



Willingness to Pay and The Demand for Broadband Access

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Presentation to

BROADBAND MARKETS:

BRINGING TOGETHER SUPPLY AND DEMAND

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Presentation Outline

- Statistics
- Questions
- Broadband Demand
 - Descriptive analysis
- Broadband Demand
 - Models
- Conclusions



Statistics



Cautionary Note

“If data analysis is to be well done, much of it must be a matter of judgment, and ‘theory’, whether statistical or non-statistical, will have to guide, not command.”

John W. Tukey, *Annals of Mathematical Statistics*, Vol 33, Number 1, March 1962



Also, keep in mind

- “Poor data and good reasoning give poor results. Good data and poor reasoning give poor results. Poor data and poor reasoning give rotten results.” Edmund Berkeley, Computers and Automation, V 10, Num 10, Sept, 1969
- “By no process of sound reasoning can a conclusion drawn from limited data have more than a limited application” J.W. Mellor, Higher Mathematics for Students of Chemistry and Physics



Questions

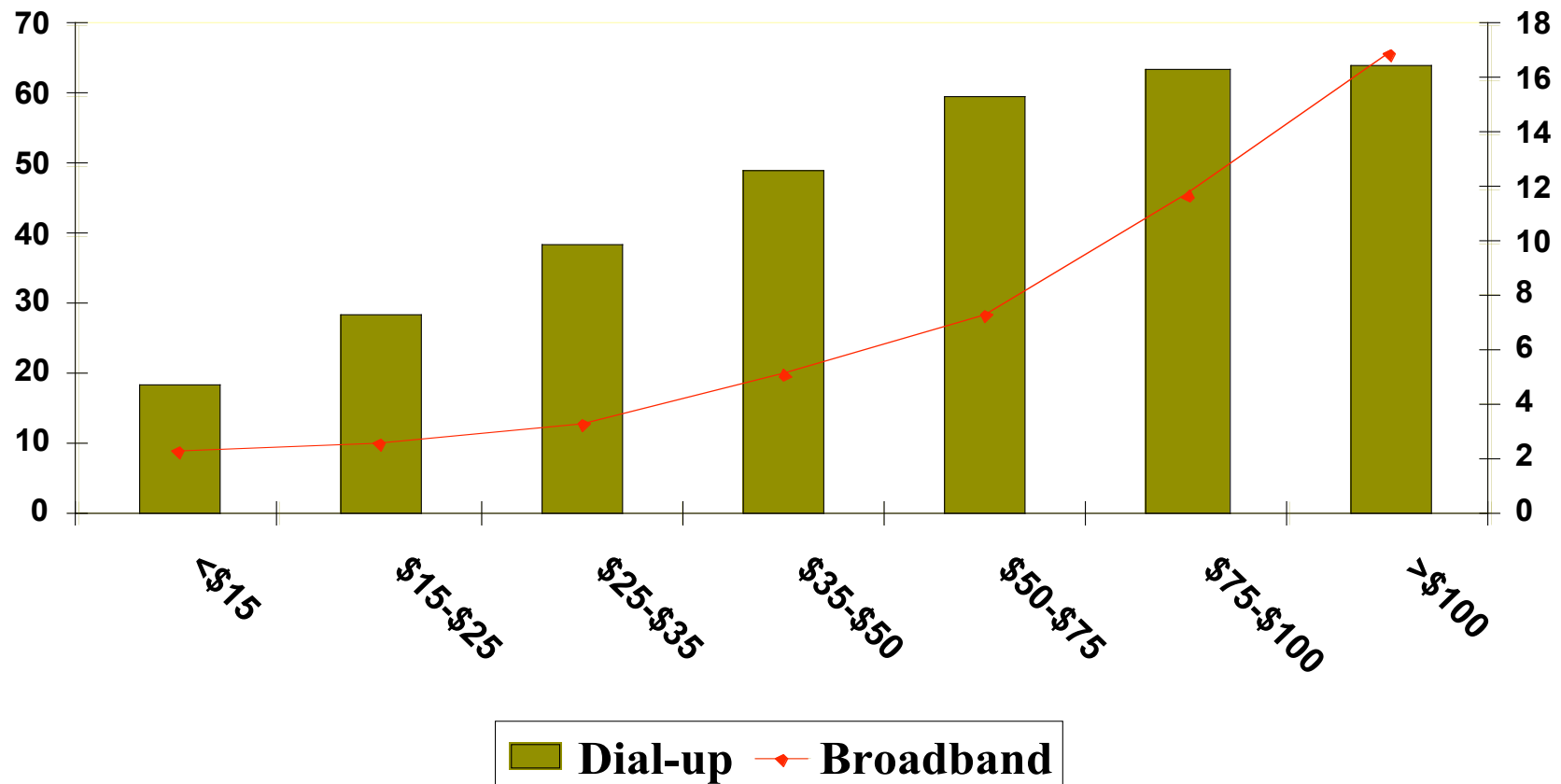
- ❑ Are the “drivers” of broadband the same as the “drivers” of dial-up Internet access?
- ❑ Is there evidence of a broadband “Digital Divide” ?
- ❑ Do “applications” correlate with the choice of access ?
- ❑ How important is price?



Descriptive Assessment

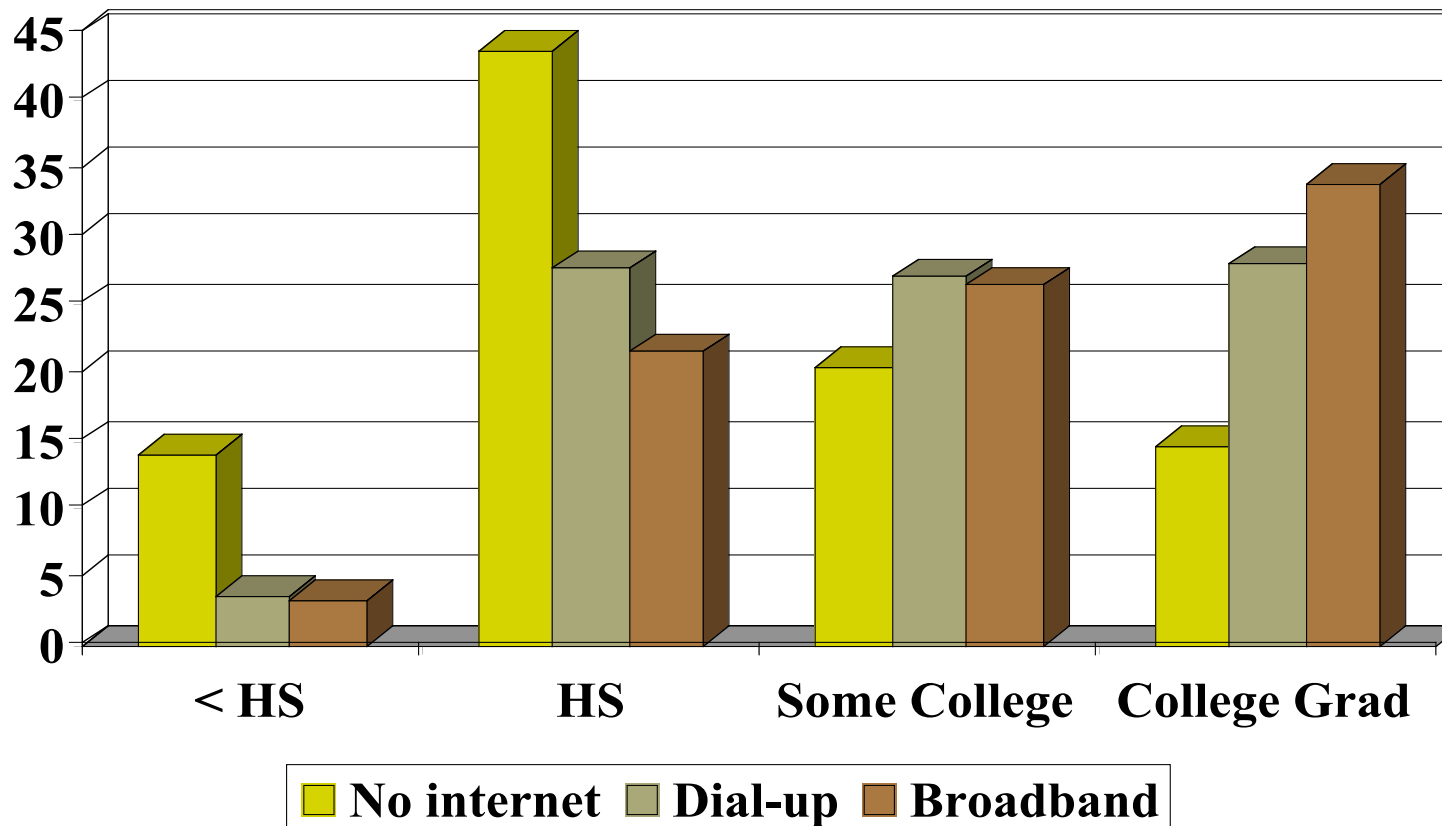
- Broadband Access
 - Income
 - Education
 - Household Size
 - Age

Distribution of Internet Penetration by Income



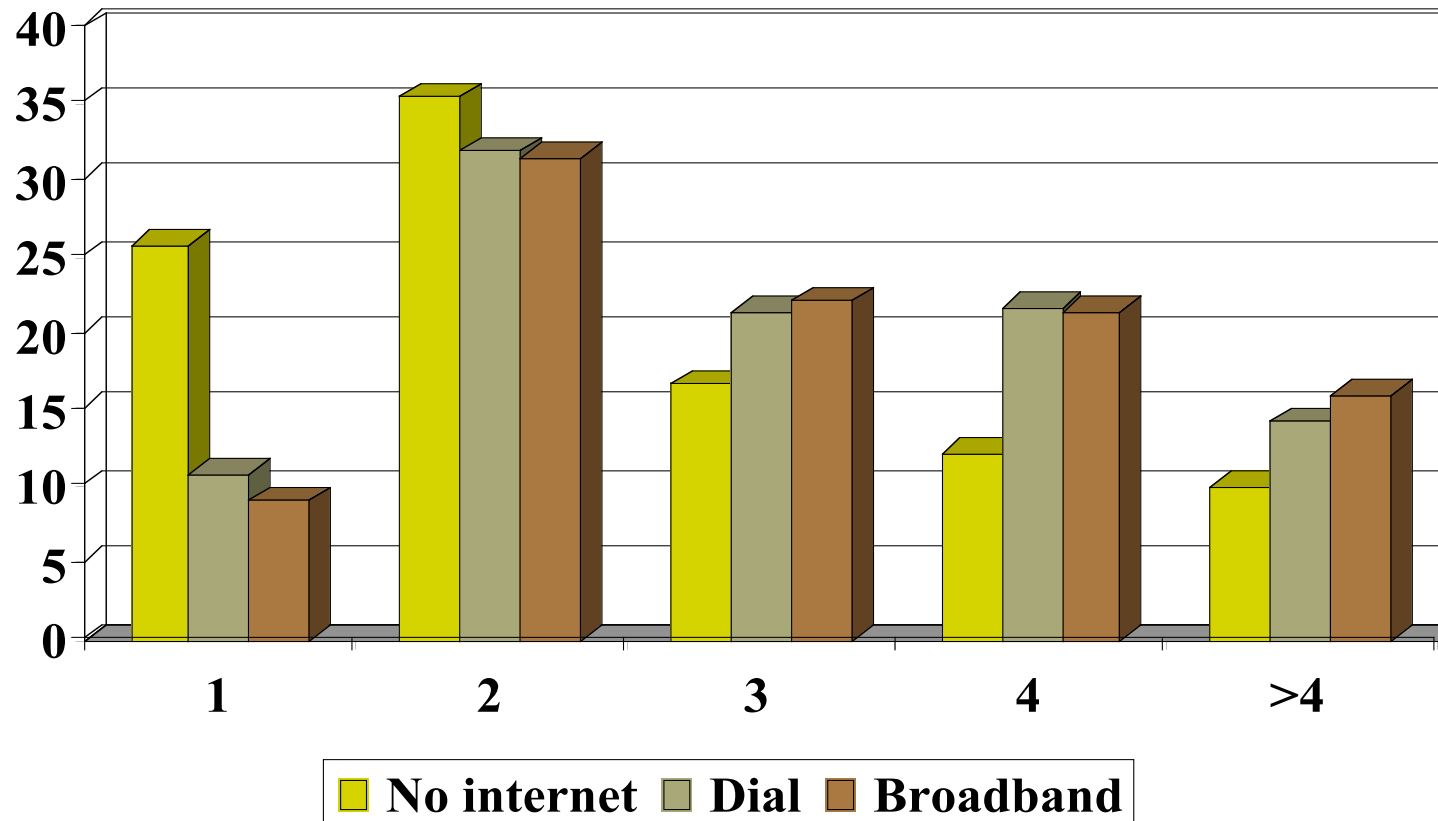
Source: MSG Centris Omnibus Survey. Unconditional Rates

Internet and Education

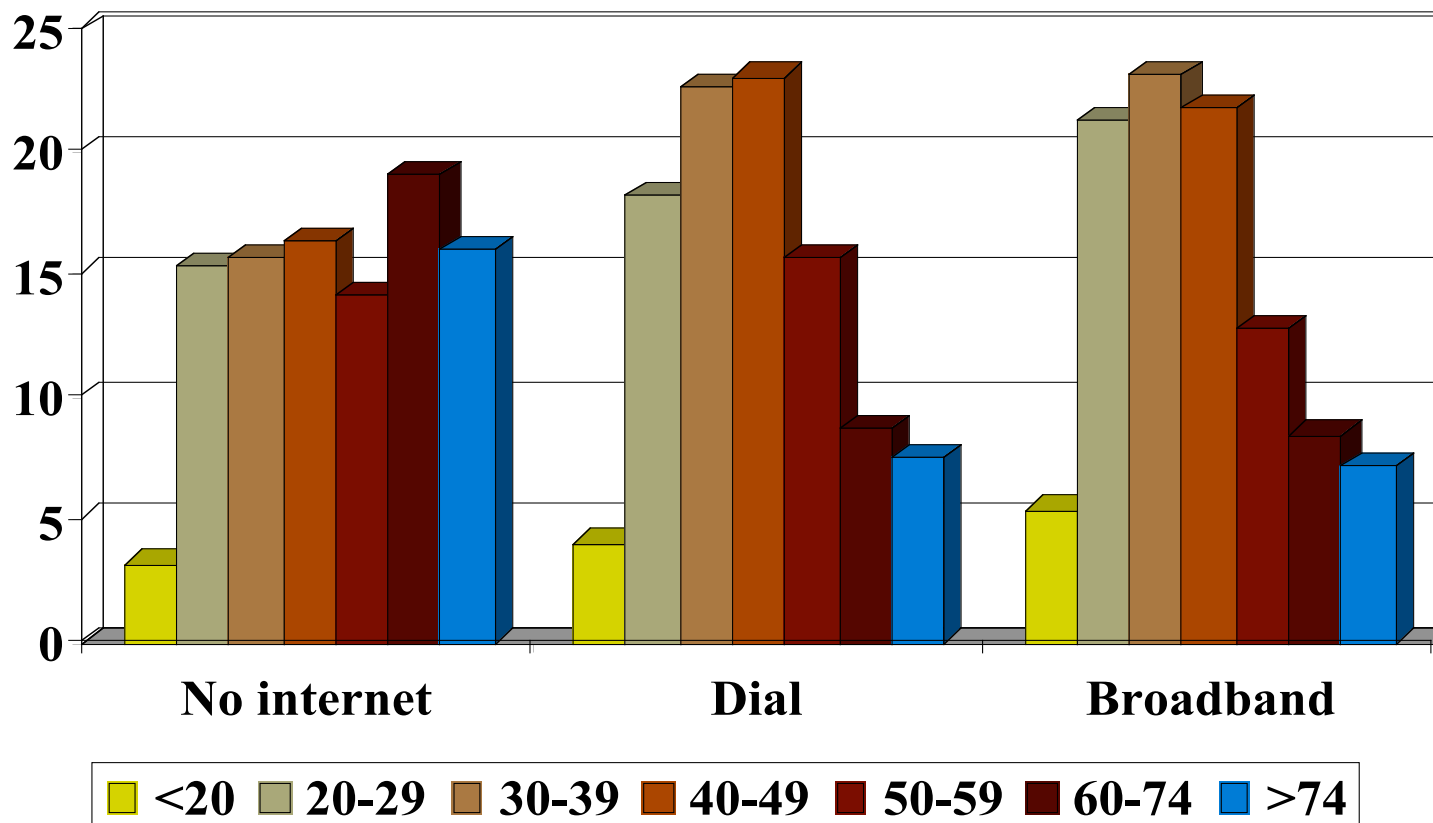


Source: MSG Centris Omnibus Survey. Unconditional Rates

Internet Penetration and Household Size



Internet Penetration by Age



Source: MSG Centris Omnibus Survey. Unconditional Rates



Analysis of Basic Demographics

Whereas the availability of broadband service matters in the choice of broadband, household demographics are of limited value when attempting to classify households as broadband or narrowband!



Descriptive Analysis

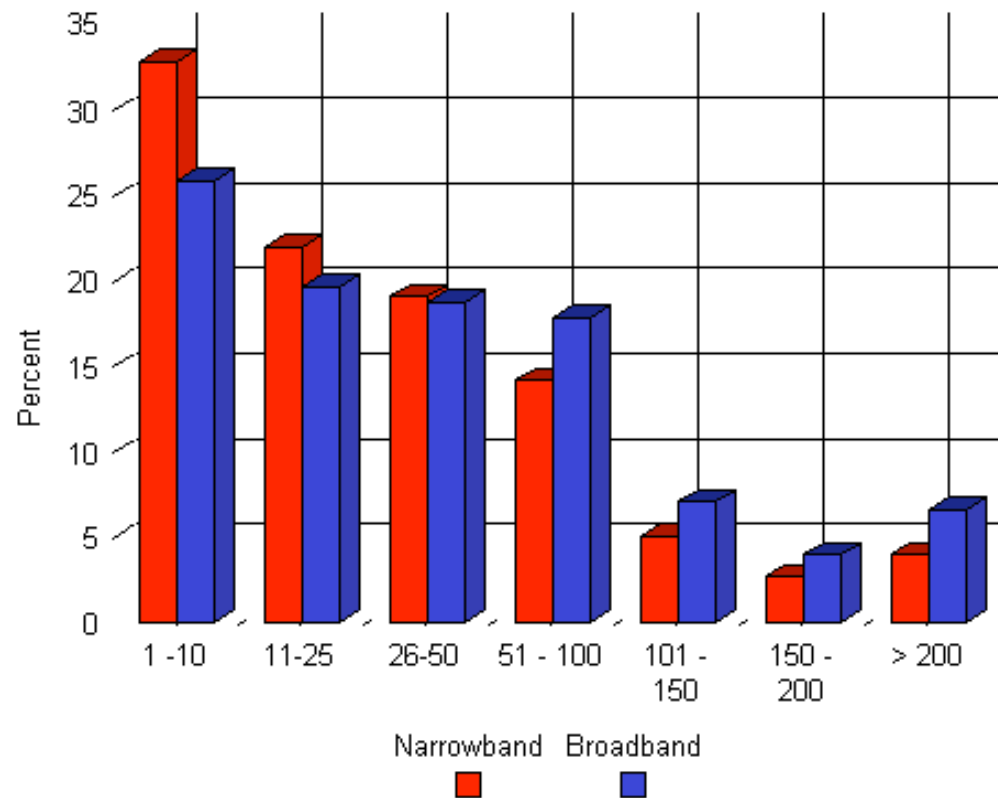
Household Internet Activity



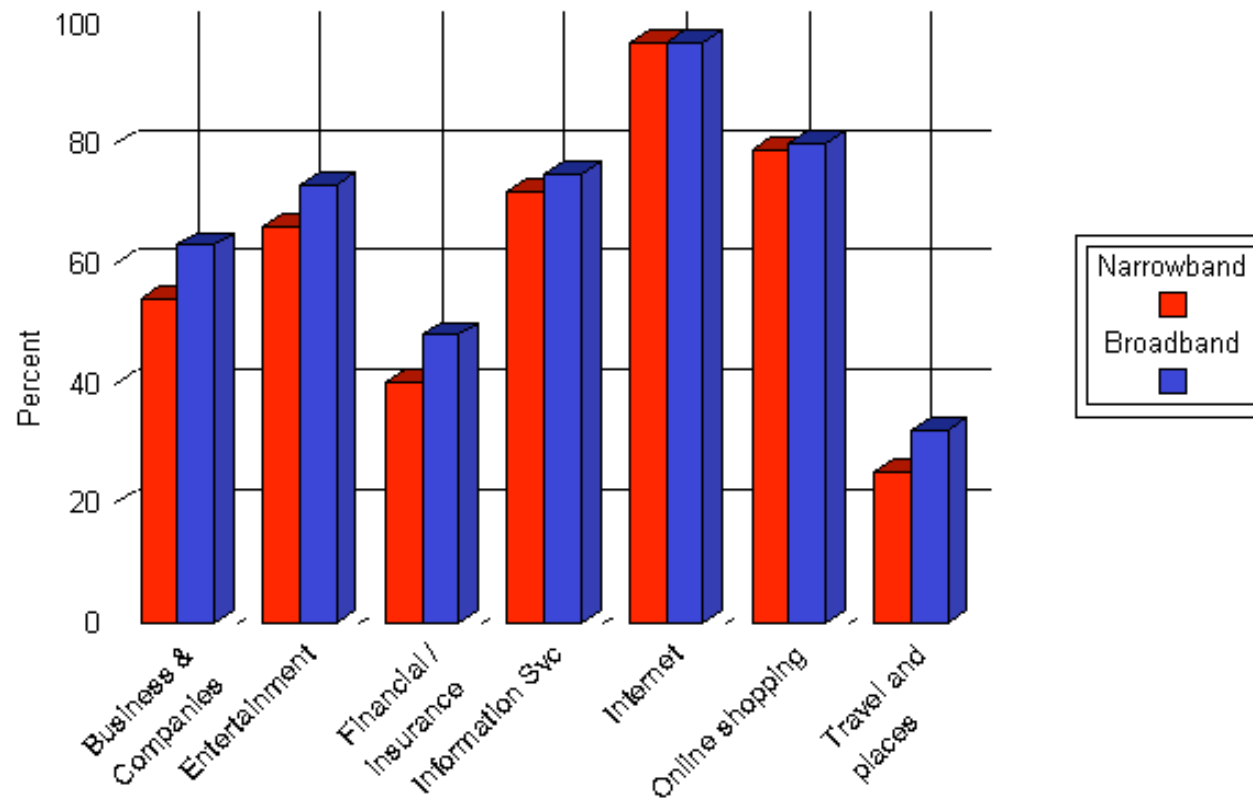
Household Activity

- Type of sites visited
- Number of sites visited
- Frequency of sites visited
- Time site was visited
- Duration of a visit
- Other activity derived from the visit

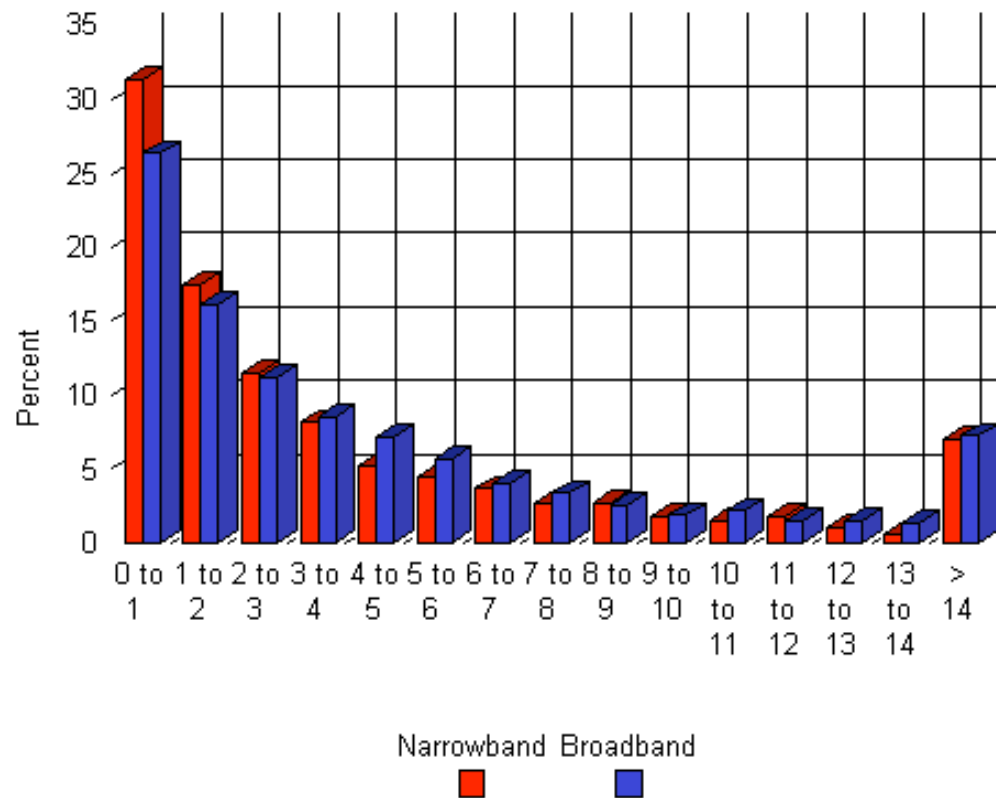
Distribution of Sites by Access



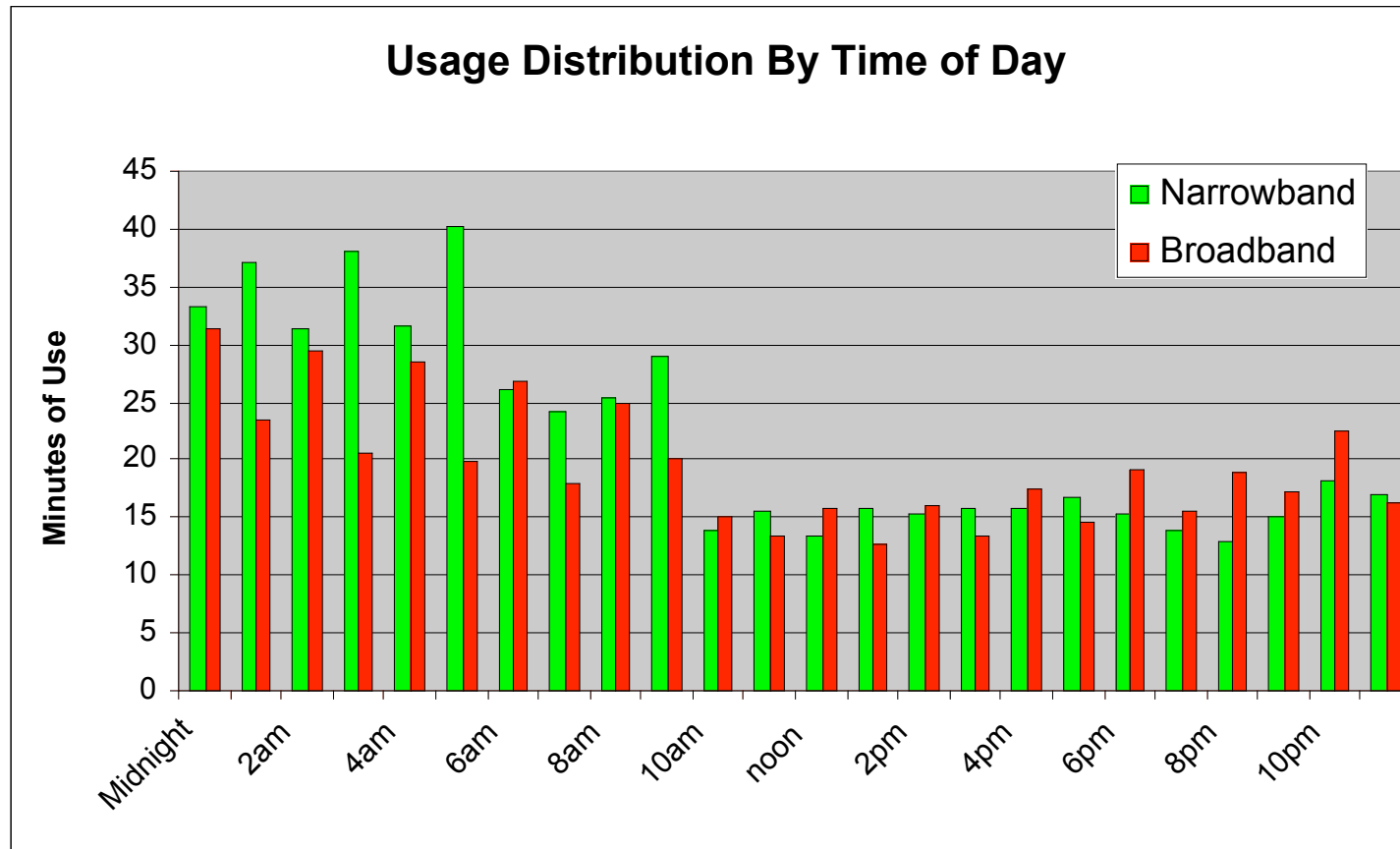
Distribution of type of site visited



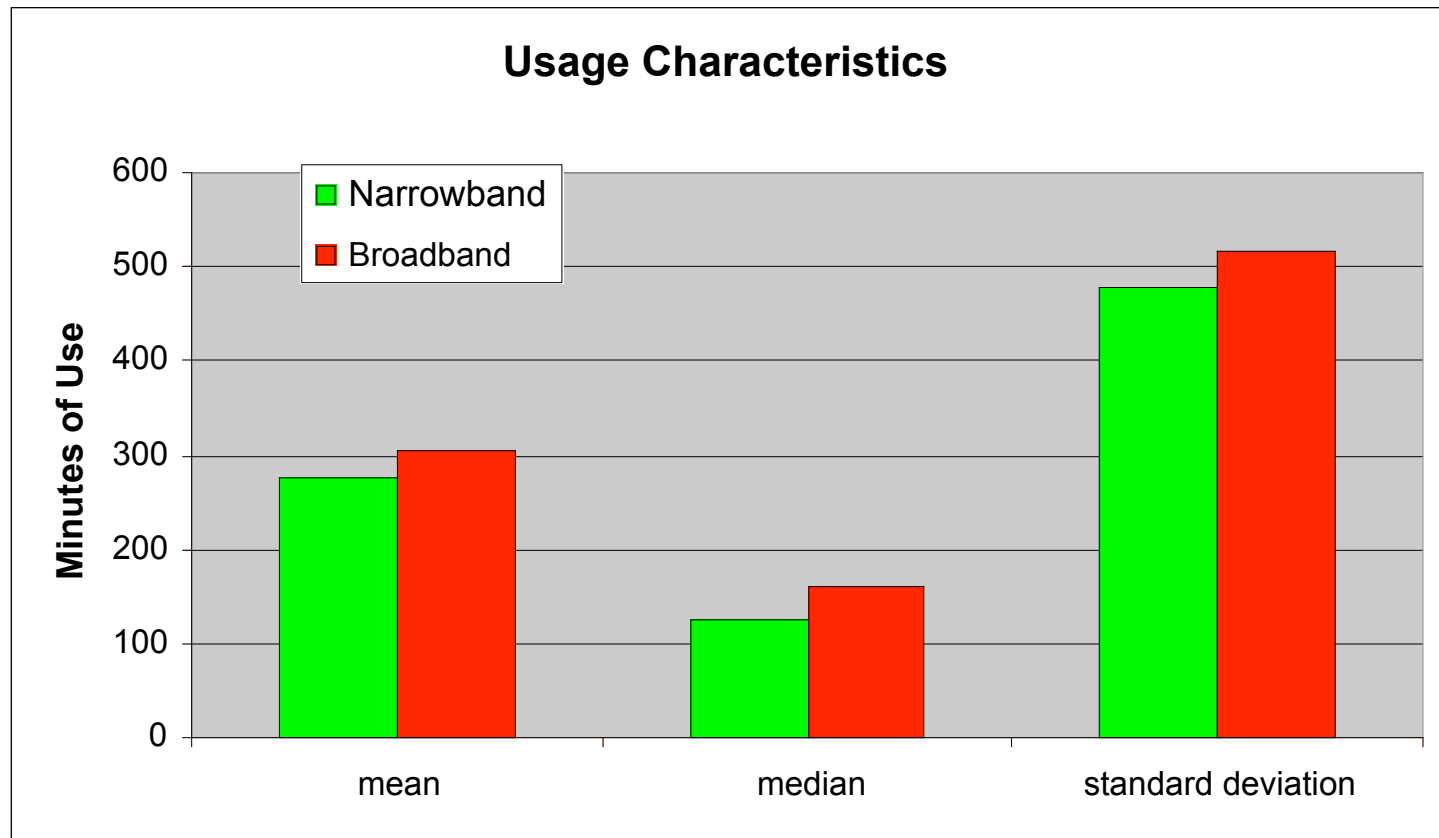
Distribution of hours on line



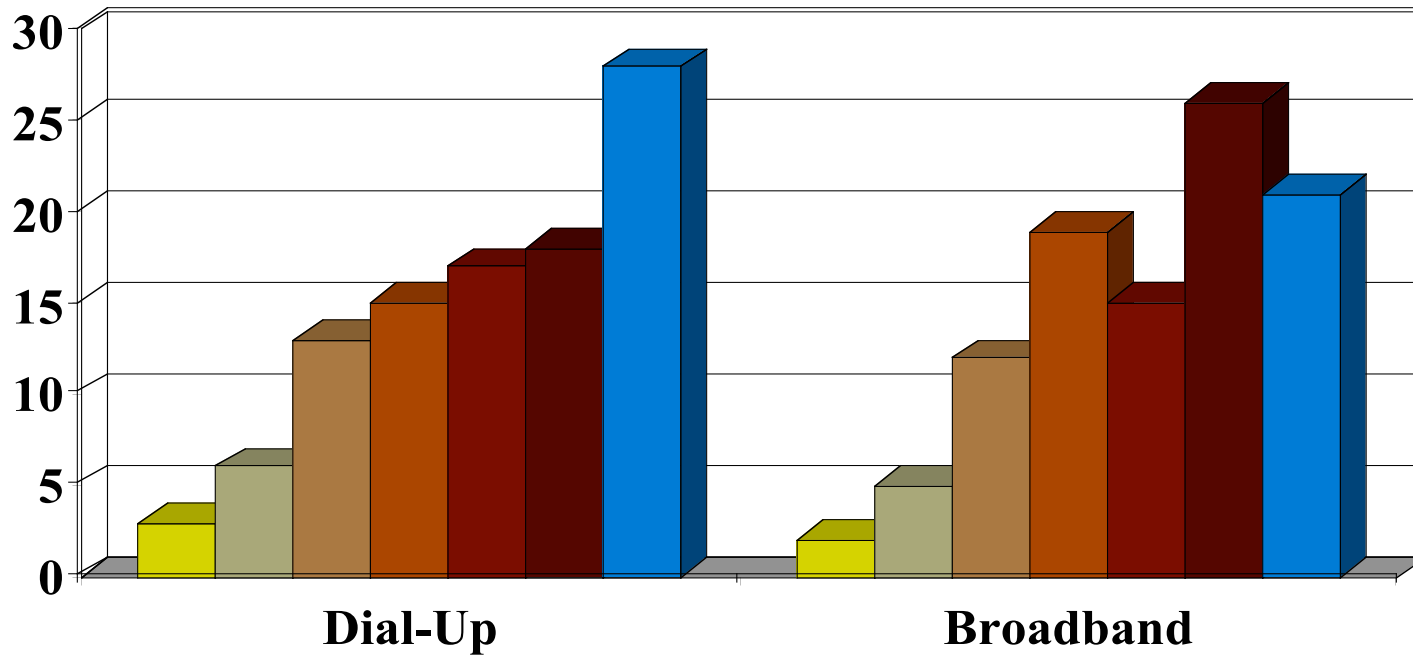
Distribution by time of day



Usage Characteristics

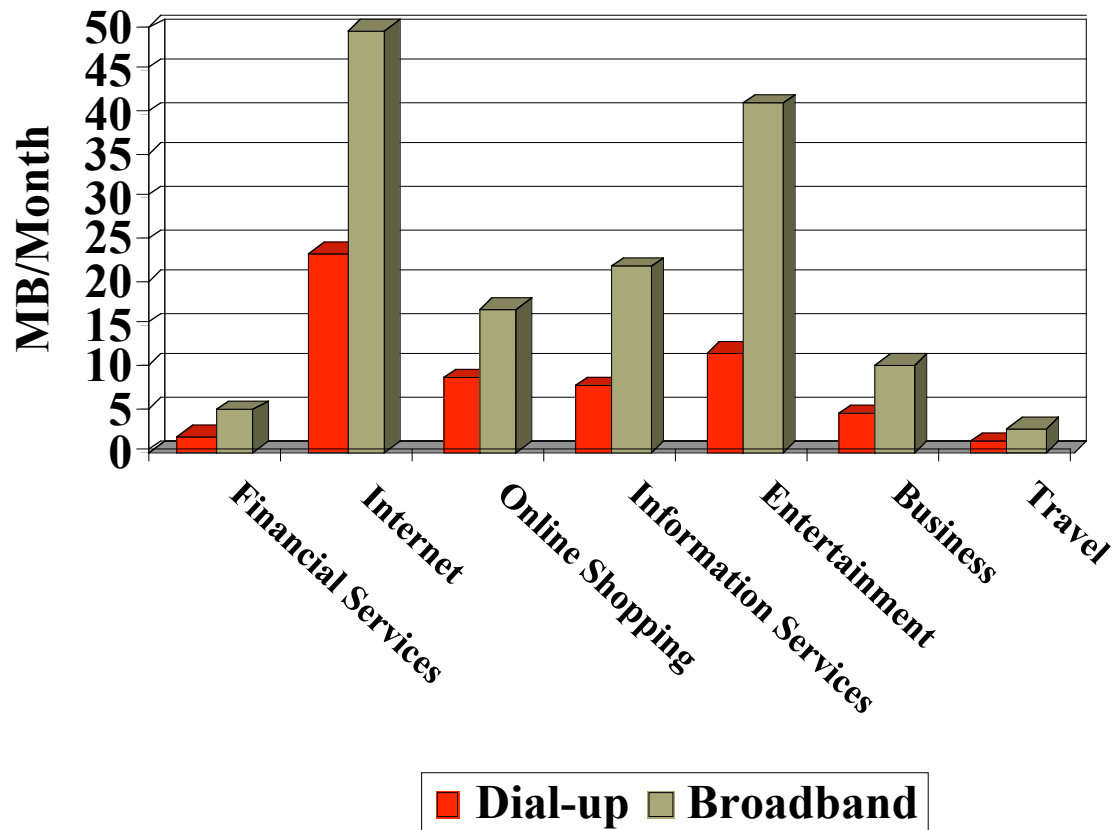


Average Share of Visits by Category



Travel **Finance** **Online Shop** **Business**
Information Svc **Entertainment** **Internet**

Downloading Intensity



Source: Click-stream data from Plurimus, Inc.



Models

- Discriminant Models
- Discrete Choice
- Discrete – Continuous Choice
- Contingent Valuation



Discriminant Analysis

- Classification of broadband users
 - Higher levels of income
 - Higher levels of education
 - Age 30- 50
 - Visits to business sites, financial sites and entertainment sites
- Internet activity important in classifying access



Discrete Choice

- Choices
 - Dial-up vs No Internet
 - Dial-up vs Cable modem
 - Dial-up vs ADSL
 - Dial-up vs Cable modem or ADSL
 - Cable modem vs ADSL

Dial-up vs CM Access Elasticities

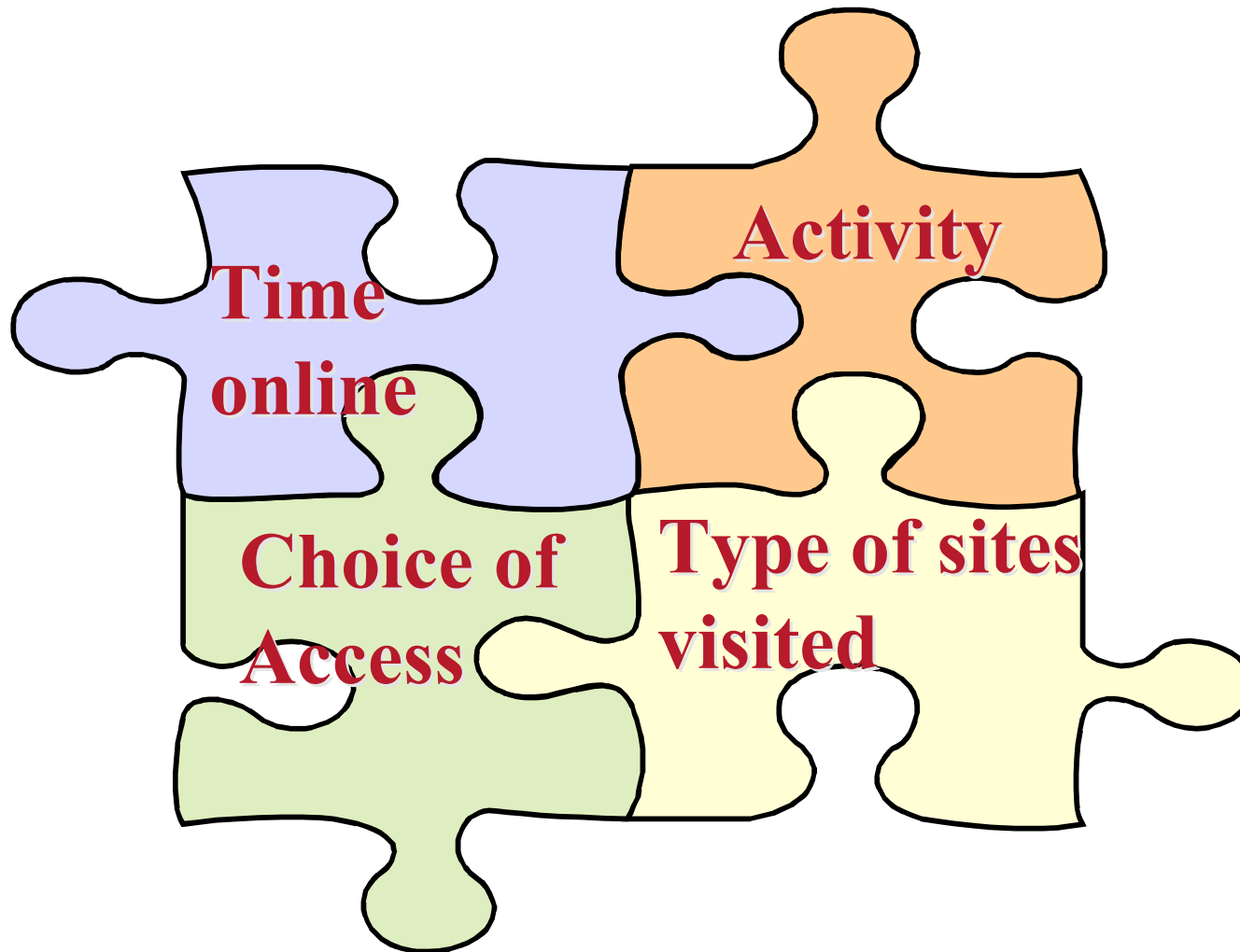
	Dial-up	CM
Dial-up	-0.230	0.518
CM	0.010	-0.895

Dial-up vs ADSL Elasticities

	Dial-up	ADSL
Dial-up	-0.168	0.423
ADSL	0.040	-1.364

Discrete – Continuous Choice

Problem: Choice and Usage Jointly Determined





Discrete – Continuous Choice

□ Issues

- Access choice and usage jointly dependent
- All other measures of usage such as sites visited, frequency of visits, duration of visit are also endogenous
- Modeling requires (at a minimum) a nested logit framework estimated within a simultaneous equations framework
- Estimation requires detailed household specific variables

Willingness to Pay



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.



Problem(s)

1. Can willingness to pay (WTP) information be obtained from surveys and used to describe “demand” ?
2. How do estimates of elasticities for broadband services compare to published estimates?
3. Can the use of WTP be generalized and applied to other products and services?



WTP and the Demand for Broadband Service

- 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



Lognormal Demand Curves

- Let x be a random variable representing demand
- Then $\ln x$ is a random variable
- Assuming that $\ln x$ is distributed as a normal with parameters μ and σ^2



Lognormal Demand

We have:



Data

- 12,000 responses to an omnibus survey administered during the second quarter, 2003.
- Questions included for broadband service (ADSL, Cable Modem) – WTP.



Application to Broadband

- 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

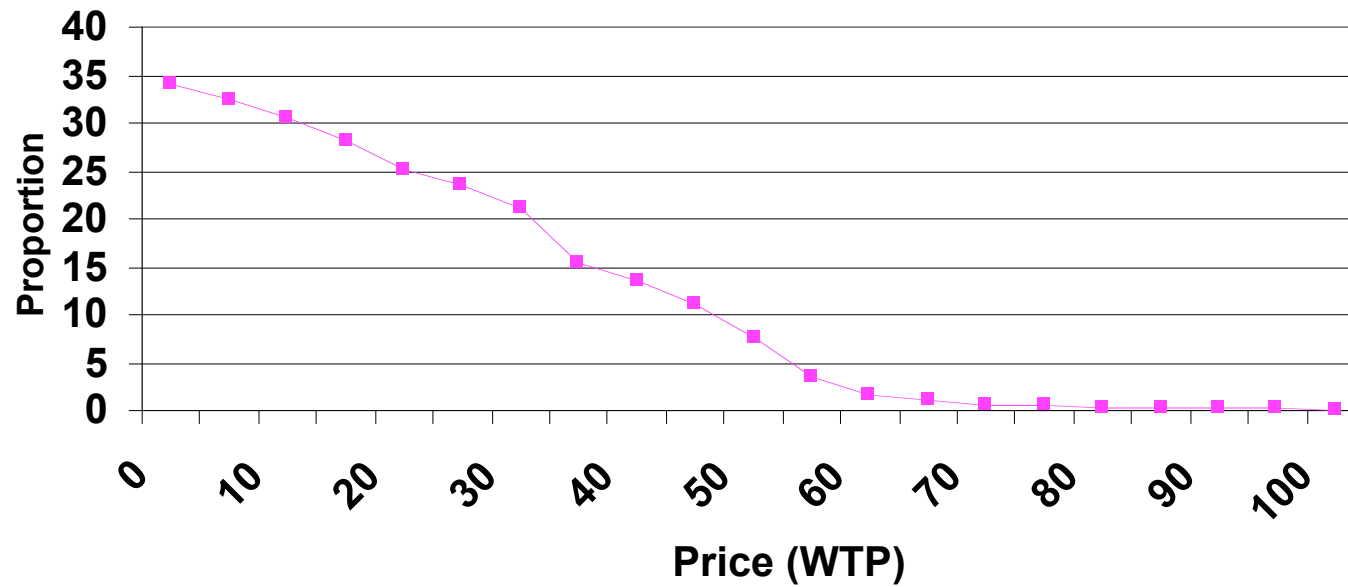


Computation

- 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 $-\frac{p}{Q(p)} \frac{dQ(p)}{dp}$

Demand for Cable Modem Service

Figure 1: Cable Modem Demand



Cable Modem Elasticity

Price	Elasticity
\$20	-0.45
\$30	-0.65
\$40	-0.87
\$50	-1.23
\$60	-1.58
\$70	-1.83



Elasticity

- Initial estimates are in line with previously published values (evaluated at price of \$40-\$50)
 - Rappoport, Taylor, Kridel
 - CM (-0.81 -1.05)
 - DSL (-1.17 -1.55)
 - WTP
 - CM (-0.87 -1.23)



Conclusions

- Theory of consumer choice appears to “work” (easily implemented)
- Illustrates potential value using WTP approach
- Derived elasticities in line with other published results



Conclusions

- ❑ Demographics play a minor role in predicting broadband vs narrowband users
- ❑ Internet activity (usage) helps discriminate between narrowband and broadband users
- ❑ Price matters
- ❑ Keep in mind, in the U.S., the top three usage-based activities are: (1) Gaming, (2) gambling and (3) other entertainment



Conclusion

- ❑ Prices for broadband will fall
- ❑ Entertainment is the focus of content providers, ISPs and telecom companies
- ❑ No evidence of a digital divide, though less densely populated areas are less likely to have broadband
- ❑ No compelling reason for government subsidies or policies promoting broadband



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