

# Bargaining, power and the net neutrality problem

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# Net neutrality, investments and must-have content

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- “Google Wants Its Own Fast Track on the Web”  
*The Wall Street Journal, December 2008*
- “Network neutrality is a policy avenue the company is no longer pursuing”  
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- Other partnerships: Amazon-Sprint (dedicated connection reading device), Yahoo-AT&T (digital subscriber partnership), ESPN-Verizon (exclusive content)

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## Existing literature

- Hermalin and Katz (2007, *Information economics and policy*)  
One network operator, many heterogeneous content providers with private information about their value.  
NN reduces quality enhancement benefits, might lower social welfare.
- Economides and Tag (2008, *Net Institute Working Paper*)  
One (or two) network operators, many homogeneous content providers, two-sided market analysis.  
NN increases online content market, improves social welfare.
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One network operator, two competing content providers, queuing theory applied.  
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# This paper, the purpose

To introduce market power on the content market.

Two possible regimes,

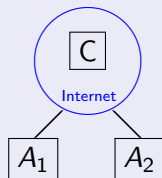
- one where access providers invest in quality
- a second, where a content provider can participate in the investment process by negotiating quality contracts with access providers

Want to determine

- the effects of the bargaining power of the content provider on the overall quality outcome
- the effects of the level of competition between access providers

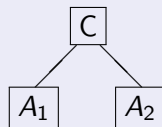
# The results

## Net neutrality



no vertical contracts

## No regulation



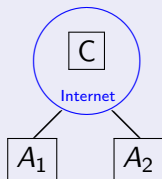
contracts possible

Allowing contractual relations between content and access providers results in higher investments, increasing overall quality.

However *competition* in the access market and the possibility of further *degrading content quality* in the last-mile creates incentives for content exclusivity, which harms consumer welfare, however consumer surplus is enhanced without regulation.

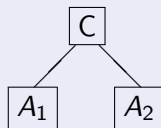
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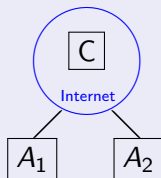
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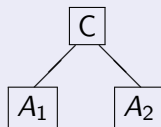
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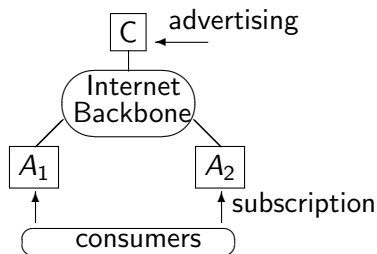
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# Outline

- 1 Introduction
- 2 The Model
  - Benchmark: Net neutrality
- 3 No regulation
  - Simultaneous agreements
  - Exclusive agreements
- 4 Consequences for Competition policy
- 5 Extensions
- 6 Discussion

# The Model

- One content provider  $C$  offers free Internet content, remunerated by advertising, increasing with consumption.
- Two Internet access providers,  $A_1$  and  $A_2$  provide access to  $C$ .
- Industry characteristics:
  - ▶ Global connectivity
  - ▶ Last-mile control



# The Model

- Demand from quadratic utility function

$$d_i = \frac{\alpha_i - p_i - \gamma(\alpha_j - p_j)}{1 - \gamma^2}$$

$\gamma \in (0, 1)$  **substitutability** between access providers  
 $\alpha_i > 0$  **quality** of content C perceived by consumers  
 $p_i$  **access prices** to consumers

- Costs for access providers depend on the quality level only, other costs are normalized to 0.
- Profits with net neutrality

$$\Pi_{A_i} = p_i d_i - I(\alpha_i), \quad \Pi_C = d_1 + d_2$$

- Profits with contracts  $\{\alpha_i, T_i\}$

$$\Pi_{A_i} = p_i d_i - I(\alpha_i) + T_i, \quad \Pi_C = d_1 + d_2 - T_i - T_j$$

# Benchmark: Net neutrality

## Timing

- 1  $A_i$  ( $i = 1, 2$ ), set qualities  $\alpha_i$  non-cooperatively.
- 2  $A_i$  set prices  $p_i$  non-cooperatively.

## Net neutrality

There exists a unique Nash equilibrium such that both access providers offer the same quality  $\alpha_n$ .

# No regulation

## Timing

- 1 C proposes a quality increase :
  - simultaneous contract to both access providers  $A_i$ ,  $i = 1, 2$
  - exclusive contract to only one access provider
  - no agreement to none of them, access providers set quality as in NN
- 2 Bargaining process occurs over  $\{\alpha_i, T_i\}$  qualities and a fixed monetary transfer  
Negotiation over the contract terms: Nash equilibrium of simultaneous generalized Nash bargaining problems
- 3  $A_i$  set prices  $p_i$  non-cooperatively

# Simultaneous agreements

## Bargaining framework

- $C$  bargains with  $A_i, A_j$  *simultaneously* and *separately*, the contract terms of the bargaining pair are *not contingent* on the disagreement of a rival pair
- the outside option is the best-reply to the other pair's agreed quality

$(C, A_i)$  negotiate the terms of  $\{\alpha_i, T_i\}$ , take as given  $\{\alpha_j, T_j\}$

$$\max_{\alpha_i, T_i} \quad \{\Pi_C(\alpha_i, T_i; \alpha_j, T_j) - \Pi_C(\underline{\alpha}_s, 0; \alpha_j, T_j)\}^\beta \\ \cdots \{\Pi_A(\alpha_i, T_i; \alpha_j, T_j) - \Pi_A(\underline{\alpha}_s, 0; \alpha_j, T_j)\}^{1-\beta}$$

outside option :  $\underline{\alpha}_s = \arg \max_{\alpha} \Pi_A(\alpha, 0; \alpha_s, T^S)$

$\beta \in [0, 1]$   $C$ 's bargaining power

## Simultaneous agreements (cont)

### Simultaneous quality

There exists a symmetric equilibrium with simultaneous contracts

$$\alpha_s > \alpha_n$$

Access providers are compensated for the investment ( $T^S > 0$ ) with advertising revenues.

The outside option  $\underline{\alpha}_s \leq \alpha_n$  it further decreases with the substitutability factor ( $\gamma$ ).

Equilibrium quality is independent of the bargaining power of the content provider!

# Exclusive agreements

## Bargaining framework

- $C$  bargains with  $A_i$  for an exclusive quality  $\alpha_E$ ,  $A_j$  sets quality  $\alpha_e$  non-cooperatively
- the outside option is the two access providers setting qualities without subsidy as in NN

$(C, A_i)$  negotiate the terms of  $\{\alpha_i, T_i\}$ , anticipating  $\alpha_e$

$$\alpha_E = \arg \max_{\alpha_i, T_i} \left\{ \Pi_C(\alpha_i, T_i; \alpha_e, 0) - \Pi_C(\alpha_n, 0; \alpha_n, 0) \right\}^\beta \cdots \left\{ \Pi_A(\alpha_i, T_i; \alpha_e, 0) - \Pi_A(\alpha_n, 0; \alpha_n, 0) \right\}^{1-\beta}$$

$$\alpha_e = \arg \max_{\alpha_j} \Pi_A(\alpha_j, 0; \alpha_E, T^E)$$

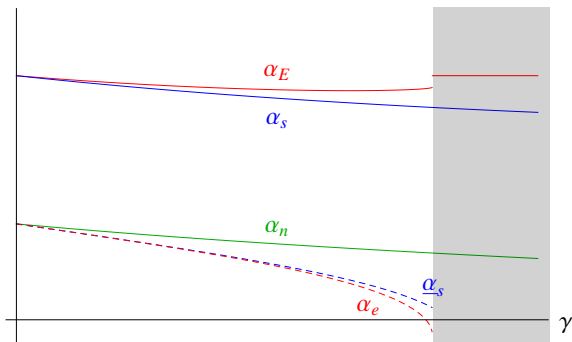
# Exclusive agreements (cont)

## Exclusive quality

There an equilibrium with exclusive contracts

$$\alpha_E \geq \alpha_s > \alpha_n \geq \underline{\alpha}_s \geq \alpha_e$$

beyond the threshold,  $A_j$  is excluded from the market.



# Content provider's choice

- Exclusive agreement
  - ▶ Pays only to one access provider
  - ▶ The network operator is willing to accept less monetary compensation, downstream advantage
  - ▶ less advertising revenue
- Simultaneous agreement
  - ▶ Global quality raise, more advertising revenue
  - ▶ Pays more, to both access providers

What to do? It depends on its bargaining power.

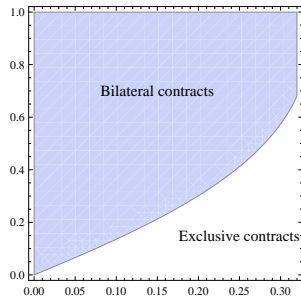
# Content provider's choice (cont)

Tariff

$$T = (1 - \beta)\Delta\Pi_C - \beta\Delta\Pi_A$$

- Small content providers get all its rents extracted
- Big content providers pay only the remaining cost of quality

$\beta$  C's bargaining power



$\gamma$  competition

# Consequences for Competition policy

- Average quality is higher without regulation
- Consumer surplus is higher without regulation
- However exclusivity harms welfare in the unregulated regime

Protect small content providers but do not hinder investment on quality enhancement.

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## Some robustness and extensions

- To negotiate with  $C$  is a dominant strategy for  $A_i$ , however when  $C$  is powerful  $A_i$  face a prisoners dilemma situation.

$$\Pi_A^e < \Pi_A^s < \Pi_A^n < \Pi_A^E$$

changing the timing of the game ( $A_i$  approaches  $C$ ) do not change the results

- A content provider with no commitment (if negotiation with one access provider has failed he goes see the rival) does not qualitatively change the results
- Robust to a downstream market where access providers are horizontally differentiated and compete in prices (Hotelling competition)

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# Discussion

We have analyze the effect of a net neutrality regulation on the overall quality an welfare.

- Allowing content providers to contract with access providers increases investment and the overall quality level.
- However, access providers abuse of their last-mile control, they further degrade the quality level, this encourages weak content providers to enter in exclusive relations.
- Exclusive content deals are harmful for consumers (but consumer surplus is lower with NN)
- Ongoing work: introducing content competition and analyzing the problem of entry barriers in the content market

Thank you for your attention



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