Body of European Regulators for Electronic Communications

BEREC

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BEREC Report on the wholesale roaming market

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Executive Summary

Regulation (EU) No. 2015/2120, adopted by the European Parliament on 27 October 2015 and published in the Official Journal of 26 November 2015, included amendments to the Roaming Regulation 531/2012. These amendments oblige mobile telecommunications operators not to levy any surcharge in addition to the domestic retail price on any EU roaming customer for any regulated voice call, SMS or use of data outside the customer's home country for periodic roaming from 15 June 2017 onwards. This obligation depends on a legislative act being proposed by the European Commission (EC) in July 2016, following a comprehensive review of national wholesale roaming markets in the EU, and to be adopted by the co-legislators by June 2017.

On 26 November 2015, the EC began its public consultation on the review of national wholesale roaming markets, fair use policy (FUP) and the sustainability mechanism referred to in Roaming Regulation 531/2012 as amended by Regulation No. 2015/2120.

In this context, the Body of European Regulators for Electronic Communications (BEREC) wishes to provide data and an analysis which will be relevant to assessing the optimum regulatory wholesale structure to accompany the implementation of Regulation No. 2015/2120 with a view to ending the roaming surcharges, including data on domestic price levels, consumption patterns, existing roaming offers and travel patterns as well as a broader analysis of the workings of the wholesale roaming market independent of the costs and assessment of different scenarios for a wholesale roaming market regulation. This report is therefore intended to constitute BEREC's response to the EC's public consultation in respect of its review of the national wholesale roaming markets.

BEREC has analysed the domestic retail and intra-EU roaming market and found that it is hard to disaggregate the different mobile communications services since they are often provided as part of a bundle. BEREC therefore used the Average Retail Revenue per User (ARRPU) figures and data on average consumption for different mobile communications services. Both these data sets show a lack of convergence between EU/EEA[1] countries for both ARRPU and service consumption and also between ARRPU and consumption, especially for data.

Important differences between EEA countries are also observed in the travel patterns. In particular, some EEA countries have higher roaming inbound traffic compared to the traffic generated by the customers when roaming, especially during the touristic season.

The current commercial and regulatory situation for intra-EU roaming is characterised by relatively high regulated wholesale data caps compared to actual roaming wholesale tariffs, non-convergent domestic prices and a range of different Roam Like at Home (RLAH) or variant offers which include special "add-ons". The number and range of such offers are diverse in nature with different terms and conditions including different FUPs, for example, in respect of maximum call duration, number of days and/or geographic

[1]The scope of the Roaming Regulation also applies to the European Economic Area (EEA) Member States Norway, Iceland and Liechtenstein. As soon as the amended obligations in Regulation (EU) No. 2015/2120 are incorporated in the EEA agreement, they will apply to these three countries also.

scope of the offer. The most complete offers also tend to be targeted at intensive users and the highest elasticities, if reported, tended to be for data.

Direct, ongoing wholesale agreements exist between mobile network operators (MNOs) which are complemented, where necessary, by annually negotiated i.e. discounted, bilateral agreements, which are based on a variety of pricing models. These agreements also reflect the variations in the number of roaming customers, and their usage of roaming services, between Member States. For operators which are part of larger groups, such annual agreements would tend to be negotiated at group level.

Light and full mobile virtual network operators (MVNOs) see their position as weak compared to MNOs due to their lack of volumes and associated negotiating power. Overall, these operators are not seen to benefit from the lower actual observed wholesale tariffs, especially for data, when compared with the current wholesale caps.

A range of measures suggested by some MNOs and MVNOs (such as converging mobile termination rates (MTRs) and lower wholesale caps) are needed to ensure that their domestic tariffs schemes are sustainable in a RLAH environment.

The cost of providing wholesale roaming services is being evaluated in a separate assignment, for which the EC published a call for tender on 23 July 2015 with the intention to estimate the cost of providing wholesale roaming services by a mobile network operator and to estimate these costs for a generic European mobile network operator. In October 2015 the EC appointed TERA consultants to build a cost model. BEREC wishes to emphasise that, in addition to estimating wholesale roaming costs, the analysis of the wholesale roaming market also implies taking account of general policy questions.

The estimates of wholesale costs are necessary but not the only input. Key issues related to wholesale regulation include the derivation of a result (or results) which meets the regulatory objectives while appropriately balancing the risks of wholesale charges being too high or too low in any Member State. The challenge is finding a balance between wholesale charges that are sufficiently low to allow for a sustainable suppression of retail roaming surcharges, protect competition and avoid significant retail price increases in the home country, and sufficiently high to allow efficient cost recovery and return on investments to visited network operators to avoid retail price increases in the visited network and avoid a negative impact on MVNO competition in the visited markets. As there is no uniform wholesale tariff that would satisfy those conditions in every Member State, this is likely to involve a trade-off between the protection of competition, investment and consumers in the home markets, on the one hand, and their protection in the visited markets on the other. Given the foreseeable impact of changes to wholesale regulation, this task may be more challenging than the technical analysis of costs because of the competition issues involved around the roaming markets and the depth of the impact of the analysis to be carried out.

Finally, BEREC sees the need to adapt the conditions in the retail and wholesale roaming market to achieve a balanced outcome for home and visited networks with regard to RLAH.

1. Introduction

On 26 November 2015 – two years after the first draft text was introduced by the EC[2] - the Regulation (EU) No. 2015/2120 of the European Parliament and of the Council laying down measures concerning open internet access and amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services and Regulation (EU) No. 531/2012 on roaming on public mobile communications networks within the Union was published (hereinafter the Roaming Regulation)[3].

The Roaming Regulation sets out the principle of RLAH where, from 15 June 2017, surcharges are abolished for regulated retail roaming services - until a yet to be defined minimum FUP has been reached – provided that the issues identified at wholesale level have been addressed and the proposed solutions are applicable by then.

Against this background co-legislators have conferred implementing powers to the EC, and entrusted it with the task of conducting a review of the wholesale roaming market with a view to assessing measures necessary to enable the abolition of retail roaming surcharges and to report to the European Parliament and Council on the findings of the review and make appropriate proposals by 15 June 2016.

In the light of this task the EC has started inter alia a public consultation running from 26 November 2015 to 18 February 2016 "on the review of national wholesale roaming markets, fair use policy and the sustainability mechanism referred to in Roaming Regulation 531/2012 as amended by Regulation 2015/2120"[4].

With this analysis BEREC is providing, inter alia, its input with regard to the questions raised in the public consultation and to inform the EC in its review of the wholesale roaming market. The analysis is mainly based on the information received from the NRAs and from the operators, to which a questionnaire was circulated in mid-September 2015.

2. Domestic retail market

2.1. Domestic price level

Taking into account the provisions of the Roaming Regulation, especially the upcoming wholesale market review and the need to apply a FUP for RLAH services, it is very important to examine the domestic price levels and whether the prices converge. Mobile services are, in some countries, mainly offered as a bundle and only to a limited extent offered separately. A typical bundle includes a certain number of (domestic) minutes for voice calls, SMS and data volume for a fixed monthly fee. In cases of combined bundles,

[2] Regulation of 11th September.2013 of the European Parliament and of the Council, laying down measures concerning the European single market for electronic communications and to achieve a Connected Continent. http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=2734
European Parliament legislative resolution of 3 April 2014 on the proposal for a regulation of the European Parliament and of the Council of 11th September.
http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P7-TA-2014-0281+0+DOC+WORD+V0//EN

[3] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R2120&from=EN

[4] https://ec.europa.eu/digital-agenda/en/news/public-consultation-review-national-wholesale-roaming-markets-fair-use-policy-and.

a specific retail price per minute, SMS or GB may not be available, and if so, only after exceeding the agreed volume limits[5]. In addition, any assumption about the allocation of the bundled revenues to a specific service, so as to estimate average (effective) retail prices, may be problematic and subjective. To that end, BEREC refrained from collecting revenue data separately for the various services in the data collection in September 2015. Thus, in the context of this report the Average Retail Revenue per User (ARRPU[6]) appears to be the only possible index for the assessment of measuring the convergence of domestic price levels across the EEA although BEREC recognises it may not be completely adequate as a parameter for comparing different countries. However, BEREC would like to emphasise that since the ARRPU depends on many other parameters than prices (volumes, handset subsidies, sensitivity to the number of active SIM cards[7], etc.), in general the ARRPU is quite a weak index for comparing domestic price levels. Further conclusions on price levels of mobile communications services can be made only by a thorough review of retail prices for mobile communications services.

For the calculation of ARRPU, BEREC used the data submitted by NRAs for the EC request of September 2015 for the wholesale roaming review. In particular, the ARRPU for 2014 was calculated per country by dividing total 2014 retail revenues with the average 2014 subscribers[8]. Apart from 2014 data, 2013 data are also presented[9] in the report in order to show some evolutions[10]. The ARRPU for 2014 varies considerably between the countries, ranging from €3.70 per month to € 43.80 per month, with a weighted average of €14.3, see Figure 1.

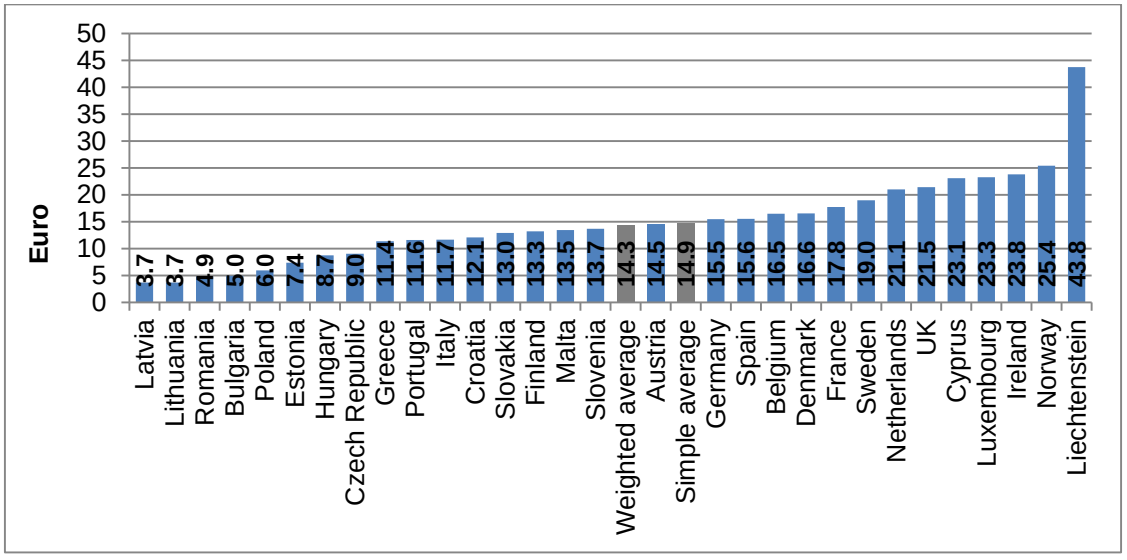


Figure 1: Average Retail Revenue per User: EUR per month (source: NRA input September 2015)

[5] This is not always the case for data services for which, when exceeding the agreed volume limits, data speed could be reduced.

[6] The difference of the ARRPU calculation from ARPU is that ARRPU does not include wholesale revenues from operators. ARRPU is the retail average monthly invoice for customers and is calculated dividing retail revenues by active SIM cards. Retail revenues are all retail revenues from own customers (monthly fee, activation fee, charges per minute/SMS/GB, handset subsidies etc.). Active SIM cards are the number of active subscriptions including prepaid subscribers and excluding M2M SIM cards.

[7] The actual number of active (vs. inactive) SIM cards is very difficult to measure and may be defined differently depending on operator and NRA.

[8] The average of 31/12/2013 and 31/12/2014 subscriptions was used for the calculation.

[9] 2013 data are presented in Table 1 below.

[10] Calculations based on data provided by NRAs to the IR EWG in summer 2014.

2.2. Consumption pattern

The data for the ARRPU per month should be complemented by data regarding the average consumption of mobile services per month. As the ARRPU is affected by both the domestic price level and the consumption, the evaluation of convergence of domestic price levels may be facilitated if the average consumption per user per service is calculated. The average consumption per user per service across countries may also be a useful input in the upcoming wholesale market review.

	ARRPU in EUR per month 2014	**ARRPU in EUR per month 2013**	**Avg Minutes per User per month 2014**	**Avg Minutes per User per month 2013**	**Avg SMS per User per month 2014**	**Avg SMS per User per month 2013**	**Avg MB per User per month 2014**	**Avg MB per User per month 2013**
Austria	14.5	14.0	140	140	29	37	1118	722
Belgium	16.5	17.3	105	102	166	176	160	135
Bulgaria	5.0	4.0	125	99	8	6	170	52
Croatia	12.1	12.0	153	141	57	59	405	273
Cyprus	23.1	21.0	261	n/a	143	n/a	1468	n/a
Czech Republic	9.0	9.0	131	111	54	54	181	137
Denmark	16.6	21.0	132	126	88	98	1232	731
Estonia	7.4	8.2	140	128	20	13	1428	1019
Finland	13.3	13.0	136	141	29	40	2959	1605
France	17.8	18.0	181	163	243	229	393	193
Germany	15.5	14.0	90	80	18	27	326	198
Greece	11.4	11.0	180	158	30	34	138	63
Hungary	8.7	8.0	109	129	10	27	224	19
Ireland	23.8	24.0	182	166	118	144	1120	652
Italy	11.7	10.6	145	135	41	65	447	302
Latvia	3.7	3.0	126	94	48	41	728	n/a
Liechtenstein	43.8	41.0	70	56	16	16	n/a	n/a
Lithuania	3.7	3.0	156	130	135	119	418	247
Luxembourg	23.3	23.7	102	104	83	92	725	441
Malta	13.5	12.6	101	88	72	80	252	128
Netherlands	21.1	21.0	106	91	17	21	259	133
Norway	25.4	24.0	173	163	79	75	844	472
Poland	6.0	6.1	122	103	76	71	381	175
Portugal	11.6	12.0	125	142	123	172	303	77
Romania	4.9	4.0	229	224	67	60	104	133
Slovakia	13.0	12.0	140	128	33	27	174	140
Slovenia	13.7	14.0	151	146	88	79	282	218
Spain	15.6	16.0	127	111	4	6	335	227
Sweden	19.0	18.0	158	149	77	84	2212	1663
UK	21.5	16.0	138	135	110	130	n/a	301

	ARRPU in EUR per month 2014	ARRPU in EUR per month 2013	Avg Minutes per User per month 2014	Avg Minutes per User per month 2013	Avg SMS per User per month 2014	Avg SMS per User per month 2013	Avg MB per User per month 2014	Avg MB per User per month 2013
Weighted average[11]	14.3		136		73		413	
Simple average	14.9	14.4	141	127	69	72	671	387
Min	3.7	3.0	70	56	4	6	104	19
Max	43.8	41.0	261	224	243	229	2959	1663

Table 1: ARRPU in EUR per month, Average Minutes per User per month, Average SMS per User per month, Average MB per User per month for 2014 and 2013 (source: NRA data collected in July 2014 and September 2015)

The strongest convergence in consumption patterns can be found for mobile minutes, because the difference is the lowest compared to SMS and data usage. The Average Minutes per User per month in 2014 vary from 70 to 261. By way of contrast, the Average SMS per User per month in 2014 vary from 4 to 243 with the lowest SMS usage being approximately 60 times lower than the highest.

Data usage ranges from 104 to 2,959 Megabyte per User per month on average in 2014, with the highest consumption in Finland being 28 times higher than the average data usage in Romania. Figure 2 and Figure 3 here below show the dispersion of consumption (voice and data) and ARRPU between countries for 2014.

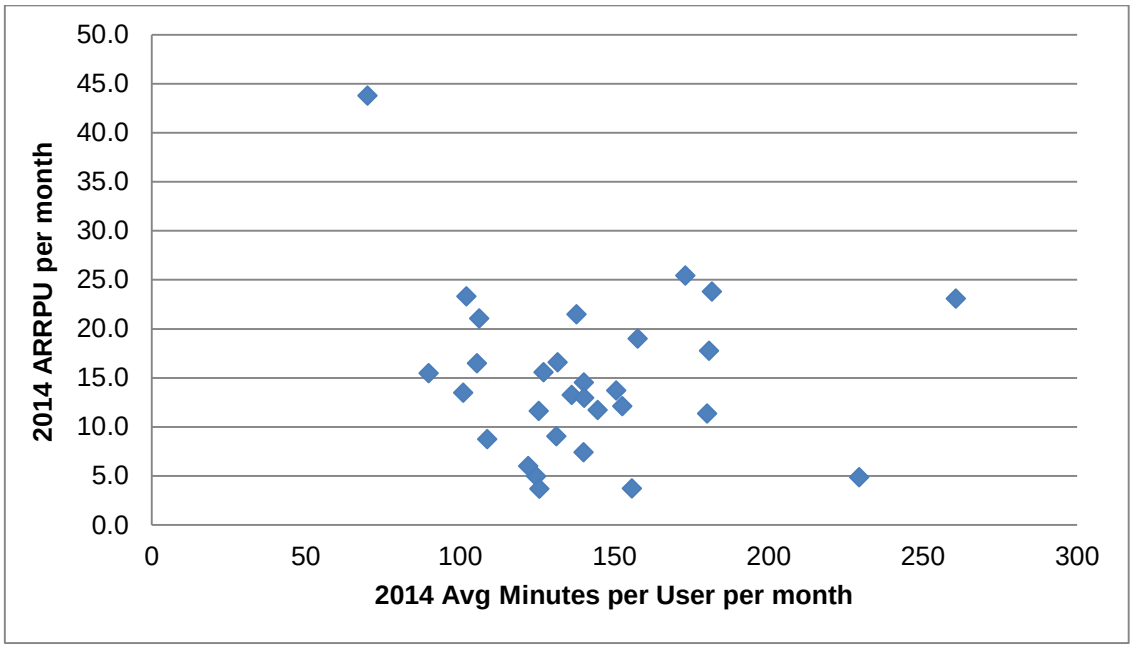


Figure 2: Dispersion of minutes' consumption and ARRPU between EEA countries (source: operators' response to BEREC questionnaire September 2015).

[11] Weighted average taking into account as weights the average 2014 subscribers per EEA country.

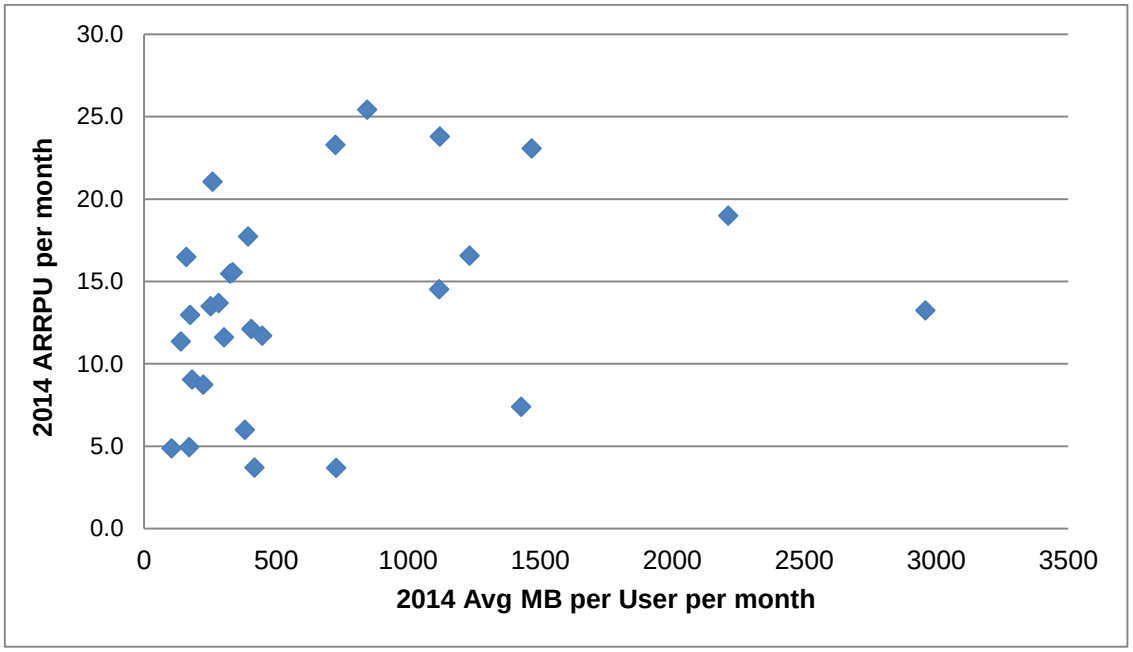


Figure 3: Dispersion of data consumption and ARRPU between EEA countries (source: operators' response to BEREC questionnaire September 2015).

Taking into account the above table and graphs, one could conclude that there are large discrepancies between some countries and few signs of convergence between all EEA countries in the near future, on both the average amount spent for mobile services (i.e. ARRPU) and the average consumption.

2.3. RLAH offers

In light of the abolition of the surcharges for international roaming services, BEREC and the EC have requested information from the operators on whether they have already put in place any RLAH tariff plans prior to the date set out in the Roaming Regulation. About half of the operators replied that they offer some sort of RLAH tariff plan which includes roaming services in the domestic bundle. However, when looking more closely at all the RLAH offers, there is much variation in how such offers are marketed, meaning that many offers would not comply with the current definition of the new Regulation: the RLAH offers have several restrictions or are instead 'add-ons', i.e. daily, weekly or monthly roaming packages at a separate price that provide specific roaming units. For a more detailed overview of all existing types of international roaming offers, we refer to the BEREC Transparency and Comparability Report[12].

Annex 2 – Overview of the amount of RLAH tariff plansgives an overview of different RLAH offers that were observed in the countries during the data request. The tables in the annex also indicate the number of operators per country that offer RLAH tariff plans.

Some of the so called 'RLAH offers' were restricted to a specified geographical scope (for example offers that include countries where the operator is present and/or countries where good deals were concluded). Other operators are able to also include non-EEA countries in their RLAH package, for example the USA, Switzerland or Turkey (e.g. offers

12 http://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/5578-draft-report-on-transparency-and-compara_0.pdf

from Norwegian, Spanish and French operators). Some RLAH offers only include roaming data whereas other offers only include voice and SMS. Most of the respondents were MNOs[13]. Only a few MVNOs commercialize (a variant of) RLAH offers.

The current RLAH offers in the market are mostly aimed at high-end or professional users. However, in some countries, RLAH offers are more common and also target residential users (e.g. Luxembourg, France and Poland[14]), whereas in other countries, no operator provides any RLAH offer and only add-ons are offered, e.g. Malta).

The RLAH offers are tied to restrictions that come in many different forms. A combination of different FUPs can occur: typically, the FUP depends on the price of the offer and is a volume-based limitation (per month). Some operators include roaming in the domestic volume (for example 3GB per month including roaming at an additional small mark-up), some offer extra specific roaming volume independent of the domestic allowance (for example 6GB of roaming per year). An FUP in terms of days was only observed in France and Poland: operators in these countries define roaming units which can be used within a range of 10 to 60 days per year. However, in most of the French and Polish RLAH tariff plans, the FUP in terms of days came in addition to a FUP in terms of volume[15].

A few operators mentioned some additional volume restriction: they track extraordinary roaming usage by applying a maximum limit on the call duration (e.g. 1 hour). Some operators mentioned that they cap the daily data usage when a significant amount of mobile data is consumed in a single day.

The amount of mobile roaming data included in the RLAH offers varies a lot between different operators in the EEA and depends on the price of the tariff plan. In most countries, the data volumes in RLAH offers are rather low, below 500MB. The roaming data allowance is always capped, even if the offer has unlimited voice and SMS roaming units.

Data allowances of 15GB (Norway) or 20GB (France) can be observed as well but can be considered as outliers. Once the FUP is exceeded, users can continue to use roaming services out of the bundle on the basis of regulated prices or daily/weekly passes. Data roaming will in most cases be throttled once the FUP limit is reached.

BEREC also asked operators whether they could report any observed impact on the demand of roaming services from the introduction of these RLAH-type offers. About 75% of the operators who launched some sort of RLAH offer were not able to report any impact because they did not have stable evidence to indicate any trends. This was due to the fact that they had not been able to extract reliable “before and after” traffic volumes for customers migrating to the RLAH products. However, independent of the type of

[13] Of the operators who indicated they offer some sort of RLAH tariff plan, 48% were categorized as MNO, 12% were categorized as MVNOs and 40% were not categorized at all.

[14] Luxembourg has a high amount of offers which include international and roaming calls. This is a particular feature of the mobile market in Luxembourg. Also France and Poland have very competitive RLAH offers which are affordable. The high degree of domestic competition in these countries could be an explanation for the fact that roaming is included in domestic offers.

[15] For example: a tariff plan in France allows unlimited voice and SMS, with 5GB of data, per month. Roaming was provided free of any additional charge, for 15 days per year. The data is implicitly still capped to 5GB. Some tariff plans offered unlimited roaming voice and SMS for 365 days/year, but these tariff plans were rather costly (more than €100 per month).

RLAH offers being introduced, almost all operators noticed a clear increase in voice and SMS usage, and a huge increase in data usage with regard to roaming.

About 25% of the operators were able to report some elasticities as a result of the introduction of RLAH-type offers, which varied between them. On average, the operators reported:

- Voice traffic: an increase of about 20%-23%. Some operators mentioned voice traffic doubled or tripled.
- SMS traffic: an increase of 10%-20%. Some operators mentioned SMS traffic doubled.
- Data traffic: 90%-200% increase. Some operators reported a much higher increase, for example 550% or more.

Given the small sample and the variance between answers, no solid conclusion can be drawn. BEREC points out several other reasons to nuance these observed elasticities:

- Customers who currently subscribe to RLAH offers are more likely to be intensive users16 who roam frequently. Hence, the elasticities operators currently report might be an overestimation of the actual impact that operators will face from July 2017 onwards, when RLAH will be in place due to the Roaming Regulation. However, it is likely that operators will face an increase in demand of roaming services from low-end users, who will no longer have a perception of high roaming prices, which could compensate the overestimation mentioned above.
- It is not clear whether all the operators who responded used the same methodology to obtain these ratios. The elasticity of demand for roaming services might be higher for customers who roam sporadically and purchase an add-on (e.g. weekly pass) than the elasticity of demand for users who subscribe to a RLAH tariff plan which they use over the year.
- It is important to keep in mind that data traffic increases cannot be attributed directly to the RLAH tariffs, since domestic data usage is also still showing an upwards trend in all types of tariff plans.

BEREC also asked whether operators set any FUP for their domestic tariff plans. About 95% of the operators indicated that they define a certain “domestic usage FUP” in their terms and conditions. Operators pointed out that these FUP terms are required to prevent cases of abuse, fraud and arbitrage, and to avoid the use of mobile gateways (e.g. baby phones) and the sending of bulkSMS.

Operators said that the FUP cap for voice and SMS is defined in such a way that it meets about 95% to 99% of the customer needs. In general, most operators report a FUP that applies to voice and SMS usage in their unlimited price plans, capped at a very high level of usage. Data is often throttled once the FUP cap is exceeded. Some operators define a very detailed FUP, or reserve the right to limit or terminate their service once the monthly usage is regularly 10 times (or more) greater than the average usage of all users of the unlimited offer.

[16] With the exception of countries like Luxembourg with a larger basis of RLAH/ roaming costumers.

2.4. Travelling patterns

BEREC collected data from NRAs and operators that were used in this section in order to study the travelling patterns of European citizens. Unless noted otherwise, the analysis carried out in this section used available data from 2013, 2014 and the first half of 2015.

2.4.1. Subscribers roaming at least once per semester in the EEA

The number of subscribers that use roaming services at least once per semester varies significantly between EEA countries. The following figures show the maximum, minimum and average (red point) values of roamers in EEA countries in percentage terms per semester. [17]

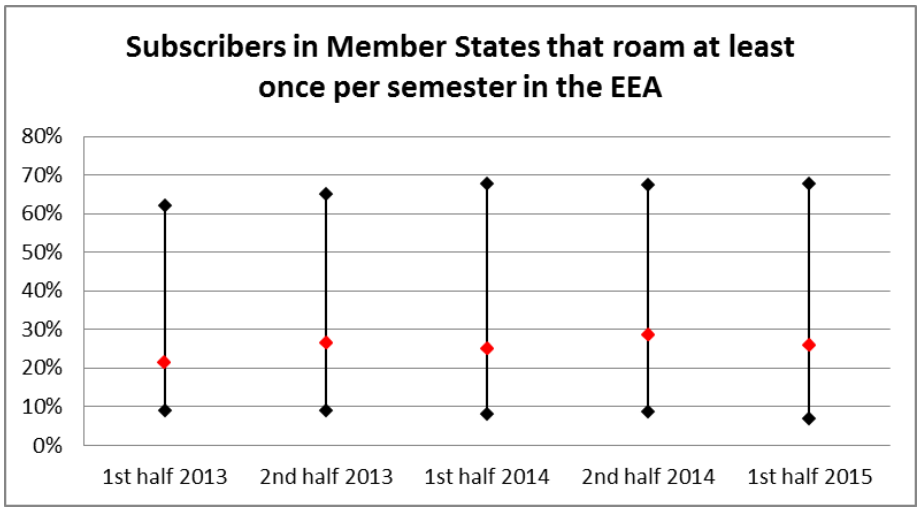


Figure 4: Percentage of subscribers in EEA countries that roam at least once per half a year (source: operators' response to BEREC questionnaire September 2015). Red dots indicate the average EEA value while the ends of the vertical lines represent the maximum and minimum values.

Although the average of the percentage of subscribers that travel at least once per semester is 28.7% for the second half of 2014, the numbers vary from 8.9 % to 67.7 % throughout the EEA (see Annex 1 – Table 4).

It is worth noting that the percentages of roaming subscribers are higher in the second half of each year than in the first half for almost all countries. This could be explained by the fact that summer vacation months are mainly in the second half of the year. In particular, during the second half of 2014 the number of roaming subscribers in EEA countries experienced an increase of 18% on average compared to the first semester. If we look at specific EEA countries' statistics, we can also observe significant variations. All of them follow different trends with variations between 2.4% and 39% of increase for the second half (see Annex 1 – Table 4). An approximation of the average number of days abroad per country can be found in the BEREC analysis of 2014[18]. The operators' input is a reliable source of information to estimate the percentage of customers who travel at least once per semester but gives no indication of the average number of days that they spend abroad, or of the proportion of travellers who go on a single-day trip. Therefore, it

[17] Red dots in the middle indicate the average EEA value while the ends of the vertical lines represent the maximum and minimum values.
[18] International Roaming Analysis of the impacts of "Roam Like at Home" (RLAH). http://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/4826-international-roaming-analysis-of-the-im_0.pdf

has not been possible to cross-check the BEREC estimates of the average number of days abroad with the input from operators.

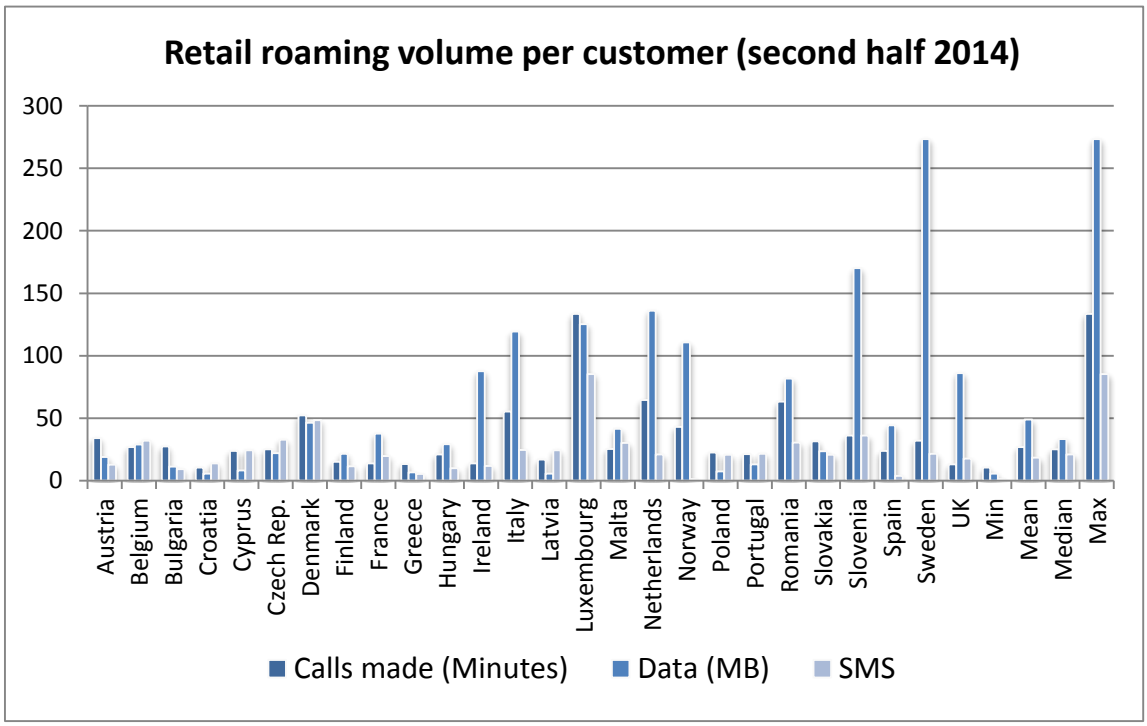
2.4.2. Roaming consumption per roamer

According to the available information for the second half of 2014, there are also significant differences between the roaming subscribers of different EEA countries in terms of the volume of roaming services consumed while travelling abroad (see Annex 1 – Table 5). The following table shows the average traffic per roaming subscriber during the second half of 2014 and the minimum and maximum values between EEA countries.

	Outbound traffic per roaming subscriber in 2H of 2014		
	Voice (min)	**Data (MB)**	**SMS**
Min	10.5	5.6	1.3
Max	133.5	273.5	85.4
Average	26.8	48.9	18.5
Median[19]	25.2	33.4	20.9

Table 2: Outbound retail roaming traffic per roaming subscriber for the second half of 2014 for voice, SMS and data (source: operators' response to BEREC questionnaire September 2015).

Data roaming is the service that shows the largest differences between countries. While there are six countries (Sweden, Slovenia, Netherlands, Luxembourg, Italy and Norway) whose subscribers consume over 100 MB within six months, there are seven countries (Portugal, Bulgaria, Cyprus, Poland, Greece, Latvia and Croatia) whose subscribers' consumption is below 15 MB in six months. In fact the maximum of data roaming consumption per user and semester is 273.5 MB in Sweden and the second highest is in Slovenia with 170.0 MB while the average is only 48.9 MB (second half of 2014).



[19] The median is the numerical value separating the higher half of each of the data sample from the lower half.

Figure 5: Average retail roaming traffic per customer during second half 2014 (source: operators' response to BEREC questionnaire September 2015).

The voice outbound traffic per user and semester is 133.5 minutes in Luxembourg, compared to the second highest outbound traffic of 64.5 minutes in the Netherlands; the remaining countries are in the range of 10.5 to 55.2 minutes with an average of 26.8 minutes per user and semester (second half of 2014).

For SMS, in Luxembourg, the outbound volume is 85.4 messages per user and semester in comparison to the second highest volume of 48.3 in Denmark; the remaining countries show a range of 1.3 to 36.1 SMS with an average of 18.5 per user and semester (second half of 2014).

2.4.3. Roaming voice traffic flows between countries

The preferences of roaming subscribers when selecting their destination country vary also depending on their country of origin. According to the data provided by operators on the distribution of subscribers' flows in terms of the destination country, it can be observed that the subscribers from one country tend to prefer visiting certain countries over others, however the preferred destinations vary (Annex 1 – Table 6). In this table only the data regarding the outbound (destination) is used. Each row presents the percentage of outbound roaming traffic generated by each EEA country in other EEA countries (presented in columns).

These trends could be justified by reasons like economic relationships, historical links, vacation periods, etc. Although the objective is not to find the reason why subscribers choose their destinations, it can be identified that countries like France, Germany, Italy, Spain and the UK are those that receive the highest share of roaming voice services from visiting subscribers (roamers) for 2014.

For the same period 2014, there are important exchanges of roaming voice services between neighbour countries. For example, Slovakian roamers spend 32.6% of roaming voice minutes in the Czech Republic and Czech Republic roamers spend 14.3% of roaming voice minutes in Slovakia. UK roamers spend 10.1% of their total roaming voice minutes in Ireland, and Irish roamers spend 53.1% of their roaming voice minutes in the UK. Belgium operators receive 14.8% of roaming voice traffic from French roamers and 18.2% from Dutch roamers. There are also significant exchanges of roaming voice traffic between Denmark, Finland, Norway and Sweden. In fact, Swedish operators receive 30.0%, 25.9% and 19.5% of roaming voice traffic from Danish, Norwegian and Finnish roamers respectively (see Table 6).

2.4.4. Inbound-outbound roaming traffic ratio

There are significant differences between EEA countries regarding the amount of roaming traffic that they receive (inbound) and roaming traffic that their subscribers generate abroad (outbound). Annex 1 – Table 7 gives an overview of the inbound/outbound ratio for roaming services (voice, data and SMS) for 2013, 2014 and the first half of 2015.

For roaming voice traffic, several countries exchange the same amount of inbound and outbound traffic and this tendency is observed for 2013, 2014 and the first half of 2015. However, there are countries like Spain, Malta and Greece where inbound voice traffic

is three times larger than the amount generated by their subscribers abroad. On the other hand, other countries have inbound traffic which is lower than the outbound traffic generated by their subscribers.

For roaming SMS traffic, although in most countries their subscribers generate more SMS traffic abroad than they receive from roaming visitors, there are significant differences between subscribers in EEA countries. For example, Romanian operators had an inbound/outbound ratio of 30% in 2014 while six other countries had an inbound/outbound ratio over 150% for the same period.

For roaming data traffic, although in most countries the subscribers generate almost the same amount of traffic abroad as they receive from visitors form other EEA countries, some significant differences can be observed. For example, while in six countries (Norway, Ireland, Netherlands, Romania, Slovenia and Slovakia,) the inbound/outbound ratios are below 50% for 2014, countries like Greece, Malta, Spain and Portugal had inbound/outbound ratios of 709%, 760%, 531% and 476% respectively for the same period. Moreover, Croatia and Cyprus also had very high inbound/outbound ratios of 4238% and 1053% for 2014, respectively. These countries are touristic destinations.

3. Wholesale roaming market

3.1. Descriptions of direct wholesale roaming agreements

This section gives a description of the wholesale roaming agreements that operators negotiate for roaming in the EEA. The description is based on the input received from operators in the EEA. Therefore it does not constitute BEREC's conclusion on these matters but a reflection of operators' views on these matters.

Operators report that they sign two types of wholesale roaming agreements. The first type called *International Roaming Agreements* or *Standard International Roaming Agreements* (STIRA) defines the operational and technical aspects of the roaming relationship. In addition, *roaming discount agreements* are annexes to the international roaming agreements and specify the commercial aspects of the agreement including the prices that have to be paid. While standard roaming agreements are valid until further notice (with the possibility to terminate them after a period of notice of six months), the discount agreements typically have a duration of 12 months (one calendar year).

The reasons given by operators for the annual renegotiation of discount agreements are the unpredictable nature of the market with a high degree of regulatory uncertainty, unpredictable traffic volumes, frequent mergers and other changes of ownership. These uncertainties need to be balanced by the transaction cost of negotiating agreements. Some discount agreements are automatically renewed every year unless one party objects.

When MNOs negotiate roaming agreements they are for the most part bilateral – each operator gets roaming access to the other operator's network. Operators describe a number of advantages of bilateral agreements; they build partnerships, enlarge roaming coverage to the benefit of customers and not least secure inbound roaming traffic and revenue that can (partly) offset the outbound roaming cost. Sometimes, bilateral agreements are (initially) used unilaterally by one roaming partner. Unilateral

agreements are signed when the requesting MNO has bad coverage or network quality or when a full MVNO requests access.

Typically, operators who are part of a group will negotiate international roaming agreements individually but will negotiate discount agreements as a group. By negotiating commercial terms for the whole group, member companies can get more attractive terms and prices on account of the higher traffic volumes. However, in some cases these operators will negotiate discount agreements individually when it is commercially relevant or for practical reasons. MNOs that are not part of a group will negotiate individually.

3.1.1. Number of agreements in each country

Generally, operators have agreements with more than one operator in each EEA country. The rationale for this is that having more agreements equals better coverage, more inbound roaming revenue and lower outbound cost. Operators in big groups say that they have agreements with almost all operators in the EEA. Nevertheless, operators typically have one preferred network in each country to which they try to steer their traffic. One operator reports that signing more agreements means that less aggressive steering is needed which enhances the customer experience.

Some smaller operators or operators from small countries only sign more than one agreement in countries where they have a lot of traffic (inbound or outbound) in order to prioritize resources.

3.1.2. Pricing models

Each operator applies a range of discount price models. The following are the most common types:

1 *Fixed rate* - there is a fixed (discounted) rate per unit per service or a discount as a percentage of the regulated cap.
2 The *balanced/unbalanced* model is a typical pricing method in bilateral discount agreements. Each party exchanges traffic and the net sender of traffic gets an additional discount on the amount of traffic that exceeds the amount of traffic received from the roaming partner. This gives both parties an incentive to send more traffic to each other since additional outbound traffic will reduce the net sender's average cost and the net receiver will increase its average revenue if it sends more traffic. One operator notes that this model is not used when traffic is highly imbalanced.
3 When using *traffic or volume commitments* the roaming party commits to sending a certain amount of traffic in exchange for a discounted price. A version of this which is also often used is *tiered pricing* where the price goes down if a certain volume threshold is reached. Sometimes prices go down from the first unit or sometimes just for the incremental volume above the threshold. Tiered pricing means that higher outbound volumes result in lower per-unit cost for the home operator.
4 With a *financial or revenue commitment* or *send-or-pay* model the visiting operator commits to paying at least a minimum amount in wholesale roaming charges across all services. This can be based on defined tariffs for each service or bundled volumes for each service. Additional discounts may apply if these thresholds are exceeded. These agreements secure a certain level of revenue for the visited network and lower

prices for the net buyer if the included volumes are consumed. Typically, the higher the committed revenue, the higher the achievable discounts.

5 For voice services sometimes a *per destination pricing* model is applied where prices vary depending on the destination of calls made in order to account for differences in interconnection cost.

These different pricing models are in many cases combined, for example a balanced/unbalanced agreement might include a minimum volume/revenue commitment. There can also be different price models for different services in the same discount agreement – e.g. one for voice and one for data services, with as a constraint, high volume/revenues commitments in order to achieve high discounts allowing RLAH offers.

3.1.3. Choice of the pricing model

A number of elements specific to each individual negotiation determine the choice of pricing model and the level of discounts that can be negotiated. These elements include *traffic volumes* and the *level of imbalances* in inbound and outbound volumes. Higher outbound volumes give an operator more bargaining power, but highly imbalanced traffic flows complicate negotiations. Other important elements are national market share, network quality and MTR cost. An operator with a high national market share and good network quality will, *ceteris paribus*, secure better discount agreements.

Some operators report that a high level of outbound traffic gives operators bargaining power that can result in higher discounts for the *net buyer* of roaming services than they have to give to the net receiving party. Other operators report that the *net seller* of roaming services has the advantage since it is usually the seller who has the geographical advantage, e.g. the best network in a popular roaming country. In addition, some operators also highlight that operators with a pan-European presence or associated with larger markets have a stronger bargaining power compared with operators with smaller footprints, namely the ones that only operate in one EEA country.

Many operators say that they are agnostic about the price model and that the choice depends on the wishes of the other party and what model will benefit their net position in a particular case.

Some operators report that if they compete in the domestic market with an operator that is part of a pan-European group, they are not able to negotiate reasonable roaming discounts with other members of this group in visited markets and thus have to rely on agreements with smaller operators in those countries.

3.1.4. Internal transfer pricing

Most group operators report that they apply internal transfer pricing that is based on an arm’s length principle. In these cases the internal rate is based on the market rates offered to external partners. One group reports that this market rate is calculated as the average rate charged to the main trading partners. One group applies bill and keep while another group uses zero pricing between subsidiaries.

3.1.5. Evolution of price models

Many operators note that it is uncertain how the wholesale roaming market will develop in light of the Roaming Regulation. In addition, many operators expect that technological developments like eSIM, OTT services and VoLTE will affect the functioning of the roaming market.

A number of operators report that there is a trend towards agreements that include revenue commitments for a bundle of services. This reflects a move away from voice revenue being the most important element at the moment to the increased importance of data revenue so that the overall revenue will instead become paramount. Other operators report no changes to the type of agreements that are signed.

A few operators expect more agreements that include a fixed charge independent of the roaming volume while other operators warn against this type of model since the visited network bears all the risk.

3.2. Situation of full/light MVNOs

This section gives a description of the MVNO situation, based on input from operators in EEA countries. Therefore it does not constitute BEREC's conclusion on these matters but a reflection of operators' views on these matters.

MVNOs include those who are dependent on their position as light MVNO using wholesale resale roaming access and as full MVNO using dual IMSI platforms with direct wholesale access. They all reported that they consider they are still weak in their positions in this market. In general, it seems that full and light MVNOs still do not benefit from the low wholesale tariffs enjoyed by MNOs. BEREC signalled the weak position of MVNOs in previous reports on the wholesale roaming market as well.

MVNOs report that they have, at best, access to the wholesale roaming market at the level of the current wholesale caps. But more than often they describe experiencing higher costs than the level of these caps. This is mostly due to their use of services needed to comply with the obligations (bill-shock measure, welcome SMS, etc.) as set out in the Roaming Regulation. The BEREC Guidelines on the application of Article 3 of the Roaming Regulation[20] explain that the wholesale (resale) roaming services provided by MNOs are limited to the supply of technical interfaces required by MVNOs. It follows that MVNOs have to invest in their own systems. More often it seems that MVNOs especially do not use a dual IMSI platform with direct wholesale roaming access but rather that they buy those services from MNOs which results in higher wholesale roaming tariffs/costs than the current wholesale roaming caps. Some MNOs, however, offer the complete services to MVNOs which are needed to comply with the Regulation at the level of the current wholesale roaming caps. But this applies only to a minority.

Full MVNOs using dual IMSI platforms suffer from the problem of not having sufficient buying power to benefit from lower wholesale roaming tariffs. They cannot offer the necessary volume commitments to the market to benefit from competitive rates.

[20] BEREC Guidelines on the application of Article 3 of the Roaming Regulation, http://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/guidelines/1015-berec-guidelines-on-the-application-of-article-3-of-the-roaming-regulation-wholesale-roaming-access

Important exceptions are MVNOs with dual IMSI platforms that belong to a group. Those groups consist of a large number of MVNOs or have one or more MNOs in their group. The group can bundle their individual volumes and therefore has buying power to enjoy the benefits of the lower wholesale roaming tariffs in the market.

The exceptions mentioned are not enough to debunk the general conclusion that the position of MVNOs remains weak.

3.3. Quantitative analysis of wholesale roaming charges

3.3.1. Balanced vs. unbalanced traffic

In this section, BEREC used the data collected from NRAs and operators to analyse the wholesale roaming charges in the EEA countries and the state of competition in the wholesale roaming market.

Wholesale roaming agreements frequently adopt a pricing policy which defines different roaming charges for balanced and unbalanced traffic. Higher levels of roaming charges for the balanced traffic can be observed when compared to the unbalanced traffic.

The following subsections aim at observing the variability of these charges in EEA countries and the share of balanced/unbalanced traffic in these countries.

3.3.2. Analysis of the tariffs charged in 2015 to EEA operators

The figures below show the levels of the wholesale prices charged for voice, SMS and data roaming traffic in 2015 for the EEA operators, for both balanced and unbalanced traffic, and in inbound and outbound roaming situations.

The variability of the values amongst EEA countries is illustrated below by using box plots. In the box plots relating to volume shares, *min* means the minimum value for volume shares, *median* the median value for volume shares, *max* the maximum value for volume shares, *Q1* the first quartile value for volume shares and *Q3* the third quartile value for volume shares.

In order to ensure a good level of confidentiality and avoid potential discrepancies, the box plots relating to tariffs only indicate Q1, median and Q3 values.

Roaming-in tariffs presented below are comparable to the ones applied in roaming-out situations, because in the aggregated view presented in the graph, when considering the group of all operators, the tariffs levied by the group for roaming in are also the tariffs paid by the group when roaming out. The differences that appear in the below graphs are due to the incompleteness of the collected data, since not all the operators replied to the questionnaire addressed to them.

Voice services

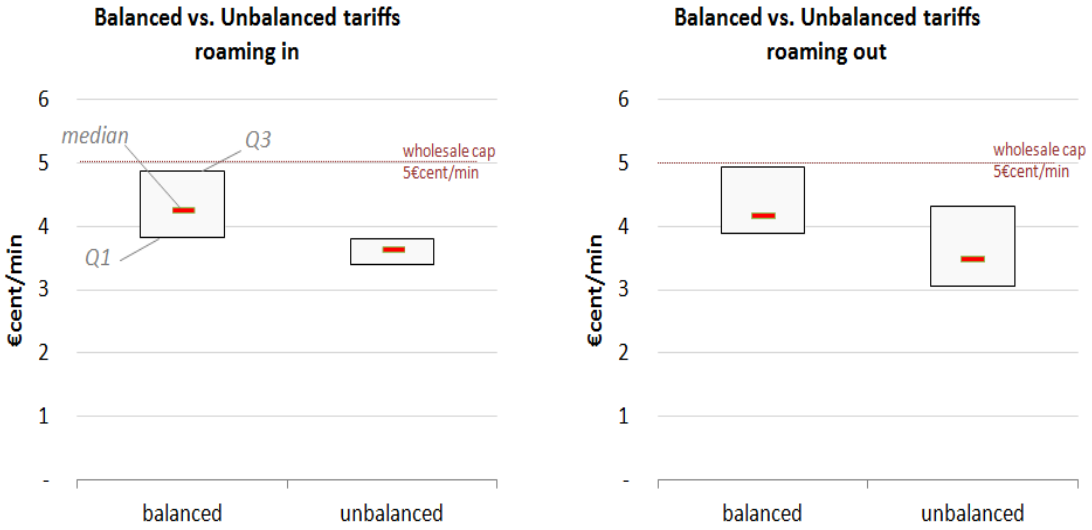


Figure 6: Wholesale roaming tariffs for inbound and outbound voice traffic (source: operators' response to BEREC questionnaire September 2015).

Tariffs applied for roaming in balanced traffic are in general higher than the ones applied for unbalanced traffic in roaming in situations. Variability of tariffs for balanced traffic is also more important around the median value. Most of the values are below the wholesale cap (5€cent/min), and the few values which are above the wholesale cap are not among the three first quartiles and appear as discrepancies that could be explained by the calculation perimeter considered by the operators in their response, taking into account the average of regulated (EU) and non-regulated (outside EU) balanced/unbalanced roaming-in/out tariffs. Nonetheless, we can observe that more than 75% of balanced tariffs are below or equal to the wholesale cap.

SMS services

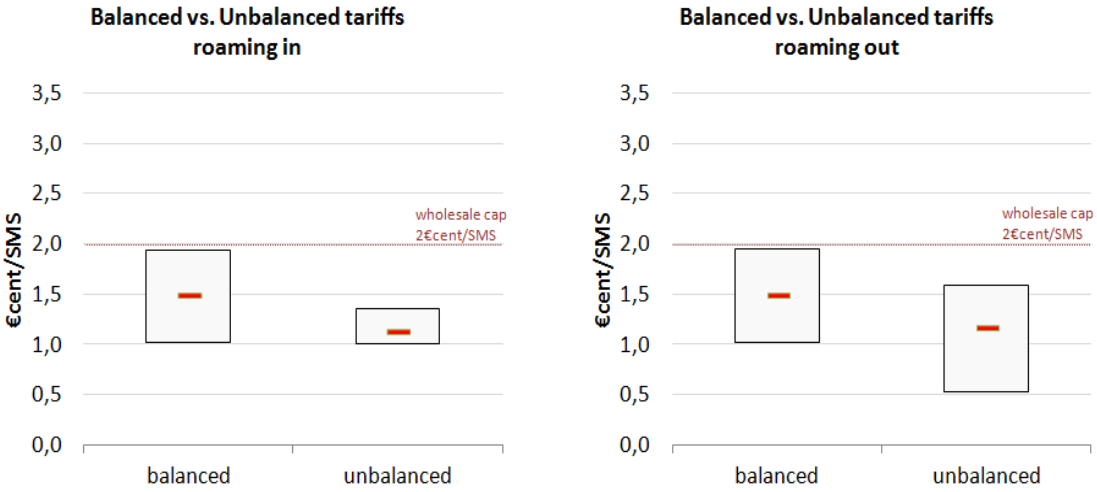


Figure 7: Wholesale roaming tariffs for inbound and outbound SMS traffic (source: operators' response to BEREC questionnaire September 2015).

The above remark on the level of tariffs can also be applied to SMS services. Unbalanced tariffs are in general lower than balanced tariffs. However, the variability of tariffs is relatively more important (~0.5€cent/SMS around the median value).

Most of the tariffs are below the wholesale cap (2€cent/SMS). The few discrepancies observed (not among the three first quartiles) could be explained as for voice services. Practically all the balanced tariffs in roaming-in situation and more than 75% of the balanced tariffs in a roaming-out situation are below or equal to the wholesale cap.

Data services

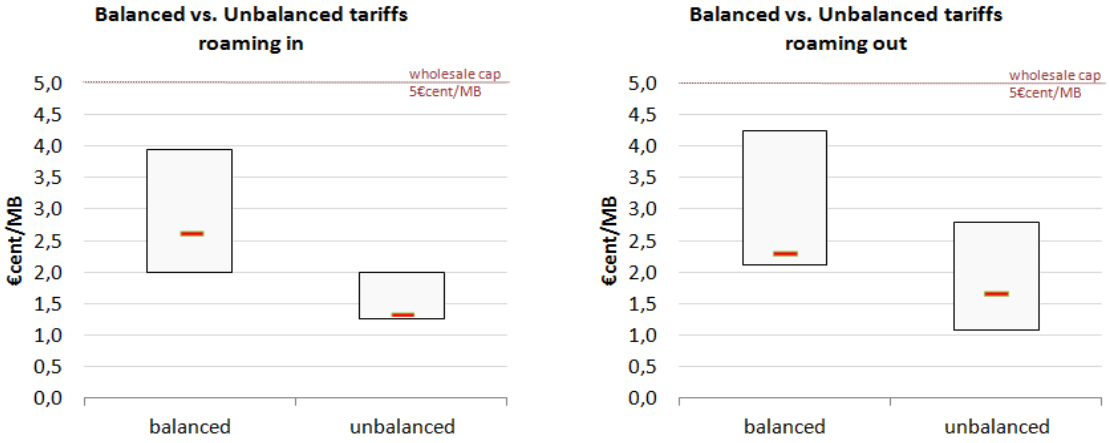


Figure 8: Wholesale roaming tariffs for inbound and outbound data traffic (source: operators' response to BEREC questionnaire September 2015).

Unbalanced tariffs for data services are lower than balanced tariffs. Their levels are mostly below the wholesale cap (5€cent/MB), except for a few discrepancies.

3.4. Permanent roaming and Machine to Machine (M2M) communication

This section gives a description of the input of operators in the EEA on permanent roaming as an arbitrage service and as an implementation for M2M services. Therefore, it does not constitute BEREC's conclusion on these matters but a reflection of operators' views on these matters. BEREC's current assessment of permanent roaming in relation to M2M is included in the BEREC Report on "Enabling the Internet of Things" (BoR (16)/39).

As identified earlier by BEREC[21], permanent roaming caused by an arbitrage service could result if wholesale caps are set too low and there are no sufficient measures in the regulation. Currently the Roaming Regulation allows operators to include conditions in their reference offer for wholesale roaming access to prevent permanent roaming or anomalous or abusive use of wholesale roaming access.

When asked about M2M, some operators argue that national networks are dimensioned and built to host domestic SIM cards. They see the risk that if a highly increased volume of foreign SIMs used for M2M communication gets located on a permanent basis, this can create problems of capacity management and possible network congestion in the visited networks. This could also be a consequence if RLAH gets introduced without

[21] BoR (14) 135 Preliminary Analysis of a "Roam like at Home" scenario based on the proposal of the European Parliament adopted on 3 April 2014

proper safeguards and foreign users stay for a long time with extended usage in a visited network.

BEREC has requested information on whether the MNOs apply any mechanisms to control the level of permanent roaming in their networks. MNOs were also asked if they had separate M2M roaming agreements containing special conditions for similar kinds of traffic. The answers are explained in the following section.

3.4.1. Wholesale roaming consumption limits

A majority of the responding MNOs have, for the time being, not implemented any measures to discourage permanent roaming. Some explain that it is not necessary since all usage is charged and others even highlight that they encourage usage by using mechanisms like volume commitments, revenue commitments etc. in their wholesale roaming agreements. Others say that they are following the development of M2M and permanent roaming, which appears to cause unforeseen signalling and other costs to their network. Some indicate that they might introduce mechanisms in the future to prevent permanent roaming, should wholesale roaming caps fall below the relevant costs. Some operators mentioned that they do not have sufficient tools in their' toolbox to prevent permanent roaming.

Very few MNOs answered that there are explicit consumption limits in their wholesale roaming agreements. One operator explained that they have a limit which is based on a maximum number of days per SIM per year to prevent permanent roaming by retail consumers.

Only around 20 percent of responding MNOs have some kind of mechanism in their wholesale roaming agreement to discourage permanent roaming. Such mechanisms seem to be in the shape of price differentiation. Permanent roaming can for example be excluded from any discounts, and the difference between discounted and non-discounted rates seems to be a crucial element for MNOs to control permanent roaming. One operator explains that individual data consumption beyond 10 GB over the period of a month will be subject to revised commercial negotiations. If the parties cannot agree, the maximum regulated wholesale tariff kicks in for all data beyond the 10 GB limit.

Four operators mention that they have mechanisms in their wholesale roaming agreements to prevent loss on terminating calls to destinations with high MTRs. Countries with high MTRs might be excluded from special negotiated low wholesale rates or a consumption limit can be added for the total number of minutes to specific countries. Mobile originated calls to Rest of the World (ROW) are also excluded from the low discount rates.

3.4.2. M2M in roaming scenarios

Around one fifth of the responding MNOs indicate that they signed separate agreements for M2M communications. The number of agreements signed by each of these MNOs seems to be fairly low. This could indicate that most MNOs do not, under the current regulatory regime, see the scope of such traffic as sufficiently significant for them to enter into specific negotiations with their roaming partners. In fact, a good number of MNOs state that "there is no necessity" for separate agreements for M2M.

The majority of operators do not apply specific prices or conditions for M2M traffic. They seem to treat M2M traffic in the same way as ordinary traffic when it comes to financial terms in the contracts. But due to the special nature of M2M applications, some MNOs expressed concerns: they see challenges with regard to covering the production cost because of the small amount of data being generated by M2M traffic. Signalling is what dominates the traffic and its costs are hard to recover from their roaming partners within today's standard roaming pricing structure. A few operators have special conditions and rates for M2M traffic, one operator says that M2M is typically excluded from discounts.

None of the respondents that come to M2M agreements employ any exclusivity clause for the use of their network. One MNO states that such clauses would not be beneficial to the M2M services themselves, meaning that the offered quality might suffer if the applications could not select the best network at any given time.

Two MNOs refer to agreements that aim to reduce the risk of having many foreign devices in their network on a permanent basis. These agreements allow a maximum percentage of traffic out of the total traffic observed from that operator to roam permanently. It is pointed out however, that for the visited network this percentage/limit is difficult to detect and control.

A need for transparency regarding traffic generated by visiting SIMs is mentioned by several respondents. This is even the case for MNOs that do not sign specific M2M agreements, i.e. they still wish to monitor the extent of such traffic. Others reveal that they have increasing strategic intentions to closely monitor SIMs that visit for longer periods. Such monitoring is foreseen to become a necessity when RLAH kicks in.

3.5. Different scenarios for a wholesale roaming market regulation

The following chapter sets out some ideas about how the wholesale roaming pricing policy may have to be modified so that operators can provide retail roaming services at the domestic price level. The Regulation requires the EC to review the wholesale roaming market. To that end, there may be a need to amend the wholesale charges or to provide for another solution taking account the issues that have been identified in the wholesale roaming market. The current wholesale cap regime provides for wholesale charges that are based on the quantity of the underlying service. The whole exercise starts with describing the views expressed by stakeholders. The second part contains a preliminary assessment of different regulation scenarios by BEREC.

3.5.1. Position of EEA operators

3.5.1.1 Arguments in favour of an unchanged regulation

A number of EEA operators, mainly large groups and the biggest independent operators consider that the existing wholesale roaming market is working efficiently and that there is therefore no need for any additional wholesale regulation. According to them, the current wholesale prices are for all kinds of operators below the regulated caps as there are strong incentives to compete for inbound roaming traffic to earn incremental revenue. Thus, in their view, wholesale roaming regulation and the imposition of caps have not had any effect on the wholesale roaming market which underlies the retail roaming market and has always adapted mechanically to allow the sustainability of regulated retail roaming prices. They argue that the caps should be formulated as a safeguard with

the expectation that competition will drive prices below the maximum permitted levels. Some operators point to the existence of RLAH offers (subject to a fair use policy) in a number of countries as evidence that RLAH is possible under the current wholesale caps.

In case of further regulatory intervention through a further decrease of the wholesale roaming price caps, some of these operators fear a *de facto* regulation of wholesale national mobile access markets or, worse, the setting of wholesale caps below the cost of providing roaming services. In their view, an overly strict wholesale regulation associated with the roaming access obligation of the current Roaming Regulation would allow operators to enter local markets by an arbitrage service due to a possibility to free ride on existing networks at a cost substantially lower than the costs borne by local operators investing heavily in these networks. A difference between wholesale roaming caps and national wholesale price levels is seen as a sustainable protection against uncontrolled market entry via arbitrage and other permanent roaming. According to some operators, due to several mechanisms (multi-IMSI, manual selection of visited network, etc.) permanent roaming could be undetected by the visited network.

Furthermore, a few operators noted that they might be required to deal with an increase of roaming use on their networks, being forced to make large investments to deal with the increase in sporadic traffic, without a proper compensation for this investment in case wholesale roaming caps are further decreased.

Some operators report that they are subject to pressure to provide other operators with a high standard roaming service (in terms of network coverage, quality of service, prime carrier service, immediate attention on trouble tickets, reliability/speed of data services, etc.), at low cost prices, causing a risk of compromising the business margin or leading to a negative margin. Some operators referred to the risk of rising domestic rates.

Moreover, operators consider that the difference between the regulated and discounted rate needs to be high enough to maintain market competition, rewarding the most dynamic access seekers.

3.5.1.2 Arguments in favour of a tighter wholesale regulation

Some operators, in particular new entrant and independent net-sender operators, consider that a change regarding the wholesale model will be required at the same time as retail intervention in the form of RLAH from June 2017. They consider that they will face a significant risk of margin decrease because there is no possibility of compensating this decrease in the retail market and that some operators may have to offer roaming on terms that are not commercially viable given the existing negotiated wholesale levels. In other words, if retail roaming charges are brought closer to domestic tariffs they see it as important to set also appropriately low wholesale caps to facilitate price competition and to prevent margin squeeze.

Some operators consider that small operators are likely to suffer from lower negotiation power and competitiveness compared to large groups, both in selling and in buying wholesale roaming. Therefore, small operators which are net senders could benefit from lower wholesale prices, while this situation would penalize small operators which are net receivers. Additionally the large groups maximize traffic on each other’s networks

thereby lowering the visitors' revenues of small operators, especially if they have a footprint in multiple countries, allowing them to internalize roaming costs. In the long term, this situation could lead to small operators being forced out of their domestic market.

A number of more recent MNOs are not considered as attractive partners since other MNOs already have long running partnerships with operators in their home countries.

Light and full MVNOs are in a similar situation as they do not receive any wholesale roaming revenues. So, according to them, a level of guaranteed sustainable competition needs to be found.

Several operators note that the introduction of RLAH is challenging, because domestic plans are typically flat rate bundles while the majority of wholesale agreements are still based on per unit cost. This is especially a problem for unlimited domestic offers. Operators from low ARRPU countries or operators with low profile offers will find that they will particularly face challenges after the introduction of RLAH.

A significant share of operators identifies the lack of harmonization of MTRs as a serious problem in the current wholesale market and especially in a future RLAH scenario.

One operator also mentions that the LBO requirement[22] is a problem since it limits the effectiveness of hard-steering resulting in higher wholesale costs. A number of operators also address the problem of fraud which they expect to increase as a result of the Roaming Regulation.

EEA operators, looking for a modification of the wholesale roaming market, shared some views on different regulation approaches in order to sustain the retail RLAH obligation, as detailed in the following paragraphs.

3.5.1.3 Reduction of per unit tariff caps

A large part of operators wanting a tighter regulation consider wholesale roaming tariff regulation by means of maximum caps per unit is the most appropriate solution for the implementation of the RLAH obligation. The caps are necessary because not all EU markets are sufficiently competitive to produce wholesale rates that are low enough to support RLAH tariffs. Wholesale caps also protect home networks when customers lose coverage from their preferred networks and roam on a network that does not have discounted rates.

For some operators, wholesale data roaming caps should follow domestic retail data price drops, which are based on market demand and are evident almost every quarter, in order for there to be healthy roaming data service competition.

3.5.1.4 Regulation on a country basis

Some operators consider that wholesale regulation should be applied on a country basis to take into account the specific situation of each EEA country. Costs of networks and markets may vary largely over the EEA. They are partially influenced by factors outside

[22] Obligation to enable separate sale of data roaming services as local break-out services (Art. 4 and 5 of the Roaming Regulation).

the control of operators (variation in licensing costs, deployment costs, national labour costs, rights of way, leasing costs for masts, rooftops and buildings, construction costs, etc.). Additionally, some costs are dependent on historic choices made and national competitive conditions (network coverage and quality). Accordingly, it may be necessary to introduce a system of wholesale regulation not based on EEA averaged costs, but which looks consistently and in detail into national markets and national networks and costs.

They want to highlight that any cost-estimate can only serve as a reference point and provide a range of expected average costs. A wholesale roaming price cap, however, must be set above this cost range in order to ensure that network operators can offer discount schemes.

3.5.1.5 Regulation of mobile termination rates (MTRs)

For a large majority of operators, even some of those that do not want any modification of the wholesale regulation, there is a need for a consistent regulation of MTRs throughout the EU. This diversity of situations creates a constraint on further decreasing wholesale caps, as the highest MTRs should remain sufficiently below wholesale voice charges. Different solutions are suggested for a sustainable RLAH approach throughout the EU:

- harmonization of MTRs in the EU;
- higher wholesale rates with operators in Member States where the mobile termination rates (MTR + transit carrier mark-up) are higher;
- the verification that regulated termination rates are available across Europe, with a possibility to assess whether transit carriers should be regulated.

3.5.1.6 Fair use policies at wholesale level

According to the majority of network operators, the setting of FUPs at wholesale level is very challenging as in general today's wholesale systems do not accommodate individual customer/IMSI pricing. Due to the increase of complexity which would be involved in introducing customer specific wholesale schemes on an operator level, they see the costs as outweighing the benefits. It would require that the billing system of the visited network and the data clearing houses between the two operators develop their "IOT charging" and "IOT check" to take this into account. Some consider that different regulated wholesale caps within and outside the wholesale FUP would be very complex and impossible to implement. Operators largely prefer a simple and predictable wholesale model.

According to some operators, the regulation should allow operators to prevent permanent roaming and to set limitations in wholesale contracts, and fair use policies, in order to prevent abuse. Hence, it could create the regulatory framework which allows an operator to include a FUP at wholesale level. In this context, as already seen, some MNOs already include this type of safeguard in their wholesale deals. For instance, a maximum amount of days/IMSI/years could be negotiated between the two partners if they think it is necessary to avoid collateral consequences in one of two of the retail market(s) concerned.

Some operators are of the view that when the future wholesale regulation modifies wholesale roaming price caps, then they should still be allowed to charge current Roaming III wholesale caps in case of detection of any SIM card behaviour which would depart from reasonable usage defined contractually.

3.5.1.7 Capacity based charges

Some MNOs think that due to the fact that the majority of domestic retail mobile packages today are “flat” offers, including large or even “unlimited” volumes of minutes, SMS and MBs, wholesale tariffs on a per unit basis are highly problematic and obsolete, although it seems that up to now no EEA MNO or operators group was willing to negotiate flat wholesale deals. These MNOs believe that the dynamics of the retail market as data traffic increases, including the introduction of VoLTE, will allow for the introduction of pure capacity models in the long term. In this regulatory context, all wholesale services are based on data usage and the commercial terms between the various operators can be based on data capacity. This will probably require the introduction of quality of services (QoS) criteria linked to data wholesale services.

However, other operators are opposed to changing the wholesale roaming rate structure from variable tariffs into a regulation based on capacity. There is uncertainty regarding traffic flows in a RLAH environment and fixed fees for roaming services would mean that the financial risk is 100% on home operators. Furthermore they consider that this model must not exclude small operators with very low demand on volumes.

3.5.1.8 Regulation for MVNOs

Lowering the regulated wholesale caps has also been suggested by MVNOs. This would be especially more beneficial to full MVNOs using dual IMSI platforms. Light MVNOs would still suffer from the burden of costs due to additional services needed to comply with the provisions of the Regulation to provide retail roaming services. Hence, some MVNOs suggest including those services within the wholesale caps. Another solution, suggested by MVNOs mainly using wholesale resale roaming access, is to impose a right to access wholesale roaming access at the RLAH level. This would mean that the wholesale resale roaming tariffs should not be higher than the wholesale prices MVNOs pay for wholesale domestic mobile access. MVNOs mentioned that the lack of buying power of most MVNOs is probably insoluble due to their customers being less focused on roaming resulting in it being impossible for MVNOs to give large volume commitments.

Lastly, often mentioned as well by MVNOs is the divergence of MTRs in the EU, which they consider as a blocking obstacle to a sustainable RLAH regime.

3.5.2. Preliminary assessment of different wholesale roaming market regulation scenarios

BEREC considers that some wholesale options need to be analysed in order to mitigate the remaining distortions resulting from the Roaming Regulation, meaning RLAH with no retail surcharge for consumption abroad. The objective of this BEREC report on the wholesale roaming market is to inform the European Commission, with regard to their task to review the wholesale market pursuant to Article 19, on the impacts of different options for wholesale regulation, on home and visited markets.

BEREC considers it is important to achieve a balanced outcome in the wholesale regulation review and more specifically in the price control obligation, including ensuring that wholesale charges are not too high or too low in any EEA country and that adverse secondary effects on national markets are thereby minimized. This task, which amounts to deciding upon the relevant tariff setting principles, may be more challenging than the technical analysis of costs because of the competition issues involved in mobile markets and the possible impacts of the outcome on stakeholders.

Moreover, BEREC would like to emphasize that wholesale regulation should enable implementation of RLAH pricing in such a way that operators can offer roaming services sustainably without surcharges. This entails that FUPs and permissions to apply surcharges are additional ways to improve the sustainability of the RLAH model.

In this context the following issues remain to be addressed:

3.5.2.1 What are the tariff setting principles?

The current Regulation sets wholesale tariff caps at a level above costs. In most cases, operators appear to negotiate commercial agreements under these caps. In the context of a tighter regulation at retail level, the question of a tighter regulation at wholesale level must be analysed.[23]

As mentioned in the Regulation, wholesale tariffs should allow all visited networks to recover all costs of providing regulated wholesale roaming services, including joint and common costs, to protect competition and investment incentives in visited markets. Therefore, costs can be seen as a floor for any wholesale regulation.

Whether tariffs should approach costs requires a careful analysis. If wholesale regulation is aligned with costs, the following remaining risk can be identified:

- Roaming regulation will amount to de facto regulation of national wholesale access markets, where MVNOs have national roaming wholesale access prices set mainly by commercial agreement. If wholesale roaming caps are set below this commercial level, the normal commercial process of reaching agreements is distorted and MVNOs in visited countries might not be able to compete against roaming services being offered on the visited network on a permanent basis.
- According to some operators, and even though according to Article 3 of the Roaming Regulation, they are allowed to prevent permanent roaming, due to limitations an abuse of roaming services (i.e. excessive usage) might become possible, with a risk of new actors entering national markets through arbitrage services and a decrease in incentives for investment for visited networks.
- If operators are subject to a situation where they are unable to recover specific investments related to roaming made at wholesale level there is a risk of a waterbed effect, leading to an increase in domestic prices for the visited country.

One should also carefully assess the possibility to evaluate costs with sufficient accuracy. In a context where the costs of providing roaming services depend on several

[23] The following reasoning reflects the analysis conducted by BEREC in BoR (14) 209 - *International Roaming - Analysis of the impacts of "Roam Like at Home" (RLAH)*

factors (see following section), setting prices precisely at the cost level can be difficult at the European level.

At the same time, roaming markets can be seen as competitive markets where the rationale for imposing cost orientation is not necessary. In this context, caps can be seen as a safeguard to protect buyers. But wholesale caps should not be too high, so as to protect competition and investment incentives in home markets. This means that:

- The risk to home operators of their roaming costs exceeding their roaming revenues could be made worse by frequent roamers and/or heavy users.
- Distortions to competition between mobile operators (including MVNOs) in the home market could be caused by an asymmetric impact of RLAH on their respective costs and revenues. Some operators are part of larger multi-territory groups able to steer roaming traffic from home customers onto the visitor network within the group, and thus internalize wholesale costs in a way that might not be possible for operators who are not part of such a group, even when those operators form roaming alliances.
- The dynamics of the roaming market also mean that operators with higher traffic volumes are generally able to negotiate lower wholesale charges, while smaller challenger operators and full MVNOs are unlikely to be able to secure wholesale roaming prices below their domestic retail prices.

Therefore, the impacts of wholesale regulation are closely linked with the situation on retail markets. The level of retail prices and the expected levels of consumption at the retail level directly impact the sustainability of RLAH in home networks, resulting in the need to coordinate the design of both wholesale regulation and retail regulation (such as FUP). It can be expected that a high FUP will lead to a more difficult setting of wholesale regulation, while a more restrictive retail policy, with a lower FUP will help to mitigate the issues associated with wholesale regulation.

3.5.2.2 Why should costs be carefully taken into account when determining tariffs?

As stated above, if tariffs are determined by approaching relevant costs, these costs to be taken into account must be analysed carefully. Indeed, the uniform regulation at European level leaves a sufficient space between cost and tariffs in all Member States today. However, should a tighter approach be preferred at wholesale level, the heterogeneity of costs should be reflected. In particular, one should take into account:

- The variability of costs within one Member State, where all operators are not necessarily generic operators, therefore resulting in varying margins (between cost and tariff) for visited operators;
- The variability of costs per country (i.e. labour costs, costs of licenses, geography, seasonality issues with significant peaks in certain periods) can have different impacts on visited networks if a single tariff cap is set at European level.

Beyond cost variability, other local differences are relevant, such as differences in revenues, which may impact the sustainability of RLAH in home networks. The setting of fair use policies at retail level may, to a certain extent, take into account these differences.

BEREC stresses the importance of these local specificities if wholesale regulation is tightened. Special precautions should be taken when setting “average values” at the European level, which might appear satisfactory at this level, but which might have significant impacts at the local level, with a risk of reaching too low or too high levels in some cases. The possibility to define national values should also be investigated, to mitigate local distortions.

3.5.2.3 Other topics

Finally, BEREC suggests that wholesale regulation is designed with a forward-looking approach keeping in mind other topics such as the following ones:

- Roaming regulation may affect, or be affected by, other regulated markets such as termination rates. The heterogeneity of situations across Europe should be taken into account when designing revised European wholesale regulation.
- Roaming patterns, in particular data consumption can be expected to evolve over the next years. The roaming regulation should take this moving context into account, by setting tariff that adequately adjust to market conditions.
- RLAH regulation would apply for periodic roaming and include operators providing reference offers that may include conditions to prevent permanent roaming or anomalous or abusive use of wholesale roaming access for purposes other than the provision of regulated roaming services to roaming providers. However, BEREC considers it essential that the Regulation carefully and judiciously defines the limit beyond which roaming is considered as anomalous or abusive use or permanent roaming as well as measures to prevent it within the scope of regulation. Otherwise, in the event that operators are not able to set conditions to prevent permanent roaming a low wholesale tariff regulation could seriously impact other wholesale access markets (example: MVNOs).

3.5.3. BEREC preliminary assessment of some scenarios

BEREC summarises, in the table below, some Regulation scenarios (including operators’ proposals) intended to solve potential issues in the wholesale roaming market, following RLAH implementation. BEREC presents a preliminary assessment of these Regulation options with a non-exhaustive list of pros and cons for each scenario. The purpose of this exercise is to provide, without taking a position, all the available relevant information to the EC in order to inform the decision making process of the EC for the review of the wholesale roaming market. The table below is focused on the effects on the wholesale market. Potential impacts on customers in the retail market are not addressed in this report. However, it is important to mention that key parameters like FUPs are not yet decided, even though a close relationship exists between the definition of the Regulation at the wholesale level and the definition of FUPs at the retail level. Lack of knowledge of the retail FUPs is a source of uncertainty which will affect the wholesale Regulation outcome.

Wholesale regulation		Description	Pros	Cons
Wholesale per unit cap at EU level	Roaming III caps level	No change in wholesale regulation compared to current caps	-Rewards the most competitive/efficient operators -Recovery of cost of providing wholesale roaming services -No indirect regulation of access market	-Risk of distortion to competition and investment in the home market (roaming costs exceeding roaming revenues) -Does not reflect the different costs in the different Member States -Risk of increase in retail prices in home markets including for non-roaming customers
	Cap = maximum LRAIC+ estimated cost in Europe	Reduction of per unit wholesale cap to a level of the maximum wholesale cost (including joint and common costs) of providing roaming services in EEA area	-Recovering of cost of providing roaming services -Allows an economic space for competition in a large majority of EU countries -Reduces the risks of increase in retail prices in home markets including for non-roaming customers	-Not reflecting the different costs in the different Member States -Risk of increase in retail prices in home markets where retail prices are very low; including for non-roaming customers. -Risk of competition distortion in home market - Risks in some home markets where the RLAH usage would deter investments
	Cap = average LRAIC+ estimated cost in Europe	Reduction of per unit wholesale cap to the average estimated cost (including joint and common costs) of providing roaming services in EEA area	-Recovering of costs of providing roaming services -Allows an economic space for competition between the efficient operators	-Risk of distortion in some visited countries as no recovery of costs of providing roaming services -Risk of less incentive to invest to provide roaming services

Wholesale regulation		Description	Pros	Cons
			-Reduces the risks of increase in retail prices in home markets including for non-roaming customers - Reduces the risks of competition distortion in home markets	- Possibility of de facto regulation in some national wholesale markets and entry to local markets and free ride on existing networks at tariff under cost for visited MNOs[24] -Risk of retail prices increase in visited market -Possibility of refusal of MNOs to sell roaming services
	Cap = minimum LRAIC+ estimated cost in Europe	Reduction of per unit wholesale cap to the minimum estimated cost (including joint and common costs) of providing roaming services in EEA area	-Very low risk of increase in retail prices in home markets including for non-roaming customers - Very low risk of competition distortions in home markets -Possibility of substantial roaming volume in retail offers -National MVNOs would not be disadvantaged vs MNOs	-Possibility of large distortion in some countries - Risk of retail prices increase in visited market - Risk of entry to local markets and free ride on existing networks at tariff under cost for visited MNOs, however the risk could be reduced as operators may set mechanisms to prevent permanent roaming[24]. -No incentive to invest to provide roaming services - Very high risk of refusal of MNOs to sell retail roaming services

[24] Risk existing in absence of a proper definition, in the Regulation, of permanent roaming and if no specific measure to prevent permanent roaming within the regulatory scope is provided in the Regulation.

Wholesale regulation		Description	Pros	Cons
Wholesale per unit caps per country	LRAIC+ estimated cost	Caps based on cost estimates (including joint and common costs) of providing roaming services in each EEA country	- Reflecting the costs in the visited markets -Recovers the costs in all Member States (assuming the costs are adequately estimated) -Reducing the risk of competitive distortion in home markets and retail price increase	-High risk of impact on competition in visited markets (de facto regulation of national wholesale markets) - Risk of margin squeeze situation for some home operators in some countries due to RLAH and consumption increase -Risk of non-cost recovery for some visited operators if the tariff misses some specificity due to it not capturing all relevant cost components.
	LRAIC+ estimated cost plus a mark-up	Estimates of providing roaming services in each EEA country with a mark-up ("cost+" regulation)	- Reflecting the costs in the visited markets -Cost recovery in each Member State -Reducing the risk of competition distortion in home markets and retail price increase	-Risk of de facto regulation of national wholesale markets - Risk of margin squeeze situation for some home operators in some countries due to RLAH and consumption increase Risk of non-cost recovery for some visited operators if the mark-up is too low
Termination rates	Regulation of MTRs for all types of calls at a European level	Full harmonisation of MTRs in Europe	-Allows the reduction of wholesale cap for outgoing voice -Reduces the margin squeeze risks for incoming voice	The Roaming Regulation is not the appropriate legislative instrument to amend the current system which would require an amendment of the current regulatory approach on termination rates
	Excluding MTRs from the wholesale cap	The wholesale cap set in the Roaming Regulation for outgoing	- avoids distortions in case of a reduction of the wholesale cap for outgoing voice	- technically more complex and involving IT developments in order to charge a different

Wholesale regulation		Description	Pros	Cons
	formula for outgoing calls	calls would be set on the basis of origination and transit cost. On top of that cap, MTRs are added in order to determine the total value of the real cap to be applied in each country. This would avoid a margin squeeze situation for the visited network and undue financial transfers		tariff on a call by call basis according to the termination rate of the destination country -does not tackle the problem of potential losses of home network for retail incoming calls
	Specific ceiling applied to termination rate only applied on incoming calls in a roaming situation		- limits the risk of margin squeeze for the home operator (reduction of potential losses)	-Risk of discrimination between roaming calls and other kinds of calls -Needs IT development to split traffic between international and roaming -Does not tackle the issue of high MTR for outgoing calls, and the risk of margin squeeze for the visited operator -The current roaming regulation provides no legal basis for a special ceiling applied to MTR only on incoming calls in a roaming situation. -Looking ahead, the roaming regulation is not the right legislative instrument to amend

Wholesale regulation		Description	Pros	Cons
				the current system. An amendment of the whole current regulatory approach on termination rates would be necessary to create an adequate legal basis.
Wholesale FUPs	Possibility of setting higher wholesale cap if FUPs are reached	In order to avoid permanent roaming or limiting the potential reduction of wholesale caps to RLAH purpose only, operators would be allowed to apply wholesale FUPs	-Limits the de facto regulation of domestic access market -Avoids the risk of permanent roaming[24] -Up to operators to implement it	- regulated wholesale caps within and outside the wholesale FUP would be complex to implement and constitute a significant burden on visited operators -Need to check and follow each visited SIM card in the network
Capacity based wholesale caps	The wholesale roaming caps based on the bandwidth and not on a price per minute, SMS or MB	In parallel to per unit cap, Roaming Regulation could impose on visited operator a requirement to develop an offer based on capacity (Mb/s). The bandwidth should be set on monthly basis to take into account the heterogeneous spread of roaming use. (Current wholesale structure can be seen as inefficient because neither aligned with the buyer's economic model, nor the	-Aligns price and costs. Network costs are fixed and do not depend on actual traffic. Costs change only when the operator decides to adjust its investment strategy -Limits margin squeeze situation for home network due to data consumption increase -Eases widespread adoption of roaming in wholesale flat-rate offers	- Very complex to implement, requiring additional costs due to adaptation of billing and charging systems -Maintains two different kinds of billing systems - Uncertainty regarding traffic flows - Uncertainty regarding needed capacity for visiting operators (example: dealing with seasonality), that could raise QoS issue for the roaming customers (need to introduce QoS management). -Possibly higher entry barriers for small operators

Wholesale regulation		Description	Pros	Cons
		provider's underlying costs)		
MVNO regulation	Pass the discounts on to the MVNO	MNOs obliged to pass the discounts for roaming services they get from the visited networks on to the MVNOs	MVNOs may be put in a situation to provide RLAH in a sustainable way and allow them to compete on roaming services with MNOs	Difficult to verify by regulators Risk of increasing domestic wholesale tariff conditions of MVNOs Intrusive with regard to the current commercial practice.
	MNOs include "RLAH" in their wholesale offer to MVNOs	MNOs may be obliged to include "RLAH" (roaming with no surcharge) in their wholesale offer to MVNOs, effectively allowing the MVNO to provide them at retail level with no surcharge	MVNOs may be put in a situation of being able to provide RLAH in a sustainable way which allows them to compete on roaming services with MNOs	Risk of increasing domestic wholesale tariff conditions of MVNOs Intrusive with regard to the current commercial practice.
	MNO supplies all services needed at wholesale charges	Include wholesale tariffs for services needed to comply with retail roaming regulation, which sometimes paid as extra above caps and sometimes supplied within caps, into the wholesale roaming caps obligatory	MVNOs may be put in a situation of being able to provide RLAH in a sustainable way which allows them to compete on roaming services with MNOs	Risk of increasing domestic wholesale tariff conditions of MVNOs Intrusive with regard to the current commercial practice.

Table 3: Some preliminary approaches to a wholesale regulation

Annex 1 – Additional information on travelling pattern

Country	%Roamers 1H2013	%Roamers 2H2013	%Roamers 1H2014	%Roamers 2H2014	%Roamers 1H2015	Roaming Subscribers increase 2H2014 vs 1H2014
Austria	33.9%	36.9%	31.5%	37.6%	31.8%	19.5%
Belgium	47.8%	59.7%	52.1%	59.9%	55.7%	15.0%
Bulgaria	9.3%	11.5%	9.6%	12.9%	12.2%	34.6%
Croatia	9.8%	23.0%	21.9%	23.8%	23.2%	5.3%
Cyprus	43.7%	57.6%	47.1%	61.7%	51.2%	29.1%
Czech	18.1%	23.7%	18.7%	24.8%	19.4%	31.4%
Denmark	16.4%	20.3%	19.3%	24.0%	21.8%	25.5%
Finland	24.9%	26.2%	24.6%	26.4%	25.3%	7.1%
France	40.1%	35.7%	36.0%	36.1%	34.9%	9.1%
Germany	n/a	19.2%	19.0%	16.4%	6.9%	4.5%
Greece	9.5%	13.5%	13.2%	16.7%	15.3%	21.9%
Hungary	24.7%	30.5%	27.9%	34.5%	27.3%	25.5%
Ireland	n/a	36.6%	37.4%	41.5%	45.7%	33.7%
Italy	9.3%	9.1%	8.4%	8.9%	7.6%	6.1%
Latvia	29.1%	31.1%	31.1%	31.9%	30.9%	2.4%
Luxembourg	62.3%	65.1%	67.9%	67.7%	67.9%	2.6%
Malta	33.1%	33.1%	34.8%	33.3%	34.3%	36.6%
Netherlands	35.1%	48.1%	42.3%	45.9%	36.9%	8.3%
Poland	26.5%	33.4%	30.4%	35.1%	28.6%	17.9%
Portugal	12.6%	16.3%	15.0%	16.2%	14.4%	11.8%
Romania	10.4%	12.8%	11.0%	13.3%	11.6%	24.9%
Slovakia	24.9%	29.1%	27.3%	32.1%	30.1%	20.2%
Slovenia	41.4%	53.0%	43.8%	54.6%	45.8%	25.7%
Spain	10.7%	13.3%	10.5%	13.1%	11.1%	22.9%
Sweden	28.7%	32.3%	28.6%	32.1%	29.0%	14.5%
UK	30.9%	39.3%	49.6%	66.9%	64.0%	39.0%
Norway	32.1%	41.7%	44.6%	51.6%	44.9%	15.9%
Min	**9.3%**	**9.1%**	**8.4%**	**8.9%**	**6.9%**	
Average	**21.5%**	**26.6%**	**25.1%**	**28.7%**	**25.9%**	
Median	**26.5%**	**31.1%**	**28.6%**	**32.1%**	**29.0%**	
Max	**62.3%**	**65.1%**	**67.9%**	**67.7%**	**67.9%**	

Table 4: Percentage of subscribers that roam at least once per semester in the EEA (source: operators' response to BEREC questionnaire September 2015).

	OUTBOUND 2H2014 per roamer		
Country	**VOICE (Min)**	**Data (MB)**	**SMS**
Austria	34.1	19.0	12.7
Belgium	26.8	29.0	32.1
Bulgaria	27.3	11.2	9.2
Croatia	10.5	5.6	13.7
Cyprus	23.9	8.2	24.4
Czech Rep.	25.1	22.1	32.8
Denmark	52.3	46.3	48.3
Estonia	n/a	n/a	n/a
Finland	15.2	21.5	11.5
France	13.7	37.6	19.8
Germany	n/a	n/a	n/a
Greece	13.4	6.5	5.4
Hungary	21.1	29.1	10.0
Iceland	n/a	n/a	n/a
Ireland	13.8	87.6	11.7
Italy	55.2	119.5	24.5
Latvia	16.9	5.7	24.2
Liechtenstein	n/a	n/a	n/a
Lithuania	n/a	n/a	n/a
Luxembourg	133.5	125.4	85.4
Malta	25.4	41.6	30.2
Netherlands	64.5	136.1	21.0
Norway	42.9	110.6	1.3
Poland	22.4	7.3	20.6
Portugal	21.2	13.1	21.5
Romania	63.3	81.8	30.4
Slovakia	31.4	23.5	20.7
Slovenia	36.2	170.0	36.1
Spain	23.7	44.3	3.9
Sweden	32.0	273.5	21.4
UK	13.1	86.1	17.6
Min	**10.5**	**5.6**	**1.3**
Average	**26.8**	**48.9**	**18.5**
Median	**25.2**	**33.4**	**20.9**
Max	**133.5**	**273.5**	**85.4**

Table 5: Amount of roaming traffic (voice, data, SMS) per roamer for the second half of 2014 (source: operators' response to BEREC questionnaire September 2015).

Country of destination → / Country of origin ↓	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech R.	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Iceland	Ireland	Italy	Latvia	Liechtenstein	Lithuania	Luxembourg	Malta	Netherlands	Norway	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK
Austria	0.0%	0.9%	0.7%	4.9%	0.1%	3.0%	0.5%	0.1%	0.3%	3.0%	36.9%	2.0%	6.4%	0.0%	0.5%	18.5%	0.1%	0.7%	0.1%	0.1%	0.2%	2.0%	0.4%	2.3%	0.5%	1.9%	2.3%	2.3%	4.1%	1.1%	3.9%
Belgium	2.1%	0.0%	0.6%	0.4%	0.1%	0.5%	0.5%	0.1%	0.2%	34.1%	9.2%	1.6%	0.6%	0.1%	0.3%	6.4%	0.1%	0.0%	0.1%	4.4%	0.1%	17.6%	0.3%	1.5%	1.9%	0.8%	0.2%	0.1%	11.5%	0.7%	3.8%
Bulgaria	6.1%	4.2%	0.0%	1.2%	0.6%	2.0%	1.2%	0.1%	0.3%	9.8%	19.6%	16.1%	2.9%	0.1%	0.2%	9.2%	0.1%	0.0%	0.1%	0.3%	0.4%	2.9%	0.5%	1.3%	0.4%	5.4%	0.6%	0.8%	5.8%	1.0%	6.9%
Croatia	3.4%	2.7%	0.5%	0.0%	0.5%	1.0%	6.0%	1.4%	7.8%	6.4%	13.3%	2.8%	1.3%	0.2%	0.6%	6.2%	2.5%	0.0%	1.9%	0.2%	0.3%	2.4%	7.2%	4.9%	1.0%	0.5%	0.3%	2.8%	12.5%	3.2%	6.1%
Cyprus	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Czech Rep.	10.0%	2.4%	1.2%	4.7%	0.2%	0.0%	0.6%	0.1%	0.2%	5.9%	29.5%	2.3%	2.5%	0.1%	0.2%	7.5%	0.1%	0.0%	0.1%	0.2%	0.1%	2.6%	0.6%	4.8%	0.4%	0.9%	14.3%	0.6%	3.6%	0.9%	3.5%
Denmark	2.7%	1.3%	0.3%	0.4%	0.2%	0.7%	0.0%	0.2%	1.3%	6.0%	18.0%	1.5%	0.5%	0.5%	0.6%	4.7%	0.3%	0.0%	0.3%	0.1%	0.2%	2.7%	9.2%	2.1%	0.8%	0.4%	0.1%	0.1%	7.9%	30.0%	7.1%
Estonia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Finland	1.6%	1.9%	0.5%	0.7%	0.3%	1.0%	2.6%	15.3%	0.0%	4.5%	10.0%	3.0%	1.1%	0.2%	0.4%	4.1%	1.0%	0.0%	0.6%	0.2%	0.3%	2.4%	3.3%	1.8%	1.5%	0.2%	0.2%	0.2%	16.9%	19.5%	4.8%
France	1.0%	14.8%	0.4%	0.6%	0.1%	0.9%	0.6%	0.1%	0.3%	0.0%	10.2%	2.2%	0.5%	0.1%	1.0%	12.7%	0.1%	0.0%	0.2%	4.0%	0.3%	3.5%	0.5%	2.2%	9.1%	1.8%	0.2%	0.1%	20.1%	1.0%	11.2%
Germany	na	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Greece	2.7%	3.5%	8.9%	0.7%	6.5%	1.1%	0.9%	0.1%	0.4%	9.0%	15.7%	0.0%	1.2%	0.3%	0.3%	16.6%	0.1%	0.1%	0.1%	0.3%	0.5%	4.0%	0.6%	1.6%	0.9%	3.6%	0.5%	0.3%	5.1%	1.0%	13.6%
Hungary	22.2%	2.6%	0.5%	2.7%	0.2%	3.0%	0.6%	0.0%	0.2%	5.7%	28.4%	1.8%	0.0%	0.3%	0.0%	7.7%	0.1%	0.0%	0.1%	0.2%	0.2%	2.9%	0.5%	1.8%	0.2%	4.4%	3.5%	1.7%	2.8%	1.1%	4.8%
Iceland	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ireland	0.7%	1.2%	0.3%	0.2%	0.1%	0.6%	0.5%	0.1%	0.2%	5.4%	4.2%	0.5%	0.5%	0.0%	0.0%	3.0%	0.3%	0.0%	0.5%	0.1%	0.3%	1.7%	0.3%	2.1%	3.3%	0.3%	0.3%	0.0%	19.6%	0.6%	53.1%
Italy	4.7%	3.1%	0.8%	2.6%	0.1%	1.4%	0.7%	0.1%	0.3%	22.4%	14.9%	4.4%	1.4%	0.1%	0.9%	0.0%	0.1%	0.0%	0.2%	0.4%	1.4%	2.7%	0.5%	2.2%	1.3%	4.6%	0.4%	1.6%	13.9%	0.8%	12.0%
Latvia	2.1%	2.9%	0.5%	1.1%	0.5%	0.9%	6.8%	1.6%	9.0%	6.8%	12.5%	3.1%	0.9%	0.2%	0.6%	4.9%	0.0%	0.0%	2.2%	0.2%	0.3%	2.5%	8.2%	5.5%	1.1%	0.4%	0.2%	0.7%	14.1%	3.6%	6.6%
Liechtenstein	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lithuania	2.1%	2.9%	0.5%	1.1%	0.5%	0.9%	6.8%	1.5%	8.9%	6.7%	12.4%	3.1%	0.9%	0.2%	0.6%	4.8%	2.8%	0.0%	0.0%	0.2%	0.3%	2.4%	8.2%	5.5%	1.1%	0.4%	0.2%	0.7%	14.0%	3.6%	6.6%
Luxembourg	2.0%	3.8%	0.3%	0.4%	0.1%	0.6%	0.5%	0.1%	0.3%	35.0%	10.4%	1.6%	0.6%	0.1%	0.4%	6.6%	0.1%	0.0%	0.1%	0.0%	0.1%	16.0%	0.4%	1.3%	2.5%	0.5%	0.2%	0.1%	11.3%	0.7%	4.0%
Malta	2.1%	2.7%	0.8%	0.6%	1.0%	0.8%	0.6%	0.1%	0.3%	6.3%	9.4%	2.0%	1.0%	1.2%	0.3%	33.4%	0.3%	0.0%	0.2%	0.3%	0.0%	2.9%	0.6%	0.9%	0.8%	0.9%	0.3%	0.4%	5.8%	2.0%	22.2%
Netherlands	3.2%	18.2%	0.5%	0.6%	0.1%	0.7%	1.9%	0.2%	1.3%	11.7%	24.9%	1.6%	0.8%	0.2%	0.7%	6.3%	0.4%	0.0%	0.4%	0.5%	0.1%	0.0%	1.8%	2.5%	1.5%	0.9%	0.2%	0.2%	8.7%	1.9%	8.3%
Norway	1.0%	0.9%	0.7%	1.3%	0.6%	0.5%	10.2%	0.5%	1.9%	4.5%	5.7%	3.4%	0.6%	0.4%	0.7%	3.3%	0.6%	0.0%	0.7%	0.0%	0.2%	2.7%	0.0%	3.1%	1.0%	0.3%	0.1%	0.1%	20.7%	25.9%	8.4%
Poland	3.7%	4.4%	0.7%	1.6%	0.1%	3.1%	1.7%	0.2%	0.5%	8.0%	37.5%	1.8%	1.3%	0.1%	0.6%	6.2%	0.3%	0.0%	0.8%	0.2%	0.1%	6.0%	3.5%	0.0%	0.5%	0.6%	2.0%	0.3%	3.5%	3.2%	7.4%
Portugal	0.7%	4.3%	0.2%	0.2%	0.0%	0.5%	0.5%	0.1%	0.2%	30.9%	7.6%	0.4%	0.3%	0.0%	0.6%	3.8%	0.1%	0.0%	0.1%	1.6%	0.1%	2.7%	0.5%	0.7%	0.0%	0.5%	0.1%	0.1%	34.1%	0.5%	8.5%
Romania	7.1%	4.6%	3.1%	0.4%	0.3%	1.4%	1.0%	0.0%	0.1%	10.5%	20.0%	4.0%	6.7%	0.1%	0.1%	11.7%	0.0%	0.0%	0.0%	0.4%	0.1%	2.9%	0.5%	1.1%	0.4%	0.0%	0.5%	1.0%	4.4%	1.4%	15.6%
Slovakia	16.8%	2.0%	0.6%	3.0%	0.1%	32.6%	0.4%	0.0%	0.2%	3.6%	16.9%	0.7%	6.9%	0.0%	0.3%	4.7%	0.0%	0.0%	0.0%	0.1%	0.1%	1.7%	0.5%	2.7%	0.1%	0.5%	0.0%	0.5%	1.5%	0.5%	3.0%
Slovenia	20.0%	1.5%	0.3%	34.9%	0.0%	1.3%	0.3%	0.1%	0.1%	2.9%	14.4%	0.8%	1.6%	0.1%	0.0%	13.6%	0.0%	0.0%	0.0%	0.2%	0.1%	1.3%	0.1%	0.6%	0.3%	0.3%	0.8%	0.0%	1.9%	0.5%	1.7%
Spain	1.2%	3.6%	0.5%	0.3%	0.1%	0.8%	0.6%	0.1%	0.4%	31.6%	12.4%	0.8%	0.6%	0.1%	1.6%	11.7%	0.1%	0.0%	0.1%	0.3%	0.3%	3.2%	0.7%	1.5%	12.1%	1.8%	0.2%	0.2%	0.0%	0.9%	12.5%
Sweden	2.0%	2.1%	0.4%	0.9%	0.6%	0.9%	15.9%	1.0%	6.8%	6.1%	9.9%	2.6%	0.8%	0.3%	0.5%	4.7%	1.5%	0.0%	1.2%	0.2%	0.3%	2.3%	13.3%	3.8%	1.1%	0.3%	0.2%	0.4%	13.8%	0.0%	6.4%
UK	1.8%	2.7%	0.6%	0.5%	1.3%	0.8%	1.4%	0.1%	0.6%	17.7%	8.3%	2.9%	0.8%	3.2%	10.1%	8.8%	0.2%	0.0%	0.3%	0.4%	0.6%	4.6%	1.5%	2.1%	3.5%	0.8%	0.2%	0.1%	21.7%	2.0%	0.0%

Table 6: Roaming voice traffic flow between countries in the second half of 2014. Green cells contain values bigger than 5% and red ones, bigger that 25%.(Source: operators' response to BEREC questionnaire September 2015)

	Voice (Inbound/ outbound ratio)			Data (Inbound/ outbound ratio)			SMS (Inbound/ outbound ratio)		
Country	**2013**	**2014**	**1H 2015**	**2013**	**2014**	**1H 2015**	**2013**	**2014**	**1H 2015**
Austria	81%	87%	96%	30%	57%	78%	120%	115%	120%
Belgium	114%	131%	168%	161%	170%	247%	102%	107%	127%
Bulgaria	124%	117%	82%	670%	383%	147%	191%	190%	145%
Croatia	144%	155%	122%	3610%	4238%	1400%	91%	91%	61%
Cyprus	153%	177%	180%	165%	1053%	1025%	186%	170%	154%
Czech Republic	107%	90%	86%	52%	77%	121%	48%	49%	50%
Denmark	72%	77%	79%	119%	152%	157%	48%	43%	40%
Estonia	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Finland	72%	77%	72%	96%	84%	78%	55%	55%	51%
France	144%	141%	149%	219%	125%	113%	102%	80%	70%
Germany	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Greece	289%	323%	240%	559%	709%	497%	733%	890%	658%
Hungary	101%	94%	80%	229%	255%	269%	101%	111%	124%
Iceland	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ireland	37%	45%	55%	27%	39%	40%	41%	42%	48%
Italy	98%	95%	116%	110%	100%	128%	125%	152%	186%
Latvia	88%	100%	97%	123%	123%	105%	52%	58%	47%
Liechtenstein	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lithuania	85%	96%	94%	113%	115%	98%	51%	57%	47%
Luxembourg	104%	120%	145%	153%	176%	247%	131%	137%	151%
Malta	330%	305%	343%	800%	760%	722%	274%	277%	314%
Netherlands	45%	51%	58%	23%	34%	49%	62%	70%	77%
Norway	54%	55%	71%	37%	48%	97%	53%	57%	60%
Poland	63%	61%	65%	108%	219%	503%	42%	38%	38%
Portugal	150%	100%	88%	584%	476%	219%	128%	143%	136%
Romania	72%	40%	21%	86%	37%	20%	35%	30%	24%
Slovakia	51%	46%	43%	62%	18%	14%	46%	42%	39%
Slovenia	115%	99%	88%	34%	31%	49%	62%	55%	58%
Spain	325%	373%	350%	523%	531%	391%	1445%	1692%	1913%
Sweden	100%	111%	117%	107%	116%	76%	52%	56%	61%
Switzerland	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
UK	75%	76%	90%	58%	55%	70%	63%	63%	74%
Min	**37%**	**40%**	**21%**	**23%**	**18%**	**14%**	**35%**	**30%**	**24%**
Average	**100%**	**101%**	**100%**	**270%**	**311%**	**218%**	**139%**	**152%**	**152%**
Median	**100%**	**96%**	**90%**	**113%**	**123%**	**121%**	**63%**	**70%**	**70%**
Max	**330%**	**373%**	**350%**	**3610%**	**4238%**	**1400%**	**1445%**	**1692%**	**1913%**

Table 7: Inbound/Outbound ratio for roaming services (voice, data and SMS) for the period 2013, 2014 and first half of 2015. The value is in green when the ratio inbound/outbound is bigger than 100% (receiving country) and the value is in red when the same ratio is smaller than 100% (sending country). (Source: operators' response to BEREC questionnaire September 2015).

Annex 2 – Overview of the amount of RLAH tariff plans

Country	Amount of operators that offer RLAH tariff plans	Total amount of tariff plans observed
Austria	2	15
Belgium	3	12
Bulgaria	1	16
Czech Republic	1	1
France	6	43
Germany	2	10-15
Greece	1	2
Hungary	2	±5
Luxembourg	4	58
Norway	1	4
Poland	3	16
Portugal	1	±7
Romania	1	9
Slovakia	3	14
Slovenia	2	3
Spain	2	6
United Kingdom	2	±7

Table 8: Overview of the amount of RLAH tariff plans and operators that offer such tariff plans, per country, September 2015 (Add-ons are excluded). Source: operators' response to BEREC questionnaire September 2015.

				Volume of domestic services			Volume of roaming services			FUP		
Country	Type of customers	Description of plan	Price of the tariff plan	voice	SMS	data	voice	SMS	data	Voice FUP	SMS FUP	Data FUP
Austria	Business		14,50 EUR	6000	1000	3GB	300			300	no sms	no data
Belgium	Business		50 EUR	unl	unl	5 GB	600	600	600 MB	600	600	600 MB
Bulgaria	Residential		16.99 LEV	2200	200	1,5GB	20			20	no sms	no data
Czech Republic	Residential			unl.	unl.	3GB	300 outgoing, 300 incoming	300	300 MB	300	300	300MB
France	Residential		36,99 EUR	unl.	unl.	10GB	unl.	unl.	10GB for 35 days	35 days/year. 120 min. max. call duration, max. 200 different recipients/month	Max. 200 different recipients/month , 35 days/year	10GB for 35 days
Germany	Business			unl.	unl.	1GB/3GB/5GB/10GB	30/60/120/Flat	30/60/120/Flat	50MB/100MB/150MB/1GB	max 7500 in the unlimited plan	max 3000 in the unlimited plan	50MB/100MB/150MB/1GB
Greece	Business			from 600 to 1200		from 300MB to 1GB	50 mins		50 MB	500mins	no sms	500 MB
Hungary		+ 50 min international calls (mostly in EU)		unl.	unl.	5 GB	unl.	unl.	5 GB	unl.	unl.	5 GB
Luxembourg	Business		64,85 EUR	unl.	unl.	unl.	500 min or SMS		500MB	500 min or SMS		500MB
Norway	Business	The included volume is shared between domestic and roaming usage.		10000	10000	15GB	10000	10000	15GB	10000	10000	15GB
Poland	Residential & Business		69,99 PLN	unl.	unl.	unl.	unl.	unl.	1GB for 60 days	Volume: unlimited. 60 Days/year	Volume: unlimited. 60 Days/year	1GB for 60 days
Portugal	Business			5500	1500	1GB - 2GB	1000		1GB - 2GB	1000	no sms	1GB - 2GB
Romania	Business		27 EUR	unl.	unl.	2.5 GB	800 units		500 MB	800 units		500 MB
Slovakia	Residential & Business		46,99 EUR	unl.	unl.	6 000 MB	1000		100 MB	1000		100 MB
Slovenia	Residential & Business			unl.	unl.	Unlimited	100		1GB	100		1GB
Spain	Residential		33 EUR	unl.	unl.	3GB	unl.	unl.	3GB			
UK	Residential		Various	unl.	unl.	Various allowances	unl.	unl.	Various	Volume: unlimited. 120 min. max. call duration	unl.	Various

Table 9: A small sample of some of the current 'RLAH tariff plans' on the market in each country that offers RLAH tariff plans, with their respective FUPs.