

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

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Information and Development

- 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 Willingness 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?

- 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 callcenter
 - 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

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

$$Buy_{ihr}(p) = 1\{WTP_{ihr} \geq p\} \quad (1)$$

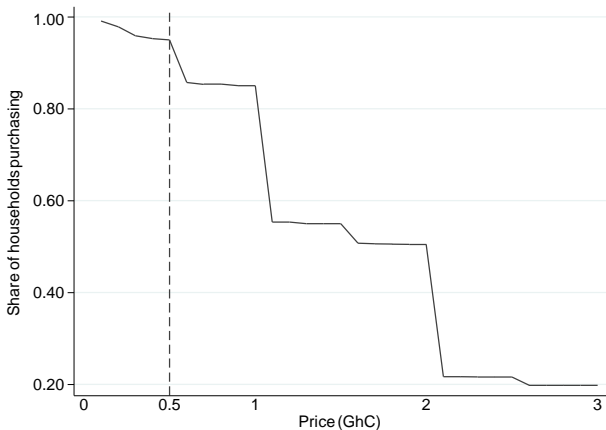
- Difference in demand by sub-treatment group:

$$WTP_{ihr} = \alpha + \delta nutrition_{hr} + \gamma female_{hr} + X'_{ihr}\beta + \pi_r + \varepsilon_{ihr} \quad (2)$$

Test for screening effects:

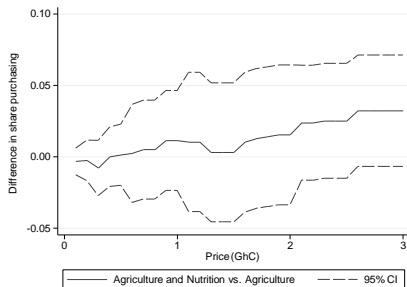
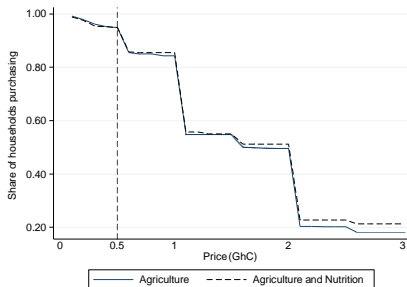
$$USE_{ihr} = \alpha + \theta WTP_{ihr} + \delta nutrition_{hr} + \gamma female_{hr} + X'_{ihr}\beta + \pi_r + \varepsilon_{ihr} \quad (3)$$

Figure: Inverse demand curve for VFC service



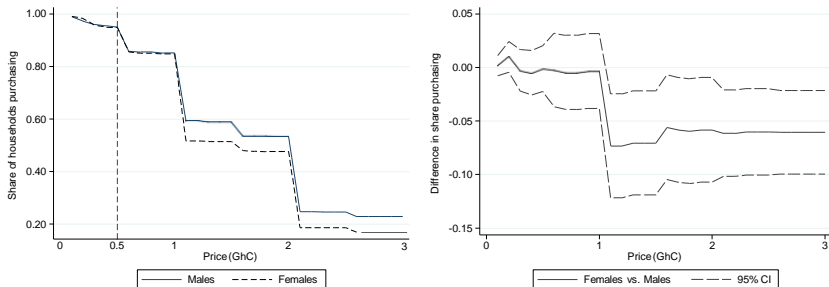
Demand for VFC by marketing script

Figure: Inverse demand curve for VFC service by marketing script



Demand for VFC by gender

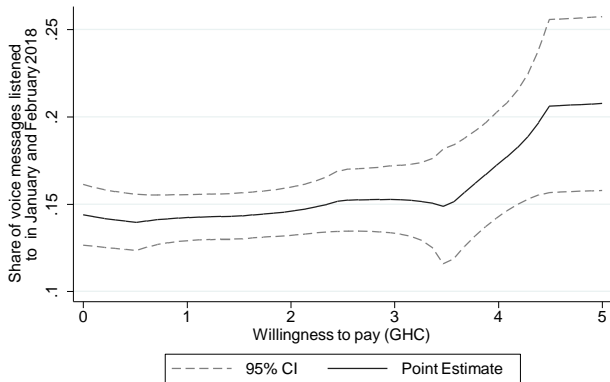
Figure: Inverse demand curve for VFC by gender



Determinants of WTP and use of service

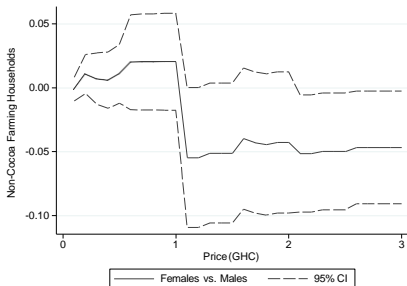
- What is correlated with WTP?
- OLS estimates of equation (2) suggest that:
 - Nutrition knowledge is positively correlated with WTP
 - Females have lower WTP
 - Household Dietary Diversity is positively correlated with WTP
 - Observable characteristics explain little consumer demand
- What is correlated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

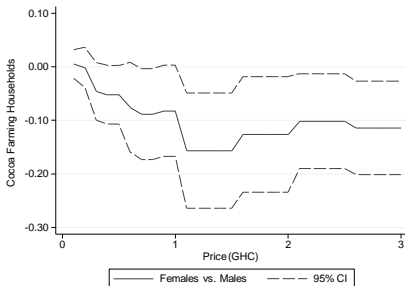


What Explains the Gender Gap in WTP?

Non-Cocoa Farming Households



Cocoa Farming Households



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? \uparrow male control resources in cocoa farming households; \downarrow 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