Paying for Digital Information: Assessing Farmers' Willingness to Pay for a Digital Agriculture and Nutrition Service in Ghana

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• Classic economic theory assumes market actors have perfect information
• Widespread evidence of information gaps
  • Particularly acute in remote rural areas of developing countries
• Potentially large economic returns to resolving these information problems
Mobile Phone Access and ICTs

• 8 in 10 people in the developing world have access to a mobile (World Development Report, 2016)

• Important knowledge gaps in these households

• Information Communication Technology interventions (ICTs) may help disseminate information
  • More than 140 ICT for agriculture deployments in 2015 (Aker et al., 2016)
  • More than 300 ICT for health or nutrition deployments since 2010 (GSMA)

• Mixed evidence on their effectiveness
Price Subsidies and Willingnes to Pay

- ICTs are cheap, not costless
- Often ICTs for Ag. and Health are heavily subsidized initially (Fafchamps and Minten, 2012)
  - May help users gain experience to strengthen demand
- Demand often drops when subsidies end
  - Exhaust new material; information can be shared; dissatisfaction with content; difficulty using program
- We know little about initial willingness to pay (WTP) for ICTs in agriculture or health
  - Key for understanding whether ICT programs should be publicly provided or subsidized
Research Questions

- What is WTP for a nutrition-sensitive agriculture ICT among rural farmers in Ghana?
  - Are initial subsidies necessary?
- What are the determinants of WTP for the service?
  - Gender; program framing (agriculture, agriculture and nutrition)
- Does WTP predict subsequent use?
  - Screening effects?
Program

- Vodafone Farmers' Club (VFC) service (current monthly price 0.5 GhC)
  - Agriculture and nutrition SMS and voice messages in 71 districts of Ghana
  - Content includes monthly weather (3), price (1), agriculture tips (3), nutrition tips (3)
  - Free access to an ag extension and nutrition call center
  - Favorable rates for messaging and calls
- Farmers are profiled to region, language, and crop choice
Study design

• WTP exercise was part of a larger study that estimates the impact of the VFC service through a two-stage randomized encouragement design.
  • 1st stage: Enumeration areas (EAs) randomly assigned to receive extra marketing of VFC service (treatment) or not receive the extra marketing (comparison)
  • 2nd stage: In treatment EAs, households were randomly assigned to either receive an agriculture script or agriculture+nutrition script and to target either male or female adult
• Study in 10 rural districts in Upper West and Central regions
  • All with markets included in VFC price information, low baseline VFC subscription rates, <10 miles from a VF phone tower
• WTP exercise conducted at the end of the baseline survey in treatment households only

• WTP exercise was a 2-stage variant of Becker - DeGroot - Marschak (BDM) method
  • Randomly selected individual is read either agriculture or agriculture+nutrition script
  • Individual is asked how much they are willing to pay for VFC service
    • Must be able to pay the bid amount that day
  • Random price drawn
  • If bid is greater than or equal to the price drawn, he/she is offered the product at the randomly drawn price.
  • If bid is below the price drawn, he/she is not offered the product
Household Survey and Vodafone Data

- Baseline household data
  - March-May 2017
  - Sample: 1703 two-person households in treatment EAs, of which 1607 completed WTP exercise
- Data on SIM card activation 2-12 months after household survey
- Data on the share of voice calls listened to ~10 months after activation
  - Voice calls contained ag. and nutrition information
  - Calls lasted ~45 seconds, on average
Empirical Strategy

- Inverse demand curve, $p \in \{0.2, 3\} \text{ GHC}$:

$$\text{Buy}_{ihr}(p) = 1\{WTP_{ihr} \geq p\} \quad (1)$$

- Difference in demand by sub-treatment group:

$$WTP_{ihr} = \alpha + \delta_{\text{nutrition}}_{hr} + \gamma_{\text{female}}_{hr} + X'_{ihr}\beta + \pi_r + \varepsilon_{ihr} \quad (2)$$

Test for screening effects:

$$USE_{ihr} = \alpha + \theta WTP_{ihr} + \delta_{\text{nutrition}}_{hr} + \gamma_{\text{female}}_{hr} + X'_{ihr}\beta + \pi_r + \varepsilon_{ihr} \quad (3)$$
Demand for VFC

Figure: Inverse demand curve for VFC service
Demand for VFC by marketing script

Figure: Inverse demand curve for VFC service by marketing script

Hidrobo et al. WTP for Information
Demand for VFC by gender

Figure: Inverse demand curve for VFC by gender
Determinants of WTP and use of service

- What is correlated with WTP?
  - OLS estimates of equation (2) suggest that:
    - Nutrition knowledge is positively correlated with WTP
    - Females have lower WTP
    - Household Dietary Diversity is positively correlated with WTP
    - Observable characteristics explain little consumer demand

- What is correlated with use of the service?
  - OLS estimates of equation (3) suggest that:
    - WTP is positively correlated with use (share of voice calls listened to)
    - Marketing script not correlated with use
    - Female targeted households have lower use
    - Total value of ag. production positively associated with use
    - Household dietary diversity and distance to markets negatively associated with use
    - Observable characteristics explain little variation in use
WTP and Information Dissemination (Use)

Share of voice messages listened to in January and February 2018

Willingness to pay (GHC)

- 95% CI
- Point Estimate
What Explains the Gender Gap in WTP?

Non-Cocoa Farming Households

Cocoa Farming Households

Hidrobo et al.  WTP for Information
Cocoa and the Gender Gap in WTP

- Female - Male difference in demand driven by cocoa farming households
- No gender gap in non-cocoa farming households
- Cocoa not grown in Upper West region (maize and groundnut)
- Central region cocoa season ~ Sept.-March
  - Survey after the conclusion of the main cocoa growing season
- Cocoa farming typically dominated by men
Conclusions

- 95% of individuals willing to register for VFC at the monthly market price (0.5 GhC)
- At all prices above 1 GhC, men have significantly higher demand than women
  - Mechanisms? ↑ male control resources in cocoa farming households; ↓ in total resources after growing season
- Observable characteristics explain little of the variation in WTP
- Positive screening effect driven by the right tail of the WTP distribution