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"
  Microsoft statement
- Other partnerships: Amazon-Sprint (dedicated connection reading device), Yahoo-AT&T (digital subscriber partnership), ESPN-Verizon (exclusive content)

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Our purpose

What is the effect of a net neutrality regulation on welfare?

We study two possible regimes,

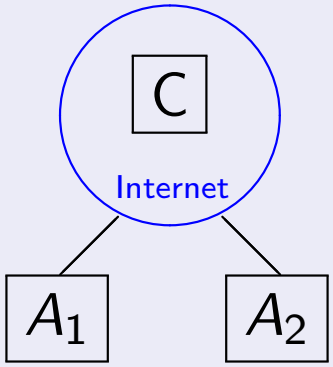
- one where access providers invest in quality
- a second, where a content provider can participate in the investment process by negotiating quality contracts with access providers

We want to determine

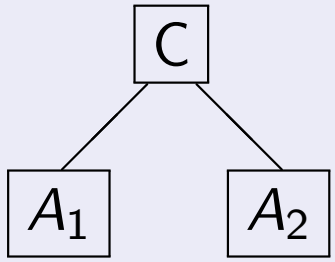
- the effects of the bargaining power of the content provider on the overall quality outcome
- the effects of the level of competition between access providers

Our results

Net neutrality



No regulation



Allowing contractual relations between content and access providers yield 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, **harming consumer welfare**.

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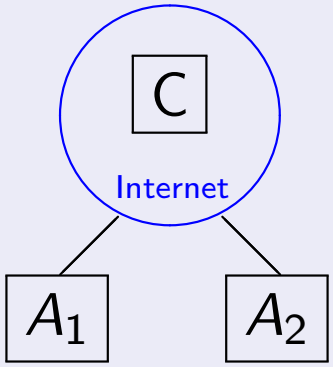
Net neutrality



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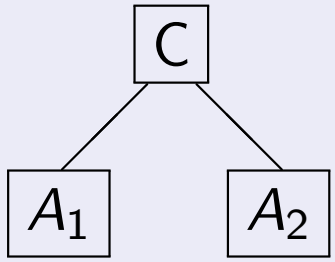

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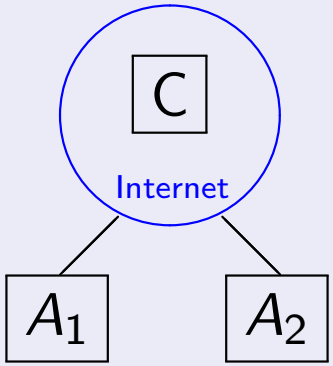

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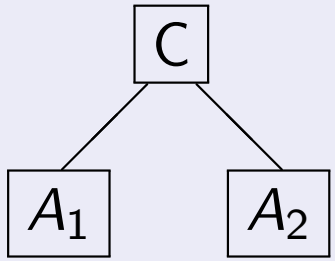

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However competition in the access market and the possibility of further degrading content quality in the last-mile creates incentives for content exclusivity, **harming consumer welfare**.

Outline

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.
- 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.

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Benchmark: Net neutrality

Timing

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

Net neutrality

There exists threshold of competition $\hat{\gamma}_{nn} > 0$, such that for $\gamma < \hat{\gamma}_{nn}$ there exists a unique Nash equilibrium such that both access providers offer the same quality α^{nn}.

No regulation

Timing

1. C proposes a quality increase :

   bilateral 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

Bilateral 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 $\{\alpha_j^{bi}, T_j^{bi}\}$

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

outside option : $\alpha^{\underline{bi}} = \arg\max_{\alpha} \Pi_A(\alpha, 0; \alpha_j^{bi}, T_j^{bi})$

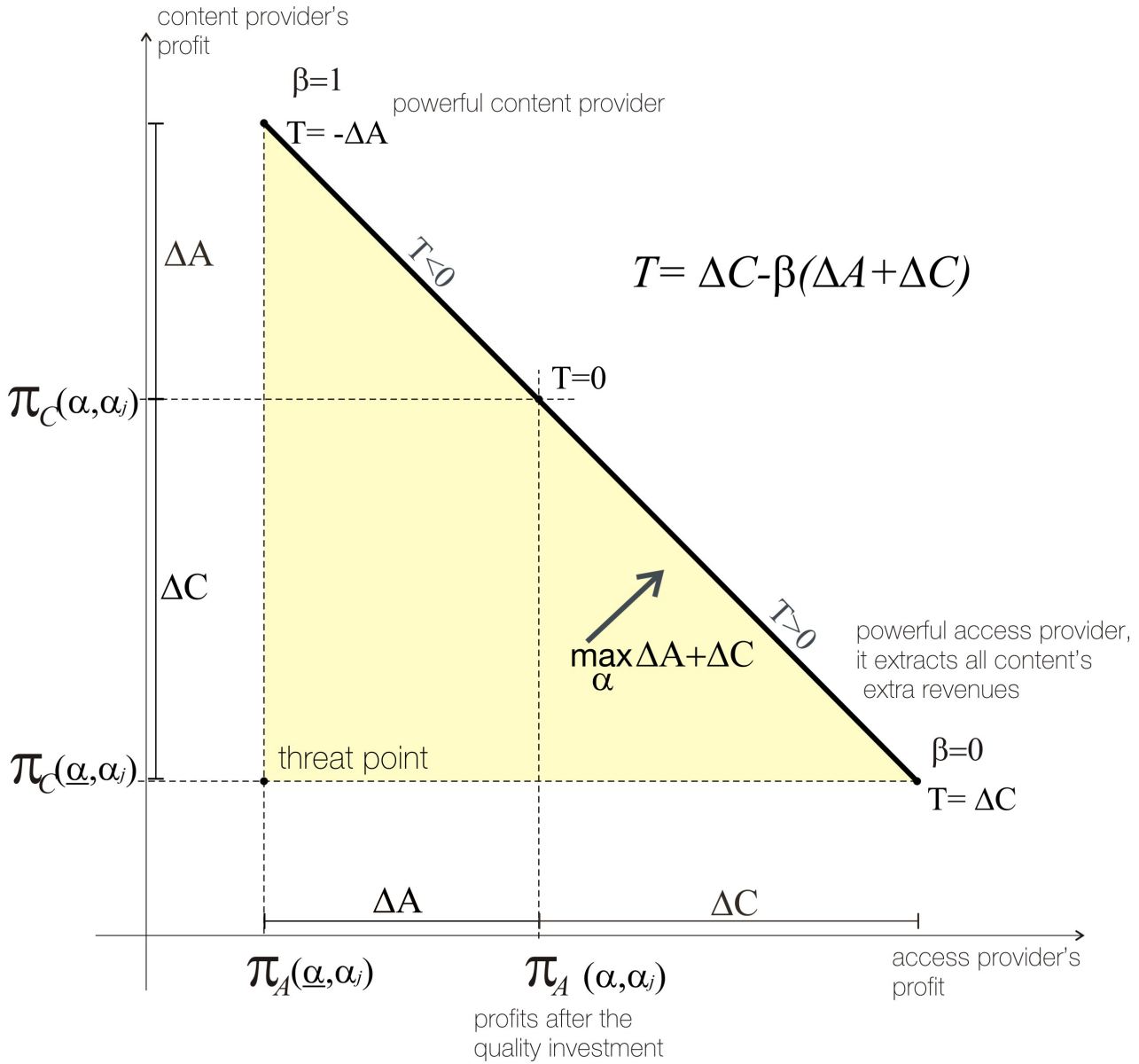
$\beta \in [0, 1]$ C's bargaining power

Bilateral agreements (cont)

Contract setting

The bargaining pair (A_i, C) sets quality level α_i to maximize their joint profits.

The surplus is shared according to their respective bargaining power



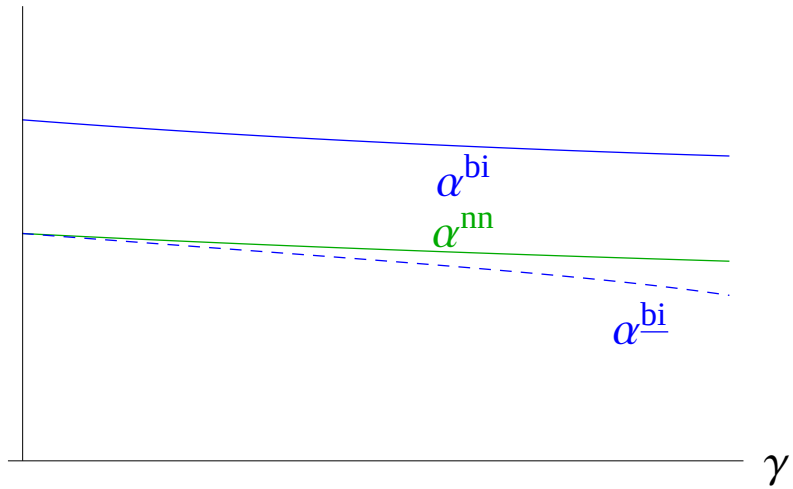
Bilateral agreements (cont)

Bilateral quality

There exists threshold $\hat{\gamma}_{bi} > 0$, such that for $\gamma < \hat{\gamma}_{bi}$ there exists a unique symmetric equilibrium with bilateral contracts

$$\alpha^{bi} > \alpha^{nn}$$

Access providers are compensated for the investment ($T^{nn} > 0$) with advertising revenues.
The outside option $\alpha^{\underline{bi}} \leq \alpha^{nn}$ it further decreases with competition (γ).



Exclusive agreements

Bargaining framework

- C bargains with A_i for an exclusive quality α^E, A_j sets quality α^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 α_j^e

$$\alpha^E = \arg\max_{\alpha_i, T_i} \quad \left\{\Pi_C(\alpha_i, T_i; \alpha_j^e, 0) - \Pi_C(\alpha^{nn}, 0; \alpha^{nn}, 0)\right\}^{\beta} \cdots \left\{\Pi_A(\alpha_i, T_i; \alpha_j^e, 0) - \Pi_A(\alpha^{nn}, 0; \alpha^{nn}, 0)\right\}^{1-\beta}$$

$$\alpha^e = \arg\max_{\alpha_j} \quad \Pi_A(\alpha_j, 0; \alpha_i^E, T_i^E)$$

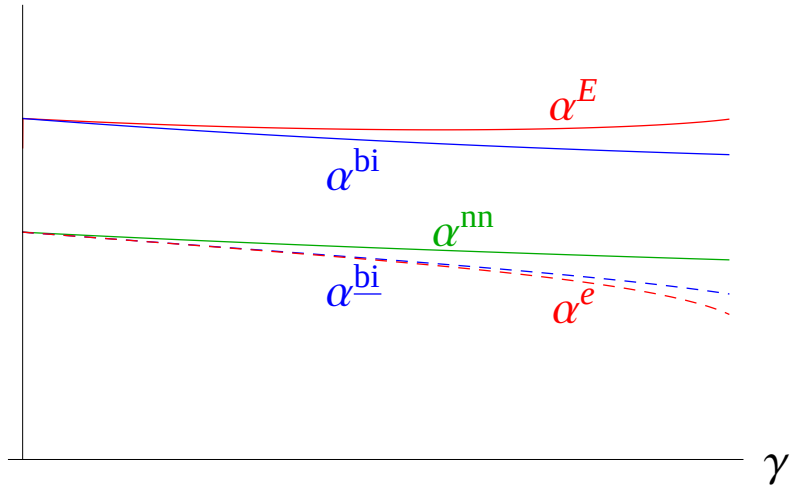
Exclusive agreements (cont)

Exclusive quality

There exists a threshold $\hat{\gamma}^e$, such that for $\gamma < \hat{\gamma}^e$ there exists a unique equilibrium with exclusive contracts

$$\alpha^{\mathbf{E}} \geq \alpha^{bi} > \alpha^{nn} \geq \alpha^{\underline{bi}} \geq \alpha^{\mathbf{e}}$$

beyond the threshold, A_j is excluded from the market.



Content provider's choice

Proposition

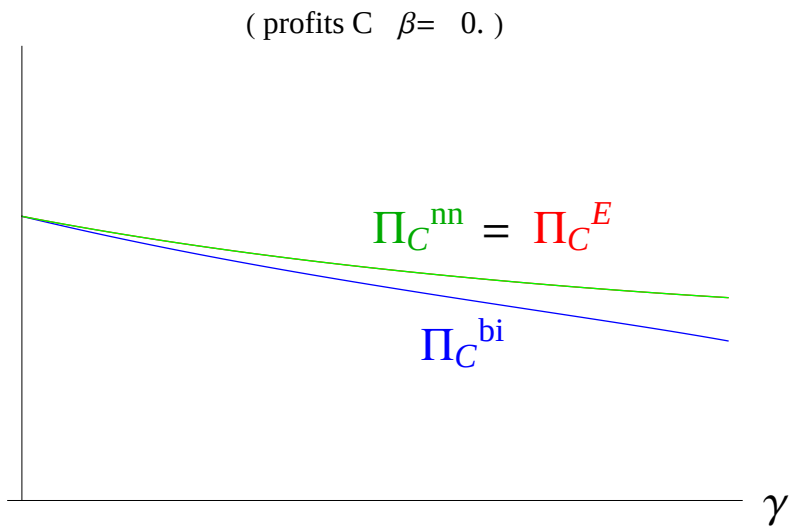
A weak content provider ($\beta \approx 0$) prefers an exclusive contract

The profits of a weak C depend only on his revenues

$$\Pi_C^E = \pi_C(\alpha^E, \alpha^e) - \left(\pi_C(\alpha^E, \alpha^e) - \pi_C(\alpha^{nn}, \alpha^{nn})\right)$$

$\alpha^{\underline{bi}}$ decreases with competition and C's profit gains

$$\Pi_C^{bi} = \pi_C(\alpha^{bi}, \alpha^{bi}) - 2\left(\pi_C(\alpha^{bi}, \alpha^{bi}) - \pi_C(\alpha^{\underline{bi}}, \alpha^{bi})\right)$$



$$T = \Delta C - \beta(\Delta A + \Delta C) \approx \Delta C$$

Content provider's choice (cont)

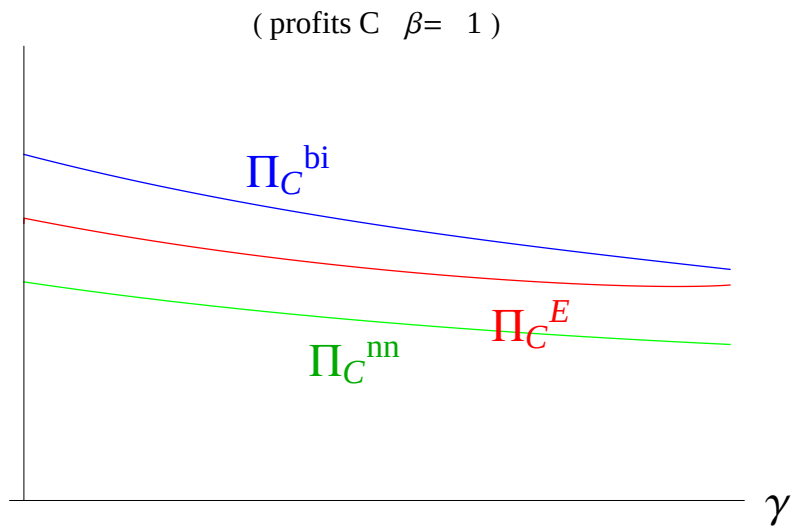
Proposition

A powerful content provider ($\beta \approx 1$) prefers bilateral contracts

The profits of a powerful C depend on A's gain

$$\Pi_C^E = \pi_C(\alpha^E, \alpha^e) + \left(\pi_A(\alpha^E, \alpha^e) - \pi_A(\alpha^{nn}, \alpha^{nn})\right)$$

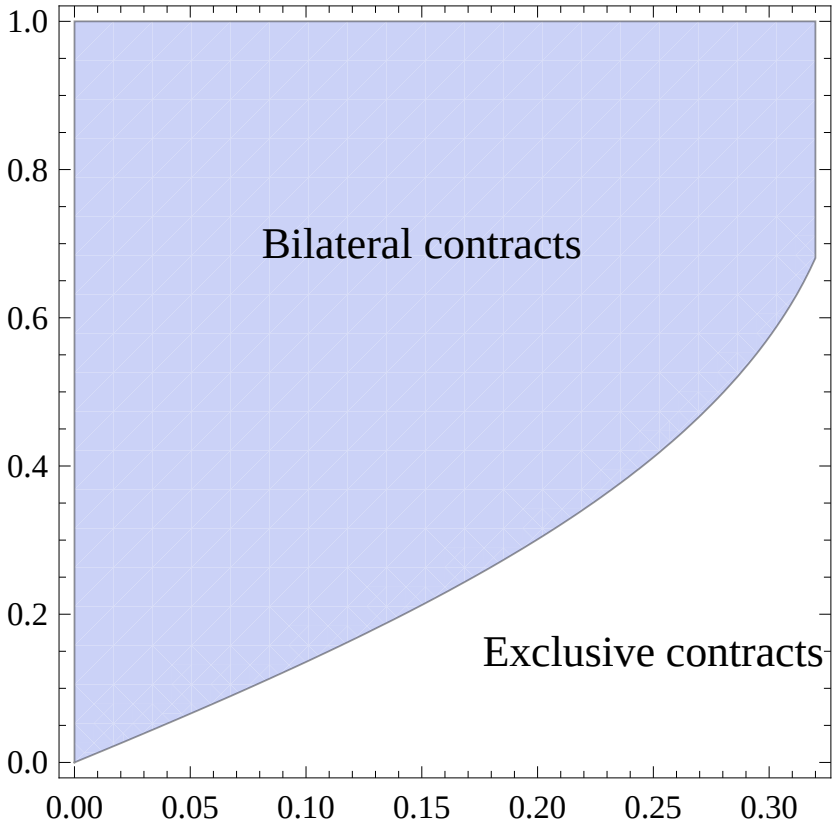
$$\Pi_C^{bi} = \pi_C(\alpha^{bi}, \alpha^{bi}) + 2\left(\pi_A(\alpha^{bi}, \alpha^{bi}) - \pi_A(\alpha^{\underline{bi}}, \alpha^{bi})\right)$$



$$T = \Delta C - \beta(\Delta A + \Delta C) \approx -\Delta A$$

Comparative statics

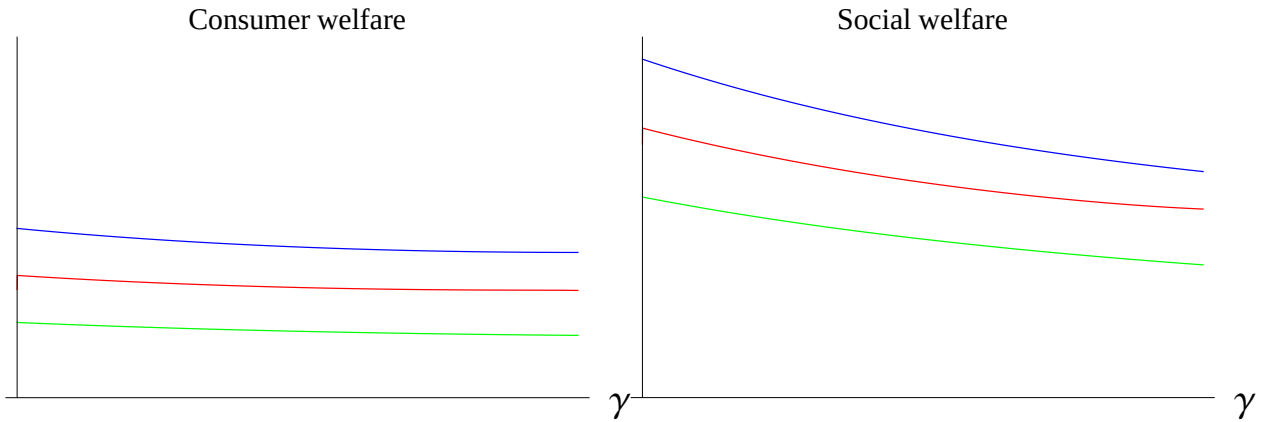
β C's bargaining power



γ competition

Consequences for Competition policy

- Social welfare is higher with global quality investments
- However **exclusivity harms consumers and social welfare**



Extension: Access providers offer contracts

Remark

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

$$\Pi_A^e < \Pi_A^{bi} < \Pi_A^{nn} < \Pi_A^E$$

Inverse timing

1. A_i decide to negotiate with C **or to abstain**
2. C accepts or not to negotiate
3. Bargaining process
4. A_i set prices p_i non-cooperatively

$\Rightarrow$ Inverting the timing of the game where access providers take the initiative to negotiate with C does not change the results

Extension: More strict regulation

No quality "degradation"

If access providers are binded to set minimal quality levels ($\alpha^{\underline{bi}} \geq \alpha^{e} \geq \alpha^{nn}$), the content provider has incentives to enter into bilateral agreements

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 can profit from their control in the last mile and further degrade the quality level, this encourages weak content providers to enter in exclusive relations.
- Exclusive content deals are harmful for consumers as well as for social welfare in this setting