Understanding heterogeneous preferences for water supply services among the urban poor:

Experience from Maputo, Mozambique

Valentina Zuin & Jenna Davis
Stanford University

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Outline

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  - Generalized Multinomial Model and Latent Class Model
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Motivation

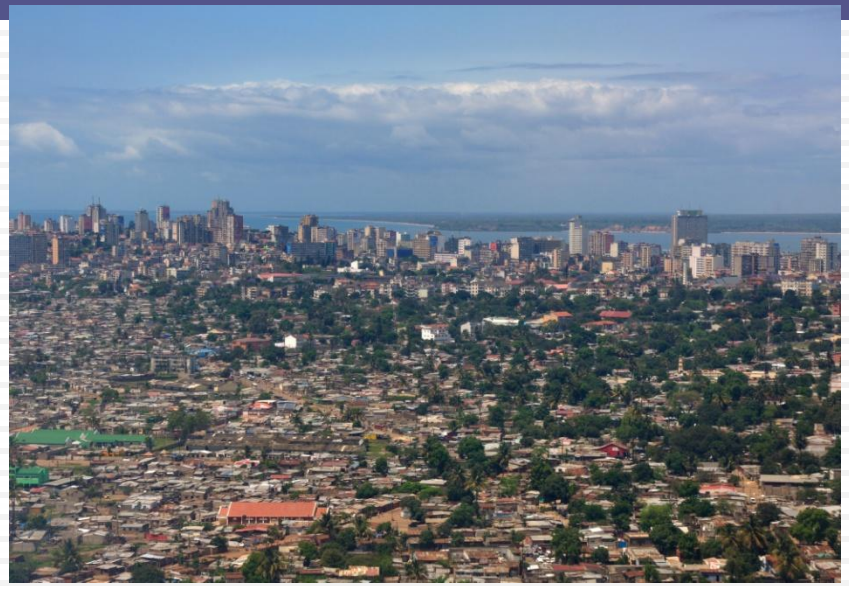
- In the last 25 years, increasing efforts to understand consumers' demand and willingness to pay (WTP)
- Main methodology: Contingent valuation (CV)
- Limits of CV:
  - Respondents are offered 1 or 2 scenarios
  - WTP for a bundle of service attributes
  - Assumes homogeneity of preferences across users
- Alternative: Choice Experiment methodology (CE)
- Few CE studies (Hope 2006, Abou-ali & Carlsson 2004), none specifically looking at urban water supply service attributes

Research Question

- What are the water supply service features that consumers without individual household connections care the most about?
- To what extent and in what ways do preferences differ across subsets of consumers living in the same community?

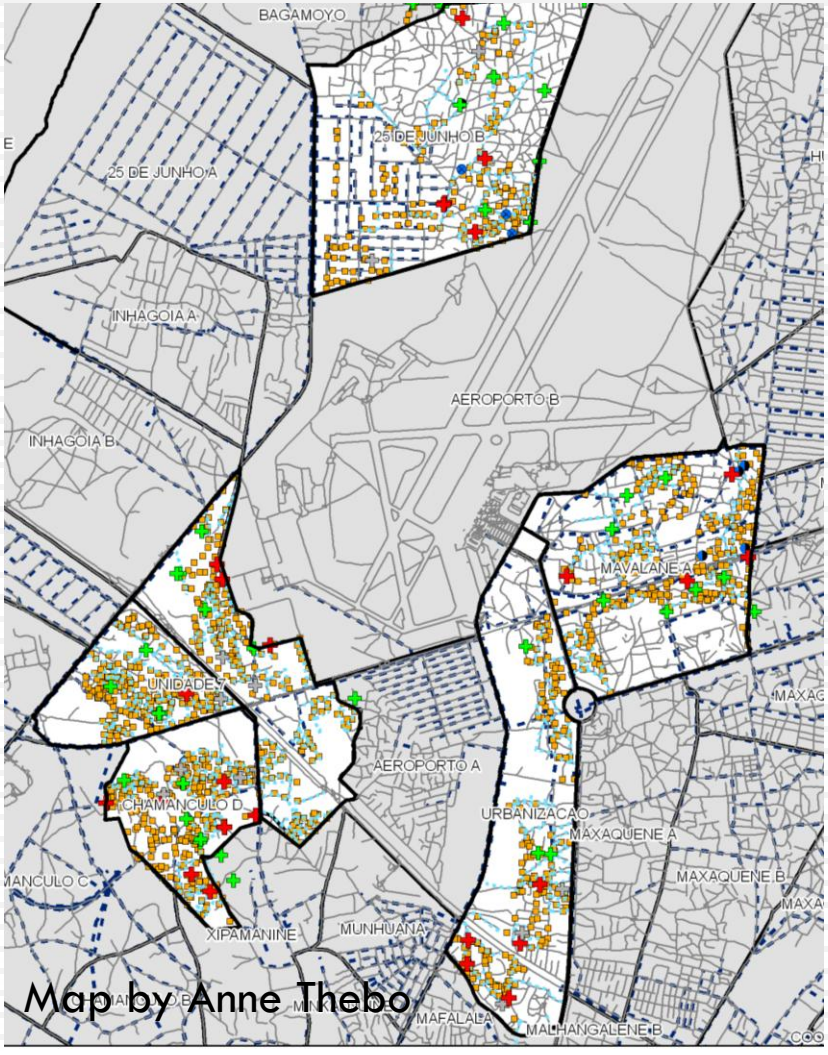
Study site: Maputo, Mozambique

- Rapid population growth after independence (1975), 81% living in peri-urban areas
- 53% of the population living on less than US$1 day
- 26% of the population relying on neighbors and 26% on public standpipes for water supply



Sample frame

- 1429 households
- 6 neighborhoods in peri-urban Maputo (combined population =106,000)
- Systematic sampling



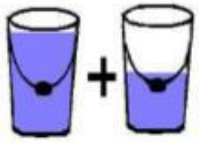
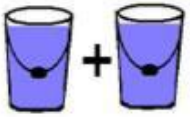
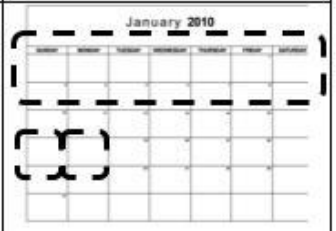
Choice experiment

- 5 attributes: price per unit volume, fetching time per day, quantity of water, type of service provider and frequency of payment
- Each attribute has two or three possible values

Attribute	**Possible values**		
Price	*Status quo*	½ *status quo*	1½ X status quo
Fetching time	*Status quo*	½ *status quo*	1½ X status quo
Volume of supply	*Status quo*	1½ X *status quo*	2 X status quo
Payment frequency	Monthly	Weekly / daily	-
Provider type	Utility	Neighbor or small-scale independent provider	-

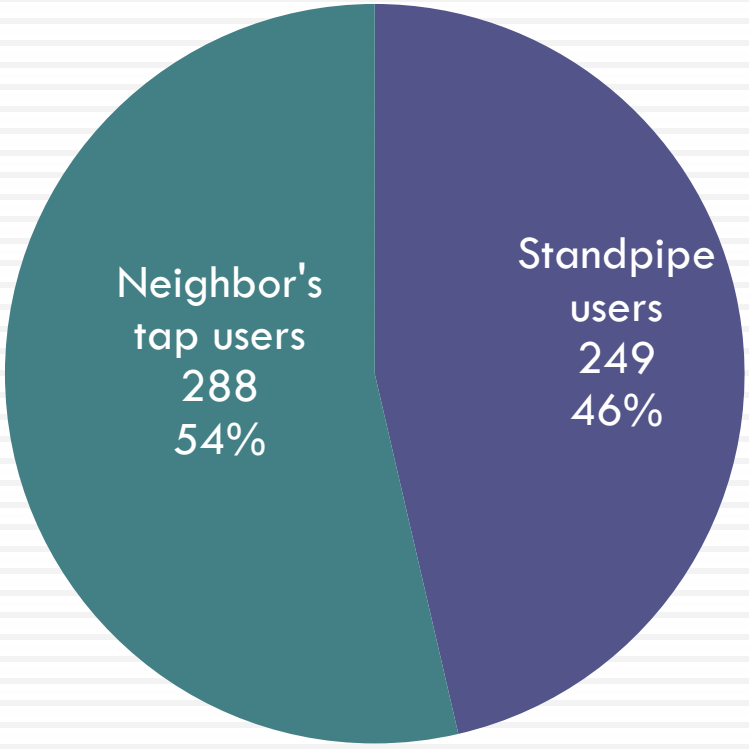
Example of a choice card

- 10 scenarios, evaluated in the same order

Situação A					
Situação B				ÁGUAS DE MOÇAMBIQUE	
Status quo					

TEST

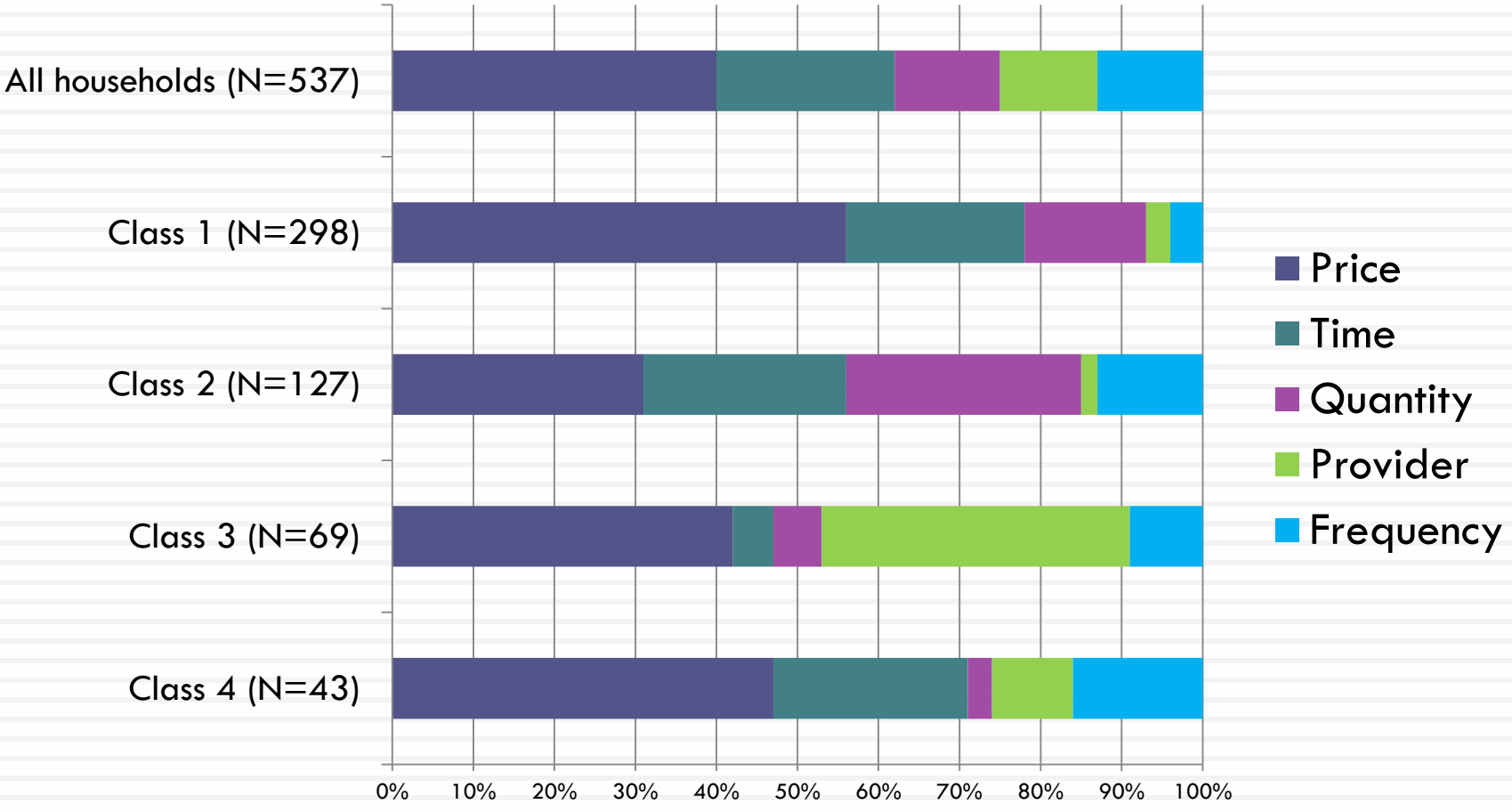
Findings: household characteristics



N=537

- Median size: 6.4 people
- 83% owners, 65% have lived in their neighborhood > 20 years
- Monthly household expenditure: US$170
- 62% of the households live on less than US$1/person/day

Findings: Household preferences are heterogeneous



Findings: generalized multinomial *versus* latent class model

Respondents were (all else held constant):

- 6 times more likely to opt for an option that includes a 50% reduction in the money cost of water supply
- 2.5 times more likely to choose an option with a 50% decrease in the time costs of supply
- 2.4 times more likely to choose an option with a 50% increase in the volume of water obtained
- 1.8 times more likely to select an option with utility provided service (as opposed to private provider)
- 1.8 times more likely to select an option with monthly billing

Findings: generalized multinomial *versus* latent class model

- Only 59% of respondents prioritize price most (class 1 and 4)
  - Class 4 (8%) households differ from class 1 (51%) in that they are strongly averse to price increases, insensitive to decreases
- The LC model reveals the heterogeneity of preferences for volume of water supplied:
  - Significantly affects the likelihood of selecting a service scenario for Class 2 households (24%), but
  - Has no effect on scenario choice for Classes 3 and 4 (21% of households).
- Only 21% of households (Class 3 and 4) are significantly more likely to choose a scenario with utility provided water

Findings: Determinants of class membership (N=475)

	Class 2 (N=97)		Class 3 (n=60)		Class 4 (n=34)	
	Beta	Exp( )	Beta	Exp( )	Beta	Exp( )
Expenditure *per capita* per day (US$) (LN)	0.65***	1.92	-0.08	0.93	0.46	1.58
At least one HH head completed secondary education (dummy)	-0.16	0.85	1.02**	2.78	0.21	1.24
Number of times household gave /received help in the prior week	0.15**	1.16	-0.05	0.95	-0.01	0.99
Number of water sources available to household	0.03	1.03	0.56***	1.75	0.32	1.37
Total daily fetching time (minutes)	0.00	1.00	0.001**	1.00	0.00	1.00
Currently pays for water with a flat monthly fee (dummy)	0.23	1.25	0.05	1.06	0.94**	2.57
% of income spent on water	-0.05**	0.95	-0.06**	0.94	-0.02	0.98

Notes: Reference class is 1 (N=230). Model includes locational (neighborhood) dummies.
***p<0.01 **.01≥p<0.05 **.05≥p<0.10
Number of observations=421 Quasi R^2=0.25

Conclusions

- Water supply preferences of peri-urban residents are hetero-geneous, even among households with similar demographic & socio-economic characteristics
- Price and time are the most important attributes overall, but price is the most important attribute for only 59% of households
- Volume of water comparatively important for only 25% of households (class 2)
- Utility supplied water is preferred over private operators, but this is a priority only for 13% of the sampled households
- Households prefer to pay monthly, although payment frequency is the least important attribute

We look forward to living in a world where 20-liter jerricans are used to play music, rather than carry water.

-- The authors

valezuin@stanford.edu & jennadavis@stanford.edu

Thank you

Findings: Comparing the GML with the Latent class model

	GML model (all HHs)	Latent class model			
		Class 1	Class 2	Class 3	Class 4
No price change (relative to 0.5-fold decrease)	-1.88***	-5.61***	-1.82***	-2.78***	0.14
	(0.13)	(0.88)	(0.46)	(0.44)	(0.46)
Price increase, 1.5-fold (relative to 0.5-fold decrease)	-1.79***	-3.77***	-1.27***	-0.59***	-2.51***
	(0.07)	(0.31)	(0.21)	(0.20)	(0.32)
Fetching time	-0.93***	-2.01***	-1.33***	-0.30**	-1.20***
	(0.06)	(0.30)	(0.16)	(0.19)	(0.27)
Volume	0.87***	-2.17*	2.43***	-0.54	-0.22
	(0.26)	(1.20)	(0.71)	(0.83)	(0.91)
Provider (dummy, 1=private provider)	-0.59***	-0.29	-0.15	-2.46***	-0.56**
	(0.07)	(0.25)	(0.19)	(0.27)	(0.27)
Payment frequency (dummy, 1=monthly)	0.63***	0.37**	0.74***	0.61***	0.86***
	(0.06)	(0.17)	(0.15)	(0.21)	(0.20)
% correctly predicted	*76*	*83*			
N	*537*	*298*	*127*	*69*	*43*
Notes	Standard errors in parentheses. Models included locational (neighborhood) dummies. ***p<0.01 **.01≥p<0.05 *.05≥p<0.10 # of cases=537. # of replications=5369.				