Power to Choose: An Analysis of Consumer Behavior in the Texas Retail Electric Market

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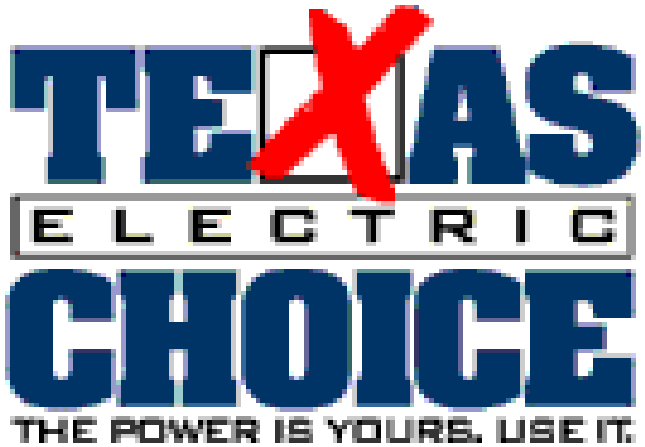

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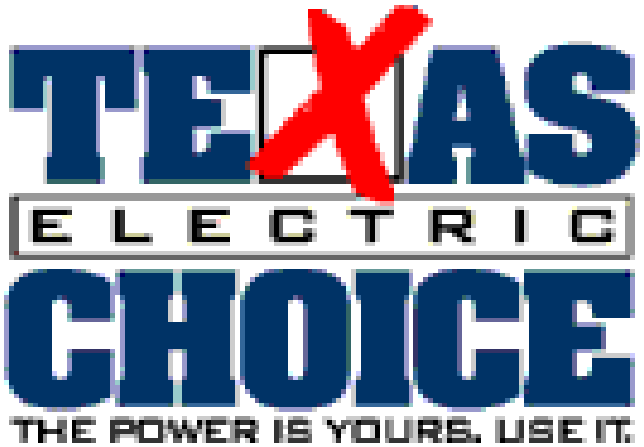
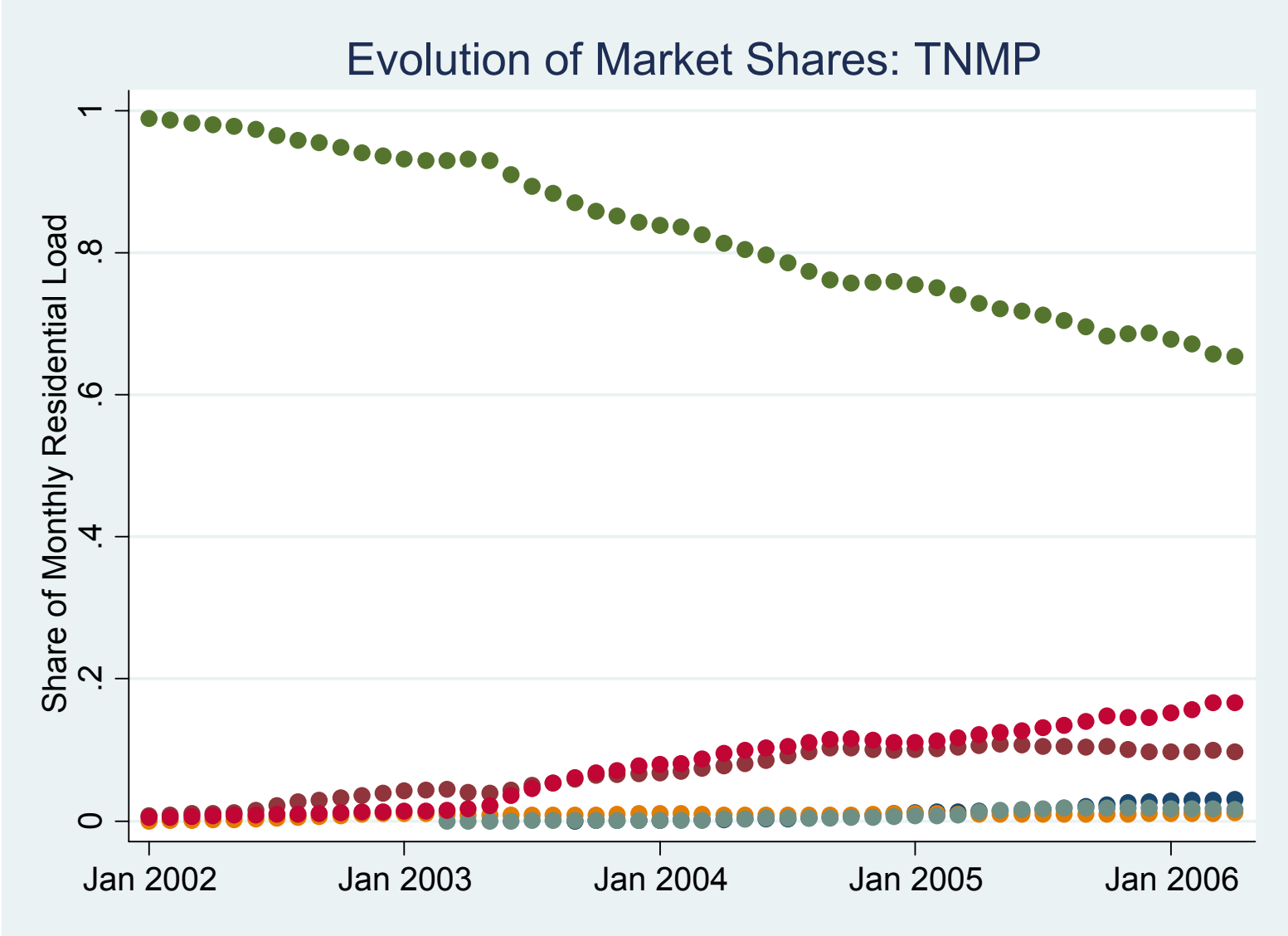
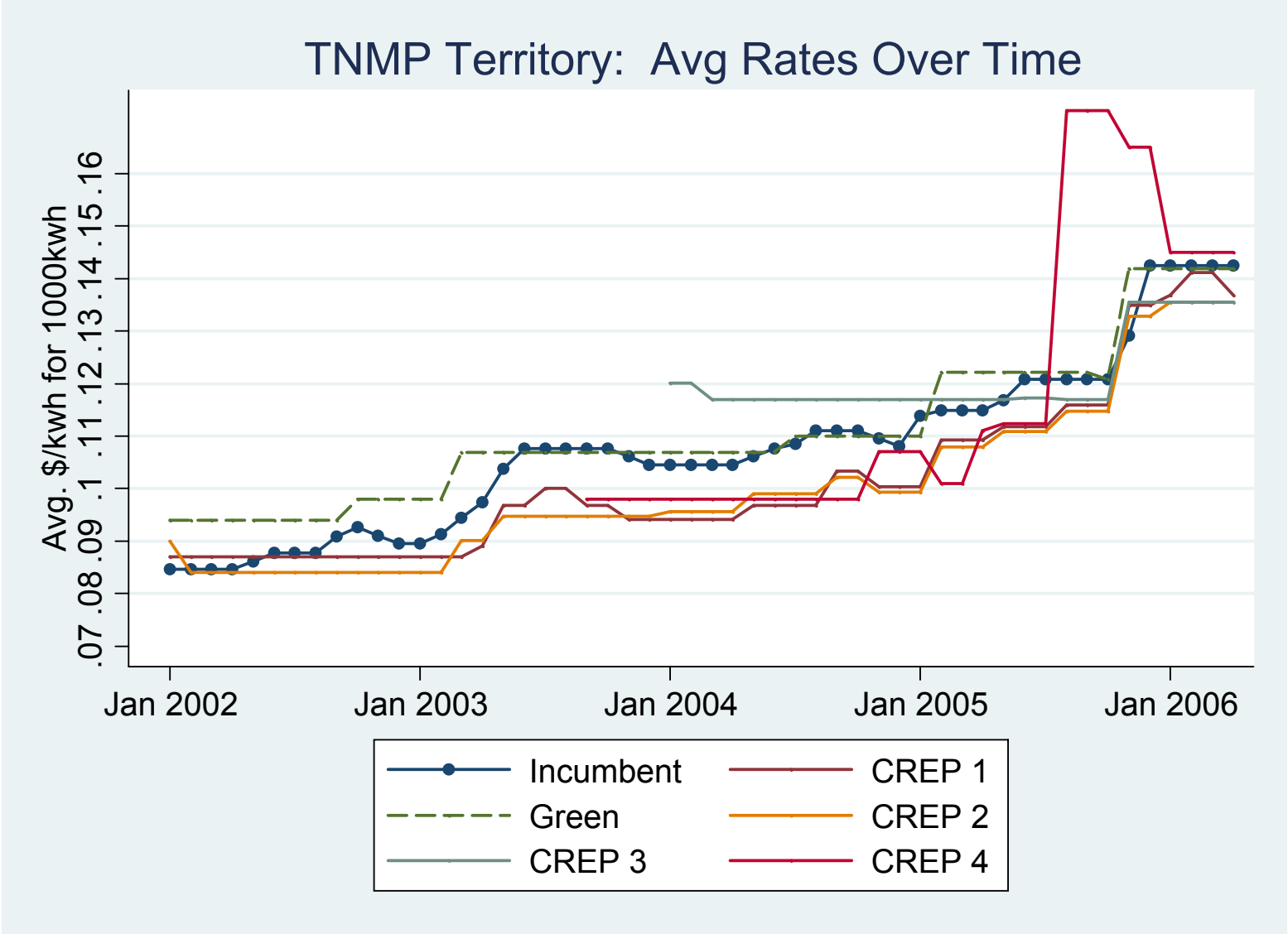


Residential Market Shares….



…Contrasted with Prices



Possible Causes of Inertial Behavior

1. Non-price product differentiation
   - Vertical
     - Incumbent perceived to have higher reliability of service?
     - Differences in customer service
2. Search/Decision Costs
   - Awareness that options exist / inattention from status quo bias
3. Switching Costs
   - Non-monetary (e.g. hassle, new bills)
   - Monetary (e.g. early cancellation fees)

Policy implications of each

Research Questions

- How large are product differentiation, search costs, and switching costs?
- Do choice frictions and preference heterogeneity vary by demographics (income, race, age, education)?

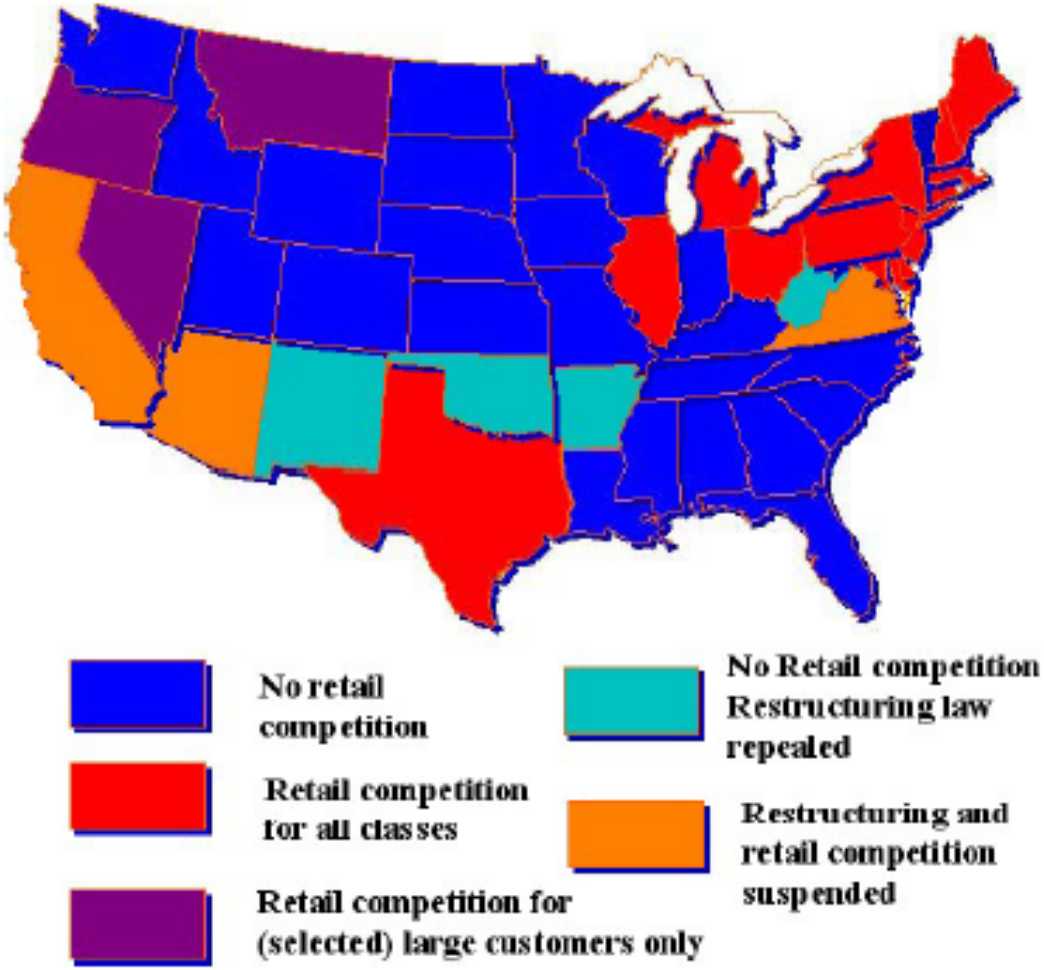
Related Literature

- Retail choice behavior in utilities
  - (e.g. Brennan, 2007; Waddams et al., 2005; Miravete, 2003; Grubb, 2009)
- Consequences of extending consumer choice rather than impose default choice
  - School choice (Hastings, Kane, Staiger, 2009)
  - Health insurance (Handel, 2009)
  - Long-distance telecom (Hausman and Sidak, 2004)

Outline

- Descriptive statistics on switching
- Model of Consumer Switching
  - Allows for product differentiation, search costs & switching costs
- We find:
  - Incumbent has a brand advantage (erodes over time)
  - Decision to consider alternatives is infrequent, but seasonal
  - Incumbent brand advantage & price sensitivity vary by demographics

STATUS OF RETAIL COMPETITION AND RESTRUCTURING REFORMS 2007



Texas Retail Market

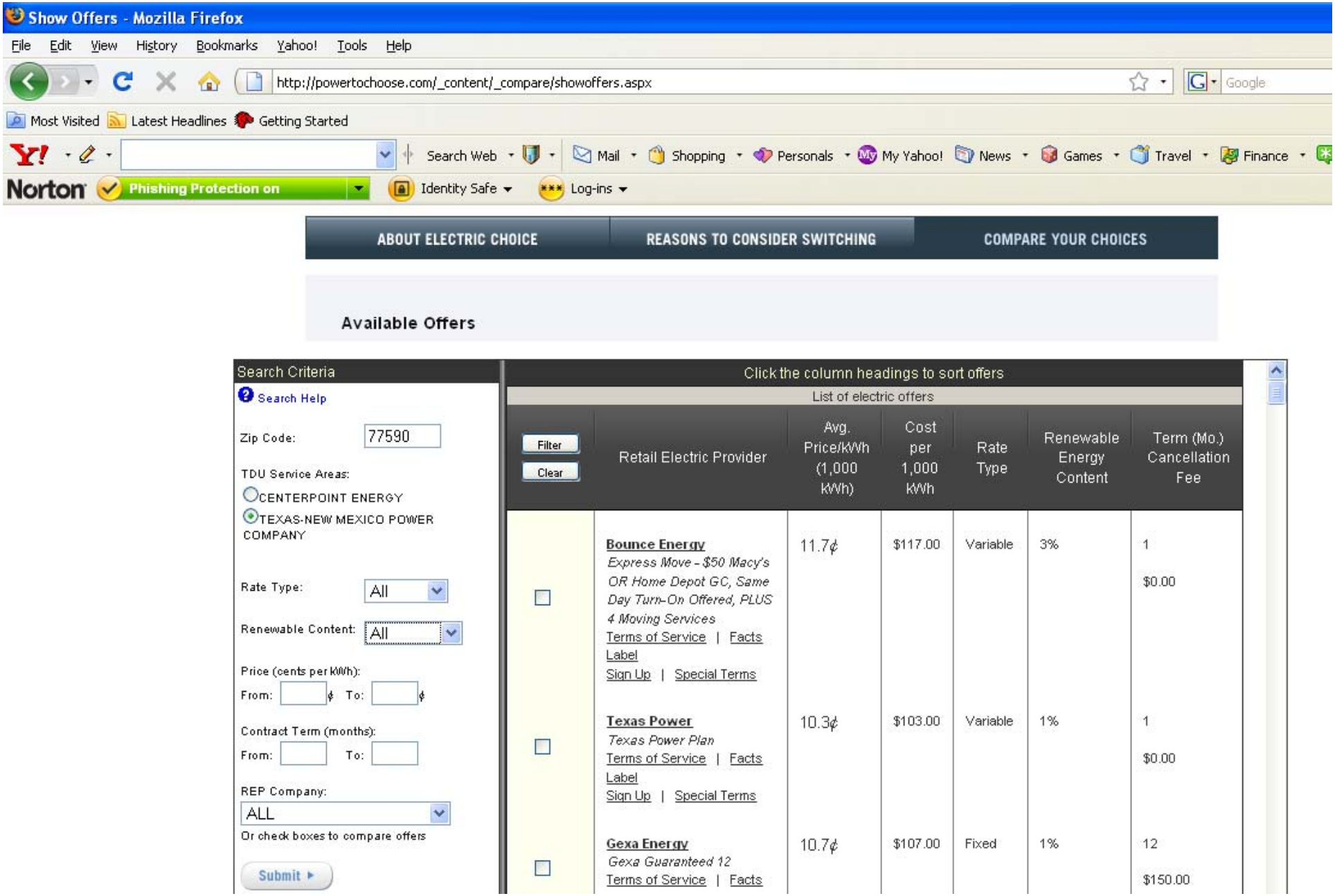
- Prior to 2002, residential customers served by “regulated utility”
- Starting Jan 1, 2002, customers could choose provider
  - By default, assigned to incumbent that was affiliated with the old utility (“AREP”)
  - Incumbent required to charge “price-to-beat” (6% reduction from previous rates)
    - Ended up being above competitive rates (“headroom”)
  - Price-to-beat adjustments indexed to natural gas price

Texas Retail Market (contd)

- Competitive retailers (CREPs)
  - Procure wholesale power and market to residential (and other types) of customers
  - Largest CREPs were the AREPs from other service territories
  - In 2002: 3-5 CREPs in each service territory
  - By 2006: 10+ CREPs

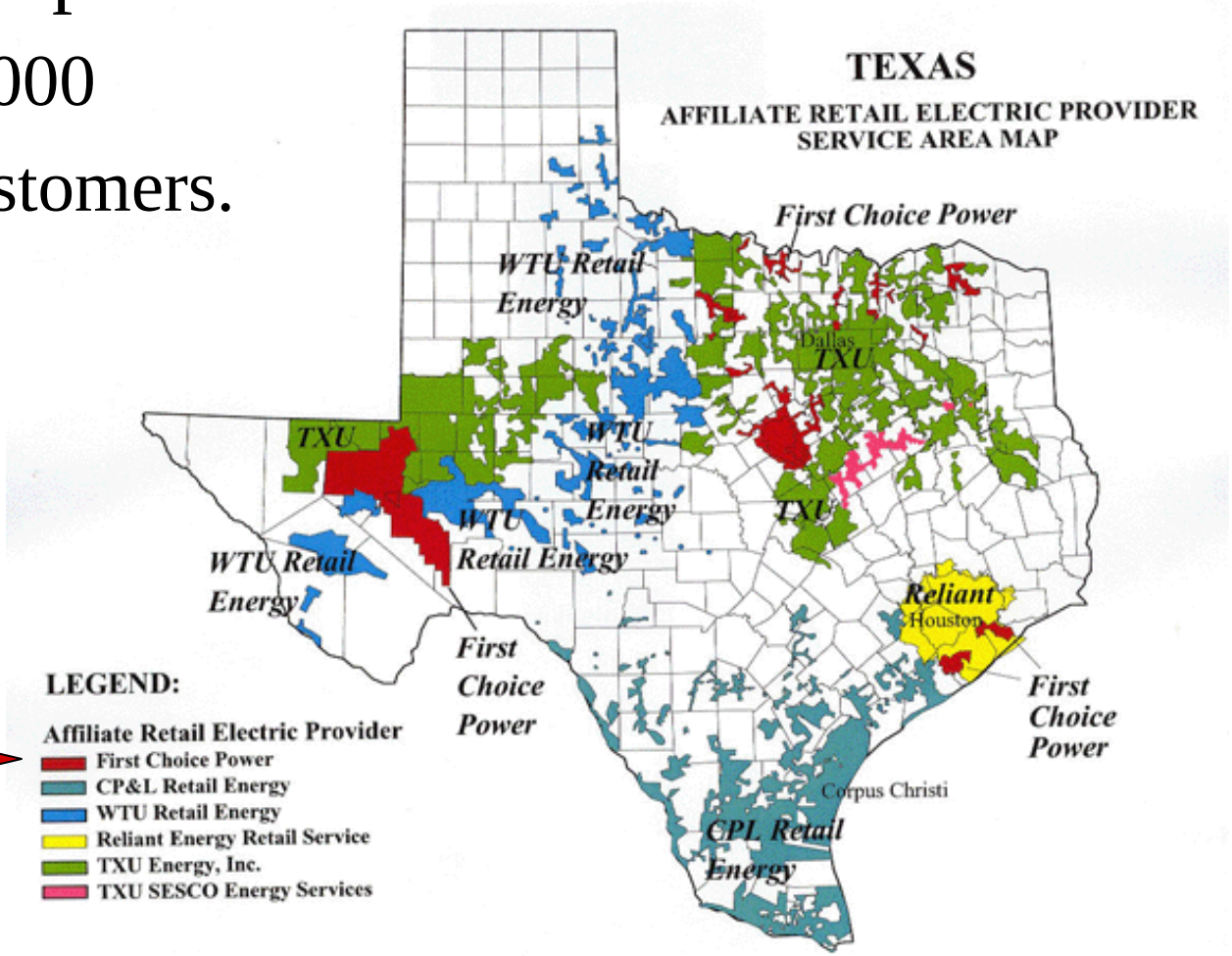
Information for Consumers

- www.powertochoose.com
  - (and www.poderdeescoger.org)
  - 2005-2006: ≈ 100K unique visitors/month
- Various media
  - Radio, TV, billboards
  - PUC public information campaign


Show Offers - Mozilla Firefox
File Edit View History Bookmarks Yahoo! Tools Help
http://powertochoose.com/_content/_compare/showoffers.aspx
Most Visited Latest Headlines Getting Started
Search Web Mail Shopping Personals My Yahoo! News Games Travel Finance
Norton Phishing Protection on Identity Safe Log-ins
ABOUT ELECTRIC CHOICE
REASONS TO CONSIDER SWITCHING
COMPARE YOUR CHOICES
Available Offers
Search Criteria
Search Help
Zip Code: 77590
TDU Service Areas:
CENTERPOINT ENERGY
TEXAS-NEW MEXICO POWER COMPANY
Rate Type: All
Renewable Content: All
Price (cents per kWh):
From: ¢ To: ¢
Contract Term (months):
From: To:
REP Company:
ALL
Or check boxes to compare offers
Submit
Click the column headings to sort offers
List of electric offers
Filter
Clear
Retail Electric Provider
Avg. Price/kWh (1,000 kWh)
Cost per 1,000 kWh
Rate Type
Renewable Energy Content
Term (Mo.) Cancellation Fee
Bounce Energy
Express Move - $50 Macy's OR Home Depot GC, Same Day Turn-On Offered, PLUS 4 Moving Services
Terms of Service | Facts Label
Sign Up | Special Terms
11.7¢ $117.00 Variable 3% 1 $0.00
Texas Power
Texas Power Plan
Terms of Service | Facts Label
Sign Up | Special Terms
10.3¢ $103.00 Variable 1% 1 $0.00
Gexa Energy
Gexa Guaranteed 12
Terms of Service | Facts
10.7¢ $107.00 Fixed 1% 12 $150.00

Our Sample

- TNMP service territory (“First Choice”)
- January 2002-April 2006
  - Approx. 192,000 residential customers.

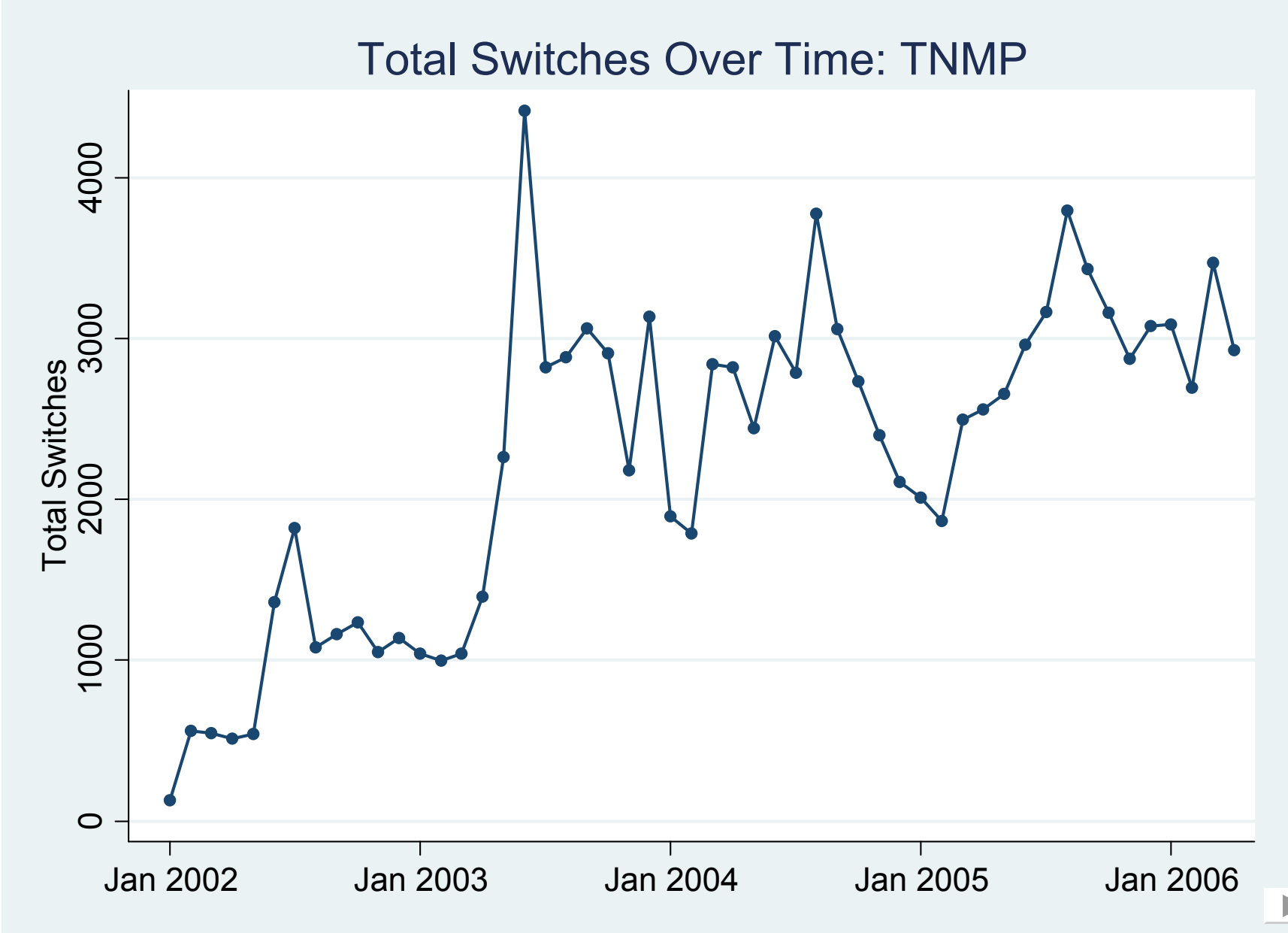


We Study →

Data

- For each residential meter in TNMP from January 2002-April 2006:
  - History of retail provider
  - Monthly consumption
  - Address to match to:
    - Census data on block group characteristics
- For each retailer:
  - PUC monthly data on rate plan(s) offered
- We focus on 6 retailers with > 1% share

Switching: Time Trend and Seasonality



Descriptive Statistics of Potential Savings

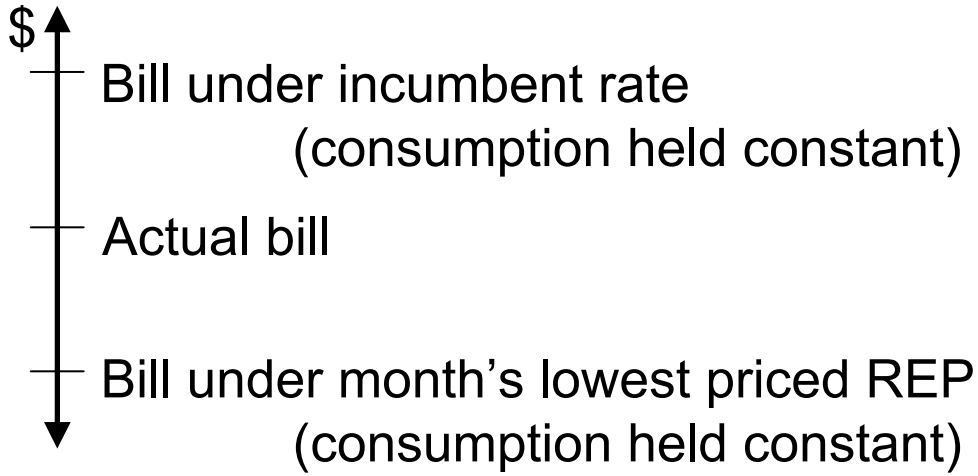
- How much would households with incumbent have saved if purchased from lowest-priced REP?
  - Assume:
    - Consumption perfectly inelastic & predictable
    - Switching costless
- Obviously, not a welfare analysis, but provides some magnitude of consumer surplus gains

Descriptive Statistics of Potential Savings

- What if households with incumbent had switched only once (in Jan ’02) to a large REP?
  - Large #1: Mean = $7.65/HH-mo
  - Large #2: Mean = $9.92/HH-mo
- What if households with incumbent switched to cheapest CREP every month?
  - Mean = $12.41/HH-mo
- For comparison, Waxman-Markey= $14.58/HH-mo (CBO)

Descriptive Evidence of Effect on Different Populations

- Fraction of potential savings realized by switching



$$\text{Pct Achieved} \equiv \frac{\text{Actual bill} - \text{Incumbent bill}}{\text{Lowest bill} - \text{Incumbent bill}}$$

(When incumbent is cheapest, we throw out because no potential savings)

Dependent Variable: Percent Achieved of Potential Savings

	Census Block Group data	
Fraction Education BS or more	0.120*	0.121*
Fraction Black	0.023*	0.023*
Fraction Hispanic	-0.044*	-0.037*
Fraction Senior	-0.230*	-0.213*
Fraction Heating Electric	-0.020*	-0.017*
Poverty Rate	-0.098*	-0.077*
Fraction inside Urbanized Areas	0.060*	0.059*
Mean Usage (1000s of kwh/mo)		0.018*
House value Zillow ($1000's)		
Single Family Home		
Condo		
Mobile Home		
Constant	0.070*	0.043*
Observations	188,540	188,540
R-squared adjusted	0.07	0.07

+ p<0.05, * p<0.01

Notes: The dependent variable is the mean of the monthly "percent achieved" across all months that a meter has positive usage. It is defined only for customers who purchase from one of the largest 6 retailers and when there are positive potential savings of switching away from the incumbent. The excluded category for building type is all other types (multi-family, duplex, unknown).

Higher percent of potential savings are realized in neighborhoods with:

More college educated
More AAs
Fewer Hispanics
Fewer Senior Citizens
Lower Poverty

HHs w/ higher usage

Model of Household-Level Choice

- In each month:
  - Stage 1: Decision to Choose
    - Household with provider *k* chooses whether to consider alternative retailers
  - Stage 2: Choice
    - Households that decide to choose will observe (all) providers' product characteristics, and choose provider that maximizes utility
    - Can choose to stay with current provider *k*
  - Allow for heterogeneity across households in decision and choice probabilities

Model (contd)

- "Movers"
  - Households that move-in during month *t*
  - Must choose; there is no default

- In stage 1, "decide" with probability = 1

Simplified Illustration

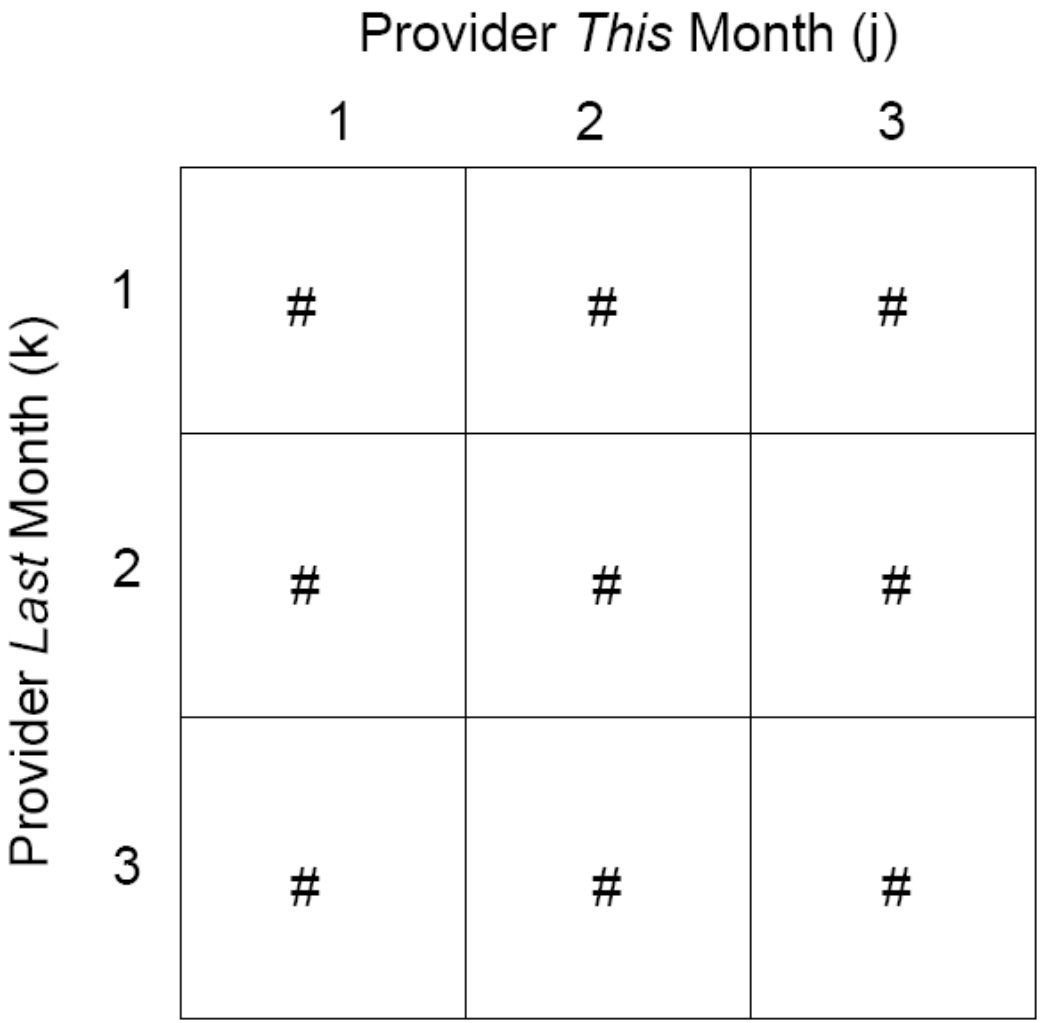
- 3 retailers
- Consumers identical
- Observe only 2 months of data ("last month" and "this month")

- Each household currently with retailer k searches with pr = λ_k
  - Heterogeneity due to k's service

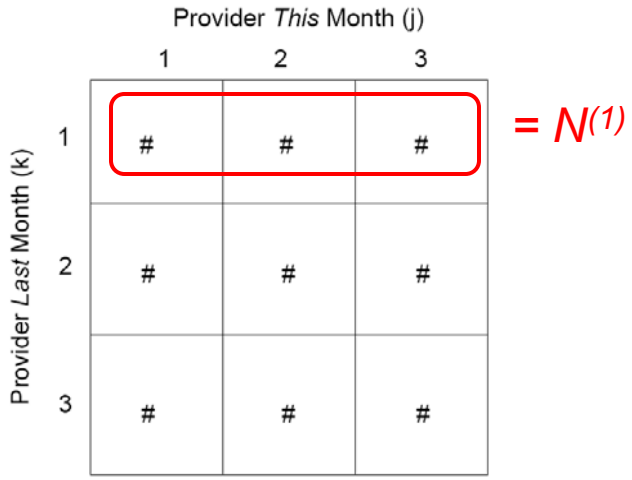
- Conditional upon "deciding", household chooses retailer j with pr = P_j

➔ 5 probabilities ($\lambda_1, \lambda_2, \lambda_3, P_1, P_2$)

Simplified Illustration

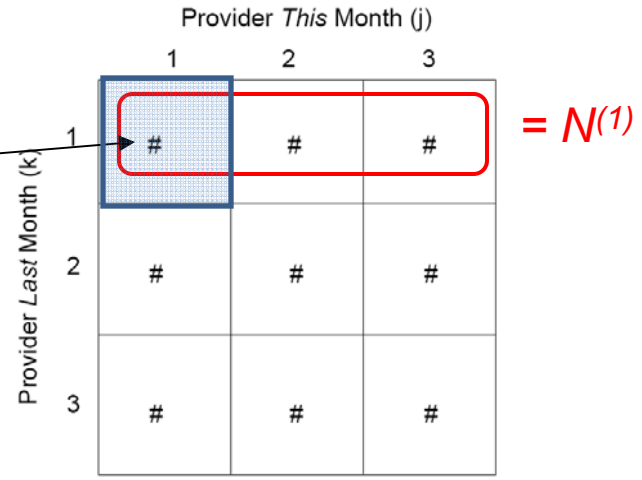


Simplified Illustration



Simplified Illustration

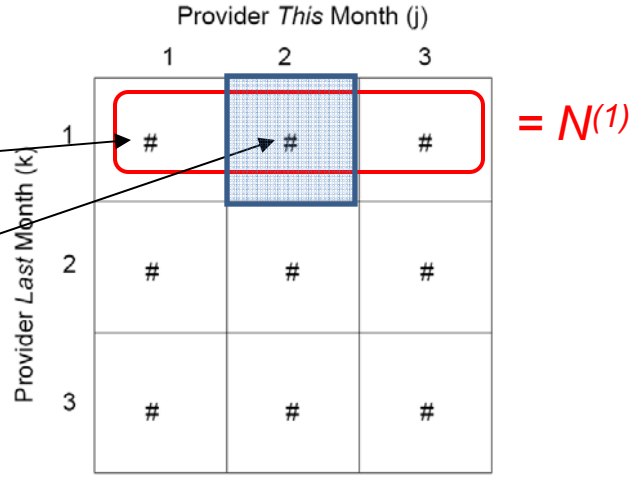
$$N^{(1)}\left[\underbrace{(1-\lambda_1)}_{\text{non-deciders}} + \underbrace{\lambda_1 P_1}_{\text{deciders choosing 1}}\right]$$



Simplified Illustration

$$N^{(1)}\left[\underbrace{(1-\lambda_1)}_{\text{non-deciders}} + \underbrace{\lambda_1 P_1}_{\text{deciders choosing 1}}\right]$$

$$N^{(1)}\left[\underbrace{\lambda_1 P_2}_{\text{deciders choosing 2}}\right]$$



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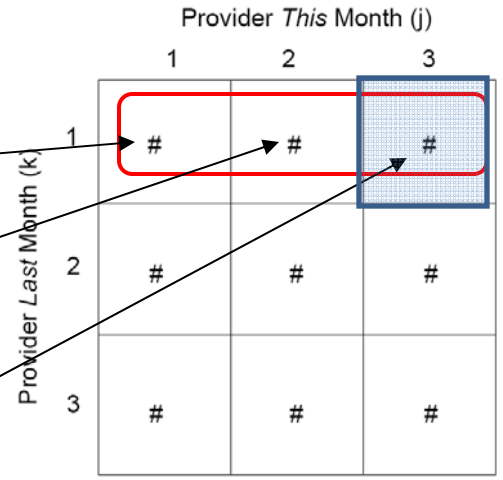
$$N^{(1)}\left[\underbrace{\lambda_1 P_2}_{\text{deciders choosing 2}}\right]$$

$$N^{(1)}\left[\underbrace{\lambda_1(1-P_1-P_2)}_{\text{deciders choosing 3}}\right]$$



= $N^{(1)}$

Simplified Illustration

$$N^{(1)}\left[\underbrace{(1-\lambda_1)}_{\text{non-deciders}} + \underbrace{\lambda_1 P_1}_{\text{deciders choosing 1}}\right]$$

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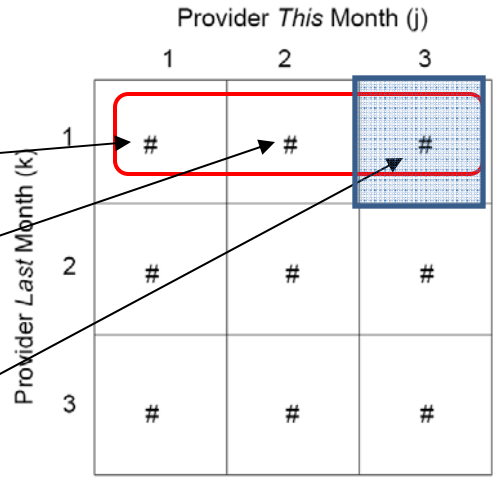

= $N^{(1)}$

➔ 9 moments e.g. E[#(k=1, j=1)] = $N^{(1)}[(1-\lambda_1)+\lambda_1 P_1]$
(1 redundant moment in each set – any customer not going to 2 or 3 stays with 1)

➔ 5 probabilities and 6 moments (use the "off-diagonal" moments)

Specifying "Decision Function" λ^k

For household previously using provider k in month t:

$$\lambda_t^k(\gamma) = \frac{e^{W_t^k}}{1 + e^{W_t^k}}$$

$$\text{where } W_t^k = \sum_r \gamma_r Z_{rt}^k$$

$Z =$ retailer dummy variables, month of year dummies, census block group demographics

Specifying "Choice Function" P_j

For each household whose provider was k in t-1 AND decides to search, it chooses the retailer that maximizes utility:

$$U_{ijt}^{(k)} = \sum_s \theta_s X_{ijt,s}^{(k)} + \varepsilon_{ijt}$$

where ε_{ijt} is Type I Extreme Value i.i.d. across consumer, provider, and time.

$$X_{ijt} = \text{price}_{jt},\ I(\text{Incumbent})_j,\ I(\text{Incumbent})_j \times \text{Month}_t,\ \underbrace{I(\text{j} = (\text{k})) \times I(i \text{ not mover}))}_{\text{No Switching Costs}}$$

In future: (1) additional covariates for CREPs, (2) IVs for price

Distributional assumption implies that:

$$P_{ijt}(\theta) = \frac{\exp(\sum_s \theta_s X_{ijt,s}^{(k)})}{\sum_{k \geq 1} \exp(\sum_s \theta_s X_{ikt,s}^{(k)})}$$

GMM Estimation

Estimate decision parameters (γ) and choice parameters (θ) via GMM:

$$\min_{\gamma,\theta} \ \eta' W \eta$$

where $\eta \equiv \left\langle \eta_{jt}^{(k)} \right\rangle$ and $\eta_{jt}^{(k)} = \dfrac{N_{jt}^{(k)} - \left(\sum_{i \in B_t^{(k)}} \lambda_{it}^{(k)} P_{ijt} \right)}{N_t^{(k)}}$

Estimate for January 2004 – April 2006 when all 6 retailers present (20% sample to ease computation)

Identification: Product Differentiation, Search Costs, and Switching Costs

- Search costs = e.g. "inattentiveness"
- Switching costs = e.g. hassle

- Identification of Search Costs (separate from choice/brand effects)
  - Flow from REP k to REP j allows separate identification of probability of search (λ^k) and probability of choice (P_j)
    - Parameters/probabilities O(J) and moments O(J^2)
  - Key assumptions:
    - "Deciding" is a function of the last provider (and not the next one)
      - E.g. high bill, bad service. Rules out advertising?
    - "Choosing" is a function of the next provider (and not the last one)

Identification: Product Differentiation, Search Costs, and Switching Costs

- Identification of Switching Costs (separate from search costs)
  - "Only" from a non-linearity in the logit probability
  - Still looking for "data driven" source of identification

No Heterogeneity

Stage 2: Choice

Stage 1: Decision

Stage 1: Decision λ^k

Stage 2: Choice P_j

Number of Observations
Choice Step Parameters
Price
Incumbent
Incumbent * Month
Same Retailer
Decision Step Parameters
Current retailer effect: Incumbent
Avg Current retailer effect: Others
Winter Effect
Spring Effect
Summer Effect
Fall Effect
July
Calculated Probabilities and Elasticities:
Decision Prob: Incumbent
Decision Prob: Retailer 2 or 3
Decision Prob: Retailer 4 or 6
Decision Prob: Green Retailer
Choice Prob: Incumbent
Choice Prob: Retailer 2 or 3
Choice Prob: Retailer 4 or 6
Choice Prob: Green Retailer
Price Elasticity: Incumbent
Price Elasticity: Retailer 2 or 3
Price Elasticity: Retailer 4 or 6
Price Elasticity: Green Retailer

No Heterogeneity

	(1)
Number of Observations	5,994,066
Choice Step Parameters	
Price	-0.475***
	(0.062)
Incumbent	3.354***
	(0.050)
Incumbent * Month	-0.051***
	(0.004)
Same Retailer	
Decision Step Parameters	
Current retailer effect: Incumbent	-3.28
Avg Current retailer effect: Others	-4.17
Winter Effect	0.03
Spring Effect	0.40
Summer Effect	0.54
Fall Effect	0.34
July	0.93
Calculated Probabilities and Elasticities:	
Decision Prob: Incumbent	5.0%
Decision Prob: Retailer 2 or 3	1.5
Decision Prob: Retailer 4 or 6	2.6
Decision Prob: Green Retailer	2.8
Choice Prob: Incumbent	81.4%
Choice Prob: Retailer 2 or 3	4.5
Choice Prob: Retailer 4 or 6	3.2
Choice Prob: Green Retailer	3.3
Price Elasticity: Incumbent	-1.06
Price Elasticity: Retailer 2 or 3	-5.18
Price Elasticity: Retailer 4 or 6	-5.68
Price Elasticity: Green Retailer	-5.21

Stage 2: Choice

Stage 1: Decision

Stage 1: Decision λ^k

Stage 2: Choice P_j

Brand Effect that erodes over time.

No Heterogeneity

Stage 2: Choice

Stage 1: Decision

Stage 1: Decision λ^k

Stage 2: Choice P_j

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Price Elasticity: Incumbent	-1.06
Price Elasticity: Retailer 2 or 3	-5.18
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Price Elasticity: Green Retailer	-5.21

Incumbent demand much less elastic

No Heterogeneity

Stage 2: Choice

Stage 1: Decision

Stage 1: Decision λ^k

Stage 2: Choice P_j

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Choice Step Parameters	
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Incumbent * Month	-0.051***
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Same Retailer	
Decision Step Parameters	
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Price Elasticity: Green Retailer	-5.21

Consider alternatives more in summer

No Heterogeneity

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Number of Observations	5,994,066
Choice Step Parameters	
Price	-0.475***
	(0.062)
Incumbent	3.354***
	(0.050)
Incumbent * Month	-0.051***
	(0.004)
Same Retailer	
Decision Step Parameters	
Current retailer effect: Incumbent	-3.28
Avg Current retailer effect: Others	-4.17
Winter Effect	0.03
Spring Effect	0.40
Summer Effect	0.54
Fall Effect	0.34
July	0.93
Calculated Probabilities and Elasticities:	
Decision Prob: Incumbent	5.0%
Decision Prob: Retailer 2 or 3	1.5
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Choice Prob: Incumbent	81.4%
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Price Elasticity: Green Retailer	-5.21

Stage 2: Choice

Stage 1: Decision

Consider alternatives more in summer

Stage 1: Decision λ^k

…but it's still rare

Stage 2: Choice P_j

No Heterogeneity

Stage 2: Choice

Stage 1: Decision

Stage 1: Decision λ^k

Stage 2: Choice P_j

	(1)	(2)
Number of Observations	5,994,066	5,994,066
Choice Step Parameters		
Price	-0.475***	-0.469***
	(0.062)	(0.061)
Incumbent	3.354***	3.352***
	(0.050)	(0.049)
Incumbent * Month	-0.051***	-0.051***
	(0.004)	(0.004)
Same Retailer		2.26***
		(0.492)
Decision Step Parameters		
Current retailer effect: Incumbent	-3.28	-0.76
Avg Current retailer effect: Others	-4.17	-3.91
Winter Effect	0.03	0.00
Spring Effect	0.40	0.41
Summer Effect	0.54	0.54
Fall Effect	0.34	0.31
July	0.93	0.99
Calculated Probabilities and Elasticities:		
Decision Prob: Incumbent	5.0%	39.0%
Decision Prob: Retailer 2 or 3	1.5	2.1
Decision Prob: Retailer 4 or 6	2.6	3.3
Decision Prob: Green Retailer	2.8	3.5
Choice Prob: Incumbent	81.4%	89.1%
Choice Prob: Retailer 2 or 3	4.5	3.8
Choice Prob: Retailer 4 or 6	3.2	1.2
Choice Prob: Green Retailer	3.3	1.0
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Price Elasticity: Retailer 2 or 3	-5.18	-4.04
Price Elasticity: Retailer 4 or 6	-5.68	-5.29
Price Elasticity: Green Retailer	-5.21	-5.13

Evidence of switching costs

First Cut Distributional Analysis

- How do brand effects, searching and switching costs vary by demographics?
  - Caveat: using Census block group characteristics
- Later: welfare calculations

	Coef Est.	Std Error
Choice Step Parameters		
Price	0.91	(0.65)
Price * Senior	-1.64	(3.33)
Price * Black	-1.35*	(0.73)
Price * EduBS	-2.45**	(1.13)
Incumbent	10.39***	(2.16)
Incumbent * Month	-0.09***	(0.02)
Incumbent * Senior	-12.05**	(5.43)
Incumbent* Black	-10.25**	(4.03)
Incumbent * EduBS	-8.95***	(2.91)
Same Retailer	5.56***	(0.66)
Decision Step Parameters		
Heat	127.3	(177.2)
EduBS	-110.6	(133.7)
Senior	289.3	(414.0)
Black	-139.4	(224.6)
Current retailer effect: Incumbent	49.15	
Avg Current retailer effect: Others	-77.01	
Winter Effect	-5.25	
Spring Effect	-0.41	
Summer Effect	0.15	
Fall Effect	-0.55	
July	1.85	

More price sensitive in neighborhoods with more:
- AA
- college-educated

	Coef Est.	Std Error
Choice Step Parameters		
Price	0.91	(0.65)
Price * Senior	-1.64	(3.33)
Price * Black	-1.35*	(0.73)
Price * EduBS	-2.45**	(1.13)
Incumbent	10.39***	(2.16)
Incumbent * Month	-0.09***	(0.02)
Incumbent * Senior	-12.05**	(5.43)
Incumbent* Black	-10.25**	(4.03)
Incumbent * EduBS	-8.95***	(2.91)
Same Retailer	5.56***	(0.66)
Decision Step Parameters		
Heat	127.3	(177.2)
EduBS	-110.6	(133.7)
Senior	289.3	(414.0)
Black	-139.4	(224.6)
Current retailer effect: Incumbent	49.15	
Avg Current retailer effect: Others	-77.01	
Winter Effect	-5.25	
Spring Effect	-0.41	
Summer Effect	0.15	
Fall Effect	-0.55	
July	1.85	

Brand advantage lower in neighborhoods with more:
seniors,
AA,
college educated

Conclusions

- Raw data:
  - $7-$12/month left on table by not switching from incumbent to competitive retailer
- Model-driven:
  - Inertial behavior due to each of:
    - (1) brand advantage,
    - (2) infrequent consideration of alternatives,
    - (3) switching costs
  - Incumbent has brand effect but erodes over time
    - Potentially large implications for consumer surplus if “it counts” & profits for incumbent
  - Brand advantage varies by neighborhood

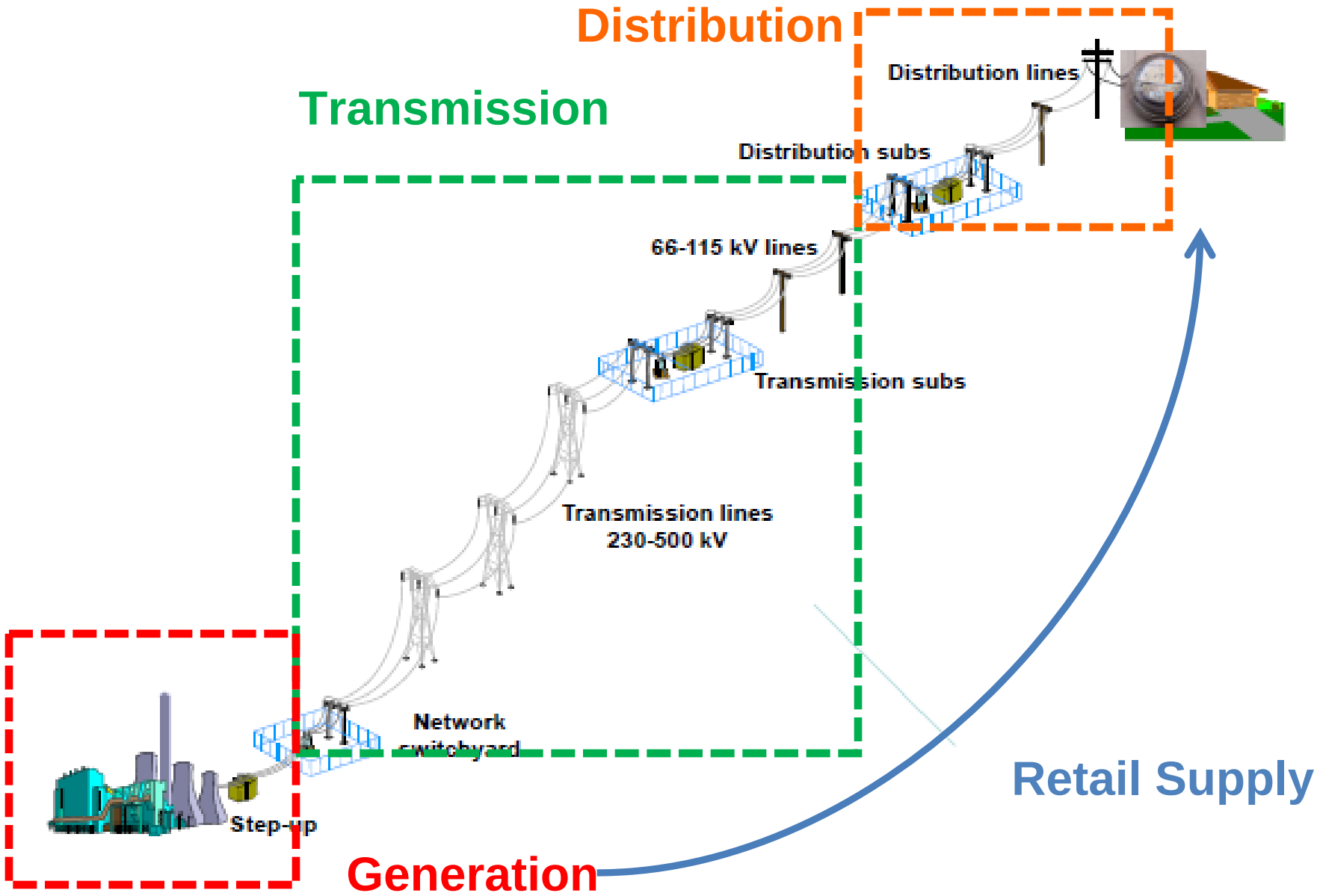
The End

Why Distinguish Between 3 Possible Causes?

1. "Brand name" of incumbent
   - Short-lived?
   - "Transition cost" to retail competition?
2. Search/Decision Costs
   - Public information campaigns can reduce (e.g. Texas Electric Choice Education Program)
3. Switching Costs
   - Unlikely to change with time?

Broad Arguments
For and Against Retail Competition

- Advocates:
  - New retailers will create value-added services (e.g. risk hedging, real-time pricing)
  - May help break utility's monopsony power in wholesale market
- Opponents:
  - Value-added services/retail innovations are more limited in electricity (as compared to e.g. telecom)
  - Economies of scale in retail billing/customer service


Distribution
Transmission
Distribution lines
Distribution subs
66-115 kV lines
Transmission subs
Transmission lines
230-500 kV
Network
switchyard
Step-up
Generation
Retail Supply

Electricity Facts

Retail Electric Provider ABC, Certificate #00000, Family Electricity Plan
Serving the State of Texas

Electricity price

Average monthly use:	500kWh	1,000kWh	1,500 kWh
Average price per kilowatt-hour:	**(¢)**	**(¢)**	**(¢)**

Contract

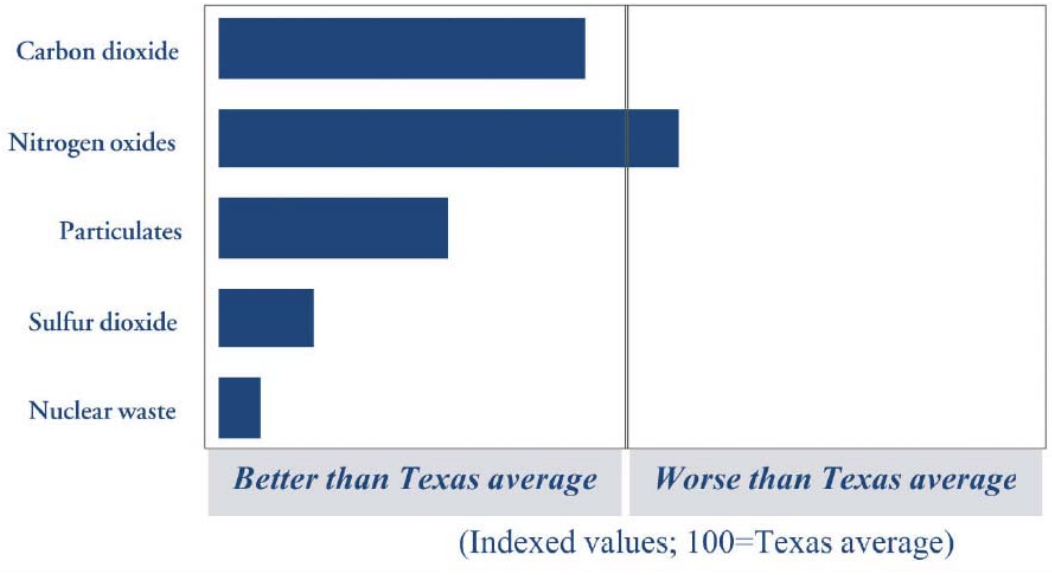
Minimum term: (months) Penalty for early cancellation: ($)

See Terms of Service statement for a full listing of fees, deposit policy, and other terms.

Sources of power generation

	This product	*Texas (for comparison)*
Coal and lignite	___%	___%
Natural gas	___%	___%
Nuclear	___%	___%
Renewable energy	___%	___%
Other	___%	___%
Total	**100%**	**100%**

Emissions and waste per kWh generated



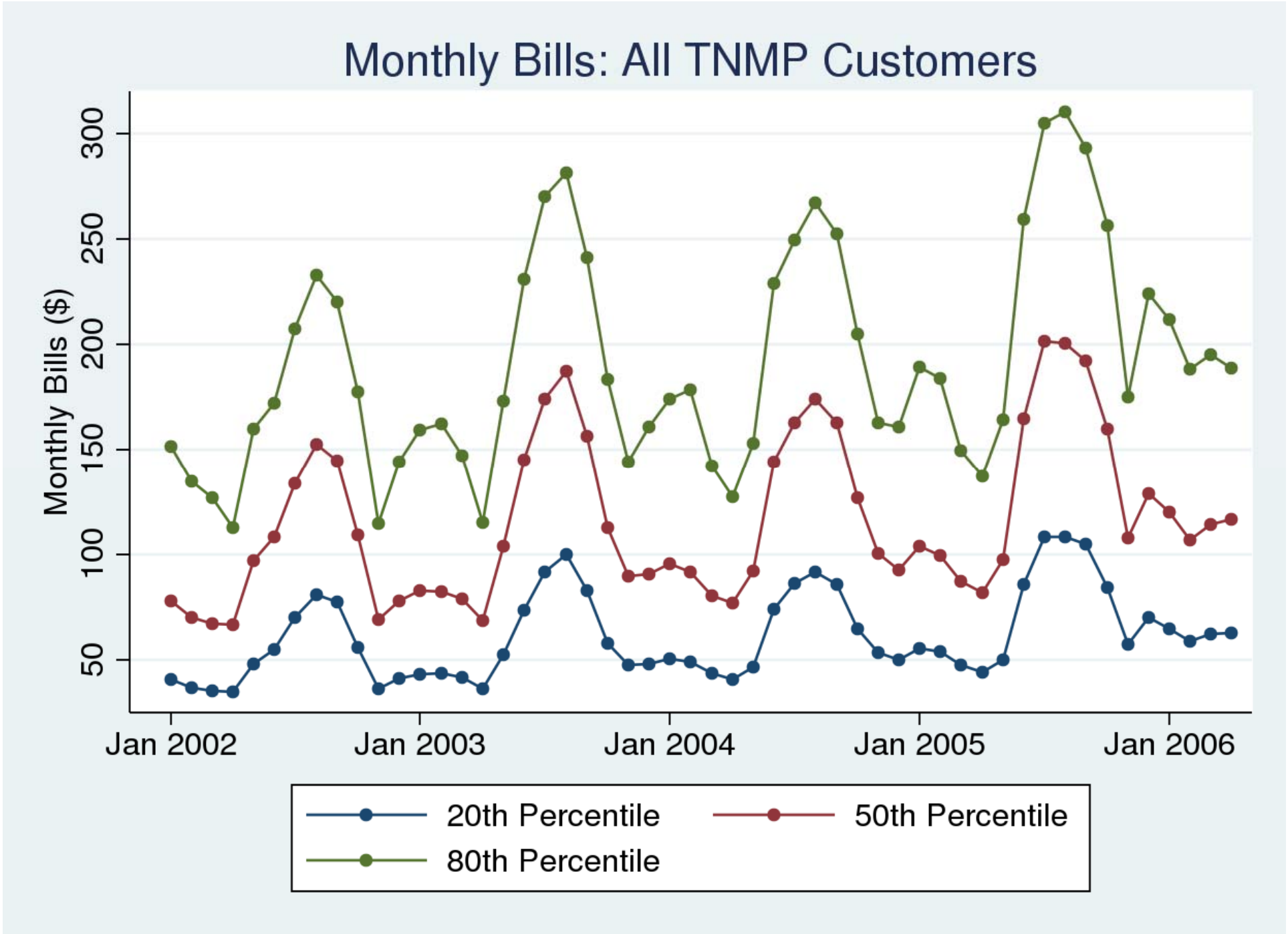
(Indexed values; 100=Texas average)

Possible Sources of Product Differentiation

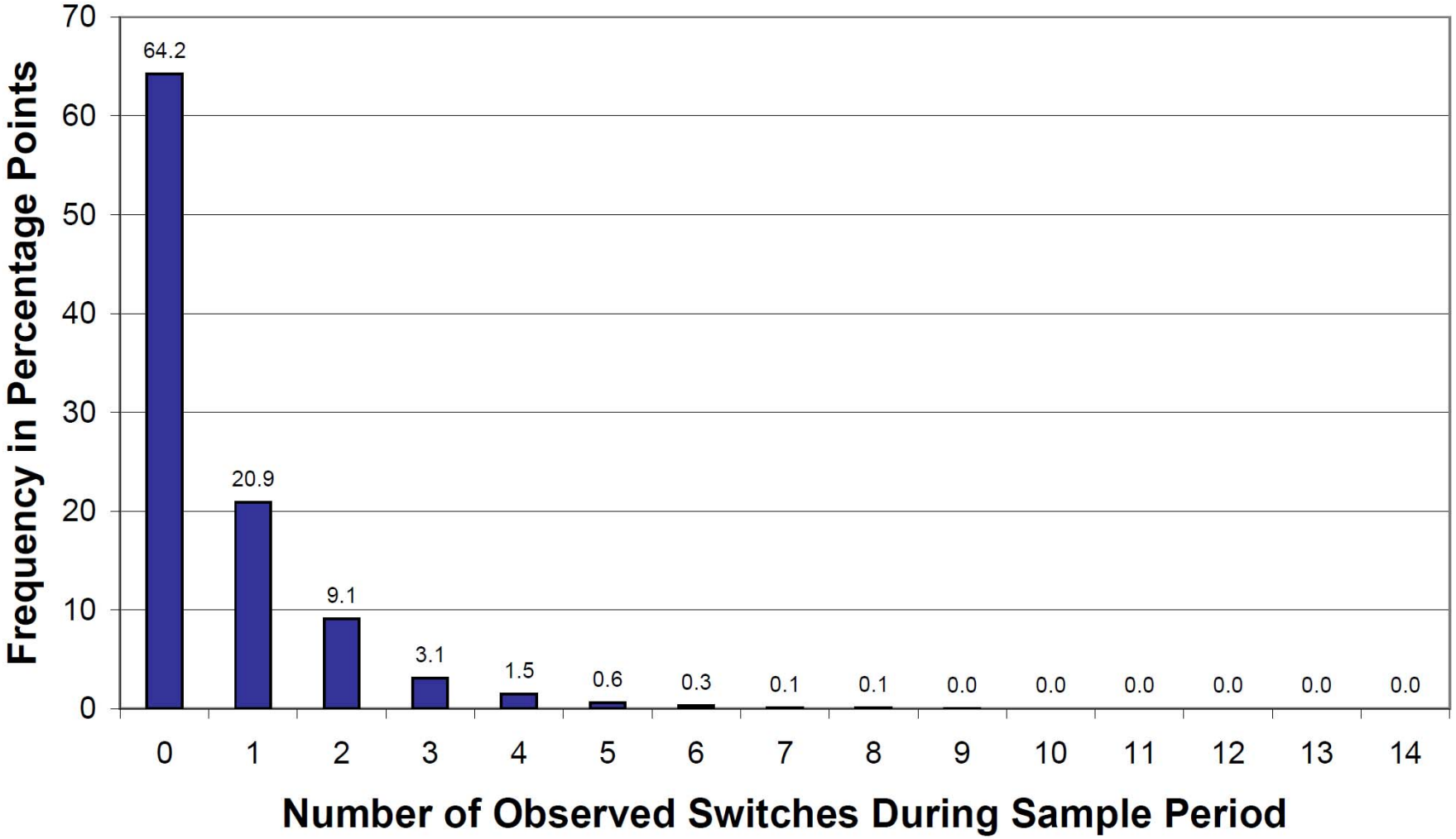
- Perceived reliability for CREPs
- Customer service quality
- Renewable energy content
- Term of rate structure (“hedging”)

Data (contd)

- We focus on 6 retailers with > 1% share
  - the incumbent, 2 “incumbents” from other service territories, 3 others (1 green)
- For each retailer:
  - PUC monthly data on rate plan(s) offered
    - 4 retailers offered only 1 rate plan
    - Other 2 retailers – chose plan guessed most popular by industry analyst

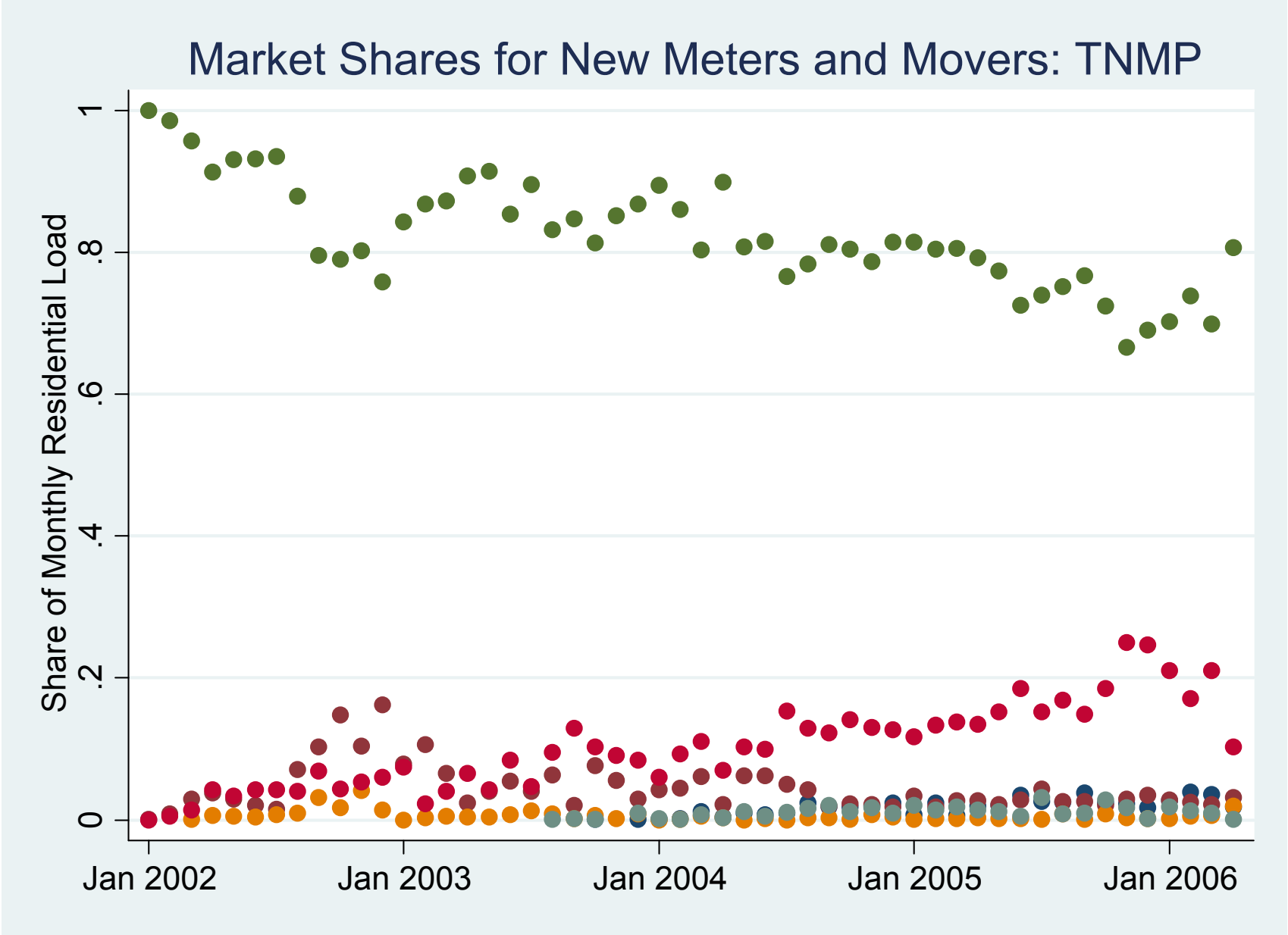

Monthly Bills: All TNMP Customers
Monthly Bills ($)
50
100
150
200
250
300
Jan 2002
Jan 2003
Jan 2004
Jan 2005
Jan 2006
20th Percentile
50th Percentile
80th Percentile

Frequency of Switches Per Household in TNMP

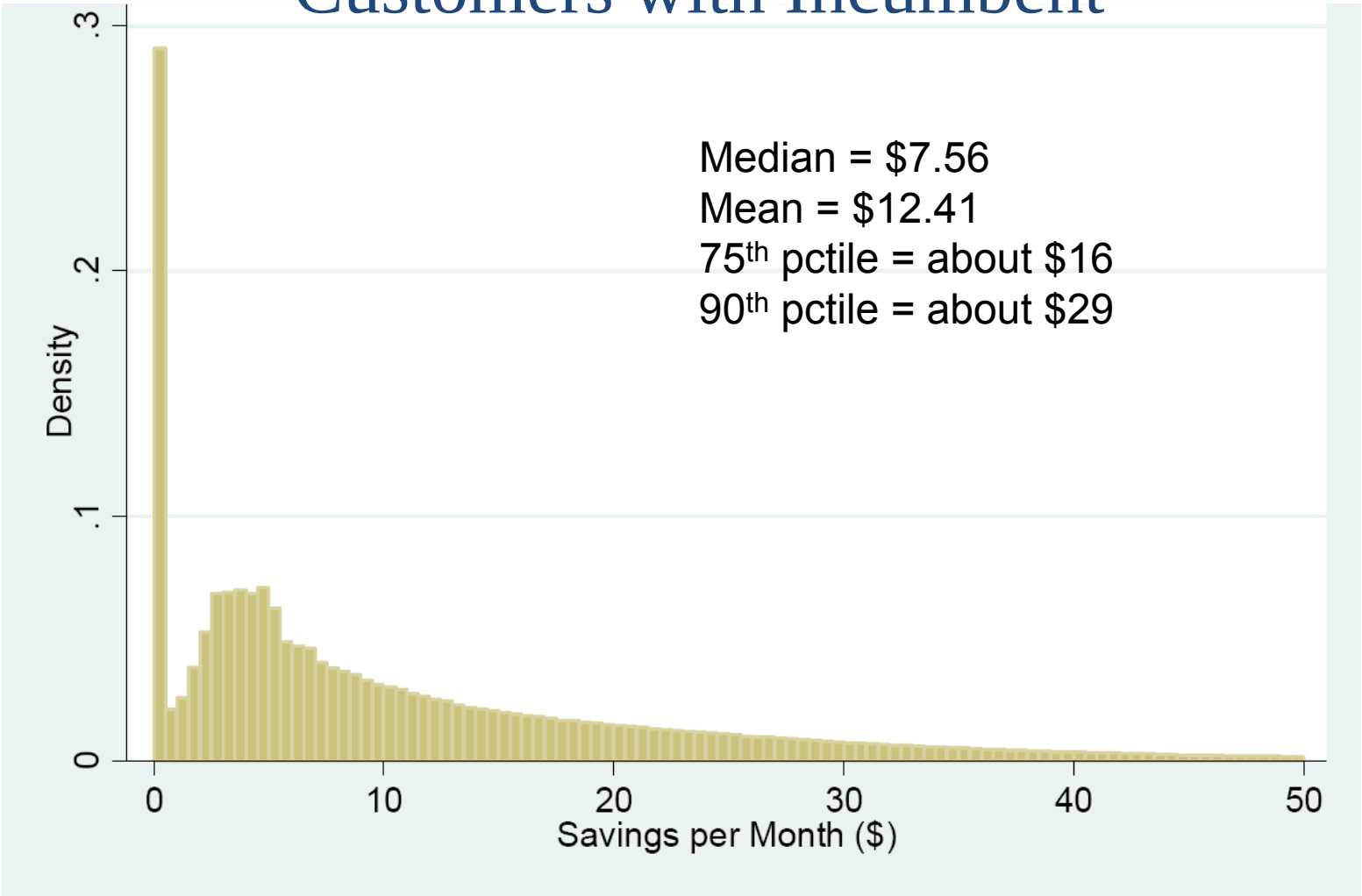


Note: Excludes “New Meters” and “Move-ins”

Incumbent Share Not Driven Entirely By Search Costs



Monthly Savings for Customers with Incumbent



This figure plots the distribution of monthly savings for households in the months served by the incumbent at the price-to-beat. This savings is the difference between the actual bill by the incumbent and the bill by the lowest priced alternative retailer, assuming consumption is the same.

Are these Savings Large (In Terms of Energy Policy)?

- Estimated cost of Waxman-Markey
  - $14.58/HH-mo (CBO)
  - $6.66 - $9.25 /HH-mo (EPA)

Descriptive Statistics of Realized Savings

- For months that households purchased from any CREP, how much higher would bill be if purchased from incumbent?
  - Mean = $8.79/HH-mo

Dependent Variable: Percent Achieved of Potential Savings

	Census Block Group data		Individual-level Zillow data	
Fraction Education BS or more	0.120*	0.121*	0.113*	0.114*
Fraction Black	0.023*	0.023*	0.015+	0.015+
Fraction Hispanic	-0.044*	-0.037*	0.003	0.003
Fraction Senior	-0.230*	-0.213*	-0.205*	-0.205*
Fraction Heating Electric	-0.020*	-0.017*	0.016*	0.015*
Poverty Rate	-0.098*	-0.077*	-0.106*	-0.105*
Fraction inside Urbanized Areas	0.060*	0.059*	0.049*	0.049*
Mean Usage (1000s of kwh/mo)		0.018*		0.003*
House value Zillow ($1000's)			0.00006*	0.00005*
Single Family Home			0.004	0.004
Condo			-0.024	-0.024
Mobile Home			-0.022	-0.022
Constant	0.070*	0.043*	0.066*	0.063*
Observations	188,540	188,540	80,445	80,445
R-squared adjusted	0.07	0.07	0.03	0.03

+ $p<0.05$, * $p<0.01$

Notes: The dependent variable is the mean of the monthly "percent achieved" across all months that a meter has positive usage. It is defined only for customers who purchase from one of the largest 6 retailers and when there are positive potential savings of switching away from the incumbent. The excluded category for building type is all other types (multi-family, duplex, unknown).

Empirical Complication

- We do not observe stage 1 outcome
- Non-switchers are:
  - "non-deciders" AND
  - "deciders" that choose current provider

Formal Model with Heterogeneity

$B_t^{(k)} \equiv$ set of households whose provider was k in month t-1

$\lambda_t^{(k)} \equiv$ *prob*(a household in $B_t^{(k)}$ "decides" in period t)

(specified later)

$N_t^{(k)} \equiv$ total number of households in $B_t^{(k)}$

Denote $N_{jt}^{(k)} \equiv$ number of these households who use provider j in month t

$$\left(\text{thus, total households using } j \text{ in month } t \equiv N_{jt} = \sum_{k} N_{jt}^{(k)}\right)$$

$P_{ijt} \equiv$ *prob*(household i who "decides" chooses provider j in t)

(specified later)

Formal Model with Heterogeneity

For each agent i in set $B_t^{(k)}$, let $d_{ijt}^{(k)} \equiv 1(i \text{ uses } j \text{ in month } t)$

For agents changing retailers (j ≠ k),

$$E_{t-1}[d_{ijt}^{(k)}] = \lambda_{it}^{(k)} P_{ijt}$$

and $N_{jt}^{(k)} = \sum_{i \in B_t^{(k)}} d_{ijt}^{(k)}$

Our moment equations:

$$E_{t-1}[N_{jt}^{(k)}] = \sum_{i \in B_t^{(k)}} \lambda_{it}^{(k)} P_{ijt}$$ where P_{ijt} can include household-level data

$J(J-1)$ moments for each time t

Our Measure of Price

- The price per kwh for 1000kwh visible on Facts Label & powertochoose.com
  - Median usage = 968kwh
- Rationale:
  - Most salient
  - Average price (rather than marginal price) may drive behavior (Ito, 2010)

Next Step…Welfare Calculations

- Choice parameter estimates allow us to estimate changes in consumer surplus
- Our current dilemma:

1. World with retail choice
   - Should incumbent brand effect "count" for welfare?
2. World of the regulatory counterfactual
   - "Brand effect" of the old regulated utility?
   - Search costs?

Reliant Energy

Reliant Energy Account: [redacted]

Billing Date: Jul 17, 2006

Date Due	Amount Due	Amount Due After Due Date
08/02/2006	$ 422.77	$ 443.91

Account Information

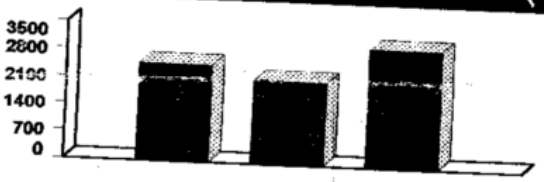
Account #: [redacted]
Invoice #:
Customer Name:

Account Summary

Previous Amount Due	$366.72
Payment 07/03/2006	-366.72
Balance Forward	0.00
Total Current Charges	422.77
Total Due	**$422.77**

Electricity Usage Summary

For more usage and temperature information logon to reliant.com/myaccount



Billing Period	06/09/2006 - 07/11/2006	05/10/2006 - 06/09/2006	06/09/2005 - 07/11/2005
Billing Days	32	30	32
Electricity Used (kWh)	2489	2164	3040
Avg. High Temperature*	90	87	94
Avg. Daily Usage (kWh)	78	72	95

*Temperature Source: National Weather Service Region: Coastal Texas

Questions or Comments

Customer Service

www.reliant.com/myaccount
Email us at: service@reliant.com

713-207-7777 **24-hours a day**
1-866-222-7100 **24-hours a day**
TDD Device for Hearing Impaired
1-888-467-3542

Reliant Energy Residential Services
Certificate: 10007

Service Address

[redacted]

For outages or emergencies
call 713-207-2222
or toll-free 1-800-332-7143.

ESI ID:

[redacted]

Electric Usage Detail

Meter Numbe [redacted]

Current Read 07/11/2006	33541
Previous Read 06/09/2006	31052
kWh Multiplier	1
kWh Usage	2,489

Current Electricity Charges Detail

32 Day Billing Period From 06/09/2006 To 07/11/2006

Residential Service

Reliant Energy Electric Service		
Monthly Customer Charge		5.59
First 250 kWh	250 KWH @ $0.029441/KWH	7.36
All Additional kWh	2,239 KWH @ $0.077171/KWH	172.79
Fuel Factor for Generation	2,489 KWH @ $0.092718/KWH	230.78
City Sales Tax 1.50%		6.25
Total Current Charges		[illegible]

The average price you paid for electric service this month (per kWh) $0.167

Table 1: Direct Measures of Expenditure Reduction Obtained by Switching

Characteristic of Block Group		
	High	**Low**
Income	14.2%	7.5%
% Senior	8.1%	13.8%
% Education Bachelor or More	14.3%	7.5%
% Black	12.3%	9.6%
% Hispanic	10.3%	11.7%
% Houses using Electric Heating	11.4%	10.6%

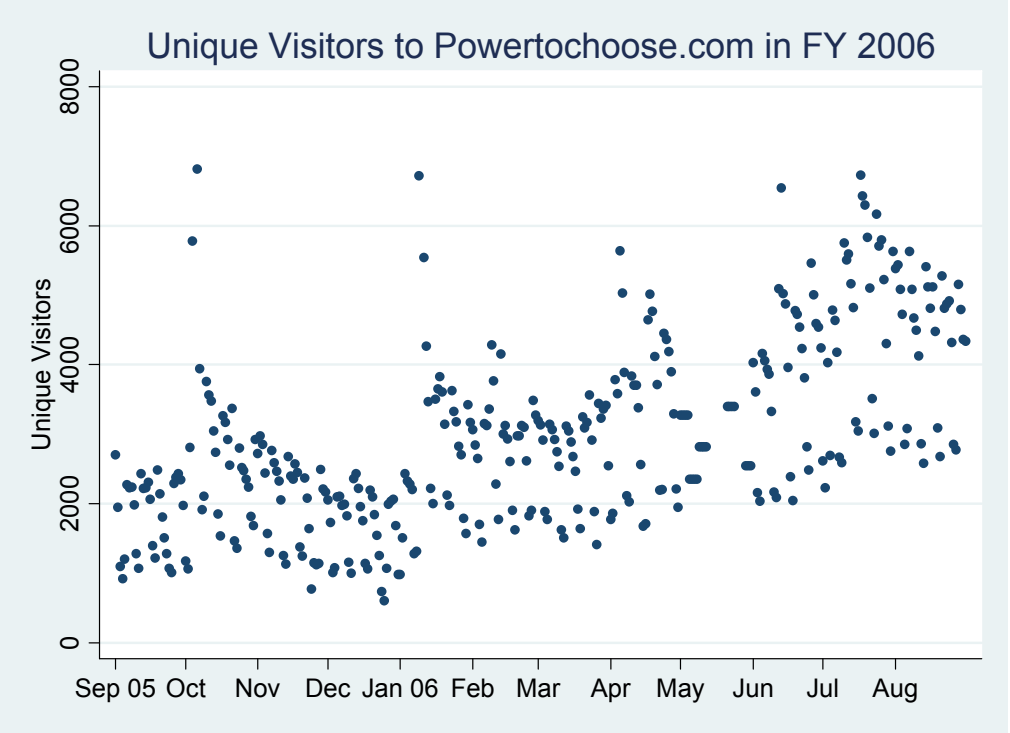
This table contains the mean "percent achieved" of possible savings from switching to the lowest price retailer, as compared to remaining with incumbent for the entire sample period. We assume consumption remains constant and calculate the monthly bill size under three scenarios: 1) staying with the incumbent for the entire period, 2) purchasing from the low price retailer each month, and 3) actual choices. "Percent achieved" is the percent of possible gains realized ((actual bill - incumbent bill) / (optimal bill - incumbent bill)). Households are grouped by the characteristics of their Census block group into categories of above or below the median for the sample.

Broader Literature on Consumer Decisionmaking

- Is this just “stupid consumer tricks?”
- Chetty – tax
- Grubb – cellphone
- Einav & Cohen
- Handel

Search Rates: Comparing Estimate to Outside Data

- # unique webhits / approx # HHs = 0.018
  - ➔1.8% search rate on powertochoose
- Season pattern consistent with estimated pattern



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Simply Better

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TEXAS ELECTRIC CHOICE
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bounce energy