spend substantial amounts of time collecting water & firewood

Infrastructure and women's work

- Concerns that public decision-making about basic infrastructure provision undervalues women's time in domestic labor & hence places inadequate weight on implications for women.
- Thus, women spend too much time in domestic labor & too little in other productive tasks.
- Implication: basic infrastructure investments could have efficiency and equity gains.
- This has led to calls for better tailoring infrastructure to women's needs to reduce the time needed for such chores.
- Women's freed up time could then be used in income generating activities & they could better contribute to growth

Implications for children?

- Women's increased control over income could enhance child welfare
- Or, greater female labor force participation (LFP) may reduce the care poor children receive at home
- Also possible impacts of higher female LFP on child schooling and health:
  - income effect makes schooling and health care more affordable.
  - potential offsetting substitution effects in time allocation
    - teenage girls are taken out of school to look after younger children or do domestic chores, or
    - if chores are shared with children, enhanced productivity of domestic labor may liberate them to attend school, with no effect on mothers' LFP.

What does the evidence suggest?

Little rigorous empirical evidence on these issues

The question left begging: *to what extent is infrastructure a key binding constraint to women's LFP?*

- Literature points to many potential reasons for low female LFP that have nothing to do with infrastructure

This paper

Focus: water infrastructure in rural areas of 9 developing countries

- *Does better water infrastructure increase poor rural women's participation in income earning (market based) activities?*
- *What are the impacts on the health and education of children?*

Infrastructure is typically endogenously placed & women's decision to participate in labor markets may be jointly determined with infrastructure placement.

Such endogeneity & selection issues make the question methodologically difficult to investigate.

Endogeneity concerns

Endogeneity concern has two distinct aspects:

1. *a geographic (between-place) component*

   – Infrastructure is often a local public good & location based. One expects to see strong geographic effects on infrastructure indicators such as access to water from survey data.

2. *a household or individual-related within-place component*

   – Within a given area, richer households will be more likely to have access to valued infrastructure

Empirical Strategy (1)

Our methodology robustly addresses latent heterogeneity at the individual level within geographic areas, assuming that the endogeneity problem between areas can be addressed through controlling for geographic observables influencing infrastructure placement.

Empirical strategy (2)

The model for h'hold or individual *i*'s outcome (Y) in place *j* is a function of *i*'s distance to water (Z), exogenous h'hold & individual characteristics (X) & geographic characteristics, both observable (G) and latent (μ):

$$Y_{ij} = \pi Z_{ij} + \phi X_{ij} + \lambda G_j + \mu_j + \varepsilon_{ij} \qquad (1)$$

However, this equation cannot be consistently estimated

Empirical strategy (3)

Reduced form model for <u>infrastructure placement</u> is:

$$Z_{ij} = \alpha X_{ij} + \gamma_j^Z + \nu_{ij} \quad (2)$$

where, $\gamma_j^Z = \beta G_j + \eta_j \quad (3)$

is the geographic effect on infrastructure placement.

Reduced form for <u>outcomes</u> is then:

$$Y_{ij} = (\pi\alpha + \phi) X_{ij} + \gamma_j^Y + \pi\upsilon_{ij} + \varepsilon_{ij} \quad (4)$$

where $\gamma_j^Y = \pi\gamma_j^Z + \lambda G_j + \mu_j \quad (5)$

is the reduced form geographic effect on outcomes

Empirical strategy

This π can be estimated consistently by OLS under a weaker assumption than exogeneity of Z_{ij} in (1), namely that only the geographic placement is conditionally exogenous, i.e.

$$Cov(\eta_j, \mu_j | G_j) = 0$$

• We assume that we have sufficient geographic controls to make it plausible that the latent geographic effects on outcomes and placement can be treated as uncorrelated.
• However we still allow for endogenous individual placement within-areas, i.e.

$$Cov(\varepsilon_{ij}, \upsilon_{ij}) \neq 0$$

We estimate the reduced form eqs (2) & (4), retrieve the geographic effects and estimate:

$$\hat{\gamma}_j^Y = \pi \hat{\gamma}_j^Z + \lambda G_j + \mu_j \qquad (6)$$

Data

- Rural areas of 9 countries:
  - Yemen (2005); Morocco (1998)
  - Malawi (2004); Uganda, Madagascar (2005); Rwanda (2000)
  - India (1998-99); Pakistan (1991); Nepal (1996, 2003);
- Outcome variables:
  - whether women 15+ participated in any off-farm market work in past year;
  - whether a girl/boy 5-19 attended school last year
- Water access: household time to walk to nearest water source
- Explanatory variables:
  - outcome regressions: large set of hh & indiv characteristics; interview month, community fixed effects (to capture both observed and unobserved geographic effects).
  - community regressions: wide range of non-water related community characteristics; community interview month

Share of total variance explained by geographic dummy variables (R^2)

	Access to water	Women's off farm work	Share of rural children 5-19 in school	
			Girls	Boys
Yemen	0.70	0.18	0.24	0.16
Morocco	0.49	0.19	0.22	0.21
Uganda	0.32	0.17	0.17	0.15
Madagascar	0.51	0.31	0.15	0.16
India	0.38	0.15	0.17	0.13
Nepal	0.48	0.20	0.28	0.16
Pakistan	0.48	0.23	0.21	0.12

Note: R^2 from a regression of each outcome on geographic dummies.

Geography plays a considerable role in explaining access to water and our outcome variables

Rural access to water

	% with water t=0	Average minutes (SD) to water 1 way t≠0	% adults 15+ spending time in water collection	
			Women	Men
Yemen	34.1	20 (16)	58	8
Morocco	21.0	21 (28)	-	-
Uganda	5.0	33 (28)	68	40
Madagascar	3.9	25 (25)	-	-
India	21.2	10 (12)	84	-
Nepal	41.3	14 (15)	79	37
Pakistan	68.6	42 (48)	61	-

Are there impacts of access to water on women's off-farm work?

	Share of rural women 15+ in off-farm work		Impact of a 1hr reduction in time to water	
	all	wage	all	t-stat
Yemen	3.3	0.6	0.02	1.19
Morocco	16.3	12.4	-0.01	-0.16
Uganda	31.5	29.3	0.03	0.94
Madagascar	39.9	19.6	-0.01	-0.29
India	21.7	19.6	-0.10	-0.82
Nepal	25.2	21.3	0.12	1.16
Pakistan	21.7	16.8	-0.02	-0.23

We find no significant impacts on women's off-farm work

Are there impacts of access to water on schooling?

	Share of rural children 5-19 in school		Impact of a 1hr reduction in time to water	
	Girls	Boys	Girls	Boys
Yemen	0.36	0.63	0.102**	0.107***
Morocco	0.30	0.58	0.159**	0.212***
Uganda	0.76	0.78	-0.021	0.007
Madagascar	0.68	0.69	-0.004	-0.038
India	0.59	0.69	0.027	-0.011
Nepal	0.41	0.59	0.219**	0.173**
Pakistan	0.28	0.56	0.145**	0.155**

Sizeable impacts in places where enrollments are low overall, and gender gaps are pronounced (Yemen, Morocco, Nepal, Pakistan)

Conclusions

- No evidence that improved access to water leads to greater off-farm work for women.
- In countries where substantial gender gaps in schooling exist, both boys' and girls' enrollments improve as a result of a reduction in time to water.
- Some signs of impacts on child health.
- Suggests that women's allocation of time to market work is not the main channel linking this aspect of infrastructure to child welfare.
- The more direct channels linking access to water to child outcomes, such as through women's time for child care, child labor in the home and water quality, appear to be more relevant.