The Value and Preferences for Improved Cook Stoves: A Choice Experiment in Ethiopia

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Where is Ethiopia?

• Ethiopia is in Eastern Africa, in a region that has the highest rates of deforestation in the world.
• Nearly 30% of Ethiopians live on less than $0.60 per day.

Why do Stoves Matter?

• Traditional stoves are bad for human health: high correlation between traditional stoves use and symptoms of respiratory illness (Duflo, Greenstone, Hanna, 2008).
• There are gender- and age-differentiated hardships and health impacts: women below age 5 and between 30-60 suffer the most (Parikh, 2011).
• Bad for the environment: deforestation and forest degradation for firewood.
• New stove technology provides a win-win solution for development and the environment (Simon, Bumpus & Mann, 2012).

Previous Literature

• Characteristics like income, education and urban location are positively correlated with clean stove adoption in most studies (Takama, Tsephel, Johnson, 2012).
• In Ethiopia, adoption rates have steadily increased over time; economic factors are important determinants of adoption behavior (Beyene & Koch, 2013).
• In Mexico, community pressures can create incentives for adoption of clean fuel (Blackman & Bannister, 1998).

Research Questions

• How do Ethiopians value new, clean stove technology?
• How do different demographic characteristics affect someone’s marginal willingness to pay (MWTP) for this technology?
• How does gender composition of a household affect MWTP?

Data and Methods

Choice Experiment Surveys
• Stated preference valuation tool to find WTP
• Estimates values of individual features

Survey attributes
• Durability of stove
• Time reduction
• Fuel reduction
• Smoke reduction
• Cost

The Survey Instrument
• Demographic Information
• Stove/fuel use information
• Seven choice questions

Survey Distribution
• 504 households surveyed
• 36 different sites chosen using stratified proportionate random sampling

The Models
• Conditional Logit model (CL): $V_j = \sum_{k=1}^{K} \beta_k X_{ij} + \beta_p P_i + \epsilon_i$ which provides limited analysis or unobserved heterogeneity
• and Mixed Multinomial Logit model (MMNL) to account for preference heterogeneity: (with cost as a non-random independent variable) $U_{ij} = \sum_{k=1}^{K} \beta_k X_{ij} + \beta_p P_i + \epsilon_{ij}$
• in which the marginal willingness to pay equals the coefficients of the attribute divided by the coefficient of the cost term: $MWTP = -\frac{\beta_k}{\beta_p}$
• including coefficients for each attribute, and an interaction term for durability*cost

Results

The most important attributes in determining choice:
• CL: Durability and fuel reduction are MMMNL: Smoke and fuel reduction in the basic model; durability in the interaction model

The positive cost coefficient means that people want more expensive stoves, but the interaction term suggests that cost and durability were substitutes for one another.

MWTP for Attributes, for Demographic Groups

Overall, households with fewer kids and fewer females are willing to pay more for new stoves.

Durability and smoke reduction are most commonly the attributes with the highest MWTP, with fuel reduction close behind. MWTP for time reduction is consistently lower than the other attributes.

Conclusions

• Ethiopians are willing to pay a considerable amount for new stoves.
• Households demographics and gender composition significantly affect MWTP for new stove technology.
• Households with many children or females are less likely to put a high value on a stove because they have more people who can take care of the cooking.
• People who had seen stoves before had higher WTP, so stove distribution and use should be widely advertised.
• Cost and durability are substitutes: People think that a more expensive stove will be of higher quality.
• Clean stove availability is the main reason why people have not adopted the new technology.

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