Body of European Regulators for Electronic Communications

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BEREC Report
Regulatory Accounting in Practice 2016

6 October 2016

1. Executive summary

This is the twelfth annual report in a series summarising the findings of a detailed survey of regulatory accounting frameworks across Europe. The information has been gathered from National Regulatory Authorities (NRAs) and covers the implementation of regulatory cost accounting methodologies, which include allocation as well as annualisation methodologies[1], systems and processes.

These regulatory accounting frameworks provide NRAs with financial information essential to facilitate some of their significant regulatory decisions such as setting price controls, monitoring compliance with *ex ante* obligations (such as cost orientation of charges and non-discrimination) and informing market reviews.

The document provides an up-to-date factual report on the regulatory accounting frameworks implemented by NRAs and an assessment of the level of consistency achieved. The report sets out an overview of the regulatory accounting frameworks updated to April 2016 and also illustrates, where possible, trends and comparisons with data collected each year, starting from 2006. Moreover this year report includes, for each graph reproducing trends, an origination/destination table of the changes over the period.

The report develops a deeper analysis that concentrates on the Wholesale Line Rental (WLR) service and the following key wholesale markets: Wholesale Local Access (Market 3a), Wholesale Central Access (Market 3b) and Wholesale high quality access (Market 4). Moreover an analysis is given of the cost base and allocation methodologies used for fixed (Market 1) and mobile (Market 2) termination markets.[2]

Furthermore, as in last years' report, to emphasise factors influencing NRAs regulatory strategy, additional structural data (e.g. population, market structure, infrastructure) have been collected from NRAs. Not surprisingly, considerable differences in the market/competitive situation as well as infrastructure in place can be observed between (and within) the responding countries reflecting different external and technical requirements which NRAs need to take into account.

The report also looks at annualisation methodologies provided by respondent NRAs. As in last year's report, accounting information for some products in Market 3a, such as copper access (including LLU, SA, SLU), fibre access (LLU, VULA), dark fibre access and duct access have been further analysed.

As of last year the report includes a section on actual implementation of the Termination Rates Recommendation 2009/396 of 7 May 2009.

Moreover, this year the report includes a further analysis about the implementation of the Recommendation 2013/466/EU on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment of 11 September 2013 with regard to costing methodologies and price level (par. 3.6.5).

This year the report provides an update of the 2013 report about WACC parameters used in different markets analysing also the main methodologies used to estimate each parameter that are needed to implement the CAP-M model used by NRAs to estimate the cost of capital.

[1] The report is more precise with regard to the "labelling" of the areas covered, however this does not imply a change of the cost (accounting) methodologies covered, i.e. continuity of the time series is ensured.
[2] The report takes into account the new version of the relevant market recommendation as adopted by the Commission on 9th October 2014 (2014/710/EU).

Key findings

The overall picture of the cost accounting methodologies (chapter 3) is relatively stable in comparison to last year with just a small number of changes by NRAs since last year. There are clear preferences for price control methods (cost orientation alone or in combination with price cap, but the overall picture is getting more differentiated), cost base (current cost accounting – CCA) and allocation methodologies (mainly long run incremental costs (LR(A)IC) with fully distributed costs (FDC) preferred only in a few markets). The degree of consistent application of methodologies continues to be high and accommodates the use of elements or parameters that reflect national circumstances.

These findings reflect the primary cost base or allocation methodology selected by a NRA but do not bring out situations where a NRA would strengthen its financial analysis by comparing outcomes from one principal methodology with alternative approaches such as comparing bottom-up models with top-down or incurred costs. For all markets except Market 1/2007 – and to a lesser extent in Markets 3b and 4 – the combination of CCA and (FL) LR(A)IC is the most favoured approach, in particular this combination is preferred in the termination markets (Market 1 and Market 2), where the LRIC approach often takes the form of pure LRIC to comply with the Recommendation 2009/396/EC on termination rates.

The analysis over time of the key wholesale markets – Local Access (Market 3a), Central Access for mass-market products (Market 3b) and High quality Access (Market 4) – has shown a clear preference for cost orientation (and a complementary use of ERT (economic replicability test) in Market 3a in 2016), a trend towards CCA and LRIC (reaching an even distribution of LRIC and FDC in Market 3b in 2015) accounting methods and a preference for FDC in Market 4. Slightly different results are observed for Wholesale Line Rental, where retail minus is the favoured price control method, HCA (historical cost accounting) and CCA are used quite in the same proportion and FDC is clearly the preferred choice of allocation methodology.

Taking into account the information detailed for different products in Market 3a, it results that cost orientation is the preferred price control method for all products under analysis. As far as the allocation methodology is concerned, LR(A)IC is prevailing by far for all products except duct access products where also FDC is observed. For Market 3a the breakdown by access products shows that NRAs mostly use “tilted annuity” as annualisation method (when CCA was declared as cost base). The breakdown in legacy and NGA products in Market 3b did not show specific differences in terms of choice of costing methodologies.

The analysis of the structural data (chapter 4) confirms that countries start from very different points in terms of population, topography, market situation etc.. These factors influence the regulation strategy of NRAs for the wholesale access markets.

The analysis of the main motivation behind the choice of the costing methodology (chapter 5) showed that the “strict cost orientation” is the instrument of choice to promote competition and stimulate investments and increase consumer benefit. With respect to previous years there is an increase of NRAs that declared as main motivation to enhance replicability of infrastructures.

Regarding the WACC, the in-depth survey and the update provided in this report (chapter 6) shows that nearly all NRAs use the Capital-Asset-Pricing-Model (CAP-M)[3] and hence the same parameters for determining the WACC, but the value of these parameters naturally differs reflecting different national financial market conditions. This is due to the underlying calculations that are based on economic and financial market circumstances as well as tax and inflation rates in the individual

[3] Cf. BoR (13) 110.

European countries. Furthermore, the regulatory periods and therefore the update periods for the WACC parameters differ in each country. No significant variations between fixed and mobile markets with regard to methodological choices can be seen. The analysis of the parameters used by NRAs to calculate the WACC shows a quite homogenous methodological approach for this calculation.

Overall the 2016 data confirms the trend towards an increasingly consistent approach to regulatory accounting approaches and a stabilisation in the application of particular methods for cost valuation or cost allocation among NRAs. The latter indicates that NRAs are providing predictable and stable regulatory environments in their countries. The convergence of regulatory accounting approaches is more pronounced for the termination markets whereas we see a more differentiated picture for the wholesale access markets reflecting the different national market situations and structural factors influencing the regulatory strategy.

Future development

Good progress has been made in developing effective regulatory accounting frameworks to meet the needs of NRAs. However, this is a complex and highly technical topic which requires regular maintenance and enhanced implementation of the regulatory accounting framework as competition develops, technology improves and new regulatory challenges emerge.

2. Introduction

2.1 Background

The BEREC Regulatory Accounting EWG has been gathering and reporting data from National Regulatory Authorities (NRAs) with the aim of describing how regulatory accounting systems are implemented in European countries with respect to cost-orientation or non-discrimination obligations or to assist price control decisions. This is the twelfth annual report summarising the results of this survey.

The report has been updated since 2005 in order to monitor the level and trend in harmonisation of regulatory accounting systems across Europe over time.[4] By the end of the first quarter 2006 several countries had completed the first round of the market reviews for the 18 markets listed in the 2003 Recommendation; therefore it was possible to start evaluating how various NRAs implemented the obligations provided for by articles 10, 11 and 13 of the Access Directive (for wholesale markets), by article 17 of the Universal Service Directive (for retail markets) and the principles contained in the new European Commission Recommendation on Cost Accounting and Accounting Separation of September 2005.[5] Subsequently, as the Commission issued the 2007 Recommendation that reduced the number of markets susceptible to ex ante regulation, the Report focused gradually on a lower number of markets and more recently on how NRAs implemented the principles of the Commission Recommendation on consistent non-discrimination obligations and costing methodologies.[6]

Generally speaking previous years' reports showed a clear trend towards an increasingly consistent approach to regulatory accounting approaches among NRAs. This trend is further confirmed by the 2016 data, though with signs of stabilising at a high level of applying particular methods for cost valuation or cost allocation. The latter indicates that NRAs are providing predictable and stable regulatory environments in their countries.

[4] - IRG (05) 24 Regulatory accounting in practice 2005.
- ERG (06) 23 Regulatory accounting in practice 2006.
- ERG (07) 22 Regulatory accounting in practice 2007.
- ERG (08) 47 Regulatory accounting in practice 2008.
- ERG (09) 41 Regulatory accounting in practice 2009.
- BoR (10) 48 Regulatory accounting in practice 2010.
- BoR (11) 34 Regulatory accounting in practice 2011.
- BoR (12) 78 Regulatory accounting in practice 2012.
- BoR (13) 110 Regulatory accounting in practice 2013.
- BoR (14) 114 Regulatory accounting in practice 2014.
- BoR (15) 143 Regulatory accounting in practice 2015.

[5] Recommendation 2005/698/EC replacing Recommendation 98/322/EC on Accounting Separation and Cost Accounting of 8 April 1998. In September 2005 the ERG published a Common Position containing "Guidelines on implementing the EC Recommendation 2005/698/EC", cf. document ERG (05) 29.

[6] The Commission worked on a new recommendation covering "Costing methodologies for key wholesale access prices". BEREC provided detailed input to the public consultation, cf. Document BoR (11) 65. Furthermore it submitted the BEREC Opinion on the draft recommendation on non-discrimination and costing methodologies on March 26th 2013, cf. Document BoR (13) 41. The Commission published the new "Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU)" (C(2013) 5761) on 11 September 2013.

2.2 Current report

This report provides an update on the status of regulatory accounting systems across Europe. It monitors how regulatory accounting methods and models have been developed as a consequence of the adoption by NRAs of decisions regarding market analyses. This year's report confirms the trend towards the consistent implementation of accounting methods and models already observed during the last few years.

The report benefits from information collected from 34 authorities (listed in Annex 1) with most NRAs responding to the majority of the questions, thus providing a solid base for further analysis.

The information provided in this report refers to those markets for which the market analyses are either concluded or under consultation. The report reflects, therefore, also measures which are planned to be implemented by the end of 2016, although the final decisions may still be subject to further consultations and may therefore still be part of the next market analysis rounds.

2.3 The data collection process

NRAs can, in principle, use a variety of objective and appropriate regulatory accounting methodologies depending on their market analysis[7], however NRAs should aim at following regulatory best practice.

In order to obtain a general view of cost accounting systems across Europe, the Regulatory Accounting EWG has collected a broad range of data since 2005, including, *inter alia*, a comparison between the cost-base (e.g. historical cost versus current cost) and the allocation methodology (e.g. fully distributed cost – FDC – or long run incremental cost – LRIC) chosen by different NRAs.

Such data, providing a valuable source of information, form a database, which is an informal data exchange tool among NRAs.[8] It includes the following information:

- cost base;
- accounting system/allocation methodology;
- price control method;
- auditing process;
- WACC calculation methodology; and
- remedies imposed on Significant Market Power (SMP) operators.

In order to improve data comparability the following pre-defined options were included in the data request:
For the Cost base:

- *HCA Family (Historical Cost Accounting);*
- *CCA Family (Current Cost Accounting and Forward Looking – Current Cost Accounting);*

[7] For an exhaustive explanation of how to implement a regulatory accounting system see the ERG (05) 29 "Common position on EC Recommendation on Cost accounting systems and accounting separation under the regulatory framework for electronic communications" (2005/698/EC). Cf. also BEREC response to the Commission's questionnaire on costing methodologies for key wholesale access products in electronic communications, BoR (11) 65.
[8] The database contains confidential information and therefore is not published.

- *Other cost base methodologies that do not appear in the above definitions.*
-

For the Accounting System / Cost Model[9]:

- *LRIC, LRAIC (Long Run Incremental costs, Long Run Average Incremental costs);*
- *FDC (Fully Distributed Costs).*
-

For the Price control method:

- *Cost orientation (alone);*
- *Price Cap (alone);*
- *Retail Minus;*
- *Cost orientation and Price cap;*
- *Benchmarking;*
- *Benchmarking in compliance with Rec. 2013/466/EU of 11 Sept 2013;*
- *ERT (economic replicability test) as laid down in Rec. 2013/466/EU;*
- *Other price control methods that do not appear in the above definition.*

Besides the above mentioned data, countries have provided further information regarding the approach used to develop cost models (e.g. Top-Down (TD) or Bottom-Up (BU)).
Data for other markets not listed in the 2014 EC Recommendation[10] on relevant markets, as susceptible to *ex ante* regulation, are also collected.

Finally, in order to simplify the data presentation and also to respect the confidentiality request made by some NRAs for certain data, this report, as in the previous years, does not present and comment all the data collected. The report concentrates on the markets listed in the 2014 Recommendation, which are typically subject to regulatory accounting remedies.

[9] According to Art. 13 Access Directive 2002/19/EC a NRA may impose obligations relating to cost recovery and price controls, including obligations for cost orientation of prices and obligations concerning cost accounting systems. According to Recommendation 2005/698/EC "*The purpose of imposing an obligation to implement a cost accounting system is to ensure that fair, objective and transparent criteria are followed by notified operators in allocating their costs to services in situations where they are subject to obligations for price controls or cost-oriented prices.*"
[10] Recommendation 2014/710/EU.

3. Outline of the Results

3.1 A snapshot of 2016 regulatory accounting data

The information collected for the Regulatory Accounting Report has been referred, until 2013 data collection, to the 18 markets listed in the Recommendation 2003/311/EC. In December 2007, this Recommendation was replaced by a new Recommendation (2007/879/EC) which, following the evolution observed in electronic communication markets over recent years, revised the list of relevant markets of the previous one and reduced the list of markets susceptible to *ex ante* regulation to seven, one at the retail level[11] and the other six at the wholesale level.[12]
In October 2014 the Commission issued another Recommendation which further reduced the number of markets, by eliminating the retail market from the list of markets susceptible to *ex ante* regulation and reducing the number of wholesale markets to four (Appendix A.4).[13]

As, for most NRAs, the remedies referred to deleted markets – that is to say to the retail fixed line access market and the wholesale fixed call origination market – were adopted before the 2014 Recommendation has become effective. Since the process of market review requires time, so that in many cases a final decision is not yet available, data referred to those markets have been still collected and presented in this report.

The following figures show a snapshot of the "Price control method", the "Cost base" (incl. the "Annualisation methodology") and the "Allocation methodology" used in the year 2016 for regulated markets listed in the new Recommendation (2014/710/EU). Moreover the analysis shows results for Market 1 and 2 of the 2007 Recommendation and the WLR service.

3.1.1 Price control method

Figure 1 below gives an overview of the price control methods used to regulate the markets listed in the EC 2014 Recommendation in the year 2016. Moreover Markets 1/2007 and 2/2007 and WLR service have been included. In order to better reflect the actual price control methods, BEREC has further streamlined the possible price control options. Moreover this year report takes explicitly into account, in the analysis, disaggregate information, price control and costing methodology, applied in conjunction with a geographical approach of the market/remedies.[14]

Figure 1 represents the price control method when each market/service is regulated, in case of no obligation is imposed no information is reported. It shows that cost orientation remains the

[11] Market 1: "*Access to the public telephone network at a fixed location for residential and non-residential customers*" (Markets 1 and 2 of 2003/311/EC Recommendation).
[12] Market 2: "*Call origination on the public telephone network provided at a fixed location*" (Market 8 of 2003/311/EC Recommendation) ; Market 3: "*Call termination on individual public telephone networks provided at a fixed location*" (Markets 9 of 2003/311/EC Recommendation); Market 4: "*Wholesale network infrastructure access at a fixed location*" (Markets 11 of 2003/311/EC Recommendation); Market 5: "*Wholesale broadband access*" (Markets 12 of 2003/311/EC Recommendation); Market 6: "*Wholesale terminating segments of leased lines*" (Markets 13 of 2003/311/EC Recommendation) and Market 7: "*Voice call termination on individual mobile networks*" (Markets 16 of 2003/311/EC Recommendation).
[13] Market 1: "*Wholesale call termination on individual public telephone networks provided at fixed location*"; Market 2: "*Wholesale voice call termination on individual mobile networks*; Market 3a: "*Wholesale local access provided at fixed location*"; Market 3b: "*Wholesale central access provided at fixed location for mass-market product*"; Market 4: "*Wholesale high quality access provided at fixed location*".
[14] When there are different price control methods due to a geographical approach (i.e "no price control" in conjugation of "cost orientation alone") in a market the "others" option has been used in the following picture, specific information then is provided in the text.

most commonly used price control method in wholesale markets, but the picture gets more differentiated.

In Market 3b (Wholesale Central Access), Retail Minus remains a method applied by three NRAs, to set prices and it is mainly used in WLR services (by 13 out of 24 NRAs).

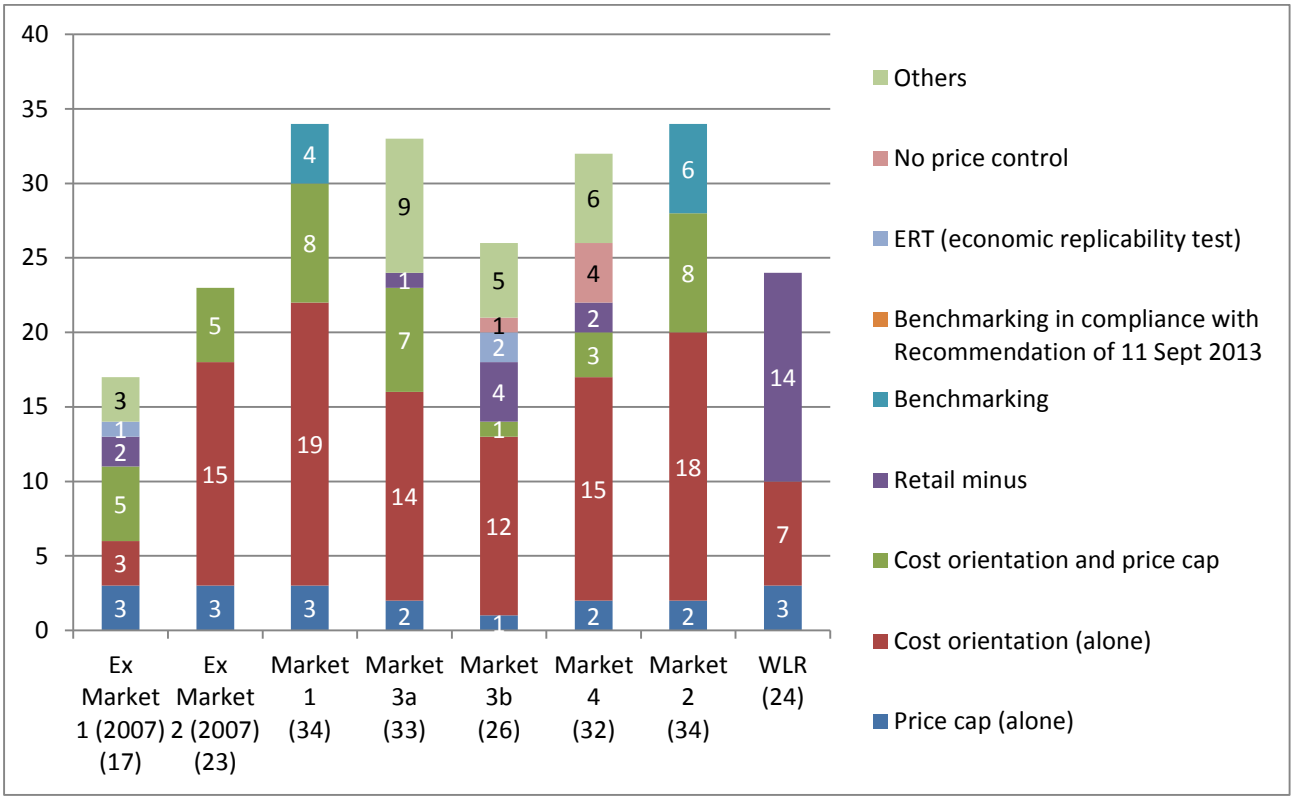
Another common price control method used in wholesale markets is cost orientation accompanied by a *price cap*. The situation is different for Market 1/2007 where a variety of methods are being used.[15]

"Benchmarking" was adopted by six NRAs in Market 2/2007 and four NRAs in Market 1/2007, some NRA explicitly declared that benchmarking in these markets has been conducted taking into account only countries that explicitly apply the Termination Rates Recommendation 2009/396/EC of 7 May 2009.

Explicitly "no price control" is chosen when (only) an access obligation is applied mainly in Market 4 and marginally in Market 3b.

[15] For market 3a, generally when more than one price control method is used, excluding the option "no price control method", between different products (LLU, SA, SLU, fibre access LLU, VULA), the price control method of the country has been classified as "Others".

Figure 1 – Price control method used in 2016 in the Markets listed in Recommendation 2014/710/EU, in Market 1 and 2/2007 and for the WLR service

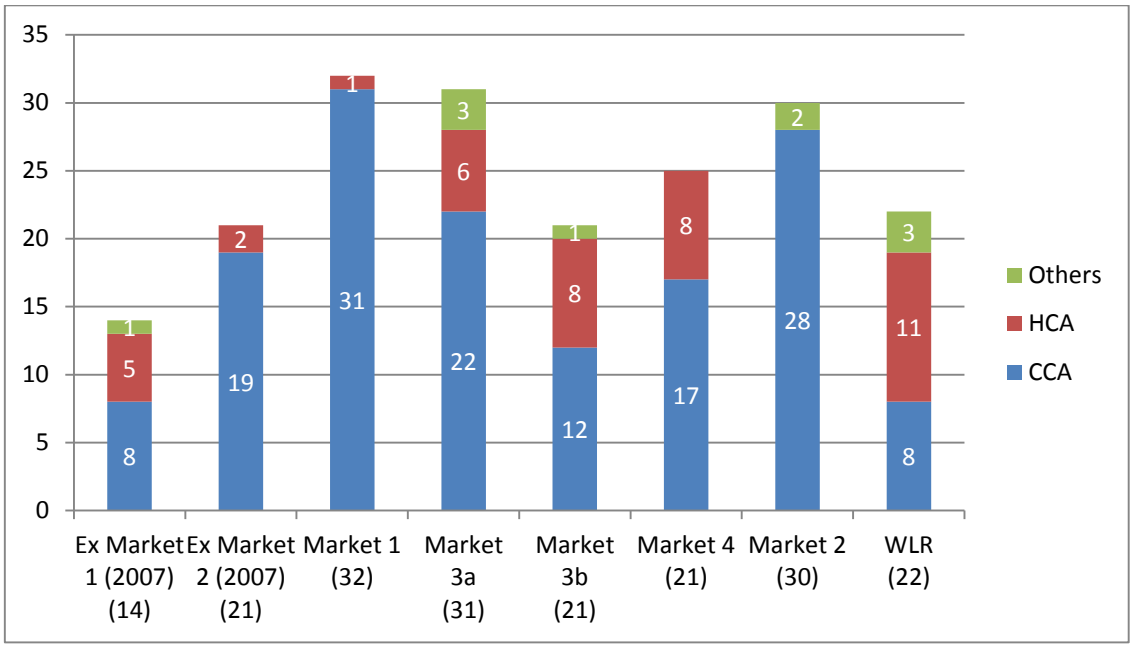


Source: BEREC RA database 2016

3.1.2 Cost base, annualisation methods and allocation methodologies

As far as the cost base is concerned, Figure 2 shows that in 2016 CCA is again by far the most commonly used methodology for all markets. Exemptions on this are Market 1/2007 and WLR where HCA is also frequently being used.

Figure 2 – Cost base used in 2016 in the Markets listed in Recommendation 2014/710/EU, in Market 1 and 2/2007 and for the WLR service

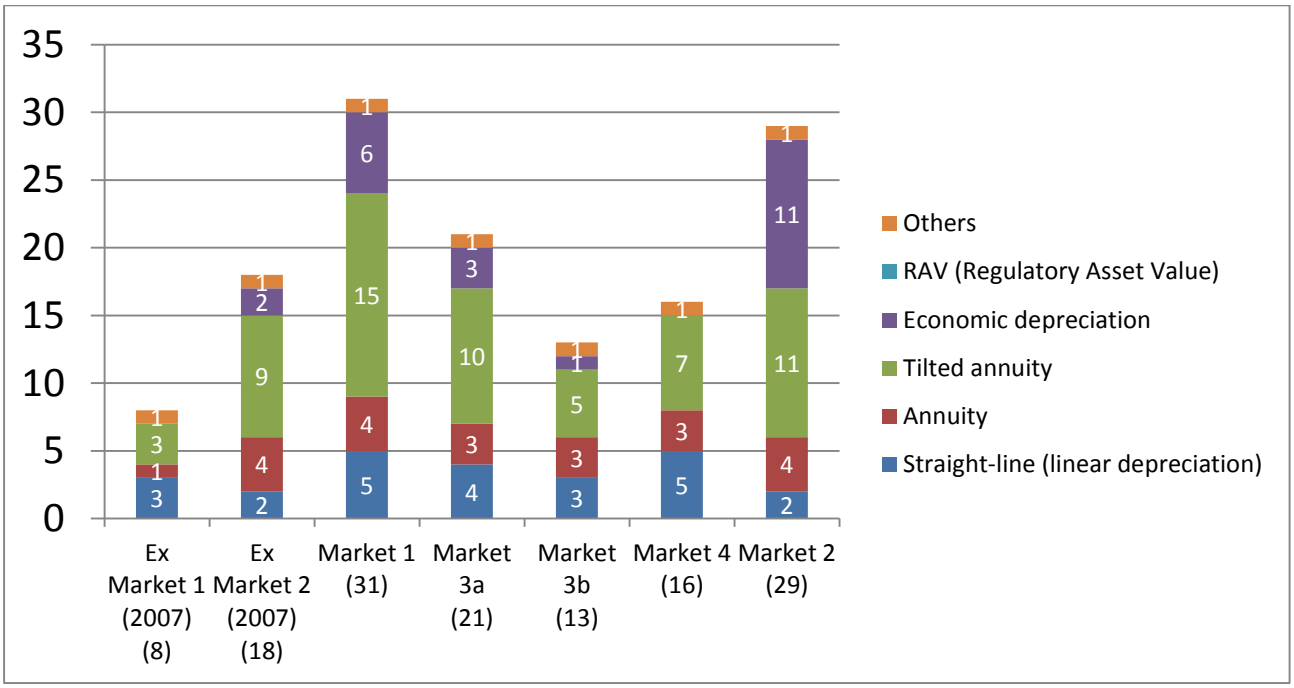


Source: BEREC RA database 2016

Figure 3 shows the annualisation methodology chosen by NRAs when using CCA as cost base.[16]

[16] For Market 3a the ULL service is represented, moreover a more disaggregate analysis is given in section of focus on Market 3a.

Figure 3 – Annualisation methodology used in 2016 in the markets listed in Recommendation 2014/710/EU, in Market 1 and 2/2007

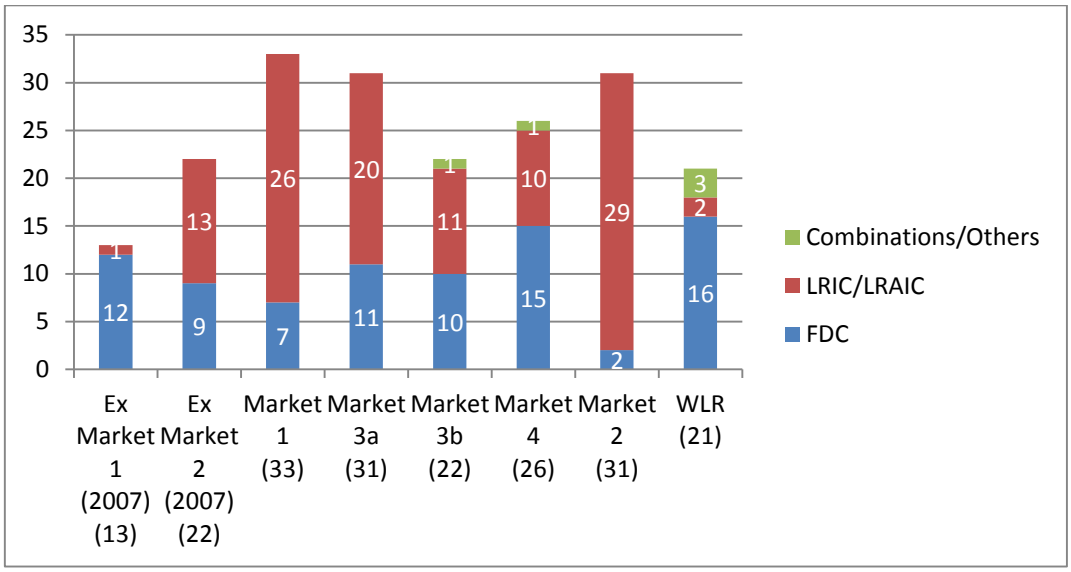


Source: BEREC RA database 2016

The figure shows that the most widespread annualisation methodology used in wholesale markets is the "tilted annuity", while economic depreciation is adopted by some NRAs mainly in termination markets.

As far as the allocation methodology is concerned, as shown in Figure 4 the LRIC/LRAIC methodology is mainly used in case of termination markets, where the pure LRIC is the main variant; instead FDC is a widely used methodology for access Markets 4 and the retail market (Market 1/2007) and for WLR, and more or less with the same share as LRIC/LRAIC in Market 3b.

Figure 4 – Allocation methodology used in 2016 in the Markets listed in Recommendation 2014/710/EU, in Market 1 and 2/2007 and for the WLR service



Source: BEREC RA database 2016

NRAs were also required to give details on the treatment of fully depreciated assets. In general it can be said that in countries where the FDC methodology is in use, fully depreciated assets are generally excluded from the cost base, since their value has already been recovered through past depreciation or because there is no mechanism to control whether there are depreciated assets in use by the SMP operator. Alternatively, they have a zero value in the financial accounting system or are replaced by new assets using the estimated lifetime of the new asset. In one country the case of assets being fully depreciated does not occur since by applying CCA/OCM, gross replacement costs are used and the efficient asset base is re-valued with current prices and then written off.

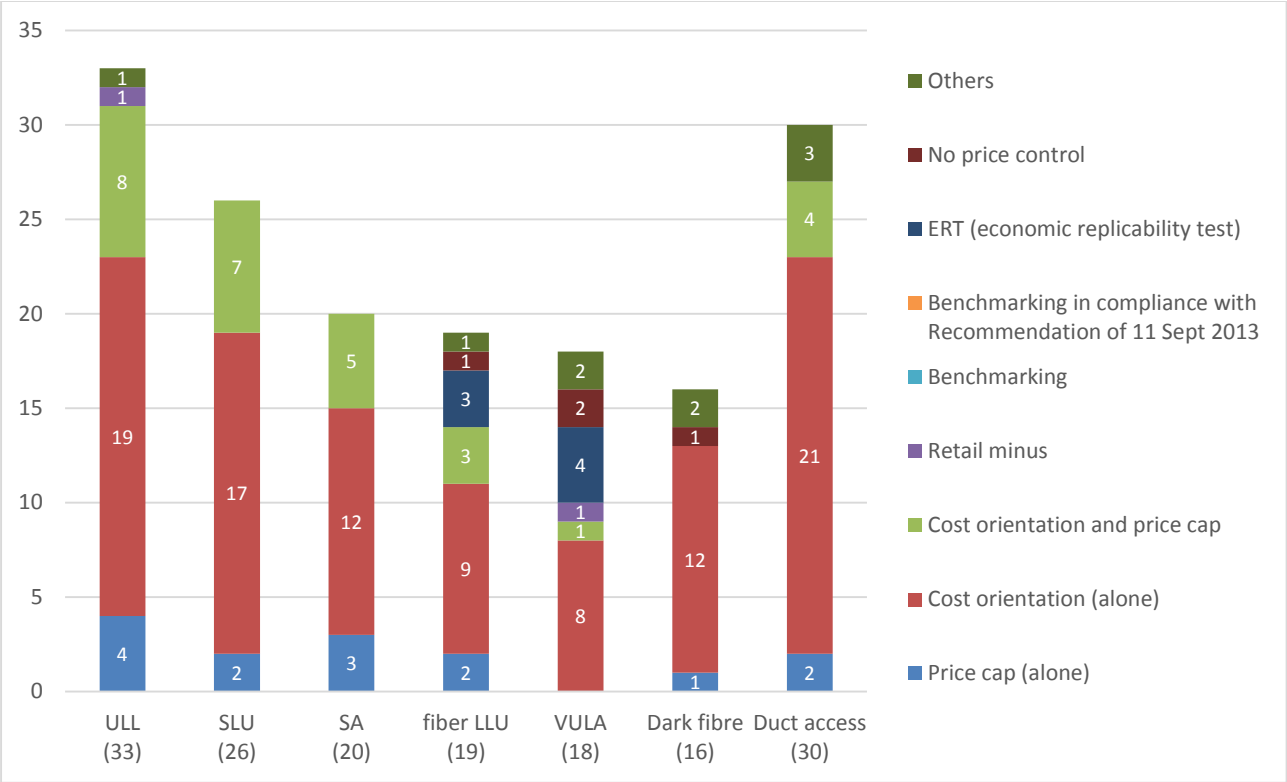
3.2 Focus on Market 3a

Also this year the data collection focused on important products in the Wholesale Local Access: 1) copper access (including LLU, SA, SLU); 2) fibre access (LLU, VULA); 3) dark fibre access and 4) duct access.

Figure 5 presents the price regulation applied in case a specific obligation is in charge for the main products in the market 3a.

NRAs were asked to detail the price control method, the cost base and the allocation methodology for the above products. Taking into account only those countries with no missing data for the detailed products, cost orientation is the most commonly used price control method for all products. The Economic Replicability Test (ERT) is also widely used in the case of VULA. When “Other” for VULA service is indicated one NRA explained that “fair and reasonable price” is applied. Instead one NRA that indicated “no price control” found VULA as substitute in Market 4.

Figure 5 – Price control method declared in 2016 for some products in Market 3a



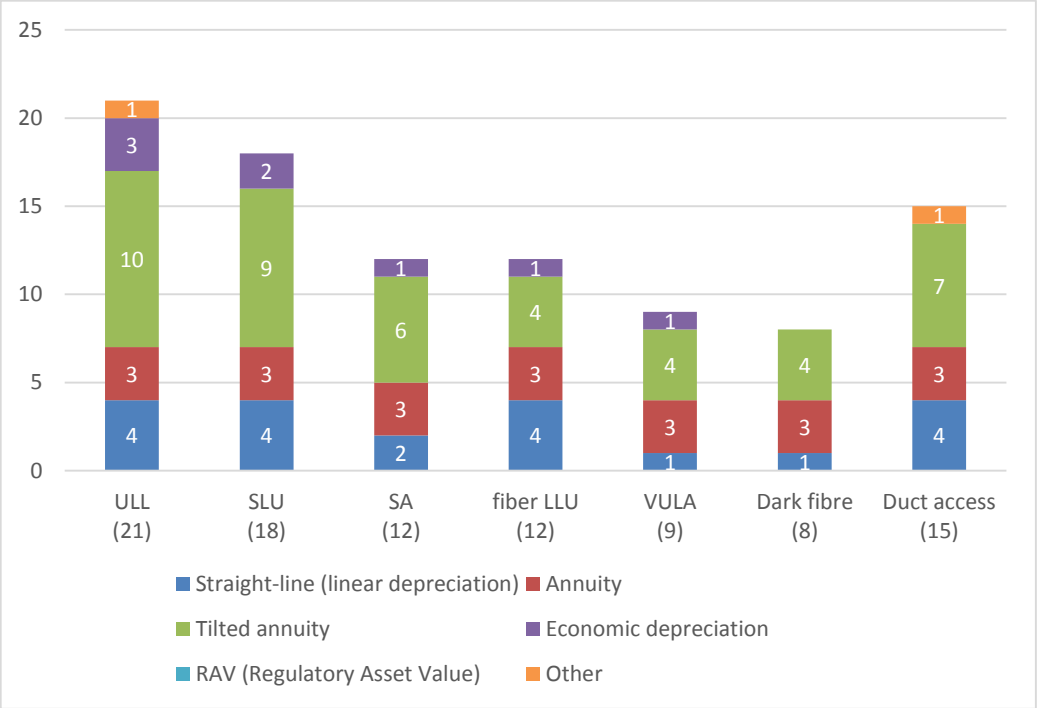
Source: BEREC RA database 2016

Specifically in Market 3a only two NRAs declared to introduce a geographical approach for price regulation (market or remedies). One NRA applied a geographical approach for VULA and in this case in the no-competitive area (65% of population) the ERT approach is in use.

In Figure 6[17] the specific annualisation methodology when CCA or "Other" has been declared as cost base is also shown and in this case "tilted annuity" is the cost annualisation methodology mostly used for all services, "economic depreciation" is growing also for copper service with respect to previous years.

[17] The data reported include cases where a cost base and an annualisation method have been declared even if no cost orientation is declared as a price methodology.

Figure 6 – Annualisation method declared in 2016 for some products in Market 3a

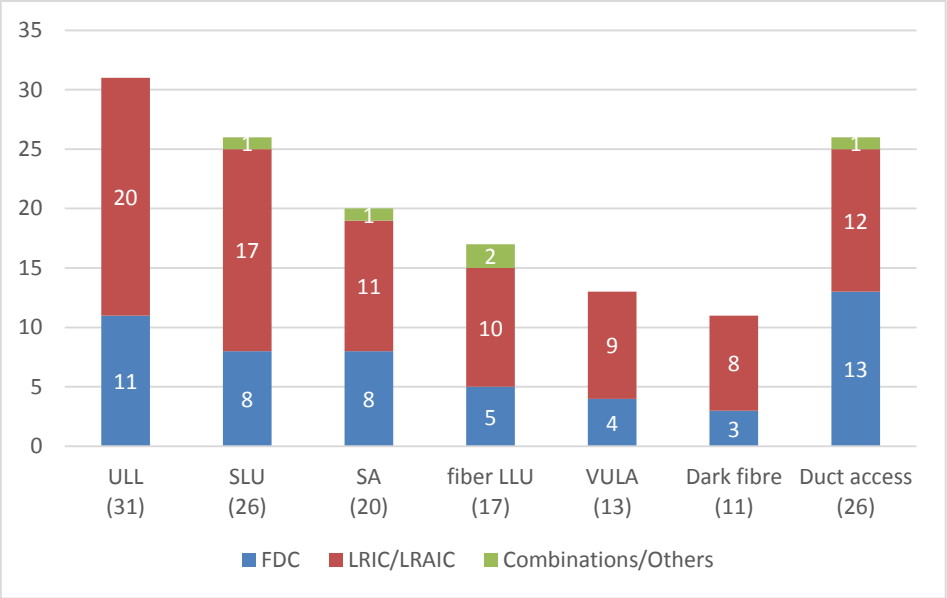


Source: BEREC RA database 2016

** Cost Base is referred to all asset base except legacy civil engineering.*

As far as the allocation methodology (Figure 7) for different products in Market 3a is concerned, data analysis shows that FDC is also used for copper access LLU, copper access SLU and duct access, while LRIC is widespread for all products in Market 3a.

Figure 7 – Allocation methodology declared in 2016 for some products in Market 3a

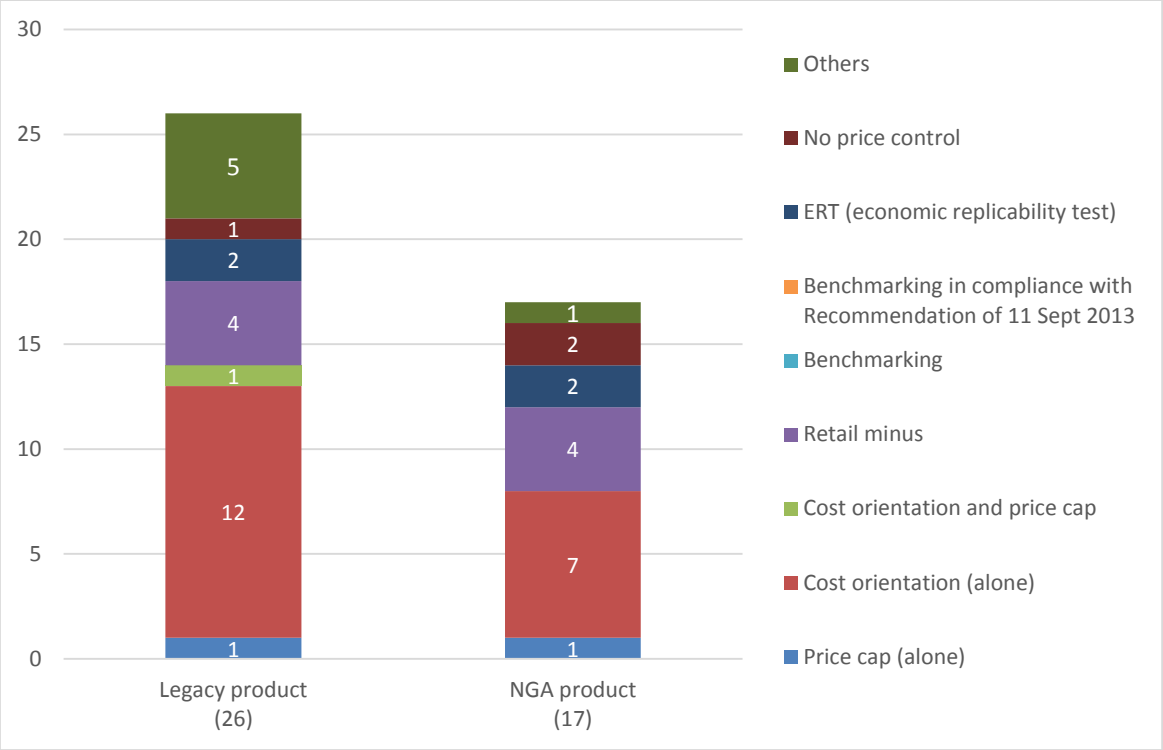


Source: BEREC RA database 2016

3.3 Focus on Market 3b

This year's report provides also a focus on products in Market 3b differentiating between legacy and NGA products. The following results come out: first of all only 17 NRAs regulate a bitstream NGA product, in both cases cost orientation alone is the most widely used approach for price regulation. For the NGA product moreover 2 NRAs used the ERT and two NRAs do not apply any price control obligation.

Figure 8 – Price control method declared in 2016 for some products in Market 3b



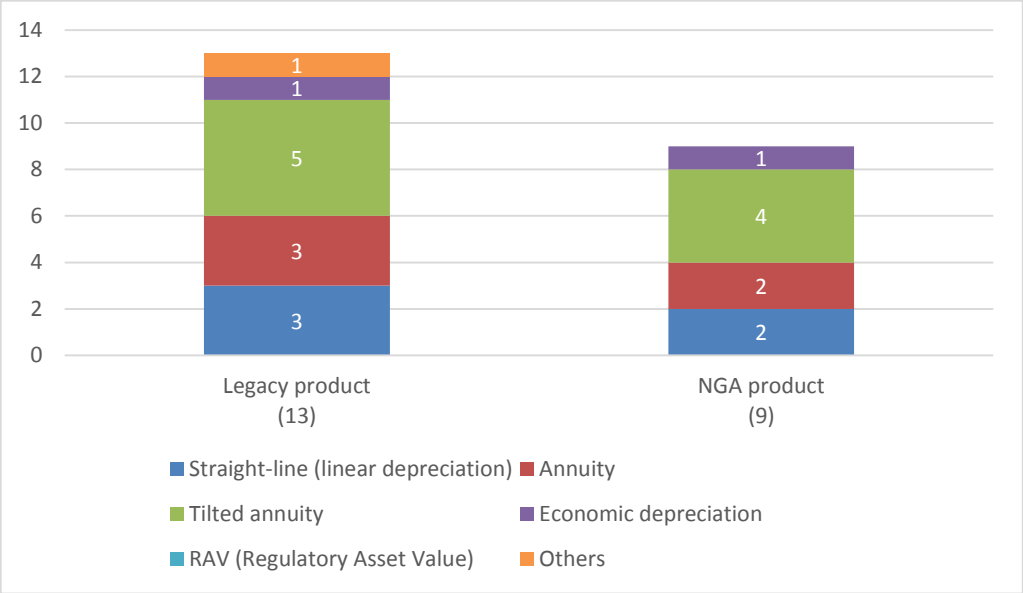
Source: BEREC RA database 2016

More specifically for the legacy product three NRAs apply a geographical approach to the regulation: in the not competitive area one NRA uses cost orientation (10% of the population); one a price cap approach (9.5% of the population); one the ERT approach (40% of the population).[18] One of these NRAs regulates also in the same way the bitstream NGA product following an ERT approach.

In Figure 9 the specific annualisation methodology when CCA or "Other" has been declared as cost base is also shown. In this case "tilted annuity" is still more widespread than "annuity", but to a lesser extent than with respect to products in Market 3a; no specific difference in terms of choice of costing methodologies seems to be present between the legacy product and the NGA product.

[18] In Figure 8 this three NRA are classified as "Others".

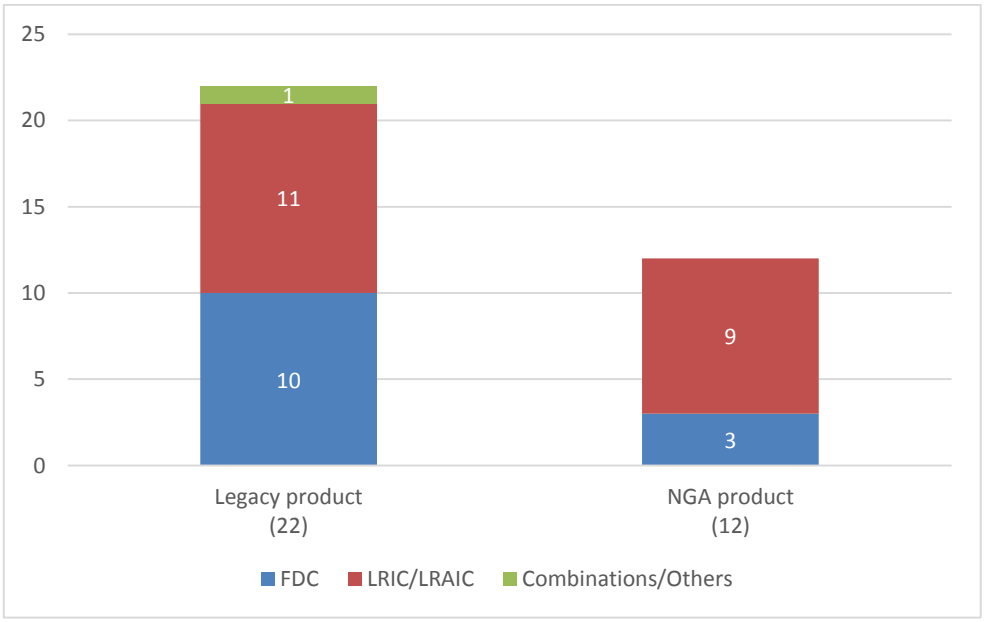
Figure 9 – Annualisation method declared in 2016 for some products in Market 3b



Source: BEREC RA database 2016

As far as the allocation methodology (Figure 10) for different products in Market 3b is concerned, data analysis shows that LRIC/LRAIC is clearly the main approach used in case of the NGA product.

Figure 10 – Allocation methodology declared in 2016 for some products in Market 3b

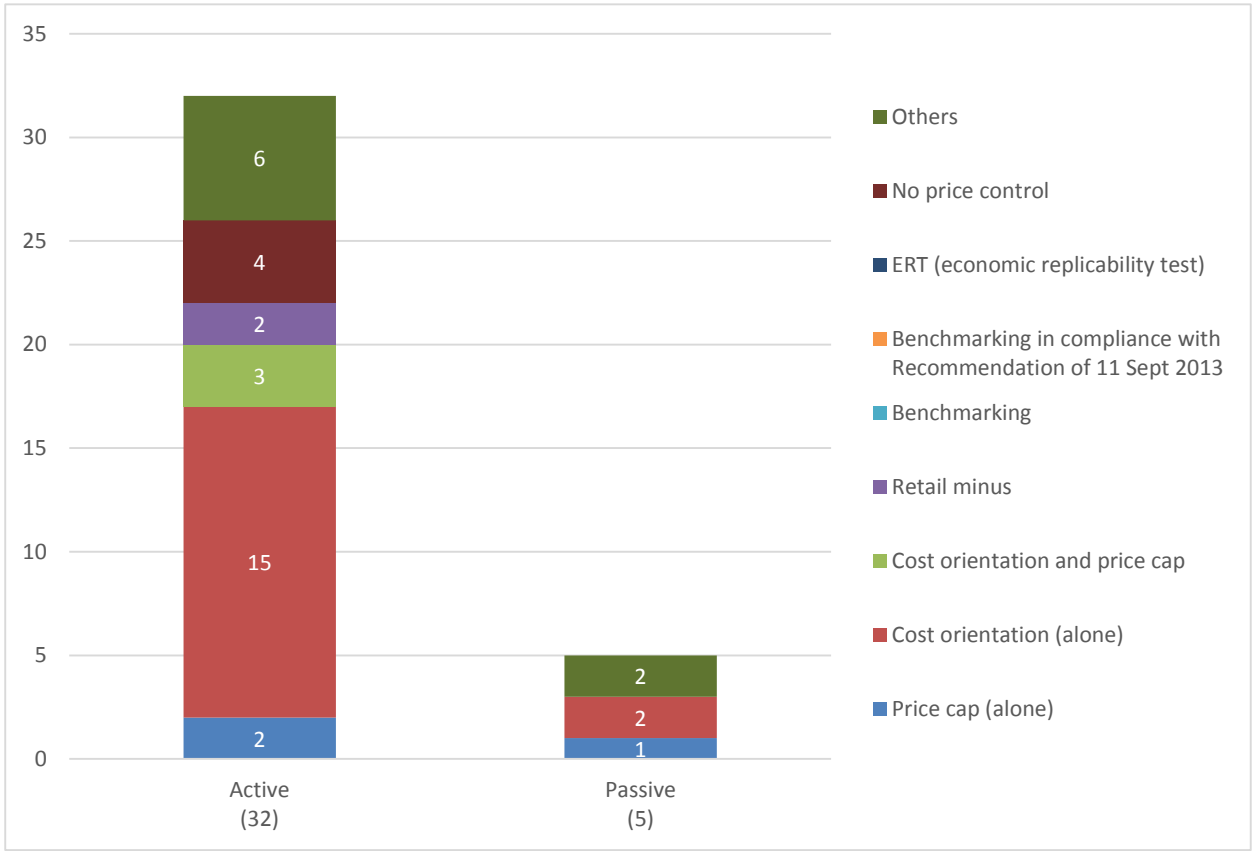


Source: BEREC RA database 2016

3.4 Focus on Market 4

As for Market 3b we will provide some new elements about Market 4/2014. Specifically the questionnaire this year asked details about active and passive product. Only a few NRAs regulate passive products in Market 4, so for this reason we pointed out only price control methodologies. Moreover two NRAs indicate to apply a geographical approach to the market, in one case "no price control" and "price cap" are applied; in the other case "no price control", "ERT" and "cost orientation alone" are applied in the three different geographical areas respectively from the more competitive until the less competitive areas.[19]

Figure 11 – Price control methods declared in 2016 for some products in Market 4



Source: BEREC RA database 2016

[19] In coherence with other elaborations when a geographical approach is applied for price control method, the NRAs are classified in the picture as "Others".

3.5 Markets outside the scope of 2007 and 2014 EC Recommendation

In some countries, markets not listed in the 2007 and 2014 Recommendation are susceptible to *ex ante* regulation and are still regulated, as NRAs assessed that they are not yet competitive.

NRAs declared to regulate in particular Market 18 2003/311/EC Recommendation (10 NRAs), followed by Market 3, 5, 10 and 15 2003/311/EC Recommendation (3 NRAs).

3.6 Cost base, allocation methodology and price control method over time

While in the previous paragraphs a snapshot of the current situation (year 2016) in the various markets has been illustrated as far as price control, cost base, allocation methodology, annualisation methodologies and treatment of fully depreciated assets are concerned, the following paragraphs illustrate the development of regulatory accounting practices across Europe over time. Specifically the paragraphs illustrate the evolution of accounting and price control remedies over time, concentrating on WLR service and on the following three wholesale markets listed in the EC Recommendation as susceptible to *ex ante* regulation: Wholesale Local Access (including shared or fully unbundled access) at a fixed location (Market 3a), Wholesale Central Access at fixed location (Market 3b) and Wholesale high quality access provided at fixed location (Market 4).

In order to present a reliable trend analysis, data have only been included where respondent NRAs provided information for at least eight years.[20] Therefore the number of countries analysed may vary[21] and differ from the number of countries taken into account in the previous paragraphs.

In the following picture BEREC decided, contrary to the previous years, to include all the countries that updated the historical series from 2006/2008 up to 2016, thus the countries that introduced the regulation during the years contribute positively now to the historical graph from the year in which they start to regulate. This means that if the total number of countries changes from one year to the next this is not a meaning of no homogeneity of the series, but means that some country introduced regulation starting from that year or deregulate during the following years.

As far as the cost base and the allocation methodology are concerned, it is often the case that a NRA, when setting up its regulatory accounting framework for the fixed notified operator/s, will apply a consistent cost base and accounting methodology to all regulated fixed markets. In the following paragraphs it is therefore to be expected that those countries that moved for example from HCA to CCA, did that for all relevant markets.

3.6.1 Wholesale Line Rental

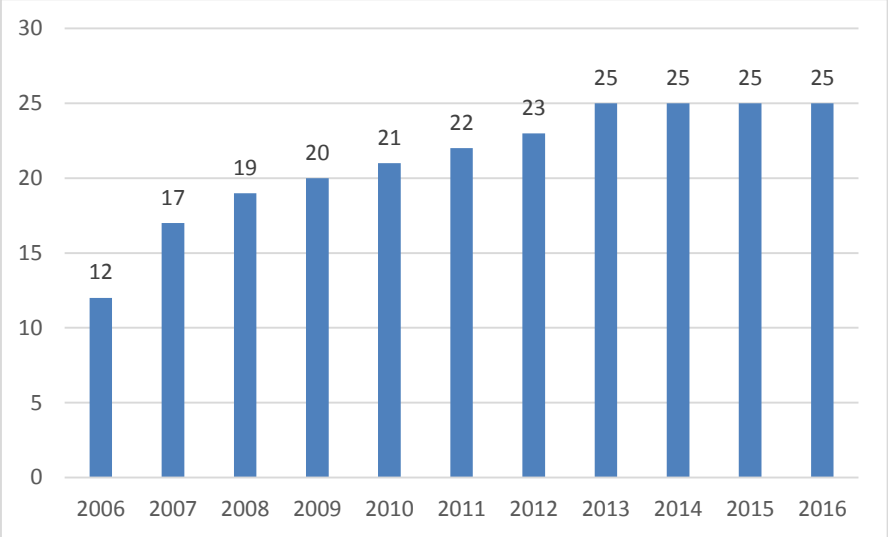
Wholesale Line Rental services are those services enabling alternative operators to enter the retail narrowband access market without sustaining the high investments required by ULL services, hence bearing a lower risk. Moreover, the WLR obligation benefits final customers allowing them a larger choice among different access providers.

[20] This year report provides more consistent data with respect to previous reports considering the fact that NRAs provided a check on the historical series and provided data where missing; moreover the number of NRAs during the years increases.

[21] The actual number of countries considered is reported in the legend below each figure.

The number of countries in which the WLR obligation is in force has increased over time. In 12 countries, the WLR obligation has been in place since 2006, but the number increased considerably (20 countries) three years later. In 2016, in homogenous terms 25 countries had a WLR offer (Figure 8).

Figure 12 – Number of Countries with WLR obligation by year



Source: BEREC RA database 2016
Number of countries: 31

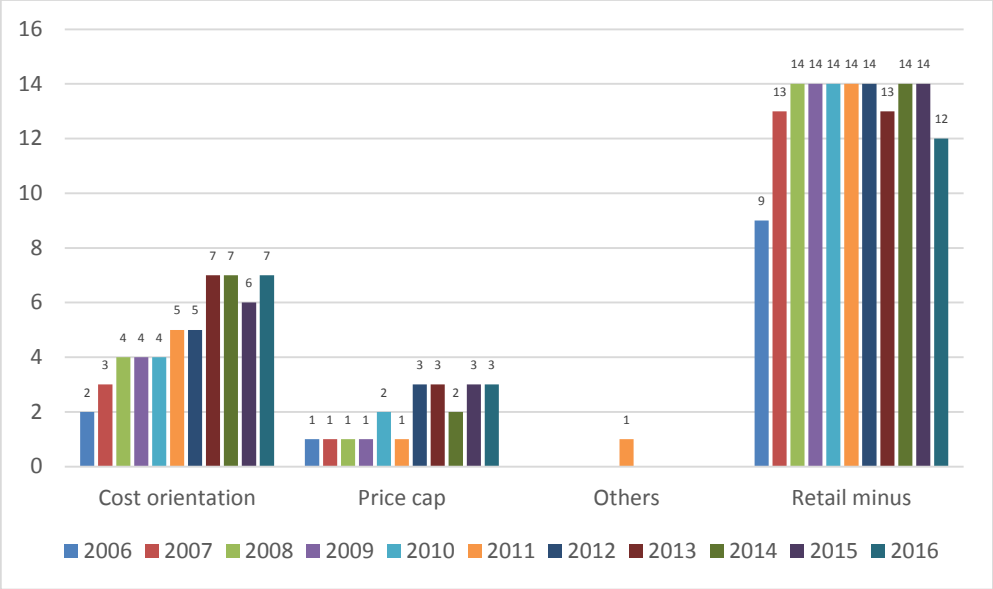
Trend analysis:

Price control method

The most used price control method for WLR is retail minus, declared in 2016 by 14 NRAs out of 27 that declared to have a WLR reference offer[22]. It was still the most common methodology in previous years (Figure 13). Three NRAs declared that the reference offer is provided on a voluntary basis from the SMP operator and in this case no price control method is applied.

[22] 24 countries with a price control method (Figure 1) and three countries have a Reference Offer for WLR on a commercial basis (no regulation).

Figure 13 – Price Control Method for Wholesale Line Rental



Source: BEREC RA database 2016
Number of countries: From 12 in 2006 to 22 in 2016

From 2006 to 2016, in homogeneous terms, the changing in pricing methodology over the years can be summarized in the following way (table below).[23]

		End point			
		Retail minus	**cost orientation**	**Price cap**	**No regulation**
Starting point	**Retail minus**		1	3	1
	Cost orientation	1			
	Price cap		1		
	No regulation	6	3		

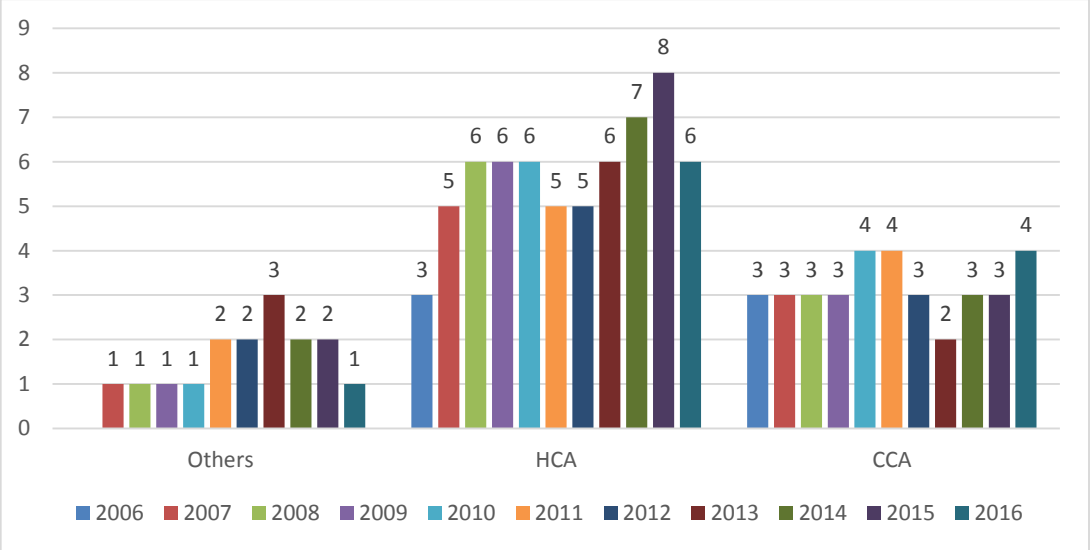
Generally from no regulation the preferred starting point is Retail Minus and then cost orientation; few NRAs changed methodologies moving mainly from retail minus to price cap and only one NRA moved from cost orientation to retail minus. Only one deregulates the WLR service moving from retail minus to no regulation.

[23] Unstable changings from one starting point to any methodology and again toward the starting point after just one year have been left out.

Cost base

Taking into account only those NRAs declaring to impose retail minus as price control method for the WLR service, it can be observed that, as far as the cost base is concerned, the preferred cost base in 2016, as in previous years, is HCA (Figure 14).

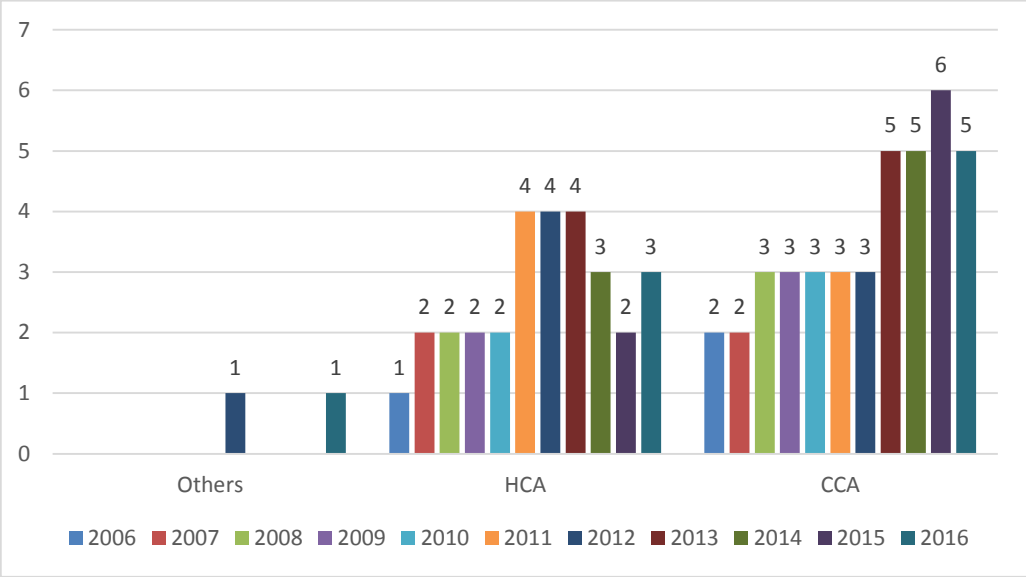
Figure 14 – Cost Base for Wholesale Line Rental for countries with Retail Minus as Price Control Method



Source: BEREC RA database 2016
Number of countries: From 6 in 2006 to 11 in 2016

Considering the case of remaining kinds of price control methods (i.e. cost orientation, price cap and others) for the WLR obligation, it can be observed that CCA is the most recurrent cost base in the last years (Figure 15).

Figure 15 – Cost Base for Wholesale Line Rental for Countries with other kinds of Price Control Method

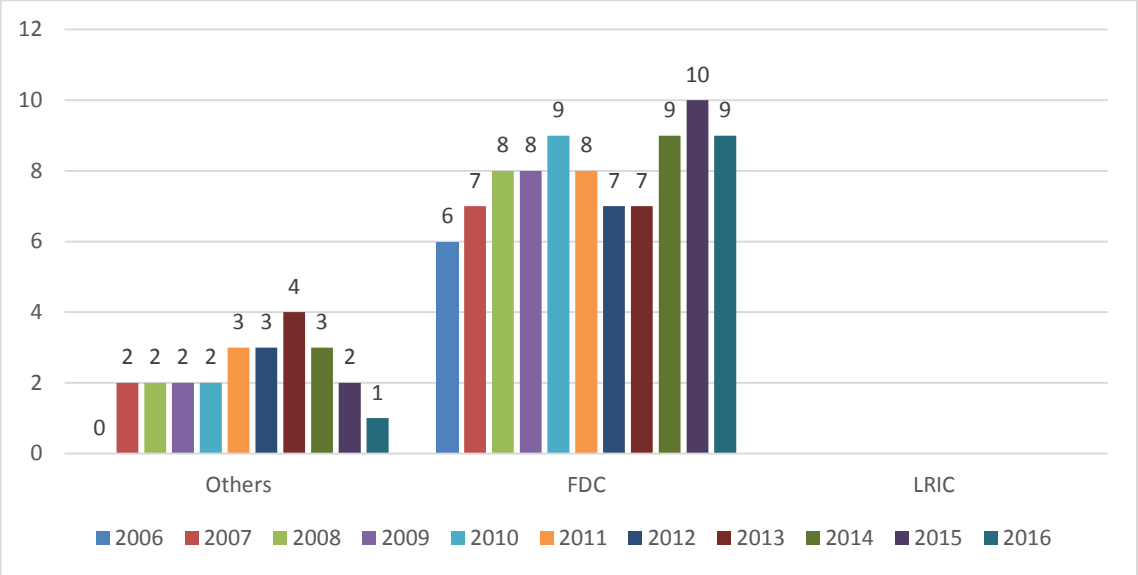


Source: BEREC RA database 2016
Number of countries: From 2 for 2006 to 9 for 2016

Allocation methodology

There is clear evidence that FDC is the preferred allocation methodology (Figure 16) for those countries with retail minus as price control method. As a matter of fact its use has increased since 2006. Other allocation methodologies have also been declared since 2007.

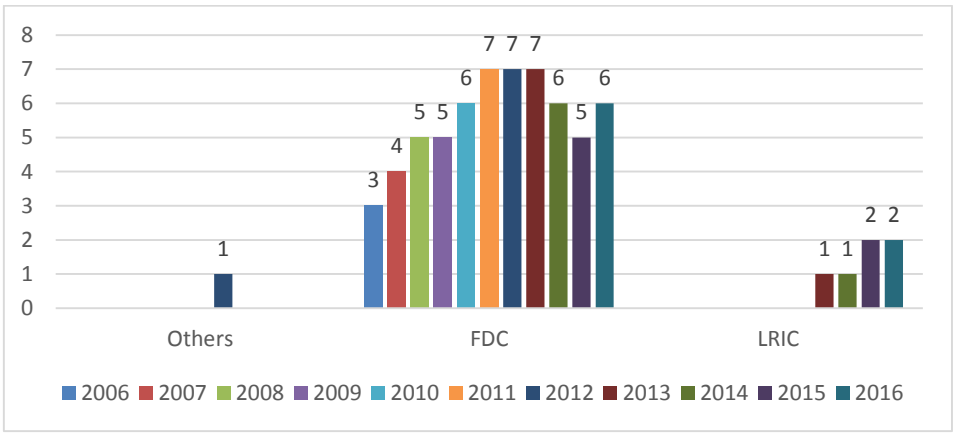
Figure 16 – Allocation Methodology for Wholesale Line Rental for countries with Retail Minus as Price Control Method



Source: BEREC RA database 2016
Number of countries: From 6 in 2006 to maximum 10 in 2016

Taking into account those NRAs declaring to impose the WLR obligation with other kinds of price control methods, it can be observed that in this case FDC is the preferred allocation methodology and its use has increased over time until 2013 (Figure 17).

Figure 17 – Allocation Methodology for Wholesale Line Rental for countries with other types of Price Control Method



Source: BEREC RA database 2016
Number of countries: From 3 in 2006 to 9 in 2016

<u>Key points for Wholesale Line Rental:</u> Retail minus is the preferred price control method, while FDC is the most popular allocation methodology. Moreover, the number of countries using HCA as cost base exceeds those using CCA over time in case retail minus is the price control method.

3.6.2 Wholesale local access (Market 3a)

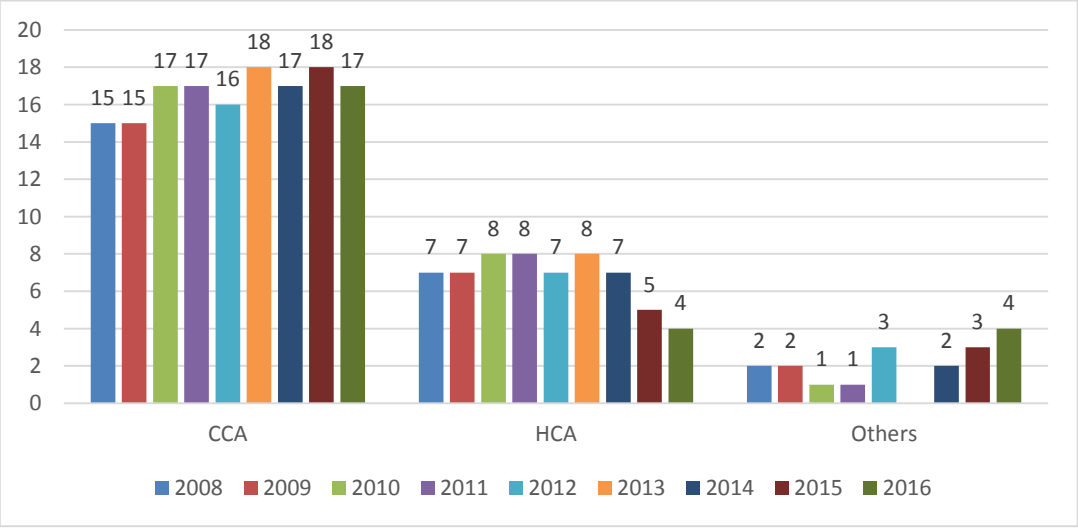
The 2014 Recommendation on relevant markets defines Market 3a as the market for "*wholesale local access provided at fixed location*". Previously, in the 2007 Recommendation, it was the market for "*wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location*" (Market 4/2007).
For most NRAs Market 3a and Market 4/2007 are still the same. For some NRAs the market definition is still pending, moreover one NRA includes VULA, previously included in Market 5/2007, in the Market 3a product definition.

Trend analysis:

Cost base

CCA is the cost base declared by 22 NRAs taking part in the survey for the year 2016 (see Figure 2). Unlike Figure 2, which is based on data for the countries that answered the 2016 BEREC questionnaire, the figure below gives an insight into how the choice of cost base has changed over time, taking into account homogeneous data by 26 NRAs each year since 2008.[24] Figure 18 shows a quite stable situation. In this market, CCA is by far the most commonly used cost base methodology and the number of countries using this method has remained stable since 2008, HCA seems to have a slight decrease in the last few years in correlation to the use of hybrid cost base ("Others" increase).

Figure 18 – Cost Base for Wholesale local access at a fixed location (Mkt 3a)



Source: BEREC RA database 2016
Number of countries: 26

[24] The historical series include countries that introduce the regulation over the years.

It is important to observe that the change of cost base (from HCA to CCA) is relevant for this market. Over the years the changing in cost base methodology can be summarized in the following way (table below).[25]

		End Point			
		HCA	CCA	Others	No regulation
Starting Point	HCA		3	3	
	CCA	2		1	1
	Others		2		
	No regulation	1	1		

Unlike other markets, where a high percentage of total costs is represented by network equipment subject to technical progress, in the wholesale local access at a fixed location market the highest percentage of costs is related to duct civil engineering which inherently has a very long economic life and is not subject to significant technological progress. Broadly speaking this may imply that the expected reduction in real terms of asset values - which is normally observed in other markets when adopting a CCA approach mainly due to technical progress reducing equipment costs (e.g. routers are generally cheaper than switches)[26] - is not necessarily observed in the unbundled access market. Moreover, the use of CCA is likely to remain relevant in a time of roll-out of fibre access networks and could send better investment signals to promote infrastructure-based competition as well as investment in infrastructure. Finally, the effect of declining copper lines will impact on the level of costs.

It is worth noting that the 2013 Recommendation on consistent non-discrimination and costing methodologies (2013/466/EU) should further reinforce the changing from HCA to CCA for this market (except for the reusable legacy civil engineering assets which should be valued on the basis of the indexation method). Indeed Figure 18 shows a continuous decrease in the use of HCA.

If these considerations are correct they may have an impact on all the other access services that use the same assets to provide ULL services.

Generally speaking, countries still using HCA in this market use the same cost base for other fixed wholesale markets.

Allocation methodology

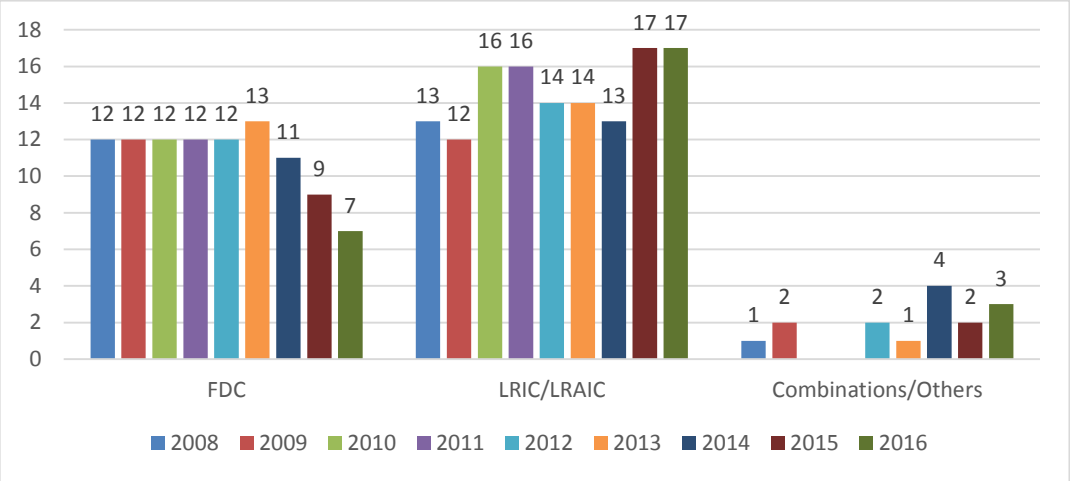
Figure 4 shows that LRIC/LRAIC is mainly adopted in 2016. Following the BoR (11) 65 this trend shows that countries are moving towards cost signals based on an economic approach instead of an accounting one. This trend is in line with the approach promoted by the Recommendation on consistent non-discrimination and costing methodologies (2013/466/EU) in force since October 2013.

Taking into account only those countries providing information since 2008 (which is less than the number of countries in Figure 4) LRIC appears to be the most recurrent allocation methodology, as observed in Figure 19.

[25] In the table the not clear “changing” in methodology due to a transitory regulatory regime between a regulatory period from one other are not included.

[26] For the NGN core network it is generally acknowledged that NGN technology has produced cost savings to a considerable extent (cf. e.g. ERG IP-Interconnection Report 2007 and ERG Common Statement on Regulatory Principles of IP-IC/NGN Core – A work program towards a Common Position, ERG (08)26 – Oct 2008, pp. 21, pp. 82).

Figure 19 – Allocation Methodology for Wholesale local access at a fixed location (Market 3a)



Source: BEREC RA database 2016
Number of countries: 28

Over the years the changing in methodology can be summarized in the following way (table below). It shows that there is a clear preference in moving from FDC approach, mostly accounting based, to a modelling/economic approach LRIC/LRAIC.

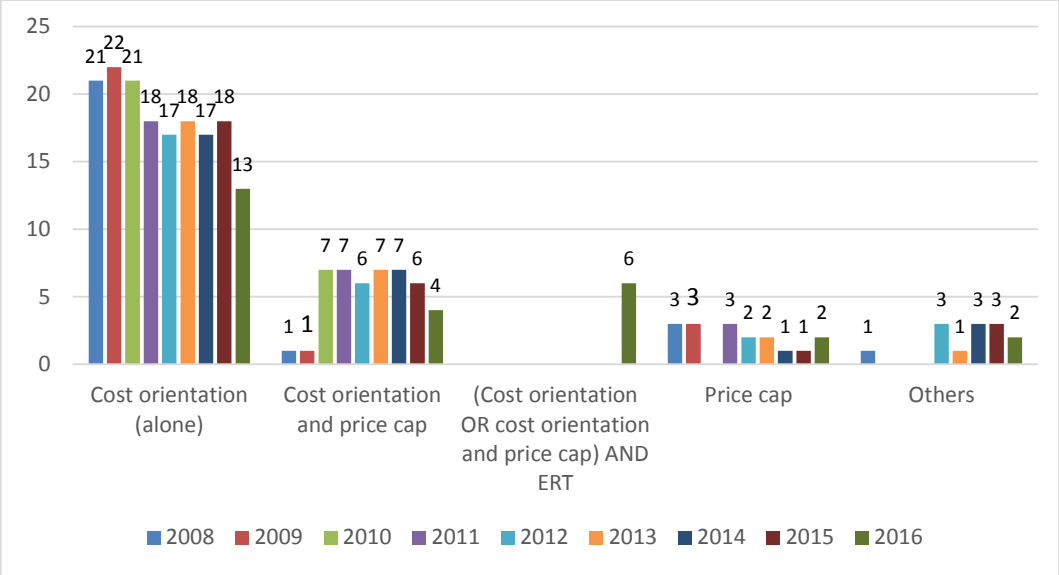
		End Point			
		FDC	LRIC/LRAIC	Combination/Others	No regulation
Starting point	FDC		5	1	
	LRIC/LRAIC				1
	Combination/Others		1		
	No regulation		2		

Price control method

The most common price control method in 2016 in the Wholesale local access at a fixed location market is by far cost orientation (Figure 1), which is declared by 21 NRAs (although for 7 NRAs it is combined with price cap).

Figure 20 provides a picture of how this method changed over time, taking into account 28 countries participating in the data collection since 2008. It can be observed that cost orientation alone or together with price cap is also the preferred price control method by NRAs over time, this last year. Specifically this year a new data classification has been included in the presentation (Cost orientation or cost orientation and price cap and ERT). For this reason historical data up to 2015 do not take into account this separate classification. It can be shown that 6 countries can be classified in this category.

Figure 20 – Price Control Method for Wholesale local access at a fixed location (Mkt 3a)



Source: BEREC RA database 2016
Number of countries: 28

Over the years the changes in methodology can be summarized in the following way (table below). From this analysis it seems that "cost orientation (alone)" even if it is the main methodology used during the years is becoming more frequent in combination with other pricing methodologies in Market 3a.

		End Point					
		Cost orientation (alone)	Cost orientation and price cap	(Cost orientation OR cost orientation and price cap) AND ERT	Price cap	Others	No regulation
Starting point	Cost orientation (alone)		3	2		3	1
	Cost orientation and price cap	2		3	2		
	(Cost orientation OR cost orientation and price cap) AND ERT						
	Price cap		3				
	Others			1			

	No regulation		1				

<u>Key points for Market 3a:</u> Over time CCA is the preferred cost base combined with LRIC as the allocation methodology and cost orientation as the price control method. This trend is in line with the NGA Recommendation adopted in September 2010 and, in particular, the 2013 Recommendation on consistent non-discrimination and costing methodologies is reinforcing this trend. In 2016 some NRAs use ERT in addition to cost orientation and cost orientation in combination with price cap.

3.6.3 Wholesale central access (Market 3b)

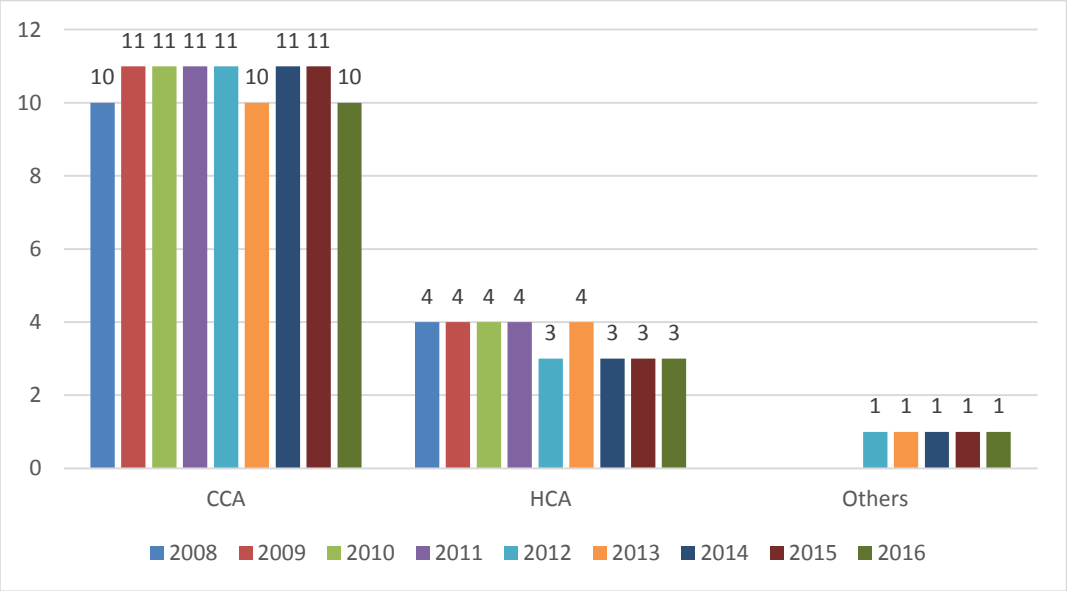
The 2014 EC Recommendation on relevant markets defines Market 3b as the market for *"wholesale central access provided at a fixed location for mass-market products"*.
In this market all the analysed countries are the ones which notified at least one operator (typically the national incumbent) as SMP. The most part of NRAs considered the previous market definition approach to be still valid, other NRAs declared that a decision about the market definition is still in progress, one NRA modified the product market definition including now residential and non-residential market.

Trend analysis:

Cost base

Figure 21 shows data for 16 countries that have provided relevant information since 2008 and, as such, this is less than the number of countries in Figure 2.
The market for wholesale central access shows a similar trend to that of the unbundled local loop market in terms of the cost base used. Furthermore, it can be observed that CCA is by far the most commonly used cost base methodology.
This market is characterised by the prevailing use of network elements subject to rapid technological change, whose asset value in real terms can be expected to decrease over time using a CCA cost base.

Figure 21 – Cost Base for Wholesale central access (Mkt 3b)



Source: BEREC RA database 2016
Number of countries: 16

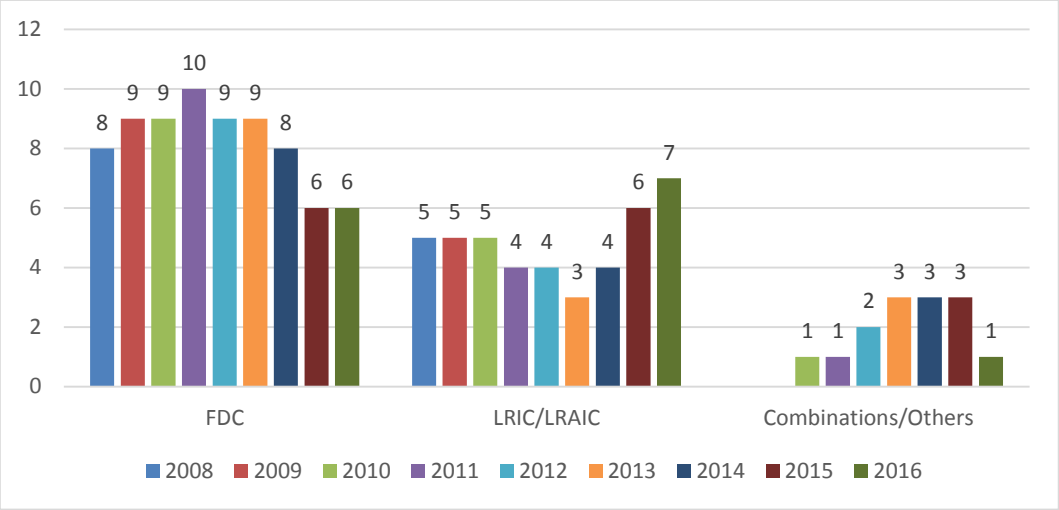
Over the years the changing in methodology can be summarized in the following way (table below). From this analysis we can see that there is a quite stable approach of NRAs and only few have changed cost base over the years.

		End point			
		HCA	CCA	Others	No regulation
Starting point	HCA		2		
	CCA	1		2	
	Others				1
	No regulation	1			

Allocation methodology

Figure 22 shows the allocation methodology used in the wholesale central access market by 15 countries since 2008. It can be seen a clear evolution to a modelling approach based on LRIC/LRAIC.

Figure 22 – Allocation Methodology for Wholesale central access (Mkt 3b)



Source: BEREC RA database 2016
Number of countries: 15

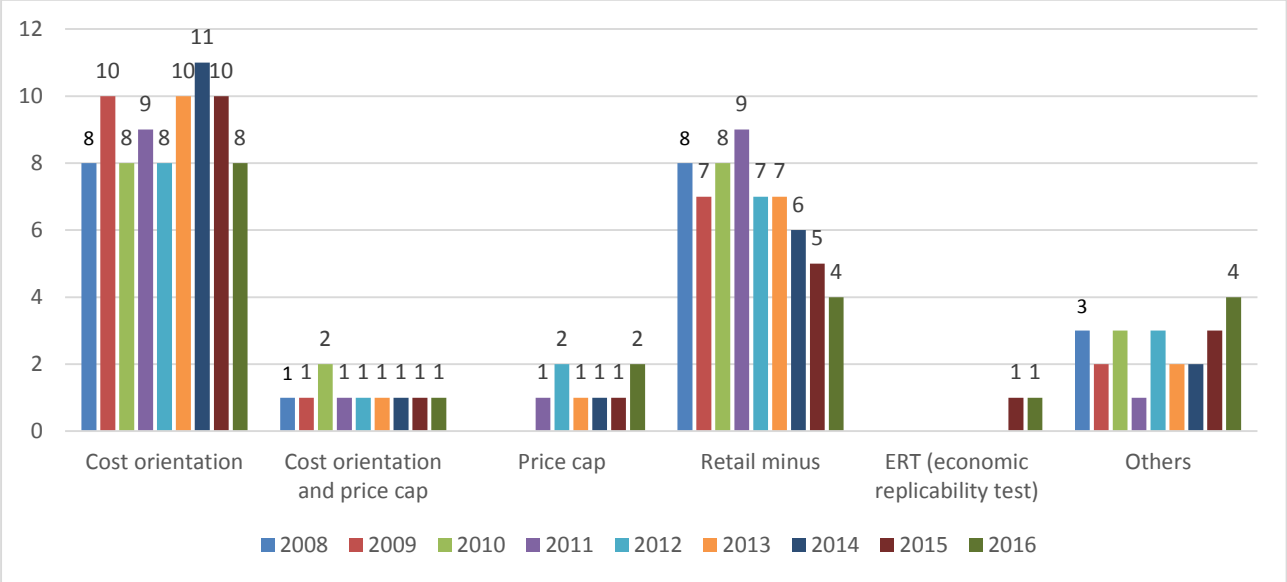
Over the years the changing in methodology can be summarized in the following way (table below). Only one NRA moved from LRIC/LRAIC to FDC, in most of the cases NRAs that applied FDC moved to a LRAIC/LRIC approach or to a hybrid approach. Two NRAs started regulating the market during the period considered.

		End point			
		FDC	LRIC/LRAIC	Combination/Others	No regulation
Starting point	FDC		2	2	
	LRIC/LRAIC	1			
	Combination/Others		1		1
	No regulation	1		1	

Price control method

The most commonly used price control method in 2016 in the wholesale central access market is still cost orientation (Figure 1), declared by 12 NRAs. However, taking into account the 22 countries answering the questionnaire since 2008 (Figure 23), mixed results can be observed in terms of trends due to the fact that many NRAs changed the price control method over time.

Figure 23 – Price Control Method for Wholesale Central Access (Mkt 3b)



Source: BEREC RA database 2016
Number of countries: 22

Over the years almost all NRAs changed the price control method for products in Market 3b. Two NRAs started with cost orientation passed through retail minus and changed again to cost orientation. For the other changes in methodology the table below summarized the results. A more complex development is observed for NRAs starting with cost orientation or retail minus. NRAs starting with either of them moved mainly to a combination of methodologies, such as ex-post price control or a geographical approach to regulation, which is illustrated by the numbers in the column “Others”. One NRA deregulated the market during the period considered.

		End point						
		Cost orientation alone	Cost orientation and price cap	Price cap	Retail minus	ERT	Others	No regulation
Starting point	Cost orientation alone		1		1		2	
	Cost orientation and price cap	1		2				
	Price cap							
	Retail minus	1				1	3	
	ERT							
	Others	1		1				1
	No regulation	1						

<u>Key points for Market 3b:</u> CCA is, by far, the most common cost base over time. As far as the allocation methodology is concerned, the number of countries using LRIC is almost the same as those using FDC, while cost orientation is chosen as main price control method over the years, but undergoing changes in favour of more flexible approaches such as price cap or combinations of methodologies mainly due to a geographical approach to regulation.

3.6.4 Wholesale high-quality access provided at a fixed location (Market 4)

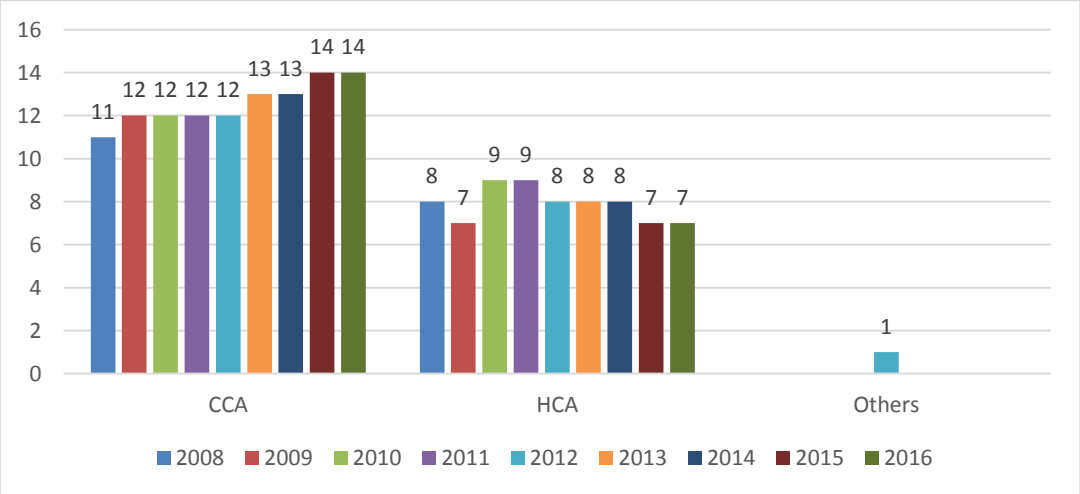
The 2014 Recommendation on relevant markets defines Market 4 as the market for "*Wholesale high-quality access provided at fixed location*". This market, although redefined by the Commission, is considered by most NRAs to be the same as the previous Market 6 of the 2007 Recommendation, that is to say, the wholesale terminating segments of leased lines. Moreover some NRA are concluding their market analysis procedure, therefore the decision about the market definition is not final yet; one NRA considers that Market 4 will include part of Market 5/2007.

Trend analysis:

Cost base

Figure 24 shows the countries adopting CCA, HCA or a combination of other methodologies to set wholesale high quality access provided at fixed location from 2008 to 2016.

Figure 24 – Cost Base for Wholesale High Quality Access at fixed location (Mkt 4)



Source: BEREC RA database 2016
Number of countries: 21

Regarding the changes in methodology the table below summarized the results. The approach adopted is stable, only few NRAs changed their approach from 2008 mainly passing from HCA to CCA.

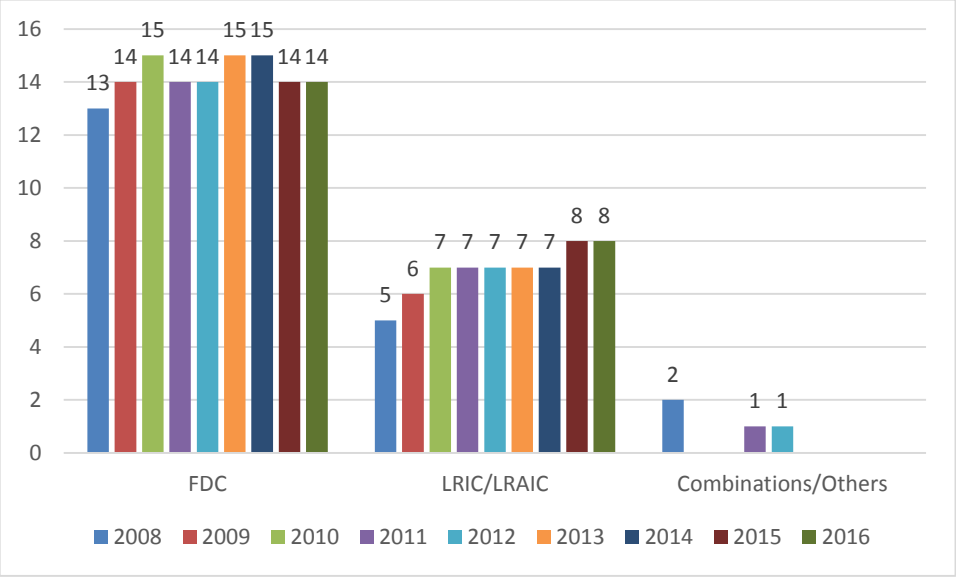
		End point			
		HCA	CCA	Others	No regulation
Starting point	HCA		2		
	CCA	1			
	Others				
	No regulation	1	1		

Allocation methodology

Figure 25 shows the number of countries adopting LRIC, FDC or other mixed allocation methodologies in the wholesale high quality access market for the eight year period under analysis.

The most common allocation methodology in this market observed since 2008 is FDC. At the same time, the number of countries using LRIC has increased slightly.

Figure 25 – Allocation Methodology for Wholesale High Quality Access at fixed location (Mkt 4)



Source: BEREC RA database 2016
Number of countries: 26

For changes in methodology the table below summarizes the results. The approach adopted is stable only few NRAs changed their approach from 2008 mainly passing from FDC to LRAIC/LRIC, and two NRAs passing from “No regulation” to FDC or LRIC/LRAIC.

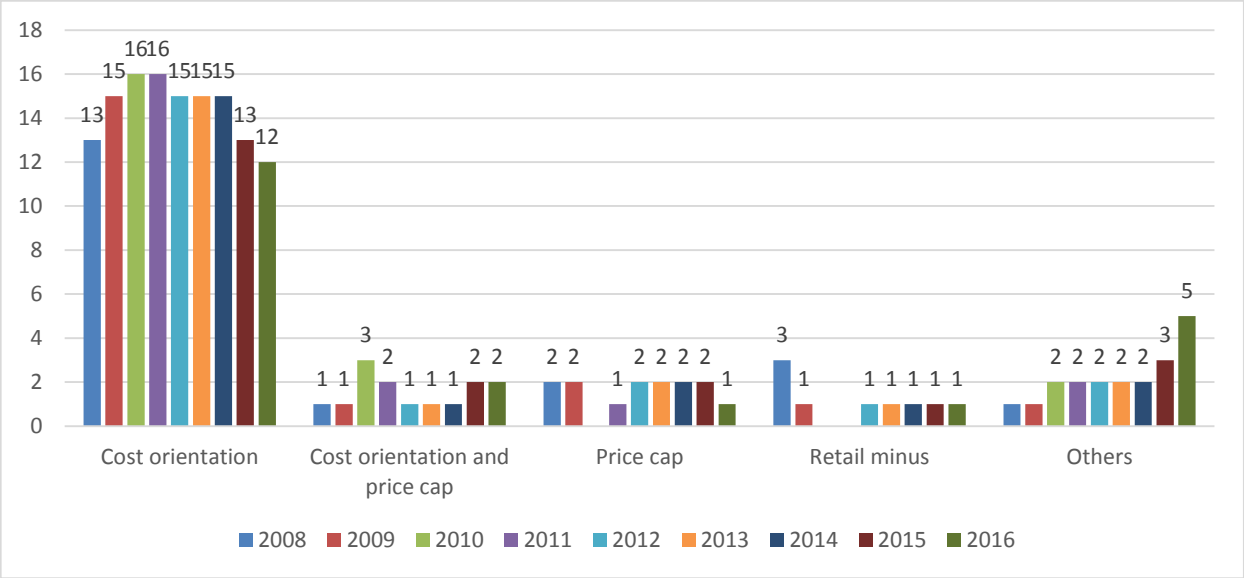
		End point			
		FDC	LRIC/LRAIC	Other	No regulation
	FDC		1		

Starting point	LRIC				
	Other		1		
	No regulation	1	1		

Price control method

Taking into account the 21 countries whose data have been collected since 2008, the results can be observed in Figure 26.

Figure 26 – Price Control Method for High Quality Access at fixed location (Mkt 4)



Source: BEREC RA database 2016
Number of countries: 21

Regarding changes in methodology the table below summarizes the results. Only few NRAs changed their methodology during the year moving from cost orientation to a combination of methodologies. Only one NRA moved from retail minus to cost orientation (alone).

		End point					
		cost orientation (alone)	Cost orientation and price cap	Price cap	retail minus	others	no regulation
Starting point	Cost orientation (alone)		1		1	2	
	cost orientation and price cap						
	price cap					1	
	retail minus	1					
	others						
	no regulation					1	

<u>Key points for Market 4:</u> FDC is the prevailing allocation methodology over time. Cost orientation is the recurrent price control methodology in this market both in the current year and over time. CCA is the preferred cost base. Almost no changes were observed from 2015 to 2016 despite the change of market definition.

3.6.5 Implementation of the EC Recommendation on non-discrimination and costing methodologies

This section gives an overview of the implementation of the "Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU)" of 11 September 2013, with regard to costing methodologies.
To this end, data collection included, as in the previous release of the report, some questions on this topic.
Specifically this year's report provides a deeper analysis about the implementation of the Recommendation, considering that almost three years have passed since the adoption and considering the fact that the 31 December of 2016 is the deadline for the implementation.

Specifically NRAs were asked how they intend to implement the framework of the Recommendation for non-discrimination obligations and costing methodologies in Market 3a, first of all asking specifically to choose between the following options: i) Recommends 30-37 (CCA-BU LRIC+); ii) Recommend 40; iii) Recommend 42; iv) No one of the previous option.
Recommends 30-37 indicates that when "cost orientation" is imposed to legacy and NGA access services the costing methodology should follow a forward looking CCA BU-LRIC+ approach.
Recommend 40 indicates that NRAs may continue to apply beyond 31 December 2016 the costing methodology that they use at the time of entry into force of the Recommendation, if it meets the general objectives of consistency, predictability and price stability over time during the migration from legacy network to NGA network (recital 25-28) and *inter alia:* i) it should reflect a gradual shift from copper network to an NGA network; ii) it should apply an asset valuation method that takes into account that certain civil infrastructure assets would not be replicated in the competitive process; iii) it should guarantee that copper network prices do not fluctuate significantly and therefore will remain stable over a long time period; iv) it should require only minimal modifications with respect to the costing methodology already in place.

Recommend 42 indicates that in those Member States where at the time of entry into force of this Recommendation the monthly rental price for the full unbundled copper local loop falls within the price band, NRAs may continue to apply until 31 December 2016 the costing methodology that they use at the time of entry into force of the Recommendation.

Eighteen NRAs provide explicit information to the proposed questions. The result is shown in the table below, with the indication of the price control methodology used.

	Price cap (alone)	Cost orientation (alone)	Cost orientation and price cap	Retail minus	Benchmarking	Benchmarking in compliance with Recommendation of 11 Sept 2013	ERT (economic replicability test)	No price control	Others	Total
Recommend 30-37 (CCA-BU LRIC+)	1	3	3	0	0	0	0	0	0	7
Recommend 40	1	3	2	0	0	0	0	0	0	6
Recommend 42	0	0	0	0	0	0	0	0	0	0
None of the previous options	1	4	0	0	0	0	0	0	0	5
Total	3	10	5	0	0	0	0	0	0	18

At the moment 13 NRAs explicitly take into account the Recommendation on non-discrimination obligations and costing methodologies: 7 following the framework of Recommends 30-37, and 6 following the framework of Recommend 40, among 32 NRAs that apply a price control method for LLU service.

In line with the Recommends 30-37 and 40 of the Commission Recommendation a few relevant questions have been addressed in the questionnaire about the asset life as well as the percentage of civil infrastructures considered as reusable asset (table below with the proposed options for reply).

Recommendation on non-discrimination and costing methodology Recommend 30-37 (CCA-BU LRIC+)	Did you consider the DEA Target in your model	-if yes please explain how	Take into account reusable civil infrastructure?	-if yes which method did you use to consider already depreciated infrastructure?	Did you consider cable as reusable infrastructure	Civil infrastructure: provide asset life	Percentage of civil infrastructures considered reusable	Percentage of asset life already depreciated of reusable civil infrastructures	- if cable infrastructure considered as reusable provide asset life	Other comments
Yes	Yes		Yes	Accounting data from SMP operator	Yes					
No	No		No	Benchmark	No					

Recommendation on non-discrimination and costing methodology Recommend 40	gradual shift from copper network to NGA network is taking into account?	Take into account Reusable civil infrastructure?	Percentage of civil infrastructures considered reusable	Percentage of asset life already depreciated	Other comments
Yes	Yes	Yes			
No	No	No			

The responses of NRAs to this part of the questionnaire are summarized in the following tables.

From this analysis we understand that DEA targets are explicitly implemented in the BU-LRIC model of only one country. The NRA declared that they reflect the operator's plans in every case. The majority of NRAs that implement Recommends 30-37 has taken into account reusable civil infrastructures in the modelling process, whereby cables are not considered as reusable infrastructures. Furthermore the analysis shows that the level of the depreciated infrastructure is derived mainly from the accounting data of the SMP operator.

Recommendation on non-discrimination and costing methodology Recommend 30-37 (CCA-BU LRIC+)	Did you consider the DEA Target in your model		Take into account Reusable civil infrastructure?		-if yes which method did you use to consider already depreciated infrastructure?		Did you consider cable as reusable infrastructure	
7 NRAs replied to apply this framework	Yes	1	Yes	4	Accounting data from SMP operator	3	Yes	1
	No	4	No	1	Benchmark	1	No	4

Recommendation on non-discrimination and costing methodology Recommend 40	gradual shift from copper network to NGA network is taking into account?		Take into account Reusable civil infrastructure?	
6 NRAs replied to apply this framework	Yes	3	Yes	2
	No	1	No	2

The following table resumes the replies provided about the level of asset life of civil infrastructures, the percentage of civil infrastructures considered reusable and the percentage of asset life already depreciated.[27]

	Recommend 30-37 (CCA-BU LRIC+) (minimum-maximum)	**Recommend 40 (minimum-maximum)**
Civil infrastructure asset life (number of year) (minimum - maximum)	30-40	30-44
Percentage of civil infrastructures considered reusable (minimum - maximum)	35%-72%	84.54%-100%
Percentage of asset life already depreciated of reusable civil infrastructures (minimum - maximum)	20.5%-33%	-

[27] In the table only maximum and minimum are given as only few NRAs provide information.

The questionnaire also included a question on the outcome of the application of the Recommendation in terms of prices for the fully unbundled copper local loop.

At Recommend 41 the Commission Recommendation indicates that the outcome of the methodology proposed should ensure that the average monthly rental access price for the fully unbundled copper local loop should be within a band between EUR 8 and EUR 10 (net of all taxes) expressed in 2012 prices (the price band).

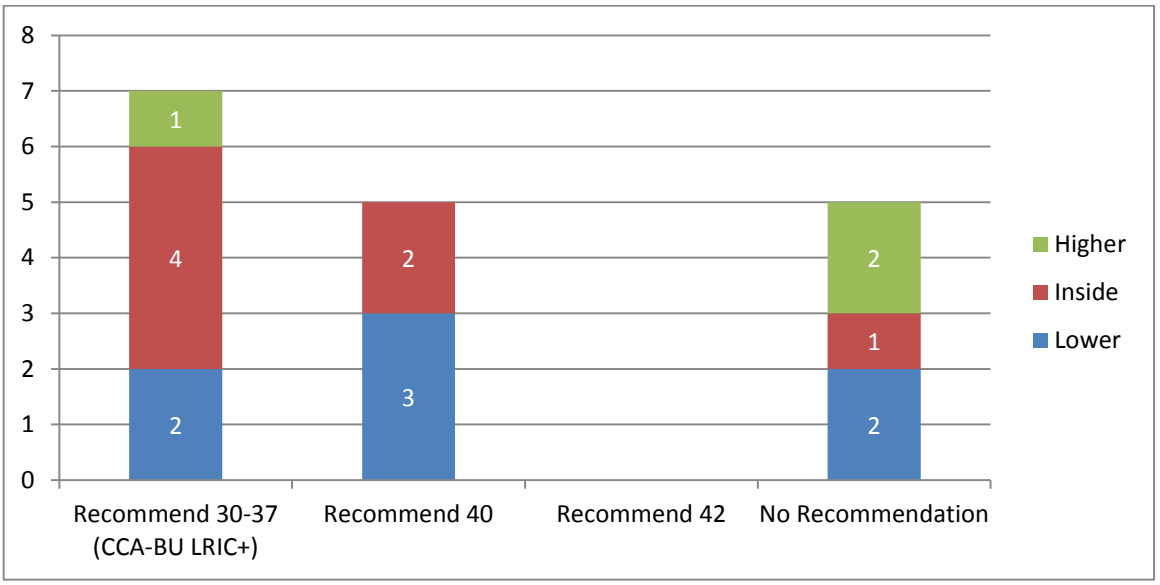
This year's questionnaire to this end included questions about prices: i) "before the adoption of the recommendation"; ii) "after the adoption of the recommendation"; iii) "actual prices".

BEREC asked also about the inflation rate cumulated between January 2013 and January 2016 to evaluate the price band in nominal term.

Including only countries that have provided data for this section we can classify NRAs in the following way. For the price "before the adoption of the Recommendation" the price band has been left at the price of 2012 not including inflation. For "actual price" as well as for the price after "the adoption of the Recommendation" the price band has been updated taking into account information provided by the NRAs about inflation.[28] The following Figures show the results, counting NRAs that have prices inside, or lower or higher than the price band evaluated.

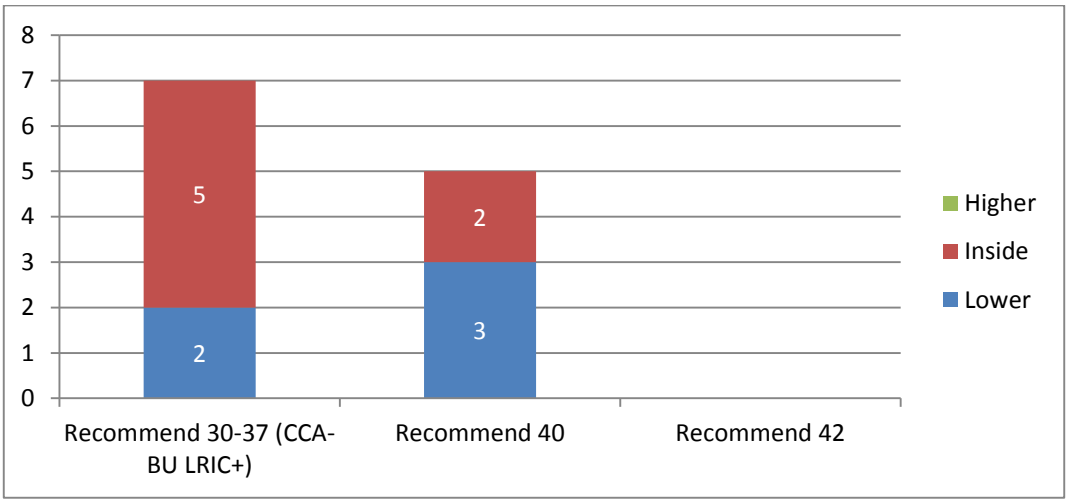
[28] In case of missing data about the inflation rate of the country the BCE "Euro Area Harmonized Index of consumer price" has been used (https://www.ecb.europa.eu/stats/prices/hicp/html/inflation.en.html).

Figure 27 – Price before the adoption of the Recommendation



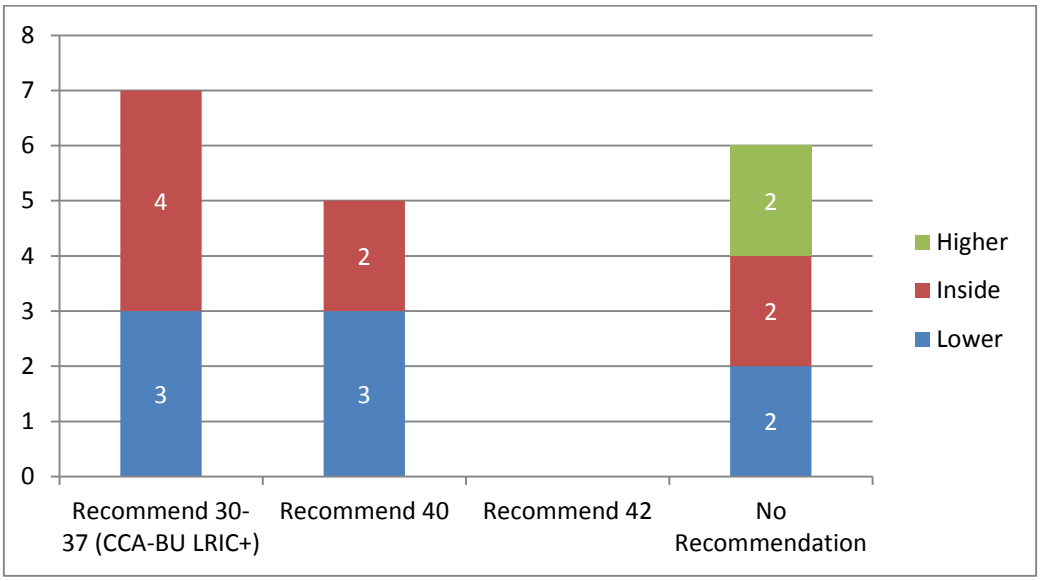
Source: BEREC RA database 2016

Figure 28 – Price after the adoption of the Recommendation



Source: BEREC RA database 2016

Figure 29 – Actual price for the Recommendation



Source: BEREC RA database 2016

Moreover one NRA, where the starting price is below the price band, declared that the LLU price derived from BU-LRAIC+ model in line with the EU Recommendation on non-discrimination obligations and costing methodologies (2013/466/EU) would be significantly higher than the current LLU price derived from the SMP's HCA/FDC model so the price derived from the BU-LRIC+ model is set as price-cap and the SMP operator is obliged to conduct margin squeeze test if it intends to change the current LLU price.

Due to the limited number of countries that provided data, no clear conclusions can be drawn regarding this topic. However bearing this disclaimer in mind some preliminary elements can be summarized as follows. The analysis shows a slight tendency towards homogeneity in prices for countries which follow Recommends 30-37. As for Recommend 40 NRAs apply the methodology in line with the general objectives of consistency, predictability and price stability over time.

3.7 Termination Markets

3.7.1 Fixed call termination (Market 1)

The 2014 Recommendation on relevant markets defines Market 1 as "Wholesale *call termination on individual public telephone networks provided at fixed location*" and identifies a relevant market for each operator. It is common, therefore, to see both incumbents and alternative operators having been notified as SMP operators.
However, as explained in the ERG Common Position on symmetry[29], a clear distinction can be observed between remedies imposed on incumbents on one side, and remedies imposed on other authorised operators (OAOs) on the other side. In particular, OAOs are often regulated

[29] ERG (07) 83 Common Position on symmetry of fixed call termination rates and symmetry of mobile call termination rates.

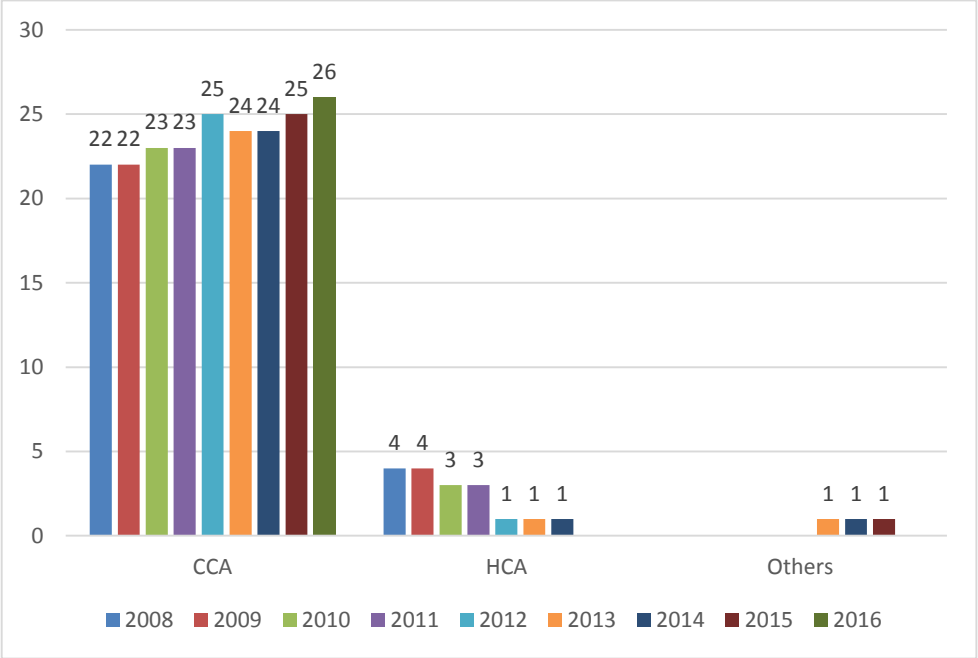
less strictly than the incumbent and are not usually subject to accounting separation, price control and cost accounting obligations. The obligations related to tariff setting for OAOs often take the form of “fair and reasonable”, “non-abusive” prices or “delayed reciprocity”.
However, the data on cost base and price control evolution over time in this section refers to incumbent operators. Unlike Figures 2 and 4, which show data only for those countries participating in the 2016 survey, the figures below show data for those NRAs that have provided the relevant information since 2008.

Trend analysis:

Cost base

Figure 30 shows the absolute number of countries adopting CCA or HCA to set incumbent’s fixed terminating charges in the nine year period under observation.
It shows that the most common cost base for fixed networks is CCA. It has to be noted that such a result is stable over time, as in fixed networks HCA had already been replaced with CCA by the majority of NRAs since 2008.

Figure 30 – Cost Base for Fixed Call Termination (Mkt 1)



Source: BEREC RA database 2016
Number of countries: 26

For changes in methodology the table below summarizes the results. Only few NRA changed their methodology during the years moving from HCA to CCA in line with the Commission Recommendation of 2009.

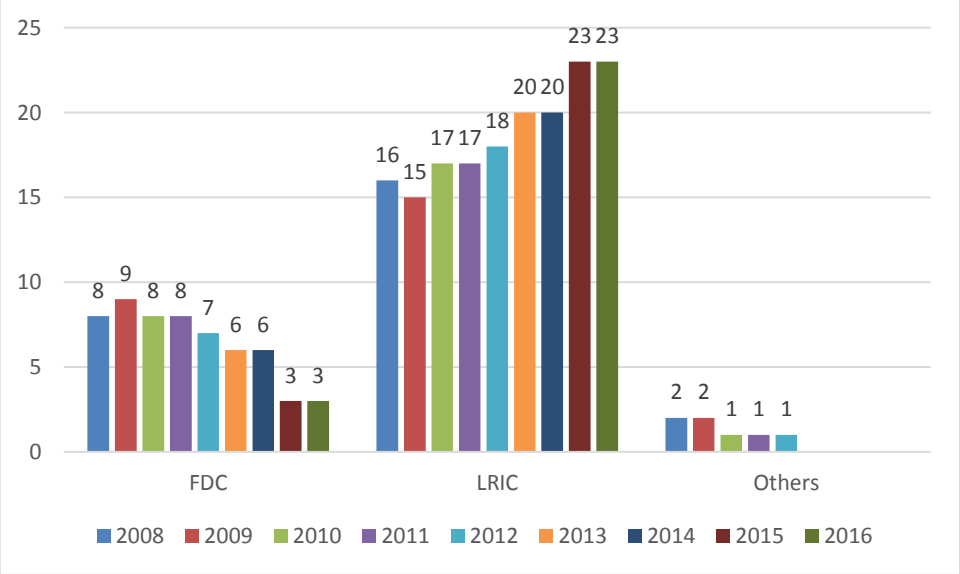
	End point

		HCA	CCA	Others	No regulation
Starting point	HCA		4		
	CCA				
	Others				
	No regulation				

Allocation methodology

Figure 31 shows the number of countries using LRIC, FDC or other mixed methodologies for fixed termination services from 2008 to 2016.

Figure 31 – Allocation methodologies for Fixed Call Termination (Mkt 1)



Source: BEREC RA database 2016
Number of countries: 26

For changes in methodology the table below summarizes the results. 9 NRAs changed their methodology during the years moving from FDC or combinations of methodologies to a LRIC approach.

		End point			
		FDC	LRIC/LRAIC	Others	No regulation
Starting point	FDC		8		
	LRIC/LRAIC				
	Others		1		
	No regulation				

<u>Key points for Market 1:</u> CCA is the preferred cost base for this market combined with LRIC as the allocation methodology. This trend is more evident now that a greater number of countries is implementing the EC Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC).

3.7.2 Mobile call termination (Market 2)

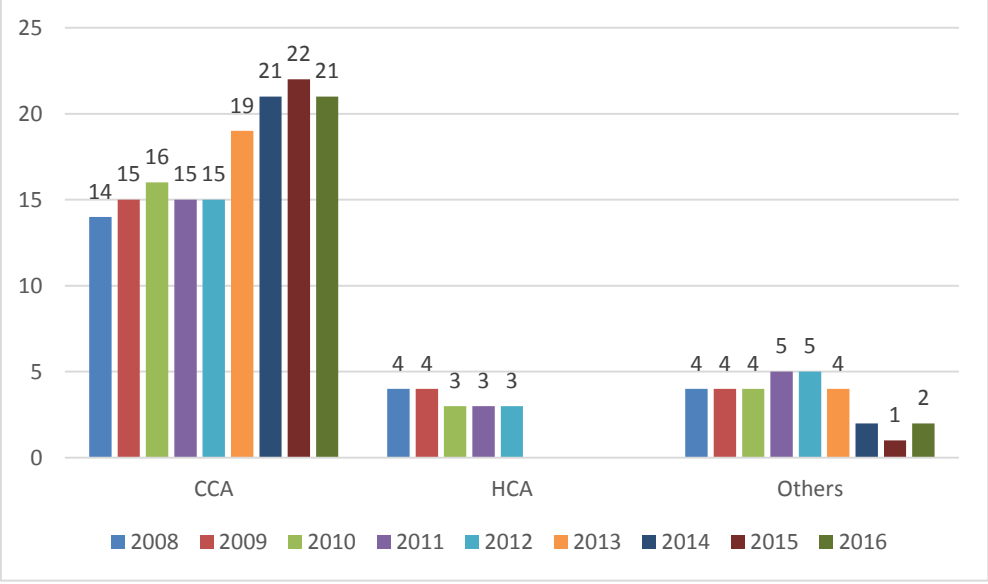
The 2014 EC Recommendation on relevant markets defines Market 2 as "*Wholesale Voice call termination on individual mobile networks*". In all countries all mobile operators have been found to be SMP in the termination market and, stemming from the second round of market analysis, in some countries also MVNO (Mobile Virtual Network Operators) have been declared SMP operators. Definitions in Market 2 are unchanged in comparison to Market 7 of the 2007 EC Recommendation.
Unlike Figures 2 and 4, the figures below show data for those NRAs that have been providing the relevant information since 2008, only. Therefore they show the data for 26 countries.

Trend analysis:

Cost base

Figure 32 shows the number of countries adopting CCA, HCA or a combination of methodologies to set mobile terminating charges from 2008 till 2016. Since 2008 the most commonly used cost base for mobile networks has been CCA.

Figure 32 – Cost Base for Mobile Call Termination (Mkt 2)



Source: BEREC RA database 2016
Number of countries: 26

For changes in methodology the table below summarizes the results. NRAs that used a benchmarking approach or hybrid cost base moved mainly to CCA, only one NRA came back to the HCA methodology from CCA in 2016 considering that it moved from a price control method

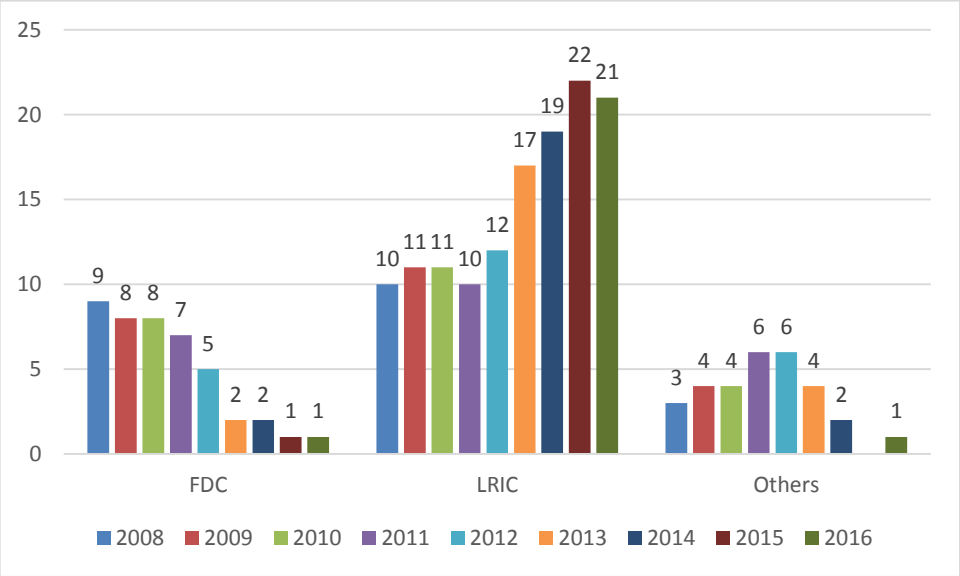
based on cost orientation and price cap to a “benchmarking approach” on countries that adopted the Recommendation of 2009 on termination rates in 2015.[30]

		End point			
		HCA	CCA	Others	No regulation
Starting point	HCA		3	1	
	CCA			2	
	Others		5		
	No regulation			1	

Allocation methodology

Figure 33 shows the number of countries using LRIC, FDC or other mixed methodologies for call termination in mobile networks during the nine years period.
In the mobile sector the most commonly used allocation methodology is LRIC.

Figure 33 – Accounting methodology for Mobile Call Termination (Mkt 2)



Source: BEREC RA database 2016
Number of countries: 23

For changes in methodology the table below summarizes the results. NRAs moved from FDC to LRIC or from FDC to “Others”.

[30] Circular changings covering small time horizons have not been considered in the tables.

		End point			
		FDC	LRIC/LRAIC	Others	No regulation
Starting point	FDC		5	2	
	LRIC/LRAIC			1	
	Others		6		
	No regulation			1	

In conclusion, the analysis of the mobile termination market shows a stabilisation at a high level in the use of both CCA and LRIC approach.

<u>Key points for Market 2:</u> CCA is the preferred cost base for this market combined with LRIC or LR(A)IC variant as the main allocation methodology. The trend analysis suggests that the development of costing tools is still relatively new, but is in the process of being reinforced with the ongoing implementation of the EC Recommendation on the Regulatory Treatment of Fixed and Mobile Terminations Rates in the EU (2009/396/EC) where CCA and LR(A)IC (and more specifically BU-LRIC) are foreseen as a first option.

3.8 Implementation of the Termination Rates Recommendation of 7 May 2009

This paragraph provides an overview of the level of implementation of the Commission Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC), using also data contained in the BEREC Report "Fixed and mobile termination rates in EU – January 2016", prepared by the BEREC Benchmarking EWG in cooperation with the BEREC Termination Rates EWG and the BEREC Office.[31]

Data from the previous BEREC Report shows that, for the fixed termination market, 29 countries out of 36 providing data declared that symmetry in rates has already been reached. In two cases there is no symmetry in fixed termination rates, while 5 NRAs declared that symmetry is partially applied.

As far as the model used by NRAs is concerned, 18 countries out of 36 with a valid answer have declared that a pure BU-LRIC model has been implemented; 5 out of 35 countries use benchmarking.

One of the effects of the implementation of the TR Recommendation is that from 2012 to 2015 the simple EU average of TRs in the incumbent's fixed network at the three fixed interconnection layers decreased on average by 42 per cent: the highest reduction can be observed for layer 3 (-47 per cent, from 0.81 €-cent/min in 2012 (doc. BoR(12)56) to 0.43 €-cent/min in 2016 (doc. BoR(16)90)).

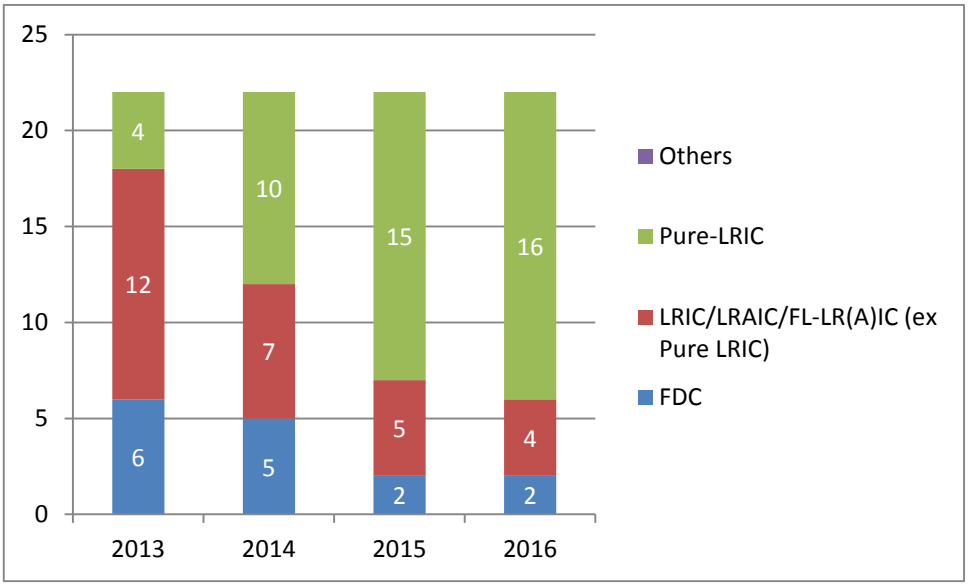
For the mobile termination market the analysis shows that in almost all the countries (33 out of 36 providing data) symmetry has already been reached.

As far as the model used by the NRAs is concerned, it can be observed that 21 countries out of 36 have declared that a pure BU-LRIC model has been implemented, while 7 countries declared to use benchmarking.

[31] Request for information sent to all NRAs refers, in general, to data as of 1st January 2016. Thirty-six (36) NRAs provided data.

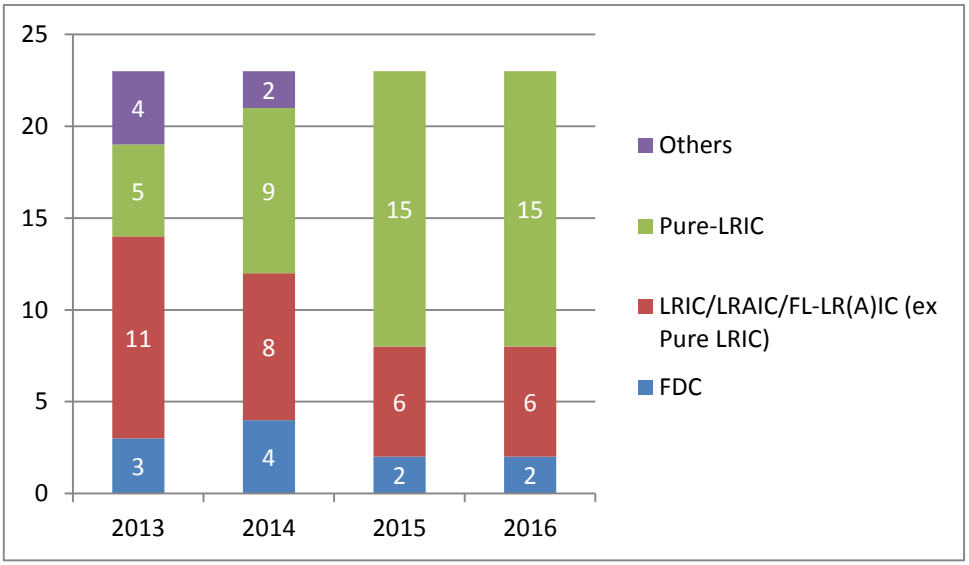
From 1st January 2012 to 1st January 2015 the simple EU average of MTRs decreased by 65 per cent (from 4.03 €-cent/min in 2012 (doc. BoR(12)56) to 1.41 €-cent/min (doc. BoR(16)90)). For mobile termination too this result can be considered as one of the effects of the implementation of the TR Recommendation.
In light of the Commission Recommendation on Termination Rates (2009/396/EC) which had to be applied as of 2013 a more specific view about the cost allocation methodology applied since 2013 is given in Figures 34 and 35. Indeed 22 and 23 EU Member States provided information about the cost accounting methodology applied in the last four years of the RA EWG data collection process in Market 1 and 2 enlightening the differences between the number of NRAs that applied a pure LRIC approach with respect to other methodologies. The graphs confirm a growing adoption of a pure LRIC approach in both markets as recommended.

Figure 34 – Accounting methodology for Fixed Call Termination in EU members (Mkt 1)



Source: BEREC RA database 2016
Number of countries: 22

Figure 35 – Accounting methodology for Mobile Call Termination in EU members (Mkt 2)



Source: BEREC RA database 2016
Number of countries: 23

3.9 Combination of cost base and allocation methodology – all markets

Figure 36 shows the combinations of cost base and accounting methodologies applied by NRAs.[32] There are four main combinations:

- CCA and pure LRIC[33];
- CCA and (FL)-LR(A)IC[34];
- CCA/FDC;
- HCA/FDC.

The following can be observed in 2016 in comparison to the two previous years:

- Market 1/2007: In this market which is not (or ex-post) regulated in 17 countries (12 in 2014), 25 per cent of respondents apply HCA/FDC and 43 per cent CCA/FDC (HCA/FDC was applied by 32 per cent in 2015 and 45 percent in 2014; CCA/FDC was applied by 37 per cent in 2015 and 35 per cent in 2014[35]). In 2016, 25 per cent apply "other" methods including "no relevant information" category,[36] or do not provide any reply this is the case of 2 NRAs applying a price cap alone methodology and another one applying a retail minus approach.

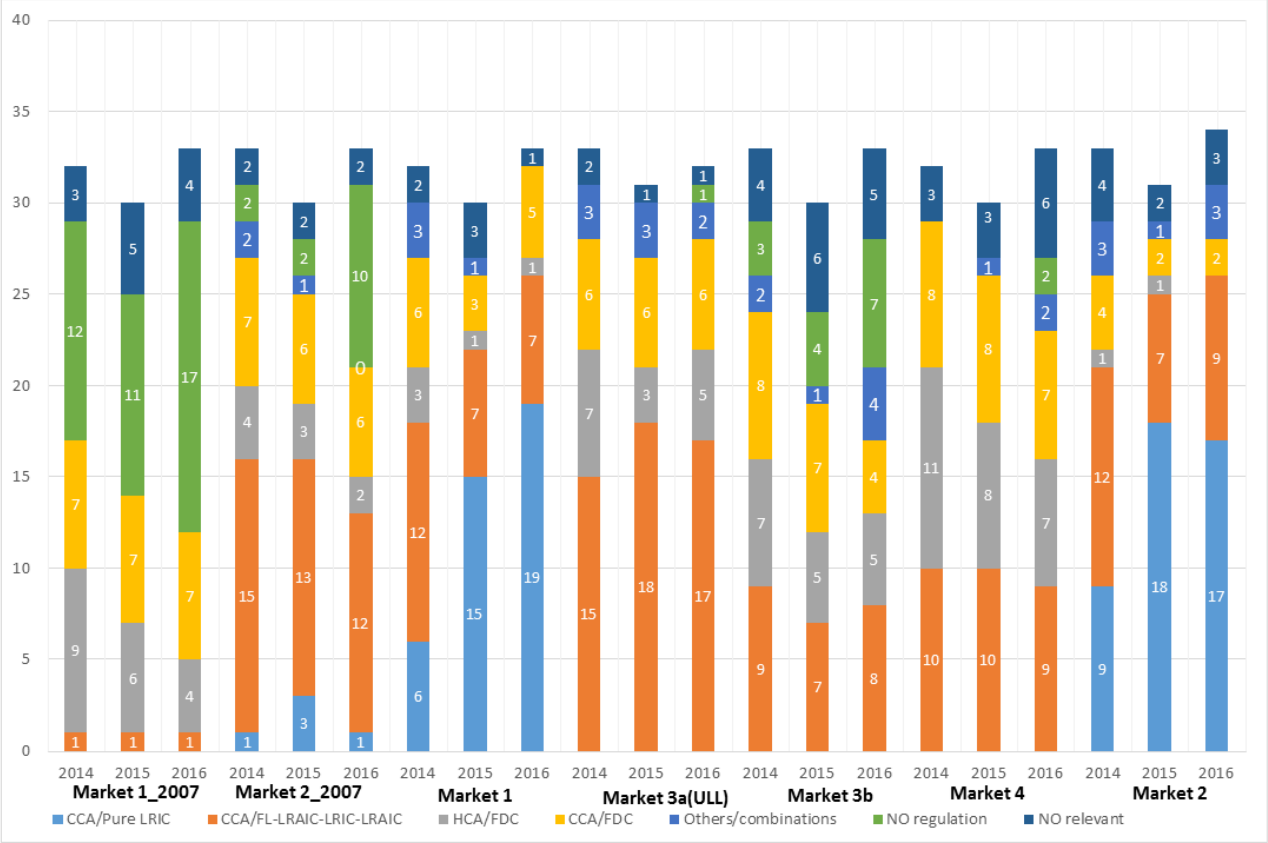
[32] This paragraph uses data collected by the BEREC RA EWG updated to April 2016. Possible inconsistencies with data in the previous paragraph arise from the different time periods used for collecting data and to ensure data consistency of time series.
[33] The combination CCA/pure LRIC has been added as a separate category since the 2014 Report since several NRAs had adopted a pure BU-LRIC approach in line with the Recommendation 2009/396/EC on Termination Rates in wholesale fixed call termination and mobile call termination markets.
[34] Referred to as CCA/LR(A)IC from hereon, the "FL" will be omitted.
[35] This value has been calculated from the total excluding the categories "not regulated" and "no relevant information".
[36] In this category are classified the NRAs that did not provide any reply even if an access obligation is in force.

- Market 2/2007: In 2016 many NRAs deregulate the market, taking into account all the respondents, the percentage of NRAs that deregulate in 2016 arrived to 27 percent against the 6 per cent in 2015 and 2014. If we consider only the NRAs that have an access obligation still in force, CCA/LR(A)IC approach is the most used (52 per cent): this is a quite stable value with respect to 2015 and 2014 (46 per cent and 48 respectively). The majority of NRAs that declared in 2015 to use a pure LRIC approach have deregulated the market. In fact, not considering the category "No regulation", the pure LRIC approach in this market is still in use by only the 4 per cent of the respondents instead of 11 per cent in 2015 and 3 per cent in 2014.[37] The second most popular combination is CCA/FDC that is applied by 26 per cent of respondents in 2016 with respect to 22 per cent in 2015 and 2014. Two NRAs have been included in the "not relevant" category[38]: in this case a "price cap alone" methodology as price control method is in use.
- Market 1/2014-Market 3/2007: In 2016 the combination CCA/pure LRIC remains the most used, in fact applied by 57 per cent of respondents, with a lower increment in respect to the previous years (19 per cent was in 2014 and 50 percent in 2015)[39]; CCA/LR(A)IC is the second combination covering the 21 per cent – (23 per cent in 2015 and 38 per cent in 2014). Benchmarking is applied by 1 NRA that has been included in the "no relevant information" category.
- Market 3a/2014-Market 4/2007 (LLU service):[40] A majority of 55 per cent of all respondents applies CCA/LR(A)IC in 2016, similar to previous years (58 per cent in 2015 and 45 per cent in 2014). 9 per cent of NRAs have been classified as "Other" or "no relevant information"; in the first case two NRAs declared to use an LRIC approach with HCA in conjunction with cost orientation alone as price control method, in the second case (no relevant information) one NRA uses a price cap alone as price control method.
- Market 3b/2014-Market 5/2007: In 2016 the combination CCA/LR(A)IC is applied by 31 per cent of respondents stable with respect to previous years (27 per cent in 2015 and 30 per cent in 2014), HCA/FDC by 19 per cent also stable with respect to previous years (19 per cent in 2015 and 23 per cent in 2014) and CCA/FDC by 15 per cent (4 per cent in 2015 and 7 per cent in 2014). 34 percent of NRAs have been classified as "Others" or "no relevant information", in this last case 5 NRAs are included in this category in fact one NRA does not have a price control method, one NRA applies ex post surveillance, 3 NRAs apply a retail minus approach. No regulation is applied in 7 cases (4 in 2015 and 3 in 2014).
- Market 4/2014-Market 6/2007: In 2016 the combinations CCA/LR(A)IC (applied by 29 per cent of respondents), HCA/FDC (applied by 23 per cent of respondents) and CCA/FDC (applied by 23 per cent of respondents) are relatively evenly spread (similar to previous years with 33/26/26 per cent in 2015 and 31/34/25 per cent in 2014). 28 per cent of respondents have been classified, in the "Others" category or "no relevant information" category, in this last case one NRA applies a price cap methodology, one a retail minus approach and four other NRAs do not apply a price control method.

[37] This category did not exist in 2013.
[38] In this category are classified the NRAs that did not provide any reply even if an access obligation is in force.
[39] This category did not exist in 2013.
[40] Since there is available data specifically for the LLU service in the period year analyzed (2014-2016) for Market 3a we will present results about this relevant product as representative for the market.

- Market 2/2014-Market 7/2007: In 2016 a majority of 50 per cent of NRAs applies CCA/pure LRIC (58 per cent in 2015 and 27 per cent in 2014[41]) while CCA LR(A)IC is applied by 26 per cent of respondents (23 per cent in 2015 and 36 per cent in 2014); 18 per cent of NRAs have been classified as "Others" or "no relevant information" in this last case three NRAs use benchmarking as the instrument for price control method. Moreover in two cases where NRAs are classified as "Others" this is due to the fact that a LRIC approach is combined with "Others" cost base.

Figure 36 – Combination Cost Base / Accounting Methods



Source: BEREC RA database 2014, 2015 and 2016
Please note that the number of responses recorded varies over the years: 33 in 2016, 31 in 2015, 33 in 2014.

4. Additional Information: structural data

This section serves to identify main structural differences within European countries, for example the competitive and market situation in each country, population and population density indicators as well as existing telecommunications infrastructure. These structural differences may have an influence on NRAs regulation strategies and therefore the choice of price control method. The influence of factors such as infrastructure competition, demand and supply side

[41] This category did not exist in 2013.

factors is analysed in more detail in the BEREC Report on Challenges and drivers of NGA rollout infrastructure competition (BoR (16) 96).
However, it should be pointed out that there are a number of other important factors influencing NRAs regulation strategies (such as e.g. the national broadband strategy).
Data collected from NRAs and other sources[42] are the following:

[42] EU Working document "Broadband Access in the EU, situation at 1 July 2015"; Fischer Weltalmanach 2016; ITU study "fixed telephone subscriptions 2015".

Table 1 - Structural Data Information collected from NRAs

1	Market situation[43]
1.1	fixed broadband penetration (subscription as a % of population)
1.2	fixed broadband subscriptions: % of cable modems (DOCSIS 3.0 included)
1.3	fixed broadband subscriptions: % of DSL lines (VDSL included)
1.4	fixed broadband subscriptions: % FTTH/B
1.5	mobile broadband penetration (all active users as a % of population)
2	Population and surface area per country[44]
2.1	number of inhabitants
2.2	number of inhabitants biggest city
2.3	% of total population (main metropolis population density)
2.4	number of inhabitants three biggest cities
2.5	% of total population (metro population density)
2.6	country area in sqkm
2.7	number of inhabitants per sqkm
3	Subscriber lines
3.1	ITU fixed telephone lines (active) 2015[45]
3.2	ITU fixed telephone lines per 100 inhabitants 2015[46]
4	MDF
	total number
5	Street cabinets
	total number
6	Local loop (MDF to customer site)
6.1	total average length in m (total copper pair m per active access)
6.2	average trench m per active subscriber line (total length of cable conduit + buried cable / active physical lines)
7	Distribution cable (street cabinet to customer site)
	total average length in m (total copper pair m per active access)
8	Civil engineering
8.1	% of feeder cable (MDF to street cabinet): cable conduit/buried cable[47]
8.2	% of distribution cable (street cabinet to customer site): cable conduit/buried cable[48]
8.3	% feeder/distribution cable (proportion of copper pair m) [49]
9	Duct/infrastructure sharing
9.1	% of duct sharing with other services
9.2	% of duct sharing per feeder/distribution cable
9.3	average cost saving (estimate)
10	Market shares
10.1	Fixed broadband subscriptions – operator market shares
10.2	DSL broadband subscriptions - operator market shares SMP operator ("incumbent")
10.3	DSL broadband subscriptions - operator market shares (DSL competitors aggregate market share)
10.4	Cable operators market share in fixed broadband subscriptions (aggregate market share)

[43] Data source: EU Working document “Broadband Access in the EU, situation at 1 July 2015” for MT, LU, CY, EE, LV, SI, LT, HR, SK, IE, BG, FI, AT, DK, HU, PT, CZ, EL, SE, BE, RO, NL, PL, ES, IT, UK, FR, DE and NRA information all other countries.

[44] Data source: Fischer Weltalmanach 2016.

[45] Source: International Telecommunication Union (ITU), 2015 data. Definition: number of active (registered activity in the last 3 months) lines connecting the subscriber's terminal equipment to the PSTN.

[46] Source: International Telecommunication Union (ITU), 2015 data.

[47] Within the feeder cable: the relation of cable conduit in a cable canal/cable duct to cable conduit in the ground without a cable canal (i.e. 40% of cable is in a cable canal, 60% is not in a cable canal).

[48] Within the distribution cable: the relation of cable conduit in a cable canal/cable duct to cable conduit in the ground without a cable canal (i.e. 40% of cable is in a cable canal, 60% is not in a cable canal).

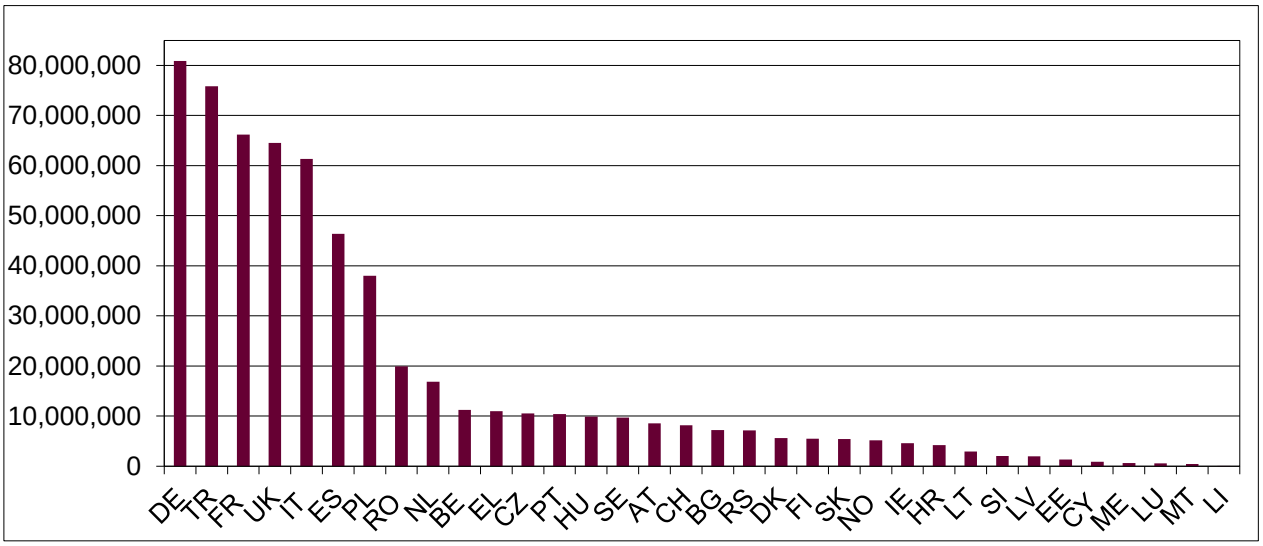
A total of 34 countries have provided information on structural data.
Information on Market situation, Population and country size data as well as subscriber lines stem from publicly available data and can thus be shown for each individual country.
All other data are the latest available data from NRAs and will be presented in an anonymous form.

Population and country size

Naturally this data has remained largely unchanged in comparison to last year's data.

When looking at total population data (i.e. the total number of inhabitants per country): 21 countries have less than or around 10 million inhabitants (AT, BG, CH, CY, DK, EE, FI, HR, HU, IE, LT, LU, LV, ME, MT, LI, NO, RS, SE, SI, SK), 3 countries have between 15 and 40 million inhabitants (NL, PL, RO) and 6 have more than 40 million inhabitants (DE, ES, FR, IT, TR, UK).

Figure 37 - Total Population

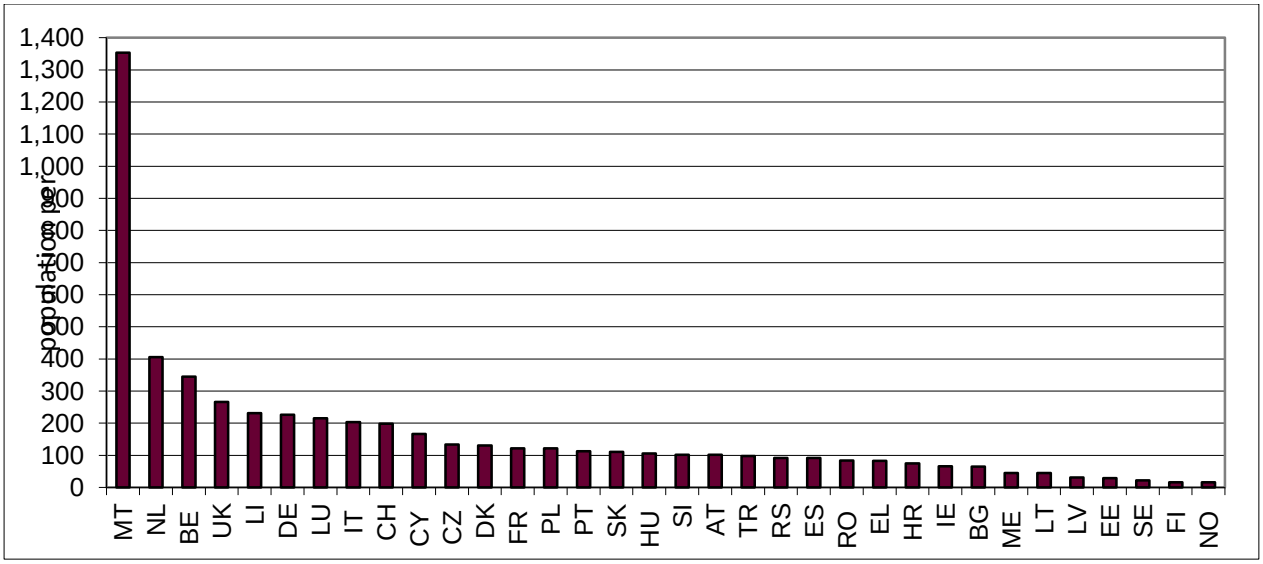


Source: Fischer Weltalmanach 2016

[49] Calculated as follows: (1) Length of the local sub-loop/length local loop = percentage of the distribution-part of the local loop (local sub-loop) (2) Percentage of the feeder-part of the local loop = 1 – the percentage of the distribution-part of the local loop.

In terms of population density (i.e. the number of inhabitants per square kilometre), 15 countries have around or less than 100 people per square km (BG, EE, EL, ES, FI, HR, IE, LT, LV, ME, NO, RO, RS, SE, TR), 11 countries have 100 to 200 people per square km (AT, CH, CY, CZ, DK, FR, HU, PL, PT, SI, SK) and 8 countries more than 200 people per square km (BE, DE, IT, LU, , LI, MT, NL, UK).

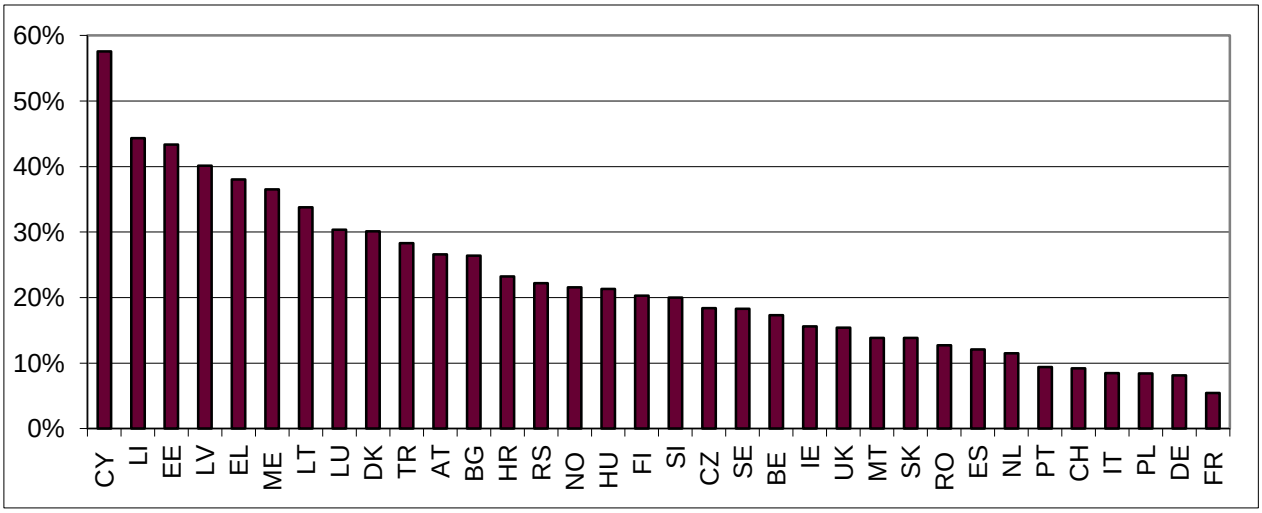
Figure 38 - Population Density



Source: Fischer Weltalmanach 2016

Looking at the population density of the main metropolitan areas (i.e. the number of inhabitants in the three biggest cities) as a percentage of the total population it is interesting to note that Baltic and South-Eastern European countries have the highest metro population density while in many of the larger countries like Germany, Spain, France, Poland and the United Kingdom this measure is rather low. 17 countries have a metro population density of less than or just on 20 per cent (BE, CH, CZ, DE, ES, FR, IE, IT, MT, NL, PL, PT, RO, SE, SI, SK, UK), 8 countries between 20 and 30 per cent (AT, BG, FI, HR, HU, NO, RS, TR) and 9 countries above 30 per cent (CY, DK, EE; EL, LI, LT, LU, LV, ME).

Figure 39 - Metro Population Density

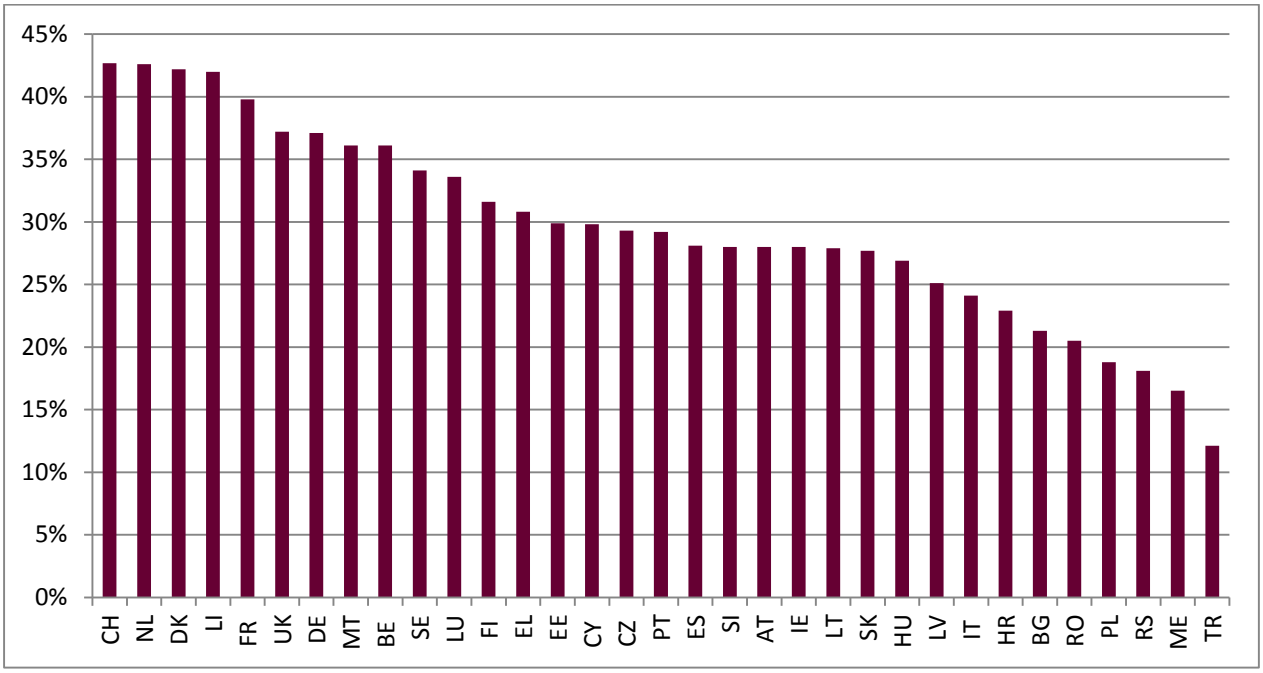


Source: Fischer Weltalmanach 2016

Market and competitive situation

The market and competitive situation within the different countries shows considerable disparity. The fixed broadband penetration[50], representing subscriptions as a percentage of the total population, varies between 12.1 per cent and 42.7 per cent. 13 countries have a penetration rate of above 30 per cent (BE, CH, DE, DK, EL, FI, FR, LI, LU, MT, NL, SE, UK).

Figure 40 - Fixed Broadband Penetration (subscription as a percentage of the population)

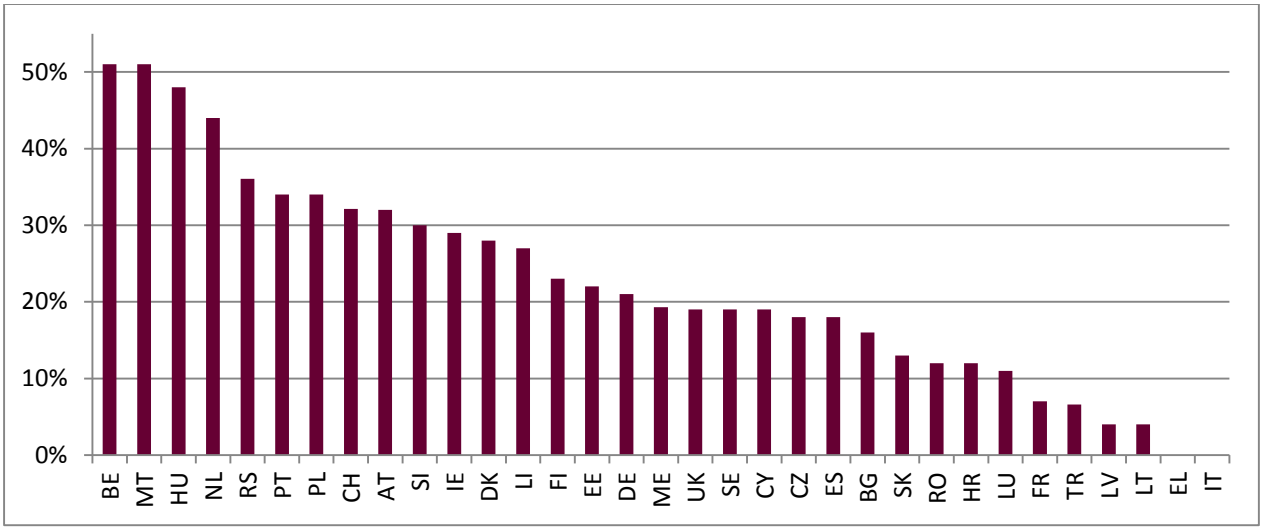


Source: EU Working document "Broadband Access in the EU, situation at 1 July 2015" / BEREC RA Database 2016

[50] No information was available from NO.

The fixed broadband subscriptions[51], as a percentage of cable modems (DOCSIS 3.0 included) range from 0 per cent to 51 per cent. In 7 countries it is between 20 and 30 per cent (DE, DK, EE, FI, IE, LI, SI) and in 4 countries the percentage is higher than 40 per cent (BE, HU, MT, NL).

Figure 41 - Fixed Broadband Subscriptions (percentage of cable modems)

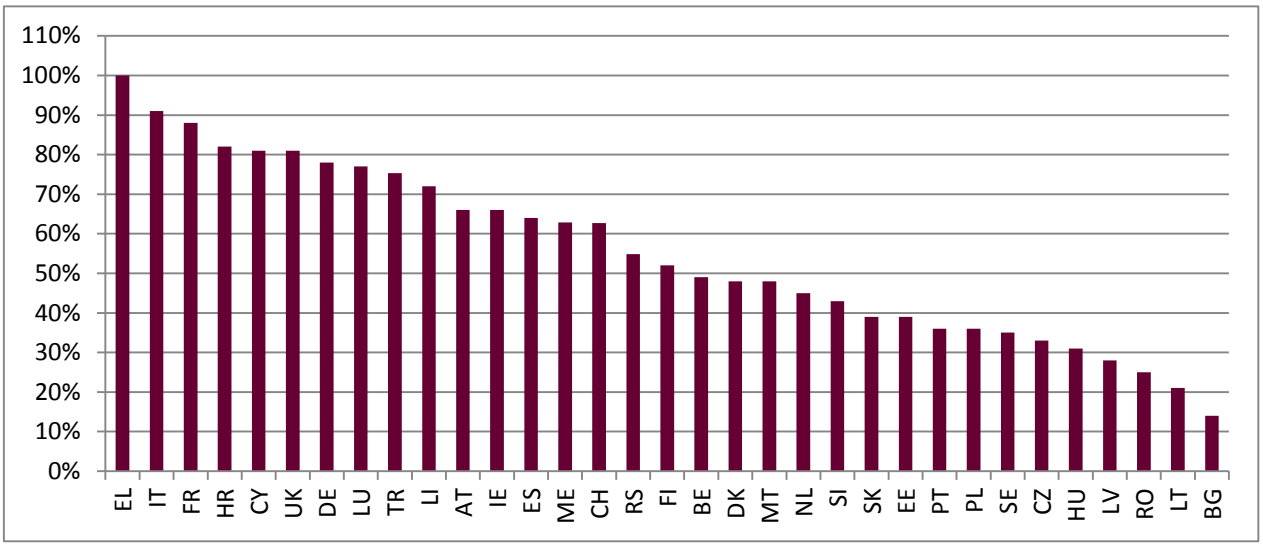


Source: EU Working document "Broadband Access in the EU, situation at 1 July 2015" / BEREC RA database 2016

[51] No information was available from NO.

The fixed broadband subscriptions[52] as a percentage of DSL lines (VDSL included) range from 14 per cent to 100 per cent. In 10 countries the percentage is higher than 70 per cent (CY; DE, EL, FR, HR; IT, LI, LU, TR, UK).

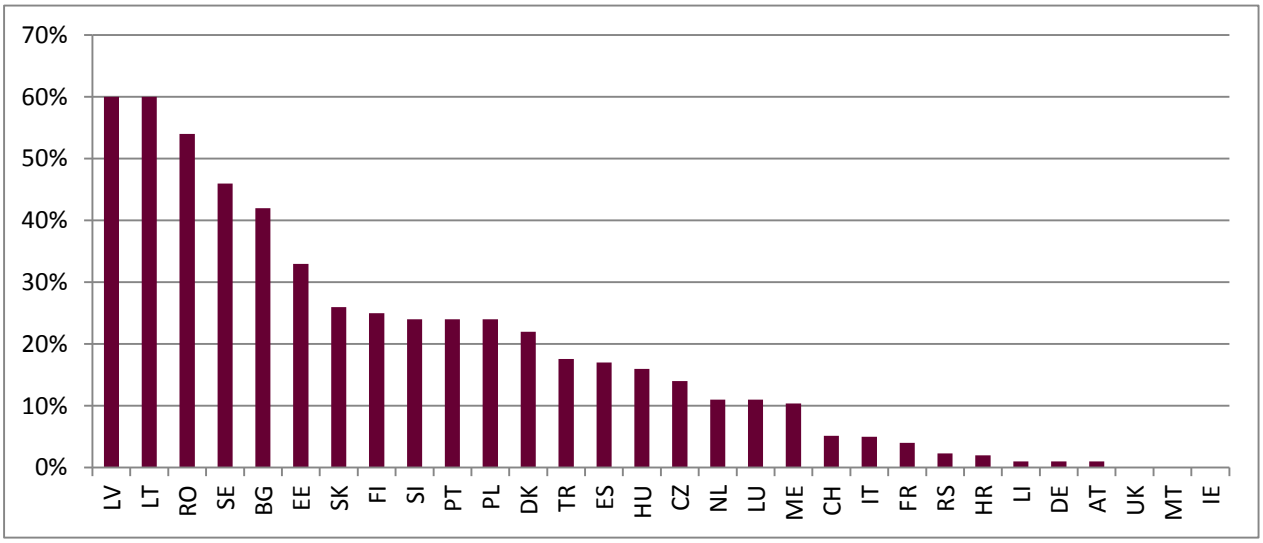
Figure 42 - Fixed Broadband Subscriptions (percentage of DSL lines)



Source: EU Working document "Broadband Access in the EU, situation at 1 July 2015" / BEREC RA Database 2016

The fixed broadband subscriptions as a percentage of FTTH/B[53] range from 0 per cent to 60 per cent. 6 countries have a percentage higher than 30 per cent (LV, LT, RO, SE, BG, EE).

Figure 43 - Fixed Broadband Subscriptions (percentage of FTTH/B)

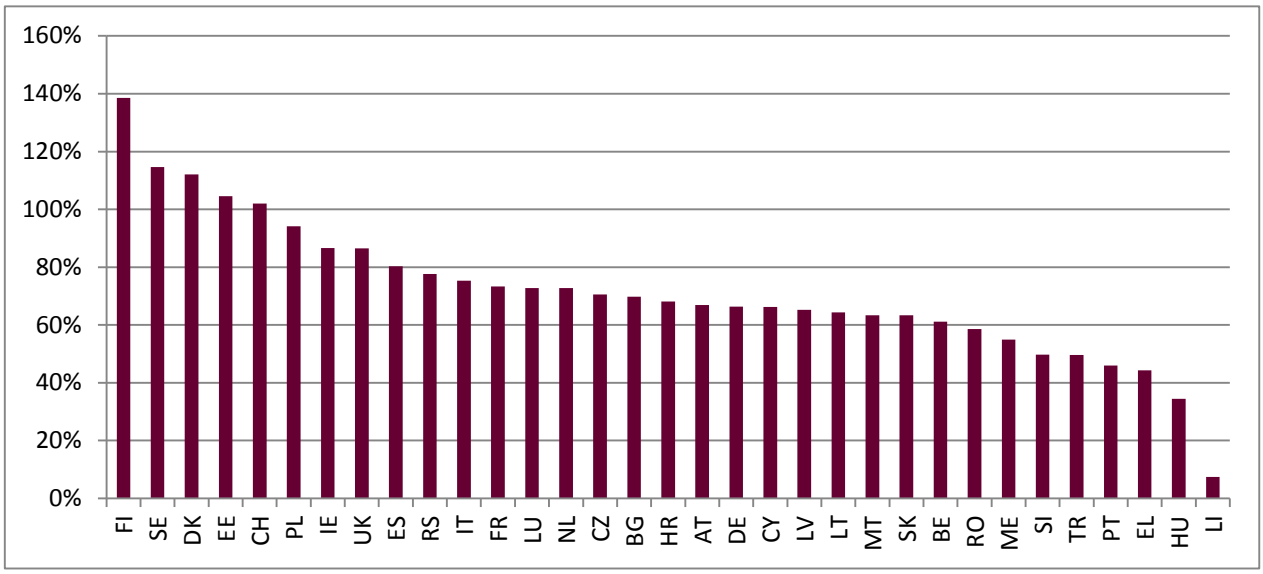


Source: EU Working document "Broadband Access in the EU, situation at 1 July 2015" / BEREC RA Database 2016

[52] No information was available from NO.
[53] No information was available from NO.

The mobile broadband penetration[54], representing all active users as a percentage of the total population, ranges from 7.4 per cent to 138.6 per cent. 15 countries have a penetration which is higher than 70 per cent.

Figure 44 - Mobile Broadband Penetration



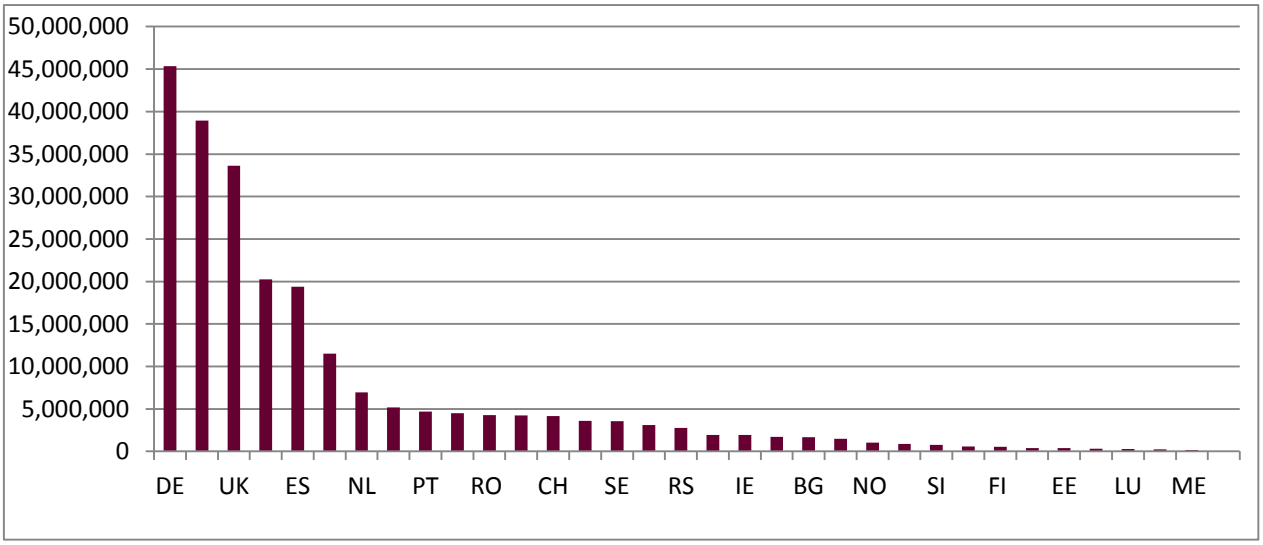
Source: EU Working document "Broadband Access in the EU, situation at 1 July 2015" / BEREC RA database 2016

[54] No information available from NO.

It should be pointed out that, while the fixed and mobile broadband penetration continues to increase, this is not necessarily associated with increasing average revenues.

The total number of active physical subscriber lines ranges from 17,184 to more than 45 million active physical lines (usually in correlation with the size of the country).

Figure 45 - Active Physical Lines



Source: International Telecommunication Union (ITU), 2015 data

Network infrastructure

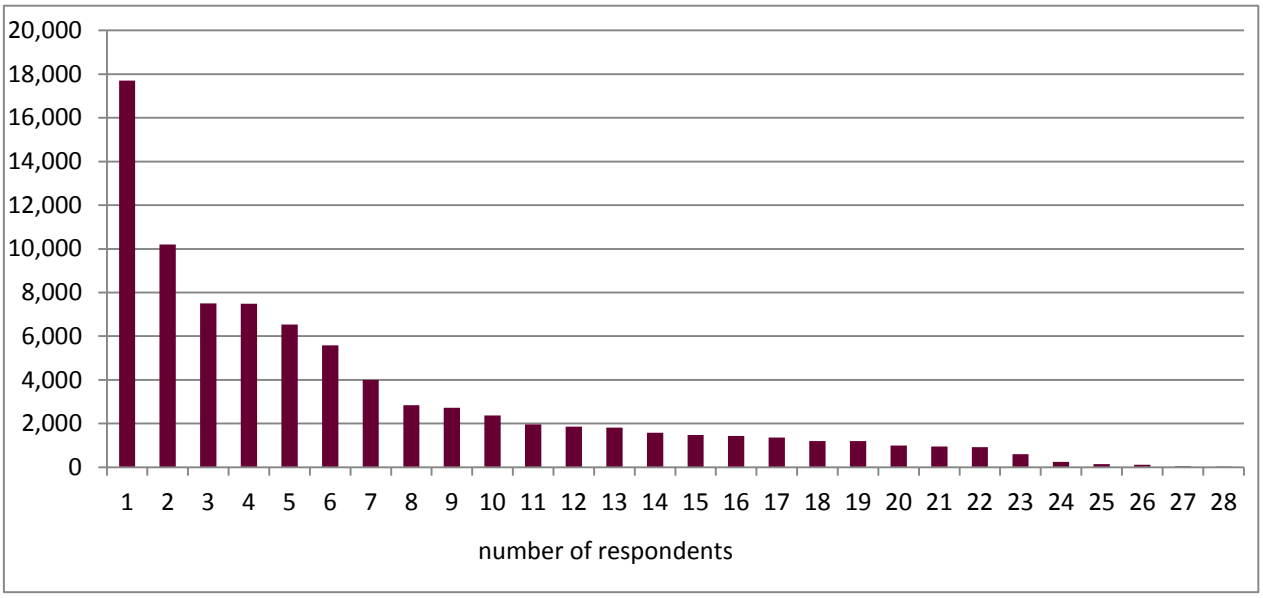
Not many NRAs have provided information on their country's network infrastructure, i.e. the numbers of MDF, street cabinets, length of local loop, feeder or distribution cable. This data is highly dependent on:

- the size and shape of the country,
- the number and density of its inhabitants,
- the infrastructure in use.

Some countries also have a proportion of poles in their access networks which are not recorded in this survey.
Large variations are observed between countries. The data does not show much change from last year's data; a change will naturally only be observed if significant changes in the access infrastructure occur (i.e. All-IP network rollout).

The total number of MDF[55] ranges from a minimum of 15 to a maximum of 16,500 MDF nationwide.

Figure 46 - Number of MDF

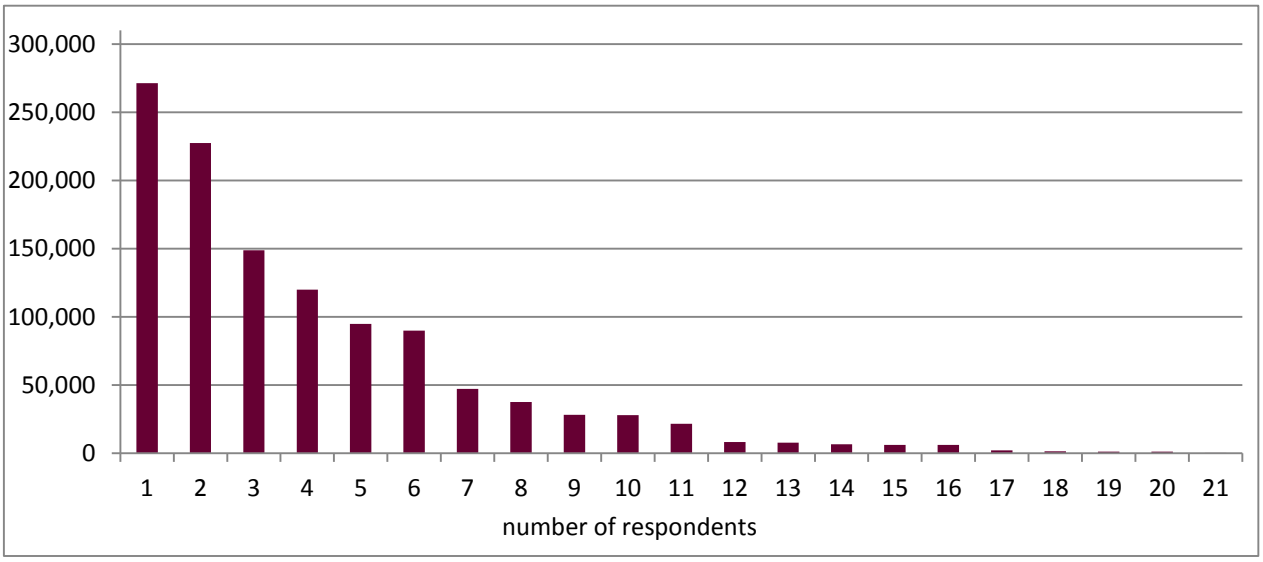


Source: BEREC RA database 2016

[55] 6 countries have not provided information. 2 country's data are approximated, 1 country uses modelled data.

The number of street cabinets[56] range from a minimum of 600 to a maximum of more than 300,000 cabinets nationwide.

Figure 47 - Number of Street Cabinets

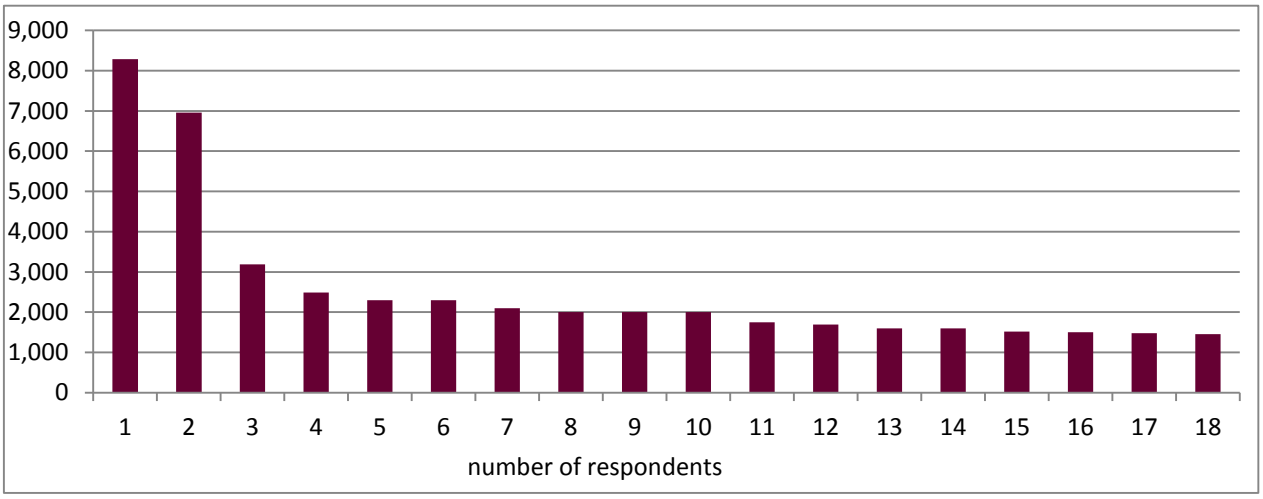


Source: BEREC RA database 2016

[56] 12 NRAs have not provided information on the number of street cabinets. 1 NRA has provided modelled data, which renders street cabinets obsolete since it uses a full FTTH P2P model.

The total average length of the local loop[57] is between a minimum of 1,453 and a maximum of over 8,000 metres.

Figure 48 - Local Loop: Average Length in Metres

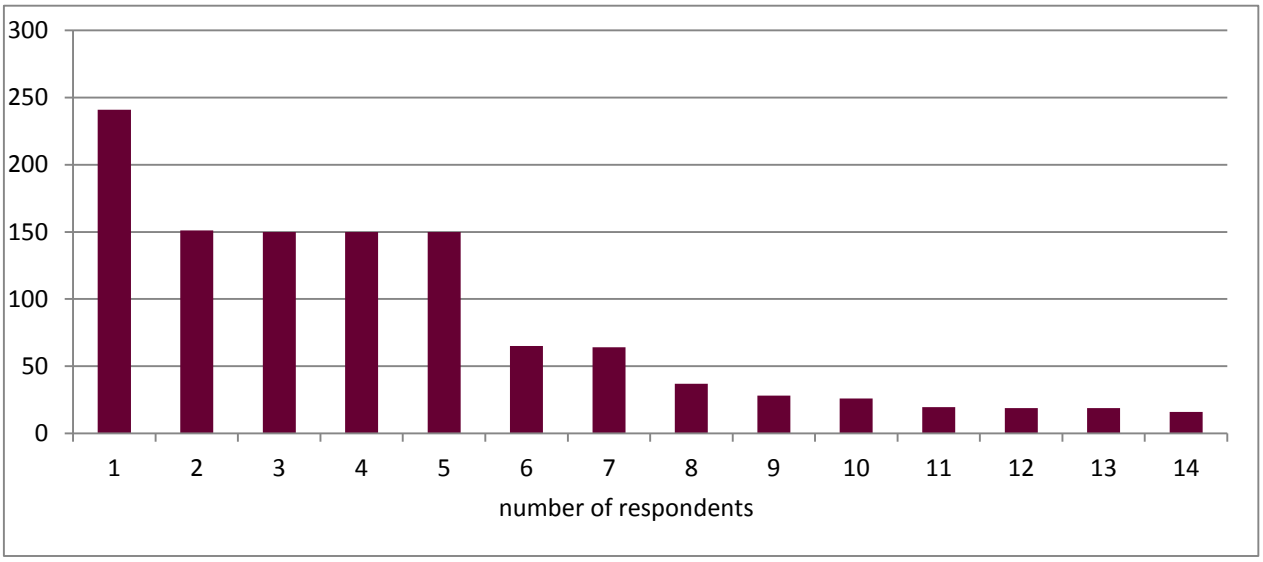


Source: BEREC RA database 2016

[57] 16 NRAs have not provided information on the length of the local loop. 2 NRAs have provided a range: the maximum has been used. 1 NRA's data is a weighted average of active and free lines.

The average trench metre per active subscriber line[58] is between a minimum of 16 and a maximum of more than 150 metres.

Figure 49 - Average Trench Metre

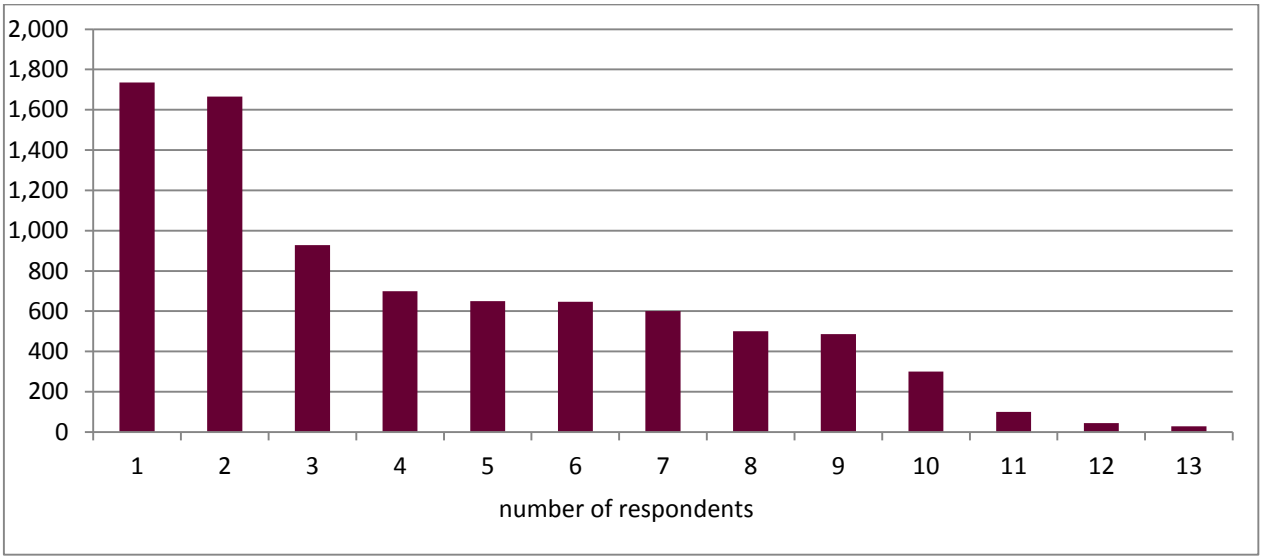


Source: BEREC RA database 2016

[58] 20 NRAs have not provided information.

The total average length of the distribution cable[59] is between a minimum of 29 and a maximum of around 1,735 metres.

Figure 50 - Distribution Cable: Average Length in Metres



Source: BEREC RA database 2016

Civil engineering incl. duct sharing

There are two important cost components within the telecommunications industry: civil engineering incl. duct sharing. Unfortunately only few NRAs have provided information on these topics, limiting the representativeness of the analysed values.

When looking at the proportion of cables laid in cable ducts to cables laid in the ground within the feeder cable[60] (which makes a difference in terms of cost), the percentage of cables in cable ducts ranges from 0 per cent to 100 per cent, i.e. in 2 countries all (copper) cables are buried and in another all cables are in cable ducts. 1 NRA specified that there is a difference between copper and fibre: fibre is predominantly (80 per cent) run in cable ducts whereas copper is predominantly buried. Another NRA specified that the proportion changes considerably depending on urban and rural areas (0 to 30 per cent cable conduit and 50 to 95 per cent buried cable). 1 NRA specified 15 per cent to be cable conduit and 85 per cent buried cable.

The same disparity is observed when looking at the proportion of cables laid in cable ducts to cables laid in the ground within the distribution cable[61], i.e. the percentage of cables in cable ducts ranges from 0 per cent to 100 per cent. In one country the relation is another 0-5 cable conduit to 15-90 per cent buried cable, depending on urban or rural areas (rest are poles). In one country the proportion is around 3 per cent cable conduit to 97 per cent buried cable.

[59] 21 NRAs did not provide information on the total average length. 1 NRA provided a range: the maximum is shown.
[60] 9 NRAs replied, however only 5 answers were conclusive.
[61] 8 NRAs replied, however only 5 answers were conclusive.

The proportion of feeder to distribution cable[62] was stated by one country to be 95 to 5 per cent and by another to be around 64 to 36 per cent.

Duct sharing with other services[63] was stated to be unavailable in 2 countries. In one country it amounts to less than 10 per cent, in other countries it is between 20 and 50 per cent.

In terms of the percentage of duct sharing per feeder and distribution cables[64] one NRA has stated 22 per cent (feeder cable) and 51 per cent (distribution cable), another 41 per cent (feeder cable) and 59 per cent (distribution cable). Another NRA evenly distributes duct sharing (50/50) between feeder and distribution cables.

The average cost saving[65] for the telecommunications provider was around 10 per cent (feeder cable) and around 20 per cent (distribution cable). In a second country the average saving is 25 per cent, shared equally between utility and telecommunications provider, in another a cost saving of 50 per cent is specified.

Of course the percentage of duct sharing and cost saving was nil for the countries where duct sharing is not available.

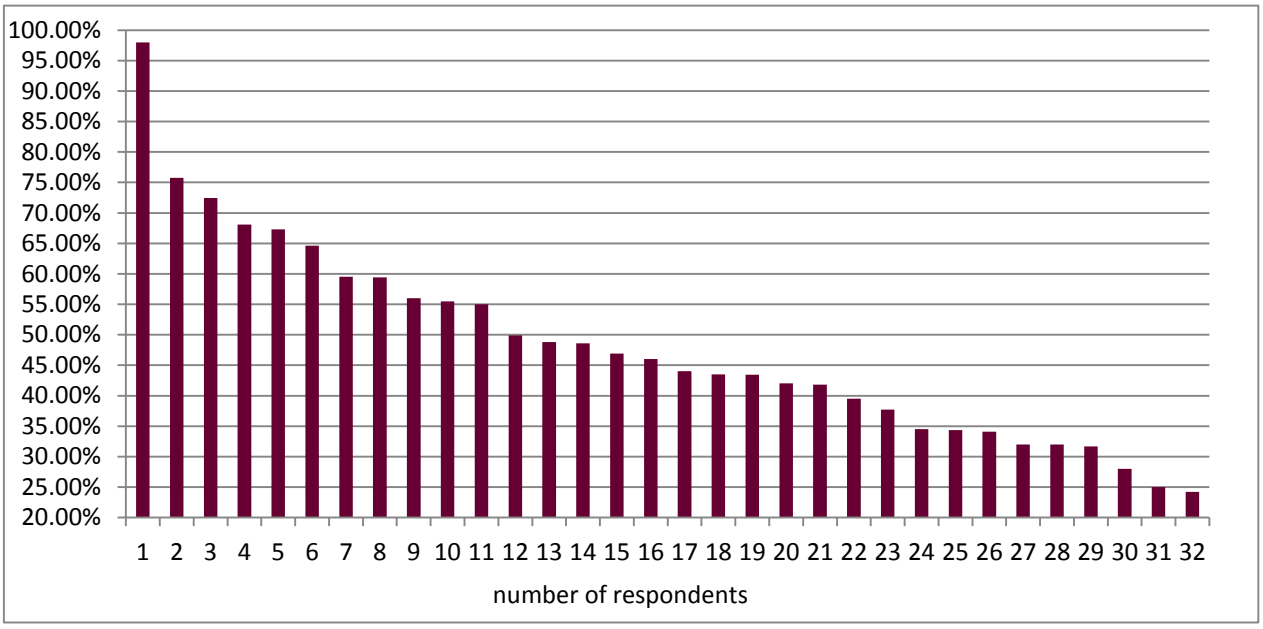
Market shares

The market and competitive situation between the different countries also shows considerable diversity.

[62] 6 NRAs replied, however only 2 answers were conclusive.
[63] 6 NRAs replied.
[64] 4 NRAs provided information, in one country the percentage is 0.
[65] 5 NRAs provided information, in 2 countries it is nil, one answer was not conclusive.

The operator market shares of the domestic incumbents[66] range from a minimum of 24.20 per cent to a maximum of 98 per cent.

Figure 51 - Fixed broadband subscriptions - operator market shares SMP operator ("incumbent")

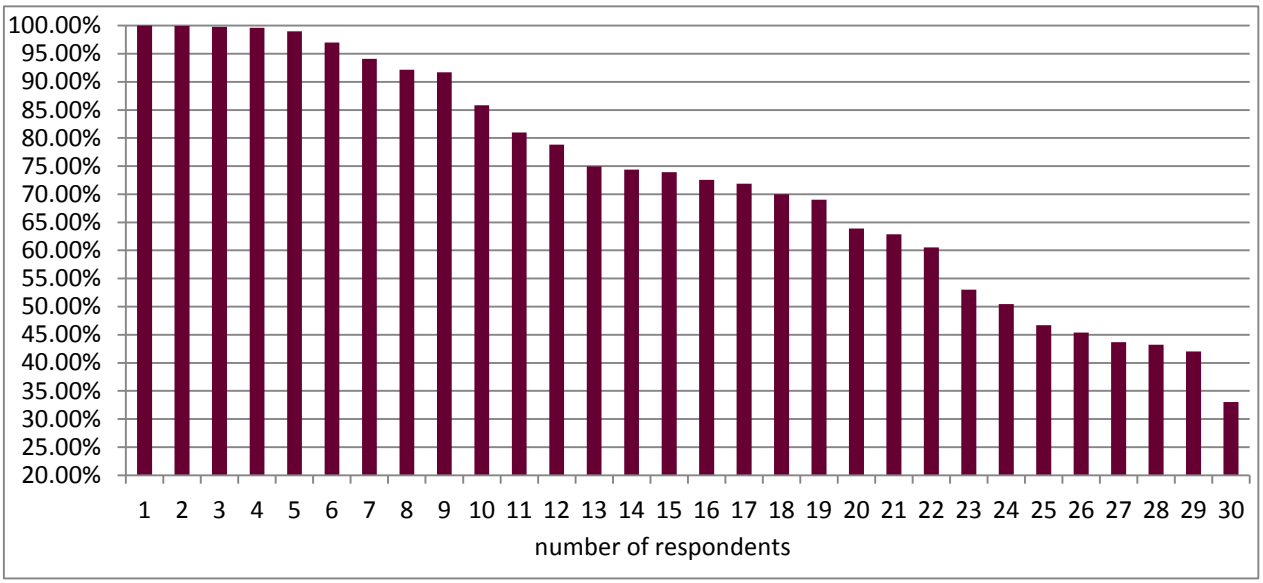


Source: BEREC RA database 2016

[66] 2 countries have not provided information.

For the DSL broadband subscriptions the operator market shares for the incumbent[67] range from a minimum of 33 per cent to a maximum of 100 per cent.

Figure 52 - DSL broadband subscriptions - operator market shares SMP operator ("incumbent")

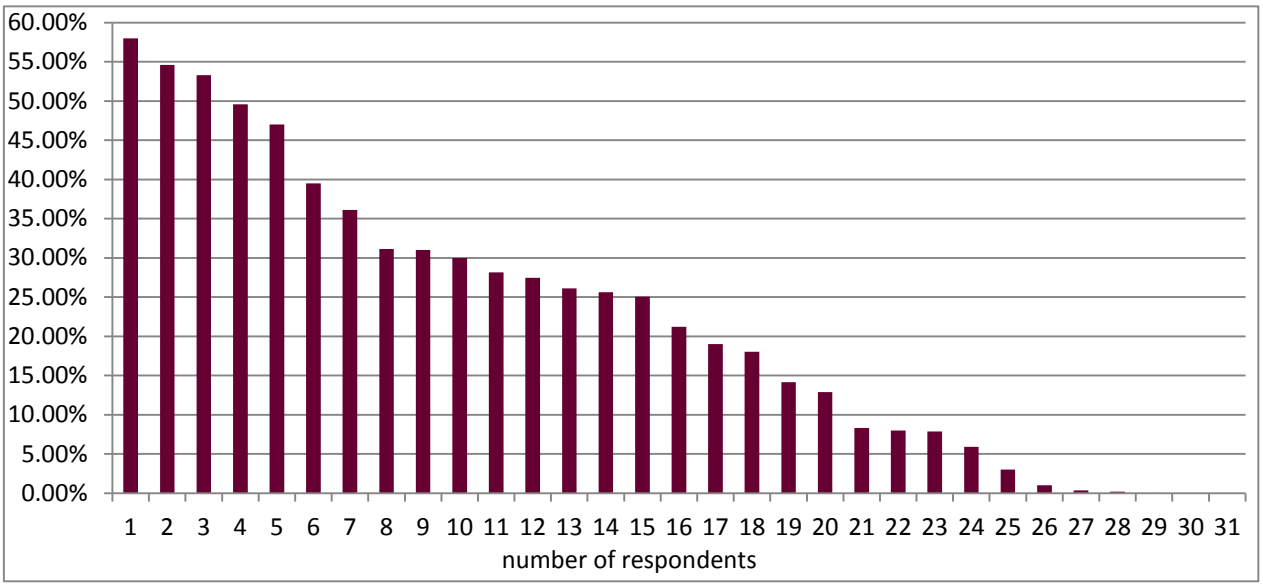


Source: BEREC RA database 2016

[67] 3 NRAs have not provided information.

Subsequently for the competitors the operator market shares of DSL broadband subscriptions[68] are between a minimum of 0 per cent and a maximum of over 57 per cent.

Figure 53 - DSL broadband subscriptions - operator market shares (DSL competitors' aggregate market share)

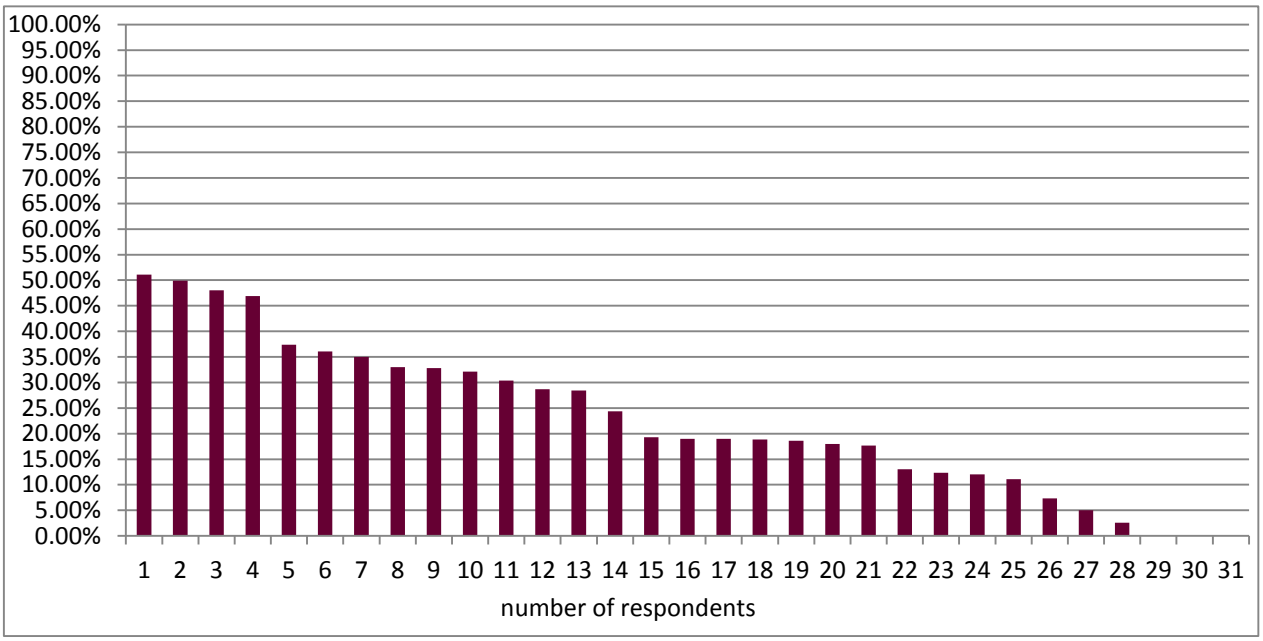


Source: BEREC RA database 2016

[68] 16 NRAs have not provided information on the length of the local loop. 2 NRAs have provided a range: the maximum has been used. 1 NRA's data is a weighted average of active and free lines.

The market shares in fixed broadband subscription for the cable operators[69] are between a minimum of 0 per cent and a maximum of 51.10 per cent.

Figure 54 - Cable operators market shares in fixed broadband subscriptions (aggregate market share)



Source: BEREC RA database 2016

[69] 20 NRAs have not provided information.

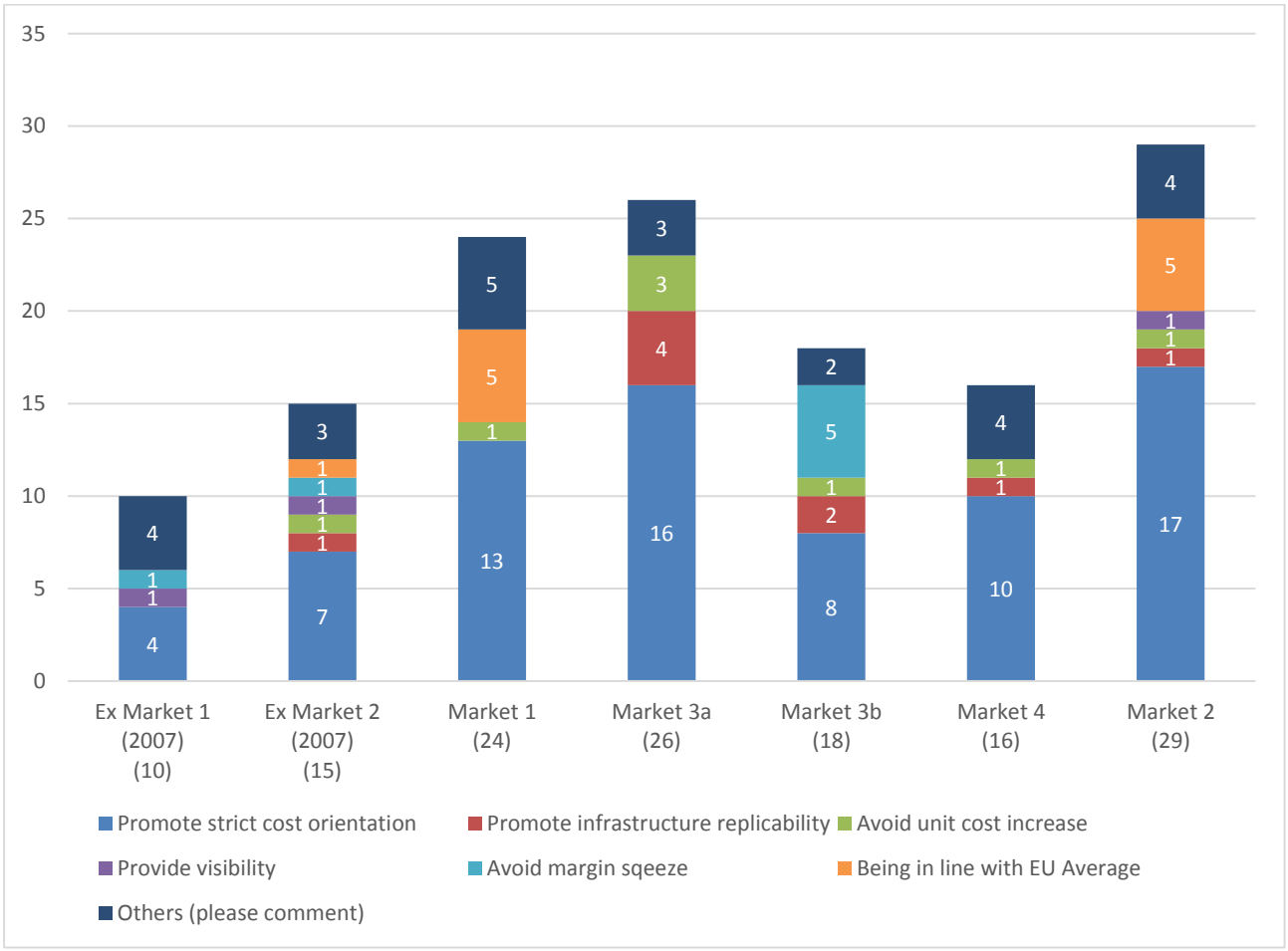
5. The main motivation behind the choice of the costing methodology

There may be of course several objectives that a NRA has to balance in arriving at a decision about a pricing approach. For a deeper explanation about these choices and the reasons for selecting them, readers should refer to the relevant statements/publications from each NRA. However, as last year, data concerning the "main" motivation behind the choice of the costing methodology has been included in the report.[70] In practice, this data was collected by adding another variable to each market sheet in the questionnaire. However, in order to make the new data useful for comparisons and statistics some predefined alternatives were given from which NRAs could choose. These predefined alternatives were: "promote strict cost orientation", "promote infrastructure replicability", "avoid unit cost increase", "provide visibility", "avoid margin squeeze", "being in line with EU average" and "others" (in cases where the NRA chooses this alternative, they were asked to give more detailed comments). Moreover, for the markets in the new Recommendation 2014/710/EU, in case more than one objective is pursued, the questionnaire gives the opportunity to rank and explain the principles behind the rationale.

Answers were given by 10 to 29 NRAs depending on the market in question. Figure 55 shows the main motivations expressed by the NRAs in each market. Figure 56 shows a deeper analysis about the products in Market 3a (ULL, SLU, SA, fibre LLU, VULA, dark fibre, duct access).

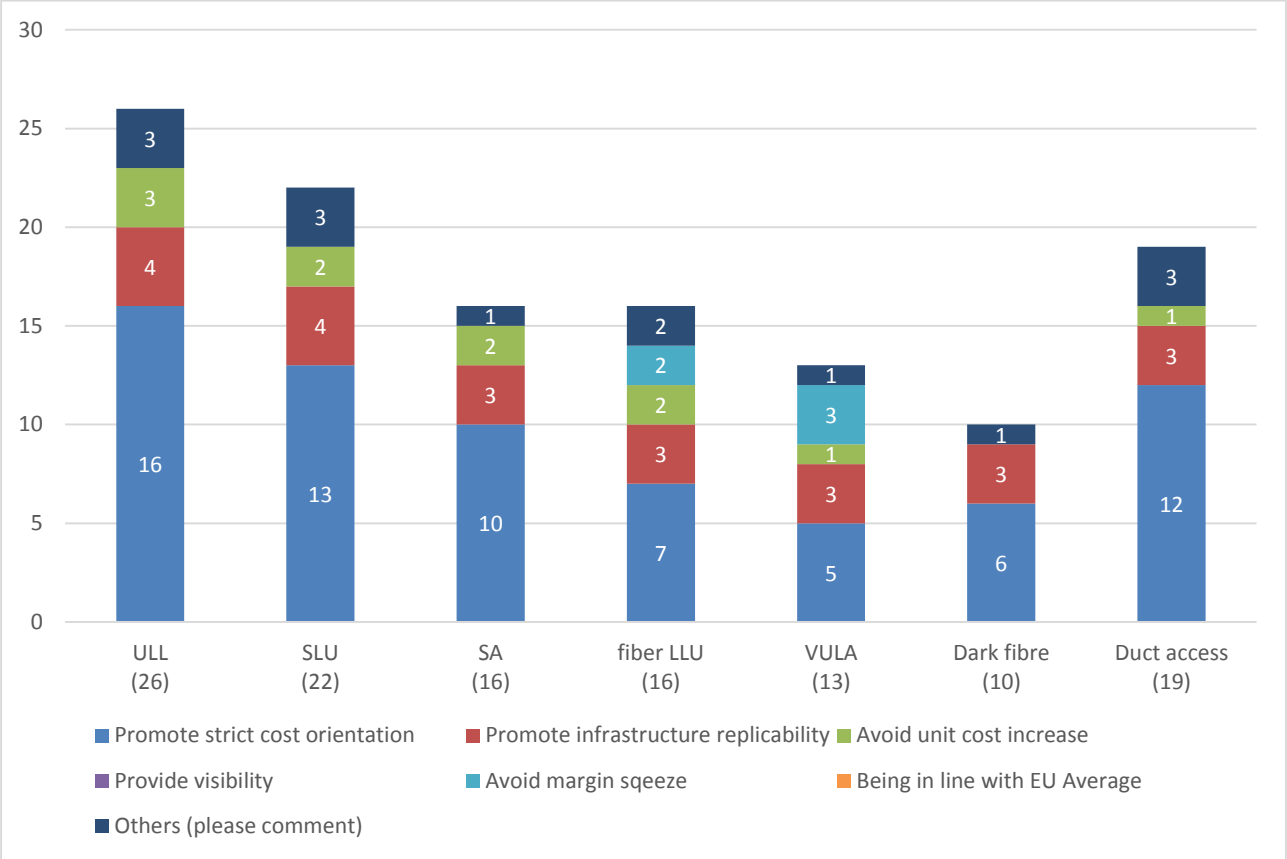
[70] Cf. also BEREC input to the consultation on "costing methodologies", doc. BoR (11) 65.

Figure 55 – The main motivation behind the choice of the costing methodology 2014/710/EU plus Market 1 and 2/2007



Source: BEREC RA database 2016

Figure 56 – The main motivation behind the choice of the costing methodology for some products in the Market 3a of the Recommendation 2014/710/EC



Source: BEREC RA database 2016

Moreover, on the basis of the detailed comments it seems that in most cases the motivation behind the choice of costing methodology was a combination of the given list of alternatives.
It is interesting to note that the objective "to promote strict cost orientation" is the main motivation for the choice of the costing methodology in almost every market (except in Market 1/2007 and Market 3b). With respect to previous years, there is an increase of NRAs that declared to enhance replicability of infrastructures as main motivation.

A general ranking of the option has not been provided, but from the comments received we can understand that the "strict cost orientation" is considered as the instrument to promote competition and, at the same time, stimulate investments and increase consumer benefits. Only for Market 3a some NRAs mentioned explicitly that following the "Recommendation on non-discrimination obligations and costing methodologies" would be the best way to ensure correct build/buy signals taking into account already elapsed asset life of reusable asset. In every case more than one NRA indicated that there is no prioritization of the objectives behind the choice of the costing methodologies. One NRA also highlighted that geographical market segmentation and different regimes for setting regulated access prices are the main drivers to strike a balance between safeguarding competition and promoting investment.

Table 2 below shows the various combinations of motivations in order of relevance reported as reply to the questionnaire.

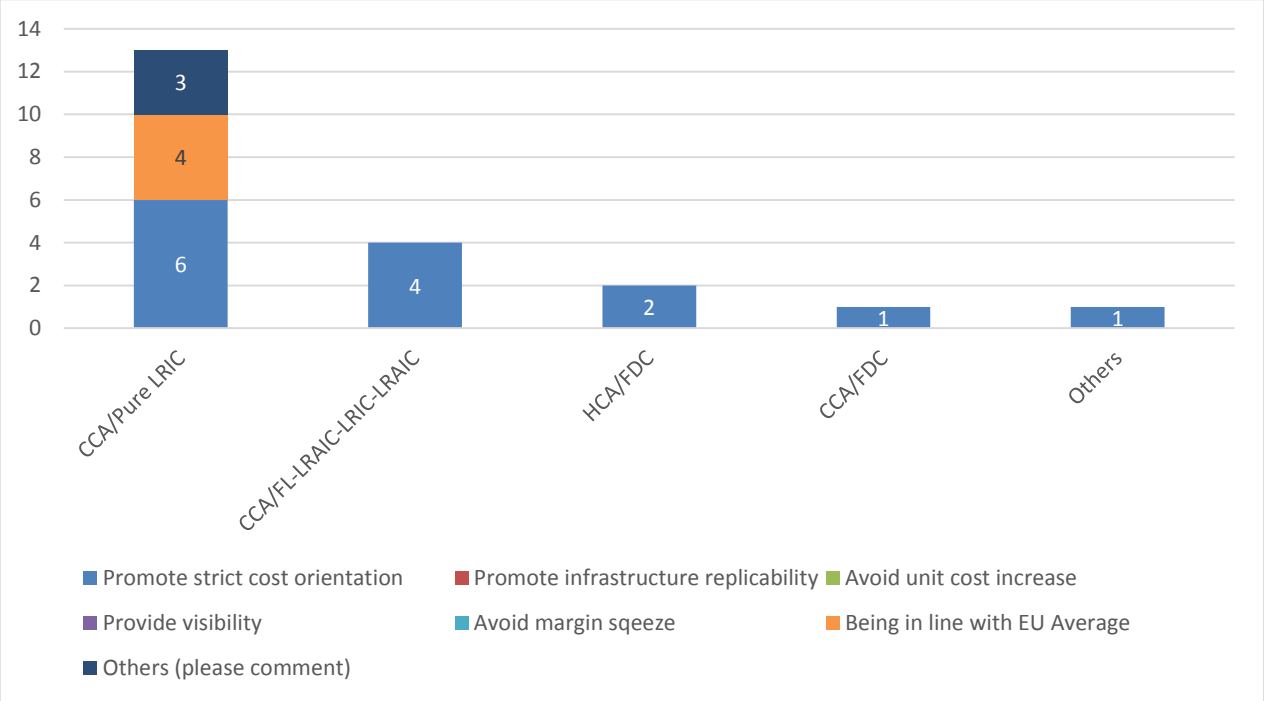
TABLE 2 Motivation	Market 1	Market 2	Market 3a (ULL)	Market 3a (VULA)	Market 3b (active)	Market 4
Promote strict cost-orientation	i) Principle applied: objective, transparent, non-discriminatory and proportionate (no prioritization of objective); ii) Avoiding excessive price and margin squeeze;	i) Avoiding excessive wholesale prices, avoiding margin squeeze; ii) Promote benefits to the consumer; promote competition; iii) Principle applied: objective, transparent, non-discriminatory and proportionate (no prioritization of objective);	i) Avoid margin squeeze; ii) No ranking but market segmentation and different regimes for setting regulated access prices are the main drivers to strike a balance between safeguarding competition and promoting investment; iii) Principle applied: objective, transparent, non-discriminatory and proportionate (no prioritization of objective);		i) No ranking but Market segmentation and different regimes for setting regulated access prices are the main drivers to strike a balance between safeguarding competition and promoting investment.	i) Promote competition without hindering investment and promote benefits to consumers. Ii) Besides avoiding excessive wholesale prices, a second motivation is to avoid margin squeeze
Promote infrastructure replicability	-	-	i) Provide the correct build or buy signal for alternative operators to appropriately invest in infrastructure; be consistent with the 2013 EC Recommendation	i) Promote competition; promote infrastructure replicability; promote investment; promote efficient use of infrastructure.	-	-
Avoid unit cost increase			Promote competition; promote infrastructure replicability; promote investment; promote efficient use of infrastructures.			
Provide visibility						

Avoid margin squeeze				i) No ranking but market segmentation and different regimes for setting regulated access prices are the main drivers to strike a balance between safeguarding competition and promoting investment.	i)Promote internal market and benefits for end user	

Being in line with EU average						
Others	i) Promote competition, Provide efficient build or buy signals (promote infrastructure competition); account for technological process; ii) Promote efficient use of infrastructures; promote infrastructure replicability; promote investment; promote competition; iii) Follow 2009 EC Recommendation (2 NRAs)	i) Promote competition; Provide efficient build or buy signals (promote infrastructure competition); account for technological progress	i) Promote investment; provide visibility; avoid price increase on copper where fiber is not available; ii) Promote competition; provide efficient build or buy signals (promote infrastructure competition); account for technological progress; iii) follow the EC Recommendation to ensure correct incentive for build/buy; iv) Set charges based on efficient forward looking cost in order to maximise benefits for consumers and citizens, and allow recovery of non-replicable assets (e.g. civil infrastructure);		i) To follow the EC recommendations, to ensure correct incentive for build /buy; ii) benefit for consumers and citizens and allow recovery of non-replicable assets (eg. civil infrastructure);	i) Promote competition; provide efficient build or buy signals; account for technological progress; ii) Avoid excessive pricing;

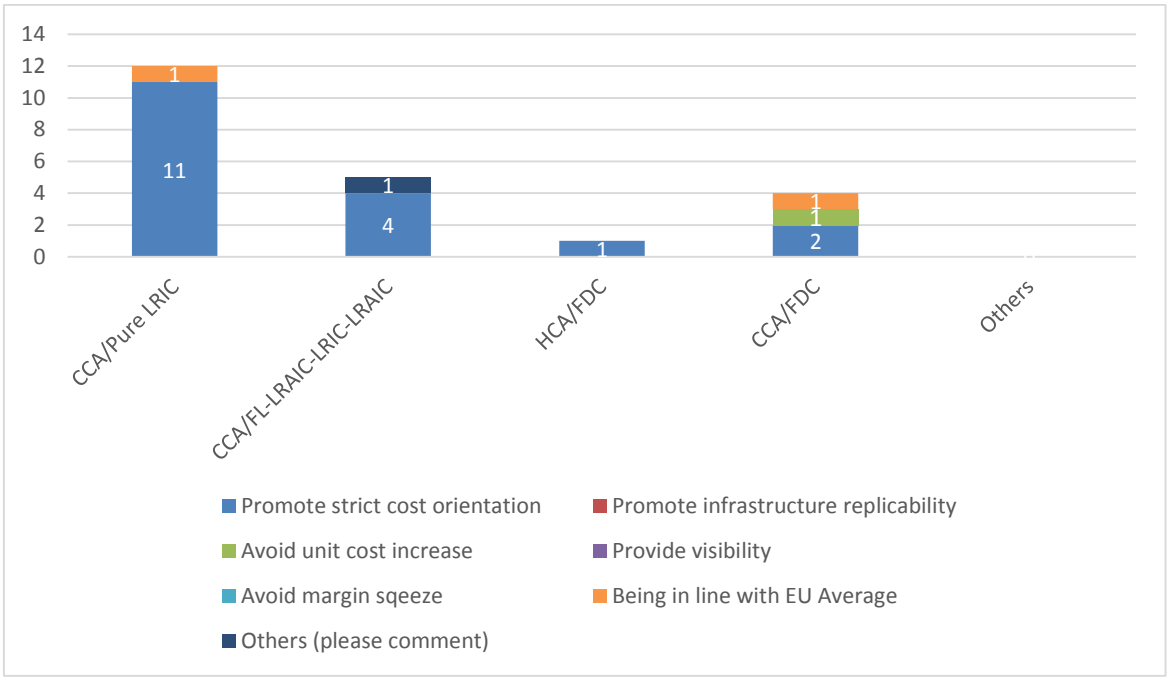
In the following figures the relation between the combinations of costing methodologies and motivation are provided for Market 1, Market 2, Market 3a ULL service, Market 3a VULA service, Market 3b Legacy product and Market 4.

Figure 57 – Combination costing methodology and main motivation (Market 1)



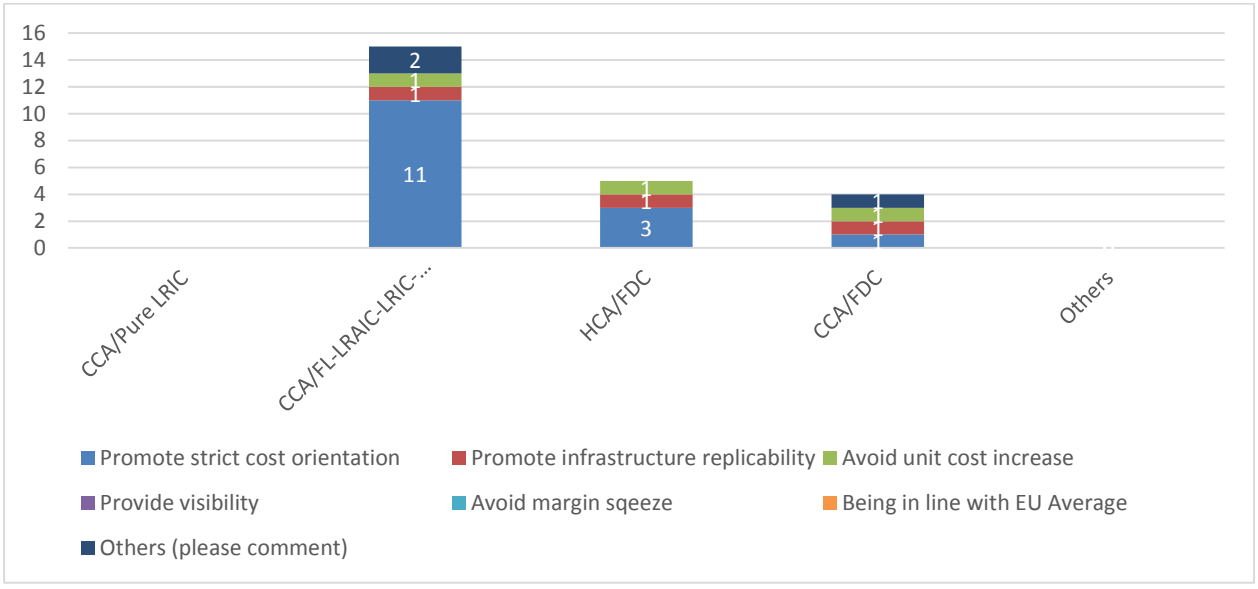
Source: BEREC RA database 2016

Figure 58 – Combination costing methodology and main motivation (Market 2)



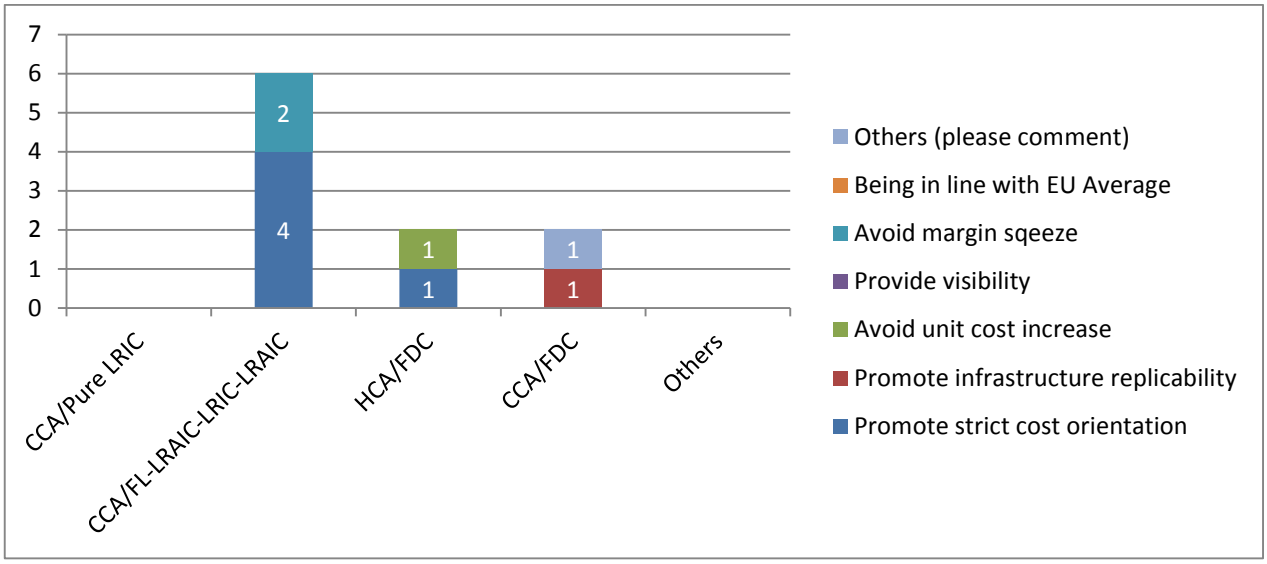
Source: BEREC RA database 2016

Figure 59 – Combination costing methodology and main motivation (ULL service)



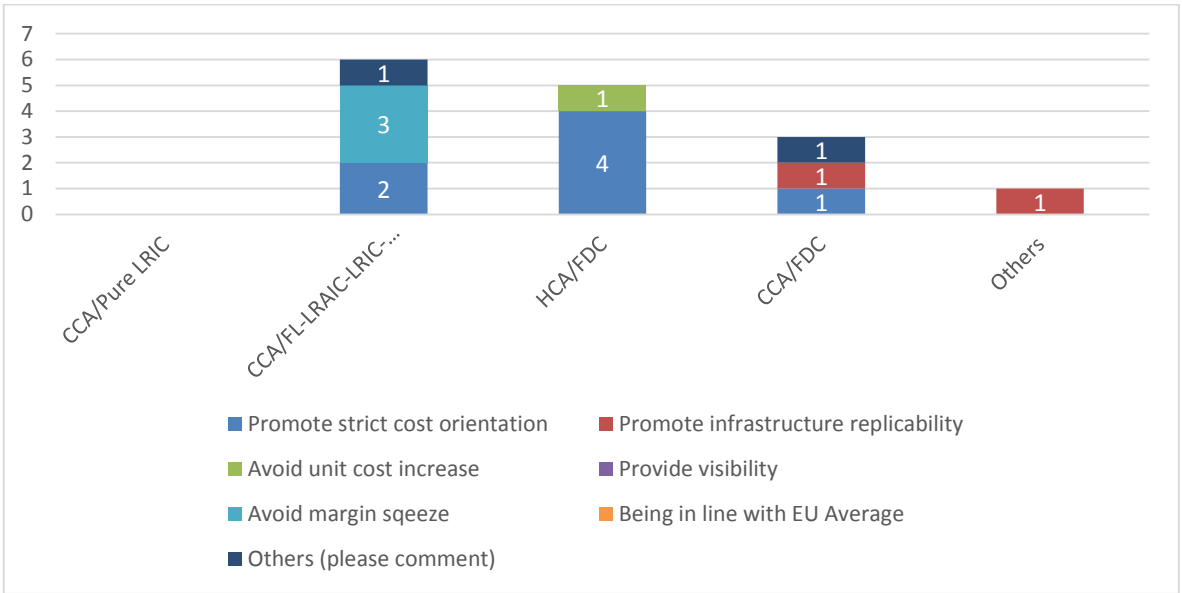
Source: BEREC RA database 2016

Figure 60 – Combination costing methodology and main motivation (VULA service)



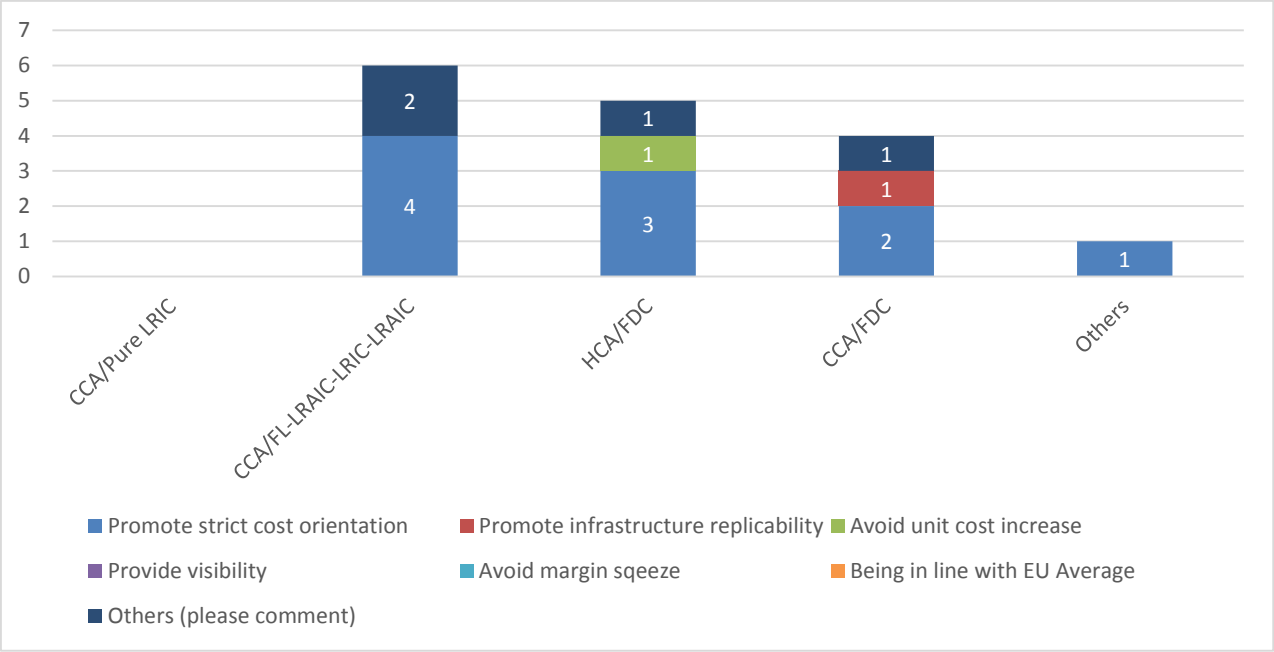
Source: BEREC RA database 2016

Figure 61 – Combination costing methodology and main motivation (M3b legacy service)



Source: BEREC RA database 2016

Figure 62 – Combination costing methodology and main motivation (Market 4)



Source: BEREC RA database 2016

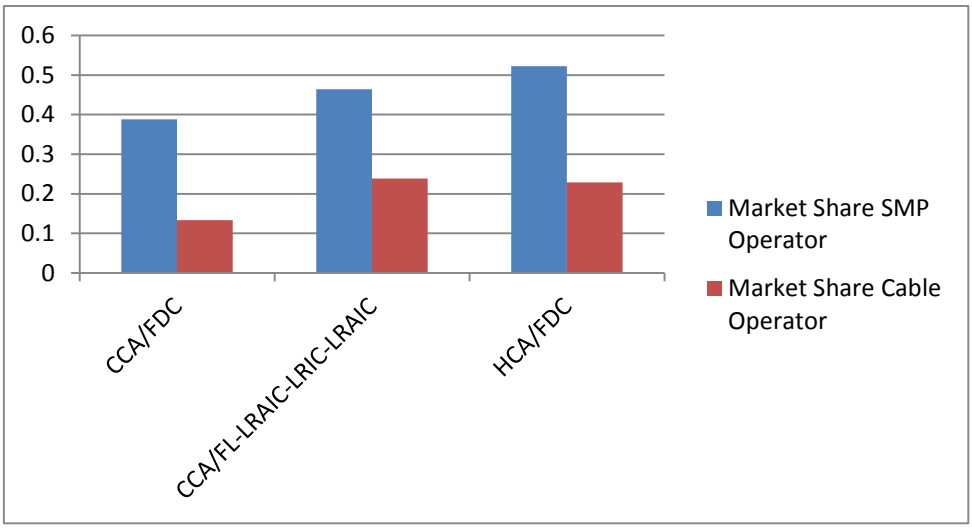
Overall it can be concluded that NRAs pursue the objective of effective price control measures mainly by setting strict cost-oriented prices as this is considered to be the best way to achieve the overarching objectives of Art. 8 Framework Directive (2002/21/EC). Hardly any NRA motivated its choice of costing methodology with the option "avoid unit cost increase" which shows clearly that NRAs are not thinking from the end ("*reverse engineering*", i.e. setting a fixed price not allowing cost variations), but are rather setting prices following a cost concept they consider the best to reach the objectives of the Regulatory Framework (even if this includes allowing cost increases). Although, cost-orientation may be interpreted differently, it has to be mentioned that NRAs consider different cost concepts appropriate to achieve the objectives of the Regulatory Framework exercising their discretion in order to regulate their national markets effectively.

In every case it is also relevant to understand the relation between some structural data parameters (see also Chapter 4), costing methodologies and price control. BEREC asked this year parameters about "Fixed broadband subscriptions - operator market shares SMP operator ("incumbent")" and "Cable operators market share in fixed broadband subscriptions (aggregate market share)". Analysing this two indicators with respect to costing methodologies and price control method on Market 3a (LLU service) the following element can be highlighted. Specifically in Figure 63a (24 NRAs) and 63b (27 NRAs) the arithmetic averages of the market share of the incumbent operator and cable operators are presented in respect to costing methodologies and, separately, in respect to price control method used. It is possible to show that a higher market share of the incumbent operator is positively correlated with costing methodology HCA/FDC and a retail minus price control method. This seems to be consistent with the general consideration that CCA/LRIC in combination with strict cost orientation provides a neutral efficient make or buy decision when access competition is low and NRAs would likely prioritise the

promotion/incentivisation of efficient investment with strict cost-orientation.[71] Data shows also that price cap in combination with CCA/FDC approach is the most used solution in case of a higher competition environment. A less clear impact on price control decision/costing methodology can be found on the level of infrastructure competition based on cable infrastructure.

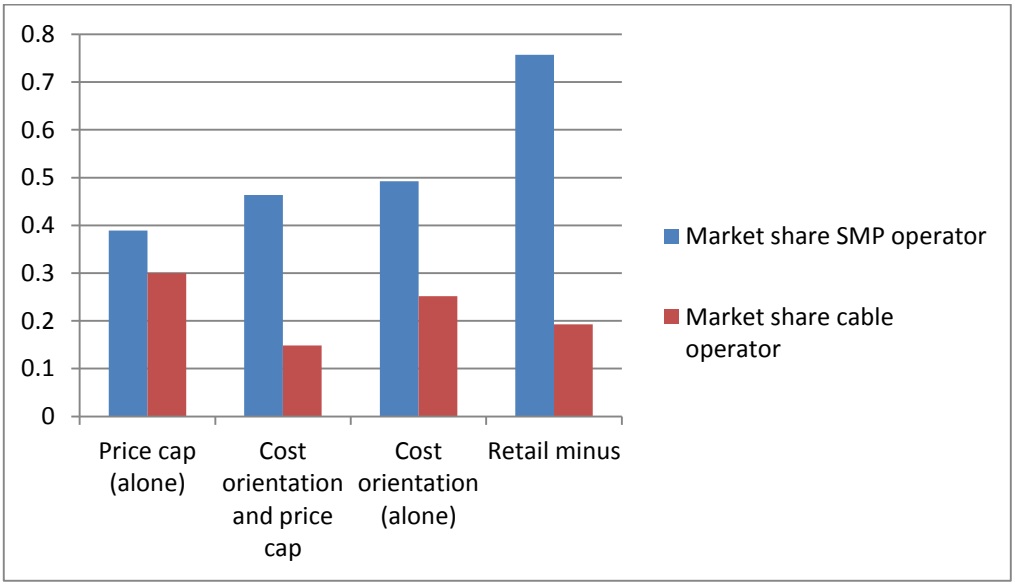
[71] BoR (11) 65

Figure 63a – Combination costing methodology LLU service and one structural parameter



Source: BEREC RA database 2016

Figure 63b – Combination Price control method and one structural parameter (M3a service)



Source: BEREC RA database 2016

6. WACC Calculation

According to Article 13 of the Access Directive, when imposing obligations relating to cost recovery and price controls, a NRA shall take into account the investments made by the SMP operator and allow a reasonable rate of return on adequate capital employed, taking into account the risks involved. This "rate of return" is typically determined using the Weighted Average Cost of Capital (WACC) formula.

Over the years BEREC has collected some information about the estimated WACC used by all the NRAs in each regulated market (i.e. nominal value and WACC type[72]). In BoR (13) 110, an extensive and complex survey has been carried out on the subject of WACC[73] confirming that nearly all NRAs use the CAPM (Capital Asset Pricing Model) to evaluate the equity rate of return from which they derive the WACC as a weighted average of the cost of debt and the cost of equity. In the same survey detailed information has been collected on the determination and the values of the parameters used by each NRA in their WACC calculation such as: i) the equity or asset beta, ii) the market risk premium, iii) the risk free rate, iv) the debt premium, v) the average tax rate and vi) the inflation rate. In the 2013 Regulatory Accounting Report, although information on all seven markets of the 2007 Recommendation was gathered, it was decided to concentrate the WACC analysis on the fixed and the mobile network markets, i.e. Market 4/2007 and Market 7/2007.

Due to the relevance of the topic[74] in this year's report BEREC decided to update in a more widely way the information collected for the WACC section providing an update of the 2013 Annex report as well as providing some new benchmark about WACC parameters estimation methodologies.

BEREC introduced a new questionnaire targeted to collect information in order: i) to update the study done in 2013 mainly focused on parameter values to evaluate the WACC; ii) to understand which are the main methodologies currently used to estimate each parameter starting from predefined options included.

Specifically BEREC asked NRAs to provide separate information about the following main parameters that compose the WACC calculation as well as the WACC value.

	WACC parameters
1.	**Risk Free Rate (RFR)**
2.	**Cost of debt (RFR+ Debt premium)**
3.	**Beta**

[72] For example "before tax real", "before tax nominal" etc.

[73] Annex to the 2013 RA Report "Cost of Capital in Europe – Cost of Capital Parameters in 27 European Countries" (Data as of 1st January 2012).

[74] The European Commission during the 2015 has sponsored a project "Review of approaches to estimate a reasonable rate of return for investments in telecoms networks in regulatory proceedings and options for EU harmonization": https://ec.europa.eu/digital-single-market/en/news/commission-publishes-study-common-approach-calculation-weighted-average-cost-capital-telecoms. The study of The Brattle Group was published on 18 July on the Commission's website: http://data.europa.eu/doi/10.2759/84741; see also https://ec.europa.eu/digital-single-market/en/news/commission-publishes-study-common-approach-calculation-weighted-average-cost-capital-telecoms.

4.	**Equity risk premium (ERP)**
5.	**Gearing**
6.	**Tax rate**
7.	**Inflation**
8.	**WACC Nominal pre-tax**
9.	**WACC Nominal post-tax**
10.	**WACC Real pre-tax**
11.	**WACC Real post-tax**

Although information on all 4 markets of the Commission Recommendation 2014/710/EU was gathered, as done in the 2013 Report it was decided to concentrate the analysis on one fixed and one mobile network market, where the most complete and therefore conclusive information has been provided.[75] Moreover the same information are requested for the NGA fixed service including risk premium. In fact only few NRAs have different values for WACC in Market 1 and Market 3a/3b mainly due to a different time of regulatory decision. For this reason in the following elaboration we consider for the fixed market the information provided for Market 3a or Market 3b and when not explicitly available we included the data set information provided for Market 1. Data have been provided at maximum by 27 NRAs that replied to the WACC section of the questionnaire. Some NRAs replied to all questions, others to a sub set only. For the reason of statistical meaningfulness we include in the following presentation of the analysis all the information provided.
A specific question has been also included about the application of a “risk premium” for NGA fixed access services.

Risk free Rate (RFR)
The Risk free rate (nominal) is the expected return of an asset, which bears in theory no risk at all, i.e. where expected return is certain.
For the risk free rate NRAs usually use the average of a mid to long term time line of interest of country bond. The questionnaire proposed to NRA include the following elements with a predefined options of replay as reported in table below: i) country bond to address if a domestic or different country/ies bond is considered; ii) the length of the bond considered; iii) the sampling period used to estimate the value; iv) the average windows to understand the length of the series included in the estimation; v) the average methodology; vi) if explicit elements have been included to take into account the “Quantitative Easing” measure to estimate the RFR.

[75] The data contained within this section have to be read and interpreted with caution: while utmost care was taken in the questionnaire design – providing technical explanations and definitions where necessary – some questions may have nevertheless been interpreted in different ways. Not all NRAs have provided information on all questions, limiting the representativeness of those questions that have been answered by only few respondents. It has to be taken into account that regulatory periods vary between different NRAs; therefore, parameters provided were estimated at different points in time. It also has to be kept in mind that all data collected for the survey has been provided as available in April 2016.

Table 1 WACC – RFR Questionnaire

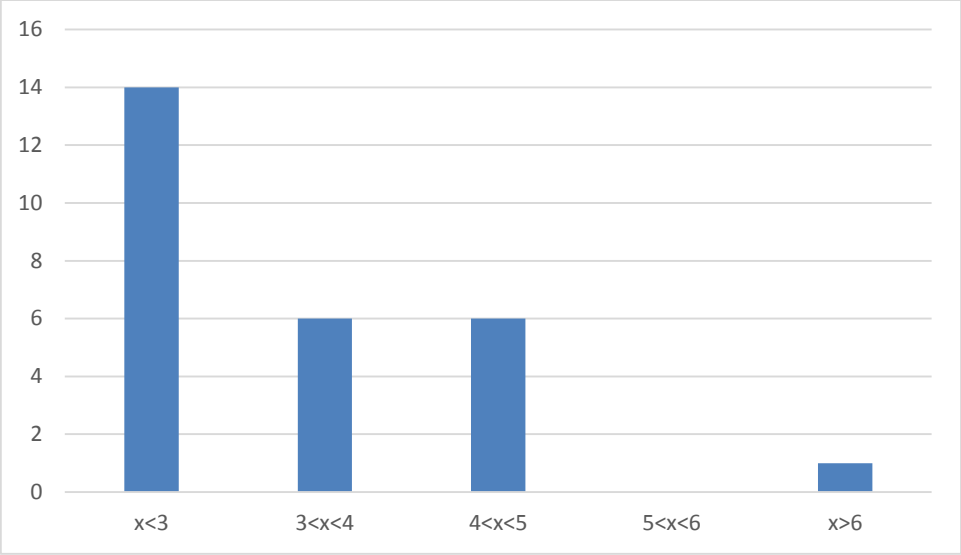
	Country bond	-if "country specific bond" is chosen indicate the country/ies considered	- if "other" is chosen explain your approach	Bond length	Sampling period used	Averaging window	Average methodology	Quantitative Easing	-if "Comment" has been chosen please explain how you have taken into account	Other remarks	Value (%)
Risk Free Rate (in %)	1) Domestic Bond			1Year	Daily	Spoot rate	Arithmetic average	Yes			
	2) Specific Country			3Years	Weekly	3 months	Geometric Average	No			
	3) Others			5Years	Montly	6 months	Moving Average	Comment			
				10Years	Other	1 Year	Median				
				20Years		2 Year	Others				
				Others		3 Year					
						5 Year					
						10 Year					
						Others					

Fixed market

The values of the RFR of 27 NRAs range from 0.77% (minimum) to 6.41% (maximum) with the following arithmetic mean, median and Standard deviation.

Arithmetic Average	Median	Standard deviation
3.03%	3%	1.40%

Figure 1 WACC – Nominal Risk free Rate (value range)



Source: BEREC RA database 2016

From the methodological point of view the following results: the majority of the NRA use domestic bonds for evaluating the risk free rate, few NRAs use also country specific bonds. In this case German or Average Eurozone's government bonds are included. The most used bond length is 10 years with a daily sampling period. For averaging window the most used values are 1-3 and 5 years with an arithmetic average methodology. Some NRAs that explicitly do not reply to the item 2 to 6 indicate to use for RFR an expected long-term normal level.

Regarding Quantitative Easing (QE) one NRA that declared to take it into account explicitly modifies the averaging window to 10 years length. One NRA that comments on it declared that QE is one reason for preferring longer term average yields rather than spot rates.

Table 2 WACC – RFR Methodology results

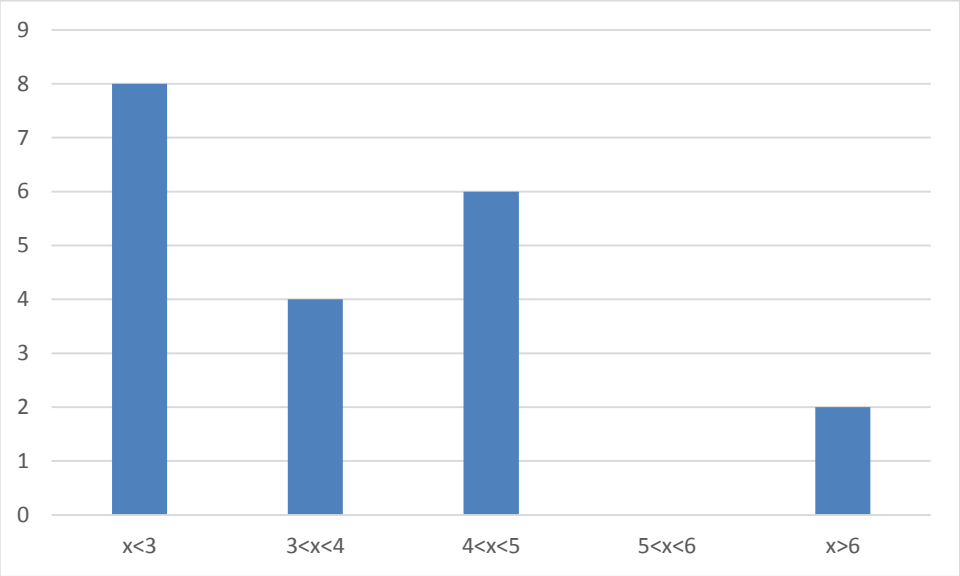
Country bond (1)		Bond length (2)		Sampling period used (3)		Averaging window (4)		Average methodology (5)		Quantitative Easing (6)	
domestic bond	18	1 year	0	daily	11	Spot rate	3	Arithmetic average	17	Yes	2
country specific bond	4	3 years	1	weekly	0	3 months	0	Geometric Average	0	No	13
other	5	5 years	1	montly	7	6 months	1	Moving Average	1	Comment	1
		10 years	21	other	3	1 Year	4	Median	2		
		20 years	0			2 Years	1	Other	2		
		Other	2			3 Years	4				
						5 Years	4				
						10 Years	2				
						Others	3				
Total	27	Total	25	Total	20	Total	21	Total	22	Total	16

Mobile market

The values range of RFR of 20 NRAs is included between 0.77% until 6.41% as in the fixed market with the following arithmethic mean, median and Standard deviation.

Arithmetic Average	Median	Standard deviation
3.50%	4%	1.52%

Figure 2 WACC – Nominal Risk free Rate (value range)



Source: BEREC RA database 2016

Table 3 WACC – RFR Methodology results

Country bond		Bond length		Sampling period used		Averaging window		Average methodology		Quantitative Easing	
domestic bond	10	1 year	0	daily	6	Spot rate	2	Arithmetic average	13	Yes	2
country specific bond	5	3 years	1	weekly	0	3 months	0	Geometric Average	0	No	10
other	5	5 years	0	montly	5	6 months	0	Moving Average	1	Comment	1
		10 years	15	other	3	1 Year	3	Median	1		
		20 years	0			2 Years	1	Other	1		
		Other	2			3 Years	5				
						5 Years	2				
						10 Years	1				
						Others	2				
	20		18		14		16		16		13

Cost of Debt (pre-tax)

The cost of debt is the cost that a company incurs to finance its activities by third party capital (bond, bank loan etc.). The pre-tax cost of debt can be estimated using directly the corporate bond yields or as a sum of two variables the risk-free rate and the premium for the debt (risk premium of default). The questionnaire proposed to NRAs includes the following elements with predefined options for the response as reported in Table 4: i) methodology including if a notional approach is considered in place of a value of the SMP operator; ii) if the premium with respect to the RFR is used or directly the cost of debt; iii) if a market value or a book value approach is used; iv) in case of a market value approach the questionnaire ask about the source data considered; v) the bond window and vi) the average window included as well as the average methodology.

Table 4 WACC – Cost of debt Questionnaire

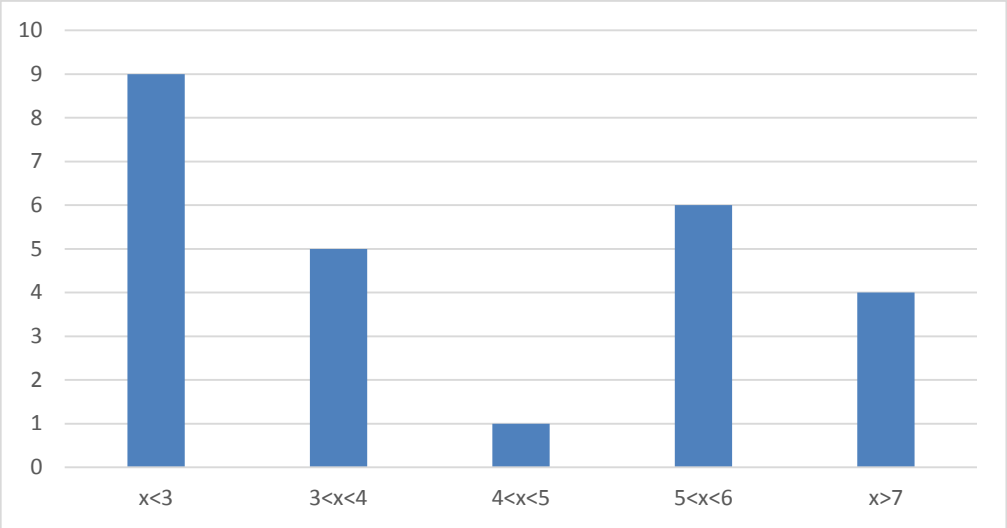
	Methodology			-if "Market value" Source data	-if "Market value" bond window	-if "Market value" Average window	Average methodology	Other remarks	Value (%)
Cost of debt (pre-tax)	notional (generic operator)	Cost of Debt	Book value	Secondary traded market	1 year	Spot rate	Arithmetic average		
	SMP Operator	Debt premium	Market Value (Company bond)	Nominal bond yield	3 years	3 months	Geometric Average		
	Other		Other	Other	5 years	6 months	Moving Average		
					10 years	1 Year	Median		
					20 years	2 Years	Other		
					Other	3 Years			
						5 Years			
						10 Years			
						Others			

Fixed market

The values for the cost of debt range from 1.2% to 7.94% with the following arithmetic mean, median and Standard deviation.

Arithmetic average	Median	Standard deviation

Figure 3 WACC – Cost of debt (pre-tax) (value range)



Source: BEREC RA database 2016

Regarding the methodology the following results: there is no clear preference with respect to the methodology (“notional” or “single SMP operator debt”). If “other” is chosen some NRAs comment about the approach applied explaining that the cost of debt is determined: i) through an average interest rate for loans; ii) benchmark with other European country; iii) as long-term "normal" credit premium of a single generic fixed operator of the country; iv) as an hybrid approach between “single SMP debt” and a “notional” approach comparing and adjusting the “SMP debt” using bond yield of same credit rating operator; v) one NRA also included a sensitivity analysis against an embedded debt approach. Furthermore most of the NRAs prefer estimating the debt premium instead of the whole cost of debt. So in this case both cost of equity and cost of debt include the same RFR in the WACC evaluation. Only one NRA uses a “book value approach” as data source, whereas the nominal bond yield of the SMP operator or of a group of comparable operators in the case of a “market value” approach, is used more often.

Table 5 WACC – Cost of debt (pre-tax) Methodology results

Methodology						**-if "Market value" Source data**		**-if "Market value" bond window**		**-if "Market value" Average window**		**Average methodology**	
notional (generic operator)	8	Cost of Debt	9	Book value	1	Secondary traded market	5	1 year	0	Spot rate	1	Arithmetic average	9
SMP Operator	8	Debt premium	16	Market Value (Company bond)	15	Nominal bond yield	9	3 years	0	3 months	0	Geometric Average	0
Other	8			Other	7	Other	2	5 years	2	6 months	1	Moving Average	0

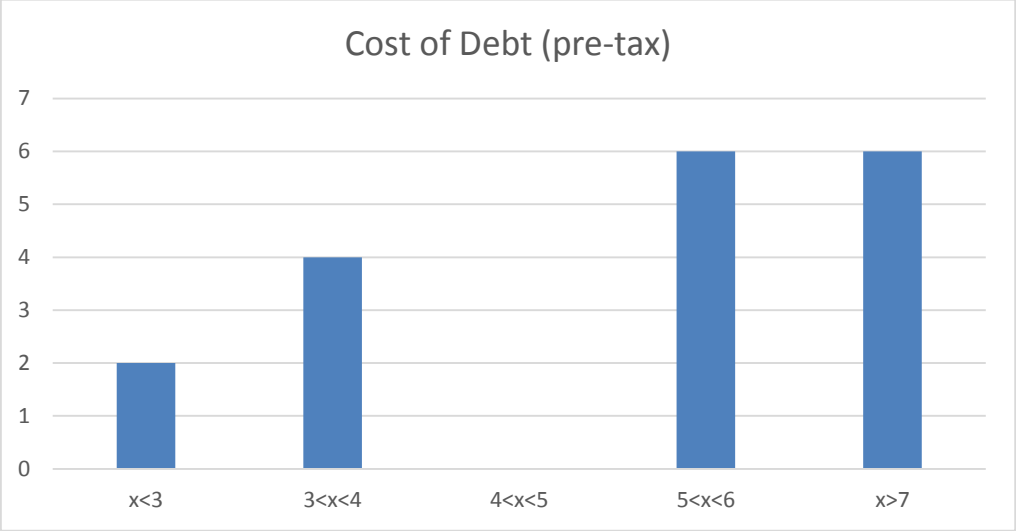
								10 years	9	1 Year	2	Median	1
								20 years	0	2 Years	0	Other	4
								Other	3	3 Years	2		
										5 Years	2		
										10 Years	2		
										Others	1		
Total	24		25		23		16		14		11		14

Mobile Market

The values for the cost of debt range from 2.05% to 7.93% with the following arithmetic mean, median and Standard deviation.

Arithmetic average	Median	Standard deviation
5.40%	5.62%	1.65%

Figure 4 WACC – Cost of debt (pre-tax) (value range)



Source: BEREC RA database 2016

For the mobile market two NRAs declared to analyse also the CDS spread with respect to country bond rate to estimate the debt premium. Finally, one NRA declared to not evaluate the debt premium as the gearing ratio is 0.

Table 6 WACC – Cost of debt (pre-tax) Methodology results

Methodology						-if "Market value" Source data		-if "Market value" bond window		-if "Market value" Average window		Average methodology	
notional (generic operator)	12	Cost of Debt	2	Book value	0	Secondary traded market	4	1 year	0	Spot rate	2	Arithmetic average	5
SMP Operator	1	Debt premium	15	Market Value (Company bond)	12	Nominal bond yield	7	3 years	0	3 months	0	Geometric Average	1
Other	5			Other	4	Other	2	5 years	1	6 months	0	Moving Average	0
								10 years	9	1 Year	3	Median	0
								20 years	0	2 Years	0	Other	5
								Other	2	3 Years	2		
										5 Years	1		
										10 Years	2		
										Others	1		
	18		17		16		13		12		11		11

Beta

The beta is the systematic risk of a given equity security and indicates how varies the stock yield of an undertaking with respect to the general market return. The beta levered (equity beta) includes also the capital structure of the undertaking, in the CAPM model this parameter multiplied with the Equity Risk Premium (ERP) of the country provides the component of the market risk premium included in the cost of equity. The questionnaire proposed to NRAs the following elements with a predefined option of replay as reported in Table 7: i) methodology including if a notional approach is considered in place of a value of the SMP operator; ii) the number of comparable operators used; iii) the sampling period of the series; iv) the time window of the series; v) the kind of adjustment used to eventually correct the pure CAPM model; vi) the questionnaire also requested information about the approach used by NRAs to “unlever” and “relever” the beta to make a fair comparison between comparable operators in terms of equity yield; vii) different options have been included to provide an indication about the “formula” used to unlever and relever the beta.

Table 7 WACC – Beta Questionnaire

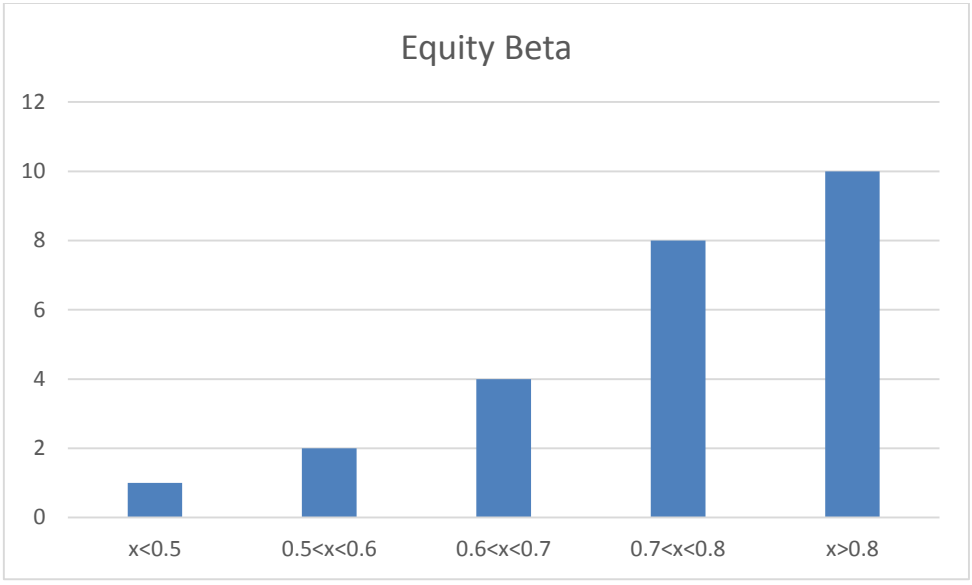
	Methodology	-if notional please indicate the number of comparable used	Sampling period used	Time window	Adjustment Used	Market reference index used	Do you unlever your beta?	- if yes which formula do you apply?	Other remarks	Value (Equity Beta)	Value (Asset Beta)	Value (Beta Debt)
Beta	notional (generic operator)		daily	1 week	Dimson		yes	Modigliani-Miller				
	SMP Operator		weekly	1 month	Bayesian/Blume		no	Miles & Ezzell				
	Other		montly	3 month	Vasicek			Hamada				
			other	6 months	others			Other				
				12 months	No Adjustment							
				2 years								
				3 years								
				5 years								
				10 years								
				others								

Fixed market

The values for the equity beta range from 0.45 to 1.06 (25 NRAs); for the asset beta the values ranges from 0.41 to 0.99 (18 NRAs) and for debt beta from 0.1 to 5.25 (6 NRAs) with the following arithmetic mean, median and Standard deviation.

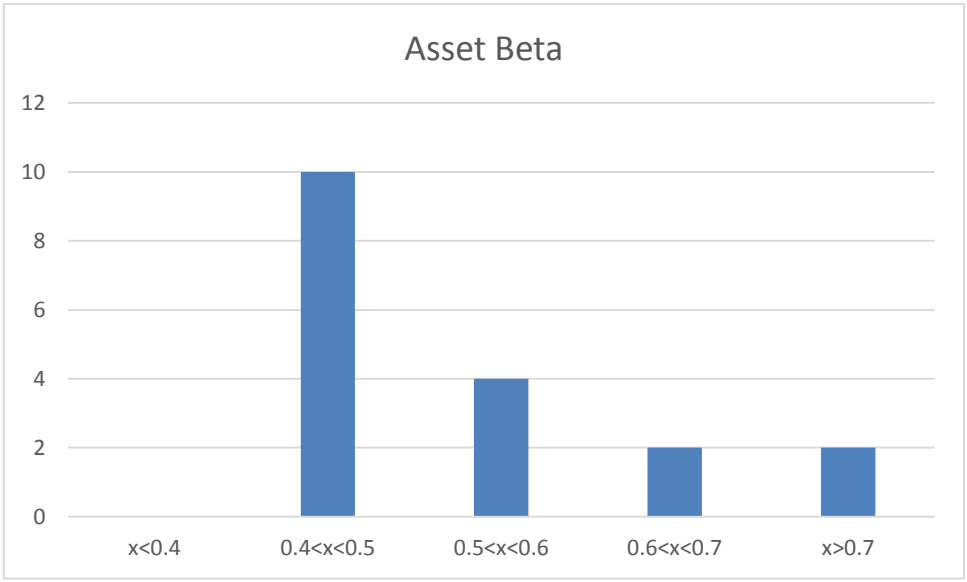
	Arithmetic average	Median	Standard deviation
Equity beta	0.78	0.78	0.13
Asset beta	0.56	0.50	0.14
Beta debt	1.16	0.41	1.83

Figure 5 WACC – Beta levered (equity) (value range)



Source: BEREC RA database 2016

Figure 6 WACC – Beta unlevered (beta asset) (value range)



Source: BEREC RA database 2016

Regarding the methodology to estimate the beta the following results: there is a preference of a "notional" methodology with respect to using directly the beta of the SMP operator, but a

consistent part of the NRAs chose "other" as option, too, i.e. a hybrid approach.[76] Regarding the length of the historical series for beta estimation, most NRAs use 5, 3 or 2 years. Moreover there is a preference to apply some adjustment to the pure CAPM model mainly through the Bayesian/Blume approach. Almost all the respondents re-lever the estimated beta through a Modigliani Miller formula. The questionnaire also asked about the number of comparable operators and in this case most NRAs used around 10 operators, whereas one NRA is using up to 20 operators. Finally market index is used by 7 NRAs, only. Two of them use an European index, two a local index, two a world index and one NRA uses both a local and a world index.

Table 8 WACC– Beta Methodology result

Methodology		Sampling period used		Time window		Adjustment Used		Do you unlever your beta?		- if yes which formula do you apply?	
notional (generic operator)	10	daily	7	1 week	2	Dimson	0	yes	19	Modigliani-Miller	14
SMP Operator	7	weekly	6	1 month	0	Bayesian/Blume	9	no	4	Miles & Ezzell	0
Other	10	montly	3	3 month	0	Vasicek	2			Hamada	1
		other	4	6 months	0	others	2			Other	2
				12 months	2	No Adjustment	9				
				2 years	5						
				3 years	4						
				5 years	6						
				10 years	0						
				others	3						
	27		16		2		11		23		15

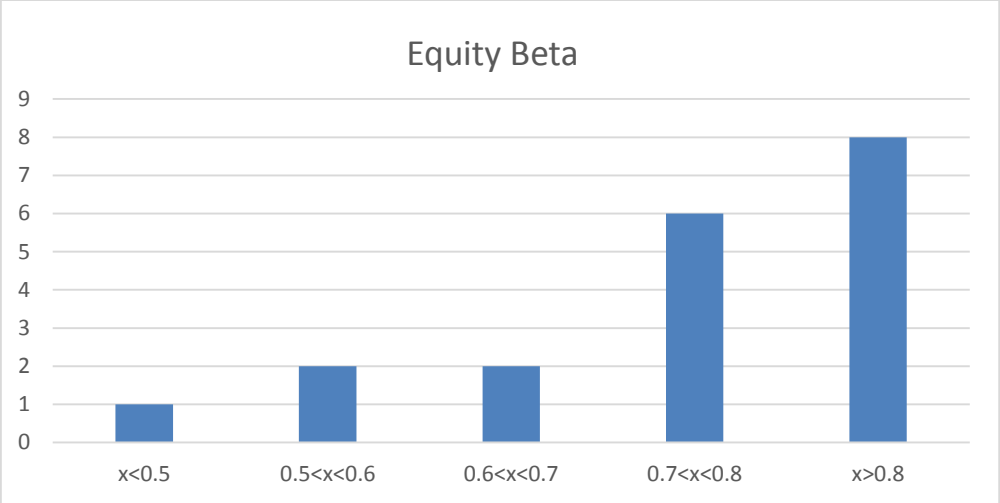
Mobile market

The value for the equity beta ranges from 0.5 to 1.51 (19 NRAs); for the asset beta from 0.33 to 1 (17 NRAs) and for the debt beta from 0.1 to 5.25 (5 NRAs) with the following arithmetic mean, median and Standard deviation.

	Arithmetic average	Median	Standard deviation
Equity beta	0.85	0.78	0.29
Asset beta	0.62	0.60	0.16
Beta debt	1.36	0.48	1.95

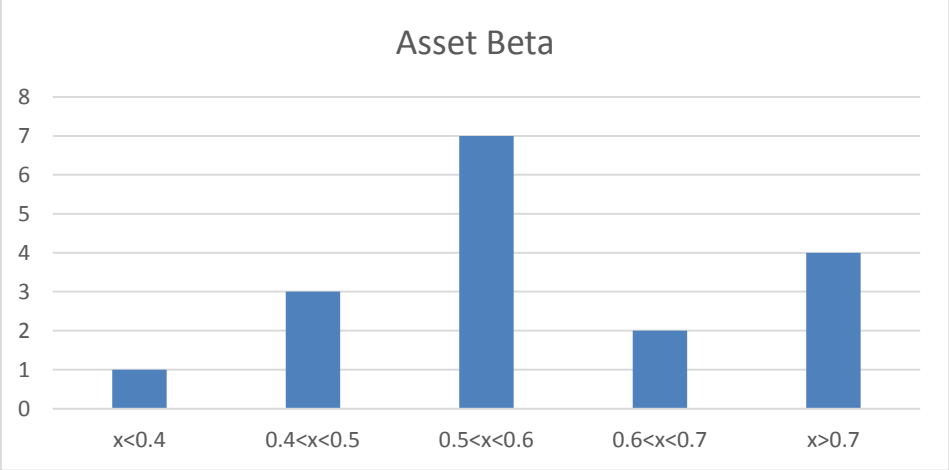
[76] The comments provided are not sufficient to find conclusive result about the approach used in case of "Other" option.

Figure 7 WACC – Beta levered (equity) (value range)



Source: BEREC RA database 2016

Figure 8 WACC – Beta unlevered (beta asset) (value range)



Source: BEREC RA database 2016

For the mobile market in general the main difference with respect to the fixed one is in the peer group considered. Specifically, few NRAs provide information about the number of peer group considered with a maximum of 28 comparable, a minimum of 3 comparable, with an average of 11. One NRA specified that the comparables are only the European operators. Moreover about the market index used to implement the CAPM model, NRAs that reply to the questionnaire, declared to use the same index both for fixed and mobile market.

Table 9 WACC – Beta Methodology result

Methodology		Sampling period used		Time window		Adjustment Used		Do you unlever your beta?		- if yes which formula do you apply?	
notional (generic operator)	12	daily	5	1 week	1	Dimson	1	yes	14	Modigliani-Miller	11
SMP Operator	2	weekly	2	1 month	0	Bayesian/Blume	5	no	2	Miles & Ezzell	0
Other	5	montly	2	3 months	0	Vasicek	0			Hamada	0
		other	4	6 months	0	others	3			Other	2
				12 months	2	No Adjustment	7				
				2 years	2						
				3 years	3						
				5 years	5						
				10 years	0						
				others	2						
	19		9		1		6		16		11

Equity Risk Premium (ERP)

The equity risk premium (ERP) is the difference between the yield of the market and the activity without risk. It is generally estimated averaging daily information from historical series about the difference between the market yield and the bond rate. The questionnaire proposed to NRAs to include the following elements with a predefined option of replies, as reported in Table 10: i) methodology, including the notional approach, if considered, in place of a country specific value; ii) if an historical or a forward looking approach is used; iii) the kind of averaging methodology is in charge.

Table 10 WACC – ERP Questionnaire

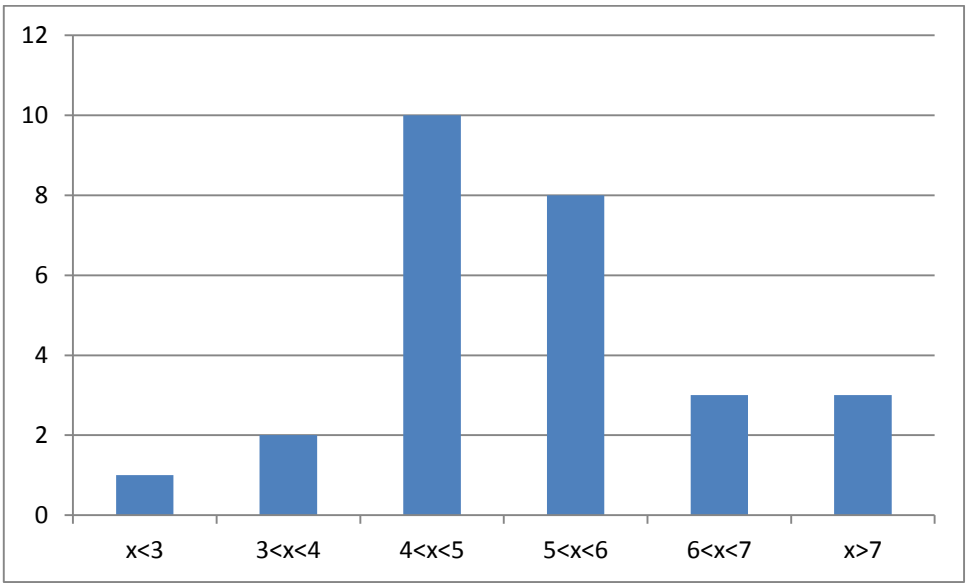
	Methodology		- if historical data provide the legth of the series	Average methodology	Value (%)
ERP	Notional value	Historical data		Arithmetic average	
	Country specific	Dividend grow model		Geometric Average	
	Other	Other		Moving Average	
				Median	
				Other	

Fixed market

The value for the Equity risk premium (ERP) ranges from a minimum of 1.06% to 18.48% (27 NRAs) with the following arithmetic mean, median and Standard deviation.

Arithmetic average	Median	Standard deviation
5.69%	5.25%	2.79%

Figure 9 WACC – Equity Risk Premium (value range)



Source: BEREC RA database 2016

For this methodology the following results come out: there is a preference of a "notional" methodology with respect to use a domestic ERP. The historical data analysis is the most used in conjunction with an arithmetic average. About the length of the series few NRAs reply to the question indicating historical series that starting from 1900.

Table 11 WACC – Equity Risk Premium Methodology result

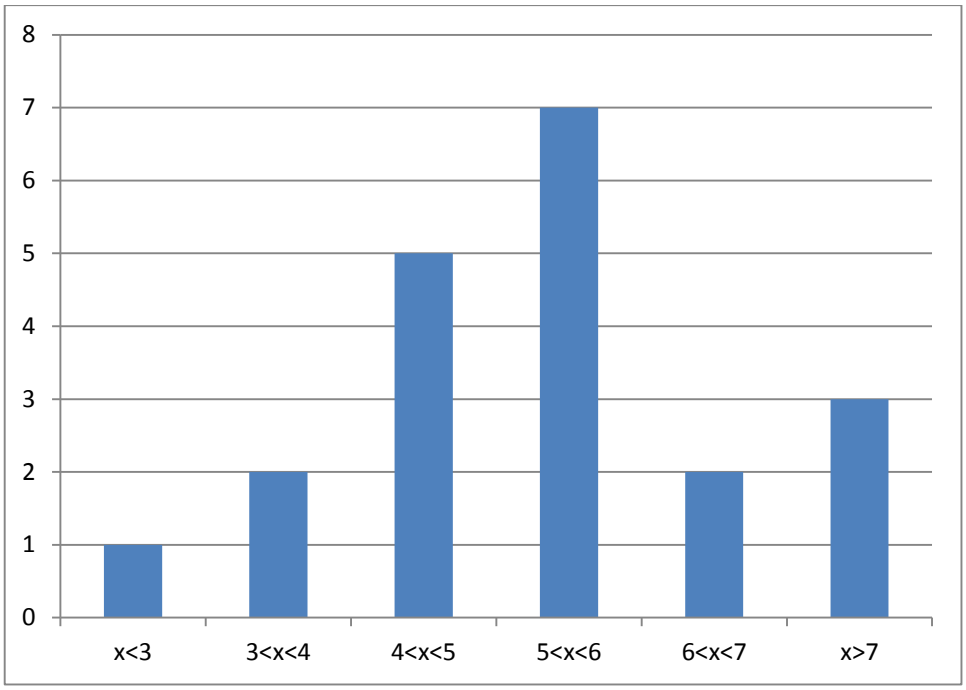
Methodology				**Average methodology**	
Notional value	11	Historical data	15	Arithmetic average	9
Country specific	7	Dividend grow model	0	Geometric Average	4
Other	6	Other	10	Moving Average	0
				Median	1
				Other	7
	24		25		13

Mobile market

The values for the Equity Risk Premium (ERP) range between a minimum of 2.45% until a value of 11.88% (20 NRAs) with the following arithmetic mean, median and Standard deviation.

Arithmetic average	Median	Standard deviation
5.69%	5.53%	1.94%

Figure 10 WACC – Equity Risk Premium (value range)



Source: BEREC RA database 2016

From this methodology the following results come out: there is no clear difference with respect to the fixed case in the methodology.

Table 12 WACC – Equity Risk Premium methodology result

Methodology				Average methodology	
Notional value	8	Historical data	11	Arithmetic average	8
Country specific	6	Dividend grow model	0	Geometric Average	2
Other	3	Other	7	Moving Average	0
				Median	0
				Other	6
	17		18		10

Gearing ratio

The gearing ratio is the ratio between the Debt and the sum of Equity and Debt. It provides the weight for the cost of equity in the WACC calculation. It can be generally estimated from the book value of the undertakings, or can be evaluated from the market value of equity and debt. The proposed questionnaire included the following elements with a predefined option of replies as reported in Table 13: i) methodology, including a notional approach, if considered, in place of a value of the SMP operator; ii) the methodology used to estimate the value; iii) and in case of notional methodology NRAs were asked about the average methodology.

Table 13 WACC – Gearing Ratio Questionnaire

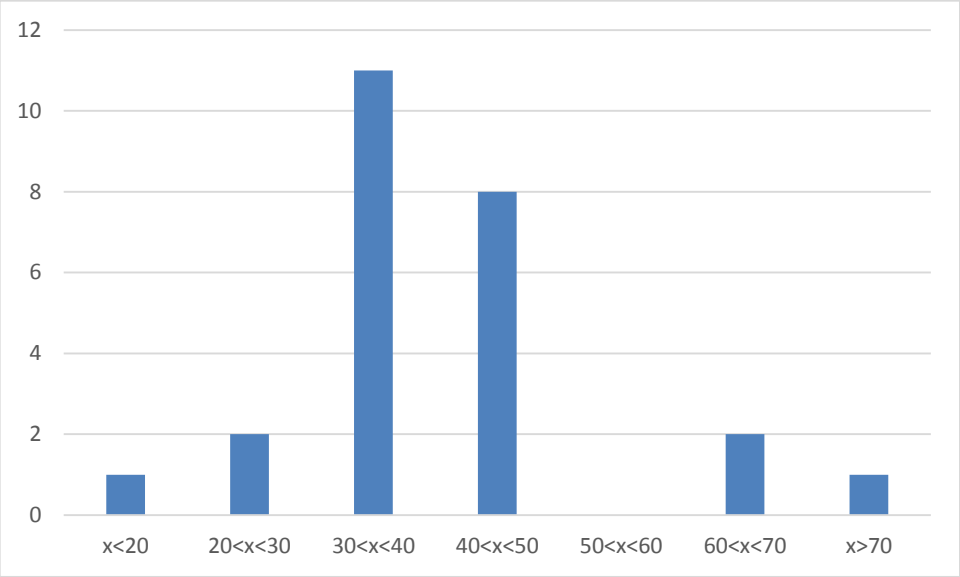
Methodology		-if notional value "Average methodology"	Value (%)
Notional (generic operator)	Book value	Arithmetic average	
SMP Operator	Market value	Geometric Average	
Other	Other	Moving Average	
		Median	
		Other	

Fixed market

The value for the gearing ratio ranges from 0.0088% up to 72.47% (25 NRAs) with the following arithmetic mean, median and Standard deviation.

Arithmetic average	Median	Standard deviation
41.10%	40.00%	14.14%

Figure 11 WACC – Gering Ratio (value range)



Source: BEREC RA database 2016

From this methodology the following results come out: there is a preference of a “notional” methodology with respect to use an SMP evaluation. The most part of the respondent use a market value approach applying an arithmetic average.

Table 14 – Gearing Ratio Methodology result

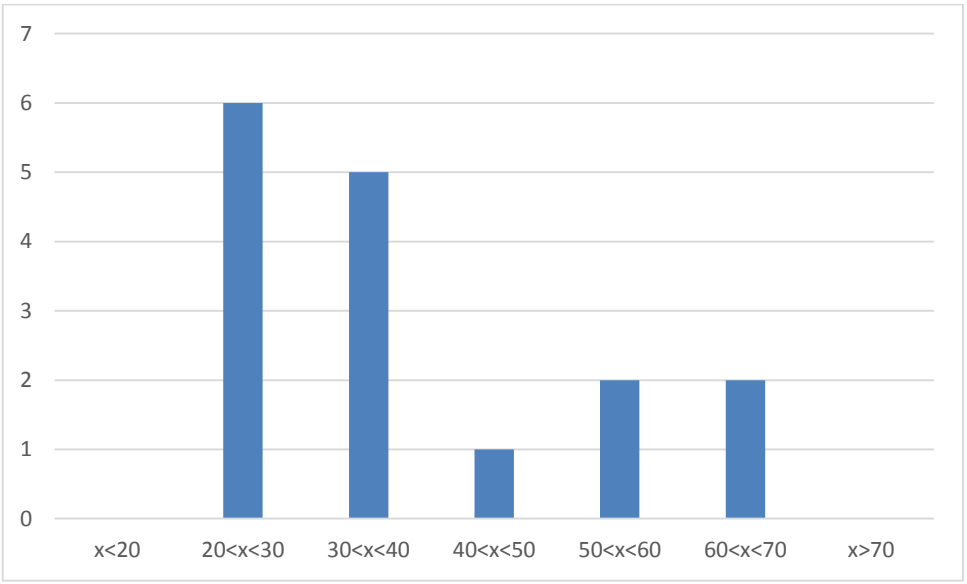
Methodology				**-if notional value "Average methodology"**	
Notional (generic operator)	11	Book value	4	Arithmetic average	6
SMP Operator	8	Market value	12	Geometric Average	0
Other	4	Other	8	Moving Average	0
				Median	2
				Other	3
	23		24		11

Mobile Market

The value for the gearing ratioranges from 22% to 77% (17 NRA) with the following arithmetic mean, median and Standard deviation.

Arithmetic average	Median	Standard deviation
37.82%	33.62%	14.01%

Figure 12 WACC – Gering Ratio (value range)



Source: BEREC RA database 2016

From this methodology the following results come out: with respect to fixed market a more clear preference seems to be given to the case of a market value approach, moreover also the arithmetic average is not the preferred solution in this case.

Table 15 WACC – Gearing Ratio Methodology result

Methodology				-if notional value "Average methodology"	
Notional (generic operator)	10	Book value	0	Arithmetic average	2
SMP Operator	3	Market value	9	Geometric Average	0
Other	2	Other	5	Moving Average	0
				Median	2
				Other	4
	15		14		8

Tax Rate (Corporate Tax)

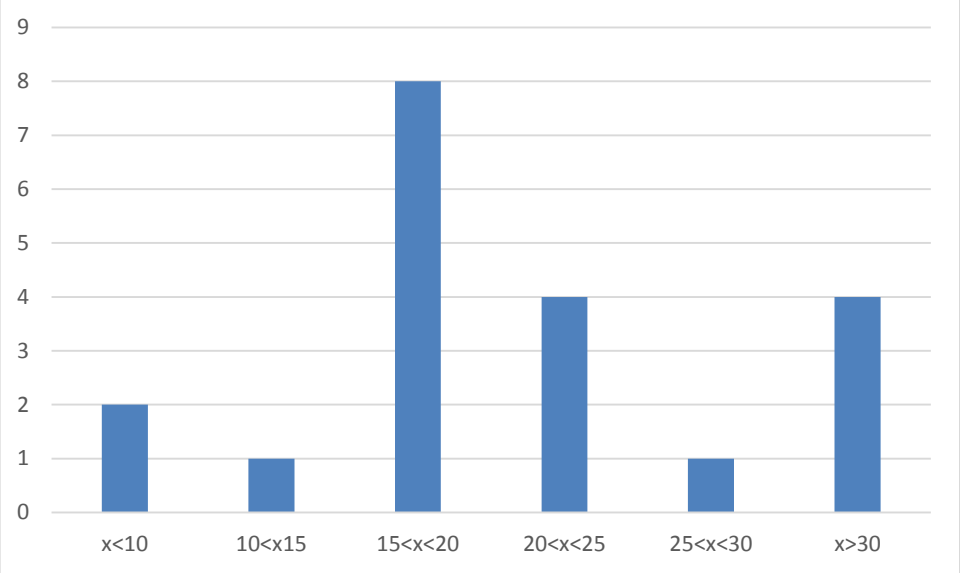
The average tax rate is used to determine the pre-tax values of the WACC, in a way that the WACC can include not only the financial charge, but also the fiscal one; the tax rate is generally used to make a discount of the cost of the equity and of the cost of the debt, . No information has been provided on the specific formula used to evaluate the pre-tax cost of equity and the pre-tax cost of debt. In the next evaluation the numerical difference between fixed and mobile market are manly related to the number of NRAs considered in the group, even if from one regulatory period to another the tax rate can change. In the mobile group of NRAs considered only two NRAs provided different “tax rate” for fixed and mobile.

Fixed market

The value for the corporate tax ranges from a minimum of 9% to 36% (26 NRAs) with the following arithmetic mean, median and Standard deviation and distribution.

Arithmetic Average	Median	Standard deviation
21.86%	20.45%	7.68%

Figure 13 WACC – Corporate Tax Rate (value range)



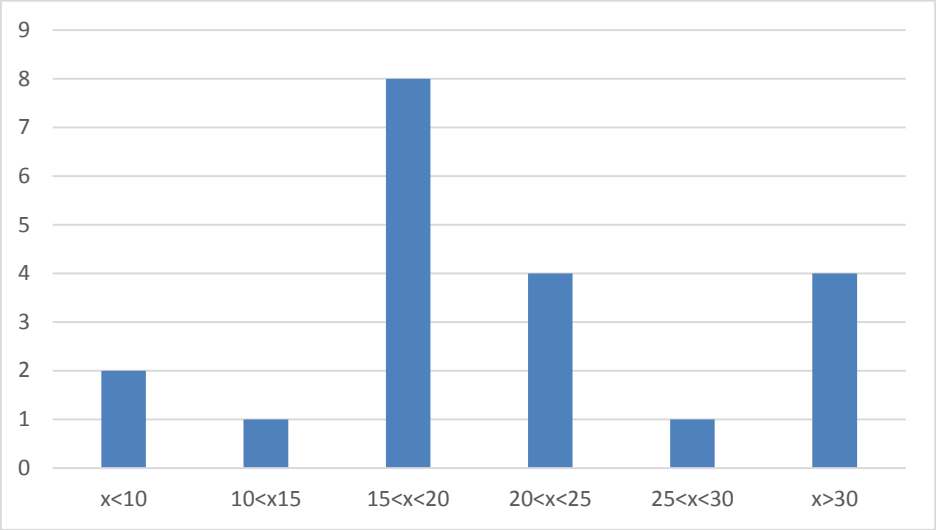
Source: BEREC RA database 2016

Mobile Market

The value for the corporate tax are ranges from 9% to 36% (26 NRAs) with the following arithmetic mean, median and Standard deviation and distribution.

Arithmetic Average	Median	Standard deviation
22.22%	20%	7.76%

Figure 14 WACC – Corporate Tax Rate (value range)



Source: BEREC RA database 2016

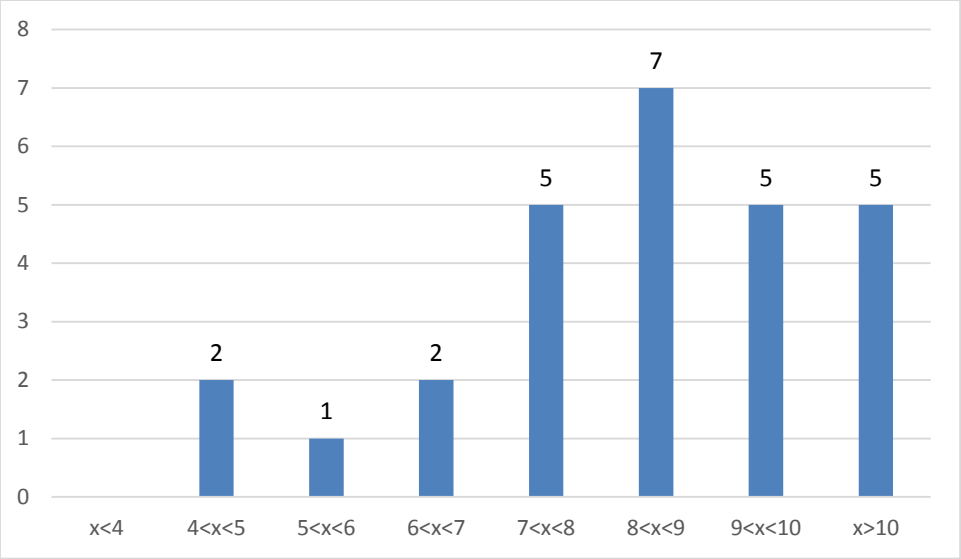
WACC nominal (pre-tax)

Fixed market

Twenty seven NRAs provided information about value on Nominal pre-tax WACC with the following results:

Arithmetic Average	Median	Standard deviation	Min	Max
8.52%	8.55%	1.99%	4.2%	12.6%

Figure 15 WACC – WACC Nominal pre-tax (value range)



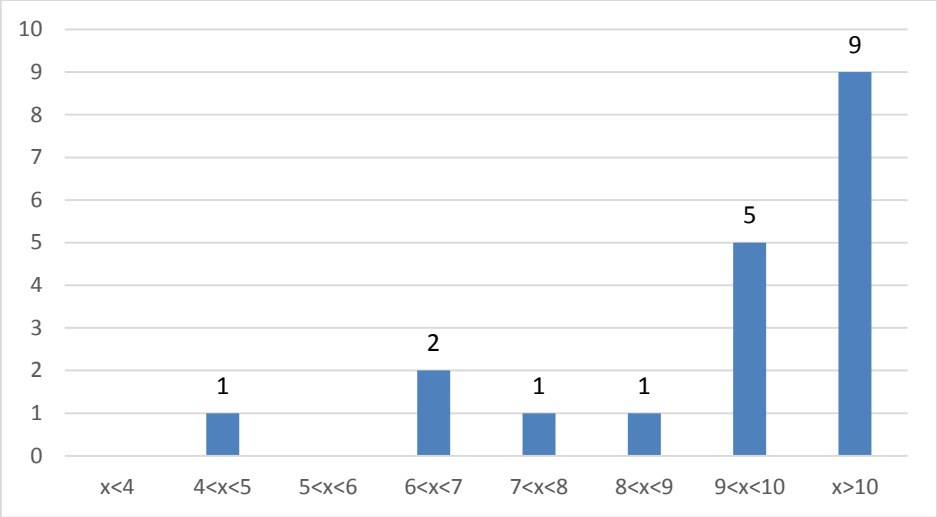
Source: BEREC RA database 2016

Mobile Market

Nineteen NRAs provided information about value on Nominal pre-tax WACC with the following results:

Arithmetic Average	Median	Standard deviation	Min	Max
9.46%	9.97%	1.92%	4.58%	11.83%

Figure 16 WACC – WACC Nominal pre-tax (value range)



Source: BEREC RA database 2016

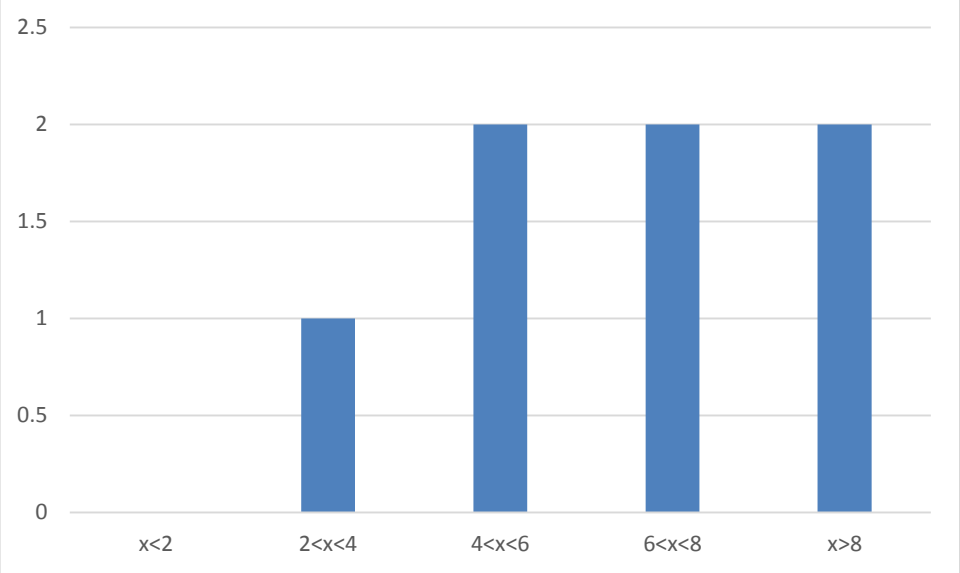
WACC real pre-tax

Fixed market

Seven NRAs provided information about value of Real pre-tax WACC with the following results:

Arithmetic Average	Median	Standard deviation	Min	Max
6.38%	6.20%	2.23%	2.93%	9.98%

Figure 17 WACC – WACC Real pre-tax (value range)



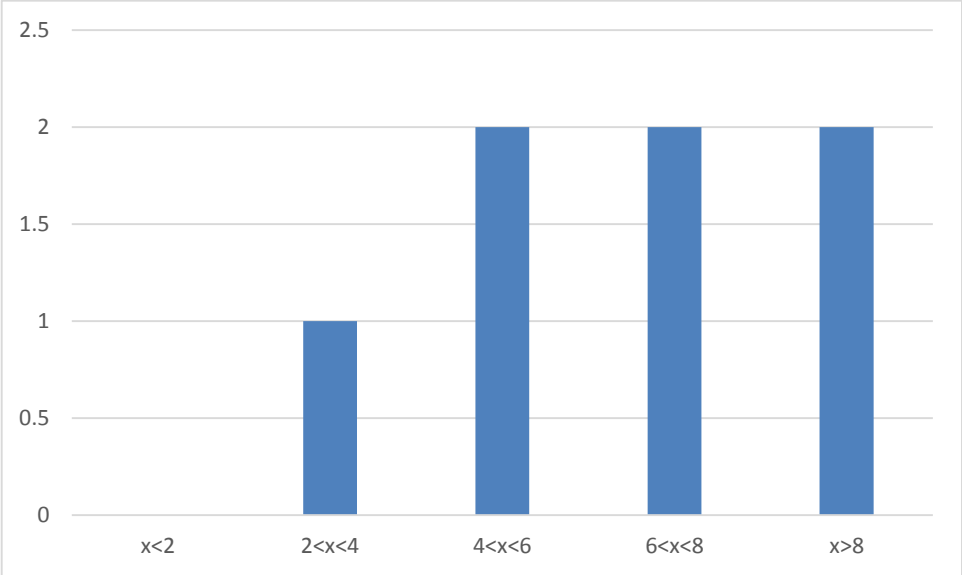
Source: BEREC RA database 2016

Mobile market

Seven NRAs provided information about value of Real pre-tax WACC with the following results:

Arithmetic Average	Median	Standard deviation	Min	Max
6.92	6.70	2.91	2.75	12.49

Figure 18 WACC – WACC Real pre-tax (value range)



Source: BEREC RA database 2016

Risk premium on NGA access products

BEREC has also included a separate questionnaire to take into account the specificity of the NGA access products. The NRAs that consider a different WACC for NGA services do this applying a specific risk premium for that. The questionnaire proposed to NRAs is reported in table 16, asking: i) on which architecture the risk premium is applied, ii) on which asset (active or passive); iii) the main methodology used to derive it; iv) the value of the premium separated for architecture.

Table 16 WACC – Risk Premium for NGA Questionnaire

	Do you consider a risk premium for NGA product?	On wich Architecture do you consider the premium?	Where do you apply your premium?	Describe briefly the methodology	Value (%) (FTTC)	Value (%) (FTTB)	Value (%) (FTTH)
Risk Premium	Yes	Only FTTC	All asset (active and passive)				
	No	Only FTTB	Only passive asset (civil infrastructure/fibre cables)				
		Only FTTH					
		both FTTC&FTTH/B					
		both FTTB & FTTH					

The following results come out: 9 NRAs reply to apply a risk premium for NGA services, 5 NRAs apply a risk premium on FTTH or FTTH/FTTB architecture, 1 NRA apply a risk premium only on

FTTC and 3 NRAs apply a risk premium to all architectures FTTC and FTTH/B. The 88% of NRAs that reply “yes” apply to all asset (active and passive) the premium.

Table 17 WACC – Risk Premium “Methodology” result

Do you consider a risk premium for NGA product?[77]		On wich architecture do you consider the premium?		Where do you apply your premium?	
Yes	9	Only FTTC	1	All asset (active and passive)	8
No		Only FTTB	0	Only passive asset (civil infrastructure/fibre cables)	1
		Only FTTH	4		
		both FTTC&FTTH/B	3		
		both FTTB & FTTH	1		

Moreover two NRAs declared to have used a benchmark to determine the premium; one NRA declared to include in the risk premium a systematic component and a not systematic component; one NRA determined the risk premium comparing the risk between a FTTH-based business model and a copper-based business model taking into account the uncertainty of demand; one NRA determined the premium applying the option pricing model including only not systematic risk related to two different options included, one related to the “wait and see” and the other related to the fact the under mandatory access, the access seeker has the flexibility to purchase access or not purchase access, in this last case the option in practical terms is evaluated through the impact of risk sharing pricing mechanism (contract length and fractional of total charge prepaid) on NGA business case.
About the values of risk premium provided by 9 NRAs in the survey the following results come out:[78]

	Value (%) (FTTC) (4)	Value (%) (FTTH) (8)
Mean	1.51%	2.79%
Standard Deviation	0.58%	1.16%
Median	1.28%	2.91%
Min	1.00%	1.25%
Max	2.50%	4.81%

[77] Only NRAs that reply “yes” has been reported.
[78] Only values for FTTC and FTTH are reported as the NRAs that appy a premium also on FTTB architecture do not differentiate between FTTB and FTTH.

Key points for WACC: The outlined survey on the WACC calculation indicates that nearly all NRAs use the same methodology, i.e. the CAPM for determining the equity rate of return. Differences of the cost of capital thus reflect differences in national financial market conditions.
No significant variations between fixed and mobile markets with regard to methodological choices can be seen. The standard deviation of all considered parameters is below the 50% from the average meaning, therefore a quite homogenous approach in all cases may be detected.
More in detail, the standard deviation of the cost of debt seems to have a greater difference between fixed and mobile. Specifically, by comparing the answers given for the methodology behind this parameter, it can be shown that, in case of the fixed market, methodologies are more widespread than in the mobile case. In case of mobile, the standard deviation for the cost of debt is about 30% of the average, while in the fixed market the standard deviation is about 44% of the average (differences may be affected by the tendency to use the SMP cost of debt in the fixed market instead of a notional approach). Differences occur also in the approach used for the estimation: in case of mobile the cost of debt is obtained mainly through a debt premium on RFR, while in the fixed case there is a higher number of NRAs that estimate the cost of debt independently from the RFR. Moreover, the difference in the standard deviation between fixed and mobile of the ERP parameter (49%[79] of the average for fixed and 34% of the average for mobile) can be attributed mainly to the elaboration of data, rather than to real differences in methodology (i.e. only NRAs that provided data specifically for Market 2 have been considered for data elaboration).
When differences between fixed and mobile market have been declared for the ERP, these can be justified also by lag time between decisions in different markets. Regarding RFR, the standard deviation of fixed and mobile are respectively about 46% and 43% of the average. In this case the variations can be mainly attributed to the specific financial condition of the country as the most part of NRAs in both cases use domestic bond for evaluating the RFR.
These preliminary results will be further analysed by BEREC and compared to the results of the Commission's study "Review of approaches to estimate a reasonable rate of return for investments in telecoms networks in regulatory proceedings and options for EU harmonization" by The Brattle Group, published in July 2016 in the next year carry-over to Work Programme 2017.

7. Conclusions

The overall picture of the cost accounting methodologies (chapter 3) is relatively stable in comparison to last year with just a small number of changes by NRAs. Price control methods and

[79] Not including one evident outlier in the fixed market the standard deviation with respect to the average reduces to 24%.

costing methodologies for different markets and products have been analysed both from a static point of view (current year situation) and from a dynamic point of view (data since 2008).

To summarize the main outcomes we can distinguish between termination markets (Markets 1/2014 and 2/2014) on one side, where the calculation of a single tariff of the termination service is almost the only task to be addressed as price control remedy, and wholesale access market (Markets 3a/2014, 3b/2014 and 4/2014) on the other side, where the definition of price control and costing methodology is only one of the elements to be addressed in the remedies tool box.

In the first case cost orientation alone is clearly the main instrument to apply the price control obligation; for these markets the benchmarking approach is also frequent. Since the adoption of Recommendation of 2009/396/EC, the application of a pure LRIC approach with CCA cost base is the predominant costing methodology mainly used to derive termination rates. Regarding the annualisation methodology, the survey shows that, in these markets, Economic Depreciation is becoming common (more for mobile termination than for fixed) as an instrument to ensure stable prices in case of highly variable volume demand.

With regard to the wholesale access market (Markets 3a/2014, 3b/2014), data shows that "combinations" of methodologies and geographical market definition provide a more differentiated situation within the same market for the price control obligation and costing methodologies. For Market 3a and 3b thus it is better to apply a "product based" approach rather than a "market based" approach to the monitoring process of price control and costing methodologies. About Market 3a, by considering copper LLU service, cost orientation (alone or in combination with price cap) is the most used approach for price control, in combination with a costing methodology based on CCA-LR(A)IC approach with "tilted annuity" as annualisation method. The analysis over time shows a trend towards CCA and LRIC accounting methods which has been increasing significantly since the adoption of the Recommendation (2013/466/EU). In case of NGA services (fiber LLU, or VULA services) even if cost orientation is still the preferred price control method applied, also ERT (economic replicability test) or no price control method have been declared by some NRAs.

About the implementation of the Recommendation 2013/466/EU in Market 3a at the moment only 13 NRAs (among 32 NRAs that apply a price control method for LLU services) replied to explicitly take it into account: 7 following the framework of Recommends 30-37 (BU-LRIC+ model), and 6 following the framework of Recommend 40.

For product in Market 3b (Central Access for mass-market products) the situation is more spread: together with cost orientation also retail minus, ERT and no price control are quite common as price control methodology, both for legacy bitstream products and NGA products. It is also relevant to mention that only 17 NRAs over 26 in Market 3b, that provide explicitly information on this market, declared to have NGA bitstream offers. Taking into account the analysis over time in this market CCA is, by far, the most common cost base over time, in combination with LRIC and FDC, while even if cost orientation is chosen as main price control method over the years, but changes in favour of more flexible approaches such as price cap or combinations of methodologies mainly due to a geographical approach to regulation are on-going. It is relevant to mention that when "provide strict cost orientation" is declared as main objective for choosing the costing methodology, it is mainly chosen when a combination of FDC/HCA approach is applied, instead "avoid margin squeeze" is mainly chosen when a combination of CCA/LR(A)IC approach is in charge.

About Market 4 (High quality Access), cost orientation is the most used price control methodology, moreover only a few NRAs (5) over 32 NRAs that declared to have an offer in this market include also a passive product (e.g. dark fibre). Taking into account the analysis over time it is possible to

observe a quite stable situation where FDC is the prevailing allocation methodology over time, cost orientation is the recurrent price control methodology and CCA is the preferred cost base. Few changes happen to price control method mainly due to an application of a geographical approach to regulation during the years.

About Wholesale Line Rental, there is a constant number of 25 countries on 31 respondents in the last four years where a reference offer is still available, in this case retail minus is the most common price control method, HCA and CCA are used quite in the same proportion and FDC is clearly the preferred choice of allocation methodology.

The analysis of the structural data (chapter 4) confirms that countries' profiles significantly vary in terms of population, topography, market situation etc.. These factors influence the regulation strategy of NRAs for the wholesale access markets. In fact the trade-off of incentivising only efficient investment, looking at the same competitive output in term of choice, quality and economic condition of services cannot be achieved in the same way and in the same path across Europe due to different structural, economic parameters. In terms of choice of costing methodologies and price control methods it seems that NRAs apply a quite coherent approach based on starting with FDC/HCA and retail minus in case of less competitive market with higher retail price due to lack of competitive constraint, moving through cost orientation based on CCA/LR(A)IC approach providing a neutral make or buy signal, and then providing greater flexibility to the SMP operator at wholesale level (i.e. price cap) in case of a more competitive situation.

The analysis of the main motivation behind the choice of the costing methodology (chapter 5) showed that the "strict cost orientation" is chosen as a tool to promote competition, stimulate investments and increase consumer benefit. With respect to previous years there is an increase of NRAs that declared as main motivation to enhance replicability of infrastructures due to the increase of the relevance of the objective of enhancing NGA coverage from all operator (not only SMP).

Regarding the WACC, the in-depth survey and the update provided in this report (chapter 6) shows that nearly all NRAs use the Capital-Asset-Pricing-Model (CAP-M)[80] and hence the same parameters for determining the WACC, but the value of these parameters naturally differs reflecting different national financial market conditions (from risk free rate to tax and inflation rates in the individual European countries). Furthermore, the regulatory periods and therefore the update periods for the WACC parameters differ in each country. No significant variations between fixed and mobile markets with regard to methodological choices can be seen. The analysis of the parameters used by NRAs to calculate the WACC shows a quite homogenous methodological approach for this calculation.

The overall 2016 EU picture confirms the trend towards an increasingly consistent approach to regulatory accounting approaches and a stabilisation in the application of methodologies for cost valuation or cost allocation among NRAs. The latter indicates that NRAs are providing predictable and stable regulatory environments in their countries. The convergence of regulatory accounting approaches is more pronounced for the termination markets whereas we see a more differentiated picture for the wholesale access markets reflecting the different national market situations and structural factors influencing the regulatory strategy.

[80] Cf. BoR (13) 110.

A.1 Countries participating in the 2016 survey

1.	Austria
2.	Belgium
3.	Bulgaria
4.	Croatia
5.	Cyprus
6.	Czech Republic
7.	Denmark
8.	Estonia
9.	Finland
10.	France
11.	Germany
12.	Greece
13.	Hungary
14.	Ireland
15.	Italy
16.	Latvia
17.	Lithuania
18.	Liechtenstein
19.	Luxemburg
20.	Malta
21.	Montenegro
22.	Norway
23.	Poland
24.	Portugal
25.	Republic of Serbia
26.	Romania
27.	Slovakia
28.	Slovenia
29.	Spain
30.	Sweden
31.	Switzerland
32.	The Netherlands
33.	Turkey
34.	United Kingdom

A.2 References

- COMMISSION RECOMMENDATION of 19 September 2005 on accounting separation and cost accounting systems under the regulatory framework for electronic communications (2005/698/EC).
- COMMISSION RECOMMENDATION of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC).
- COMMISSION RECOMMENDATION of 20 September 2010 on regulated access to Next Generation Access Networks (NGA) (2010/572/EU).
- COMMISSION RECOMMENDATION of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU).
- COMMISSION RECOMMENDATION of 9 October 2014 on relevant product and service markets within the electronic communications sector susceptible to *ex ante* regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services (2014/710/EU).
- ERG (05) 29 Common position on EC Recommendation on Cost accounting and accounting separation, published in September 2005, available on http://berec.europa.eu/documents/erg/index_en.htm.
- IRG (05) 24 Regulatory accounting in practice 2005, available on http://www.irg.eu/template20.jsp?categoryId=260350&contentId=543311.
- ERG (06) 23 Regulatory accounting in practice 2006.
- ERG (07) 22 Regulatory Accounting in Practice Report 2007.
- ERG (08) 47 Regulatory Accounting in Practice Report 2008.
- ERG (09) 41 Regulatory Accounting in Practice Report 2009.
- BoR (10) 48 Regulatory Accounting in Practice Report 2010.
- BoR (11) 34 Regulatory Accounting in Practice Report 2011.
- BoR (12) 78 Regulatory Accounting in Practice Report 2012.
- BoR (13) 110 Regulatory Accounting in Practice Report 2013.
- BoR (14) 114 Regulatory Accounting in Practice Report 2014.
- BoR (15) 143 Regulatory Accounting in Practice Report 2015.
- BoR (11) 65 BEREC's response to Commission public consultation on costing methodologies.
- BoR (13) 41 BEREC Opinion on the Commission draft recommendation on non-discrimination and costing methodologies.
- ERG (07) 83 ERG CP on symmetry of fixed call termination rates and on symmetry of mobile call termination rates.
- EU Working document "Broadband Access in the EU, situation at 1 July 2015".

- Fischer, Der neue Fischer Weltalmanach 2016, Frankfurt am Main 2015 (editorial deadline 01.07.2015), www.weltalmanach.de.
- International Telecommunication Union (ITU), 2015 data.

A.3 Glossary of terms

General terms

1. **Regulatory cost accounting:** Regulatory cost accounting is an accounting system with specific regulatory rules and conditions under which the costs, the revenues and the capital employed of services and activities have to be recorded. Regulatory cost accounting is often derived from the statutory accounting system of the regulated operator but includes specific regulatory rules and standards in addition to the rules and standards provided for by the Generally Accepted Accounting Principles. The regulatory cost accounting system must respect the principles of cost causality, objectivity, consistency and auditability. A regulatory cost accounting obligation may be imposed by the regulator on operators with significant market power.

2. **Accounting separation:** An accounting separation system is a comprehensive set of accounting policies, procedures and techniques that demonstrates compliance with non-discrimination obligations and the absence of anticompetitive cross-subsidies from a vertically integrated regulated operator. The outputs from such a system must be capable of independent verification (auditable) and fairly present the financial position and relationship (transfer charge arrangements) between the wholesale and retail activity of the vertically integrated operator. As the regulatory cost accounting system, the accounting separation system must respect the principles of cost causality, objectivity, consistency and auditability. An accounting separation obligation may be imposed by the regulator, together with a regulatory cost accounting obligation, on operators with significant market power.

3. **Forward looking cost:** The economic cost of an activity is the actual forward-looking cost of accomplishing that activity in the most efficient possible way, given technological, geographical, and other real world constraints that exist. In contrast to embedded costs, forward-looking costs are those associated with present and future uses of the firm's resources. Only these costs are relevant for making present and future production and investment decisions, for placing resources in alternative uses, and for setting prices for the services to be provided at current time or in the future.[81]

4. **Cost model / Costing methodology:** The cost model / costing methodology contains all the rules and guidelines on how to derive the relevant cost (cost base, depreciation methodology) for regulatory purposes and how to attribute those costs (allocation methods) to the regulated services.

[81] This definition comes directly from the ITU Regulatory Accounting Guide.

Terms related to the cost base and asset valuation methodologies

5. **Cost base:** The cost base is the relevant set of costs that can be attributed, directly or indirectly, to a given activity or to the production of a service. Two main approaches exist in terms of assessment of the cost base:

   5.1. **Top-down:** In a top-down (TD) approach, the accounted costs of the operator's regulatory accounts are used in order to assess the relevant regulatory cost base for a given activity or service or for a set of activities or services. A top-down approach usually implies that the actually incurred costs are taken into account, i.e. without efficiency adjustments.

   5.2. Bottom-up: In a bottom-up (BU) approach, an engineering model which satisfies the expected demand in terms of subscribers and/or traffic for a given service or for a set of services is used in order to assess the relevant regulatory cost base for such service or set of services. A bottom-up approach usually implies calculating the costs an efficient operator would incur.

6. **Capital expenditures (CAPEX):** Capital expenditures are investments in fixed, physical, non-consumable assets, such as infrastructures and equipment.

7. **Capital costs:** Capital costs are the annual costs originated by capital expenditures (CAPEX) and recorded in firm's accounts in the form of annuities. Annuities include two components: depreciation, which correspond to the depreciation of the value of the asset, and cost of capital employed, which corresponds to the cost of holding the capital i.e. the opportunity cost of the sum invested.

8. **Operating expenditures (OPEX):** Operating expenses or operating expenditures are the on-going costs for running a product, business, or system by the firm. In firm's accounts or in bottom-up models, those expenses are the sum of the expenses made over a period of time, generally a year.

9. **Gross replacement costs:** Gross replacement cost (GRC) are the price that would be paid on a given date for an asset bought in the past. It is calculated based on the recorded technical progress rate for such asset. The net replacement cost is equal to the gross replacement cost net of accumulated depreciation.

10. **HCA:** In an historical cost accounting (HCA) approach, the actually incurred costs recorded in the regulated operator's statutory accounts, most often annualized following a straight-line depreciation methodology, are used in order to assess the relevant regulatory cost base. As historical costs may include inefficient investments, incorporate tax optimisation and may especially lack data of the pre-liberalisation era, adjustments might be applied.

11. **CCA:** In a current cost accounting (CCA) approach, the operator's asset base is annualised based on the gross replacement cost of the assets. CCA belongs to the family of constant annualisation methodologies where the depreciation share is stable and the cost of capital share decreases over time, resulting in decreasing annuities. Nevertheless, unlike historical cost accounting, in current cost annualisation methods the amortization is adjusted

according to variations in the price of the assets being considered due to technical progress and general variations in price (inflation). Three main kinds of CCA exist:

11.1. **FCM:** Financial capital maintenance (FCM): CCA FCM aims to maintain the enterprise's financial capital: whatever transpires the sum of the discounted annuities must be equal to the initial investment

11.2. **OCM:** Operating capital maintenance (OCM): under CCA OCM it is the gross replacement value, in other words the current price of an asset with the same productive output, expressed in constant Euros, which is amortised.

11.3. **MEA:** Modern equivalent asset (MEA): refers to assessing costs of a network rolled-out today, i.e. reflecting modern least cost technology instead of legacy technology, as this would be the cost relevant in a competitive market.

Terms related to cost annualisation methodologies

12. **Annualisation methodology:** As capital expenditures are intended to create future benefits for the firm, they are annualised in firm's accounts by means of annualisation methodologies. Annualisation methodologies spread investment costs over time based on regulatory assets lives and, for every asset, they result in a series of annualised costs (called annuities), each of which corresponds to the portion of the investment cost allocated to the year.

13. **Straight-line (linear) depreciation:** Straight line depreciation belongs to the family of constant depreciation methodologies. In these methodologies, the depreciation share is stable and the cost of capital share decreases over time which results in decreasing annuities. Constant depreciations not readjusted for price evolution are usually referred to as "linear depreciation".

14. **Annuity:** The annuity methodology calculates the charge that, after discounting, recovers the asset's purchase price and financing costs in equal annual costs. At the beginning, the payment will consist more of capital payments and less of depreciation charges, while over time it will be the opposite, resulting in an upward sloping depreciation schedule (increasing depreciation charges).

15. **Tilted annuity:** The tilted annuity methodology is an annuity methodology where the annuity value changes from year to year at the same rate as the price of the asset is expected to vary. When asset's price is expected to change over time, a tilted annuity methodology would be more appropriate than a flat annuity methodology.

16. **Economic depreciation:** The economic depreciation methodology takes into account both price changes and output changes. It becomes more appropriate when, besides asset's price changes, there is an expectation of changes in output which may affect unit costs evolution.

Terms related to cost allocation methodologies

17. **Allocation methodology:** Allocation methodologies are used to assess the cost of individual services/products in the context of a multi-product firm. The choice of a particular method depends on the objectives and the competitive environment. The implementation of

one particular allocation methodology has a significant impact on the costs of a service/product and, therefore, on the regulated wholesale prices as well.

18. **Fully distributed cost (FDC) / fully allocated cost (FAC):** Using the fully distributed cost or fully allocated cost approach, the total costs of a product or service are taken into account, i.e. the costs actually incurred by the operator. These include a share of the joint and overhead costs, arrived at by applying certain allocation bases. Thus, in contrast to the marginal cost approach, fixed costs independent of output are also taken into consideration. Usually also parts of joint and common cost are included in the calculation.

19. **Long run incremental cost (LRIC):** Long run incremental cost is the cost of producing a specific additional increment of a given service in the long run (the period over which all costs are variable) assuming at least one other increment is produced. It includes all the directly assignable variable economic costs of a specific increment of service, which is usually less than the whole service. In principle, there are an infinite number of different sized increments that could be measured. However, these increments can effectively be grouped into three different categories: 1. a small change in the volume of a particular service; 2. the addition of a whole service; or 3. the addition of a whole group of services.

20. **Long run average incremental cost (LRAIC):** Long run average incremental cost is a form of LRIC where the Increment is a whole group of services. In the context of telecommunications, LRAIC has often been used to set interconnection charges with the increments usually defined as the whole group of services using the core network. These services (PSTN, leased lines, etc.) include those provided by the operator with significant market power, as well as those of interconnecting operators. The costs of the network providing this wider group of services are then divided by all traffic to produce the average incremental cost.

21. **LRIC and its several variations:** The LR(A)IC acronym is also used in conjunction with Forward-Looking (FL) and the plus sign (+). In principle this additions lead to a more specific description of all the elements which add up to the cost model as a whole. In this sense the FL would imply the bottom-up cost base according to a current cost accounting is used and the + would imply that joint and common costs are taken into account in the cost allocation process, too. Incremental costs are generally calculated for an efficient operator.

22. **Stand alone cost (SAC):** Measures the cost of providing a service provided by the operator separately from the other services of the company. SAC includes all directly attributable costs and all shared cost categories related to production of the service, thus including direct variable costs, direct fixed costs, common and joint costs. Under this allocation method, the shared costs are totally supported by the service that is to be provided in isolation.

23. **Embedded direct cost (EDC):** Considers the directly attributable and indirectly attributable volume sensitive and fixed costs as recorded in the books and records of a firm. It therefore measures the embedded cost provided by the statutory accounts and does not question the efficiency involved.

Terms related to price control methodologies

24. **Price control methodology:** The price control methodology designates the approach that regulators adopt in order to set tariffs of regulated services. The most common approaches are cost orientation, retail minus, price-cap and benchmarking.

25. **Cost orientation:** Under cost orientation, the regulated price charged for the provision of a service reflects the underlying relevant regulatory costs, as defined by the regulator.

26. **Retail minus:** Under retail minus, the wholesale price charged for a given service is set in relation to the price of the underlying retail service rather than calculating the wholesale price on the basis of the costs incurred in producing the wholesale service.

27. **Price-cap:** Under price-cap, the regulator sets a cap on the price that the regulated operator may charge for a given service or for a basket of services. The cap may be set based on a top-down or on a bottom-up approach and may evolve according to several economic factors. The basic formula employed to set price caps is CPI – X, where the expected efficiency savings X are subtracted from the rate of inflation, measured by the Consumer Price Index (CPI). This price control methodology is intended to provide incentives for efficiency savings, as any savings above the predicted rate X can be kept by the operator and passed on to shareholders. In Europe, price-caps are generally reviewed every three years, corresponding to the length of validity of market analysis.

28. **Benchmarking:** Under benchmarking, the price of a given service is set in relation to the prices of comparable services charged in other countries.

Terms related to WACC

29. **Nominal Risk Free Rate (RFR):** The risk free rate is the theoretical rate of return of an investment without volatility and so without any financial risk. Financial analyst generally refer that a good proxy of rate of return of risk free investment can be the rate of return of a country bond in stable economic conditions.

30. **Cost of debt (RFR+ Debt premium) (pre-tax):** The cost of debt is the cost that an undertaking incurs to found its activities by resorting to third-party capital (bond, bank loans etc.).

31. **Beta:** Following the capital asset pricing model (CAPM), the beta (equity) is the systematic risk (market risk) of a given equity security and provide a measure about how much his yield perform with respect to the reference whole market yield.

32. **Equity risk premium (ERP):** The Equity Risk Premium (ERP) represents the excess return, compared to the return on a risk free rate, required by investors as compensation for the risk of investing in the stock market.

33. **Tax rate (corporate):** is the total theoretical rate of incidence of taxes on the profit of the undertakings, necessary to evaluate the pre-tax WACC.

34. **Gearing:** The gearing ratio is the ratio between the Debt and the sum of Equity and Debt. It provides the weight for the cost of debt and equity in the WACC calculation. It can be

generally estimated from the book value of the undertakings, or can be evaluated from the market value of equity and debt.

35. **WACC Nominal pre-tax:** The Weighted Average Cost of Capital is the rate that an operator is expecting to pay on average to all its security holders (equity and debt) to finance its assets including inflation and tax charge. The general formula can be expressed in the following way: (1-g)*Ce/(1-T)+g*Cd where g is the gearing ratio, Ce is the post-tax cost of equity and Cd is the pre-tax cost of debt, T is the Corporate tax rate.
36. **WACC Nominal post-tax:** The Weighted Average Cost of Capital is the rate that an operator is expecting to pay on average to all its security holders (equity and debt) to finance its assets including inflation. The general formula can be expressed in the following way: (1-g)*Ce+g*Cd.
37. **WACC Real pre-tax:** The Weighted Average Cost of Capital is the rate that an operator is expecting to pay on average to all its security holders (equity and debt) to finance its assets net of inflation including tax charge. It can be obtained from the nominal pre tax WACC applying the Fisher equation: (1+WACC_Nominal)/(1-Inflation rate)-1.
38. **WACC Real post-tax:** The Weighted Average Cost of Capital is the rate that an operator is expecting to pay on average to all its security holders (equity and debt) to finance its assets net of inflation and tax charge. It can be obtained from the nominal post tax WACC applying the Fisher equation: (1+WACC_Nominal)/(1-Inflation rate)-1.

A.4 Markets identified by Recommendation 2014/710/EU

Market 1: Wholesale call termination on individual public telephone networks provided at a fixed location.

Market 2: Wholesale voice call termination on individual mobile networks.

Market 3:

a) Wholesale local access provided at a fixed location.
b) Wholesale central access provided at a fixed location for mass-market products.

Market 4: Wholesale high-quality access provided at a fixed location.