

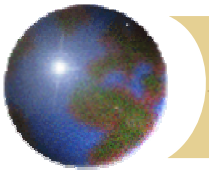
Modeling Demand for Telecom Services Using Surveys

Paul Rappoport, Temple University
James Alleman, University of Colorado

Experts Dialogue: Adjusting Forecasting Methods to the
Needs of the Telecommunications Sector

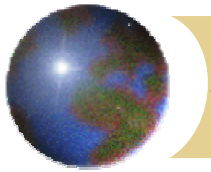
International Telecommunication Union

Geneva, Switzerland
25-26 October 2004



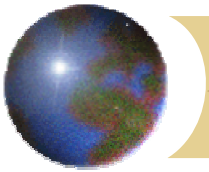
Outline

- ✦ Statement of the Problem
- ✦ Theoretical Structures
- ✦ Surveys and Data
- ✦ Results
- ✦ Conclusions



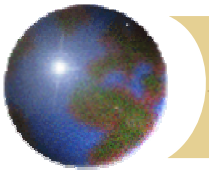
Problem(s)

1. Can willingness to pay (WTP) information be obtained from surveys and used to describe “demand” ?
2. How are estimates of elasticities computed from WTP studies?
3. Can the use of WTP be generalized and applied to a range of products and services?



Models of Consumer Choice

- ✦ Probability Models
 - ▣ Probit model of WTP
 - ▣ Discrete – continuous choice models
- ✦ Contingent Valuation
 - ▣ Lognormal Demand
- ✦ Conjoint and related models



Probability models

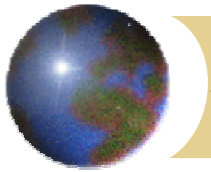
✦ Probit Model

- ✦ Ask if a product is of interest
- ✦ Ask how much more they would be willing to pay for a product with specified features

✦ Discrete – continuous

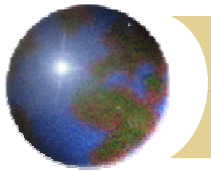
- ✦ Stage 1 - assess level of interest
- ✦ Stage 2 – assess how much more they would be willing to pay

✦ Difficult to estimate demand (and elasticities)



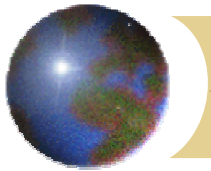
Discrete Choice

- ✦ Models from Surveys
 - ☒ Dial-up vs Cable Modem
 - ☒ Dial-up vs DSL
 - ☒ Cable Modem vs DSL



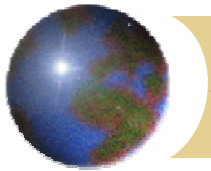
Access Elasticities

	Dial-up	CM
Dial-up	-0.230	0.518
CM	0.010	-0.895



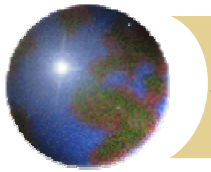
Dial-up vs DSL Access

	Dial-up	DSL
Dial-up	-0.168	0.423
DSL	0.040	-1.364



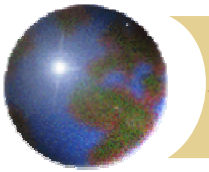
CM vs DSL Access

	Cable Modem	DSL
Cable Modem	-0.587	0.766
DSL	0.618	1.462



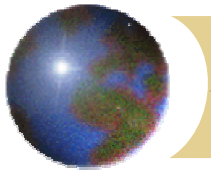
Issues

- ✦ Assumes respondents has a joint decision to make – (1) whether or not to pay more for something and (2) how much more to pay.
- ✦ Estimation problems – question (2) represents a censored sample
- ✦ Requires a complex sampling frame



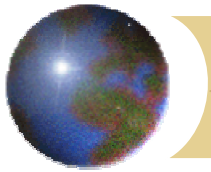
Conjoint

- ✦ Requires a complex sampling framework – generally time consuming and expensive.
- ✦ Typically limited to small samples
- ✦ Address product attributes
- ✦ Focus is market research and segmentation – not demand modeling



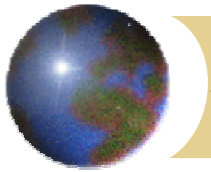
Contingent Valuation: Overview

- ✦ Method that requires asking people directly, in a survey, how much they would be willing to pay for a specific service.
- ✦ “Contingent” in the sense that people are asked their willingness to pay, contingent on specific hypothetical scenario.



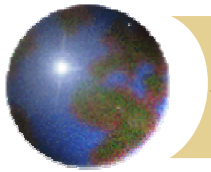
Contingent Valuation and Demand

- ✦ Focus is on the price of the service – thus economic value associated with a service is generally bounded
- ✦ Application is directed towards the estimation of price elasticities
- ✦ Underlying theoretical structure is lognormal demand (common for most choice models)
- ✦ Demand curve – representation of WTP



Lognormal Demand Curves

- ✦ Let p_{oi} be the tolerance price of the i th household
 p be the actual market price
 $q_i = 1$ if $p_{oi} \geq p$
- ✦ Then $q_i = 0$ otherwise
- ✦ Assuming that p_{oi} is distributed as a lognormal with parameters μ_p and σ_p^2



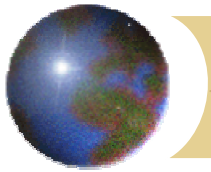
Lognormal Demand

We have:

$$P(q_i = 1 | p) = P(p_{oi} \geq p) = 1 - \Lambda(p; \mu_p, \sigma_p^2)$$

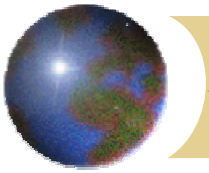
Let Q represent the expected proportion of buyers we have:

$$Q(p) = 1 - \Lambda(p; \mu_p, \sigma_p^2) = \Lambda(1/p; -\mu_p, \sigma_p^2)$$



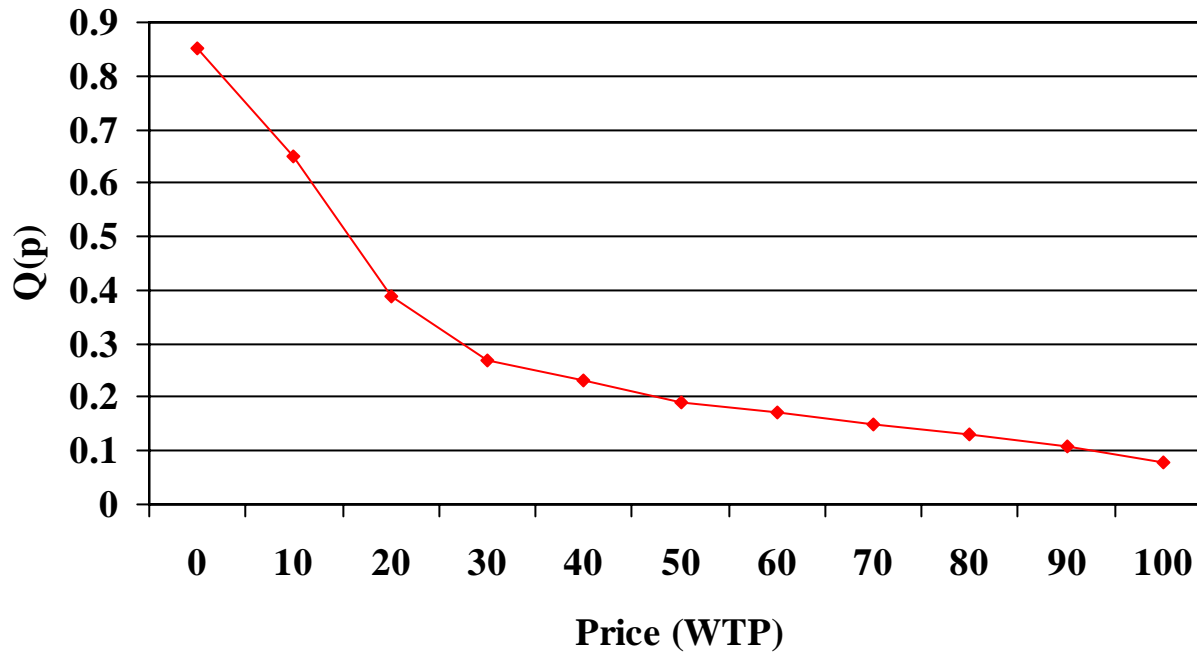
*Suggestion by Cramer**

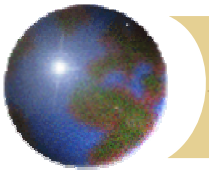
- ✚ Frame questions in a survey to ask the most one would be willing to pay for a product or service
- ✚ Construct the cumulative distribution of responses as a function of the observed WTP responses
- ✚ Resulting distribution, under reasonable assumptions, is a demand function



Lognormal Demand Cont.

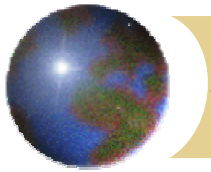
Demand for Product X





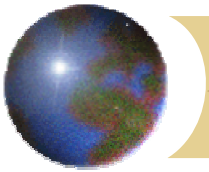
Survey Methodology

- ✦ Sampling Frame
 - ▣ Qualify Respondent
 - ▣ Use RDD approach
- ✦ Sample Size
- ✦ Framing the Questions
- ✦ The Data



Who is a Qualified Respondent?

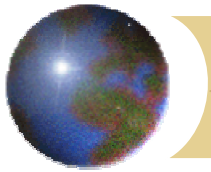
- ✦ Currently Subscribe to Broadband?
 - ▣ Length of time?
 - ▣ Current provider
 - ▣ Price
- ✦ If Not, is Broadband Available?
 - ▣ Why not
 - ▣ Likely



Sampling Methodology

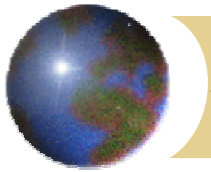
✦ Random Digit Dialing

- ✦ All households in the underlying population have the same probability of being selected
- ✦ Telephone based
- ✦ Issues
 - Fatigue (number of questions)
 - Complexity (trying to ask too much)
 - Telephone issues (Do not Call)



Sample size and related issues

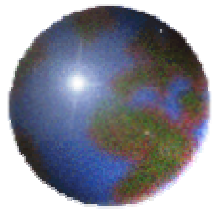
- ✦ Trade off between size and cost
- ✦ WTP analysis requires large number of responses (> 2000)
- ✦ Projection to underlying population requires computing weights correctly
- ✦ Historically, mixed results when asking about expenditures



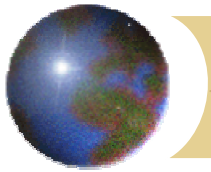
Framing the question:

Switching Intent

- ✦ Ask about relative importance
 - ✦ Quality
 - ✦ Price
 - ✦ Provider
- ✦ How does they rate their current provider
- ✦ Ask about likelihood to switch
- ✦ Ask about reasons for switching

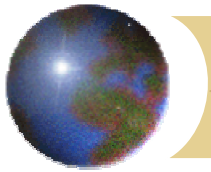


Demand for Broadband



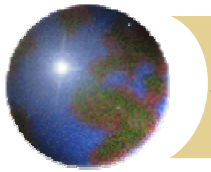
Broadband: Consider

- ✚ Little price variation at a point in time
- ✚ Observed price is market price – not Willingness to Pay
- ✚ Broadband – confusion? Requires definition (DSL, Cable Modem, ISDN?)
- ✚ Does Broadband availability matter
- ✚ What does a non response mean?



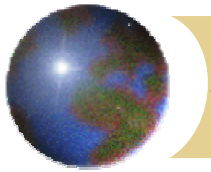
Survey Data

- ❖ 2,011 responses to an omnibus survey administered during the first quarter, 2002.
- ❖ Questions included for broadband service (DSL, Cable Modem), and other electronic products (DVD players and Digital Cameras).
- ❖ Questions were included covering WTP



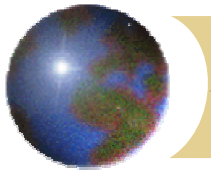
Phrasing the Question

- ❖ Question 1 What is the least price at which the respondent would consider the item too expensive
- ❖ Question 2 What is the highest price at which he would dismiss it as a shoddy article of inferior quality



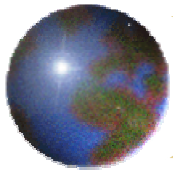
Computation

- ✦ Compute the fraction of respondents quoting a threshold price that exceeds a price p .
- ✦ Plot $Q(p)$ against p
- ✦ Estimate lognormal parameters from the data
- ✦ Elasticity given by $\pi = \frac{d \log Q(p)}{d \log(p)}$



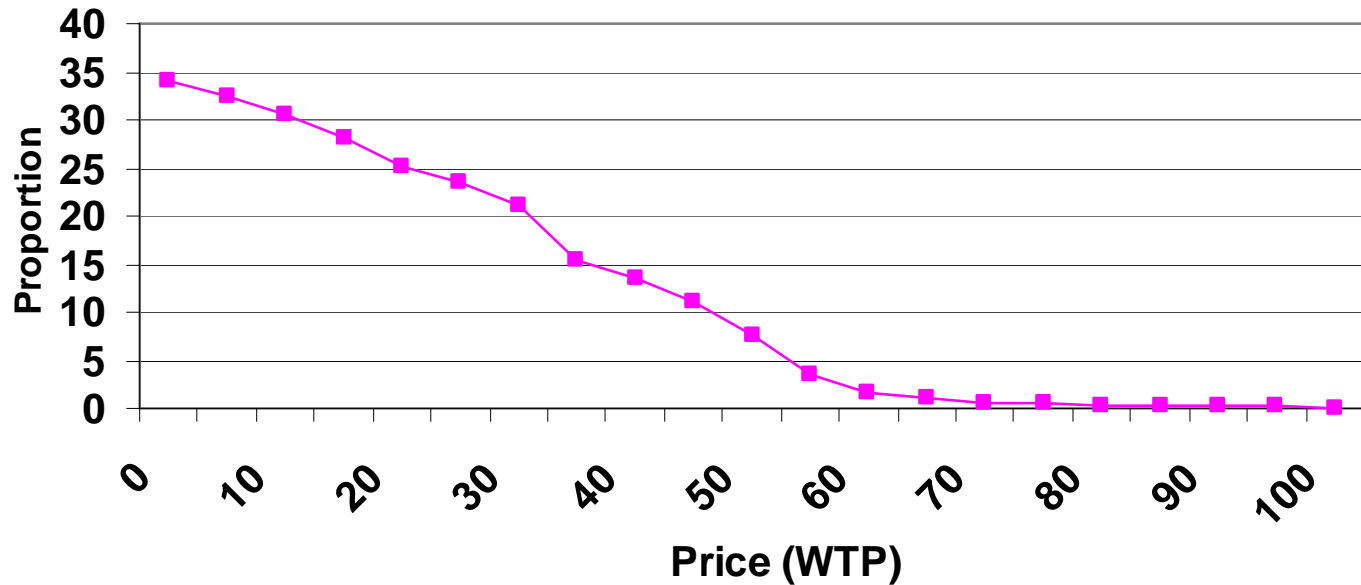
Results

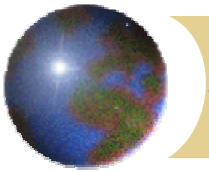
- ⊕ Demand for Cable modem Service
- ⊕ Demand for DSL Service
- ⊕ Demand for DVD Players
- ⊕ Demand for Digital Cameras



Preliminary Findings: Demand for Cable Modem Service

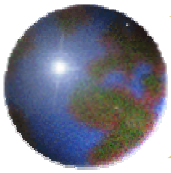
Figure 1: Cable Modem Demand





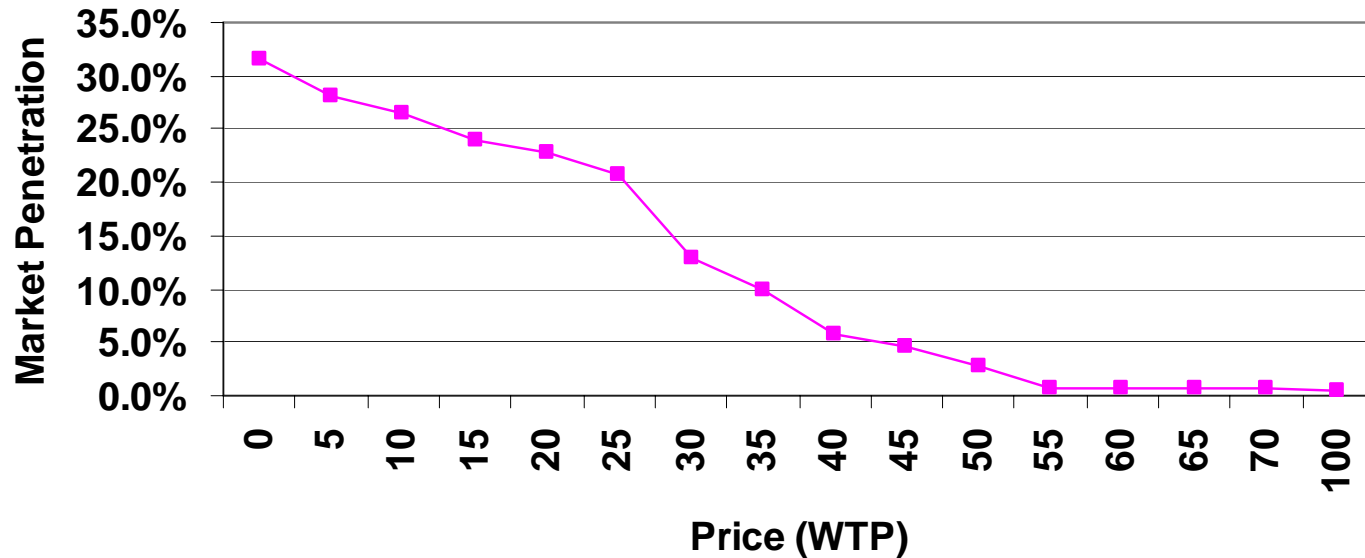
Cable Modem Elasticity

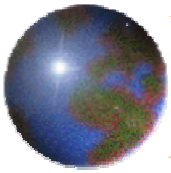
Price	Elasticity
\$20	-0.53
\$30	-0.59
\$40	-0.75
\$50	-0.98
\$60	-2.25
\$70	-3.34



Preliminary Findings DSL

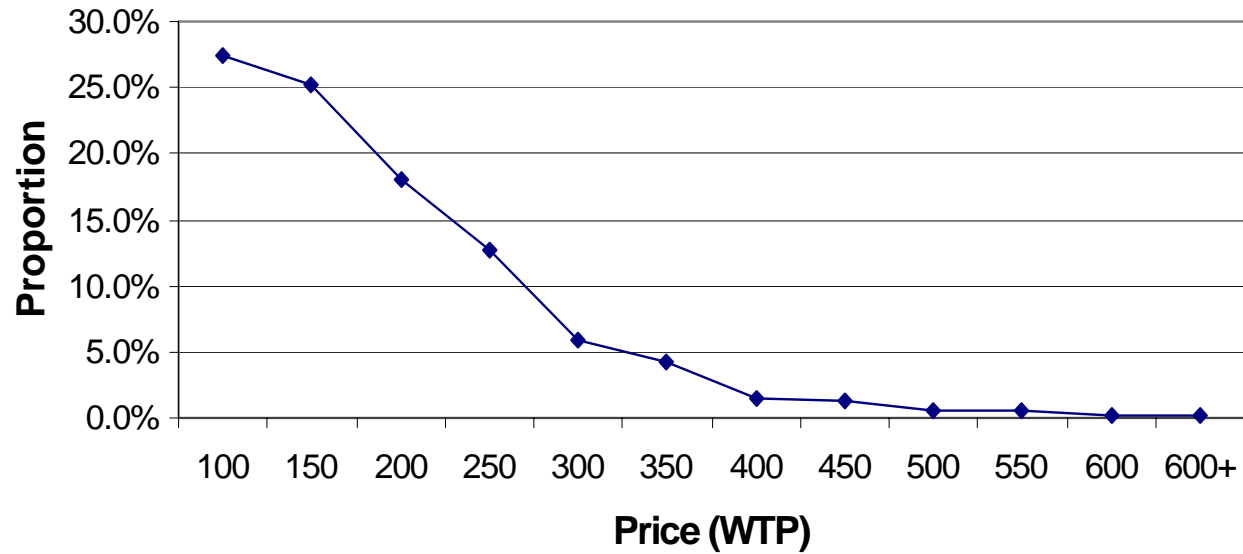
The Demand for ADSL

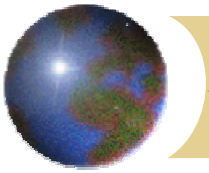




DVD Players

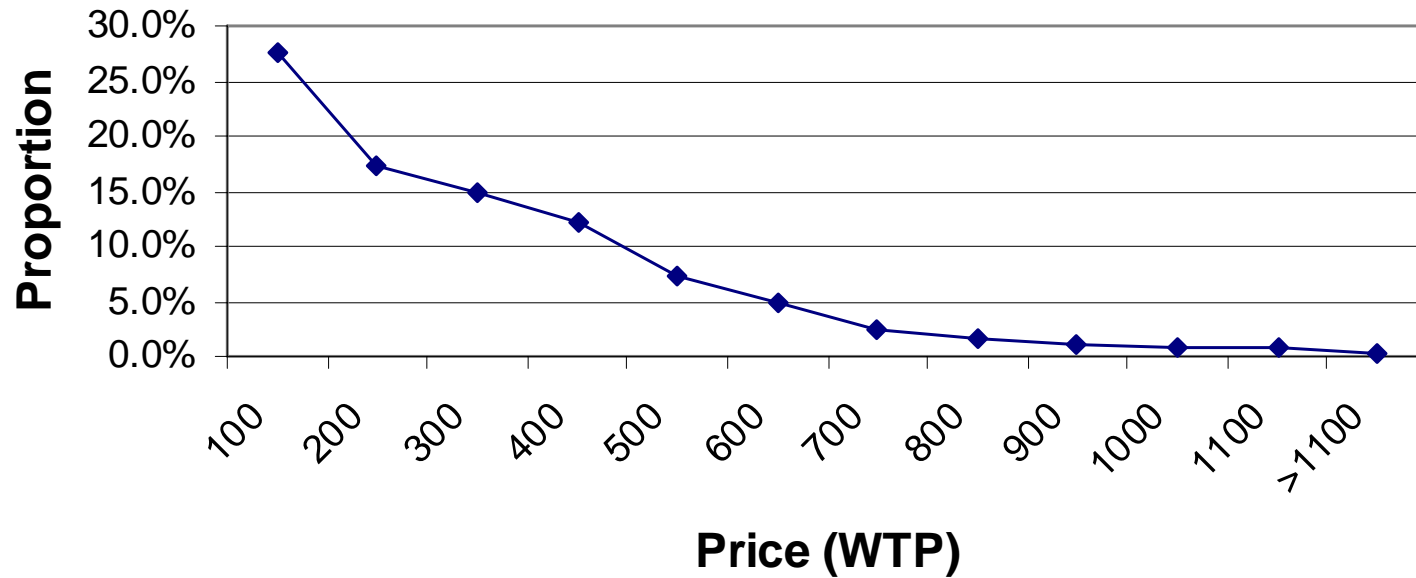
Figure 4: Demand for DVD

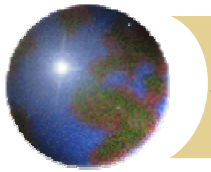




Digital Cameras

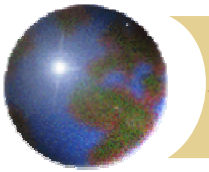
Demand for Digital Camera





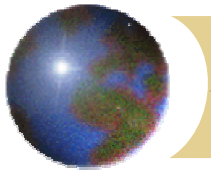
Elasticity

- ✚ Initial estimates are in line with previously published values
 - ▣ Rappoport, Taylor, Kridel
 - CM -0.81, -1.05
 - DSL -1.17 -1.55
 - ▣ WTP
 - CM -0.75 -0.98
 - DSL -1.17 -1.76



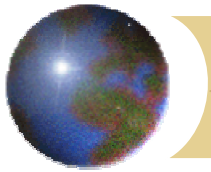
Conclusions

- ✦ Theory of consumer choice “works” (easily implemented)
- ✦ Illustrates potential value using CV approach
- ✦ Derived elasticities in line with other published results



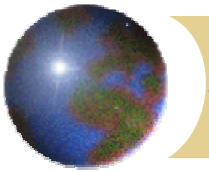
Issues and Further Research

- ✚ Further testing of wording of questions for CV required
- ✚ Test question design that focuses on specific attributes and a consumer's WTP for attributes on the margin (hedonic price approach)
- ✚ Explore ways to incorporate demographics directly



Issues and Further Research (cont.)

- ✚ Use successive surveys to track “demand” curves
- ✚ Use WTP approach to estimate saturation levels
- ✚ Incorporate demographics directly by estimating a first stage function
(WTP = 0 vs WTP > 0)



Contact

✦ Paul Rappoport

✦ Prapp4@comcast.net

✦ James Alleman

✦ James.Alleman@Colorado.edu