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Composition of players matters

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Papai, Z - Nagy, P - Papp, B:
Does the number or the composition of players matter on the mobile broadband markets? - Lessons from a benchmarking study of the large-screen mobile broadband prices in the European Union

28th European Regional ITS Conference, Passau, Germany, 2017

Motivation

1. Competition and regulatory decisions require reliable and solid understanding of how the mobile markets work in practice
   - spectrum auction design concerns: facilitating entry or positive discrimination for the weakest/smallest players
   - in-country mergers between MNOs
   - in-country mergers between FNOs and MNOs
   - competition policy judgement on network sharing agreements
   - …
2. Lack of good empirical information and knowledge on the comparative performance of the mobile markets in general and especially of the mobile broadband markets
3. Too much emphasis on the number of the players may result in significant biases in decisions

Is there a difference in competitive performance between 3 and 4 player mobile broadband markets?

What factors may explain the observed differences in the price performance of the national mobile broadband markets?

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The benchmarking challenge

Mobile broadband is a complex service - a bundle of services with different quality features

- each small-screen plan is a combination of voice, sms, and data
- large-screen is „simply" data
  - but they are package deals with different quantity-price combinations
  - in case of smartphone plans quantities of the voice, sms and data service ingredients may differ from package to package
- price increasing with quantity, but nonlinear
- quality feature differentiation (like connection speed) may also be at play

Large-screen MBB is less challenging and easier to handle

- can be a proxy of the market performance?

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Aim of the paper

1. Propose and use a workable, coherent and methodology for mobile broadband market price level benchmarking
2. Show the overall picture of large-screen mobile broadband prices in the EU28, between 2013 and 2016
3. Look behind the differences:
   - with the help of simple statistics and visualization
   - econometric analysis of the 2013-2016 panel
     - country level
     - operator level

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The panel

	2013	2014	2015	2016
number of countries	27	28	28	28
number of operators	90	92	91	90
number of plans	322	343	338	319

- data on public LS MBB offers was gathered from EU28 MNOs' websites (March, 2013-2016)

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Ensuring comparability

- Focus on data quantity (allowance)
- Requirement: functional broadband
  - Connection speed threshold
  - Connection speed can also be a differentiator, primarily with unlimited tariffs
- Unlimited offer = no GB limit + no speed degradation above some limit
- Different plans can be functional for different usage purposes
  - from basic (browsing, e-mail, Facebook) to intensive (downloading large files regularly, video, gaming)
  - what are the characteristic usage purposes?

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First step : basket methodology

„There is nothing new under the sun"

- The known basket method can serve well for our purposes
- Predefined baskets by data quantity
  - corresponding to different user/usage characteristics
  - speed can be a secondary differentiator
- Calculation of a single basket price
- But which baskets are relevant?
  - low user /medium user / large user
    - this can change in time as the market develops,
    - the meaning of low/medium/high may differ between markets
  - relevant = widely used
    - but no take up information available
    - information exist only about what plans are on offer

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Which baskets?

- Basket choice criteria:
  - must fit to realistic usage patterns
  - must be empirically relevant = they must be one of the modes of the frequency distribution of the offered packages
  - it is preferable to use baskets similar to OECD-defined LSMBB baskets if there is no particular reason not to
- Chosen baskets:
  - low user: 1GB, 2GB and 3 GB;
  - medium user: 5GB and 10 GB;
  - high user: 15GB, 20GB and 30 GB

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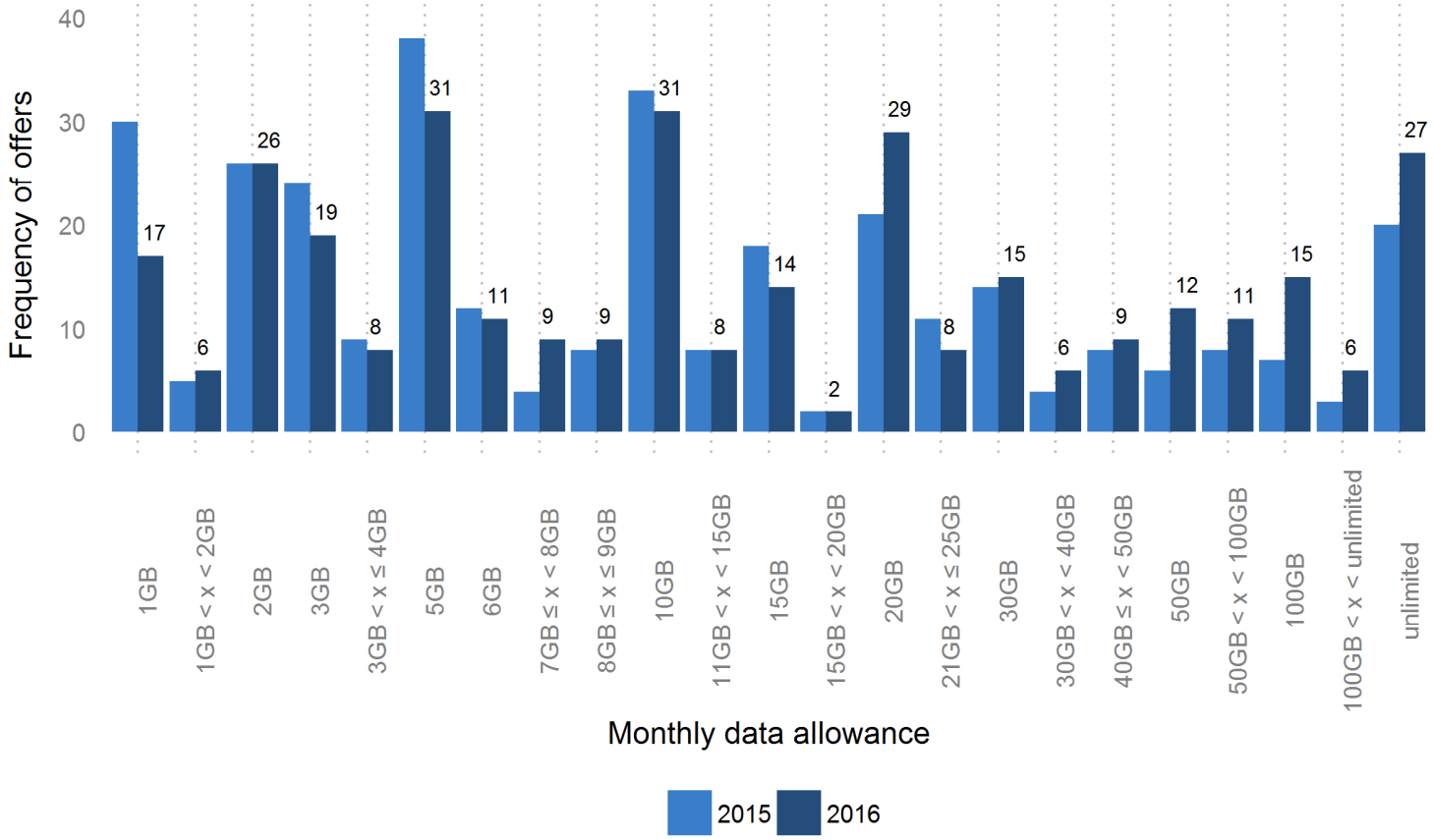
Frequency of the plans by monthly data allowance (GB; number of plans)



Source: Infrapont, based on operators' websites, Labels are for 2016 frequencies.

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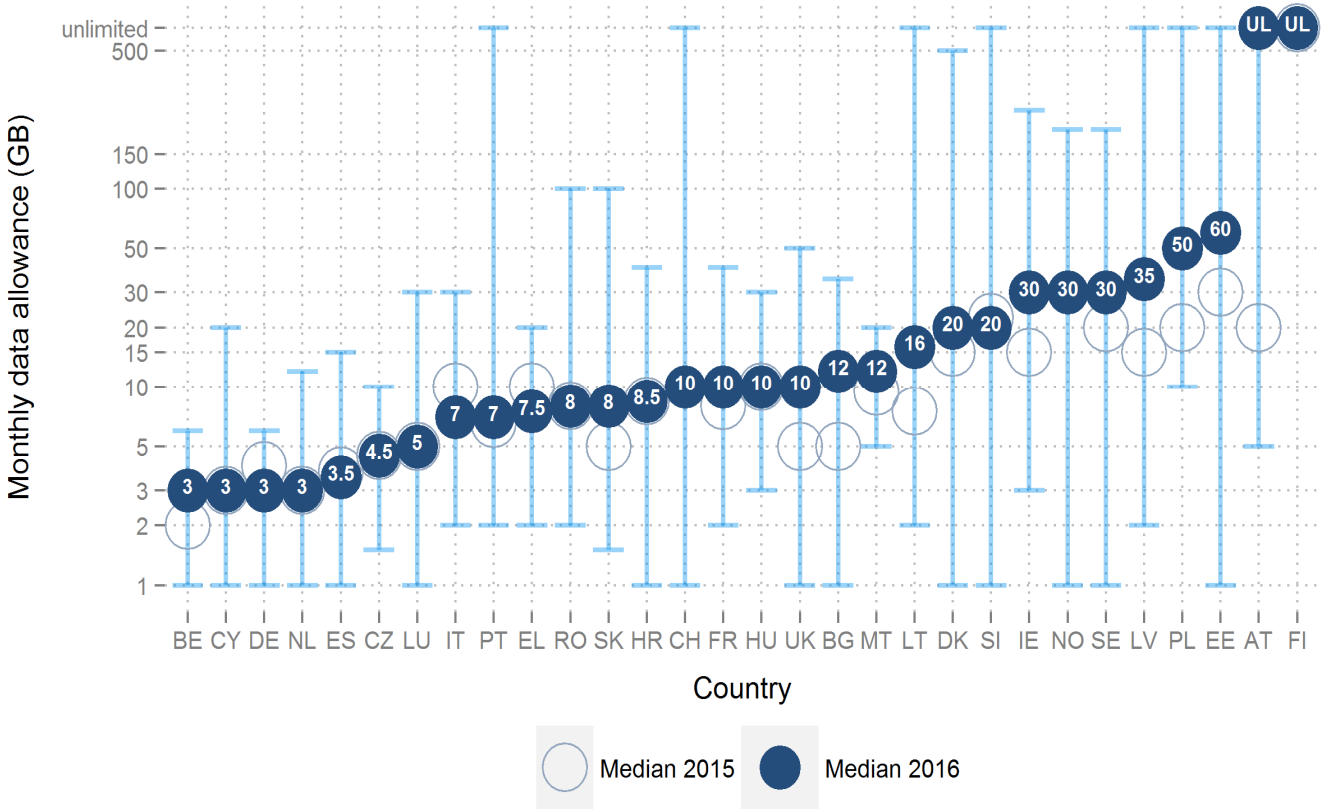
Large differences between countries

Minimum, maximum and median offers by country



Source: Infrapont, based on operators' websites

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Calculation of the monthly prices of individual plans

Monthly price =

+ monthly paid subscription price of the plan,
+ one time fees (activation, administrative, service fees, etc.)
+ price of the stick/modem
- unambiguously quantifiable discounts

- One time elements are depreciated according to the contract length, usually 12 or 24 months
  - stick depreciation is 24 months

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Matching plans and baskets

- Match the cheapest plan to each user basket whenever possible
- When an operator does not have an offer corresponding exactly to the size of the predefined basket, apply the cheaper one of the following two options:
  - the price of the plan with the closest, but higher data allowance,
  - the price of the package with the closest, but smaller data allowance + the extra data charge
- If there is no exactly matching offer for the smaller user baskets, choose the plan with the smallest data allowance
  - relevant where only large, perhaps unlimited plans are available

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Basket prices for countries

Two options

1. **average** of the MNOs' corresponding basket prices
2. **minimum** of the MNOs' corresponding basket prices

- Merits and drawbacks
  - the first represents the mass
  - the second represents the competitive edge
- They are informative together

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Prices for comparison

Two options:

1. **nominal Euro price**
   - calculated with relevant exchange rates for non-eurozone countries
2. **PPP adjusted price**

- Both have merits and drawbacks
- PPP is preferred for comparison of consumer prices, because it handles the countries' price level differences

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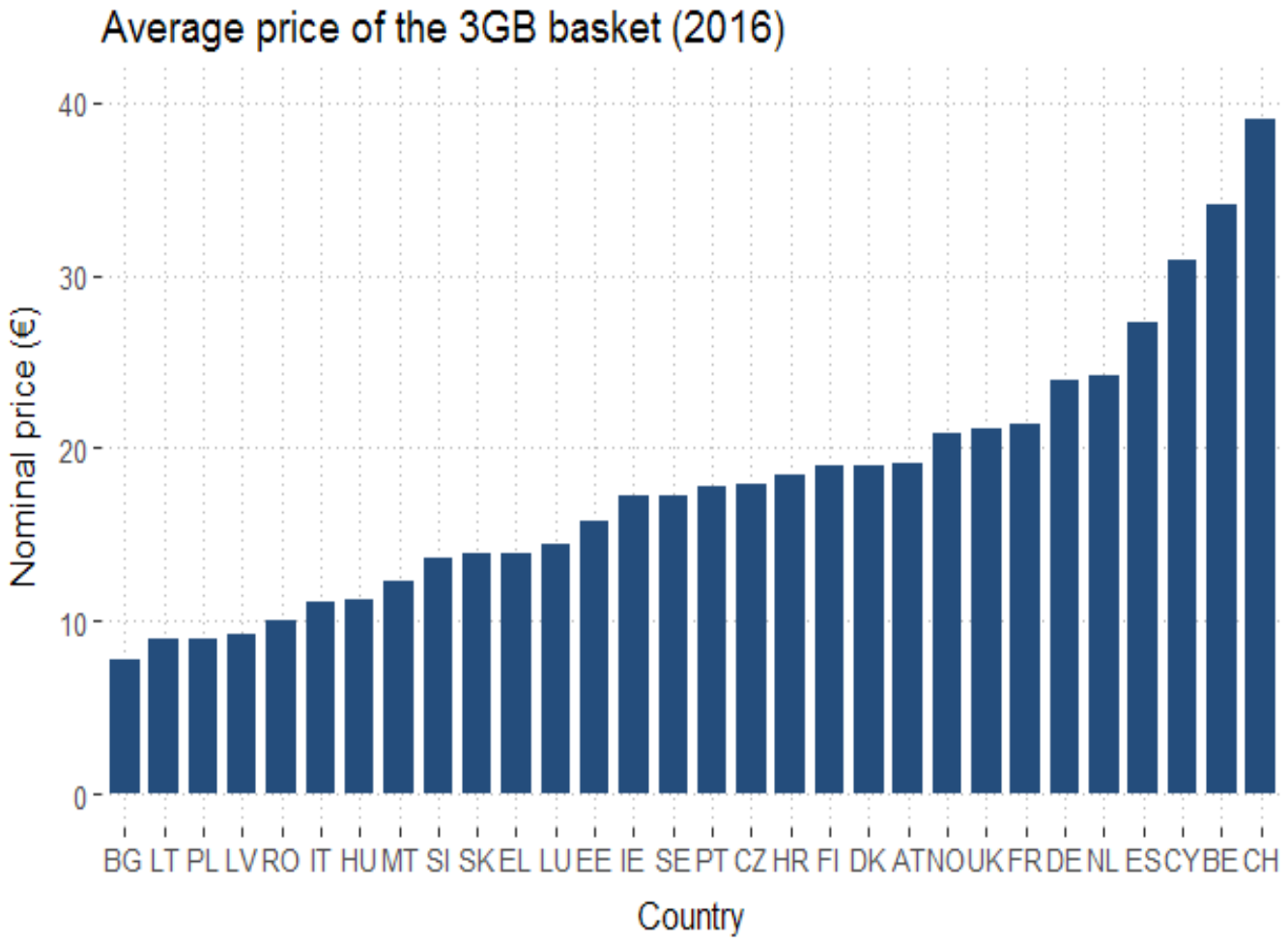
Basket comparison – 3GB basket, 2016



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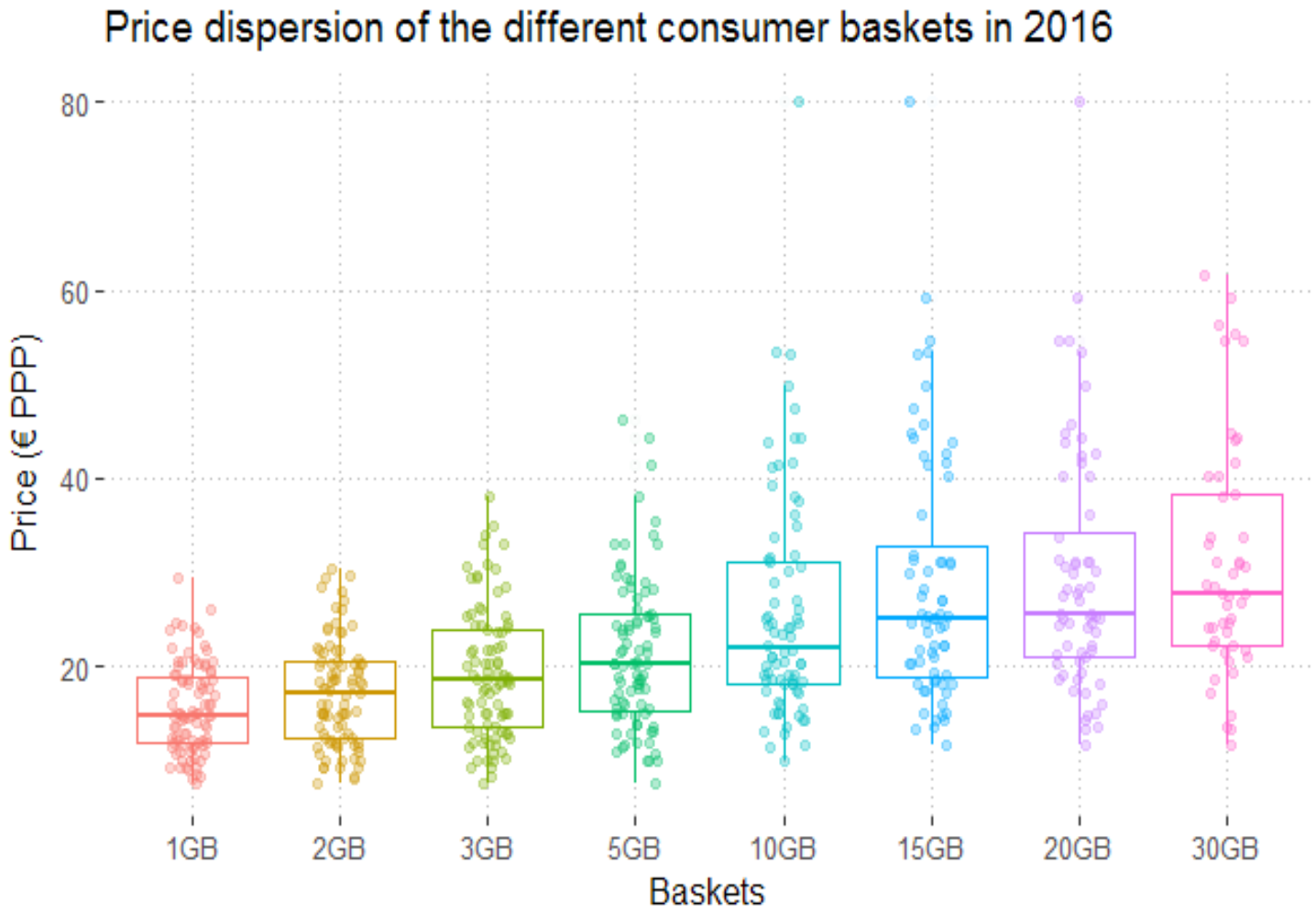
Basket prices compared – large differences even with PPP



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„Normalization"

Basket price index with „Normalization", i.e. Min-max scaling of the basket prices to the [0-100]

- 2013 highest basket price = 100
- basket price index for an entity (operator or country) =

$$100 \times \text{price}/\text{max price}_{2013}$$

Intertemporal comparability is ensured by fixing the max of the basket index on the max level of 2013

  - index value above 100 may occur

Price indices for each basket:

- operator basket price index
- country basket price index

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Third step: mapping to 1 dimension

Entity (operator or country) overall price index =

simple arithmetic average of the basket price indices

Two options for handling missing baskets on the high end of the menu:

a) calculate the average only for the really existing baskets

b) assign index score of 100 where a basket is missing

Consequences:

- a) might favor entities without the full range of the basket menu, but b) is punishing them
- fact: most of the entities are not affected
- the correlation between the two types of the index is above 0.95

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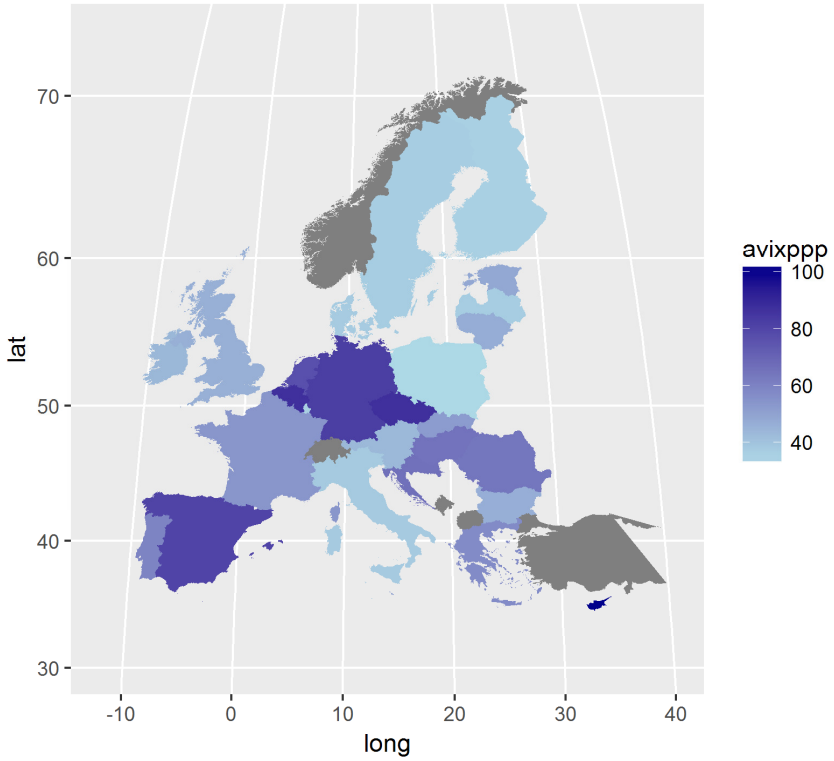
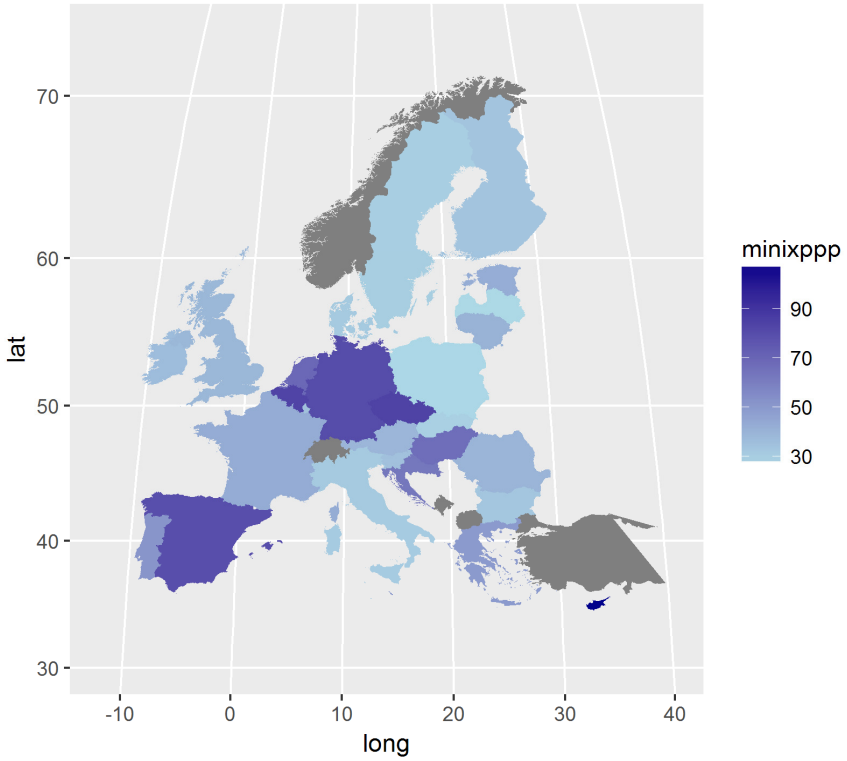
Average and minimum price indices, 2016

Average price index, (2016, PPP)



Minimum price index, (2016, PPP)



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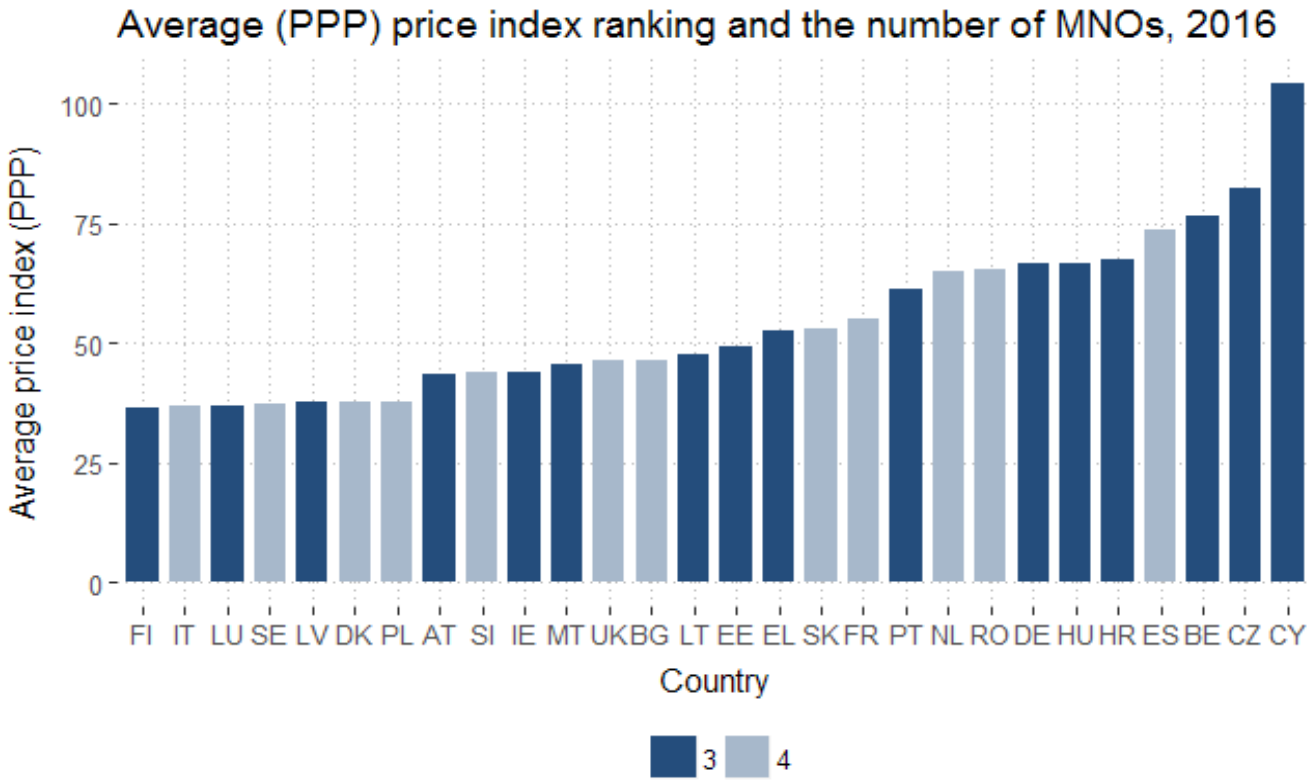
LSMBB Price Index comparison of countries
Does the number of operators matter?



Do you see a clear pattern?

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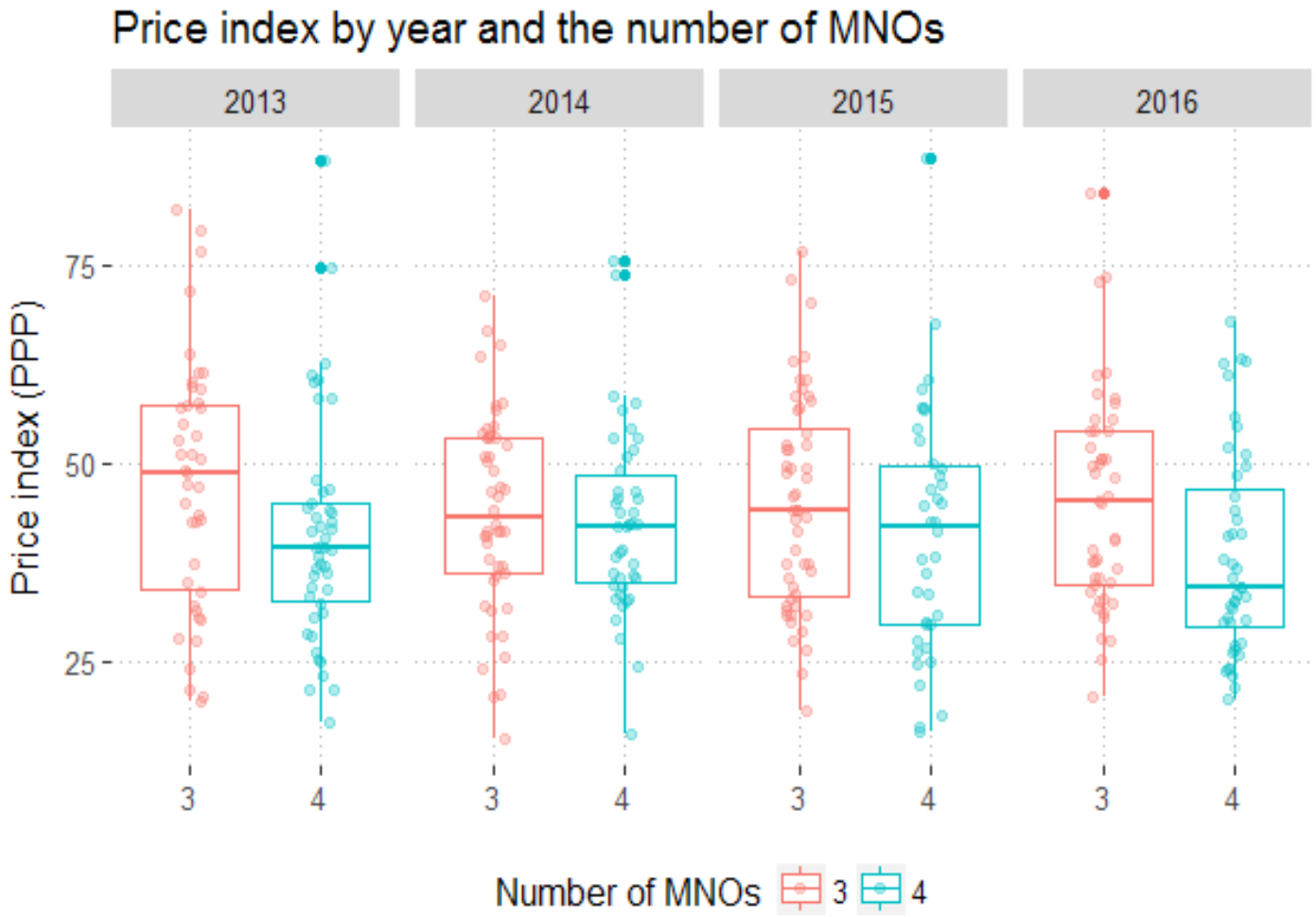
Operator price index and the number of MNOs (2013-2016)



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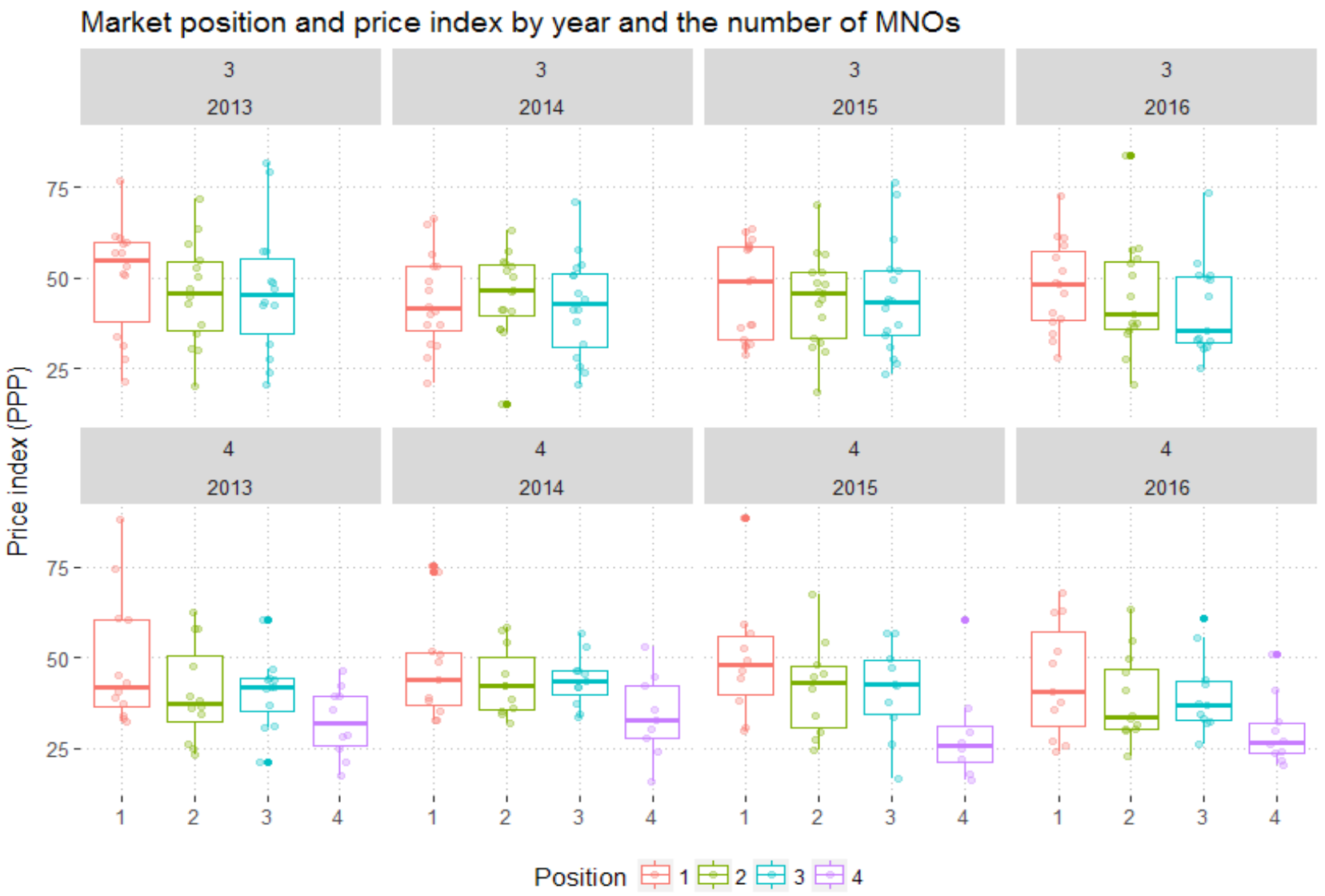
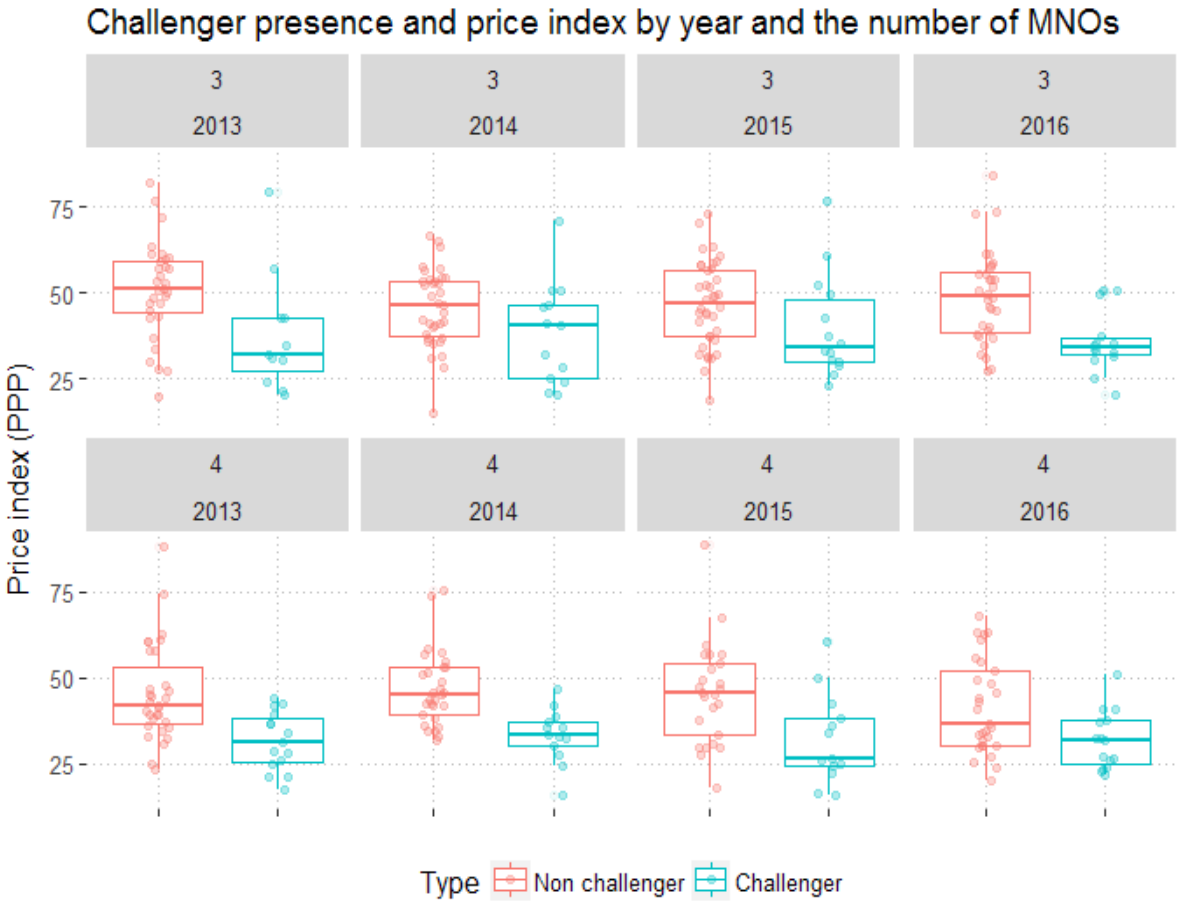
Only the fourth players seem pricing markedly lower



Challengers are pricing more aggressively



challenger: a players whose current parent was not any of the first two operator on any of the EEA mobile markets

- the definition does not involves judgement
- challengers are usually the 3rd or 4th players on the markets, but not always because mergers might change the ranking

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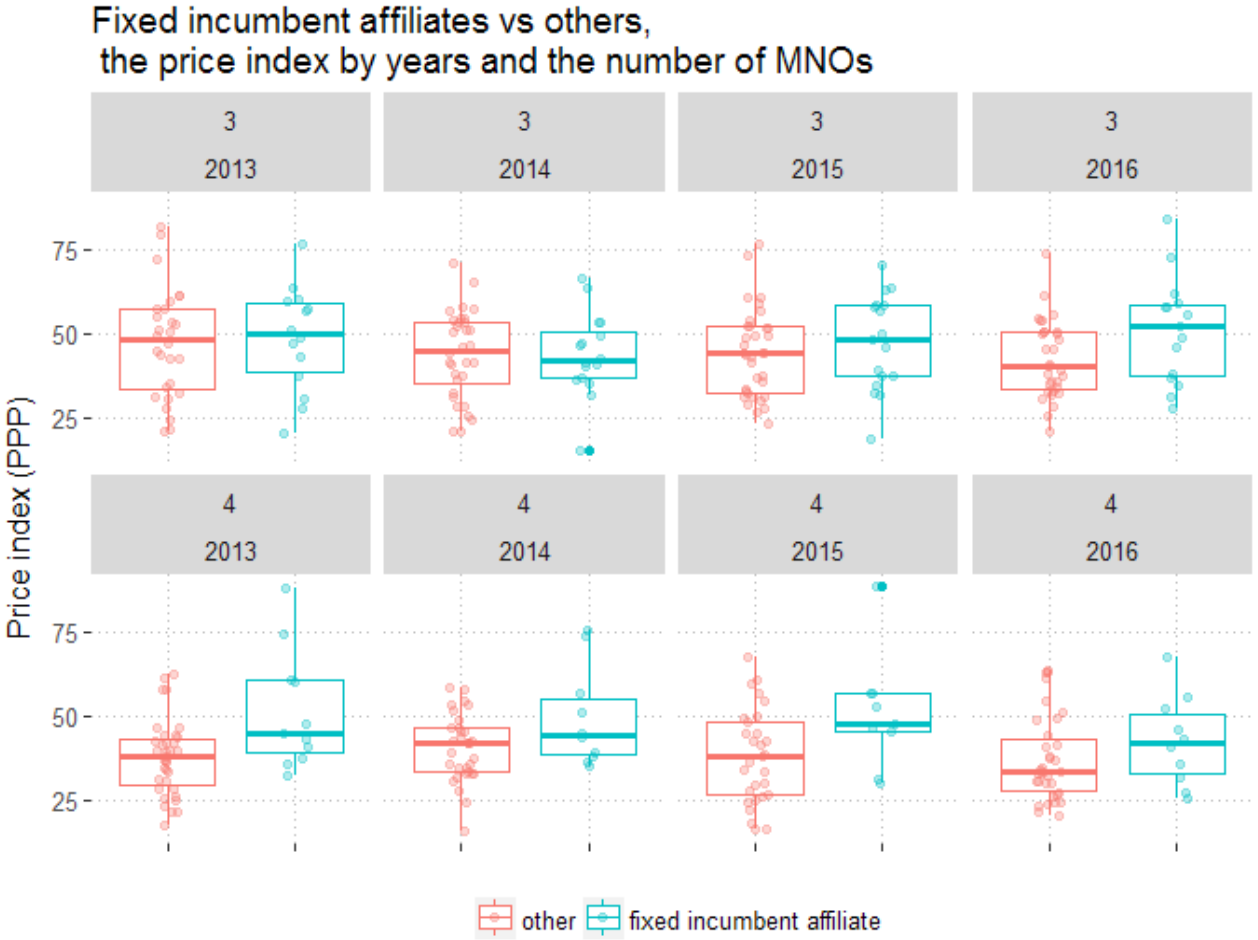
Fixed incumbents' affiliates seem to be pricier



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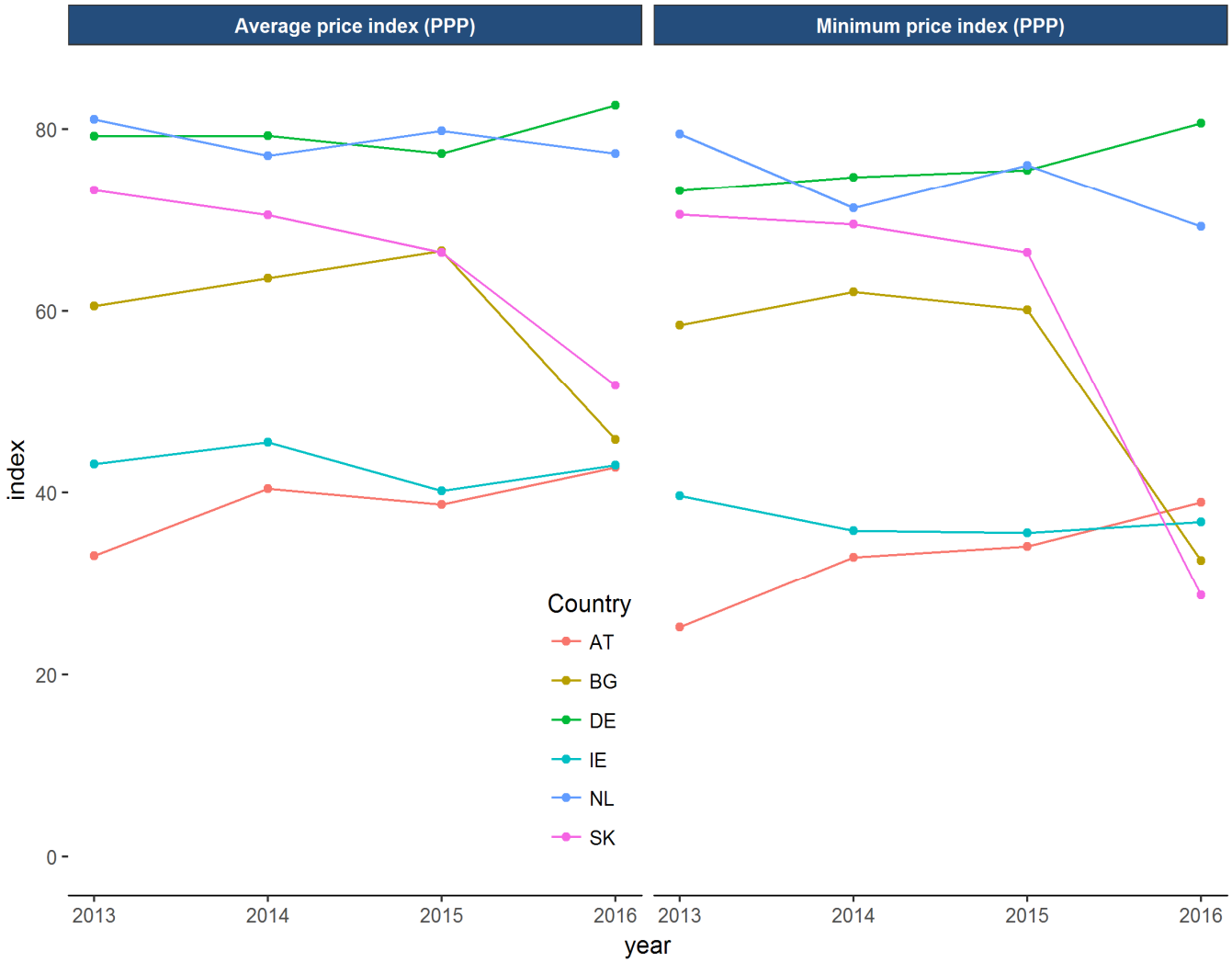
Effects of changing numbers



entry: 3-to-4

- NL (2015)
- BG (2014)
- SK (2015)

merger: 4-to-3

- AT (2013)
- IE (2014)
- DE (2014)

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Panel regressions - Country level

- dependent variables:
  - minimum or average price index
  - type a or b index
- model: Random Effect
- SEs are heteroskedasticity robust estimates with small sample correction
- data: EU 25, as CY, LU, and MT are intentionally left out
  - special characteristics (size, population density, and/or GDP per capita

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	Dependent variable:			
	avix	minix	avix2	minix2
	(1)	(2)	(3)	(4)
loggdppoppps	**-12.892****	-8.154	**-13.300****	-8.579
	(5.761)	(5.443)	(5.688)	(5.370)
popdens	0.011	0.001	**0.043****	**0.033****
	(0.013)	(0.013)	(0.017)	(0.016)
mbbpen	-0.029	-0.060	-0.036	-0.076
	(0.064)	(0.072)	(0.073)	(0.080)
fbbpen	0.444	0.457*	0.430	0.496**
	(0.288)	(0.234)	(0.310)	(0.246)
mobpen	**-0.130****	**-0.117****	**-0.140****	**-0.137****
	(0.052)	(0.055)	(0.065)	(0.062)
opnum4	2.244	-1.993	-0.177	-3.892
	(3.145)	(3.190)	(2.747)	(2.969)
laptopnomaduse	-0.202	-0.202	-0.136	-0.144
	(0.170)	(0.143)	(0.159)	(0.147)
chal	**-14.713*****	**-18.713*****	**-14.860*****	**-20.518*****
	(4.383)	(4.562)	(5.002)	(5.495)
basketstatusincomplete	2.489	2.124		
	(3.607)	(3.855)		
Constant	205.640***	156.738***	210.482***	163.959***
	(55.293)	(53.957)	(53.757)	(52.460)
Effect	RE	RE	RE	RE
Observations	98	98	98	98
R^2	0.519	0.541	0.487	0.564
Adjusted R^2	0.470	0.494	0.440	0.525
F Statistic	10.534*** (df = 9; 88)	11.501*** (df = 9; 88)	10.532*** (df = 8; 89)	14.412*** (df = 8; 89)
Note:		*p<0.1; **p<0.05; ***p<0.01		

Country level findings

- *number of players* is not significant
- In the presence of a *challenger* prices are lower,
  - this is not conditional on the number of players
  - the effect is large, and as expected it is larger with minimum price
- *mobile penetration* coefficient is significant and negative
- *population density* is significant and positive in models with the b type index
  - larger baskets are less available in densely populated countries

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Panel regressions – Operator level

- dependent variables:
  - type *a* price index (models 1-3, with op_agrindex)
  - type *b* price index which punishes non availability of large baskets (models 4-6 with op_agrindex2)
- models:
  - (1) and (4) Random Effect
  - (2) and (5) Random Effect with country dummies
  - (3) and (6) country_operator Fixed Effect
- RE models are preferred by Hausman test, however the FE models are also presented for reference (3 and 6)
- RE models 2 and 5 with country fixed effect seems to be a priori the most relevant
- data: EU25 MNOs (CY, LU, MT are left out)
- SEs are heteroskedasticity robust estimates

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	Dependent variable:					
	op_agrindex			op_agrindex2		
	(1)	(2)	(3)	(4)	(5)	(6)
loggdppoppps	-10.152***	-4.561	1.558	-7.151	-35.137**	-34.801***
	(3.450)	(13.934)	(13.277)	(4.442)	(13.893)	(13.164)
popdens	0.016*	-0.502	-0.345	0.051***	-0.730	-0.620
	(0.009)	(0.447)	(0.417)	(0.014)	(0.486)	(0.483)
mbbpen	-0.018	0.023	0.040	-0.048	0.063	0.059
	(0.041)	(0.064)	(0.061)	(0.056)	(0.081)	(0.080)
fbbpen	0.297*	-0.419	-0.292	0.279	-0.704	-0.552
	(0.159)	(0.430)	(0.432)	(0.277)	(0.475)	(0.472)
mobpen	-0.063**	-0.006	-0.014	-0.086**	-0.031	-0.025
	(0.031)	(0.042)	(0.040)	(0.039)	(0.055)	(0.051)
opnum4	1.851	-0.131	3.404	1.053	-7.382***	-6.507**
	(1.996)	(2.775)	(3.117)	(2.233)	(2.838)	(2.699)
laptopnomaduse	-0.141		-0.065	-0.165		0.011
	(0.113)		(0.138)	(0.128)		(0.157)
challenger	-6.706***	-2.382		-11.712***	-3.386	
	(2.188)	(2.421)		(3.662)	(2.917)	
fix_incumbent	2.310	3.409*		-1.583	1.342	
	(2.270)	(1.903)		(3.079)	(1.660)	
position2	-4.004**	-3.554**	-6.481*	-1.485	-1.018	4.206
	(1.946)	(1.709)	(3.518)	(2.638)	(1.552)	(2.591)
position3	-5.680***	-4.668**	-9.640***	-4.528*	-2.465	-1.516
	(1.999)	(1.953)	(3.159)	(2.368)	(1.950)	(2.207)
position4	-12.508***	-11.893***	-13.518***	-8.611**	-6.581*	-5.413
	(3.556)	(3.581)	(4.475)	(4.260)	(3.513)	(3.377)
compwithchal	-8.550***	-1.985	-8.823**	-10.445***	2.895	1.507
	(2.428)	(2.904)	(3.980)	(2.888)	(3.046)	(4.680)
islte	-1.001	-1.345	-2.003	-6.154***	-4.238**	-5.887***
	(1.235)	(1.678)	(1.429)	(1.828)	(2.073)	(1.806)
Constant	160.132***	148.195		148.383***	507.577***	
	(33.252)	(137.972)		(42.216)	(143.828)	
Effect	RE	RE	FE	RE	RE	FE
Observations	331	334	331	331	334	331
R^2	0.335	0.471	0.078	0.363	0.632	0.171
Adjusted R^2	0.306	0.405	-0.317	0.335	0.586	-0.184
F Statistic	11.363*** (df = 14; 316)	7.132*** (df = 37; 296)	1.628* (df = 12; 231)	12.880*** (df = 14; 316)	13.725*** (df = 37; 296)	3.968*** (df = 12; 231)
Note:			*p<0.1; **p<0.05; ***p<0.01			

with models (2) and (5) country dummies are not presented

Operator level findings (models 2 and 5)

If country fixed effects are controlled for :

- the negative effect of the *number of the players* is significant in model 5
- the effect of a *challenger* is not significant in any of the two models as well as of the variable *competing with a challenger*
- prices of operators in *market position* 2, 3, and 4 are lower than the price of the market leader
  - it is significant for positions 2-4 in model 2, but only for position 4 in model 5
- affiliate of a fixed incumbent is pricing higher?
  - maybe slightly
  - it is significant in model 2 but not in 5
- negative „price effect" of *having LTE* is significant in model 5 but not in 2
  - perhaps it may rather be related to the availability of the higher baskets (which is punished in the index type b) tan the price

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Discussion

On country level:

- presence of a challenger seems more relevant in pushing prices lower than the mere number of players
- the higher the mobile penetration the lower the prices on average (and presumably *vice versa*)

On operator level (with country fixed effect):

- the further back the market position, the lower is the price
  - the lowest is for the 4th player,
- having a 4th player seems to be better deal for price sensitive costumers, but it is not clear whether this presence would force the others pricing lower than they did on a 3 player market
- LTE deployment seems increasing the availability of larger baskets

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