

Wireless Carriers' Exclusive Handset Arrangements:
An Empirical Look at the iPhone

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Wireless Industry in the U.S.

“When you buy a wireless phone in America, the vast majority of the time, that means you have to buy a *multi-year agreement* with whichever *carrier* has an exclusive deal to carry that phone.”

By Martin H. Bosworth, ConsumerAffair.com

Context

- Exclusive agreement: Allows one wireless operator to serve as the *sole* distributor of a manufacturer's handset for a given period of time.

Exclusive Contract

- In the summer of 2009, the Senate Commerce Committee held a hearing to explore the competitive effects of exclusive handset agreements in the wireless industry.
- New FCC chairman has announced his intention to explore the issue of handset exclusivity. There are several pending petitions before the FCC including one seeking to ban exclusive handset contracts.

Exclusive Contract

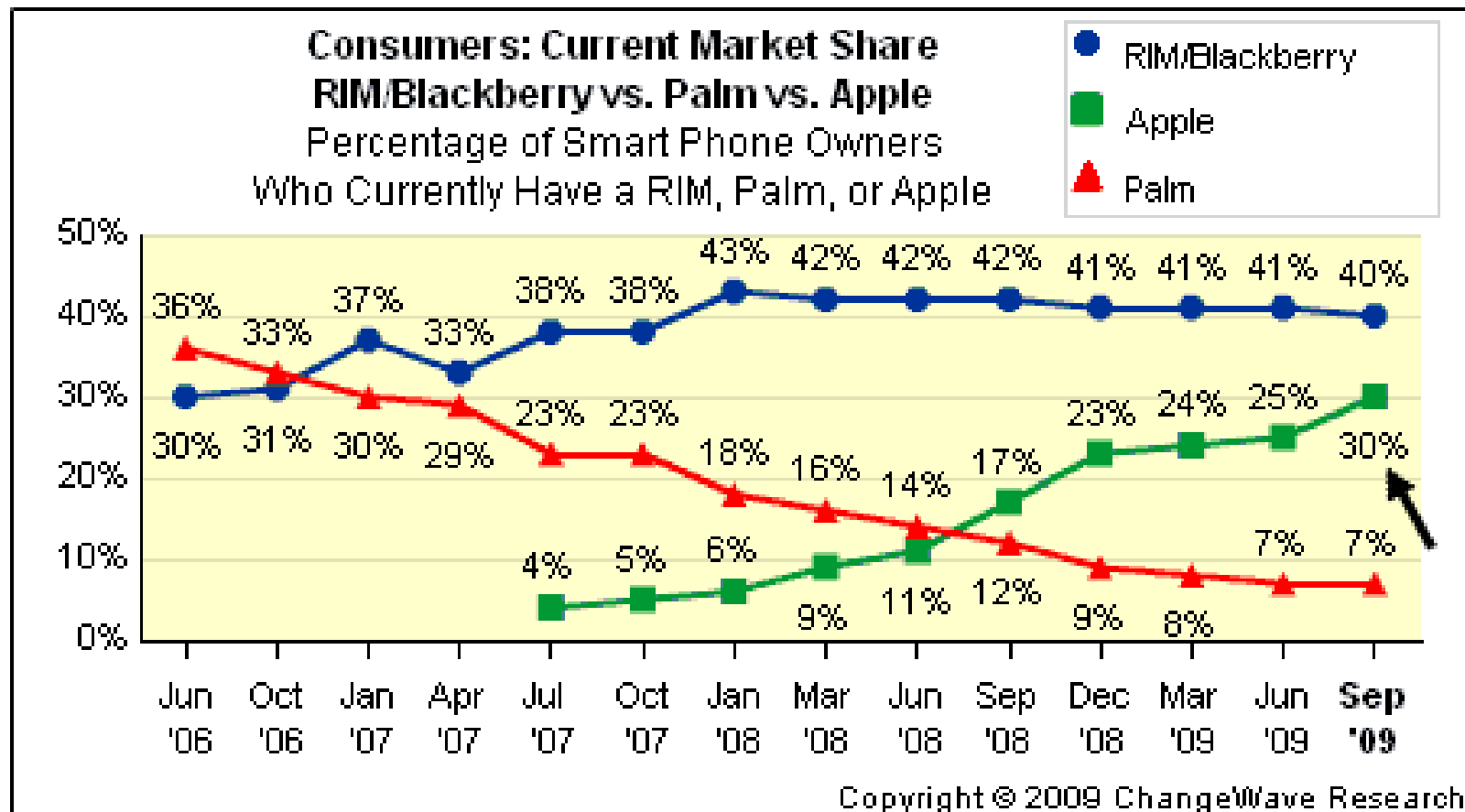
Cons (Baker 2007)

- Limit options for both consumers and manufacturers
- Diminish the ability of smaller carriers to compete

Pros (Hahn and Singer 2009)

- Share the risk of launching a new product
- Align the incentives of carrier with the handset maker
- Drives innovation by other handset makers

Success of iPhone

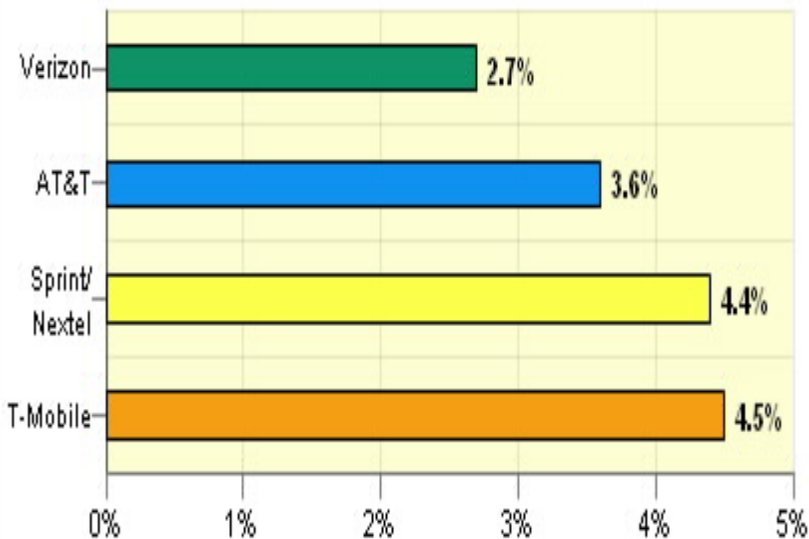


Source: <http://www.boygeniusreport.com/2009/10/28/rim-and-apple-top-u-s-smartphone-market-share/>

Verizon Wireless Leads in Performance, But AT&T Takes Market Share

Percentage of Dropped Calls Over Past 90 Days - By Provider

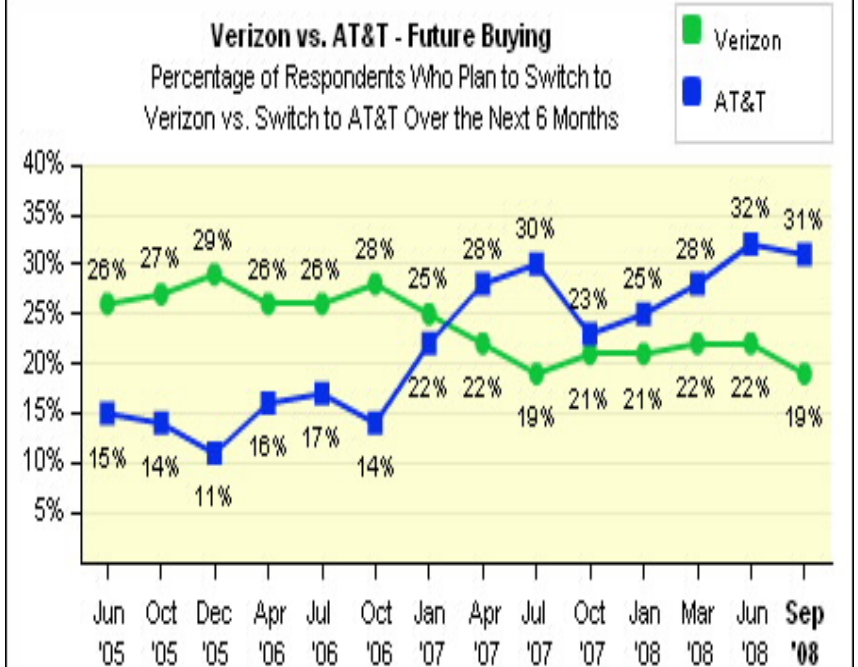
Over the past 90 days, how frequently have you experienced a "dropped call" on your cell phone?



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Verizon vs. AT&T - Future Buying

Percentage of Respondents Who Plan to Switch to Verizon vs. Switch to AT&T Over the Next 6 Months



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Other Exclusive Handset Arrangements

- LG's Voyager + Verizon
- RIM Blackberry Storm + Verizon
- Samsung Instinct + Sprint
- Google G1 + T-Mobile

Research Objectives

- Build a demand model of subscription behavior that includes
 - Handset
 - Service Provider
- Estimate the model parameters with data that will enable us to separately identify these effects
 - Preference for service provider
 - Preference for handset
 - State dependence
- Look at the impacts of exclusive contract on
 - Firm market share
 - Consumer welfare

Challenges

- What does the handset price actually mean?
- Price elasticities for handsets estimated from variation across handsets, limited temporal variation
- Price elasticities for service – some variation across providers and plan types
- Endogeneity concerns?
- Unobserved heterogeneity?

Data Description

- Household subscription decisions
 - Forrester benchmark survey; conducted in Jan 2008 & 2009 – so data are for **2007 & 2008**
 - 10,546 households appearing in both 2 surveys
 - Subscription decisions (handset and service providers)
 - household demographics
- Attributes for Handset
 - Models: Consumer Reports, Nielsen Survey
 - Attribute: Consumer Reports and www.cnet.com
- Attributes for service providers
 - Source: company websites
 - Data on prices (basic service plan, data plan)
 - Data on service quality (signalmap.com)

Summary Statistics

Brand	Market share (2007)	Market Share (2008)
Apple	0.35	1.33
Blackberry	1.69	3.89
HTC	0	0.34
Kyocera	2.34	1.96
LG	14.17	18.66
Motorola	26.13	23.51
Nokia	14.35	11.86
Palm	0.93	0.90
Samsung	12.03	13.43
Sanyo	2.57	1.81
Sony Ericsson	1.87	1.86
Others	2.35	2.26

	LG	Motorola	Nokia	Samsung
LG	356	133	32	106
Motorola	345	650	126	209
Nokia	121	201	343	126
Samsung	158	141	64	208

Household Service Subscription Decisions

	No Plan	ATT	Sprint	T-Mobile	Verizon	Others	Total(2007)
No Plan	901	103	18	39	72	204	1337
ATT	54	1378	25	27	84	101	1669
Sprint	14	46	362	16	57	43	538
T-Mobile	15	38	11	363	49	33	509
Verizon	29	90	32	32	1425	67	1675
Others	101	227	72	50	143	1205	1789
Total(2008)	1114	1882	520	527	1830	1653	7526

Data Preparation

- Estimation Sample

	No Plan(2008)	With Plan(2008)
No Plan (2007)	Active	Active
With Plan (2007)	?	?

- Selection rules:

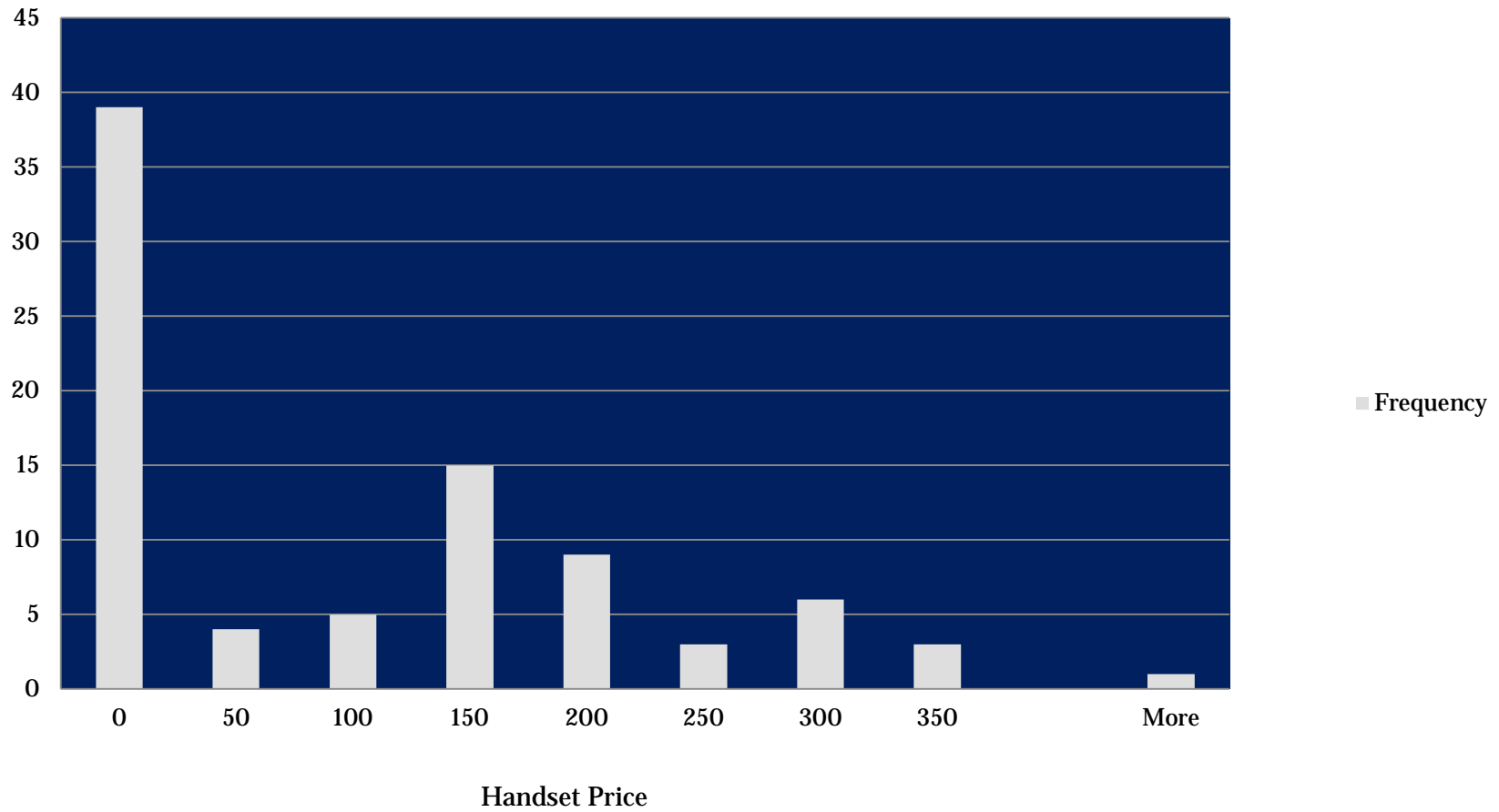
Consumer who changed service provider, or brand of handset or features of handsets.

Implication – may under estimate the state dependence if someone is free to switch but chose not to switch either service provider or handset in a year.

Choice Set

- Choice Alternative: handset + carrier
- More than 620 unique wireless devices for sale in the US.
- 4 big carriers + other small carriers
- Aggregate to
 - 33 options for smart phone + carrier
 - 54 options for regular phone + carrier
 - 1 outside option = no wireless service + no long term contract

Distribution of Handset Prices in Choice Set



Assumptions

1. Purchase decision is made when the previous contract expires.
2. The choice alternative is a bundle of a handset and a two year contract with a service provider.
3. Individual preferences for handset brands are independent of the preferences for service providers.
4. The outside options include both prepaid service and no purchase decision.
5. The brand preference is the same for regular phones and smart phones.

Identification

- Heavily relies on the price variation in handsets.
- Brand preferences:

Service provider: relative share of the same handset across carriers.

Handset: relative share of the different brands within a carrier

Model

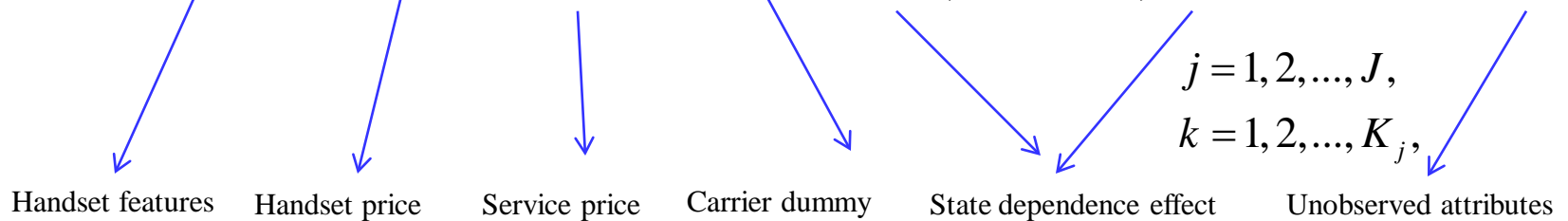
- Consumer i chooses one handset and carrier or an outside option
 - *Handset: j ($j=1, \dots, J$)*
 - *Carriers: $k=1, \dots, K_j$*
- 88 options facing each household in each market

Model Specification

- Utility function is defined over a bundle of choices:

$$u_{ijkt} = V_{ijkt} + \varepsilon_{ijkt},$$

$$V_{ijkt} = x_{jkt}' \lambda_i - \beta_i^H p_{jkt}^H - \beta_i^S p_{jkt}^S + \alpha_{ik} + \gamma_H I\{b_{i,t-1} = b_j\} + \gamma_S I\{s_{i,t-1} = k\} + \xi_{jkt}$$



i : consumer

j : handset

k : carrier

Correlated Unobservables

$$[\gamma_i^{smart}, \alpha_{i1}, \alpha_{i2}, \alpha_{i3}, \alpha_{i4}]' = [\gamma^{smart} + \tau Tech_i, \alpha_1, \alpha_2, \alpha_3, \alpha_4] + v_i$$

$$v_i \sim N \left(\begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \begin{bmatrix} \sigma_{11} & \sigma_{12} & \sigma_{13} & \sigma_{14} & \sigma_{15} \\ \sigma_{12} & \sigma_{22} & 0 & 0 & 0 \\ \sigma_{13} & 0 & \sigma_{33} & 0 & 0 \\ \sigma_{14} & 0 & 0 & \sigma_{44} & 0 \\ \sigma_{15} & 0 & 0 & 0 & \sigma_{55} \end{bmatrix} \right)$$

Estimation Issues

- Endogeneity of Prices
 - Control Function Approach

(Petrin and Train 2010, Albuquerque and Bronnenberg 2010)

we recover ξ_{jk} 'a one-to-one function of from price equation

$$p_{jk} = \omega z_{jk} + \xi_{jk} '$$

Parameter estimates: brand preferences

- Carriers

Variables	Para Est	Std Err
ATT	1.0393	0.0561
Sprint	-0.3021	0.076
T-Mobile	0.0901	0.0731
Verizon	0.9551	0.0578

- Handset

Variables	Para Est	Std Err
Apple	0.8414	0.1592
RIM	1.064	0.0951
HTC	-1.0851	0.2065
LG	-0.0053	0.0484
Motorola	-0.0675	0.0509
Nokia	-0.6704	0.0573
Sanyo	-1.878	0.1056
Sony	-1.9486	0.0933
Palm	-0.7183	0.1564
Samsung	-0.6692	0.0514

Parameter estimates: brand preferences

Variable	Estimate	Std. Err.
Brand intercepts for handsets		
Apple	0.6992	0.1554
BlackBerry	0.7424	0.0974
HTC	-1.4024	0.2028
LG	-0.051	0.049
Motorola	-0.0608	0.0516
Nokia	-0.6744	0.0574
Sanyo	-1.9407	0.1074
Sony	-2.0212	0.095
Palm	-1.605	0.1682
Samsung	-0.6842	0.0517

Parameter estimates: brand preferences

Brand intercepts for carriers		
AT&T	1.1100	0.0641
Sprint	-0.1379	0.1341
T-Mobile	-0.3001	0.2274
Verizon	0.8003	0.0711

Parameter Estimates

Price coefficients for handsets		
Income group 1 (< \$40,000)	-0.0178	0.0008
Income group 2 (\$40,000~\$90,000)	-0.0172	0.0006
Income group 3 (> \$90000)	-0.0149	0.0009
Price coefficients for carriers		
Income group 1 (< \$40,000)	-0.0732	0.0058
Income group 2 (\$40,000~\$90,000)	-0.0603	0.0057
Income group 3 (> \$90000)	-0.0593	0.0058

Parameter Estimates

Features		
Touch screen	0.7178	0.1084
GPS	0.8913	0.0795
Smartphone	1.1881	0.1822
Tech * smartphone	0.8286	0.0744
Contract	-1.1273	0.2254
Signal Strength	0.0926	0.0341

Parameter Estimates

Variables	Para Est	Std Err
State Dependence		
Handset	0.5305	0.0345
Carrier	2.4411	0.0328

- Heterogeneity in price sensitivity
- Strong preference for Apple and RIM
- Features such as touch screen and GPS matter.
- Strong state dependence in choice for both carriers and handsets

Price Elasticity

- Smart Phones (1% price change in iPhone)
 - Own price elasticity -- 3.46 at the price of \$200
 - Vary from -0.4 to -4 across models
- Regular Phones
 - Semi Price Elasticity (\$ 10 price increase in handset prices)
 - 15.6% decrease in market share on average.

Counter Factual Analysis

What would happen if iPhone is available to all service providers?

- Assumptions:
 - Given consumers' choices in 2007
 - Price is \$200 for iPhone for all carriers.
 - No price changes in other models.

Changes in Market Share

Predicted Market Shares without Price Adjustments

Carrier	iPhone for		
	AT&T only	AT&T+Verizon	All carriers
AT&T	1.35%	1.34%	1.33%
T-Mobile			0.28%
Sprint			0.23%
Verizon		0.91%	0.90%
Others			0.74%
Total	1.35%	2.25%	3.48%

Supply Side Simulation

- Set up
 - Stackelberg Game
 - Endogeneous retail and wholesale prices
- Results (without exclusivity – with exclusivity)

Table 9: Predicted Retail Prices and Market Shares

Carrier	iPhone for AT&T & Verizon		iPhone for all carriers	
	Predicted Price	Market Share	Predicted Price	Market Share
AT&T	\$199.98	1.31%	\$199.13	1.31%
T-Mobile			\$149.56	0.63%
Sprint			\$145.75	0.53%
Verizon	\$205.09	0.83%	\$205.19	0.81%
Others			\$163.37	1.31%
Total		2.14%		4.59%

Welfare Analysis

Assumption

- 300 million potential wireless subscribers
- \$145 billion in revenues for the U.S. wireless industry in 2008

Welfare impact

- the aggregate welfare loss is estimated to be \$210 million per year without price adjustment
- the aggregate welfare loss is estimated to be \$326 million per year price adjustment

Conclusions

- Competition in the mobile handset market is fierce.
- Carriers shied from competition due to strong state dependence.
- Apple greatly reduced the number of consumers its iPhone would reach due to exclusive contract.
- Annual welfare loss resulting from the exclusivity agreement for iPhones is relatively small.

In the U.S., it can be easier to end a marriage than to leave a loveless relationship with [either of the two largest wireless carriers].

- *Wired magazine, August 2006*