

# An Experimental Study of How Information Disclosure Affects Quality

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*Member States shall ensure that national regulatory authorities are able to oblige undertakings providing public electronic communications networks and/or publicly available electronic communications services to (...) provide information on any procedures put in place by the provider to measure and shape traffic so as to avoid filling or overfilling a network link, and on how those procedures could impact on service quality;*

Directive 2009/136/EC of the European Parliament and of the Council of 25 November 2009 amending Directive 2002/22/EC on universal service and users rights relating to electronic communications networks, Directive 2002/58/EC concerning the processing of personal data and the protection of privacy in the electronic communications sector and Regulation (EC) No 2006/2004 on consumer protection cooperation, OJ 2009 L337/11

- Important issue in broadband market: connection quality is hard to observe ex ante
  - ISPs only provide info on maximum bandwidth
  - For many apps, other info crucial (e.g., latency, bandwidth during peak periods, etc.)
  - Switching costs make ex post info less valuable
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- Transparency: give consumers more information on quality
- In practice: light-touch regulatory approach, details up to Member States

- Test policy scenarios with real people in a lab
- Research question: How does transparency affect market outcomes?
  - Quality of the connection offered by ISPs
  - Price
  - Welfare (total surplus)
  - Division of total surplus between ISPs and end-users

Finitely repeated version (30 periods) of 3-stage game:

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  - End-user  $i$ 's taste for quality  $\theta_i$  drawn from  $U[\underline{\theta}, \bar{\theta}]$
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- Payoffs:
  - ISPs:  $(p_j - c \cdot q_j) \times \text{units sold}$
  - End-users:  $u_i = 20 + \theta_i q_j - p_j$  if  $i$  buys from firm  $j$

We vary the amount of information on quality disclosed to end-users:

- *no info*: end-users only observe  $p_j$ , not  $q_j$
- *full info*: end-users observe  $p_j$  and  $q_j$
- *subset*: half of the end-users observes  $p_j$  and  $q_j$ , other half only  $p_j$
- *signal*: end-users receive signal  $s_j = q_j + \varepsilon_j$  where  $\varepsilon_j \in \{-5, \dots, 0, \dots, 5\}$  is a random error

We chose parameters such that  $c = \underline{\theta} = 1 \Rightarrow$  efficiency requires that all end-users obtain highest quality (10)

- No info and full info are benchmarks
  - However, no info is status quo ante!
- Subset treatment  $\approx$  detailed information understandable for specialists, available through ISPs
- Signal treatment  $\approx$  imperfect information understandable to anyone, aggregated by regulator

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 $q_A = 10, q_B = 1$
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- *subset and signal*:
  - No theoretical results for multiple quality levels
  - With 2 quality levels: existence of separating equilibrium (Yehezkel, 2007)
  - ISPs may be able to signal quality through price. Requires pricing above full-info level

# Theoretically predicted averages of key variables

|                          | <i>no info</i> | <i>full info</i> |       |
|--------------------------|----------------|------------------|-------|
|                          |                | PSNE             | MSNE  |
| Quality (supplied)       | 1              | 5.5              | 8.2   |
| $ \Delta\text{Quality} $ | 0              | 9                | 2.88  |
| Price (posted)           | 1              | 19               | 12.5  |
| ISPs' Surplus            | 0              | 60               | 19.2  |
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- ISPs do benefit → transparency requirement should not be necessary
- Quality supplied is main driver of welfare

# A first look at the data: quality

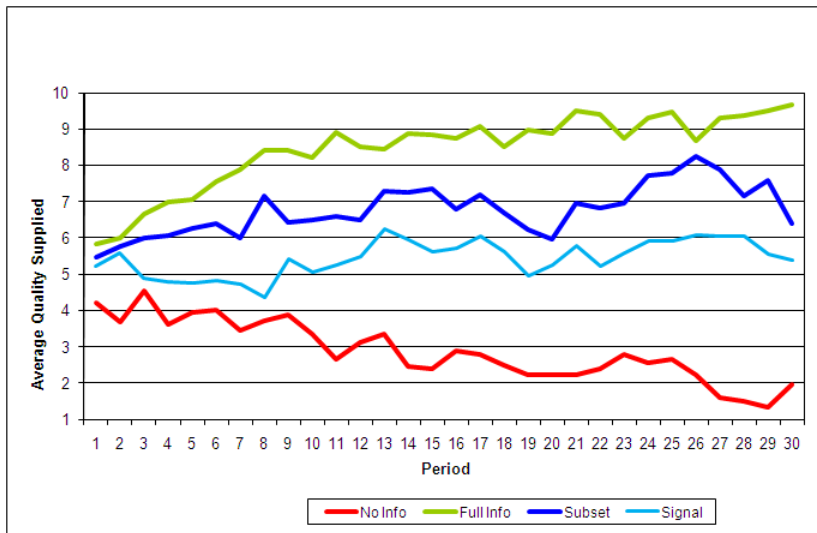


Figure: Average quality supplied by treatment and period

# A first look at the data: price

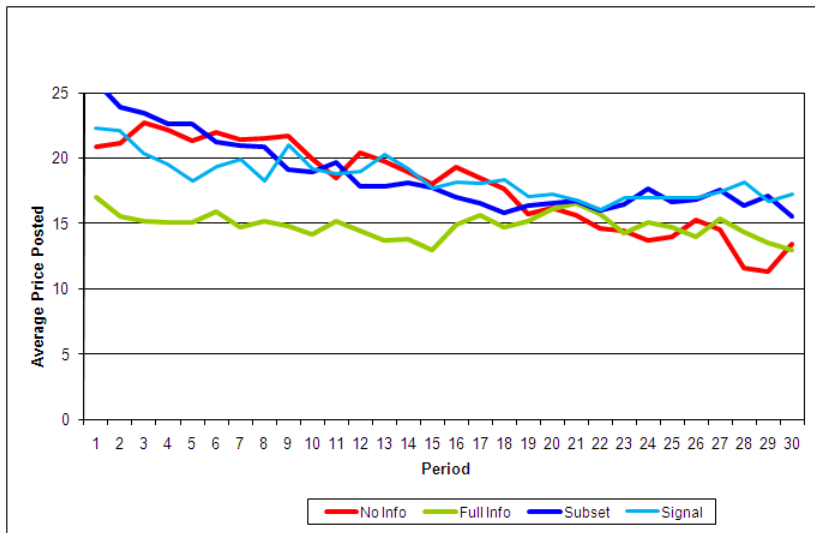


Figure: Average price posted by treatment and period

# Observed treatment averages

|                          | <i>no info</i> | <i>signal</i> | <i>subset</i> | <i>full info</i> |
|--------------------------|----------------|---------------|---------------|------------------|
| Quality (offered)        | 2.87           | 5.44          | 6.78          | 8.46             |
| $ \Delta\text{Quality} $ | 1.80           | 2.33          | 2.44          | 1.14             |
| Price (posted)           | 17.86          | 18.47         | 18.66         | 14.85            |
| ISPs' Surplus            | 50.47          | 45.53         | 41.33         | 22.00            |
| End-users' Surplus       | 37.15          | 64.16         | 80.22         | 112.17           |
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- *subset* and *signal*: intermediate quality, higher prices, more differentiation
- More information good for end-users and welfare, bad for ISPs

# Comparison across treatments: quality supplied

- Are the observed differences statistically significant?
- We perform both nonparametric and parametric tests
- Report here the more conservative nonparametric tests (Mann-Whitney):

|                | <i>signal</i> | <i>subset</i> | <i>full info</i> |
|----------------|---------------|---------------|------------------|
| <i>no info</i> | 0.057         | 0.018         | 0.029            |
| <i>signal</i>  |               | 0.095         | 0.014            |
| <i>subset</i>  |               |               | 0.008            |

**Table:**  $p$ -values for one-sided rank sum tests of differences in quality

- Despite low power, manage to reject most equalities

# Comparison across treatments: other results

- No significant differences in price with either test
- End-user surplus significantly higher in three transparent treatments than in *no info*
- ISP surplus not significantly lower in *subset* and *signal* than in *no info*

- Experimental evidence suggests case for transparency is stronger than theory predicts
  - No vertical differentiation under *full info*. Instead high quality, fierce competition
  - Lemons and high prices under *no info*
  - In more realistic imperfect-info treatments end-users still do significantly better than in *no info*
- May explain ISPs' reluctance to embrace transparency
- Some evidence that *subset* more efficient than *signal*: positive informational externalities from informed to uninformed end-users

# Thank you!

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