The Impact on Broadband Access to the Internet of the Dual Ownership of Telephone and Cable Networks

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Cable Networks

Cable Networks, *CN*

upgraded to deliver telecom services

same firm controls *PSTN* and *CN*

controls 2 local access networks

hinders ***competition***

Legal Framework

In US:

96 Telecom. Act limits dual ownership

In EU:

only requires legal separation

Dual Ownership

incumbent owns *PSTN* and *CN*

Denmark

Finland

Greece

Ireland

Portugal

Sweden

Theme

estimate impact on ***broadband***

separation ***PSTN*** and ***CN***

Portugal

Separation

horizontally differentiated infrastructures

not *vertically integrated* infrastructures

Theme

panel of consumer level data

discrete choice model

estimate demand elasticities & marginal costs

simulate effects of Separation

prices & welfare

Structural Separation

would lead to

substantial *price* reductions

Plan

(1) Model

(2) Estimation

(3) Analysis

(4) Conclusion

Part 1

Model

Discrete Choice Model

utility of household *n* in *t* from alternative *i*:

$$U_{nti}(p_{ti}, z_{nt}, x_i, \xi_n, \varsigma_n, \varepsilon_{nti}, \theta) = V_{nti}(p_{ti}, z_{nt}, x_i, \xi_n, \varsigma_n, \theta) + \varepsilon_{nti},$$

$$V_{ni}(p_i, z_n, x_i, \xi_n, \varsigma_n, \theta) := p_i \alpha(z_n, \xi_n, \gamma, \sigma_\gamma) + g(x_i, \varsigma_n, \beta, \sigma_\beta),$$

$$\alpha(z_n, \xi_n) := -\exp\left[\sum_{k=1}^{K} z_{nk}(\gamma_k + \sigma_{\gamma_k}\xi_{nk})\right],$$

$$g(x_i, \varsigma_n, \beta, \sigma_\beta) := \sum_{j=1}^{J} x_{ij}(\beta_j + \sigma_{\beta_j}\varsigma_{nj}),$$

$$\theta := (\gamma, \sigma_\gamma, \beta, \sigma_\beta),$$

Choice Probabilities

single period

$$P_{ni} = \int \frac{e^{V_{ni}}}{\sum_j e^{V_{nj}}} f(\varsigma_n, \xi_n) d\varsigma_n d\xi_n$$

panel

$$P_{ni} = \int \prod_{t=1}^{T} \frac{e^{V_{ni_t t}}}{\sum_j e^{V_{njt}}} f(\varsigma_n, \xi_n) d\varsigma_n d\xi_n$$

Consumer Surplus

$$\Delta CS_n = \frac{1}{\alpha}\left[\ln H\left(e^{V''_{n1}},\ldots,e^{V''_{nJ}}\right) - \ln H\left(e^{V'_{n1}},\ldots,e^{V'_{nJ}}\right)\right]$$

integrated over unobservables

Market Equilibrium

Firms play Bertrand game:

- choose prices
- simultaneously
- non–cooperatively

Data

invoice based micro panel

1,200 households surveyed 12 months (renewed)

Limitations:

consumers rarely change choice over time

not all firms represented (95% of 2004 market)

Part 2

Estimation

Implementation

Logits & Mixed Logits period by period:

stability of coefficients

Mixed logit over period:

random coefficients capture time dependence

Tests

Hausman-McFaden/LM tests of logit (IIA)

reject logit

do not reject null if nested is alternative

reject null if mixed is alterative (few random coef.)

Estimated Models

(1) stacked logit

(2) logit model, product dummies evolve over time

(3) mixed logit, unobs. household charact. affect price

(4) mixed logit, unobs. household component same across periods

(5) *idem*, with more components

Demand Model Estimates

household characteristics

product characteristics

stand. dev. random comp.

Variable	Model (4)	Model (5)
const	1.435***	1.653**
educ	-2.051***	-2.440***
class	1.719***	2.089
age	-3.450***	-3.290**
max(age-48,0)	8.191***	8.280***
northeast	0.698***	0.583***
south	-0.115	-0.029
dialup	6.774***	7.063***
adsl	5.957***	6.327***
cable	5.157***	5.621***
cv	-0.790***	-0.701***
payg	-3.408***	-3.529***
fast	1.418***	1.188***
std_const	0.943***	1.788***
std_educ		0.672***
std_class		0.057
std_age		0.570**
std_max(age-48,0)		0.161

Robustness of Elasticities

Uncertainty in Parameter Estimates:

draw vectors from joint normal parameterized on estimated values

compute matrix of elasticities for each draw and order them by norm

report results for lower 1% and upper 99%

small variation

Estimated Elasticities

ε_{ij}	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	s_i
(1)	0.000	0.493 *	0.005	0.013	0.003	0.044	0.007	0.008	0.001	0.618
(2)	0.000	-1.364	0.056	0.127	0.037	0.127 *	0.066	0.084	0.009	0.269
(3)	0.000	0.324	-4.037 **	0.388 *	0.356	0.041	0.184 **	0.373	0.107	0.016
(4)	0.000	0.564 **	0.303 **	-3.644 **	0.237	0.067	0.178 *	0.302	0.088	0.022
(5)	0.000	0.200	0.420 ***	0.341 *	-3.716 **	0.039	0.161 *	0.320	0.101	0.014
(6)	0.000	1.160 ***	0.083	0.166	0.067	-2.479 ***	0.086	0.109	0.013	0.027
(7)	0.000	0.566 **	0.296 **	0.365 *	0.232	0.068	-3.833 ***	0.372	0.084	0.012
(8)	0.000	0.444 *	0.330 ***	0.352 *	0.249	0.047	0.208 ***	-3.809 **	0.084	0.018
(9)	0.000	0.277	0.381 ***	0.424 ***	0.293	0.023	0.198 ***	0.361	-4.759 *	0.003

(1) - No access; (2) - Dial-up (PT); (3) - ADSL (PT); (4) - Cable V1 (PT); (5) - Cable V2 (PT); (6) - Cable, pay as you go (PT); (7) - Cable V1 (CV); (8) - Cable V2 (CV); (9) - Cable V3 (CV)

Calibration

Let s_i represent the correct market share for product i, and $\hat{\theta}_2$ the estimated value of θ_2.

The calibrated value of θ_1, denoted by $\tilde{\theta}_1$, is defined by:

$$\tilde{\theta}_1 := \arg\min_{\theta_1} \sum_{i=1}^{I} \left(s_i - \frac{1}{N} \sum_{n=1}^{N} P_{ni}(\theta_1, \hat{\theta}_2) \right)^2$$

adjust product dummies to reflect recent market shares

consider new products not available initially

Part 3

Analysis

Welfare Impact

Population		$\Delta p^{\dagger}$	$\frac{\Delta p}{p}$	$\Delta CS^{\ddagger}$	Δ profit ‡
All	Elast I	-0.99	-0.10	0.51	-0.08
All	Elast II	-1.56	-0.15	0.64	-0.27
All	Elast III	-0.50	-0.05	0.54	-0.09
Broadband	Elast I	-2.58	-0.12	0.81	-0.00
Broadband	Elast II	-2.94	-0.14	0.97	-0.26
Broadband	Elast III	-1.80	-0.09	0.92	-0.02
Narrowband	Elast I	-0.32	-0.06	0.64	-0.08
Narrowband	Elast II	-0.85	-0.17	0.80	-0.01
Narrowband	Elast III	0.07	0.01	0.71	-0.08

† Average; ‡ per household/month

Part 4

Conclusion

Conclusions

(1) estimated demand for broadband

(2) simulated effects of separation

(3) separation reduces price substantially

Thank you!