Zero-Rating in the EU

An empirical investigation into the effects on data caps and prices in 15 countries

András Róbert Király
Anton Schwarz

September 4, 2019 - Cullen International Seminar

Contents

- Introduction
- Possible effects on zero-rating
- Dataset
- Developments 2015-2018
- Estimation approach
- Results
- Conclusions

Introduction

What is zero-rating?

- The data traffic for certain services or applications does not count towards a tariff's data cap.
  - -> Only an issue for services with a data cap, i.e. mobile broadband services
- Zero-rating may come in different forms, e.g.
  - single application vs several applications or categories of applications
  - may apply only within the data cap or beyond
  - may be included in a tariff or be available as add-on
  - The data volume for zero-rating services can be unlimited or capped
  - CAP may pay for zero-rating or not

Pros and Cons

- Proponents of zero-rating claim that
  - it would make mobile broadband more attractive to end users;
  - it would give end users the opportunity to consume more (data) for certain applications;
  - it is an element of retail competition allowing operators to differentiate their products.
- Opponents argue that
  - zero-rating restricts the choice of end users;
  - it incentivises them to use certain apps (those which are zero-rated);
  - it may even increase barriers to entry for new apps, further decreasing users' choice in the long run
- Several theoretical studies but very little empirical evidence yet

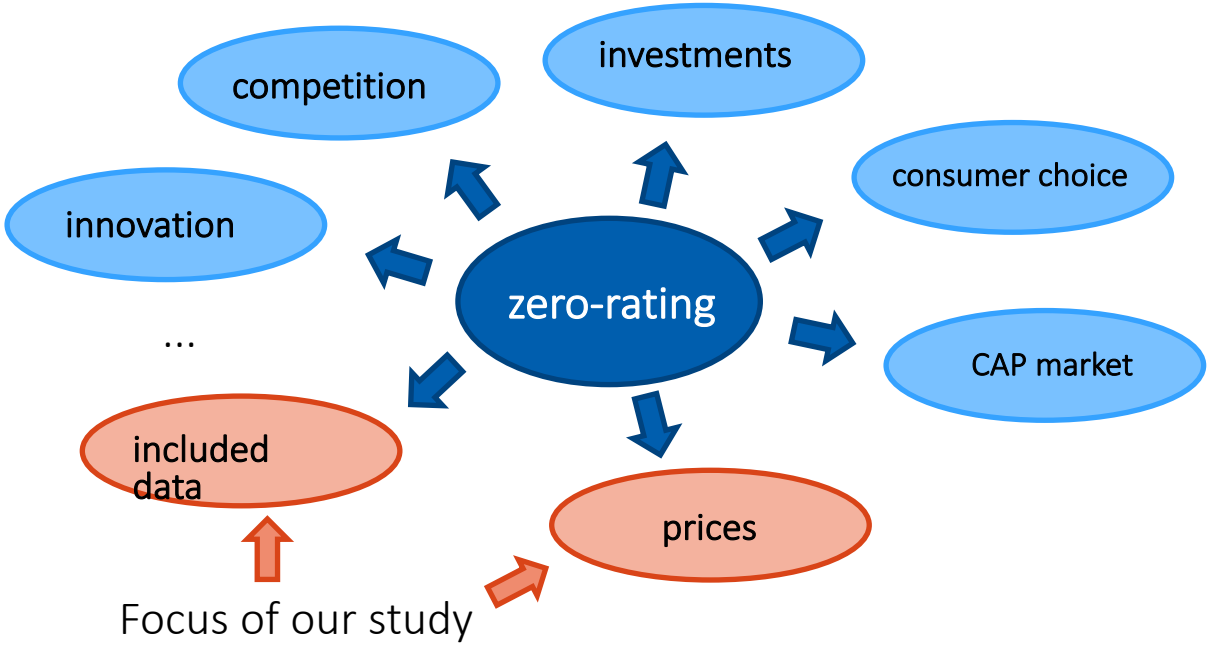
Regulation

- Zero-Rating has to be viewed in the wider context of the net neutrality debate.
- -> Regulation (EU) 2015/2120 (“open internet regulation”)
  - Prohibits technical discrimination of traffic based on its content, application, or service
  - -> Zero-rating outside the data cap is not allowed
  - Within the data cap, zero-rating is not explicitly prohibited
- -> Case by case / rule of reason approach to zero-rating
  - See also the BEREC Guidelines from August 2016

(https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/6160-berec-guidelines-on-the-implementation-b_0.pdf, pp. 11-13)

Possible effects of zero-rating

Effects discussed in the literature



Possible effects on data caps

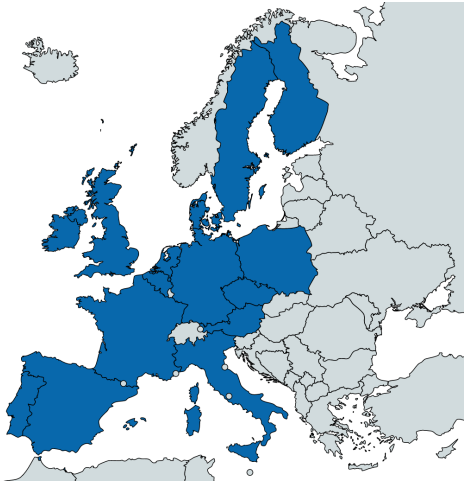
- Two different hypothesis on operators' strategies appear plausible to us:
  - (i) Zero-rating is used by an operator to **increase the value** to consumers for all or certain tariffs in order to be able to **charge more** and to **differentiate** from its competitors. In this scenario, zero-rating and **high data volumes** are likely to be complementary.
  - (ii) Zero-rating is used to **incentivise consumers to use certain apps**. In this case, zero-rating and data volumes are likely to be substitutes, i.e., zero-rating would ceteris paribus be associated with lower data volumes.
- -> Effect could go either way, depending on the motivation
- The second effect could be of concern for regulators

Empirical studies

- Only two empirical studies on zero-rating to our knowledge so far
  - Berglind (2016): effects of zero-rating on mobile broadband adoption
    - claims that zero-rating can be associated with additional growth in broadband demand and increased social welfare.
    - It is based on a quite low number of observations (17), however.
  - epicenter.works (2019) look at zero-rating and price developments
    - EU28 countries, Norway, Iceland, Japan, Korea, Turkey, and the USA
    - compare the years 2014/15 and 2015/16
    - dependent variable consists of price baskets published by the European Commission
    - They conclude that markets with zero-rating offers in both years show statistically significant lower decrease in prices than markets without zero-rating in both years (by about 10%).
- Our study has been inspired by the discussion with epicenter.works and is similar to their approach. But we can rely on a richer data set (tariff-level data) and a longer observation period.

Dataset

Tariff data



- Purchased from Tarifica
- detailed tariff data from 53 MNOs
  - monthly fee, one-off fee, contract length, included data, included minutes and SMS, pre- or post-paid, handset included
  - >11.000 ‘smartphone tariffs’ available to new subscribers in the residential segment
- 15 EU countries: AT, BE, CZ, DE, DK, ES, FI, FR, IE, IT, NL, PL, PT, SE, UK -> 85% of EU population
- 2015-2018, half-yearly -> 8 periods
- No information on subscriber numbers or actual data usage

Zero-rating database

- Data on zero-rating offers collected by RTR based on
  - European Commission (2017) (https://ec.europa.eu/competition/publications/reports/kd0217687enn.pdf)
  - Information from a database collected by epicenter.works (https://epicenter.works/document/1521)
  - Web research
  - Information from NRAs
- The database includes information on
  - the period the offer was on the market;
  - whether the offer was optional or included for certain tariffs;
    - if optional, the tariffs it could be used with;
    - if included, the tariffs where it was included;
  - The type of apps it includes, assigned to the following categories: Social (including social networks and chat apps), music, video, other (e.g. maps, cloud storage, games).

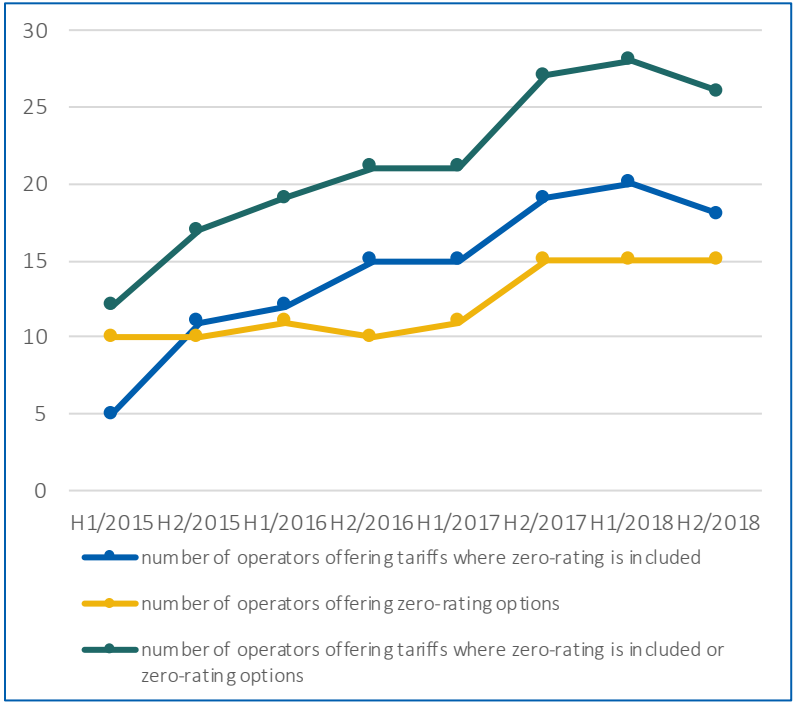
Other data used

- Gross domestic product (GDP) as demand proxy
- Mobile termination rates (MTRs) as cost proxy
- Market shares for weighting operators within a country
- Inflation to calculate real prices
- Exchange rates

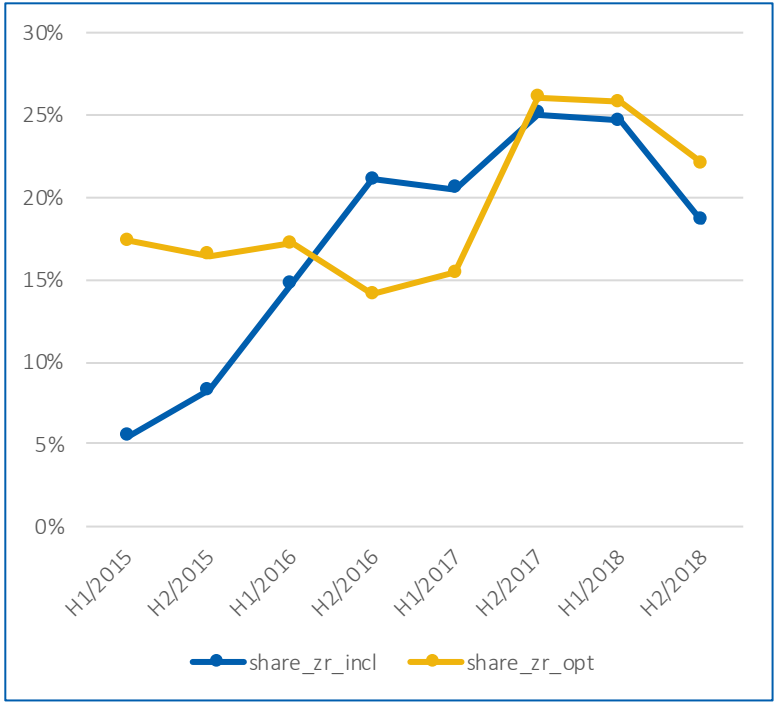
Developments 2015-2018

Increasing importance of zero-rating

number of operators (out of 53) offering zero-rating

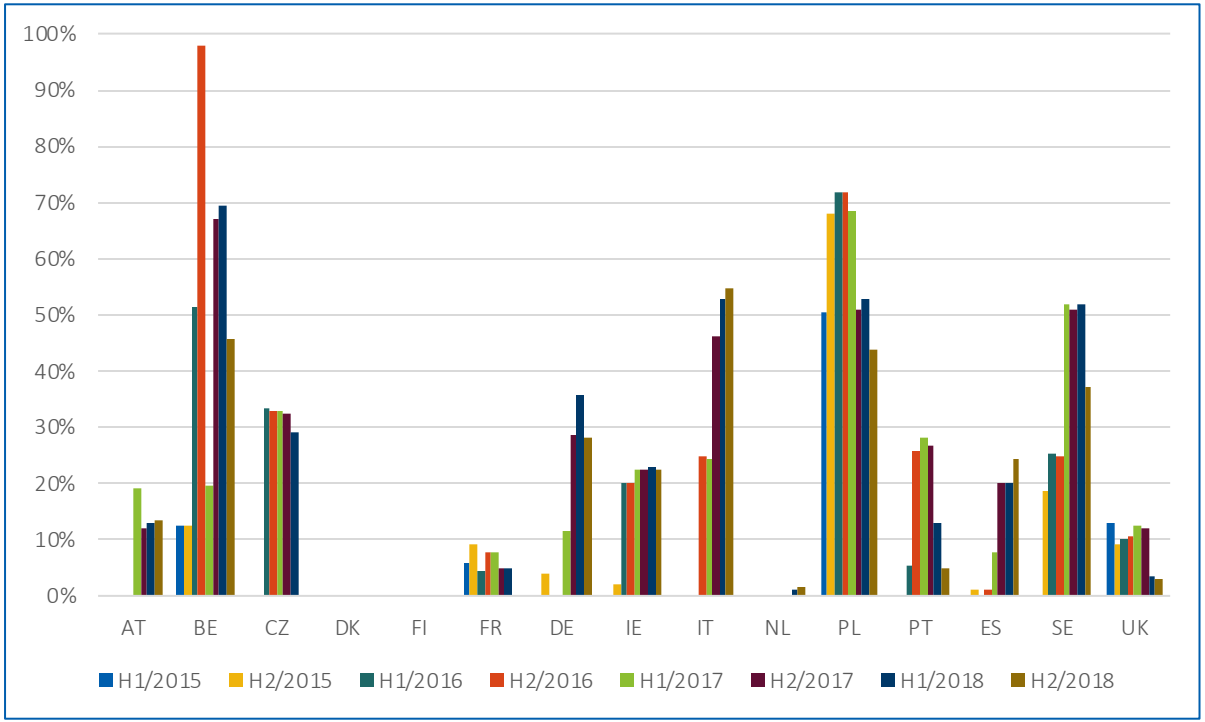


Share of tariffs with zero-rating included or available as option (weighted average)



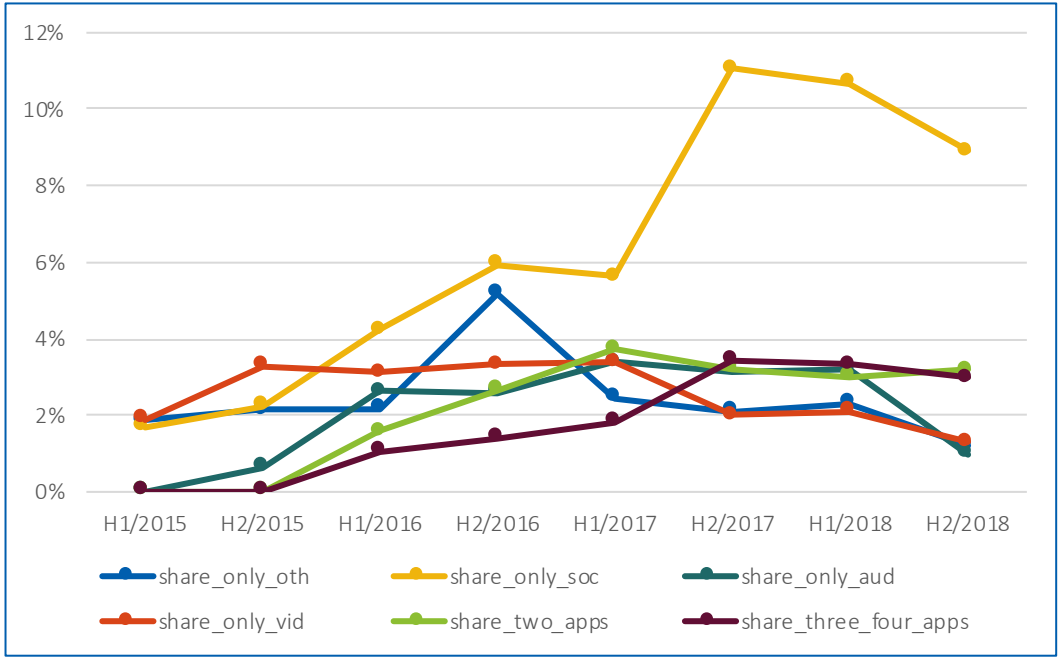
But differs widely across countries

Share of tariffs with zero-rating included by country
(market-share weighted average of MNOs)



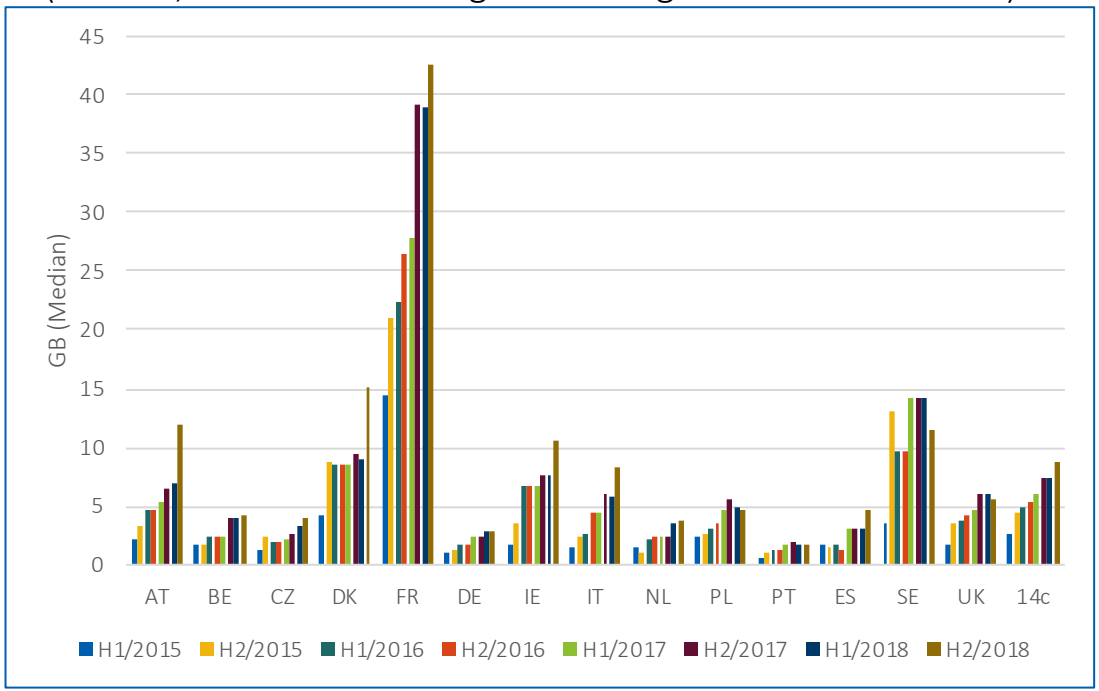
What kind of apps?

Share of tariffs with zero-rating of different application categories included (weighted average)



Development of data caps

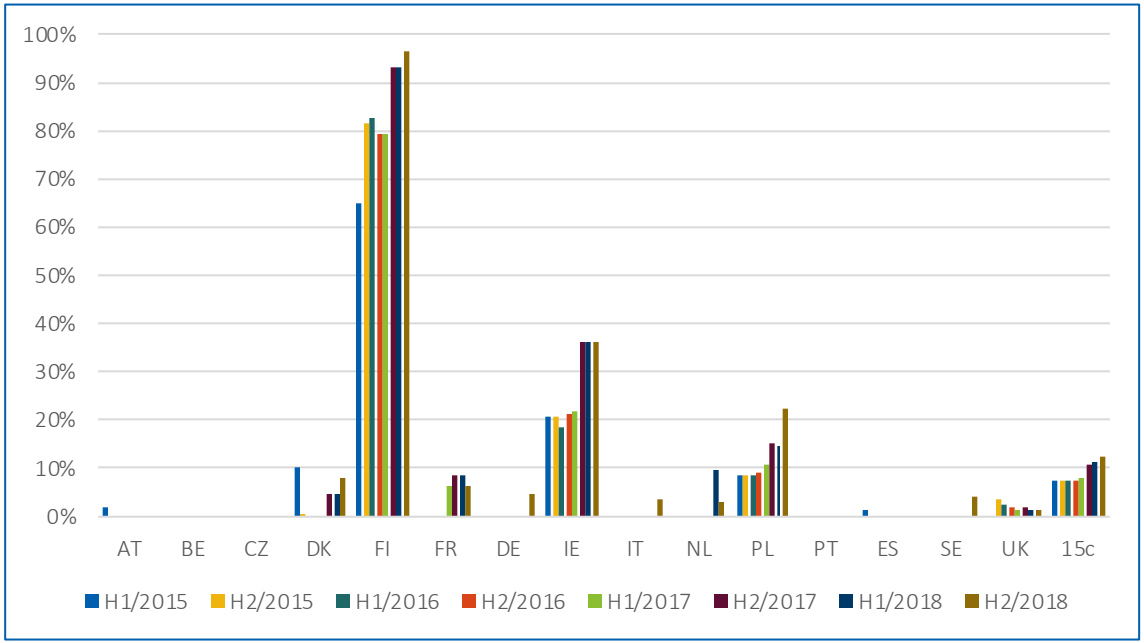
Included data in GB
(median, market share weighted average – without flat rates)



14c: Unweighted average over the 14 countries (FI not included due to very high share of flat-rate tariffs)

Development of flat-rate tariffs

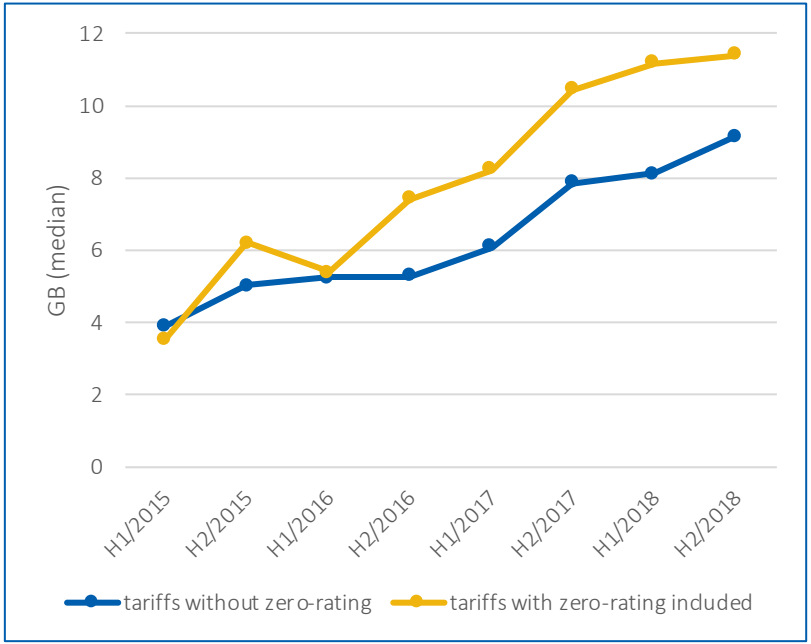
Share of flat rate tariffs (market share weighted average)



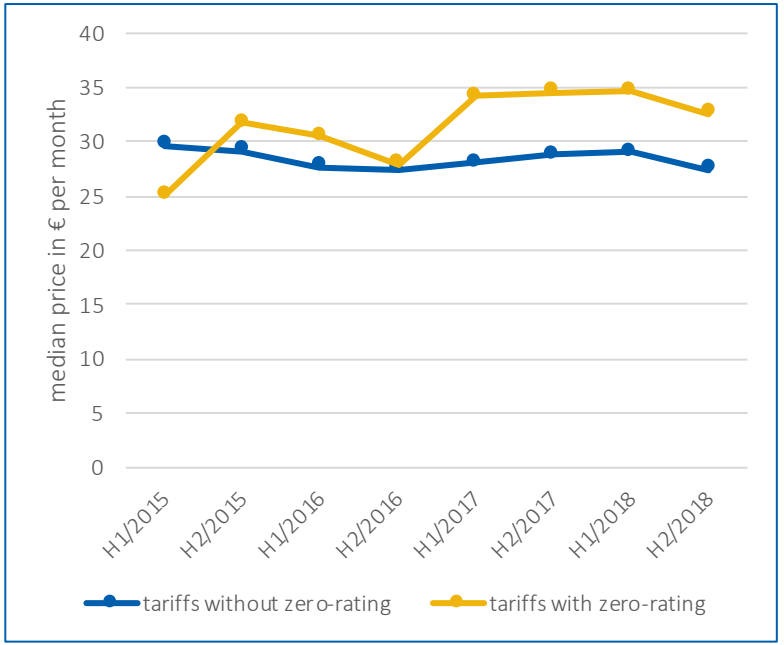
15c: Unweighted average over the 15 countries

Comparison of tariffs with and without zero-rating

Included data in GB
(median, market share weighted average)



Median price per month
(market share weighted average)



Estimation approach

Estimation approach on the tariff level

- We compare tariffs with zero-rating to tariffs without zero-rating while controlling for other product characteristics and, depending on the specification, demand- and cost proxies.
- We also control for systematic differences between operators (operator fixed effects) and allow for a flexible time trend (time fixed effects).
- Since we have, for each period, a sufficient number of tariffs (and operators) with and without zero-rating, and by controlling for other influencing factors as described above, we are able to identify the effects of zero-rating offers on other tariff characteristics.

Dependent variables

- We use the following dependent variables:
  - incl_data (included data): The number of GB included. For flat rate tariffs, this number is approximated per country and period with twice the country-maximum of the respective period.
  - ppgb (price per GB): The monthly fee (including the one-off fee spread over 24 months) divided by the number of GB included (or approximated for flat rate tariffs).
  - monthly_fee: Price per month including the one-off fee spread over 24 months.

Estimated equations (OLS)

(1) $\log(incl\_data) = \alpha + \beta_i \sum_{i=1}^{n} z_i + \gamma\ monthly\_fee + \delta_j \sum_{j=2}^{8} t_j + \theta_k \sum_{k=2}^{53} d_k + \varepsilon$

(2) $\log(ppgb) = \alpha + \beta_i \sum_{i=1}^{n} z_i + \gamma_l \sum_{l=1}^{m} x_l + \delta_j \sum_{j=2}^{8} t_j + \theta_k \sum_{k=2}^{53} d_k + \rho\ GDP_{growth} + \varphi\ MTR + \varepsilon$

(3) $\log(monthly\_fee) = \alpha + \beta_i \sum_{i=1}^{n} z_i + \gamma_l \sum_{l=1}^{m} x_l + \delta_j \sum_{j=2}^{8} t_j + \theta_k \sum_{k=2}^{53} d_k + \rho\ GDP_{growth} + \varphi\ MTR + \varepsilon$

z_i: variables indicating zero-rating
x_l: other tariff characteristics (included min/SMS, etc.)
t_j: time fixed effects (capturing an overall trend)
d_k: operator fixed effects (capturing systematic differences across operators)

Zero-rating variables

- We use different dummy variables to indicate zero-rating:
  - zr_incl: Zero-rating is included in the tariff (at no additional costs)
  - zr_incl_port: If zero-rating is included in any tariff of the tariff portfolio of a certain operator in a certain period, then this dummy variable identifies all tariffs of this operator in the respective period. The hypothesis is that an operator adapts prices and included data for all tariffs it offers as soon as zero-rating is included in at least one of its tariffs ('portfolio approach').
  - zr_incl+opt: Zero-rating is either included or can be optionally be added to the tariff (usually at additional monthly costs)
  - zr_only_soc, zr_only_vid, zr_only_aud, zr_only_oth, zr_two_app, zr_three_four_app: Variables identifying mutually exclusive apps or groups of apps, namely social, video, audio, other, apps of any two categories, apps of any three or four categories.

Basket approach

- On the tariff level, we cannot track a certain tariff over time -> no panel approach possible
- -> We apply in addition a basket approach
  - We calculate a basket value of the dependent variable for each operator at each point in time.
  - This allows us to apply a panel approach at the operator level.
  - So we can better identify the effects of the introduction (or reduction) of zero-rating offers over time.
  - On the other hand we only use a subset of the available tariff information (those tariffs which enter the basket calculation)
  - The estimated equations are similar to the tariff level approach but the zero-rating variable is continuous (the share of tariffs including zero-rating)

Results

Results across all countries and periods (tariff level)

Coefficients on the zero-rating dummy variables			
	dependent variable		
	incl_data	ppgb	monthly_fee
zr_incl	0.22***	-0.23***	0.00
	(0.00)	(0.00)	(0.83)
zr_incl_port	0.19***	-0.18***	-0.04*
	(0.00)	(0.00)	(0.10)
zr_incl+opt	-0.02	-0.02	0.03
	(0.55)	(0.59)	(0.12)
p-values in parentheses			
* p<0.10, ** p<0.05, *** p<0.01			

- Tariffs including zero-rating are associated with a higher amount of included data and a lower price per GB
- There is no consistent effect on the monthly fee
- If zero-rating options are included, the effects disappear
  - We prefer the specifications without the options since there is significant uncertainty to which extent such options (which usually increase the monthly price for users) are actually chosen

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	incl_data	incl_data	incl_data	ppgb	ppgb	ppgb	monthly_fee	monthly_fee	monthly_fee
zr_incl	0.22***			-0.23***			0.00		
	(0.00)			(0.00)			(0.83)		
zr_incl_port		0.19***			-0.18***			-0.04	
		(0.00)			(0.00)			(0.10)	
zr_incl+opt			-0.02			-0.02			0.03
			(0.55)			(0.59)			(0.12)
gross_fee	0.05***	0.05***	0.05***						
	(0.00)	(0.00)	(0.00)						
incl_data							0.01***	0.01***	0.01***
							(0.00)	(0.00)	(0.00)
incl_data_flat							0.48***	0.47***	0.49***
							(0.00)	(0.00)	(0.00)
incl_min				-0.01**	-0.01**	-0.01**	0.01***	0.01***	0.01***
				(0.02)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)
incl_min_flat				-0.72***	-0.72***	-0.73***	0.41***	0.41***	0.41***
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
incl_sms				-0.01	-0.01*	-0.01*	0.01***	0.01***	0.01***
				(0.11)	(0.09)	(0.08)	(0.00)	(0.00)	(0.00)
incl_sms_flat				-0.00	-0.01	-0.01	0.20***	0.20***	0.20***
				(0.95)	(0.77)	(0.84)	(0.00)	(0.00)	(0.00)
with_device				0.12***	0.11***	0.11***	0.33***	0.33***	0.32***
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GDP_growth				0.21	0.24	0.28	-0.12	-0.13	-0.11
				(0.79)	(0.77)	(0.72)	(0.52)	(0.46)	(0.56)
mtr				0.11	0.11	0.11	-0.01	-0.01	-0.01
				(0.18)	(0.17)	(0.19)	(0.70)	(0.76)	(0.65)
_cons	-0.68***	-0.67***	-0.69***	2.56***	2.55***	2.61***	2.92***	2.91***	2.90***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	11419	11419	11419	11419	11419	11419	11419	11419	11419
adj. R-sq	0.64	0.64	0.64	0.56	0.56	0.56	0.58	0.58	0.58

p-values in parentheses

All specifications include operator and time fixed effects

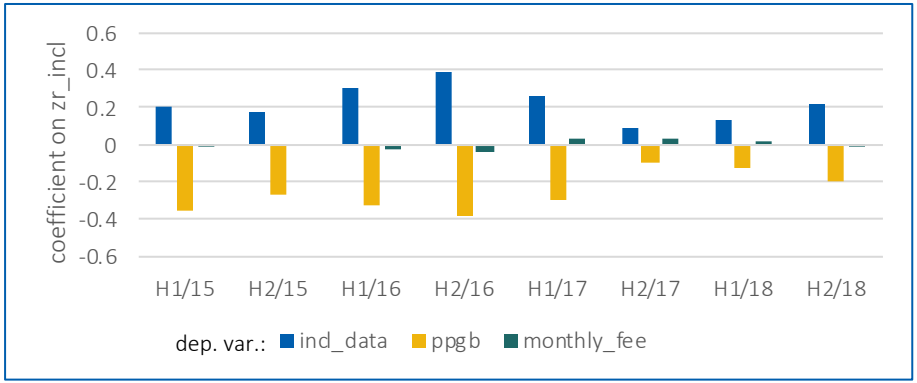
* p<0.10, ** p<0.05, *** p<0.01

Breaking down the effect

- In a next step we break down the effect of zero-rating
  - by period
  - by country
  - by app category
  - by quantile of the dependent variable
  - and some combinations of the above

Effect per period

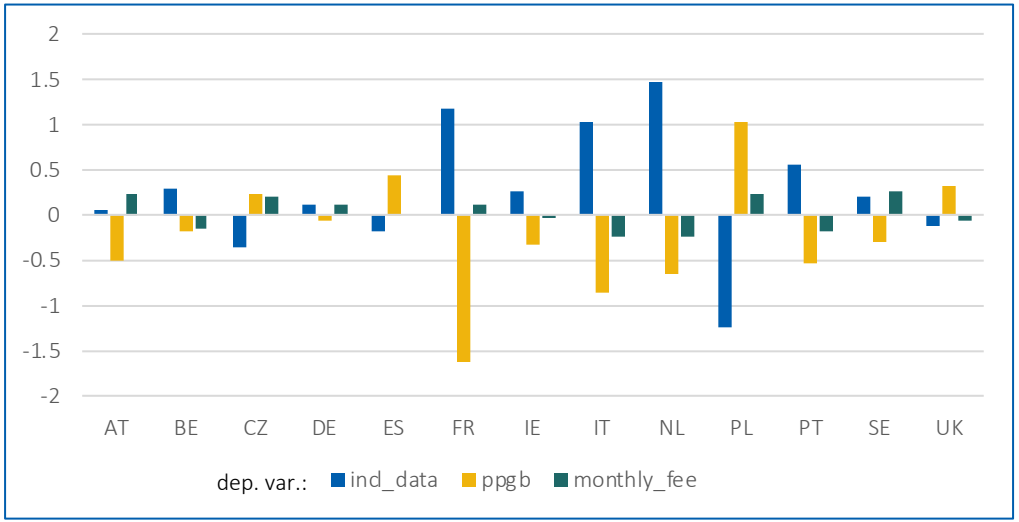
	Coefficients on zr_incl interacted with period-dummies							
	period							
dep. var.	H1/15	H2/15	H1/16	H2/16	H1/17	H2/17	H1/18	H2/18
incl_data	0.21*	0.18*	0.30***	0.39***	0.27***	0.09	0.13	0.22**
	(0.09)	(0.10)	(0.00)	(0.00)	(0.01)	(0.36)	(0.17)	(0.02)
ppgb	-0.35***	-0.26**	-0.32***	-0.38***	-0.29***	-0.10	-0.12	-0.20**
	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.34)	(0.25)	(0.03)
monthly_fee	-0.01	-0.00	-0.03	-0.04	0.04	0.04	0.02	-0.01
	(0.79)	(0.94)	(0.49)	(0.31)	(0.26)	(0.37)	(0.69)	(0.80)
p-values in parentheses								
* p<0.10, ** p<0.05, *** p<0.01								



- size and significance varies but sign remains (with incl_data and ppgb as dep. var.)

Effect per country

coefficients on zr_incl



- Large differences across countries
- Any pattern of explanation?

	Coeff. on zr_incl		
	dependent variable		
country	incl_data	ppgb	monthly_fee
AT	0.04	-0.52***	0.23***
	(0.79)	(0.01)	(0.00)
BE	0.29***	-0.19**	-0.15***
	(0.00)	(0.03)	(0.00)
CZ	-0.35**	0.24	0.20***
	(0.02)	(0.15)	(0.00)
DE	0.10	-0.07	0.10**
	(0.31)	(0.48)	(0.05)
ES	-0.17	0.43*	-0.00
	(0.43)	(0.08)	(0.96)
FR	1.16***	-1.64***	0.11
	(0.00)	(0.00)	(0.10)
IE	0.26	-0.33	-0.01
	(0.43)	(0.30)	(0.89)
IT	1.03***	-0.85***	-0.24**
	(0.00)	(0.00)	(0.01)
NL	1.48***	-0.65***	-0.23***
	(0.00)	(0.00)	(0.00)
PL	-1.23***	1.03***	0.22***
	(0.00)	(0.00)	(0.00)
PT	0.54**	-0.53**	-0.17*
	(0.02)	(0.02)	(0.05)
SE	0.19	-0.31	0.26***
	(0.22)	(0.12)	(0.00)
UK	-0.13	0.32	-0.07**
	(0.52)	(0.11)	(0.04)
p-values in parentheses			
* p<0.10, ** p<0.05, *** p<0.01			

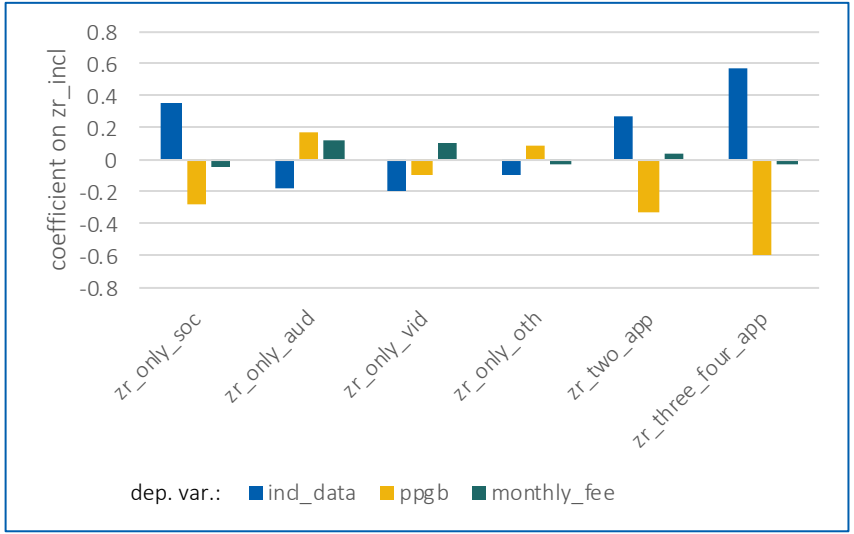
Effect on included data per country – country characteristics

dep. var.: incl_data	Coef. on zr_incl	Number of MNOs	Average included data
PL	-1.23***	4	12.22
CZ	-0.35**	3	3.91
ES	-0.17	4	4.11
UK	-0.13	4	10.11
AT	0.04	3	9.3
DE	0.10	3	4.17
SE	0.19	4	21.47
IE	0.26	3	22.82
BE	0.29***	3	4.41
PT	0.54**	3	3.5
IT	1.03***	4	6.66
FR	1.16***	4	43.11
NL	1.48***	4	6.17
p-values in parentheses			
* p<0.10, ** p<0.05, *** p<0.01			

Any pattern on the country level?

- Competition?
  - 3 vs 4 MNO countries
- General level of included data?
  - countries with a ‘high’ level of included data vs countries with a ‘low’ level
- Cannot systematically explain the differences
  - E.g. FR and PL both have 4 MNOs but very different effects
  - E.g. BE, PT, FR all have positive effects on incl_data but different numbers of MNOs and different levels of included data (BE, PT ‘low’, FR ‘high’)
- This suggests that country-individual market specificities or operator strategies are at work, which cannot easily be observed or measured.

Effect per app category



- Significant differences across app categories
- Positive coeff. on zr_incl is mainly driven by tariffs with only social apps included
- Tariffs with only audio or video apps included are associated with higher monthly fees

Coeff. on zero-rating dummies identifying different app categories			
	dependent variable		
	incl_data	ppgb	monthly_fee
zr_only_soc	0.35***	-0.28***	-0.05
	(0.00)	(0.00)	(0.13)
zr_only_aud	-0.18*	0.18	0.12***
	(0.09)	(0.13)	(0.01)
zr_only_vid	-0.20	-0.09	0.11**
	(0.17)	(0.56)	(0.04)
zr_only_oth	-0.09	0.09	-0.03
	(0.46)	(0.45)	(0.65)
zr_two_app	0.27**	-0.33***	0.04
	(0.01)	(0.00)	(0.32)
zr_three_four_app	0.58***	-0.59***	-0.02
	(0.00)	(0.00)	(0.71)
p-values in parentheses			
* p<0.10, ** p<0.05, *** p<0.01			

Quantile Regression

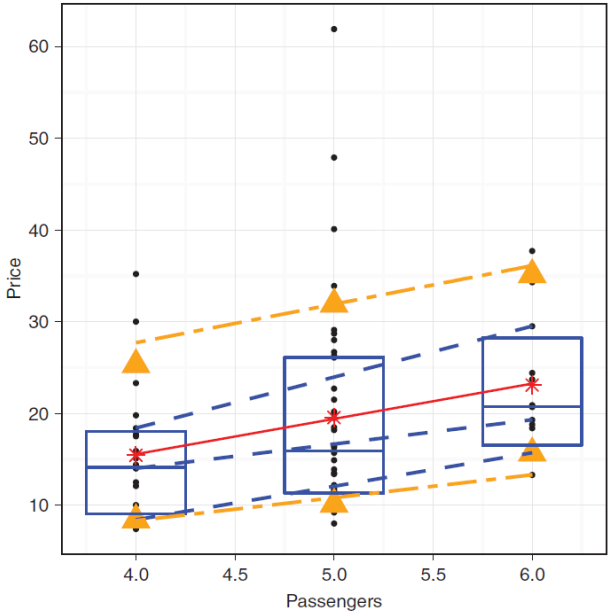
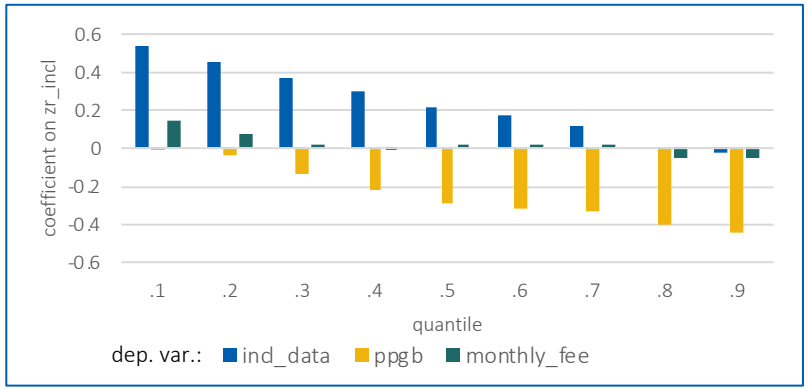


Figure 1.10 QR lines for $\theta = (0.1, 0.25, 0.5, 0.75, 0.9)$ *for the simple linear model* $\widehat{\text{Price}} = \beta_0(\theta) + \beta_1(\theta)$ Passengers. *The OLS line is recognizable by looking at the position of the asterisks, which represent the averages for the three groups.*

Source: Davino et al (2014): 17

Effect per quantile

	Coefficients on zr_incl by quantiles								
	quantiles								
dep. var.:	.1	.2	.3	.4	.5	.6	.7	.8	.9
incl_data	0.54***	0.45***	0.37***	0.30***	0.21***	0.17***	0.12**	-0.00	-0.03
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.92)	(0.66)
ppgb	-0.01	-0.04	-0.13***	-0.22***	-0.29***	-0.32***	-0.33***	-0.39***	-0.44***
	(0.70)	(0.34)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
monthly_fee	0.14***	0.07***	0.02	-0.01	0.01	0.01	0.01	-0.05***	-0.05**
	(0.00)	(0.00)	(0.39)	(0.78)	(0.77)	(0.47)	(0.67)	(0.00)	(0.02)
p-values in parentheses									
* p<0.10, ** p<0.05, *** p<0.01									



- effects vary with quantiles
- E.g. the effect on incl_data is stronger for tariffs with included data in the lower quantiles

Basket approach

	Coefficients on the zero-rating variables with the basket approach					
	dep. var.					
	incl_data		ppgb		monthly_fee	
basket value	€35	€50	€35	€50	1 & 2 GB	2 & 4 GB
share_zr_incl	-0.08	0.01	0.12	-0.03	0.03	-0.10
	(0.58)	(0.95)	(0.42)	(0.85)	(0.64)	(0.16)
zr_incl_port	0.09	0.27**	-0.12	-0.27**	-0.06	-0.16**
	(0.37)	(0.02)	(0.25)	(0.02)	(0.26)	(0.01)
share_zr_incl_opt	0.33***	0.03	-0.24**	-0.09	-0.10**	-0.16***
	(0.01)	(0.82)	(0.02)	(0.28)	(0.04)	(0.00)
N	-0.08	0.01	0.12	-0.03	0.03	-0.10
p-values in parentheses						
All specifications include operator and time fixed effects						
Regressions with ppgb and monthly_fee as dependent variable include GDP_growth and mtr.						
* p<0.10, ** p<0.05, *** p<0.01						

- Results of the basket approach are qualitatively similar to those at the tariff level.
- They indicate a positive effect of the introduction of zero-rating on included data and a negative effect on the monthly fee and the price per GB.
- These effects are not robust across the different specifications, however.

Basket approach: Effect on included data per country – country characteristics

dep. var.: incl_data	Coef. on zr_incl	Number of MNOs	Average included data
IE	-1.30***	3	22.82
PL	-1.29	4	12.22
SE	-1.02***	4	21.47
FR	-0.72	4	43.11
CZ	-0.46	3	3.91
DE	-0.36	3	4.17
PT	-0.24	3	3.5
BE	0.18	3	4.41
AT	0.39	3	9.3
ES	0.41**	4	4.11
IT	0.98***	4	6.66
UK	2.67	4	10.11
NL	13.50**	4	6.17

Conclusions

Conclusions

- The importance of zero-rating grew significantly in the years 2015-2018.
  - Several operators introduced zero-rating offers
  - The share of tariffs with zero-rating included increased fivefold
- But also data volumes and the share of flat-rate tariffs increased
- The results of our estimations show that the effect of zero-rating on included data, the price per GB, and the monthly fee varies strongly across countries, time, app categories and quantiles.
- We cannot identify a particular pattern which could help to explain or predict the effect.
- Our results are therefore supportive for a case-by-case approach to the assessment of the (potential) effects of zero-rating.

Thank you!

References

- Berglind, O. (2016): “The Effect of Zero-Rating on Mobile Broadband Demand: An Empirical Approach and Potential Implications”, International Journal of Communication, 10 (2016), pp. 2442-2459.
- Davino, C.; Furno, M.; Vistocco, D. (2014): “Quantile Regression. Theory and Applications“, Wiley Series in Probability and Statistics.
- epicenter.works (2019): “The Net Neutrality Situation in the EU. Evaluation of the First Two Years of Enforcement”, available at: https://epicenter.works/sites/default/files/2019_netneutrality_in_eu-epicenter.works-r1.pdf
- European Commission (2017): ”Zero-rating practices in broadband markets”, Report for the European Commission prepared by dot.econ, aetha, and Oswell & Vahida, available at: ec.europa.eu/competition/publications/reports/kd0217687enn.pdf.