Zero-rating and Net Neutrality

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TSE Digital Seminar
06/12/2017

A zero-rating example from France

Bouyges: content from the video streaming website B.tv will not be deducted from monthly data cap

SFR zero-rated Youtube in 2014-2015

Zero-rating: definition

Zero-rating (narrow definition)

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- Survey in 2014 conducted in 180 countries: **49% of mobile carriers** practice some form of zero-rating (Allot, 2014)
- **Different types** of zero-rated content:
  - Spain: messaging apps
  - Belgium: social media apps + Pokemon Go
  - UK, Netherlands: music streaming apps
  - US: video streaming apps

Current US market

(De facto) **exclusionary ZR programs**:

- **AT&T**: Sponsored Data program - zero-rates its own DirecTV video streaming service and in principle other CPs may join for a fee
- **Verizon**: FreeBee Data 360 program - zero-rates its own go90 video streaming service, in principle other CPs may join for a fee

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Open ZR programs:

- **T-Mobile US**: Binge On program - zero-rates **any video service** that meets its technical requirements for free
  - 120 video service providers (including Netflix, Youtube, Amazon Video and also go90, DirecTV) exempted from data cap

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Research question: What are the welfare effects of zero-rating programs?

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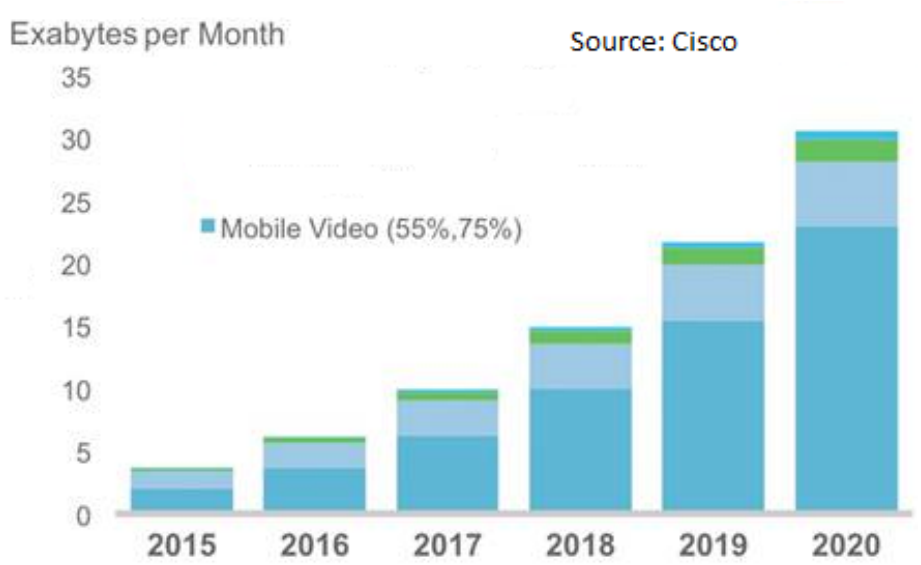
Main trade-off: **utility from increased consumption:**

Washington D.C, October 2016

versus negative externality from **increased congestion**

Congestion and video content

"*The future of mobile is video, and the future of video is mobile*" (Randall Stephenson, AT&T's CEO in Oct 2016 about the AT&T - Time Warner merger)



Source: Cisco VNI Mobile, 2016

Nevo et al. (2016); Malone et al. (2017): heterogeneous and sizable willingness-to-pay to avoid congestion

The net neutrality debate

Net neutrality

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Zero-rating violates this principle in terms of **price**:

- Some content counts against the data cap, some does not
- Thus some content is free, some is not, but their speed is homogenous

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Paid prioritization is different: discrimination in terms of **quality**,

- Some data arrive faster, some slower
- Price end users pay is homogenous

Gautier and Somogyi (2017): **comparison** of paid prioritization and zero-rating

Related literature

Paid prioritization: Hermalin and Katz (2007); Choi and Kim (2010); Economides and Hermalin (2012); Choi et al. (2014); Bourreau et al. (2015); Peitz and Schuett (2016) etc.

Zero-rating: Jullien and Sand-Zantman (2017): "*Internet Regulation, Two-Sided Pricing, and Sponsored Data*"

- Models zero-rating as a coupon from CPs to end users (correction for the missing price)
- My paper aims to model congestion more directly with capacity constraints and data caps
- Also trying to understand the difference between exclusionary and open programs

Regulatory trends

- **US**: case-by-case treatment (as opposed to paid prioritization which is banned)
  - Feb 2015: Open Internet Order adopted
  - Dec 2016 the FCC sent letters to AT & T and Verizon condemning the practice
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- **India**: total ban

Preview of results

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Whenever the zero-rated content is **unattractive**:

- Open zero-rating programs, exclusionary programs and no zero-rating can all be optimal for the ISP.
- Perverse incentives, but no missing incentives: zero-rating may be implemented when it is reducing welfare, it is always implemented when it increases welfare

A two-sided market setting

A monopolistic ISP provides a two-sided platform to connect end users and CPs

Content providers:

- 3 content providers
- V_A and V_B are video providers that are potentially zero-rated
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- May pay a fee for participating in a zero-rating program

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- Revenue from the CP side: only if it implements a zero-rating program
- Cost normalized to 0
- ISP chooses among offering zero-rating to
  - 0 CPs (=no zero-rating program)
  - 1 CP (=exclusionary ZR program)
  - 2 CPs (=open ZR program)

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  - $\delta_A = \delta_B = 0$: both CPs zero-rated
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- Heterogeneous outside utility:
  - Fraction λ of "high-types": 0
  - Fraction $1 - \lambda$ of "low-types": $w > 0$

Timing

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1. ISP chooses subscription fee and makes zero-rating offers to 0, 1 or 2 CPs
2. CPs simultaneously and independently decide to accept or reject the offer
3. End users simultaneously and independently maximize their expected net utility

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- Unattractive content: $\alpha < \overline{\alpha}$, consumption shares distorted because data cap binds

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- ISP can create a prisoners' dilemma situation for the VPs:
- Both would be better-off if both rejected the offer but they accept it out of fear that the other accepts unilaterally

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Trade-off:

- The firm that is exclusively zero-rated is very profitable thus willing to **pay more** to ISP
- **Two firms pay** the (lower) participation fee to the ISP under an open program

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Choice of F:

- Low F to attract all the end users
- High F to extract all the surplus from high-types excluding low-types

ISP's choice if content is attractive

Proposition

*ISP's optimal choice is the open zero-rating regime when content is **attractive** ($\alpha \geq \overline{\alpha}$), even for vanishingly small advertising revenues.*

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Reallocation effect on the end user side:

- Gross consumer surplus is typically increased by zero-rating:

$$Q\alpha^{\alpha}(1-\alpha)^{1-\alpha} < \frac{Q}{B} \cdot B\alpha^{\alpha}(1-\alpha)^{1-\alpha} + \left(1 - \frac{Q}{B}\right)(1-\lambda)w$$

- Same surplus achieved by serving fewer consumers + outside utility of rationed low-types

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- Same surplus achieved by serving fewer consumers + outside utility of rationed low-types
- ISP benefits from this increased surplus by charging a higher subscription fee
- Even without additional revenue from the CP side, ISP benefits from zero-rating

Welfare effects of zero-rating attractive content

Congestion effect:

- Zero-rating leads to congestion and random rationing
- Some high-types get rationed and lose their information rent
- This reduces net consumer surplus:

$$w > \left(1 - \lambda\left(1 - \frac{Q}{B}\right)\right) w$$

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- ISP chooses a low enough F to attract everyone
- Total welfare $\uparrow$, net consumer surplus $\downarrow$

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Case of high λ:

- ISP chooses a high F and excludes low-types
- Extracts all the surplus from high-types
- Total welfare $\uparrow$, net consumer surplus unchanged

Positive welfare effects of zero-rating attractive content

Cross-group network effect for an **intermediate** λ:

- Exclusion of low-types can reduce overall traffic ($\lambda B < Q$)
- Reduced traffic reduces revenue from the CP side
- Reduced incentive to exclude low-types: "anti-exclusion effect"
- Switching from exclusion to a lower F **increases** both consumer surplus and total welfare

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This positive effect dominates when

- Advertising revenues are high: $r_B \geq \overline{r_B}$ and
- Consumer groups are relatively different: $w \geq \overline{\alpha} Q \alpha^{\alpha} (1-\alpha)^{1-\alpha}$

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Consumer exclusion effect for an **intermediate** λ:

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This can happen when

- Advertising revenues are low: $r_B < \overline{r_B}$
- Or consumer groups are not very different: $w < \overline{\alpha} Q \alpha^{\alpha} (1-\alpha)^{1-\alpha}$

ISP's choice if content is unattractive

Additional trade-off when content is **unattractive** ($\alpha < \overline{\alpha}$):

Distorted consumption effect:

- Indirectly caused by congestion (binding data cap)
- Reduces gross consumer surplus and thus ISP's profit

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Richer ISP behavior:

1. ISP chooses NOT to zero-rate any content when advertising revenues are very low
2. ISP chooses zero-rating above a threshold level of advertising revenues, this threshold is increasing in congestion
3. ISP chooses exclusive ZR over open ZR if VPs' advertising revenues are sufficiently different: $r_A(\overline{\alpha} - \frac{\alpha}{2}) > r_B\overline{\alpha}$

Welfare effects of zero-rating unattractive content

More traffic to more efficient VP for exclusionary programs:

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No missing incentives:

- Despite the additional distortion, there is still a parameter region where zero-rating is unambiguously **welfare-enhancing**
- α close to $\overline{\alpha}$
- Whenever it is, zero-rating is profitable for the ISP

Summary

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- Zero-rating can be unambiguously welfare increasing or unambiguously welfare decreasing depending on market conditions

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- Perverse incentives for the ISP: zero-rating sometimes profitable even when it reduces welfare

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- When content is attractive, the ISP always offers an open zero-rating program
- Zero-rating can be unambiguously welfare increasing or unambiguously welfare decreasing depending on market conditions
- Perverse incentives for the ISP: zero-rating sometimes profitable even when it reduces welfare
- No missing incentives: zero-rating is implemented whenever it is unambiguously welfare increasing

Future research

- Endogenizing the data cap K
- Endogenizing capacity constraint Q (investment choice)
- Vertically integrated CP and ISP
- Competing ISPs
- Other forms of zero-rating

Thank you for your attention!

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Different types of zero-rating:

1. **SIM card + data plan**: some CPs' content does not count against users' monthly data cap (**this talk**)

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2. **SIM card without a data plan**: mainly in developing countries, e.g. Wikipedia Zero, Facebook Basics

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3. **No SIM card necessary, combined with other products**:
   - Amazon Whispernet, Spotify in Tesla cars