

# **30<sup>th</sup> BEREC International Roaming Benchmark Data and Monitoring Report**

7 March 2024

## Contents

<b>1. Structure of the Report .....</b>	<b>6</b>
<b>2. Introduction .....</b>	<b>6</b>
<b>3. Main findings of the roaming benchmark data.....</b>	<b>8</b>
<b>4. Main findings on the transparency of roaming tariffs.....</b>	<b>12</b>
4.1. Main findings regarding the questionnaire for operators.....	13
4.2. Main findings regarding the questionnaire for NRAs .....	15
<b>5. Charts.....</b>	<b>17</b>
5.1. Analysis of subscribers and those that use roaming services .....	18
5.1.1. Domestic average Retail Mobile Revenue per User (ARRPU).....	18
5.1.2. Consumption patterns for domestic mobile retail services .....	21
5.1.3. Consumption patterns for RLAH services (voice, SMS and data).....	24
5.2. The development of Roaming Services .....	33
5.2.1. Voice roaming services.....	33
5.2.1.1 Wholesale rates .....	33
5.2.1.2 Consumption patterns.....	35
5.2.2. SMS roaming services .....	40
5.2.2.1 Wholesale rates .....	40
5.2.3. Data roaming services .....	42
5.2.3.1 Wholesale rates .....	42
5.2.3.2 Consumption patterns.....	47
5.2.4. RoW retail roaming prices .....	52
5.3. Wholesale roaming (outbound) rates per unit for agreements applying Art. 3 Roaming Regulation .....	55
5.4. MNOs and MVNOs data.....	60
5.4.1. Consumption patterns for domestic mobile retail services .....	61
5.4.2. Consumption patterns for RLAH services (voice, SMS and data).....	66
5.4.3. Payment to the host operator for the provision of wholesale international roaming services .....	69
5.5. M2M data .....	71
5.5.1. Connected devices .....	72
5.5.2. Consumption patterns (voice, data and SMS).....	74
5.6. Transparency and Comparability of Roaming Tariffs.....	78
5.6.1. Transparency of retail offers QoS.....	79
5.6.2. Application of FUPs .....	83
5.6.3. Information and tools for consumers .....	87
5.6.4. Non-EU/EEA destinations.....	91
5.6.5. Alternative tariffs .....	93
5.6.6. Information provided .....	98
5.6.7. Cut-off limits .....	102
5.6.8. Non-EU/EEA destinations, inadvertent roaming and non-terrestrial networks.....	107
5.6.9. Welcome SMS .....	110
5.6.10. Transparency of wholesale offers regarding QoS .....	113
5.6.11. Agreements on pricing .....	117
5.6.12. Applications for sustainability surcharges.....	123
5.6.13. Complaints on transparency issues received by NRAs .....	125
<b>Annex I: Methodology for the data collection .....</b>	<b>136</b>
<b>Annex II: Regulatory evolution.....</b>	<b>139</b>
<b>Annex III: List of respondents .....</b>	<b>142</b>

## Table of Figures

Figure 1: Domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q3 23.....	19
Figure 2: EEA average: domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q4 20 – Q3 23.....	20
Figure 3: Domestic data services: average consumption per month per total number of subscribers (GB), Q3 23.....	22
Figure 4: EEA average: domestic data services: average consumption per month per total number of subscribers (GB), Q4 20 – Q3 23.....	23
Figure 5: EEA average number of RLAH minutes per month per total number of roaming subscribers with active RLAH services, Q4 20 – Q3 23.....	25
Figure 6: EEA average number of SMS per month per total number of roaming subscribers with active RLAH services, Q4 20 – Q3 23.....	26
Figure 7: Data services with active RLAH: average consumption per month per total number of roaming subscribers with active RLAH services (in GB), Q3 23.....	27
Figure 8: RLAH, data services: EEA average consumption per month per total number of roaming subscribers with active RLAH services (in GB), Q4 20 – Q3 23.....	28
Figure 9: Share of total subscribers with EU/EEA roaming enabled, Q3 23.....	29
Figure 10: Percentage of subscribers that were roaming at least once in the concerned quarter in the EEA, compared to the total number of subscribers who have roaming enabled subscriptions, Q4 20 – Q3 23.....	30
Figure 11: Number of roaming days per active SIM by quarter, Q4 21 – Q3 23.....	31
Figure 12: Roaming days per active SIM by country, Q1 21 - Q3 23.....	32
Figure 13: EEA and RoW average wholesale rates per minute, Q4 20 – Q3 23 (balanced, unbalanced, total and RoW traffic, and non-terrestrial network payments).....	34
Figure 14: EEA average: roaming calls made by share of tariff, Q4 20 – Q3 23.....	36
Figure 15: Roaming calls made: EEA average number of minutes per month per total number of roaming subscribers Q4 20 – Q3 23.....	37
Figure 16: EEA average: Roaming calls made, (millions of minutes), Q4 20 – Q3 23.....	38
Figure 17: EEA roaming calls received, (millions of minutes), Q4 20 – Q3 23.....	39
Figure 18: EEA average wholesale rates per roaming SMS, Q4 20 – Q3 23 (balanced, unbalanced, total and RoW traffic, and non-terrestrial networks).....	41
Figure 19: EEA average: wholesale roaming rates per GB (balanced and unbalanced traffic), Q4 20 – Q3 23.....	43
Figure 20: EEA average: average wholesale roaming data rates per GB (total traffic), Q4 20 – Q3 23.....	44
Figure 21: EEA average wholesale data rates per GB, Q4 20 – Q3 23 (balanced, unbalanced, total and RoW traffic, and non-terrestrial networks).....	45
Figure 22: Proportion of balanced and unbalanced traffic within EEA countries, data services, wholesale roaming inbound, Q3 23.....	46
Figure 23: EEA average: retail data roaming services by share of tariff, Q4 20 – Q3 23.....	48
Figure 24: Average data consumption per month per total number of roaming subscribers (in GB), Q3 22 and Q3 23.....	49
Figure 25: EEA average data consumption per month per total number of roaming subscribers (in GB), Q4 20 – Q3 23.....	50
Figure 26: EEA retail data, Q4 20 – Q3 23 (millions of GB).....	51
Figure 27: EEA average retail prices for RoW roaming services, Q4 20 – Q3 23.....	53
Figure 28: EEA average retail prices (in Euro cents) for roaming on non-terrestrial networks, Q4 21 – Q3 23.....	54
Figure 29: Wholesale averages outbound roaming: rate per minute for agreements applying Article 3 Roaming Regulation, Q4 20 – Q3 23.....	56

Figure 30: Wholesale averages outbound roaming: rate per SMS for agreements applying Article 3 Roaming Regulation, Q4 20 – Q3 23.....	57
Figure 31: Wholesale EEA average outbound roaming: rate per GB for agreements applying Article 3 Roaming Regulation, Q4 20 – Q3 23.....	58
Figure 32: Relation between wholesale costs and prices (min, SMS, GB), MNOs and MVNOs, Q4 22 - Q3 23.....	59
Figure 33: Domestic data services, average consumption per month per total number of subscribers (GB), MNOs and MVNOs, Q3 23.....	62
Figure 34: EEA average domestic mobile services consumption per month per total number of subscribers, Q4 22 - Q3 23.....	63
Figure 35: MNOs: share of total subscribers with EU/EEA roaming enabled, Q4 20 - Q3 23.....	64
Figure 36: MVNOs: share of total subscribers with EU/EEA roaming enabled, Q4 20 - Q3 23.....	65
Figure 37: RLAH, calls made: EEA average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q4 20 – Q3 23.....	67
Figure 38: RLAH, data services: EEA average number of GB per month per total number of roaming subscribers, MNOs and MVNOs, Q4 20 – Q3 23.....	68
Figure 39: EEA average of the payment to the host operator for the provision of wholesale roaming services (per unit), MVNOs, Q4 20 – Q3 23.....	70
Figure 40: Total number of active connected objects/devices at EEA level (with roaming enabled or domestic only), Q2 20 - Q3 23.....	73
Figure 41: EEA average: share of retail consumption of roaming and domestic data per month from connected devices/objects (in GB), Q4 20 - Q3 23.....	75
Figure 42: EEA average: share of retail consumption of roaming and domestic calls made per month from connected devices/objects (in GB), Q4 20 - Q3 23.....	76
Figure 43: EEA average: share of retail consumption of roaming and domestic SMS per month from connected devices/objects, Q4 20 - Q3 23.....	77
Figure 44: Percentage of roaming providers offering specific network technologies to their subscribers when roaming in the EU/EEA.....	80
Figure 45: Number of international roaming providers offering 5G non-standalone roaming services in different EEA countries (excluding national providers).....	81
Figure 46: Percentage of roaming providers differentiating between technologies when offering services at home.....	82
Figure 47: Number of MNOs and MVNOs using different types of FUP measures (based on data collected by BEREC for TACR report in 2018 – 2023; total number of respondents that could be identified as either MNO or MVNO Q4 2022 – Q3 2023 = 152).....	84
Figure 48: Surcharges levied by MNOs and MVNOs for voice services when exceeding the FUP.....	85
Figure 49: Surcharges levied by MNOs and MVNOs for data services when exceeding the FUP measures.....	86
Figure 50: Information provided to subscribers with an open data bundle FUP about roaming limits.....	88
Figure 51: How information about roaming limits is provided to subscribers with an open data bundle FUP.....	89
Figure 52: Where information about roaming limits is provided on websites.....	90
Figure 53: Inclusion of consumption in non-EU/EEA destinations as part of the RLAH FUP.....	92
Figure 54: Percentage of roaming providers offering alternative tariffs (based on data collected by BEREC for TACR report in 2018 – 2023).....	94
Figure 55: Types of roaming packages (daily/weekly/monthly/other) offered by respondents (based on data collected by BEREC for TACR report in 2018 – 2023).....	95
Figure 56: Number of roaming providers that inform end users with alternative tariffs about the different issues.....	96
Figure 57: Surcharges for alternative tariffs in EEA vs. non-EEA destinations.....	97
Figure 58: Number of operators that provide information about alternative tariffs/switching between tariffs through different channels.....	99

Figure 59: Number of operators that provide different types of QoS information on a per-network basis .....	100
Figure 60: Type of information provided on VAS charges in a roaming context .....	101
Figure 61: Type of information not related to charges provided on VAS while roaming .....	101
Figure 62: Types of cut-off limits offered by roaming providers .....	103
Figure 63: Share of roaming providers which provide different types of information on cut-off limits .....	104
Figure 64: Structure of cut-off limits .....	105
Figure 65: Charges for roaming in non-terrestrial networks included in the financial limits .....	106
Figure 66: Non-EU/EEA destinations, inadvertent roaming and non-terrestrial networks .....	108
Figure 67: Measures implemented to protect consumers from paying for inadvertent roaming in the EU/EEA .....	109
Figure 68: Share of providers offering different types of information in the EU/EEA Welcome SMS .....	111
Figure 69: Share of providers offering different types of information in the RoW Welcome SMS .....	112
Figure 70: Problems of access seekers with gaining access to network technologies for roaming offers .....	114
Figure 71: Implementation problems of access seekers with network technologies for roaming offers .....	115
Figure 72: Number of respondents with a certain percentage of EU/EEA outbound roaming agreements including operational VoLTE or VoNR services .....	116
Figure 73: Agreements on technology and pricing (total number of respondents Q4 2021 – Q3 2022 = a) 90, b) 97) .....	118
Figure 74: Mechanisms used for reaching agreements on roaming prices .....	119
Figure 75: Other pricing schemes used by respondents .....	120
Figure 76: Obstacles encountered at a wholesale level .....	121
Figure 77: Special wholesale contracts/agreements for services provided by connected objects/devices .....	122
Figure 78: Applications for sustainability surcharges received and granted by NRAs, (total number of respondents Q4 2022 – Q3 2023 = 29) .....	124
Figure 79: Number of complaints received by NRAs per country (total number of respondents Q4 2022 – Q3 2023 = 29) .....	126
Figure 80: Number of NRAs that received complaints from end users on specific issues (total number of respondents Q4 2022 – Q3 2023 = 25) .....	127
Figure 81: Complaints from end users received by NRAs regarding FUP related issues (total number of respondents Q4 2022 – Q3 2023 = 24) .....	128
Figure 82: Complaints from end users received by NRAs regarding inadvertent roaming (total number of respondents Q4 2022 – Q3 2023 = 26) .....	129
Figure 83: Complaints from end users received by NRAs regarding a lack of information about tariffs and conditions (total number of respondents Q4 2022 – Q3 2023 = 24) .....	130
Figure 84: Complaints from end users received by NRAs regarding the application of RLAH tariffs (total number of respondents Q4 2022 – Q3 2023 = 26) .....	131
Figure 85: Complaints from end users received by NRAs regarding VAS (total number of respondents Q4 2022 – Q3 2023 = 23) .....	132
Figure 86: Complaints from end users received by NRAs regarding roaming on non-terrestrial networks (total number of respondents Q4 2022 – Q3 2023 = 26) .....	133
Figure 87: Complaints from end users received by NRAs regarding QoS (total number of respondents Q4 2022 – Q3 2023 = 25) .....	134
Figure 88: Complaints from end users received by NRAs regarding access to emergency services and other complaints (total number of respondents Q4 2022 – Q3 2023 = 25) .....	135

## 1. Structure of the Report

The BEREC (Body of European Regulators for Electronic Communications) Report on International Roaming BEREC Benchmark Data and Transparency and Comparability Report of international roaming tariffs (the “Report”) contains five parts and three annexes. While this chapter describes the **Structure of the Report**, chapter 2 is an **Introduction** to the BEREC Report and describes BEREC’s work on roaming based on the Roaming Regulation (EU) 2022/612<sup>1</sup> (hereinafter “Roaming Regulation”).

The key findings of this Report are included in chapter 3 “**Main findings of the roaming benchmark data**” and chapter 4 “**Main findings on the transparency of roaming tariffs**”. The fifth chapter “**Charts**” presents the latest available data on the domestic mobile market and international roaming mobile market, also an overview of the transparency and comparability of retail roaming tariffs. “**Annex I: Methodology for the data collection**” provides a detailed description of the methodology for the current data collection. “**Annex II: Regulatory evolution**” outlines regulatory measures taken to reduce price levels for roaming services within the EU. “**Annex III: List of respondents**” includes the list of operators that provided data for this Report. The Report is accompanied by a spreadsheet file enabling access to the data included in the Report (published together with the Report) as well as additional data on roaming.

## 2. Introduction

The Roaming Regulation has brought several new obligations for roaming providers but also for national regulatory authorities (NRAs) and BEREC with regard to the data collection<sup>2</sup>. Besides the requirement to collect new indicators, the intervals for the data collections have been reduced from two per year to one. Therefore, BEREC had to modify the structure of its data questionnaires and the modalities of its data collection. The International Roaming Benchmark Data questionnaire and the questionnaire for the Transparency and Comparability Report have been combined into one questionnaire with additional new indicators to be collected and new templates for roaming providers and for NRAs have been introduced.

This Report presents the results of this combined data collection on European international roaming services and the transparency and comparability of retail roaming tariffs undertaken by BEREC. The Report covers the period 1 October 2022 – 30 September 2023, i.e. the 4th quarter of 2022, 1st quarter of 2023, 2nd quarter of 2023 and 3rd quarter of 2023. The Report also includes benchmark data and transparency of roaming tariffs from previous rounds of data collection. In order to compare, data published in previous years and which have been removed from the Report, remain available in the .xls file, published on the BEREC website. The earliest data in this Report is from the 4th quarter 2020. BEREC has also collected data on connected objects/devices and its related traffic/revenues at retail and wholesale level

<sup>1</sup> Regulation (EU) No. 2022/612 of the European Parliament and of the Council of 6 April 2022, available at: <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32022R0612>

<sup>2</sup> As it is described in the chapter about the methodology for the data collection, some operators and NRAs with regard to the definition of the indicators for active SIM cards (prepaid, postpaid and corporate) misunderstood the definition. This issue mainly happened due to the new template and the new indicators introduced for the data collection. Unfortunately, BEREC within the deadlines could not solve this issue. This means, that some respondents did not report the corporate customers also under prepaid and postpaid SIM cards. This circumstance leads to misleading conclusions for some countries (increase of volumes per subscriber, ARPPUs, etc.), as the denominator for active SIM card was underestimated.

since the 26th data collection. Despite the technical difficulties faced by many roaming providers in the EEA regarding the provision of information (especially on wholesale level), BEREC analysed the information gathered and presented results in this Report. It should be noted that the charts on connected objects/devices should be interpreted with caution as data in the fourth data collection is still not quite comprehensive.

The assessment of the international roaming market should be based on the requirements set out in Article 21 (2) Roaming Regulation. In order to assess the competitive developments in the Union-wide roaming markets, BEREC is tasked with regularly collecting data from NRAs on the development of retail and wholesale charges for regulated voice, SMS and data roaming services, including wholesale charges applied for balanced and unbalanced roaming traffic respectively, on the impact of the roll-out and implementation of next generation mobile communications networks and technologies on the roaming market, on the use of trading platforms and similar instruments, on the development of machine-to-machine roaming and IoT devices, and on the extent to which wholesale roaming agreements cover quality of service (QoS) and give access to different network technologies and generations.

BEREC shall also collect data regularly from NRAs on the application of fair use policies (FUP) by roaming providers, the development of domestic-only tariffs, the application of the sustainability mechanisms and complaints on roaming as well as compliance with the QoS obligations. Where appropriate, NRAs shall coordinate with and collect such data from other competent authorities. BEREC shall regularly collect and provide additional information on transparency, on the application of measures on emergency communication, on value-added services and on roaming on non-terrestrial public mobile communications networks.

BEREC shall also collect data on the wholesale roaming agreements not subject to the maximum wholesale roaming charges provided for in Articles 9, 10 or 11 of the Roaming Regulation as well as on the implementation of contractual measures at wholesale level aiming 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' customers while the latter are periodically travelling within the Union. On the basis of data collected pursuant to this paragraph, BEREC shall report regularly on the evolution of pricing and consumption patterns in the Member States both for domestic and roaming services, the evolution of actual wholesale roaming rates for unbalanced traffic between providers of roaming services, and on the relationship between retail prices, wholesale charges and wholesale costs for roaming services. BEREC shall assess how closely those elements relate to each other.

BEREC coordinates this process of data collection by pursuing the following objectives:

- simplifying the process not only for NRAs, as BEREC acts as a central point for the data collection, but also for the European Commission (EC), as the data are received from a single source and a following uniform data processing;
- coordinating the procedures of individual NRAs, as a single and commonly agreed-upon data collection model is used for the process of data collection, and the process is synchronised and based on the same collection periods. BEREC consults the market players and the EC before finalising the data collection templates;



- providing, as far as possible, a common response to the different questions posed during the collection process by roaming providers and NRAs, as BEREC serves as the forum where these questions are commonly debated and addressed.

### 3. Main findings of the roaming benchmark data

Over 160 operators providing international roaming services submitted information for this Report. This number includes virtually all of the mobile network operators (MNOs) in the EEA, as well as a significant number of mobile virtual network operators (MVNOs) that provide EEA roaming services. BEREC estimates that this report covers around 95 % of mobile customers in the EEA.

#### **Domestic prices for mobile services – Average Retail Revenue Per User (ARRPU)**

BEREC analysed the retail domestic prices and found that it is hard to disaggregate the different mobile communications services (voice, SMS and data) since they are often provided in bundle of several services, including intra-EEA roaming communications and, in several cases, also non-mobile services. Operators find it difficult to organise their revenue data by individual service categories (ISCs), such as fixed telephony, mobile telephony, fixed broadband, intra-EEA roaming communications and others, and no common methodology is defined for this purpose. Bundles challenge this practice, as ISCs require allocating bundle revenues to their components. Therefore, BEREC presents data on the evolution of the average retail revenue per user (ARRPU) for mobile communications. BEREC uses the ARRPU for its analysis but notes that the results of it should be interpreted with caution. For this calculation, BEREC used the data pertaining to mobile domestic services submitted by operators.<sup>3</sup> The domestic monthly ARRPU for Q3 2023 varies considerably between the countries, ranging from 1.19 Euros per month to 30.27 Euros per month, with a weighted EEA average of 10.83 Euros (Figure 1).<sup>4</sup>

#### **Intra-EEA roaming consumption patterns**

The BEREC data collected for this Report demonstrates the further recovery of the roaming market from the Covid-19 pandemic during Q4 2022 – Q3 2023. The ratio of roaming subscribers has increased since the respective quarters of 2020, and has almost reached pre-pandemic levels (30% Q3 2019), which is reflected in this Report (Figure 10). The same tendency cannot be found for roaming calls, they have not reached 7 billion minutes after the pandemic (Figure 16). For data roaming traffic, the volumes are well above the pre-pandemic period (Figure 26), but roaming data traffic is also impacted by the general trend of increased data consumption which occurs at the domestic level as well.

When addressing variations in intra-EEA roaming consumption patterns, it is necessary to take into account the impact of Brexit. Since Q4 2019, roaming-out traffic concerning the customers of UK roaming providers was no longer included in the benchmark, and since Q1

<sup>3</sup> The monthly ARRPU was calculated per country by dividing retail revenues (i.e. total revenues related to mobile voice, SMS and data traffic, excluding any other type of revenue, such as those originating from mobile devices, subscription fees to services etc.) in the respective quarters by the total number of domestic and roaming subscribers per country within the same period and dividing the result by 3 to arrive at a monthly value.

<sup>4</sup> BEREC would like to add note the caveat that the disproportion between national individual ARRPU could also be caused by different methodologies used by roaming providers to allocate the revenues between mobile communication services and non-mobile communication services.



2021, roaming concerning UK providers (at wholesale level) and UK subscribers (at retail level) was no longer included in the 'EEA' category but in the 'Rest of World' (RoW) category.<sup>5</sup>

### Rest of the World (RoW) roaming retail prices

With regard to the 'Rest of World' retail prices (Figure 27), EEA-based average prices depicted in Table 1.

*Table 1: The EEA average retail prices for Rest of World roaming services:*

RoW retail prices (no VAT)	Q4 2022	Q1 2023	Q2 2023	Q3 2023
Voice calls made (€/minute)	26.52	25.10	25.22	27.92
Voice calls received (€/minute)	12.88	12.47	12.68	12.96
SMS (€/unit)	10.59	11.26	10.84	10.29
Data (€/GB)	6.34	6.64	5.47	4.46

### Non-terrestrial network – retail prices

For its 30<sup>th</sup> data collection, BEREC has for the second time collected data on non-terrestrial network payments for roaming. The EEA average of retail services by EEA customers (Figure 28) are depicted in Table 2.

*Table 2: The EEA average retail prices for roaming services on non-terrestrial networks:*

Non-terrestrial network payments (no VAT)	Q4 2022	Q1 2023	Q2 2023	Q3 2023
Voice calls made (€/minute)	87.13	70.39	89.31	98.73
Voice calls received (€/minute)	56.69	46.65	52.99	62.32
SMS (€/unit)	14.40	12.93	10.45	11.98
Data (€/GB)	332.58	279.60	229.19	249.29

### Wholesale roaming rates for outgoing calls

At the wholesale level, the voice roaming charges set between roaming providers have declined below the regulated average caps (Figure 13). The EEA average rate for calls while roaming was 1.56 Euro cents in Q4 2022 and decreased 1.38 Euro cents in Q3 2023 compared to a cap of 2.20 Euro cents as of Q3 2022. A reduction in the average EEA wholesale rates for intra-EEA roaming voice calls since Q4 2020 (Figure 13) is observed. The applicable wholesale price caps and the related EEA average prices for calls attributed to totals traffic, balanced traffic and unbalanced traffic during the data collection period are listed in Table 3.

<sup>5</sup> Due to reporting system issues experienced by some operators not all UK data could be removed from the "EEA" category in Q1 2021.

*Table 3: The EEA average rates for wholesale calls (total, balanced and unbalanced traffic) and applicable wholesale price caps:*

Wholesale voice (no VAT)	Q4 2022		Q1 2023		Q2 2023		Q3 2023	
	Price Cap	EEA Average	Price Cap	EEA Average	Price Cap	EEA Average	Price Cap	EEA Average
Total traffic (€/minute)	2.20	1.54	2.20	1.43	2.20	1.38	2.20	1.38
Balanced (€/minute)		1.61		1.49		1.44		1.47
Unbalanced (€/minute)		1.03		1.04		1.07		1.09

### Wholesale roaming rates for SMS

At the wholesale level, a reduced average EEA rates for roaming SMS (Figure 18) is observed. The EEA average rate for SMS while roaming was 0.22 Euro cents in Q4 2022 and decreased 0.16 Euro cents in Q3 2023 compared to a cap of 0.40 Euro cents as of Q3 2022. The applicable wholesale price caps and the related EEA average prices for SMS attributed to totals traffic, balanced traffic and unbalanced traffic during the data collection period are listed in Table 4.

*Table 4: The EEA average prices for wholesale SMS (total, balanced and unbalanced traffic) and applicable wholesale price caps:*

Wholesale SMS (no VAT)	Q4 2022		Q1 2023		Q2 2023		Q3 2023	
	Price Cap	EEA Average	Price Cap	EEA Average	Price Cap	EEA Average	Price Cap	EEA Average
Total traffic (€/unit)	0.40	0.22	0.40	0.18	0.40	0.17	0.40	0.16
Balanced (€/unit)		0.27		0.21		0.20		0.19
Unbalanced (€/unit)		0.15		0.13		0.14		0.12

### Wholesale roaming rates for data

At the wholesale level, the data cap applicable in the EEA was 3.00 Euro per GB in Q4 2021, 2.50 Euro per GB for the period Q1 2022 – Q2 2022, 2.00 Euro per GB for the period Q3 2022– Q4 2022, and finally 1.80 Euro as of Q1 2023. The EEA average rate for wholesale data services decreased to 0.78 Euro per GB in Q3 2023 compared to 1.61 Euro per GB in Q4 2020. During this data collection period, the EEA average rate for wholesale data services fell from 0.96 Euro in Q4 2022 to 0.78 Euro in Q3 2023. (Data from Cyprus are excluded for Q4 2022 – Q3 2023. Please note that in the Q3 2023 quarter, the unbalanced rate surpasses the balanced rate due to the influence of MNOs with higher charges and substantial volume. Figure 20).

In the context of the wholesale data roaming rates (Figure 21), the EEA average rates for total traffic, balanced traffic, unbalanced traffic and the applicable wholesale price caps during the data collection period are listed in Table 5.

Please note that most MNOs report the total data, which includes all traffic regardless of whether it is balanced or unbalanced. However, when it comes to reporting specifically for balanced and unbalanced traffic, only some MNOs provide this disaggregated data. This means that the **total** figure includes all traffic from all operators, while the **balanced** and **unbalanced** figures only reflect the data from those MNOs that report such breakdowns. Therefore, since not all MNOs could split total volumes and revenues in balanced and unbalanced data, the total figure, which includes data from all MNOs, ends up being higher than the figures for balanced and unbalanced traffic, which only take into account the subset of operators that report this specific breakdown. This peculiarity highlights the importance of considering the varying reporting practices of MNOs when analysing the data.

*Table 5: The EEA average prices for wholesale data (total, balanced and unbalanced traffic) and applicable wholesale price caps:*

Wholesale data (no VAT)	Q4 2022		Q1 2023		Q2 2023		Q3 2023	
	Price Cap	EEA Average	Price Cap	EEA Average	Price Cap	EEA Average	Price Cap	EEA Average
Total traffic (€/GB)	2.00	0.96	1.80	0.81	1.80	0.77	1.80	0.78
Balanced (€/GB)		0.92		0.77		0.73		0.69
Unbalanced (€/GB)		0.71		0.36		0.49		0.84

### Wholesale roaming agreements (Article 3)

Only few roaming providers submitted data on wholesale agreements based on Article 3 Roaming Regulation. BEREC's Opinion on the functioning of the Roaming Regulation<sup>6</sup> showed that depending on the type of MVNO (full or light MVNO), MVNOs use different ways for accessing wholesale roaming services. The preferred option is to use wholesale resale access from the domestic host MNO. 30% of full MVNOs make use of resale access from other domestic MNOs, and only a few MVNOs use access via a hub or have bilateral agreements with the foreign MNOs. The wholesale rates that MVNOs pay are higher than the total average wholesale rates analysed in the previous four paragraphs and stay close to the regulated caps of the Roaming Regulation (Figure 29 and Figure 30 and Figure 31).

### How wholesale costs and rates relate to each other

BEREC compared the lowest<sup>7</sup> wholesale rates for the unbalanced traffic in Q4 2022, Q1 2023, Q2 2023 and Q3 2023 against the estimated unit costs for 2022 and 2023.<sup>8</sup> The estimation of the unit cost per service is based on the Axon Consultants cost model.<sup>9</sup> However, apart from

<sup>6</sup> [https://berec.europa.eu/eng/document\\_register/subject\\_matter/berec/opinions/8595-berec-opinion-on-the-functioning-of-the-roaming-market-as-input-to-ec-evaluation](https://berec.europa.eu/eng/document_register/subject_matter/berec/opinions/8595-berec-opinion-on-the-functioning-of-the-roaming-market-as-input-to-ec-evaluation)

<sup>7</sup> Prices are calculated from the average of 5 lowest unbalanced rates submitted by the operators.

<sup>8</sup> These cost estimates include: 1) the total wholesale roaming costs in MS estimated by Axon (including network costs, roaming-specific costs and the impact of seasonality on roaming costs); 2) an estimation for the termination rate that the visited network operator needs to pay the terminating network operator for terminating a call on its network (only for voice) and 3) an estimation for the transit costs that the visited network operator needs to pay for routing a call to the terminating network operator or to send data traffic back to the home network (only for voice and data services). More information on the approach that BEREC follows to estimate the unit costs can be found in BEREC's document BoR (19) 168.

<sup>9</sup> <https://ec.europa.eu/digital-single-market/en/news/finalisation-mobile-cost-model-roaming-and-delegated-act-single-eu-wide-mobile-voice-call>.

the Axon model's output per country<sup>10</sup>/per service, the unit costs include also an estimation for transit costs (for voice and data services) and an estimation of voice termination costs (for voice service). The Axon study does not provide one single result for each type of service, country and year, but provides 72 scenarios (e. g. for Austria, the model calculates 72 different unit costs for roaming voice service for 2022 depending on the combination of parameters/methodological approaches under which the model is run).

The evidence from the estimates of the EEA wholesale rates for outgoing calls shows that the EEA average of maximum unit cost estimates for 2022 and 2023 are significantly lower than the EEA average wholesale rates, while the EEA wholesale rates for the data services indicates that the EEA average of the maximum unit cost estimates for 2022 and 2023 are higher than but close the EEA average wholesale rates. The EEA average wholesale rate for SMS services is slightly larger than the EEA average of Axon's unit cost estimates. (Figure 32).

Further information on unit cost estimates can be found in the BEREC supplementary analysis on wholesale roaming costs.<sup>11</sup>

### **MNOs and MVNOs<sup>12</sup>**

For all quarters (Q4 2022, Q1 2023, Q2 2023 and Q3 2023), roaming consumption was, in general, very similar for MVNOs' subscribers and for MNOs' subscribers with respect to calls made, however for data MNO subscribers usually showed a significantly higher usage (Figure 37 and Figure 38). It is also worth noting that payments made by MVNOs to the host operators for wholesale roaming services are in general higher than the average wholesale rates (Figure 39).

## **4. Main findings on the transparency of roaming tariffs**

This part of the Report provides an overview of the transparency of roaming tariffs, meaning the availability of information about prices and conditions for each tariff, as well as simple procedures for customers to switch between tariffs.

In order to understand whether customers face transparent conditions (in the implementation of the RLAH regime), BEREC prepared two questionnaires, one addressed to roaming providers and one to NRAs.

Roaming providers were requested to provide information on the Quality of Service (QoS), structure of tariffs for international roaming, alternative tariffs and tariffs without roaming. This questionnaire included questions focused on the availability of roaming tariffs and the conditions applied (price limitations in terms of volumes, geographical area or any other restrictions, as well as any linkages to domestic tariffs, FUPs or derogations). It also included questions regarding the information available to the customers of roaming providers.

<sup>10</sup> Please note that the model developed for EC by Axon Consultants does not calculate unit costs for Luxembourg, Iceland and Liechtenstein because the NRAs/operators of these three countries did not provide the required data

<sup>11</sup> BoR (19) 168 BEREC supplementary analysis on wholesale roaming costs is available at: [https://berec.europa.eu/eng/document/register/subject\\_matter/berec/opinions/8756-berec-supplementary-analysis-on-wholesale-roaming-costs](https://berec.europa.eu/eng/document/register/subject_matter/berec/opinions/8756-berec-supplementary-analysis-on-wholesale-roaming-costs)

<sup>12</sup> In some cases the data for MVNOs is incomplete so the figures presented are more of an indicative nature.

NRAs were requested to provide information on end user complaints related to a lack of transparency as well as information on applications for sustainability surcharges.

A total of 29 NRAs and 156 mobile roaming providers operating in the EEA sent their responses to BEREC. Among the roaming providers, 102 of respondents were MNOs and 54 full MVNOs or light MVNOs/resellers.

## **4.1. Main findings regarding the questionnaire for operators**

### **Quality of Service**

In order to understand the impact of network technologies and generations on roaming, BEREC requested information about the network technology offered to subscribers while roaming<sup>13</sup>. On average in the EEA, 98 % of respondents stated that they offer 2G roaming services, 98% of respondents offer 3G, and 100% of respondents stated that they offer 4G. In the period observed, 5G services were already available throughout the EEA. However, the state of the implementation varied greatly at national level. Roaming using standalone 5G was offered by 16 % respondents, whereas roaming via 5G non-standalone technology was offered by 70 % of respondents (Figure 44).

The most common reason that 5G (standalone/non-standalone) was not offered to subscribers when roaming in the EU/EEA was that it was not yet available locally, that the technical implementation with other European MNOs was still pending, and that the host MNO does not provide access.

According to the Roaming Regulation, a differentiation between technologies while roaming is possible only if such a differentiation is done at home. For the EEA, an average of 23 % of roaming providers responded that they differentiate between technologies at home, 75 % indicated that they do not have such a differentiation and 2 % replied with “n.a.” (Figure 46).

### **Application of FUPs**

BEREC observes that the FUP mechanisms foreseen by the Commission Implementing Regulation (EU) 2016/2286 (CIR) have been used by MNOs and MVNOs alike to prevent anomalous and abusive usage of regulated roaming services (Figure 47).

As regards the effectiveness of the FUP measures, it can be observed that the open data bundle is the most preferred FUP measure by respondents. Overall, the usage of different kinds of FUP measures is rather stable over the years.

According to the Roaming Regulation, roaming providers are entitled to apply a surcharge for the provision of roaming services, when exceeding the FUP. Figure 48 and Figure 49 show the share of the respondents, among those implementing different FUP measures, applying a surcharge to their customers for voice and data services.

Regarding the calculation of the minimum data roaming allowance which has to be granted to customers, providers which apply the open data bundle FUP are required to calculate the roaming allowance in accordance with the detailed formula set out in the CIR. In fact, 91% of

---

<sup>13</sup> Since 1 July 2022 there is an obligation for operators to offer the same mobile network technology like at home when its technically feasible while roaming.

those providers replied that the limit determined by the CIR calculation is rounded up in favour of the customers.

Regarding FUP-related information provided to customers, Figure 50 shows that 72 % of the responding roaming providers applying an open data bundle FUP inform their customers about how the roaming allowance is calculated. Furthermore, 95 % of the roaming providers which established a FUP according to the open data bundle rule provide information for customers about their actual roaming volumes. Figure 51 shows various information channels for providing information about FUP for data bundles. Figure 52 shows where information about limits is located on the provider's website.

### **Non-EU/EEA destinations**

According to the answers received, BEREC has noted that about 56 % of roaming providers deduct in some of their RLAH tariff plans roaming consumption at non-EEA destinations from the total package available to consumers through their RLAH tariff plans (Figure 53).

### **Alternative tariffs**

BEREC has collected information on the type of packages offered as alternative roaming tariff (whether they are daily, weekly, monthly or other tariffs). According to the respondents, 33 % make use of the opportunity to offer alternative tariff plans in parallel to the provision of RLAH plans (Figure 54). Of all responding roaming providers which offer alternative roaming tariffs, 16 offer such tariffs in the form of daily packages, 14 in the form of weekly packages, 43 in the form of monthly packages and 19 in other packages (Figure 55).

Around 83 % of roaming providers inform end users about regulated and alternative tariffs. The most common ways to inform customers about alternative tariffs were call centres and websites, whereas for switching between tariffs, the most common ways were call centres and point of sales (Figure 58).

Roaming providers were also asked how they handle surcharges for alternative tariffs in EEA vs. non-EEA countries. 20 % of respondents indicated that they apply a surcharge for roaming in EU/EEA destinations to some of the alternative tariffs. For these alternative tariffs with a surcharge for EEA roaming, 39 % of the respondents with such surcharges indicated that they include non-EU/EEA destinations with no surcharge or at a reduced rate (Figure 57).

### **Information and tools for consumers**

56 % of respondents provide information to consumers about the differences between different network technologies and generations in a roaming context and 42 % of respondents provide information on QoS while roaming on a per-network basis. Additionally, Figure 59 shows the type of information that is provided to end-users during intra-EEA roaming if the granularity of the information is per visited network.

When asked whether the respondents provide information on prices for calling value-added services (VAS) in a roaming context, 68 % of roaming providers answered that they provided general information, 29 % provide information on exact VAS charges and 16 % provide other types of information (Figure 60). The share of operators that provides information not related to charges on VAS while roaming has increased by more than 10 percentage points for each item since the last collection (Figure 61).



Roaming providers must offer at least two cut-off limits by default, at 50 Euro and 100 Euro (or the equivalent in local currency). 91 % of roaming providers provide financial cut-off limits, while 34 % provide volume-based cut-off limits (Figure 62). 81 roaming providers allow end users to individually adjust their cut-off limits (Figure 64). According to the data collected, 42% of respondents only provide the 50 Euro and 100 Euro cut-off limits.

Out of a total 156 respondents, 105 roaming providers offer information about how to avoid inadvertent roaming in border regions and 58 offer tools to opt out of roaming in RoW. Regarding non-terrestrial networks, 87 roaming providers offer information about how to avoid connecting to non-terrestrial networks and 57 roaming providers offer tools to opt out from connecting to non-terrestrial networks (Figure 66).

The Welcome SMS is an important instrument for increasing the transparency of roaming charges. However, which kind of information is provided to end users via Welcome SMS varies considerably, both within the EEA (Figure 68) and in a RoW roaming context (Figure 69).

### **Transparency of wholesale offers**

The Roaming Regulation sets out a number of obligations on wholesale level, which now also extend to QoS. As the responses to BEREC's questionnaire show, roaming providers may experience different levels of ease of access to network technologies (Figure 70). In particular regarding the implementation of roaming via different technologies, 35 roaming providers indicated problems with the implementation of VoLTE and 7 expressed difficulties with the implementation of 5G standalone (Figure 71). This could also explain why 63 respondents indicated that less than 20 % of their outbound roaming agreements include operational VoLTE or VoNR services (Figure 72).

71 % of respondents stated that network technologies and generations are not negotiated separately from roaming charges and 85 % of respondents indicated that pricing does not differ according to network technologies (Figure 73). 16 respondents explained that they have faced obstacles when concluding permanent roaming agreements (Figure 76) and 45 respondents indicated that they have special wholesale contracts/agreements for services provided by connected objects/devices (Figure 77).

Regarding the mechanisms used for reaching agreements on roaming prices, 73 respondents stated that they relied on direct agreements, 6 indicated that their host MNO negotiates pricing and 10 responded that they used trading platforms or hubs for these purposes (Figure 74).

## **4.2. Main findings regarding the questionnaire for NRAs**

### **Applications for sustainability surcharges**

By way of derogation from offering roaming at domestic prices, roaming tariffs may include surcharges based on application of a provider and authorised by the NRA in order to ensure the sustainability of roaming provider's domestic charging model.

Figure 78 shows that the total number of applications received by NRAs is decreasing since RLAH came into force. It is worth mentioning that NRAs did not report increases regarding domestic-only tariffs.

**Complaints on transparency issues received by NRAs**

Section 5.6.13 provides detailed information regarding complaints received by the NRAs. The type of complaints received most frequently by the NRAs, albeit in low numbers, was related to QoS, while the highest number of complaints received by (a low number of) NRAs was related to inadvertent roaming (Figure 80). However, the number of complaints reported might not give a complete picture of the total number of complaints regarding transparency issues, as in some countries, other bodies than the NRA might handle consumer complaints. This could also explain the fact that one NRA indicated that in their country, other authorities have been designated as competent for implementing parts of the Roaming Regulation.

## 5. Charts

**5.1. Analysis of subscribers and those that use roaming services**

**5.1.1. Domestic average Retail Mobile Revenue per User (ARRPU)**

Figure 1: Domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q3 23

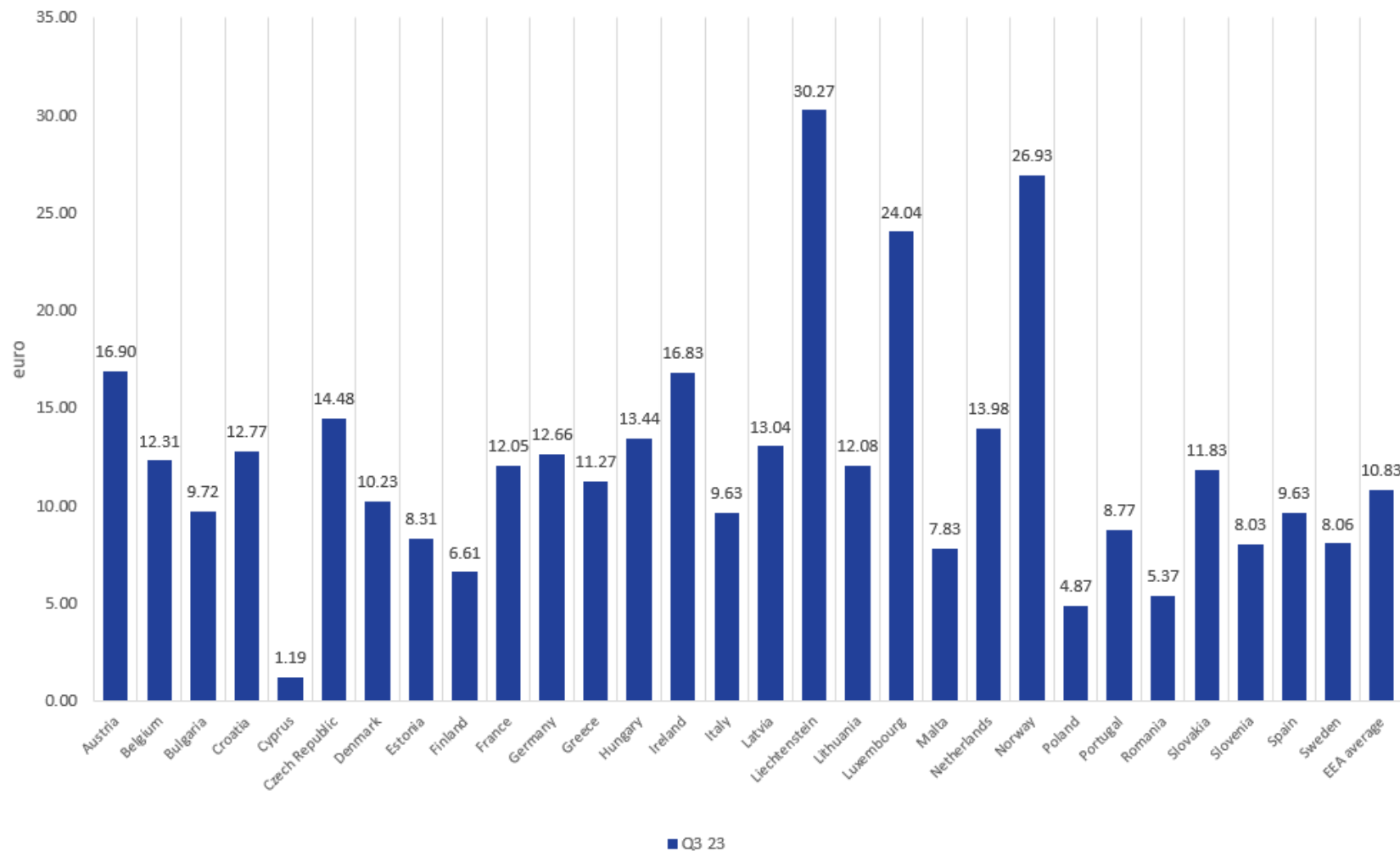


Figure 1 depicts average retail revenue per user arrived at by a division of monthly retail revenue per total number of subscribers for each country, which is then divided by three to arrive at a monthly average for Q3 2023.

In some cases, not all operators provided the data for subscribers, or revenues.

Figure 2: EEA average: domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q4 20 – Q3 23

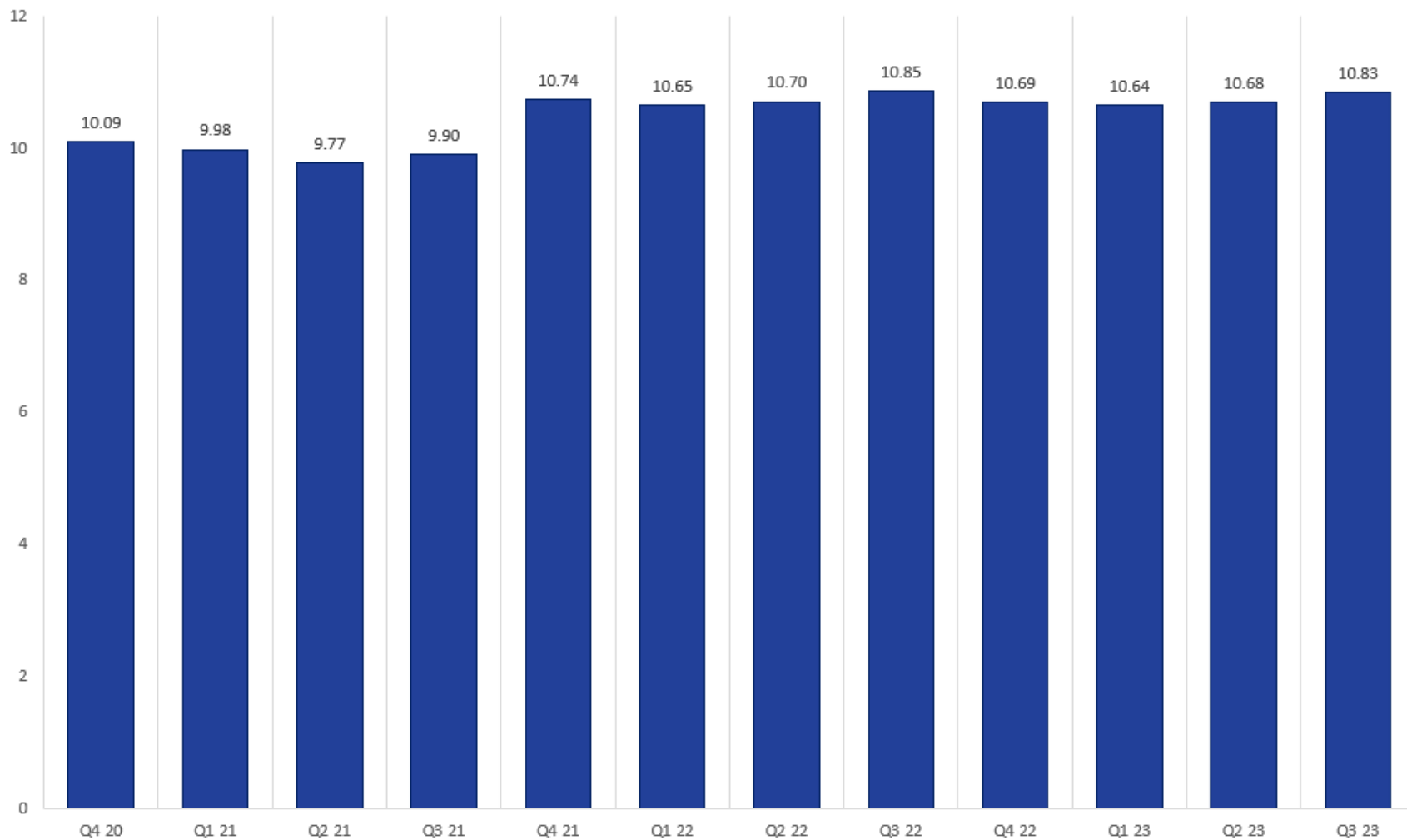


Figure 2 depicts division of monthly retail revenue per total number of subscribers, as an EEA average – average retail revenue per user in EEA, Q4 2020 - Q3 2023.



### **5.1.2. Consumption patterns for domestic mobile retail services**

Figure 3: Domestic data services: average consumption per month per total number of subscribers (GB), Q3 23

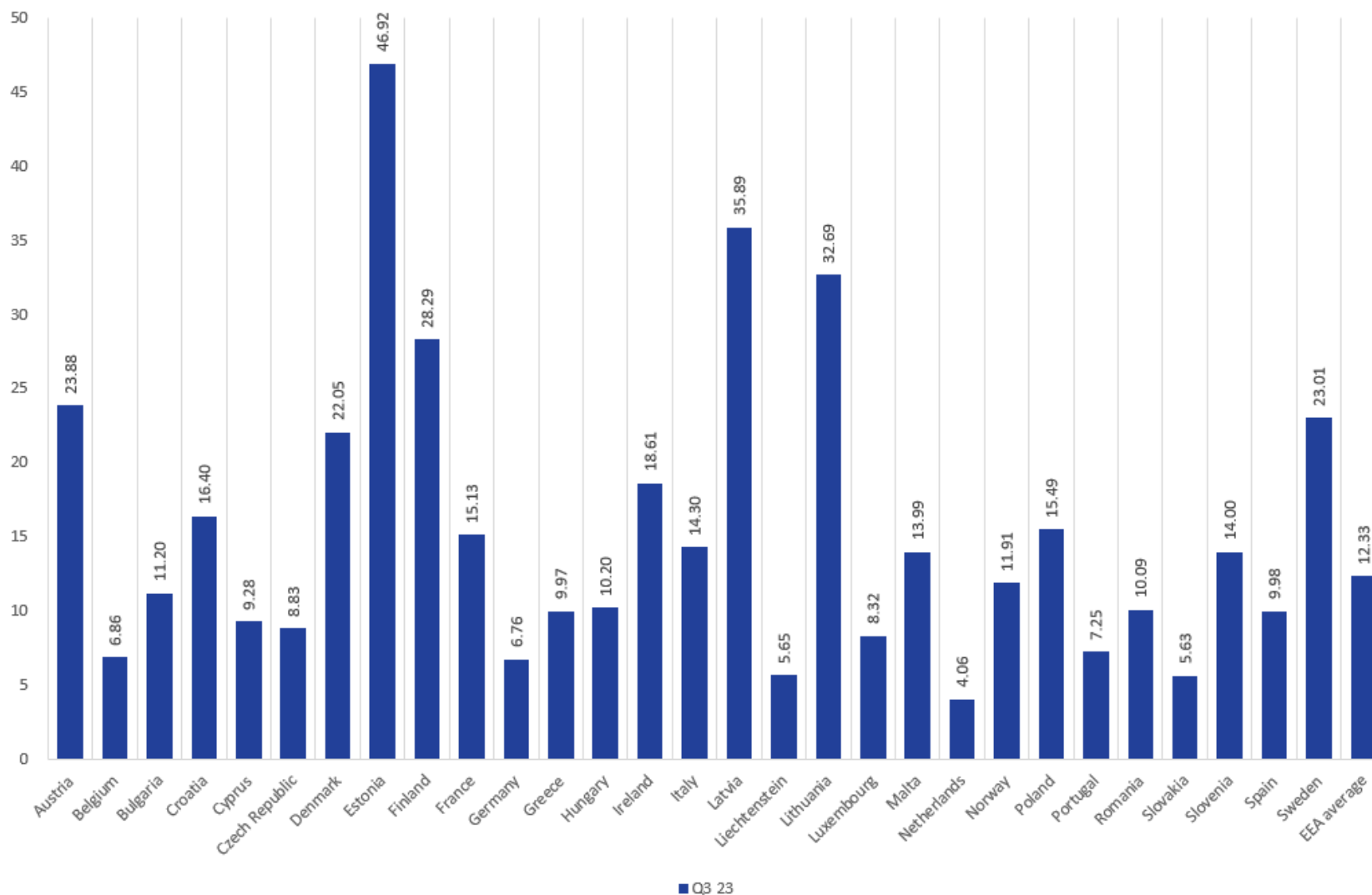


Figure 3 depicts the average data consumption per month, for which the number of GB were divided by the total number of subscribers in each country and subsequently divided by three to arrive at monthly values for Q3 2023.

Figure 4: EEA average: domestic data services: average consumption per month per total number of subscribers (GB), Q4 20 – Q3 23

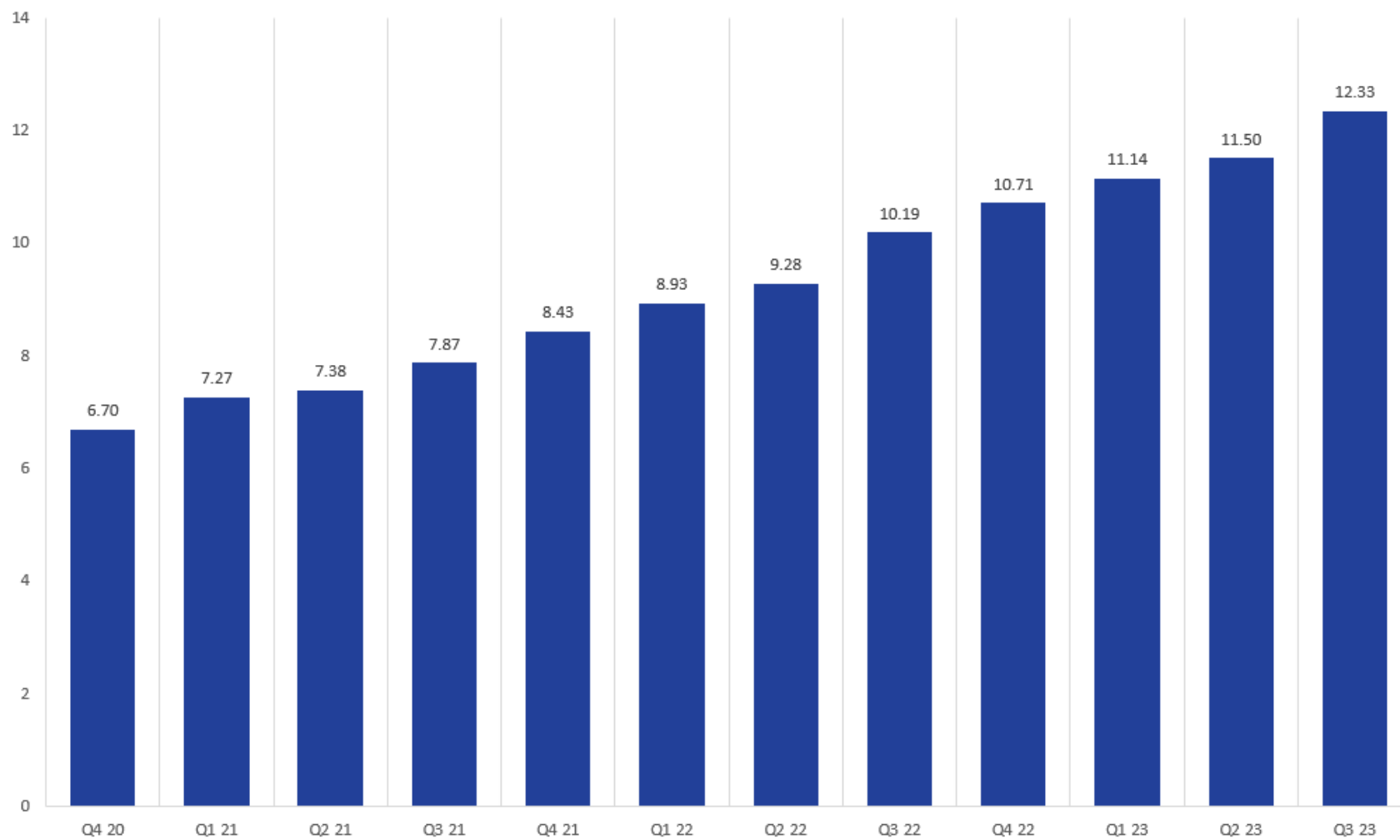


Figure 4 depicts the development of the EEA average data consumption per month (in GB) for Q4 2020 – Q3 2023.

### **5.1.3. Consumption patterns for RLAH services (voice, SMS and data)**

Figure 5: EEA average number of RLAH minutes per month per total number of roaming subscribers with active RLAH services, Q4 20 – Q3 23.

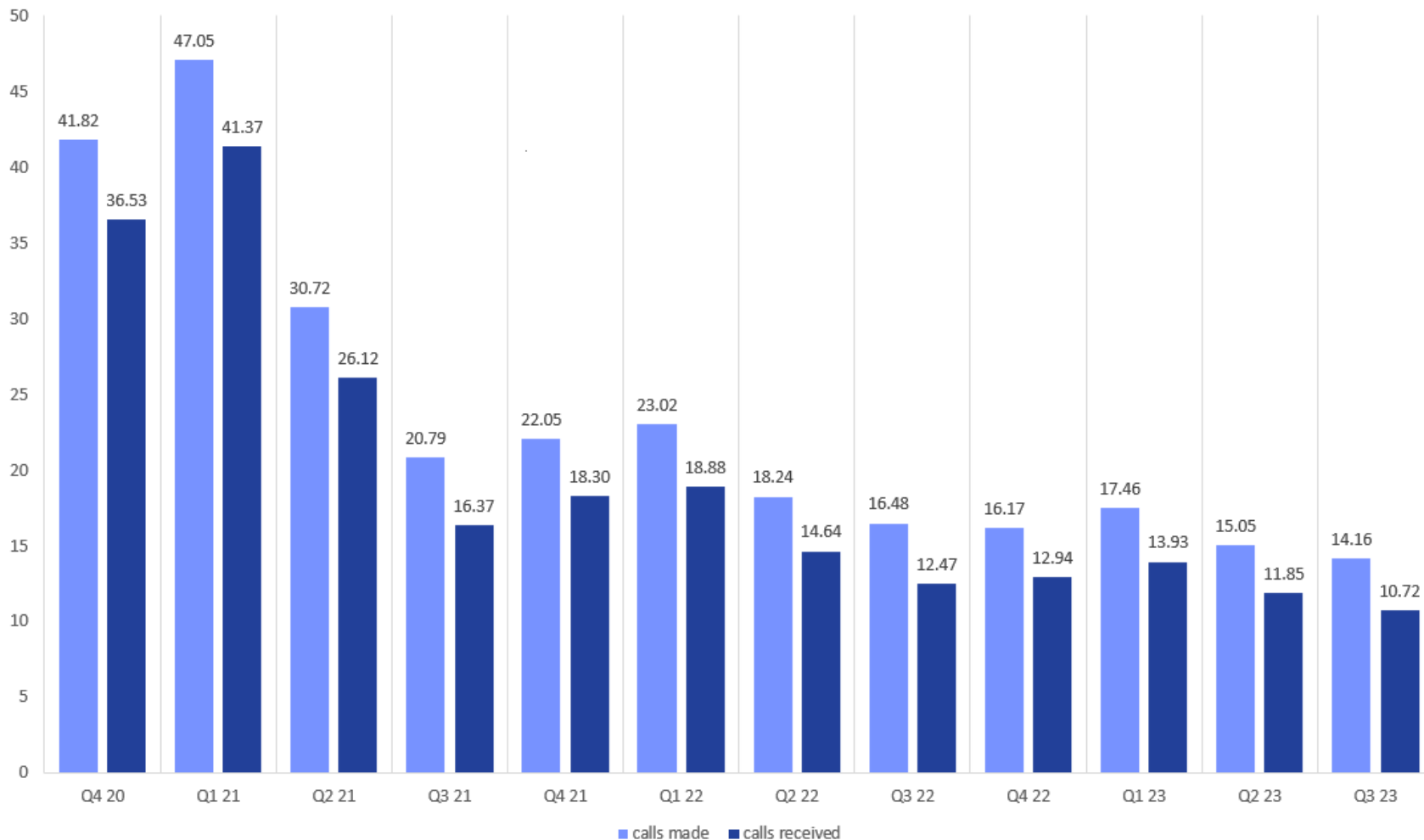


Figure 5 depicts the EEA average of the number of RLAH minutes for calls made and calls received. These averages are calculated, respectively, by dividing the number of roaming minutes by the total number of roaming subscribers with active RLAH services and again by three to arrive at monthly averages for Q4 2020 - Q3 2023. In some cases, not all operators provided the data for RLAH subscribers.

Figure 6: EEA average number of SMS per month per total number of roaming subscribers with active RLAH services, Q4 20 – Q3 23

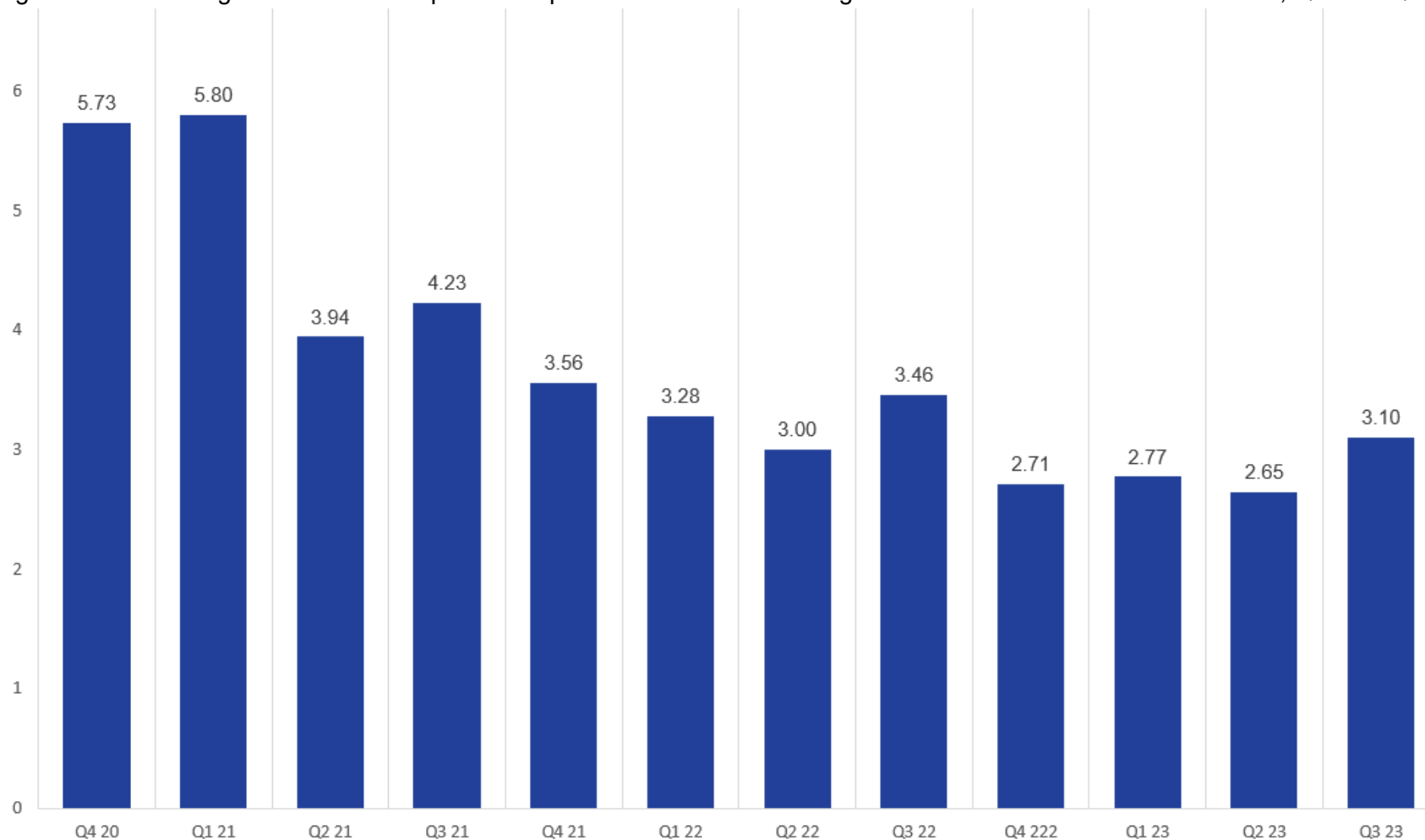


Figure 6 depicts the development of the EEA average of the number of RLAH SMS. This average is calculated by dividing the number of RLAH SMS by the total number of roaming subscribers with active RLAH services and again by three to arrive at monthly averages for Q4 2020 - Q3 2023. In some cases, not all operators provided the data for RLAH subscribers.



Figure 7: Data services with active RLAH: average consumption per month per total number of roaming subscribers with active RLAH services (in GB), Q3 23

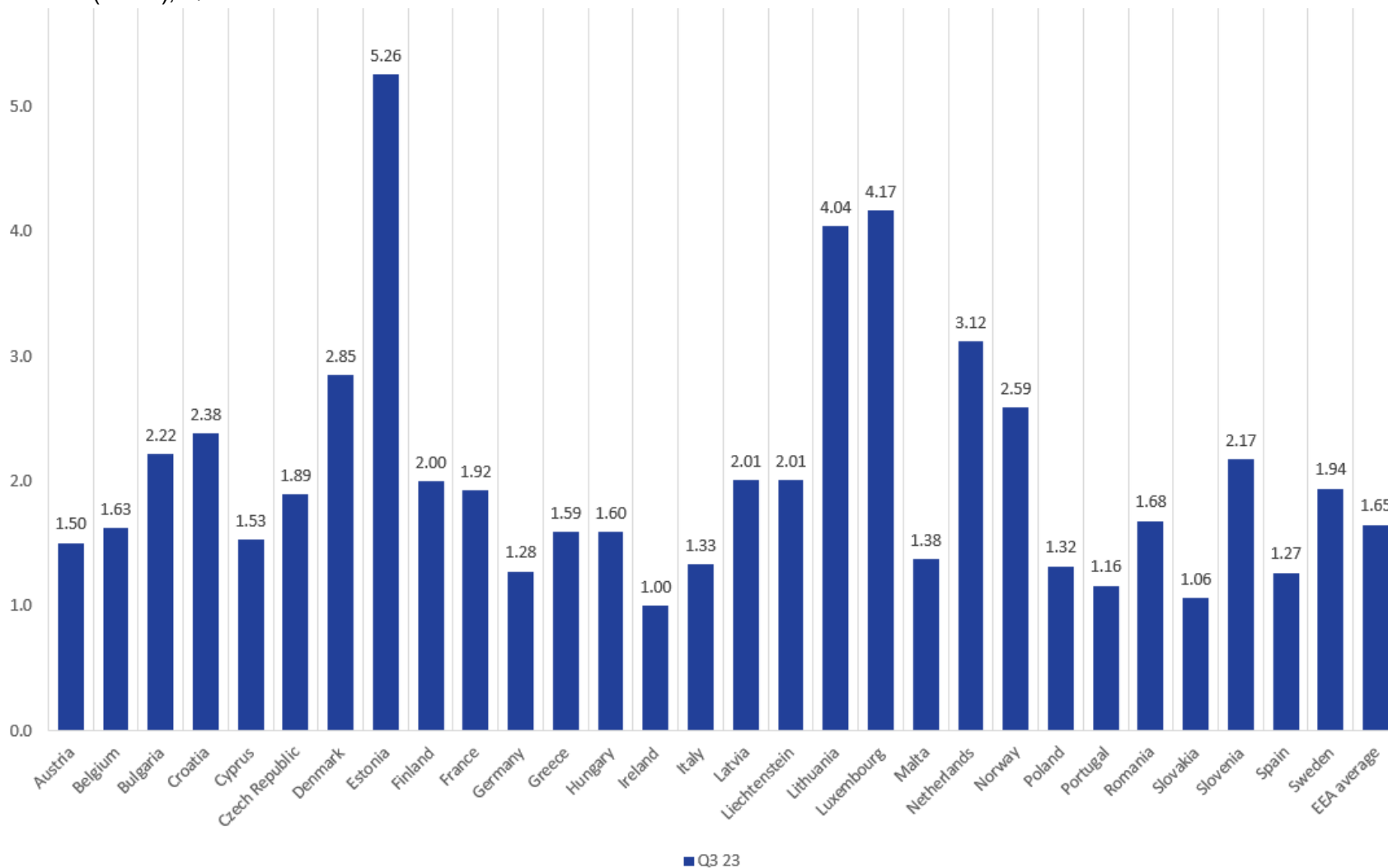


Figure 7 depicts the average RLAH data consumption on a per-country level. This average is calculated by dividing the number of RLAH GB by the total number of roaming subscribers with active RLAH services and again by three to arrive at monthly averages for Q3 2023. In some cases, not all operators provided the data for RLAH subscribers.

Figure 8: RLAH, data services: EEA average consumption per month per total number of roaming subscribers with active RLAH services (in GB), Q4 20 – Q3 23

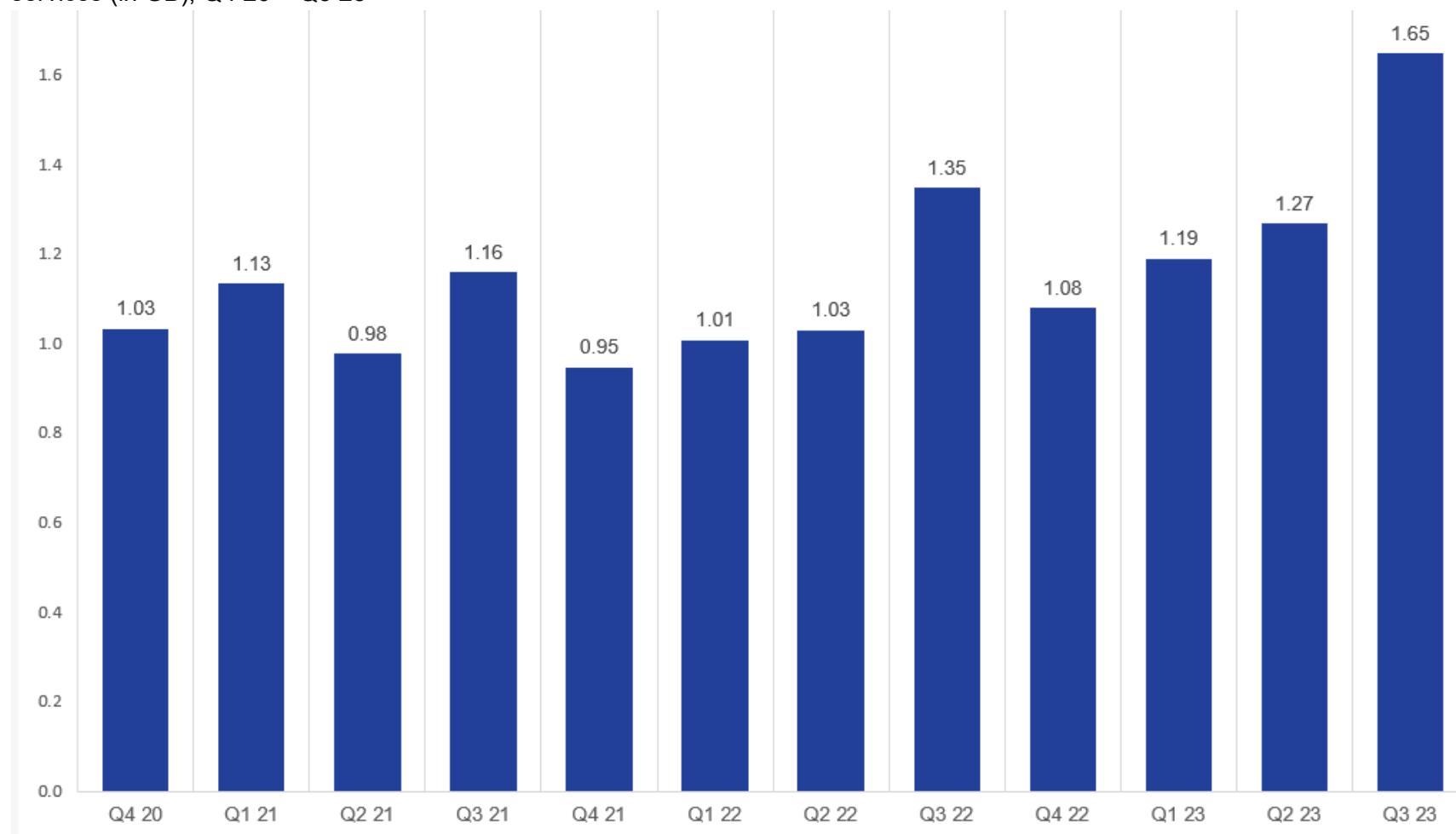


Figure 8 depicts the development of the EEA average number of RLAH data consumption (in GB) for Q4 2020 - Q3 2023. In some cases, not all operators provided the data for RLAH subscribers.

Figure 9: Share of total subscribers with EU/EEA roaming enabled, Q3 23

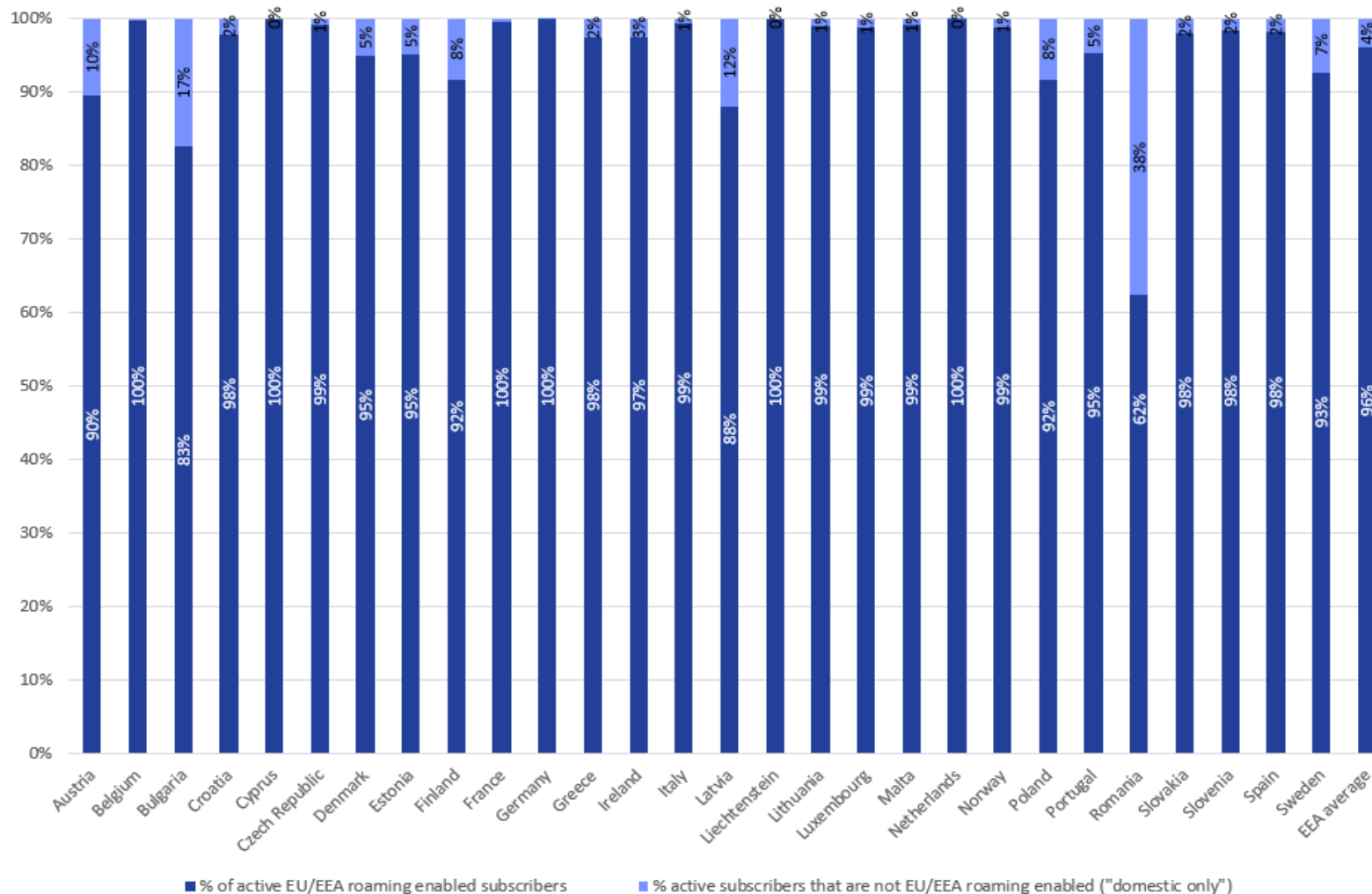


Figure 9 depicts the share of roaming-enabled subscribers per country. This share is calculated by comparing the number of active EU/EEA roaming enabled subscribers with the number of subscribers that are not EU/EEA roaming enabled (domestic only) to arrive at an average for Q3 2023.

Figure 10: Percentage of subscribers that were roaming at least once in the concerned quarter in the EEA, compared to the total number of subscribers who have roaming enabled subscriptions, Q4 20 – Q3 23

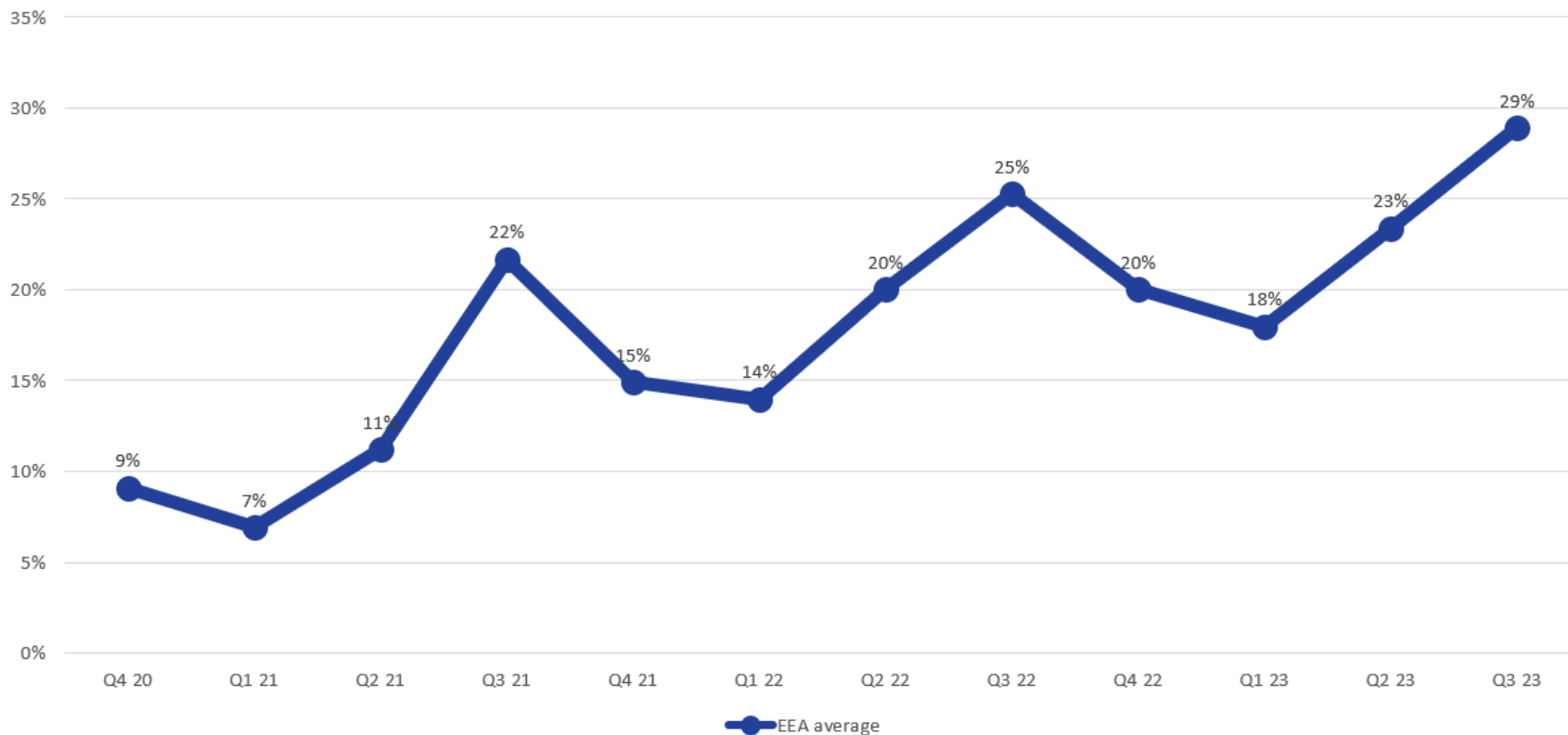


Figure 10 depicts the development of the percentage of subscribers that were roaming at least once in the concerned quarter in the EEA (compared to the total number of subscribers who have roaming enabled subscriptions) for Q4 2020 – Q3 2023.

Figure 11: Number of roaming days per active SIM by quarter, Q4 21 – Q3 23

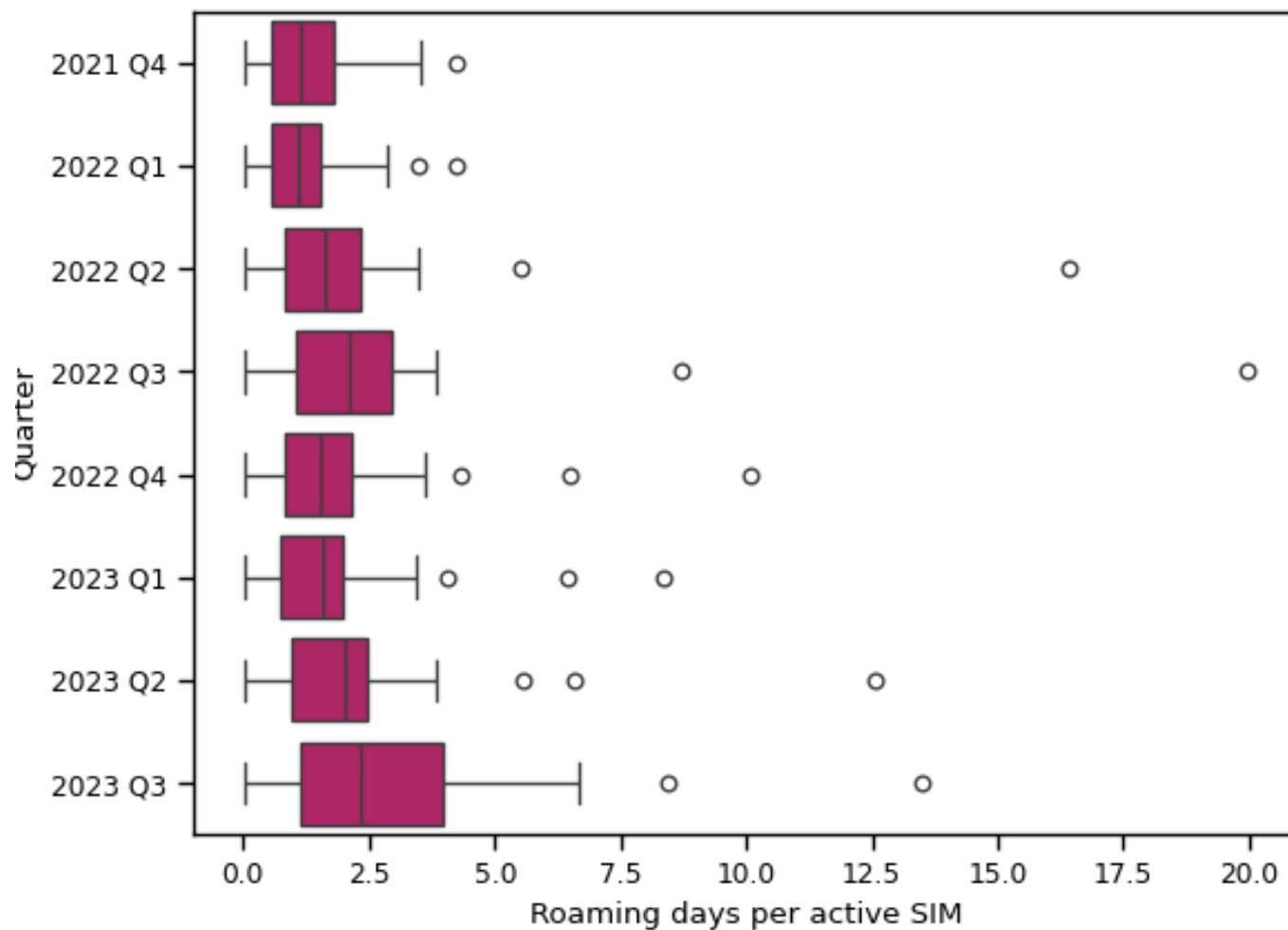


Figure 11 shows the distribution of the number of roaming days per active SIM by quarter. The line inside the box represents the median value, meaning that 50 % of the data lies on the left hand side and 50 % lies on the right hand side. 25% of observations have a value lower than the left edge of the box, and 25% of observations have a value that is higher than the right edge of the box. The whiskers of a boxplot are a representation of a multiple (default: 1.5) of the interquartile range (IQR), which is the range of values covered by the inner box.

Figure 12: Roaming days per active SIM by country, Q1 21 - Q3 23

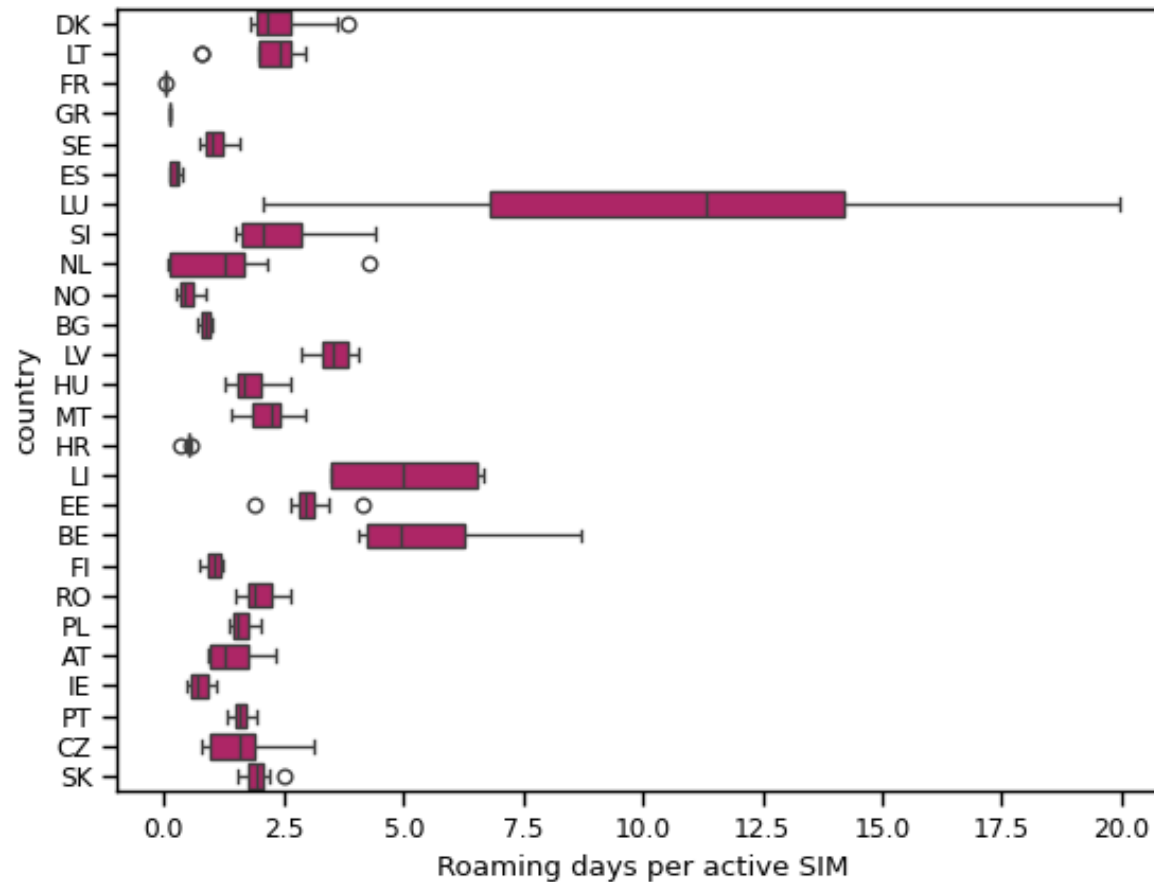


Figure 12 shows the distribution of the number of roaming days per active SIM by country. The line inside the box represents the median value, meaning that 50 % of the data lies on the left hand side and 50 % lies on the right hand side. 25% of observations have a value lower than the left edge of the box, and 25% of observations have a value that is higher than the right edge of the box. The whiskers of a boxplot are a representation of a multiple (default: 1.5) of the interquartile range (IQR), which is the range of values covered by the inner box



## **5.2. The development of Roaming Services**

### **5.2.1. Voice roaming services**

#### **5.2.1.1 Wholesale rates**

Figure 13: EEA and RoW average wholesale rates per minute, Q4 20 – Q3 23 (balanced, unbalanced, total and RoW traffic, and non-terrestrial network payments)

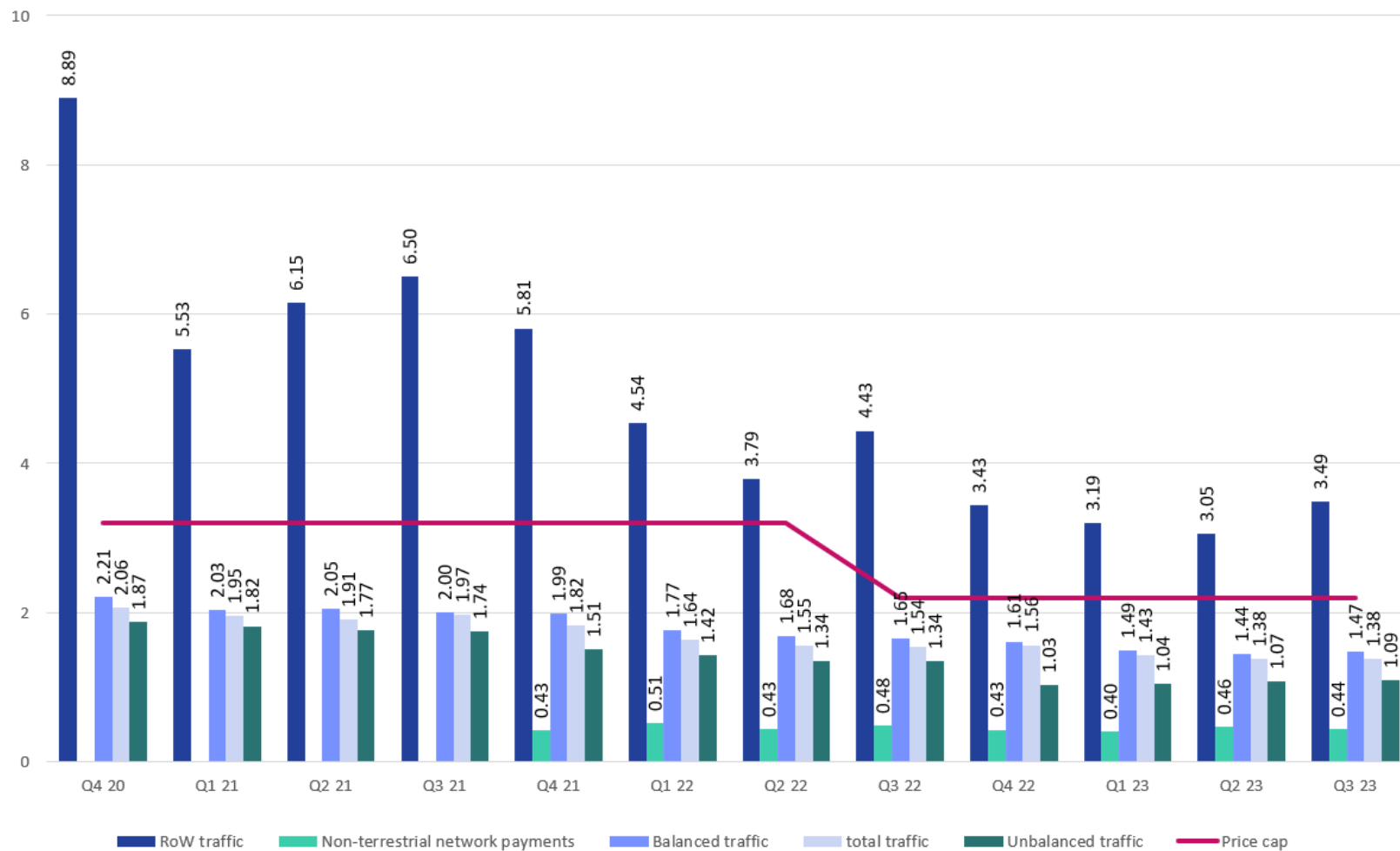


Figure 13 depicts EEA average wholesale rates for voice calls per minute for intra-EEA (balanced, unbalanced, and total), RoW and non-terrestrial network traffic, as well as the wholesale price cap applied. The average was calculated by dividing the wholesale revenues for minutes by the number of minutes in the respective category. Please note that most MNOs report total data, while only some report balanced and unbalanced data.

### **5.2.1.2 Consumption patterns**

Figure 14: EEA average: roaming calls made by share of tariff, Q4 20 – Q3 23

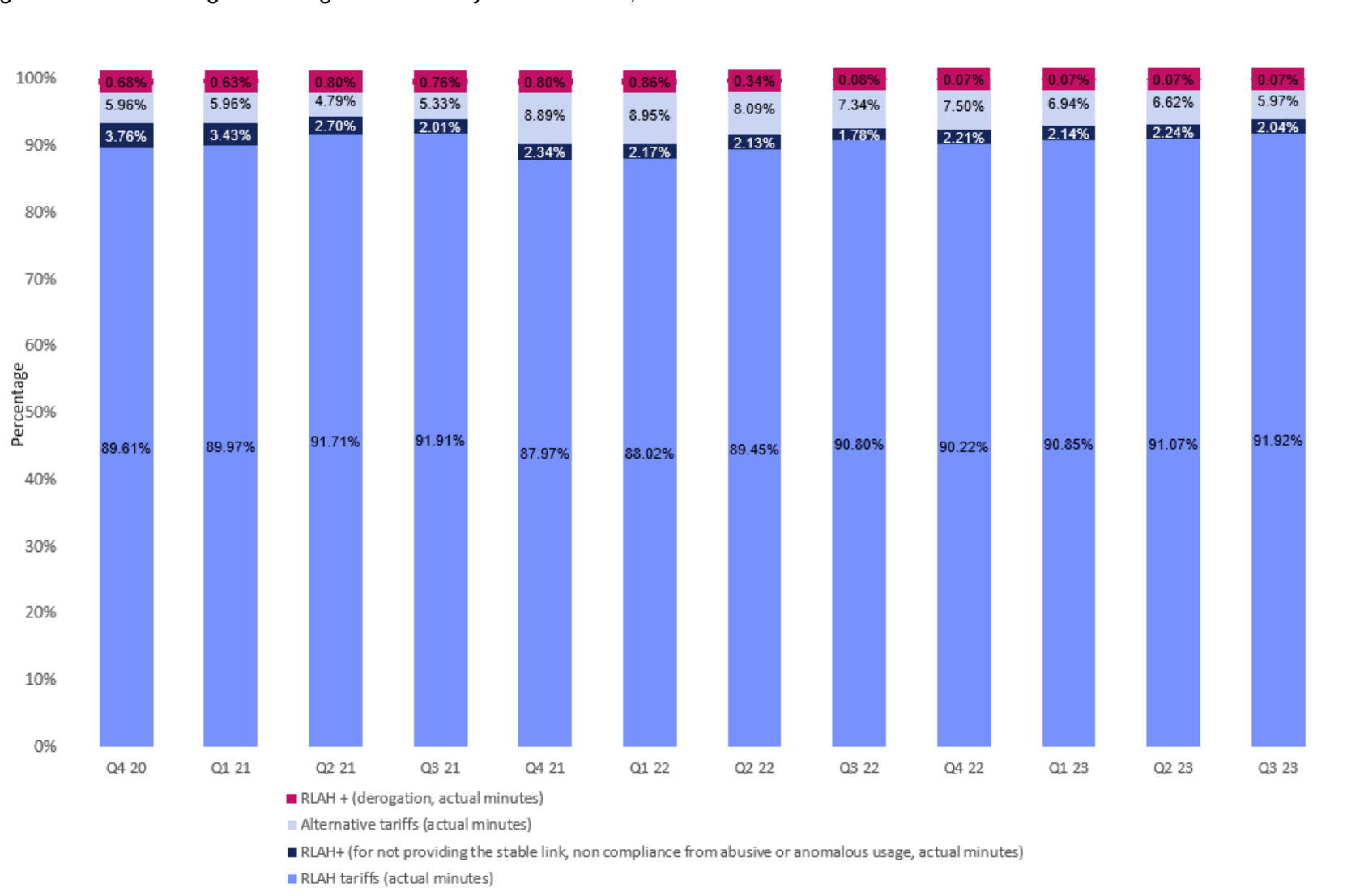


Figure 14 depicts the EEA average of the share of tariffs (RLAH tariffs, RLAH+ (derogation), RLAH+ (stable link, abusive/anomalous usage), Alternative tariffs) used for making roaming calls for Q4 2020 – Q3 2023. This average is created by calculating the contribution of each tariff to the total number of roaming calls made.

Figure 15: Roaming calls made: EEA average number of minutes per month per total number of roaming subscribers Q4 20 – Q3 23

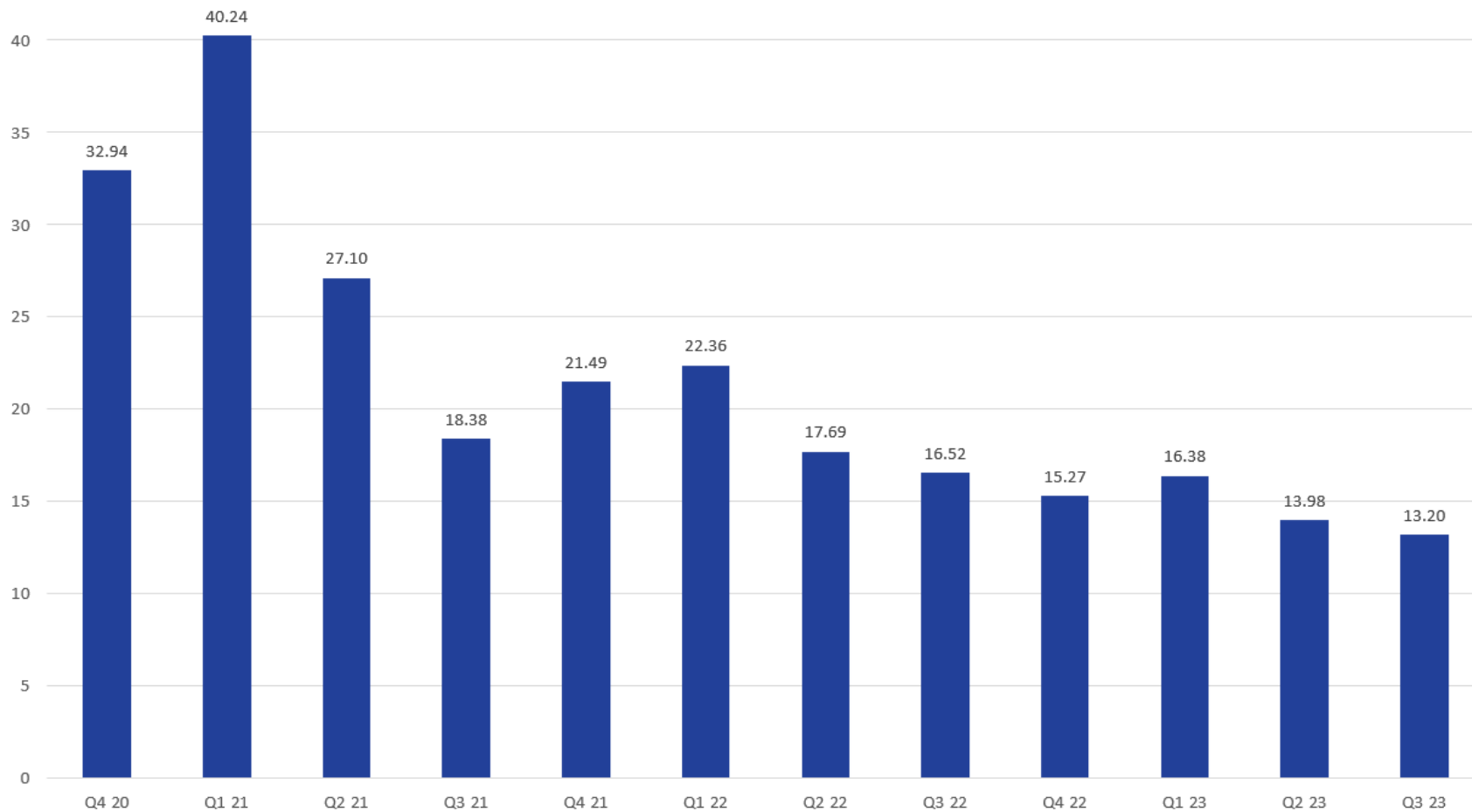


Figure 15 depicts the EEA average number of roaming calls made per subscriber. This average is calculated by dividing the number of roaming minutes by the total number of roaming subscribers and again by three to arrive at monthly values for Q4 2020 – Q3 2023.

Figure 16: EEA average: Roaming calls made, (millions of minutes), Q4 20 – Q3 23

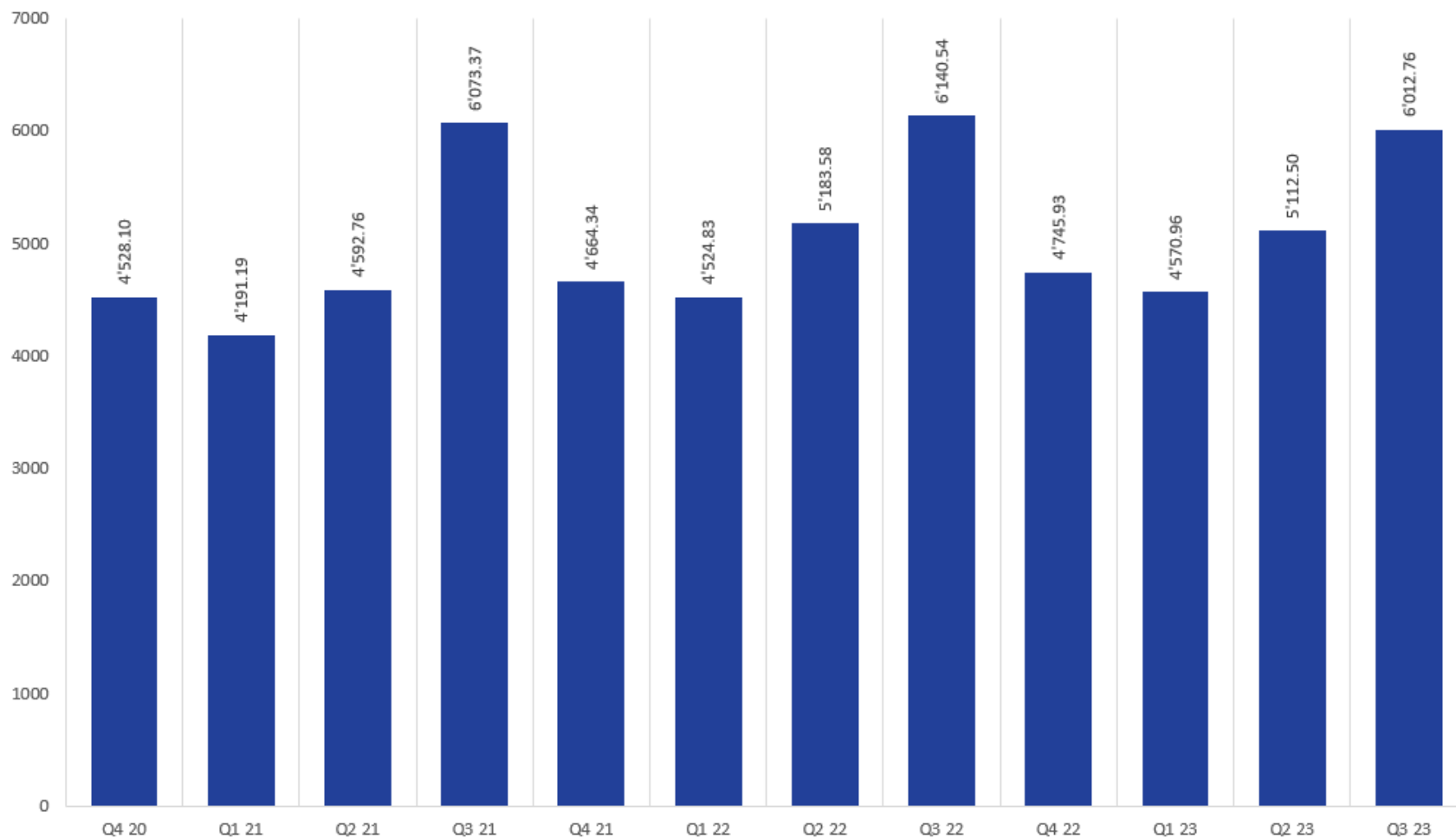


Figure 16 depicts the total number of minutes (calls made) while roaming (including RLAH, RLAH+ stable link, RLAH+ derogation, RLAH+ abusive/anomalous usage, alternative tariffs) in the EEA for Q4 2020 – Q3 2023 (in millions of minutes).

Figure 17: EEA roaming calls received, (millions of minutes), Q4 20 – Q3 23

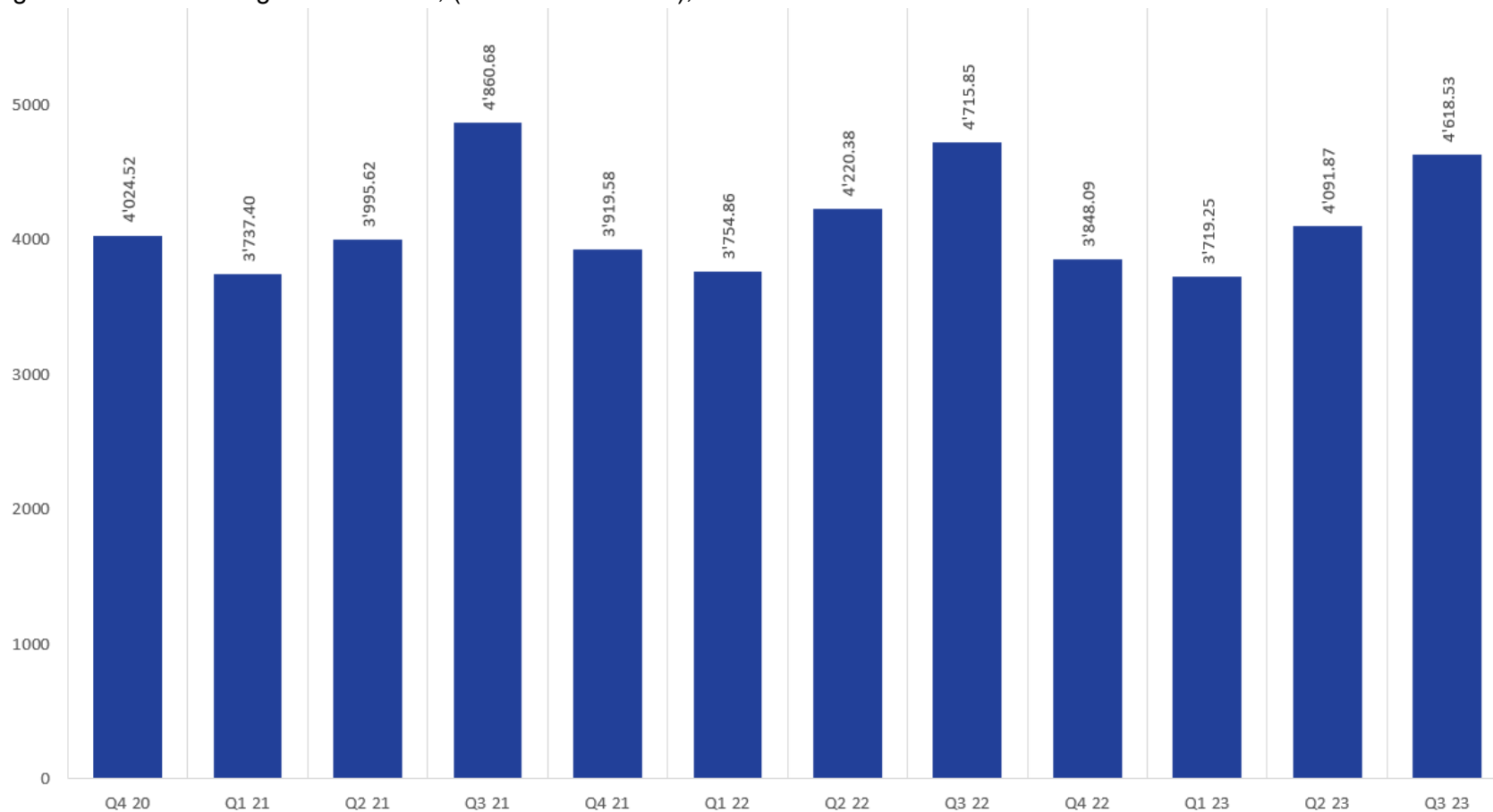


Figure 17 depicts the total number of minutes (calls received) while roaming (including RLAH, RLAH+ stable link, RLAH+ derogation, RLAH+ abusive/anomalous usage, alternative tariffs) in the EEA for Q4 2020 – Q3 2023 (in millions of minutes).

## **5.2.2. SMS roaming services**

### **5.2.2.1 Wholesale rates**



Figure 18: EEA average wholesale rates per roaming SMS, Q4 20 – Q3 23 (balanced, unbalanced, total and RoW traffic, and non-terrestrial networks)

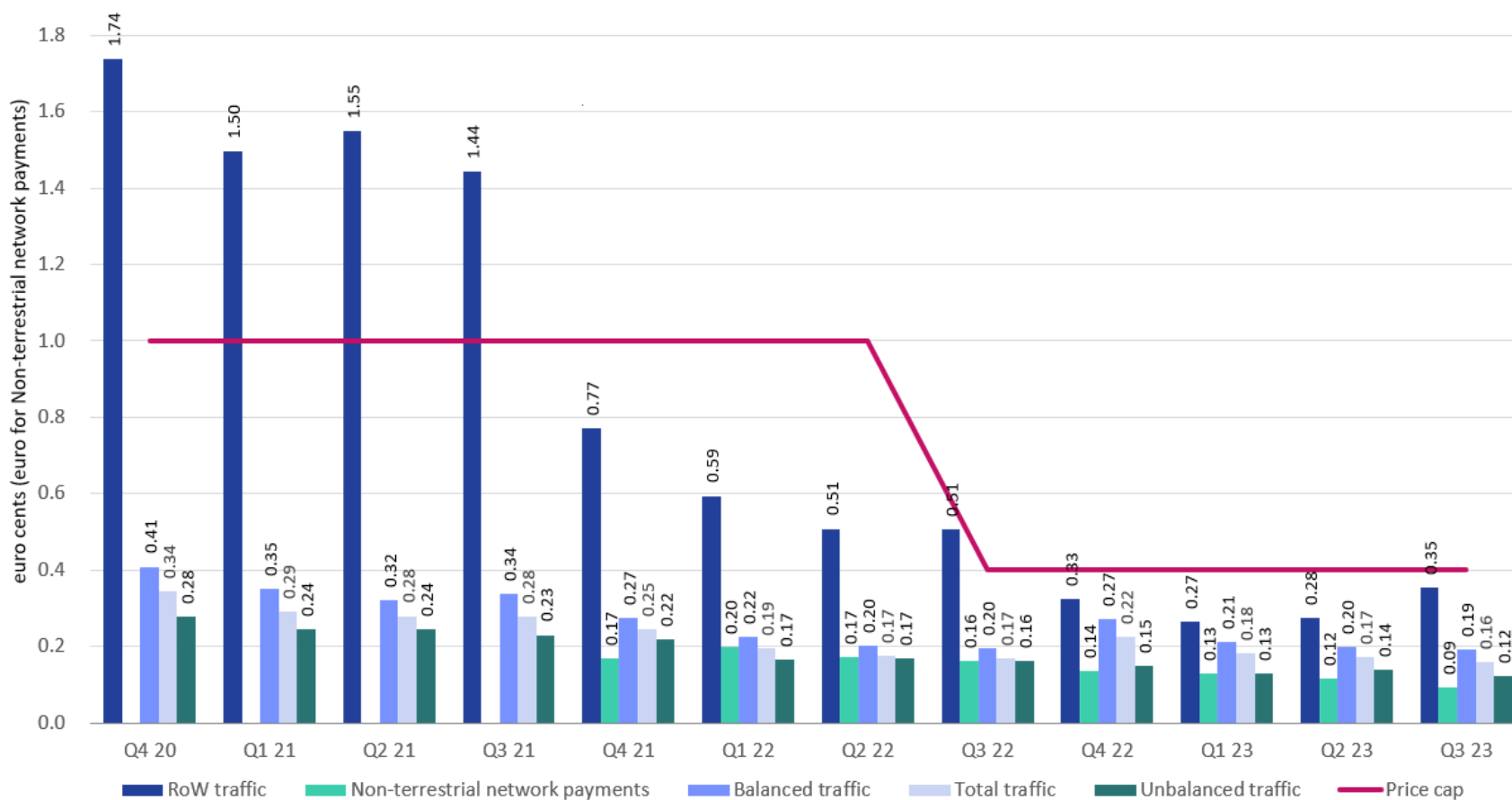


Figure 18 depicts EEA average wholesale rates per SMS for intra-EEA (balanced, unbalanced, and total), RoW and non-terrestrial network traffic, as well as the wholesale price cap applied. The average was calculated by dividing the wholesale revenues for SMS by the number of SMS in the respective category. Data from Estonia, France, and Liechtenstein are excluded for Q4 22-Q3 23.

### **5.2.3. Data roaming services**

#### **5.2.3.1 Wholesale rates**

Figure 19: EEA average: wholesale roaming rates per GB (balanced and unbalanced traffic), Q4 20 – Q3 23

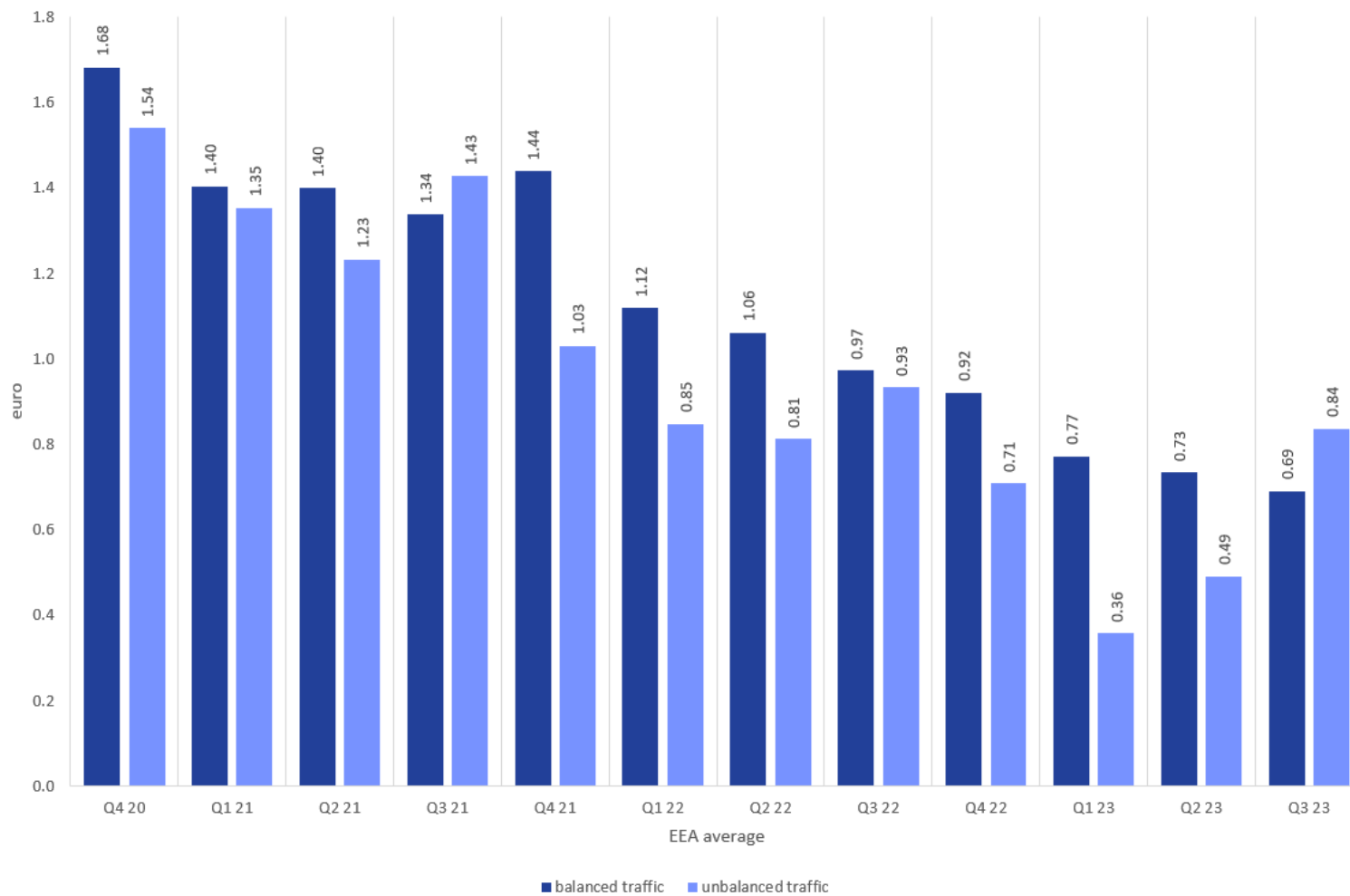


Figure 19 depicts the average wholesale rates per roaming GB for balanced and unbalanced traffic at EEA level for Q4 2020 – Q3 2023. This average is calculated, respectively, by dividing the wholesale revenues by the number of roaming GB in each traffic category. Data from Cyprus are excluded for Q4 2022 – Q3 2023. Please note that in the Q3 2023 quarter, the unbalanced rate surpasses the balanced rate due to the influence of MNOs with higher charges and substantial volume.

Figure 20: EEA average: average wholesale roaming data rates per GB (total traffic), Q4 20 – Q3 23

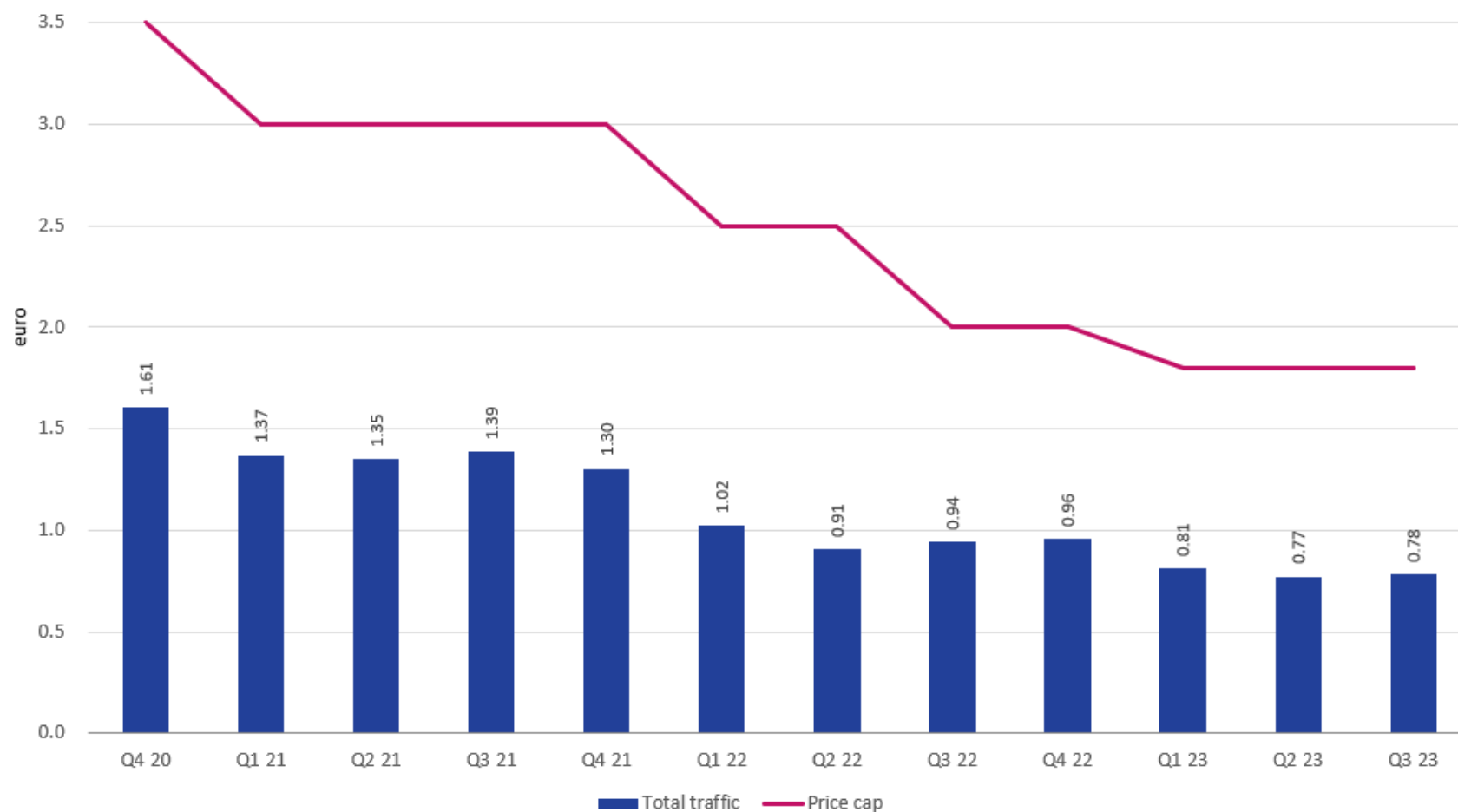


Figure 20 depicts the average wholesale rates for roaming GB of total traffic at EEA level and compares these to the wholesale price caps applied in Q4 2020 – Q3 2023. The average wholesale rates for total traffic are calculated by dividing the wholesale revenues in this category by the number of roaming GB in this category. Data from Cyprus are excluded for Q4 2022 – Q3 2023.

Figure 21: EEA average wholesale data rates per GB, Q4 20 – Q3 23 (balanced, unbalanced, total and RoW traffic, and non-terrestrial networks)

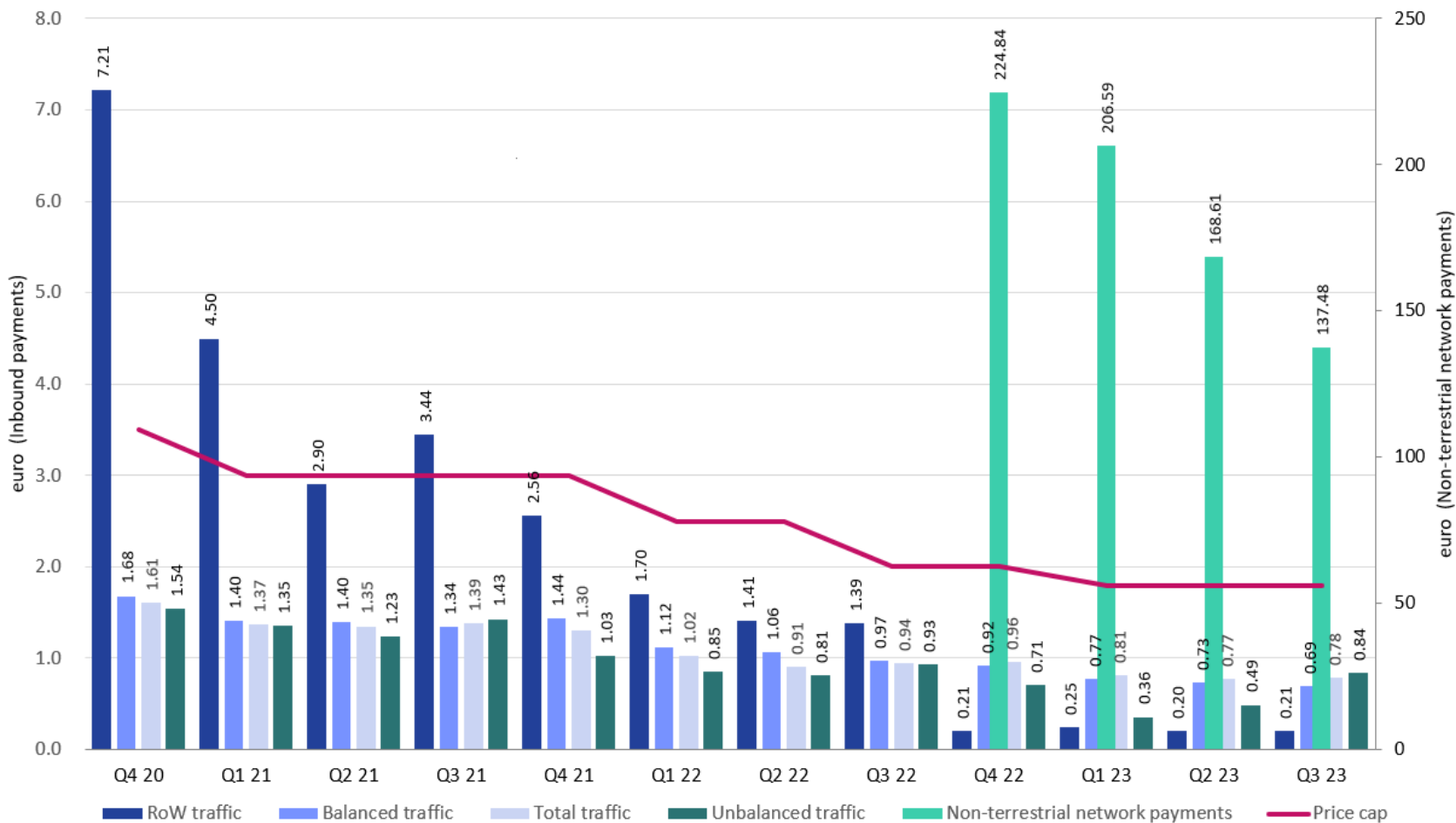


Figure 21 depicts EEA average wholesale rates for data per GB for intra-EEA (balanced, unbalanced, and total), RoW and non-terrestrial network traffic, as well as the wholesale price cap applied. The average was calculated by dividing the wholesale revenues for GB by the number of GB in the respective category. Non-terrestrial network payments are aligned to the secondary axis due to higher number differences with other services fees. Please note that most MNOs report total data, while only some report balanced and unbalanced data. Data from Cyprus are excluded for Q4 2020 – Q3 2023.

Figure 22: Proportion of balanced and unbalanced traffic within EEA countries, data services, wholesale roaming inbound, Q3 23

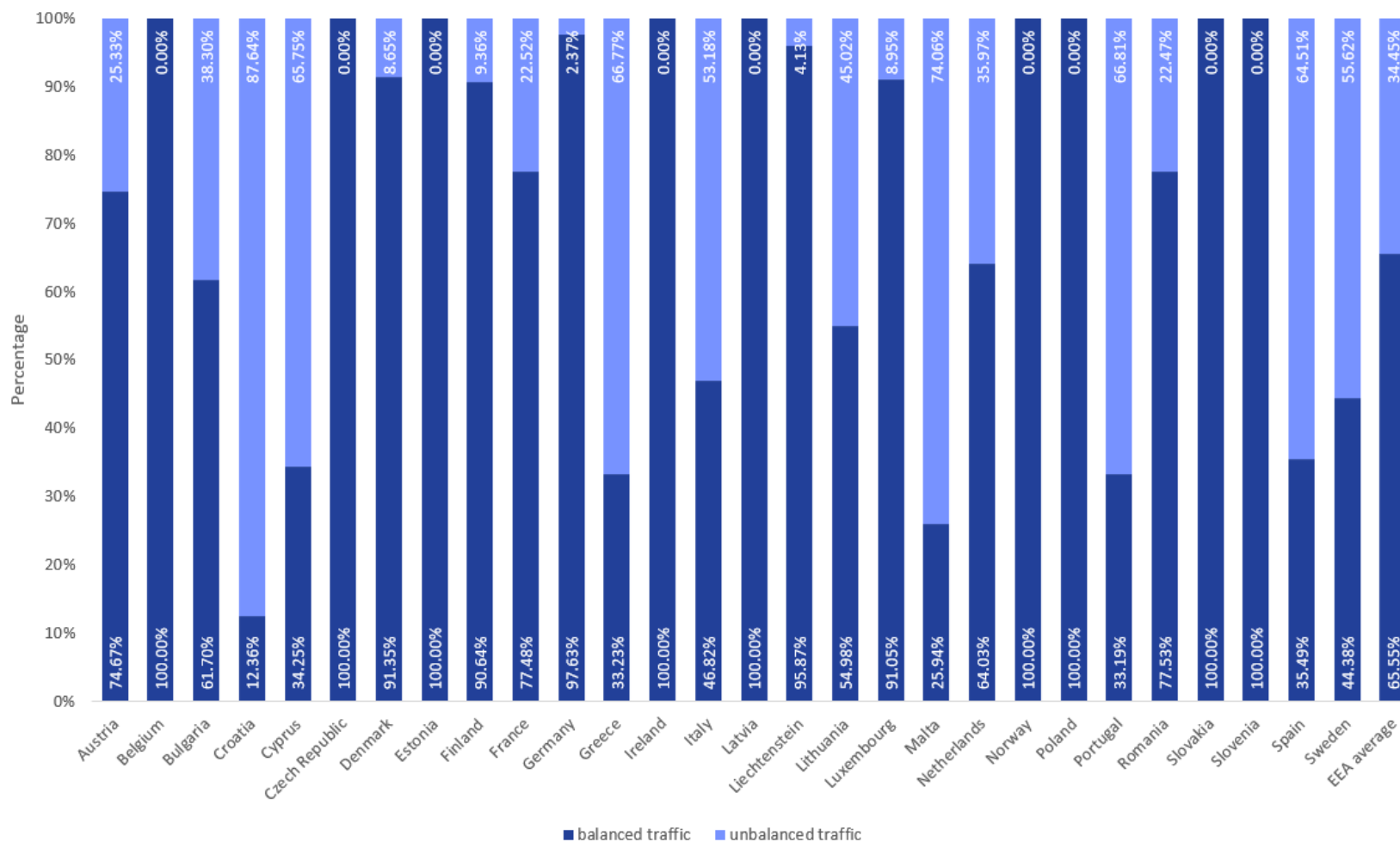


Figure 22 depicts the share of balanced and unbalanced traffic within EEA countries used for inbound data services for Q3 2023. This value is created by calculating the contribution of the number of balanced and unbalanced GB to the total number of wholesale roaming GB.

### **5.2.3.2 Consumption patterns**

Figure 23: EEA average: retail data roaming services by share of tariff, Q4 20 – Q3 23

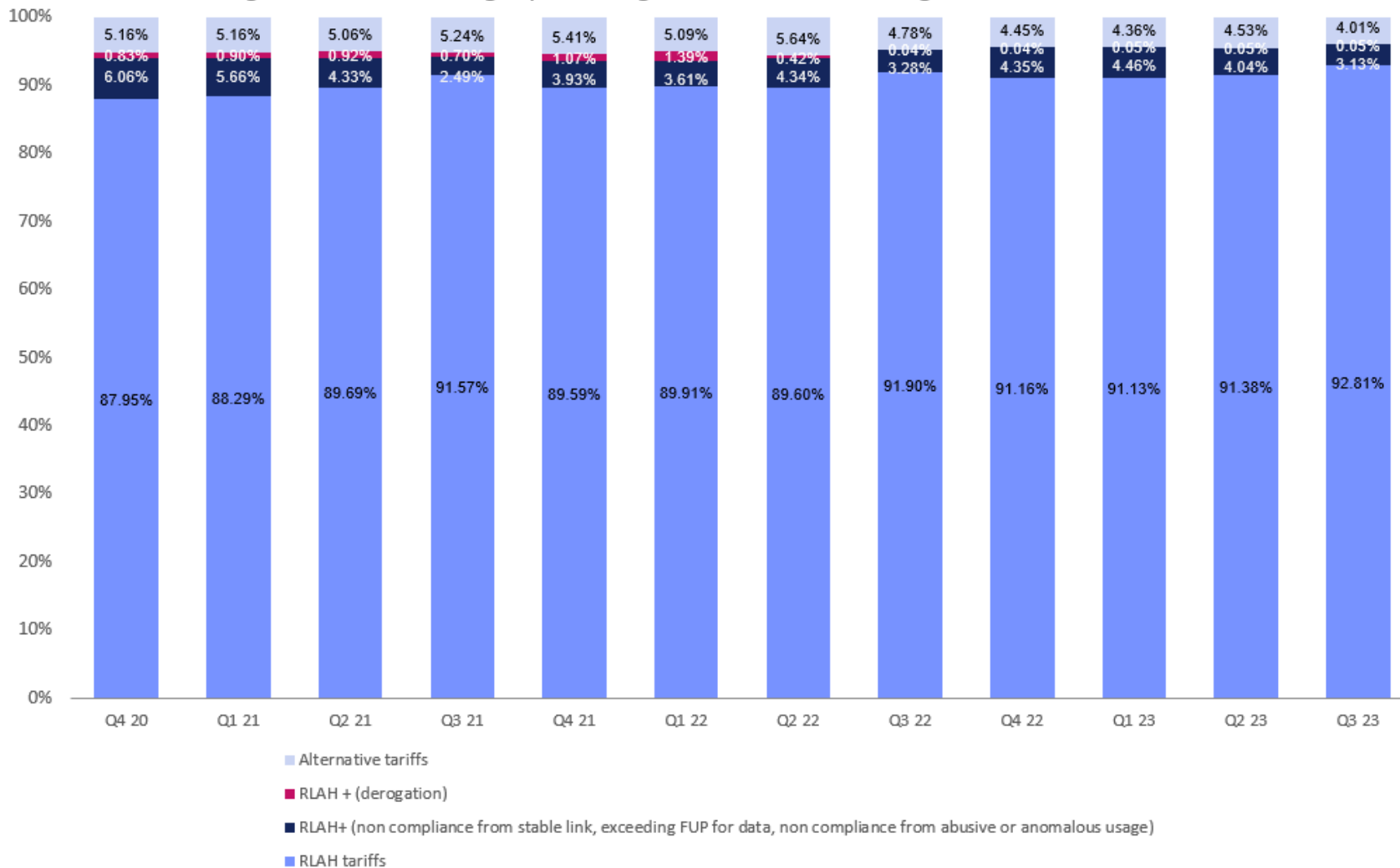


Figure 23 depicts the EEA average of the share of tariffs (RLAH tariffs, RLAH+ (derogation), RLAH+ (stable link, abusive/anomalous usage), Alternative tariffs) used for roaming data services for Q4 2020 – Q3 2023. This average is created by calculating the contribution of each tariff to the total number of roaming data services.



Figure 24: Average data consumption per month per total number of roaming subscribers (in GB), Q3 22 and Q3 23

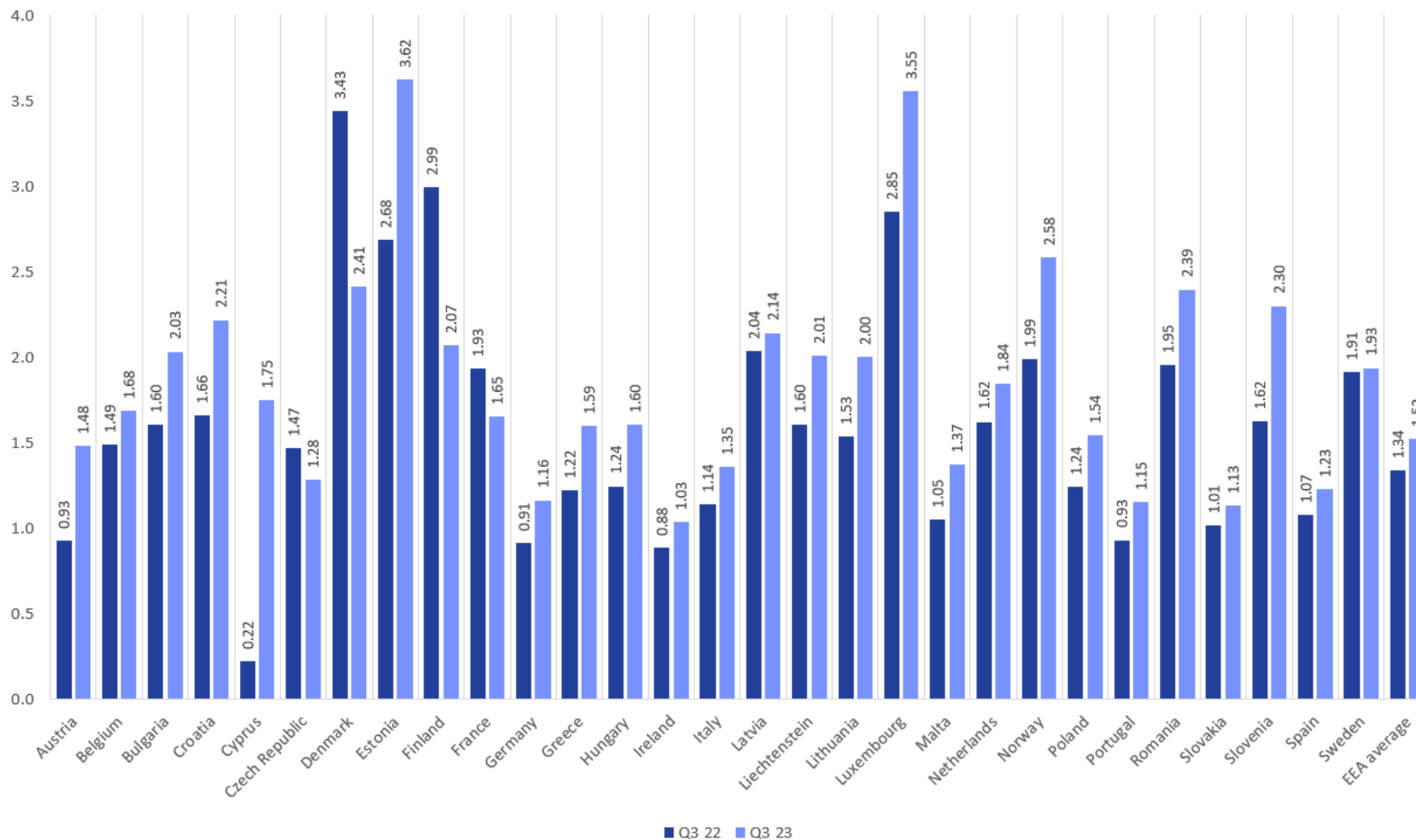


Figure 24 depicts the average number of roaming GB consumed per subscriber on a per-country level. This average is calculated by dividing the number of roaming GB by the total number of roaming subscribers and again by three to arrive at monthly values for Q3 2022 and Q3 2023. In some cases, not all operators provided the data for RLAH subscribers.

Figure 25: EEA average data consumption per month per total number of roaming subscribers (in GB), Q4 20 – Q3 23

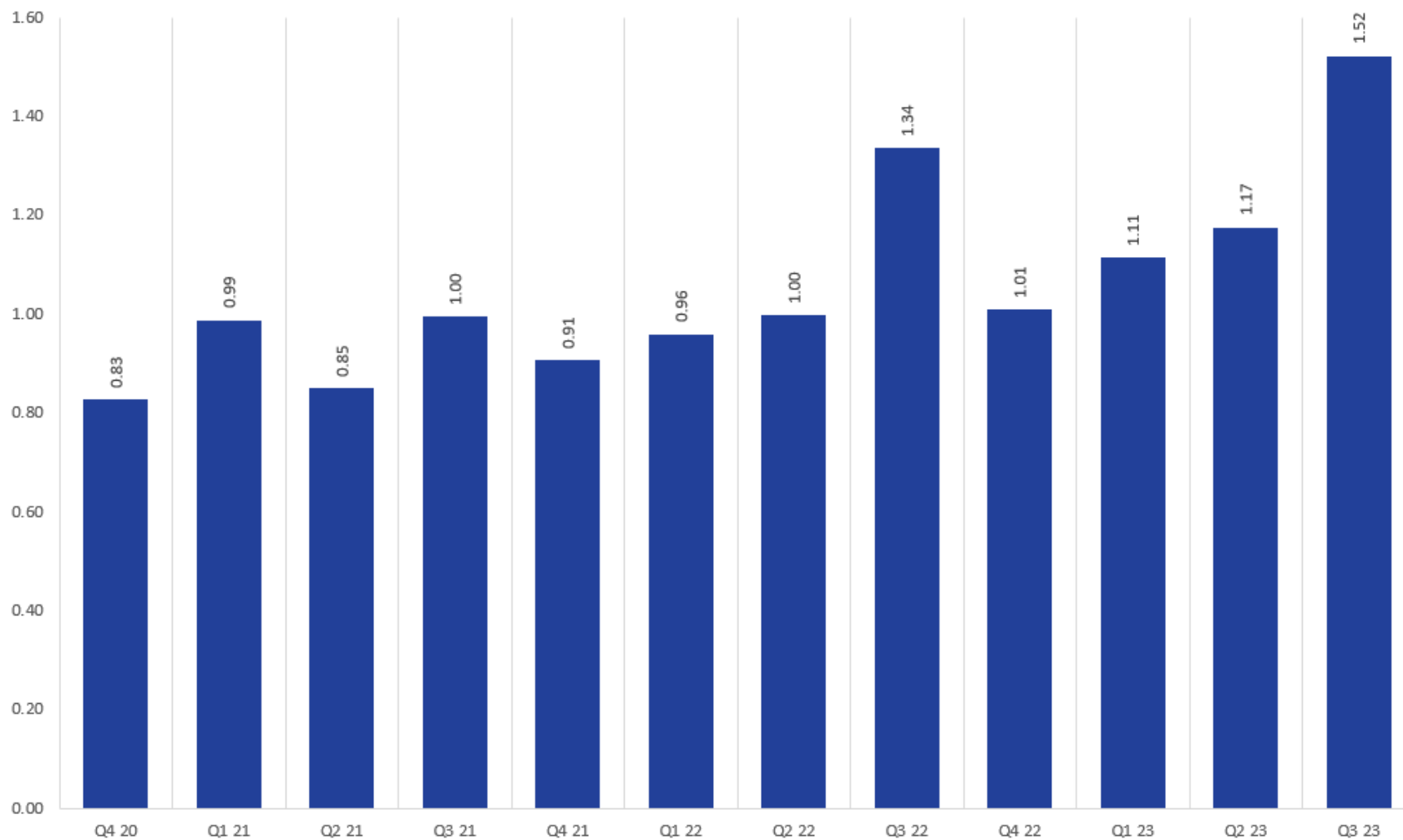


Figure 25 depicts the EEA average number of roaming GB consumed per subscriber. This average is calculated by dividing the number of roaming GB by the total number of roaming subscribers and again by three to arrive at monthly values for Q4 2020 – Q3 2023

Figure 26: EEA retail data, Q4 20 – Q3 23 (millions of GB)

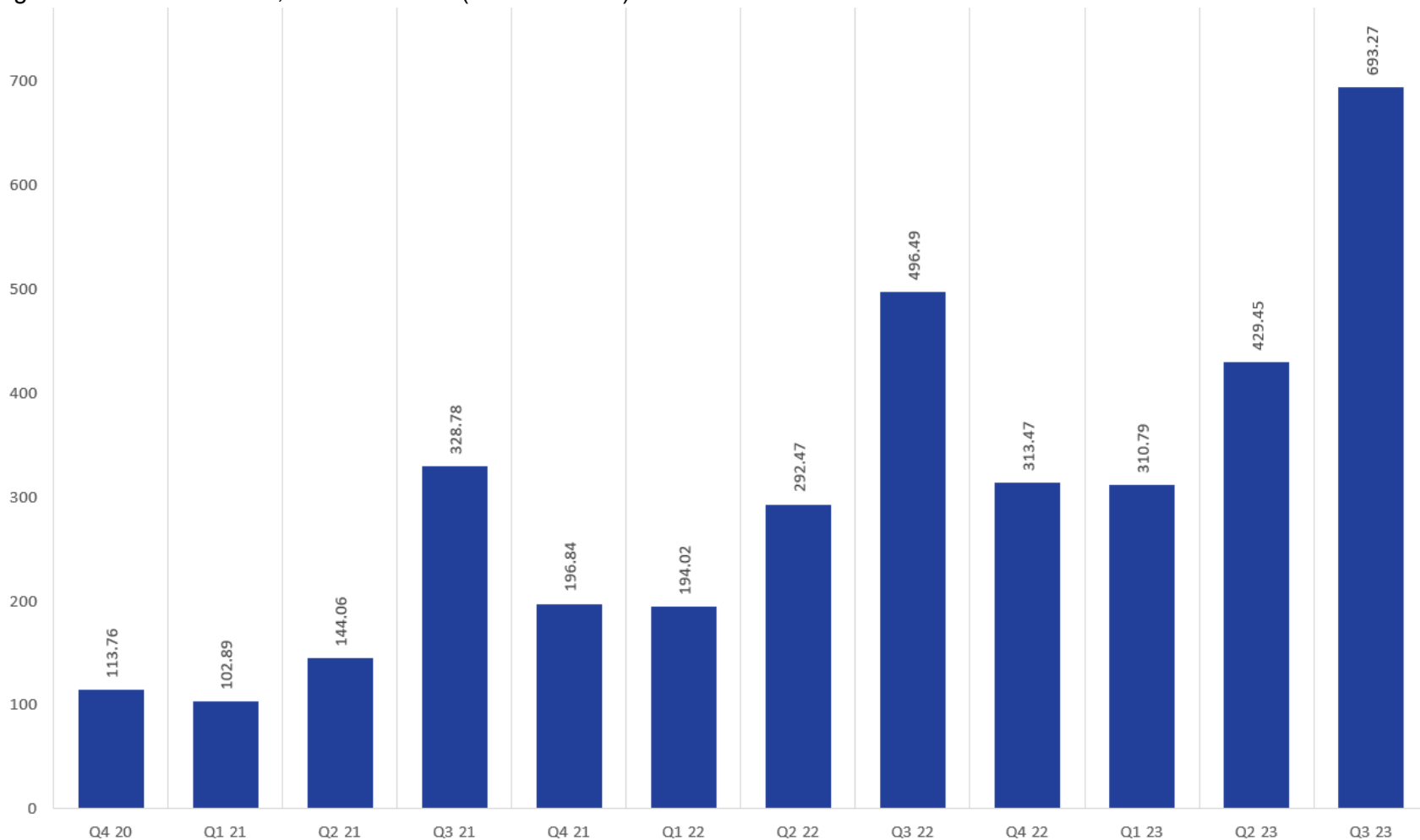


Figure 26 depicts the total number of GB while roaming (including RLAH, RLAH+ stable link, RLAH+ derogation, RLAH+ abusive/anomalous usage, RLAH+ exceeding data FUP, alternative tariffs) in the EEA for Q4 2020 – Q3 2023 (in millions of minutes).

#### **5.2.4. RoW retail roaming prices**

Figure 27: EEA average retail prices for RoW roaming services, Q4 20 – Q3 23

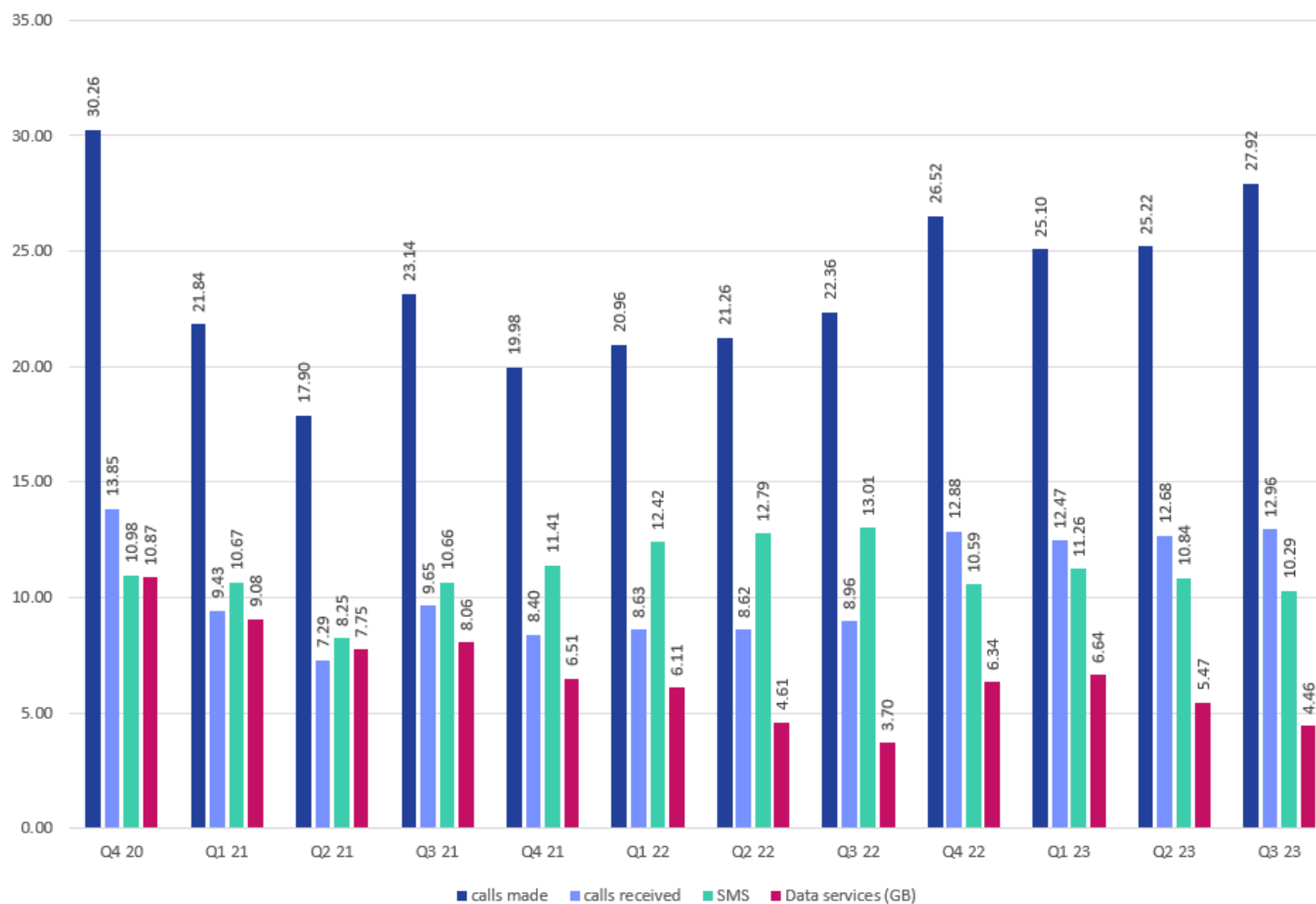


Figure 27 compares the average retail prices in RoW countries for EEA roaming subscribers. To calculate these averages, the retail roaming revenues in RoW countries were divided by the volumes of retail roaming traffic initiated by EEA roaming subscribers in RoW countries (calls made, calls received, SMS and data services) for Q4 2020 – Q3 2023.

Voice and SMS services: prices are expressed in Euro cents.

Data services: prices are expressed in Euro.

Figure 28: EEA average retail prices (in Euro cents) for roaming on non-terrestrial networks, Q4 21 – Q3 23

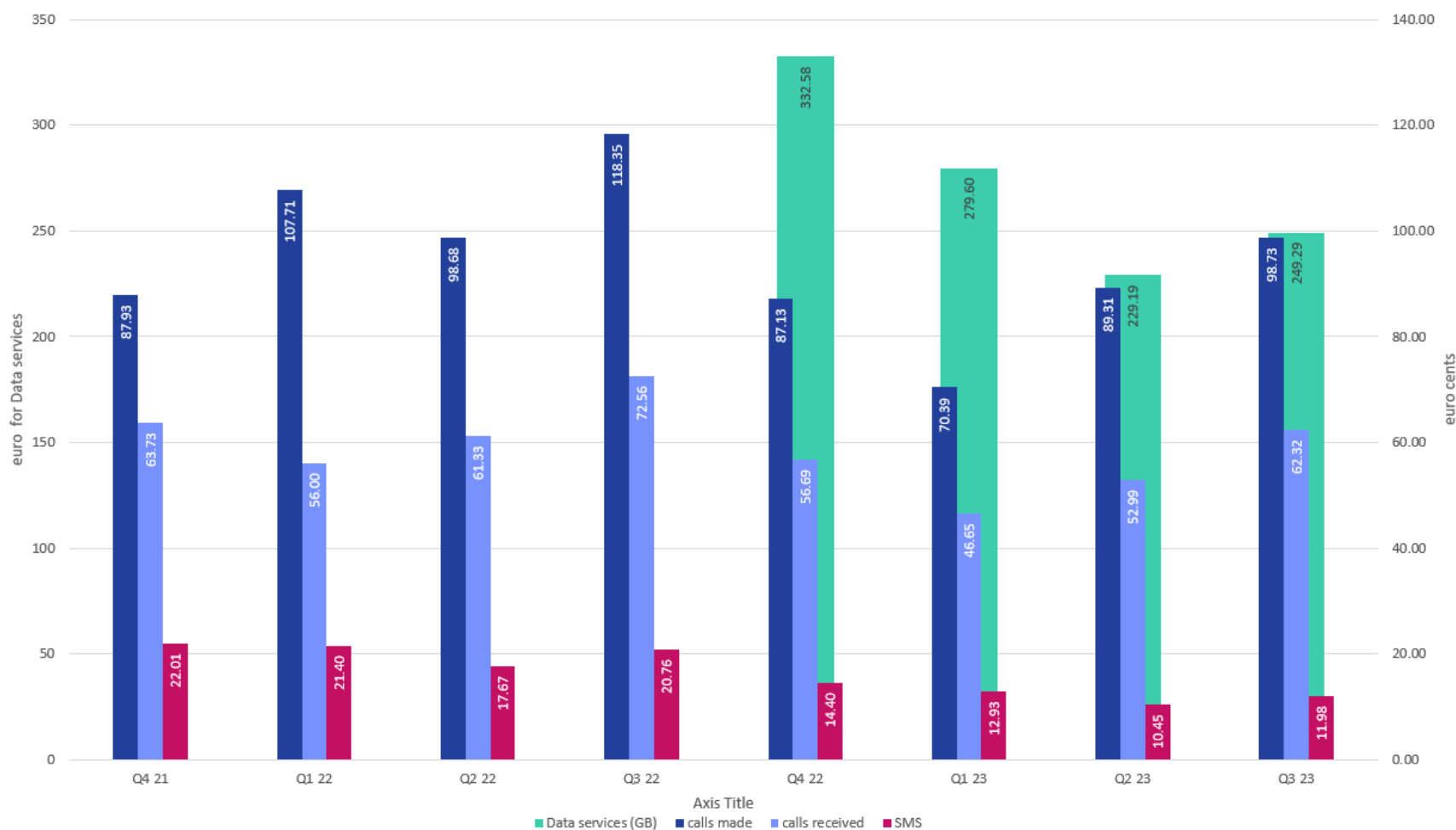


Figure 28 depicts the EEA average retail prices for roaming on non-terrestrial networks. The average was calculated by dividing the retail roaming revenues on non-terrestrial networks by the retail roaming volumes on non-terrestrial networks (separately for calls made, calls received, SMS and data services) for Q4 2021 – Q3 2023.

Data services for non-terrestrial network payments are aligned to the primary axis due to higher number differences with other services fees. The rest of services are aligned on the secondary axis. Please note that data for Q1 2021 and Q3 2022 are excluded because of inconsistencies.

### **5.3. Wholesale roaming (outbound) rates per unit for agreements applying Art. 3 Roaming Regulation**

Figure 29: Wholesale averages outbound roaming: rate per minute for agreements applying Article 3 Roaming Regulation, Q4 20 – Q3 23

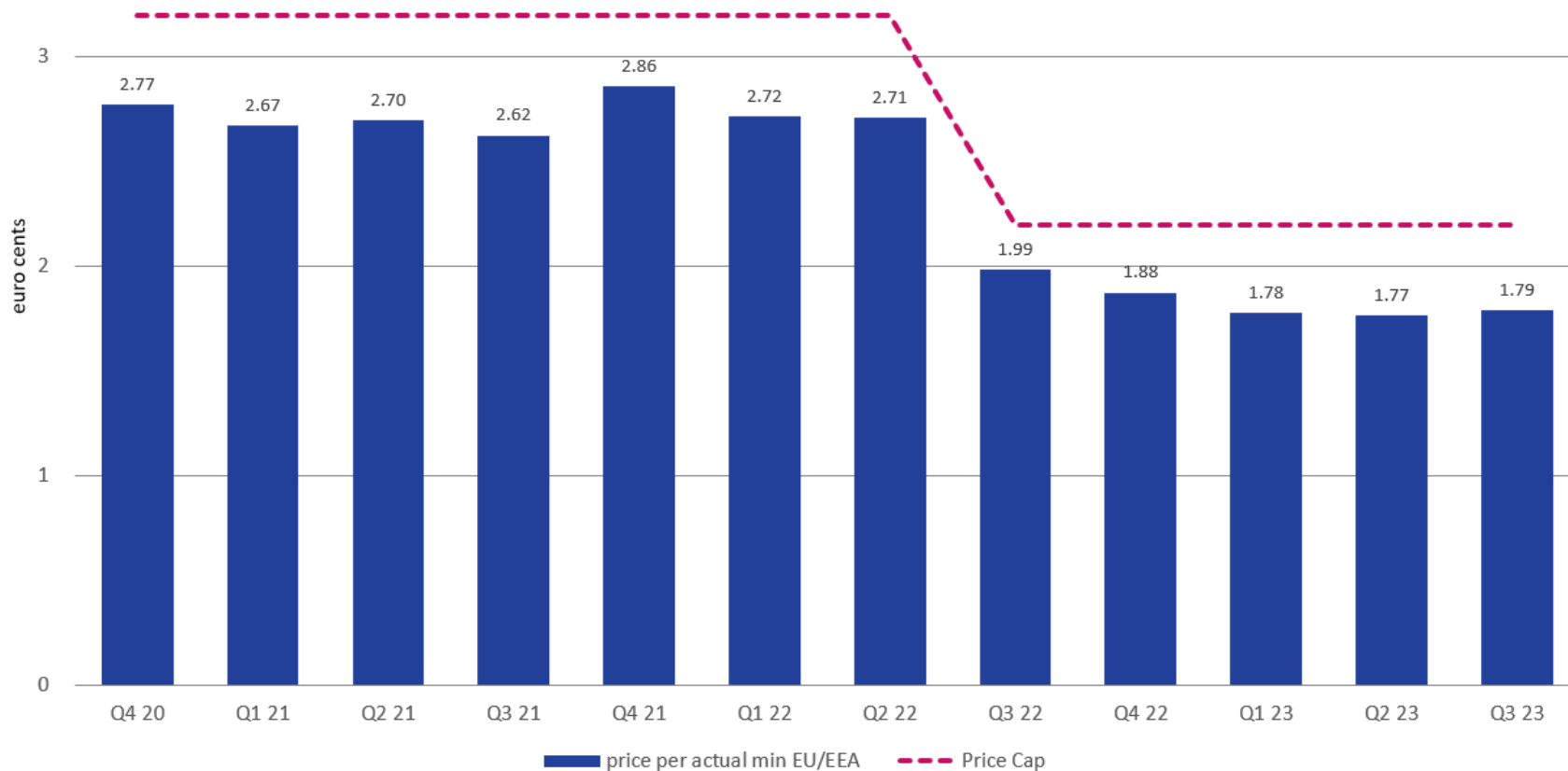


Figure 29 depicts the rate per minute for wholesale outbound resale roaming in the EEA for agreements applying Article 3 of Roaming Regulation and compares it to the wholesale price caps applied. This average is calculated by dividing the wholesale roaming revenues by the number of minutes for Q4 2020 – Q3 2023.



Figure 30: Wholesale averages outbound roaming: rate per SMS for agreements applying Article 3 Roaming Regulation, Q4 20 – Q3 23

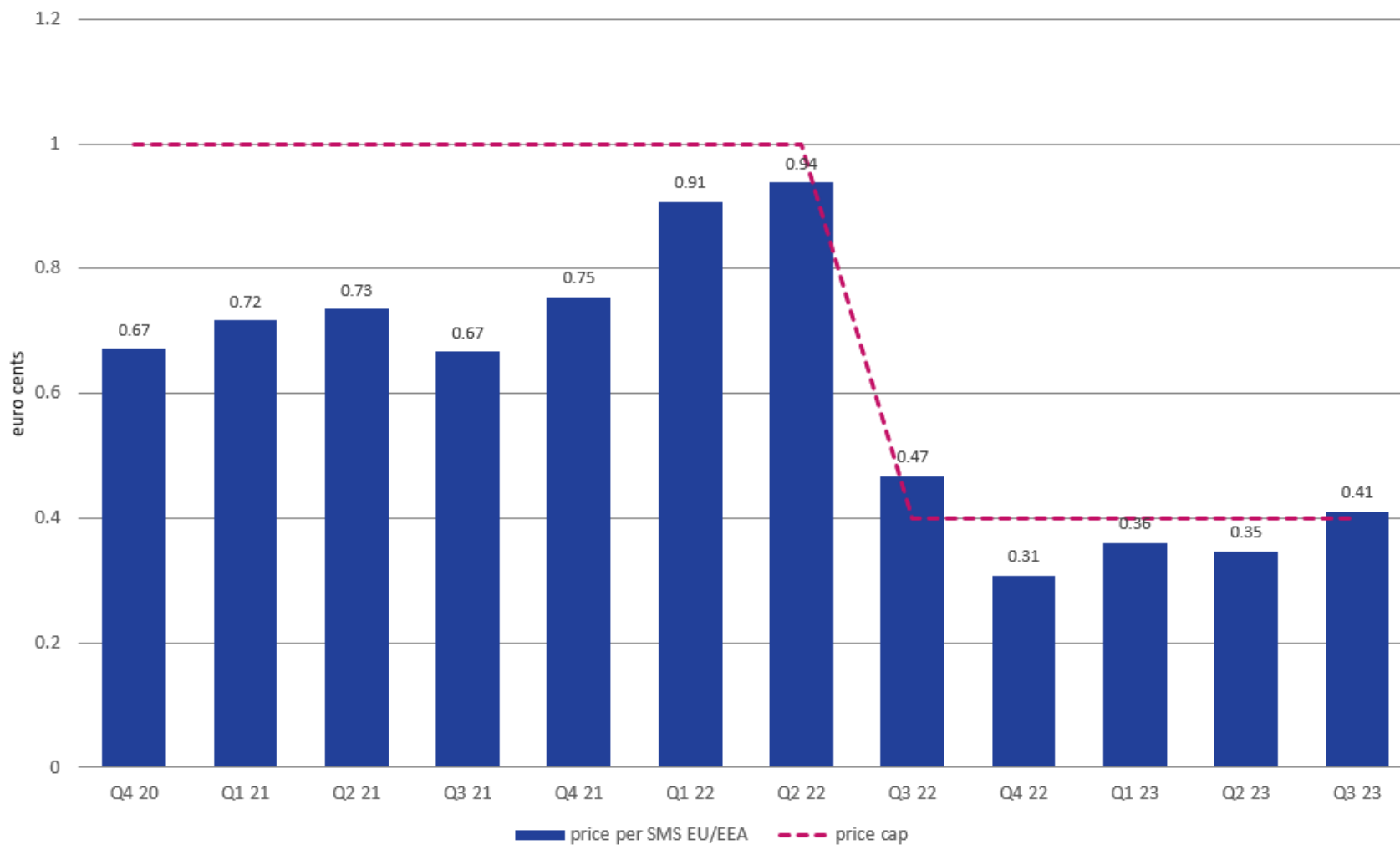


Figure 30 depicts the rate per SMS for wholesale outbound resale roaming in the EEA for agreements applying Article 3 of Roaming Regulation and compares it to the wholesale price caps applied. This average is calculated by dividing the wholesale roaming revenues by the number of SMS for Q4 2020 – Q3 2023.

Figure 31: Wholesale EEA average outbound roaming: rate per GB for agreements applying Article 3 Roaming Regulation, Q4 20 – Q3 23

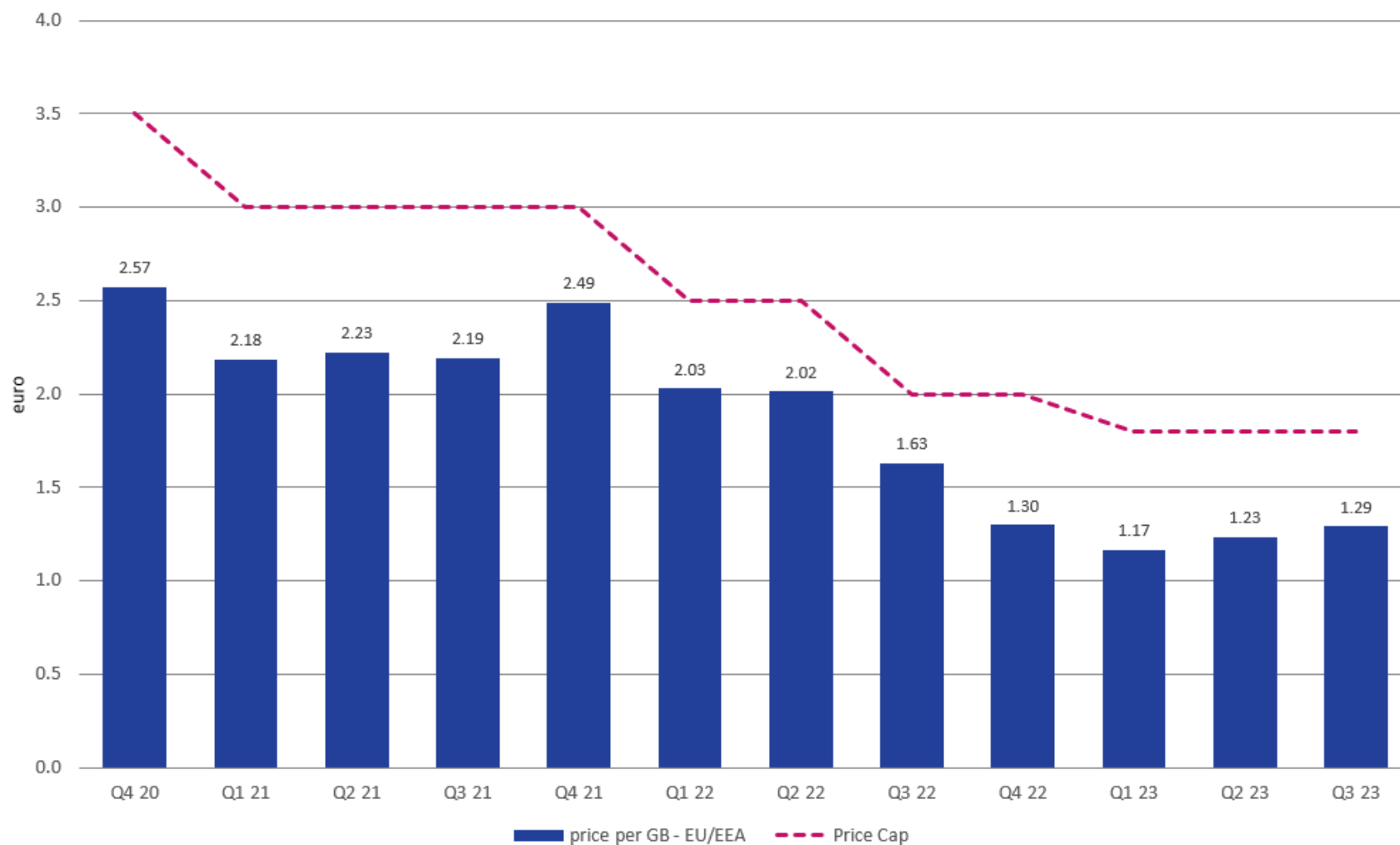


Figure 31 depicts the rate per GB for wholesale outbound resale roaming in the EEA for agreements applying Article 3 of Roaming Regulation and compares it to the wholesale price caps applied. This average is calculated by dividing the wholesale roaming revenues by the number of GB for Q4 2020 – Q3 2023.

Figure 32: Relation between wholesale costs and prices (min, SMS, GB), MNOs and MVNOs, Q4 22 - Q3 23

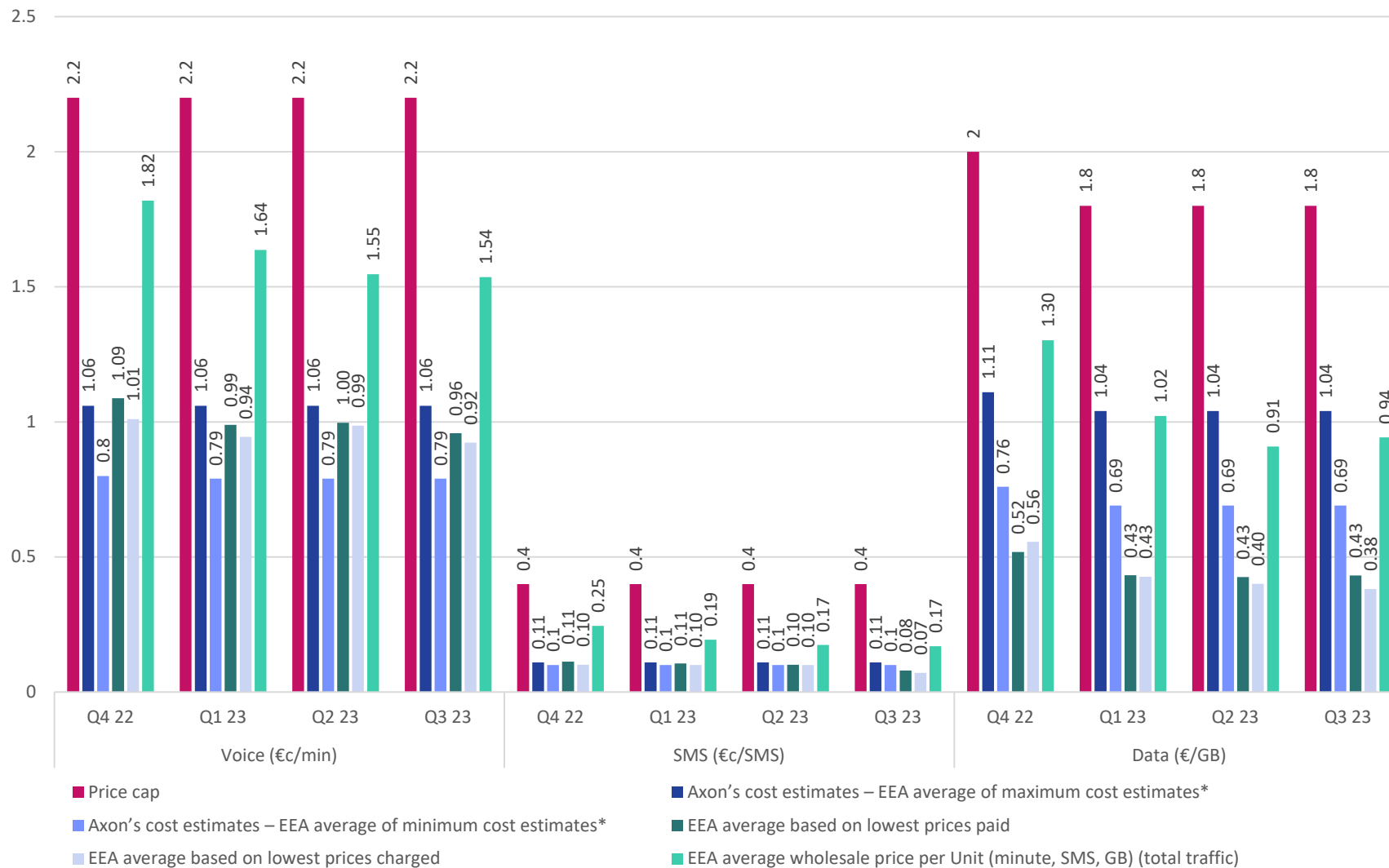


Figure 32 compares average EEA wholesale rates (based on lowest prices paid, lowest prices charged, and wholesale total traffic), Axon's cost estimates and wholesale price caps applied, separately for outgoing calls, SMS and data, for Q4 2022 – Q3 2023.

#### **5.4. MNOs and MVNOs data**

#### **5.4.1. Consumption patterns for domestic mobile retail services**

Figure 33: Domestic data services, average consumption per month per total number of subscribers (GB), MNOs and MVNOs, Q3 23

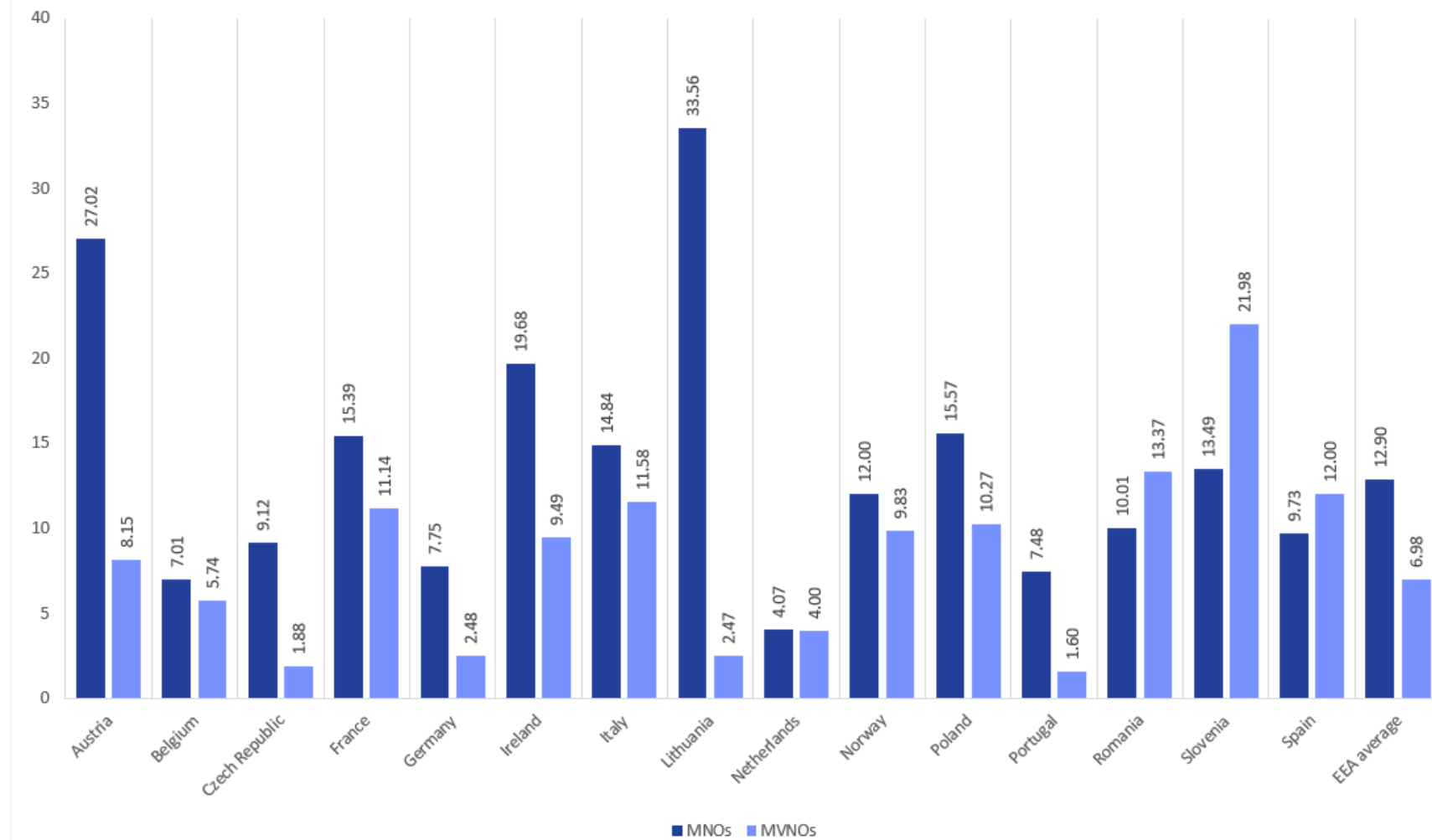


Figure 33 compares the average data consumption in each country (per month per total number of subscribers) of subscribers to different types of roaming providers (MNOs vs MVNOs) for Q3 2023.

Figure 34: EEA average domestic mobile services consumption per month per total number of subscribers, Q4 22 - Q3 23

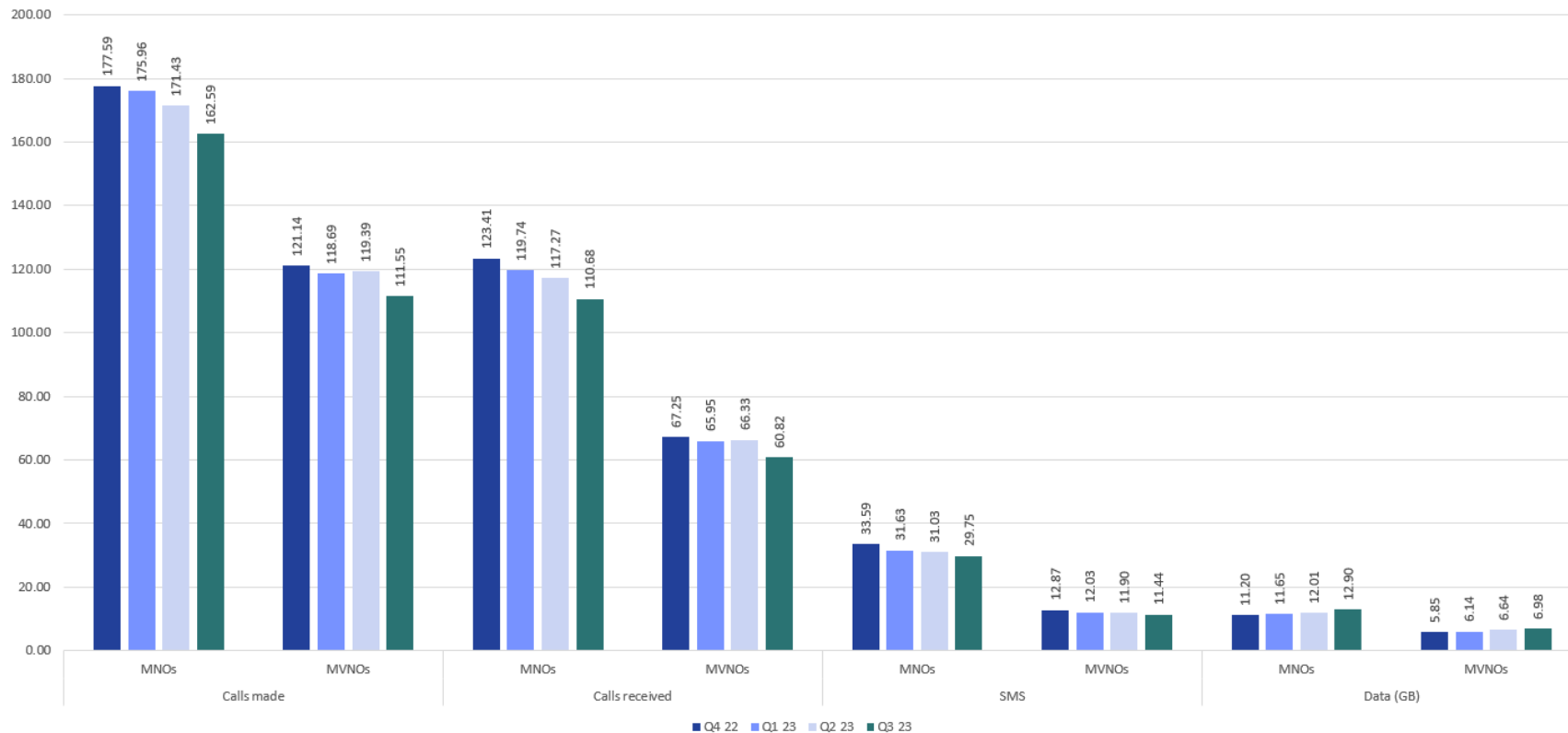


Figure 34 compares the EEA average consumption of mobile services (per month per total number of subscribers) of subscribers to different types of roaming providers (MNOs vs MVNOs) Q4 22 - Q3 2023.

Figure 35: MNOs: share of total subscribers with EU/EEA roaming enabled, Q4 20 - Q3 23

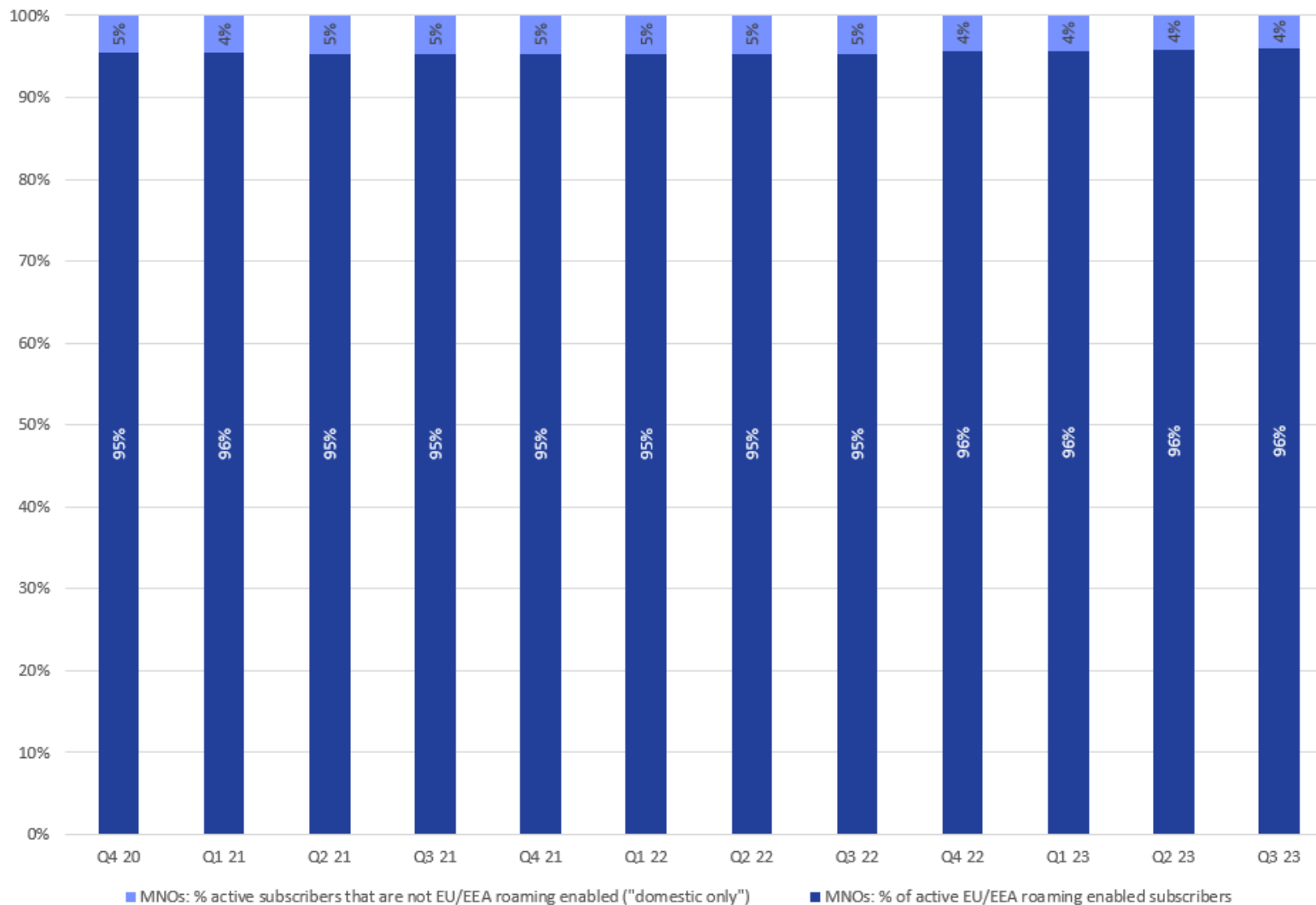


Figure 35 depicts the average share of total subscribers from MNOs only at EEA level, which compares the percentage of active EU/EEA roaming enabled subscribers to the percentage of subscribers that are not EU/EEA roaming enabled (domestic only) for Q4 2020 - Q3 2023.



Figure 36: MVNOs: share of total subscribers with EU/EEA roaming enabled, Q4 20 - Q3 23

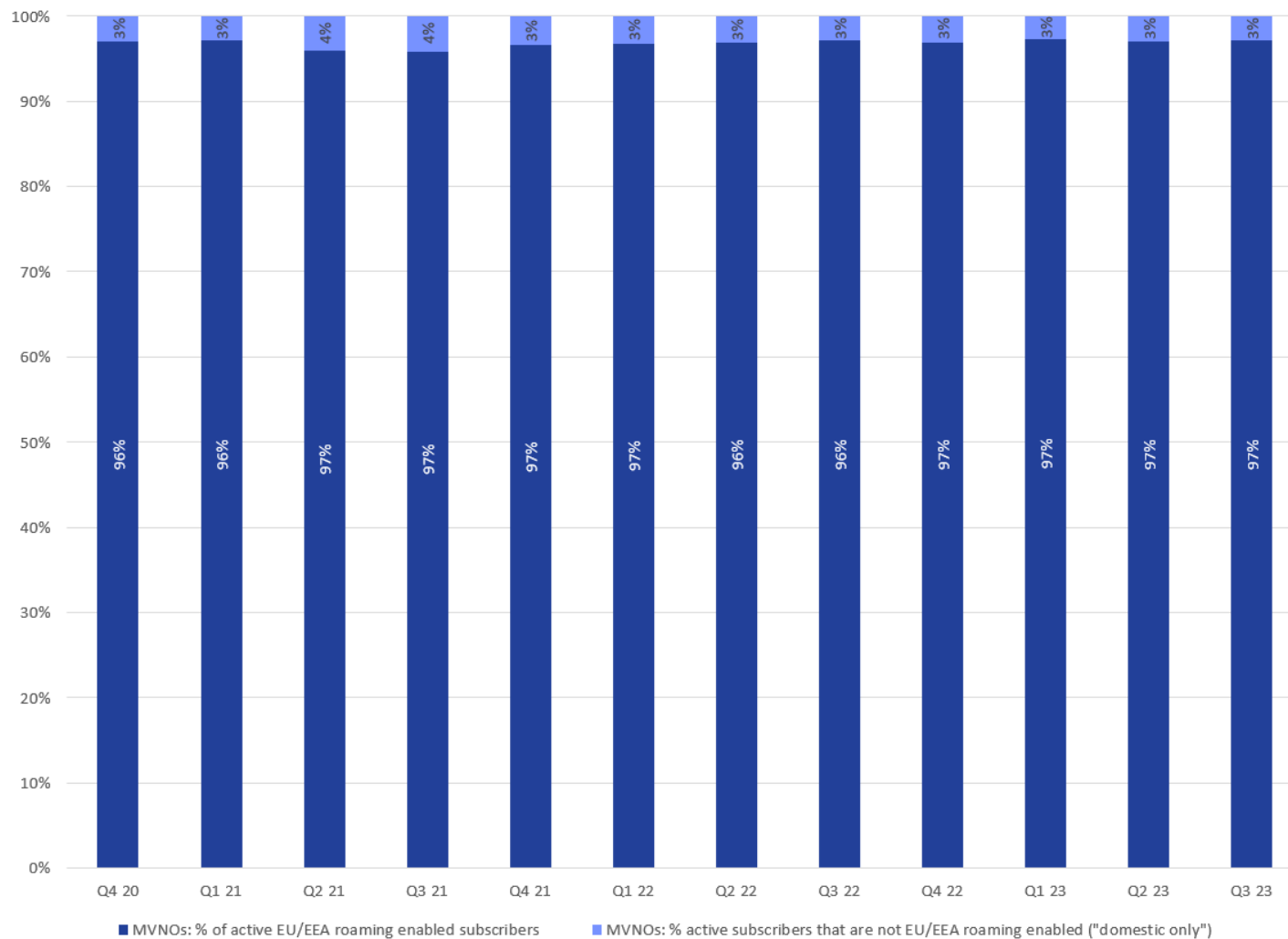


Figure 36 depicts the average share of total subscribers from MVNOs only at EEA level, which compares the percentage of active EU/EEA roaming enabled subscribers to the percentage of subscribers that are not EU/EEA roaming enabled (domestic only) for Q4 2020 - Q3 2023.

#### **5.4.2. Consumption patterns for RLAH services (voice, SMS and data)**

Figure 37: RLAH, calls made: EEA average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q4 20 – Q3 23.

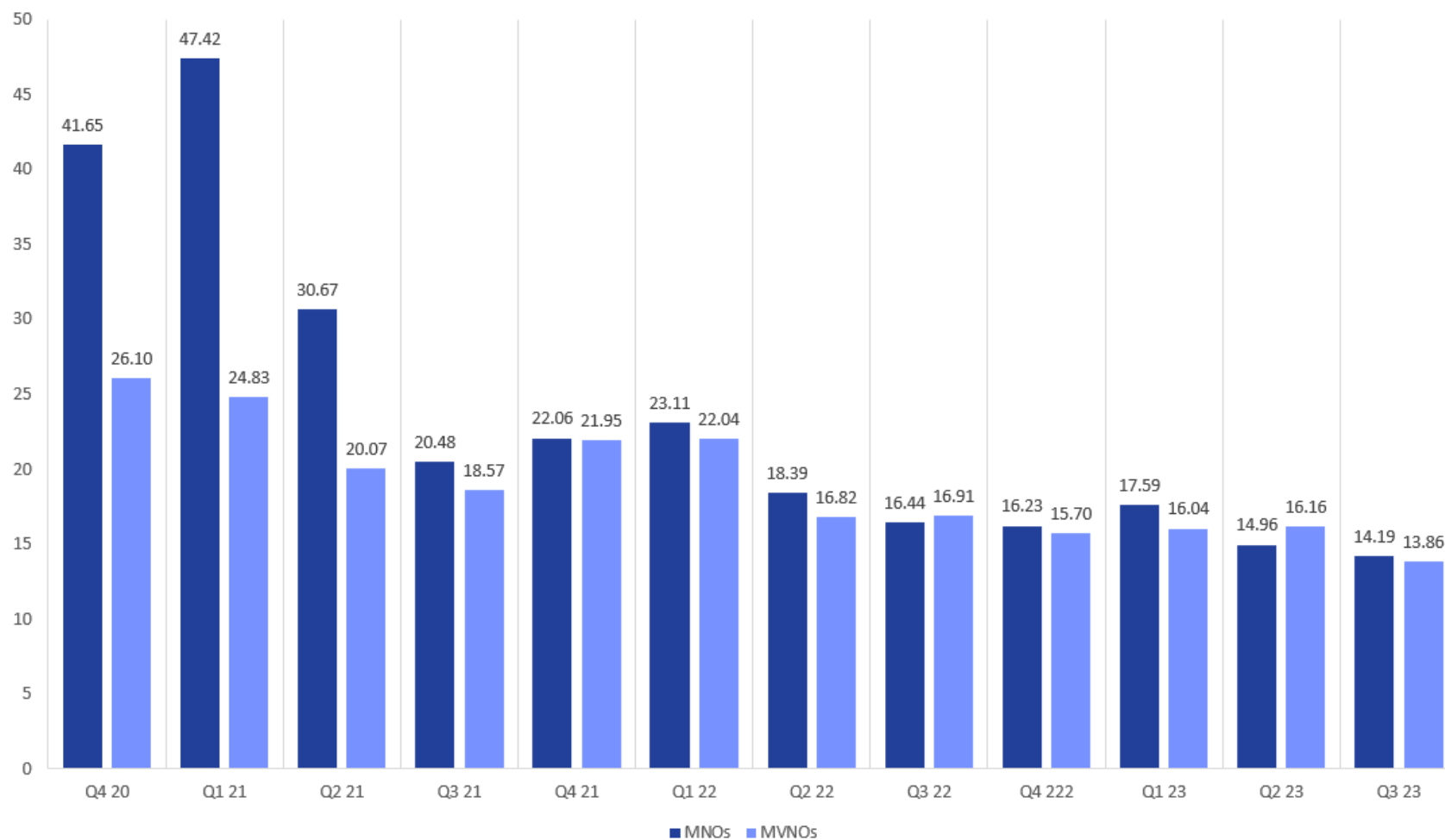


Figure 37 compares the EEA average number of RLAH minutes for calls made (per month per total number of subscribers) of subscribers to different type of roaming providers (MNOs vs MVNOs) for Q4 2020 - Q3 2023.

Figure 38: RLAH, data services: EEA average number of GB per month per total number of roaming subscribers, MNOs and MVNOs, Q4 20 – Q3 23.

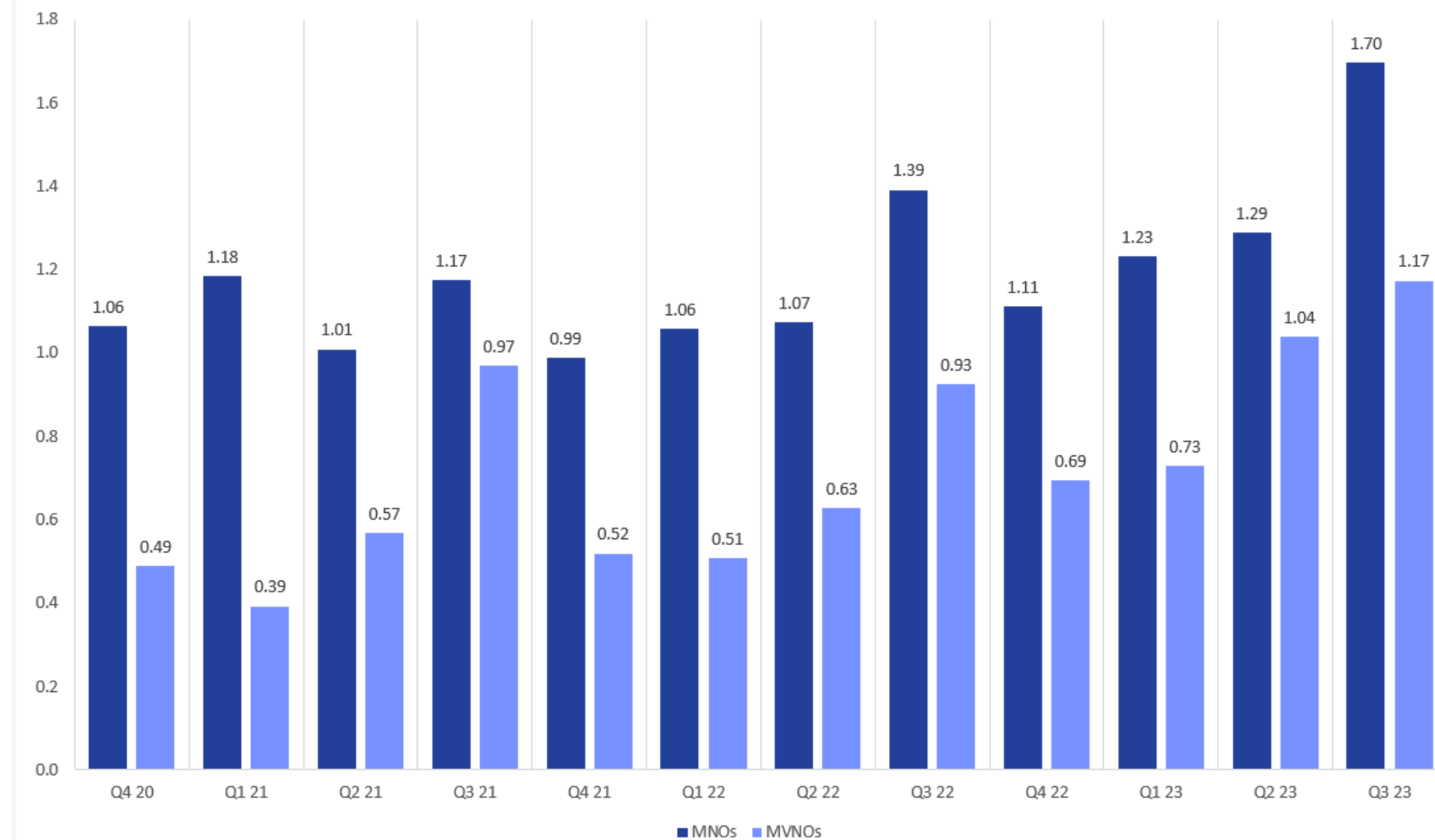


Figure 38 compares the EEA average RLAH data consumption (per month per total number of subscribers) of subscribers to different type of roaming providers (MNOs vs MVNOs) for Q4 2020 - Q3 2023

**5.4.3. Payment to the host operator for the provision of wholesale international roaming services**

Figure 39: EEA average of the payment to the host operator for the provision of wholesale roaming services (per unit), MVNOs, Q4 20 – Q3 23

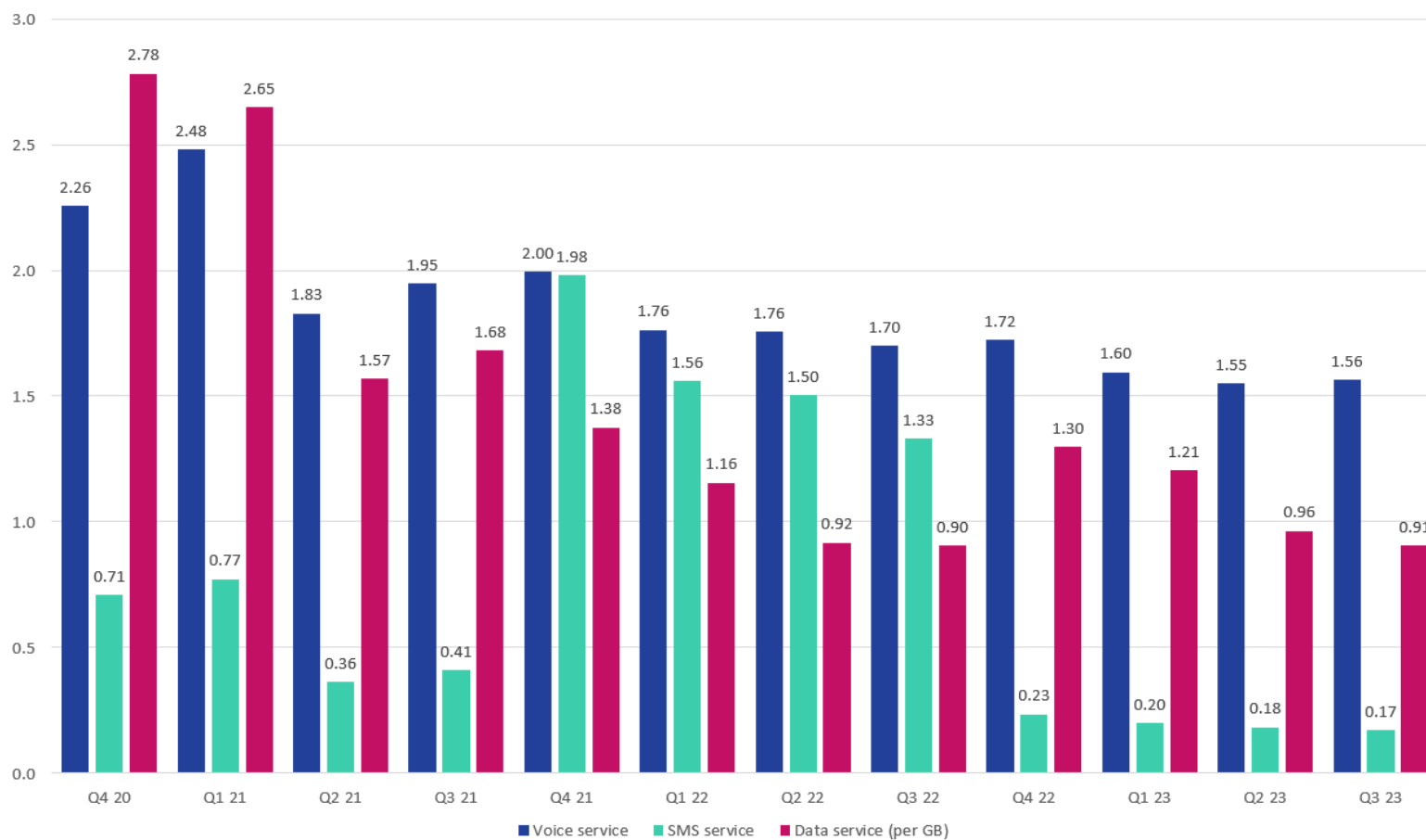


Figure 39 depicts the average cost to the host operator for the provision of wholesale roaming services (per unit) at EEA level. This average was calculated by dividing the payments for wholesale outbound roaming (of each service) by number of wholesale volumes for Q4 2020 – Q3 2023. Data services: prices are expressed in Euro.

## 5.5. M2M data

### **5.5.1. Connected devices**



Figure 40: Total number of active connected objects/devices at EEA level (with roaming enabled or domestic only), Q2 20 - Q3 23

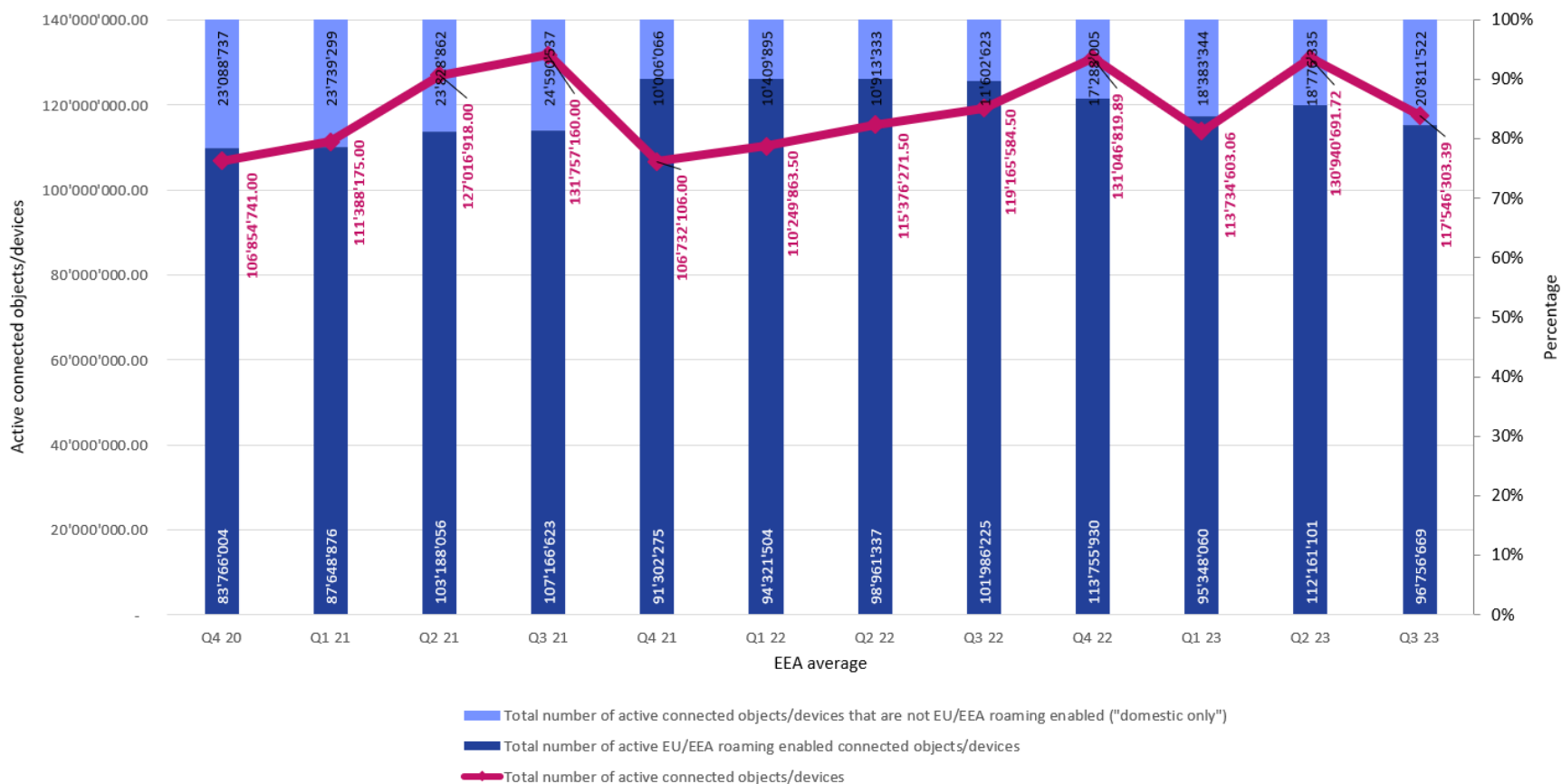


Figure 40 depicts the share of Total number of active EEA roaming enabled connected objects/devices and Total number of active connected objects/devices that are not EEA roaming enabled (domestic only) together with Total number of active connected objects/devices in EEA, Q4 2020 – Q3 2023.

### **5.5.2. Consumption patterns (voice, data and SMS)**

Figure 41: EEA average: share of retail consumption of roaming and domestic data per month from connected devices/objects (in GB), Q4 20 - Q3 23

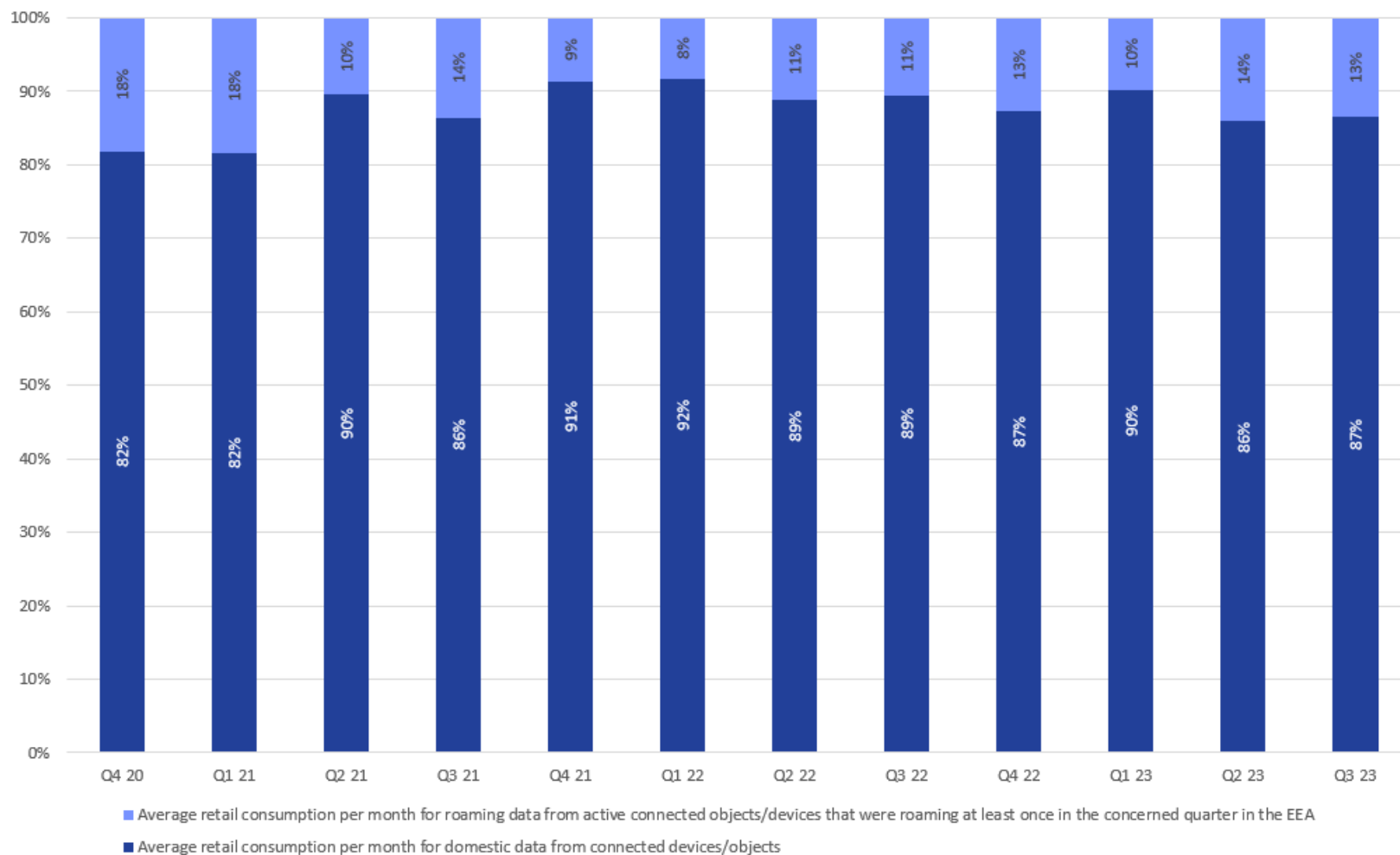


Figure 41 depicts the share of EEA average retail consumption of roaming and domestic data per month from connected objects/devices. This share is calculated by comparing the number of average retail consumption per month for roaming data from active connected objects/devices that were roaming at least once in the concerned quarter in the EEA with the number of average retail consumption per month for domestic data from connected objects/devices to arrive at an average for Q4 2020 – Q3 2023.

Figure 42: EEA average: share of retail consumption of roaming and domestic calls made per month from connected devices/objects (in GB), Q4 20 - Q3 23

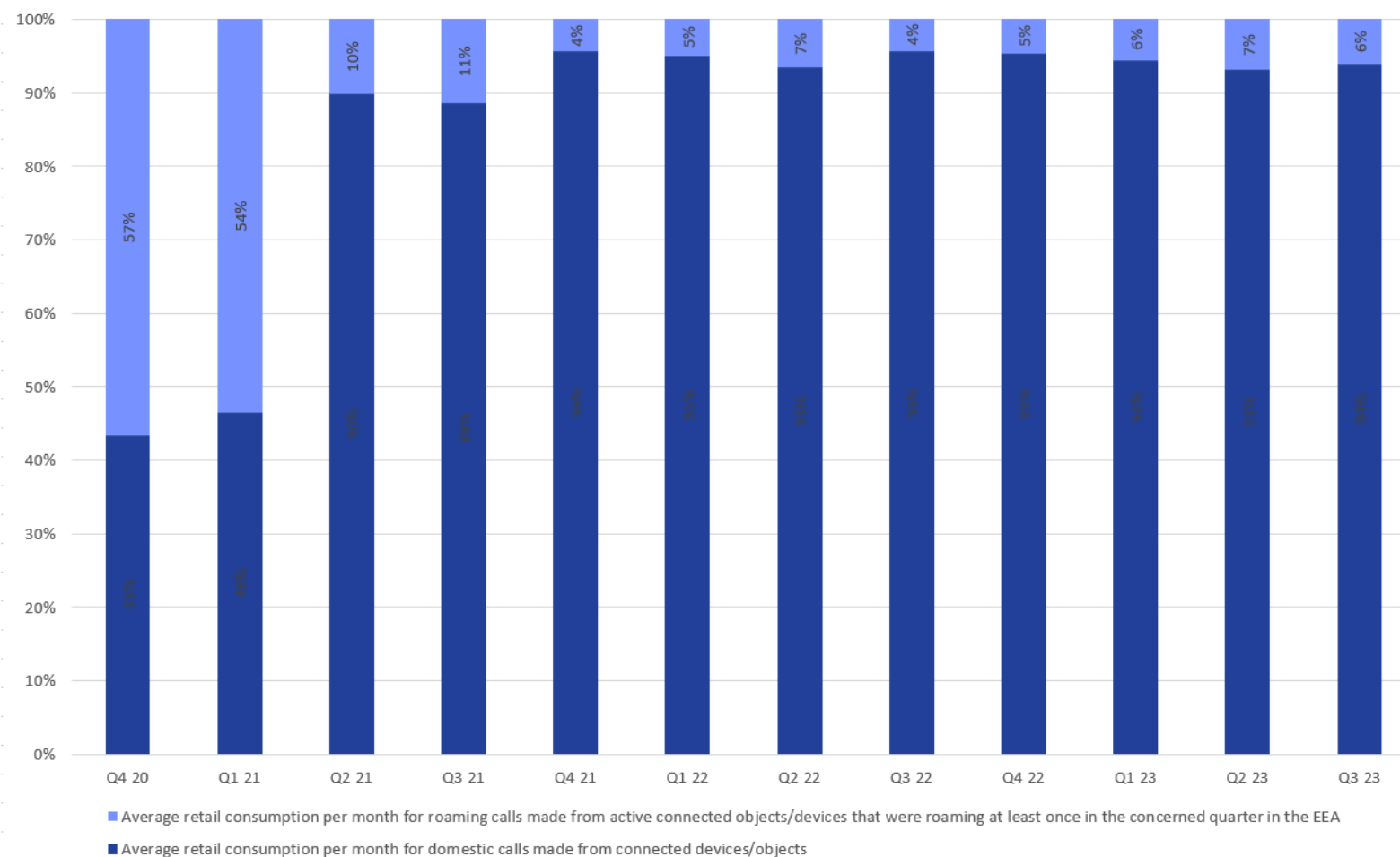


Figure 42 depicts the share of EEA average retail consumption of roaming and domestic calls made per month from connected objects/devices. This share is calculated by comparing the number of average retail consumption per month for roaming calls made from active connected objects/devices that were roaming at least once in the concerned quarter in the EEA with the number of average retail consumption per month for domestic calls made from connected objects/devices to arrive at an average for Q4 2020 – Q3 2023. Data from Greece, Spain and Sweden are excluded for Q4 2022 – Q3 2023.

Figure 43: EEA average: share of retail consumption of roaming and domestic SMS per month from connected devices/objects, Q4 20 - Q3 23

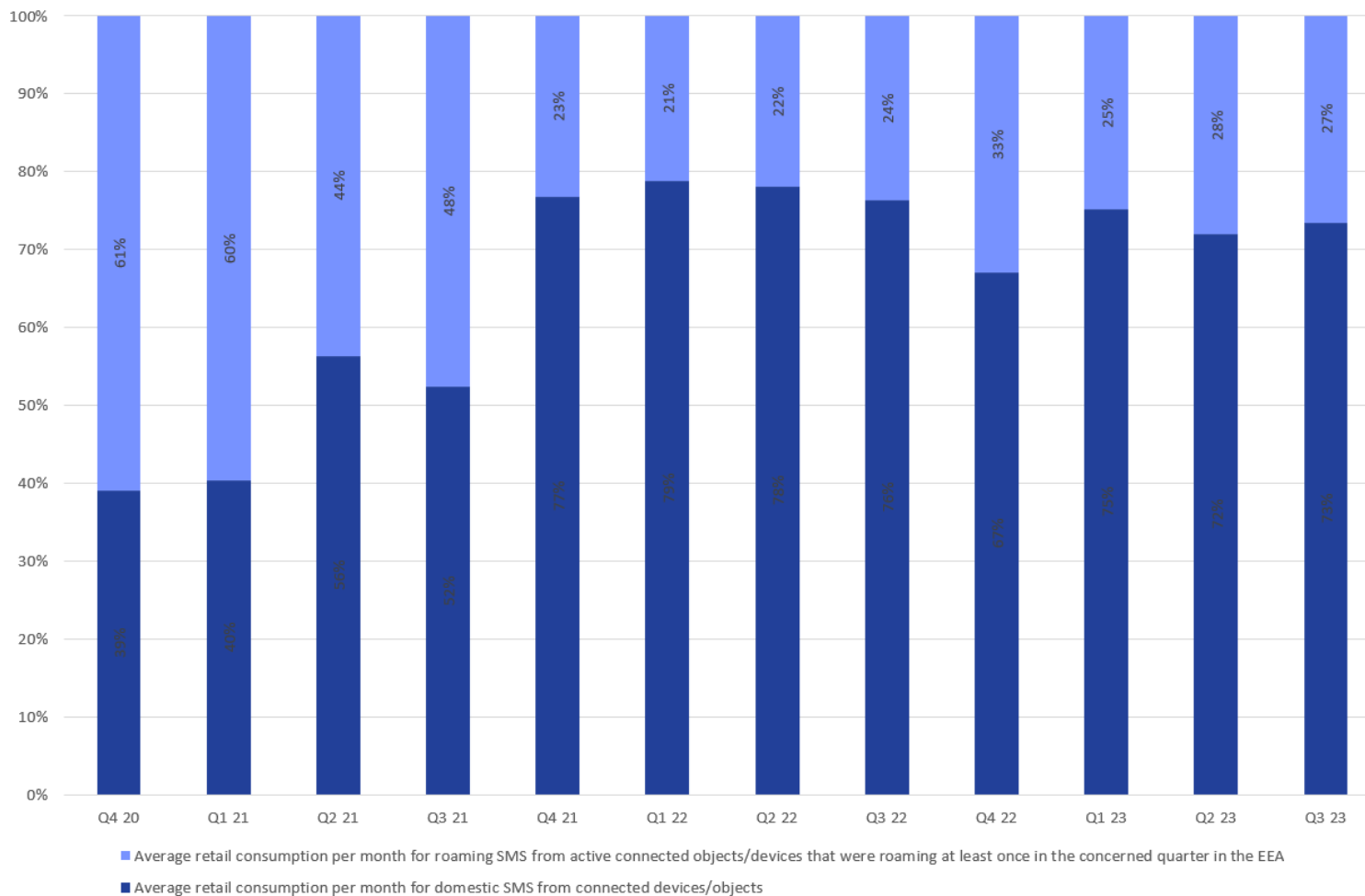


Figure 43 depicts the share of EEA average retail consumption of roaming and domestic SMS per month from connected objects/devices. This share is calculated by comparing the number of average retail consumption per month for roaming SMS from active connected objects/devices that were roaming at least once in the concerned quarter in the EEA with the number of average retail consumption per month for domestic SMS from connected objects/devices to arrive at an average for Q4 2020 – Q3 2023.

## **5.6. Transparency and Comparability of Roaming Tariffs**

### **5.6.1. Transparency of retail offers QoS**

Figure 44: Percentage of roaming providers offering specific network technologies to their subscribers when roaming in the EU/EEA

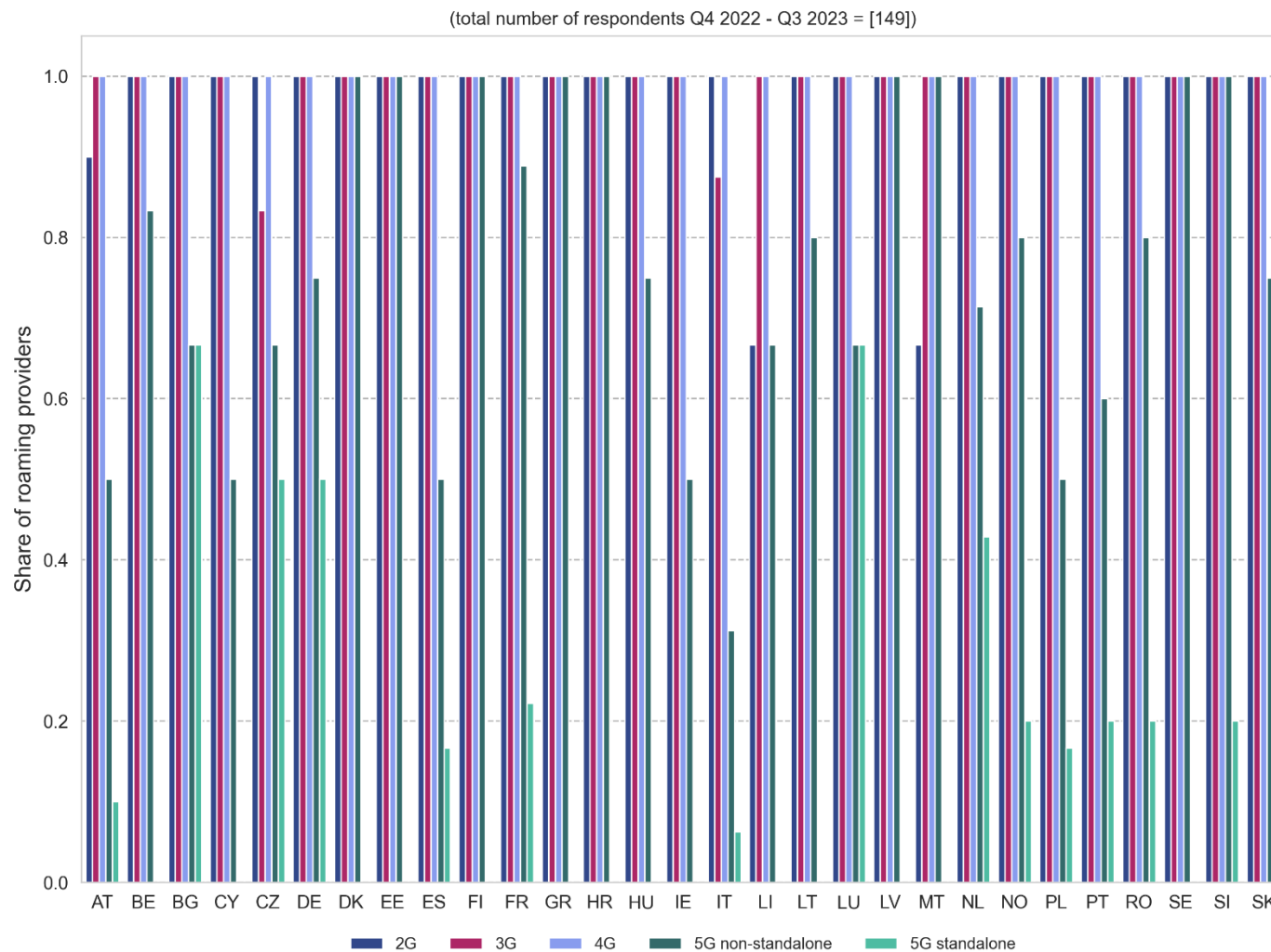


Figure 44 depicts the share of roaming providers (out of total respondents in each country) that are offering certain network technologies to their subscribers when roaming in the EU/EEA. For example, if 100% of roaming providers in a certain country offer 3G, this means that all domestic providers offer 3G services to their subscribers while roaming in the EEA.



Figure 45: Number of international roaming providers offering 5G non-standalone roaming services in different EEA countries (excluding national providers)

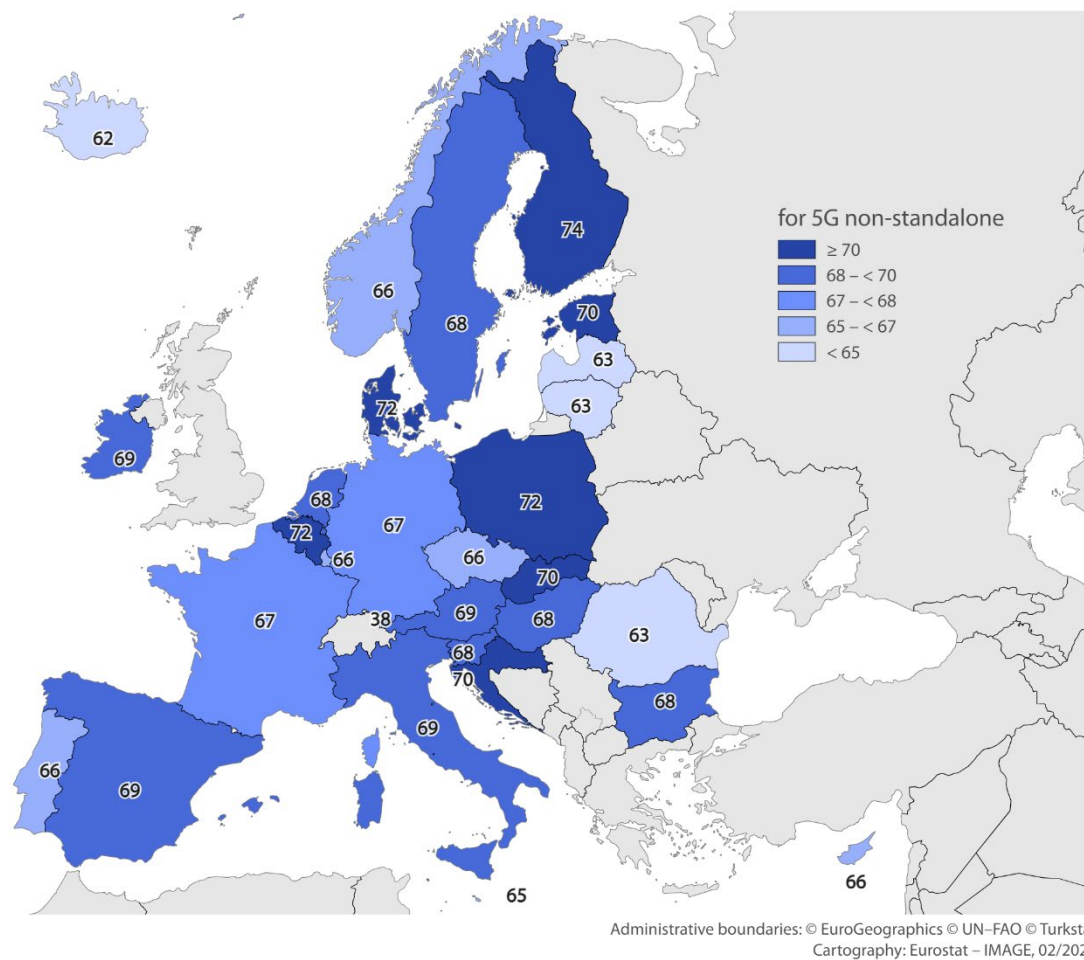


Figure 45 depicts a map of the EEA region which shows how many EEA roaming providers offer 5G non-standalone roaming services in each EEA country to illustrate the state of implementation of 5G roaming. For example, if 55 roaming providers offer 5G non-standalone roaming services in Finland, this means that 55 roaming providers from all over the EEA have reached agreements with Finnish providers allowing their subscribers (e.g. from Austria, Belgium, ...) to use 5G non-standalone services while roaming in Finland. Map includes data from 129 out of 156 operators.

Figure 46: Percentage of roaming providers differentiating between technologies when offering services at home



Figure 46 depicts the share of roaming providers (out of total respondents in each country) which differentiate between technologies when offering services at home. For example, if 100% of respondents in one country selected “Yes”, then this means that all domestic providers in this country differentiate between technologies when they offer services domestically.

### **5.6.2. Application of FUPs**

Figure 47: Number of MNOs and MVNOs using different types of FUP measures (based on data collected by BEREC for TACR report in 2018 – 2023; total number of respondents that could be identified as either MNO or MVNO Q4 2022 – Q3 2023 = 152)

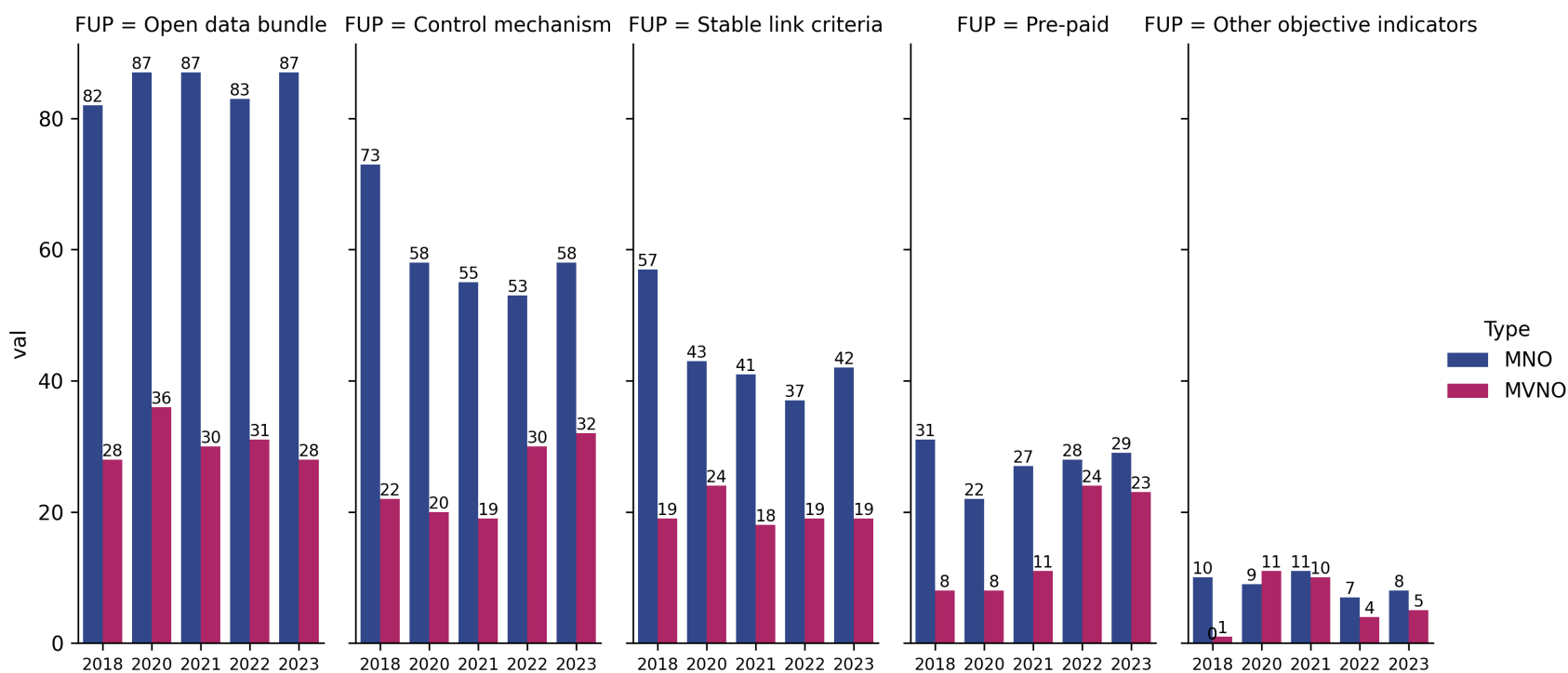


Figure 47 depicts the number of MNOs and MVNOs using different types of FUP measures over the period between 2018 and 2023. In 2019, the questionnaire did not feature a comparable question; therefore, there is no available data for that year.

Figure 48: Surcharges levied by MNOs and MVNOs for voice services when exceeding the FUP

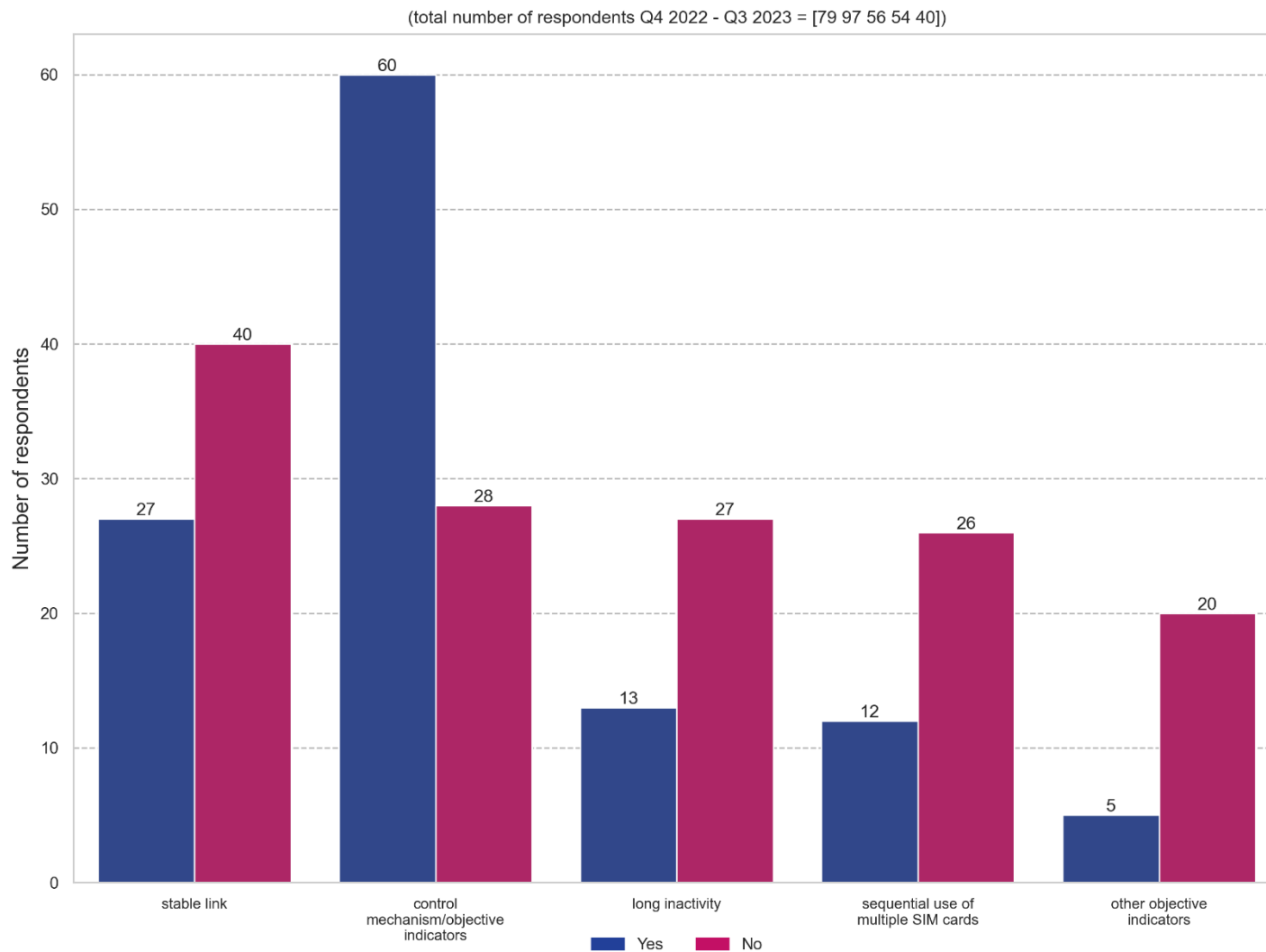


Figure 48 depicts the number of MNOs and MVNOs that levied surcharges for voice services when exceeding different types of FUP. Please note that there is also the option to answer with “n.a.”, which is not displayed here but leads to a respondent count higher than “yes” plus “no” answers.

Figure 49: Surcharges levied by MNOs and MVNOs for data services when exceeding the FUP measures

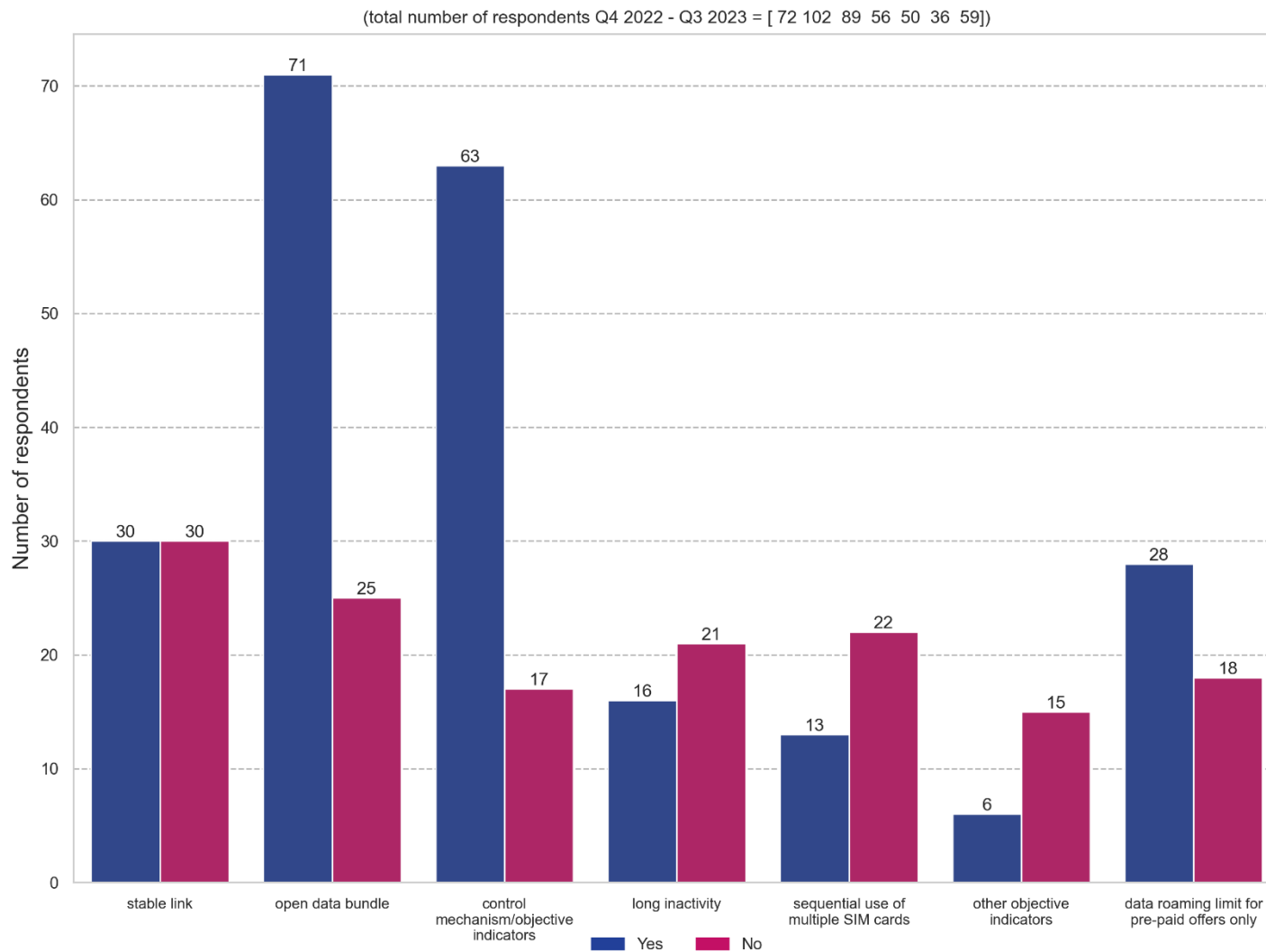


Figure 49 depicts the number of MNOs and MVNOs that levied surcharges for data services when exceeding different types of FUP

### **5.6.3. Information and tools for consumers**

Figure 50: Information provided to subscribers with an open data bundle FUP about roaming limits

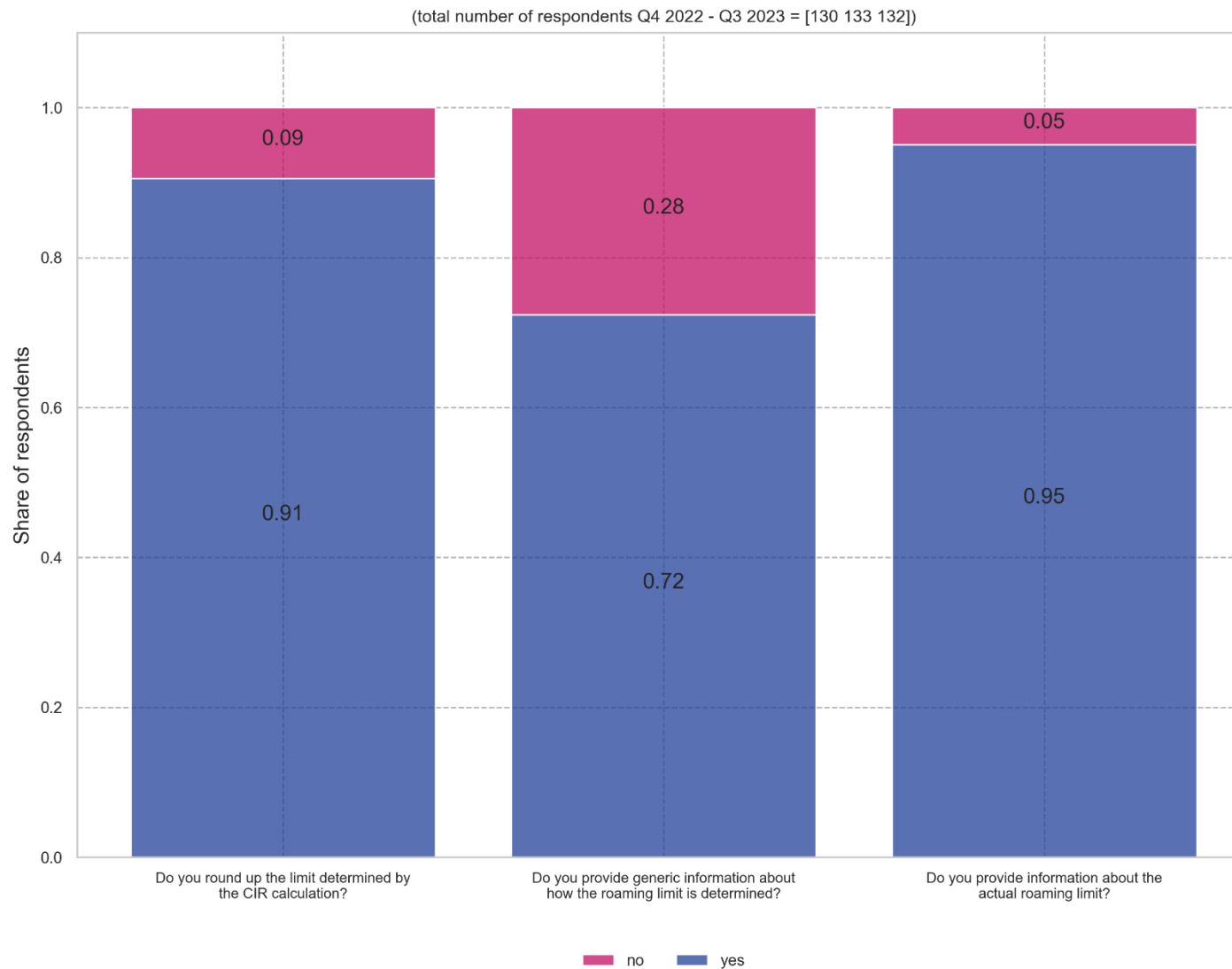


Figure 50 depicts the percentage of MNOs and MVNOs that provide information about how the roaming limit is determined and about the actual roaming limit to subscribers with an open data bundle FUP.



Figure 51: How information about roaming limits is provided to subscribers with an open data bundle FUP

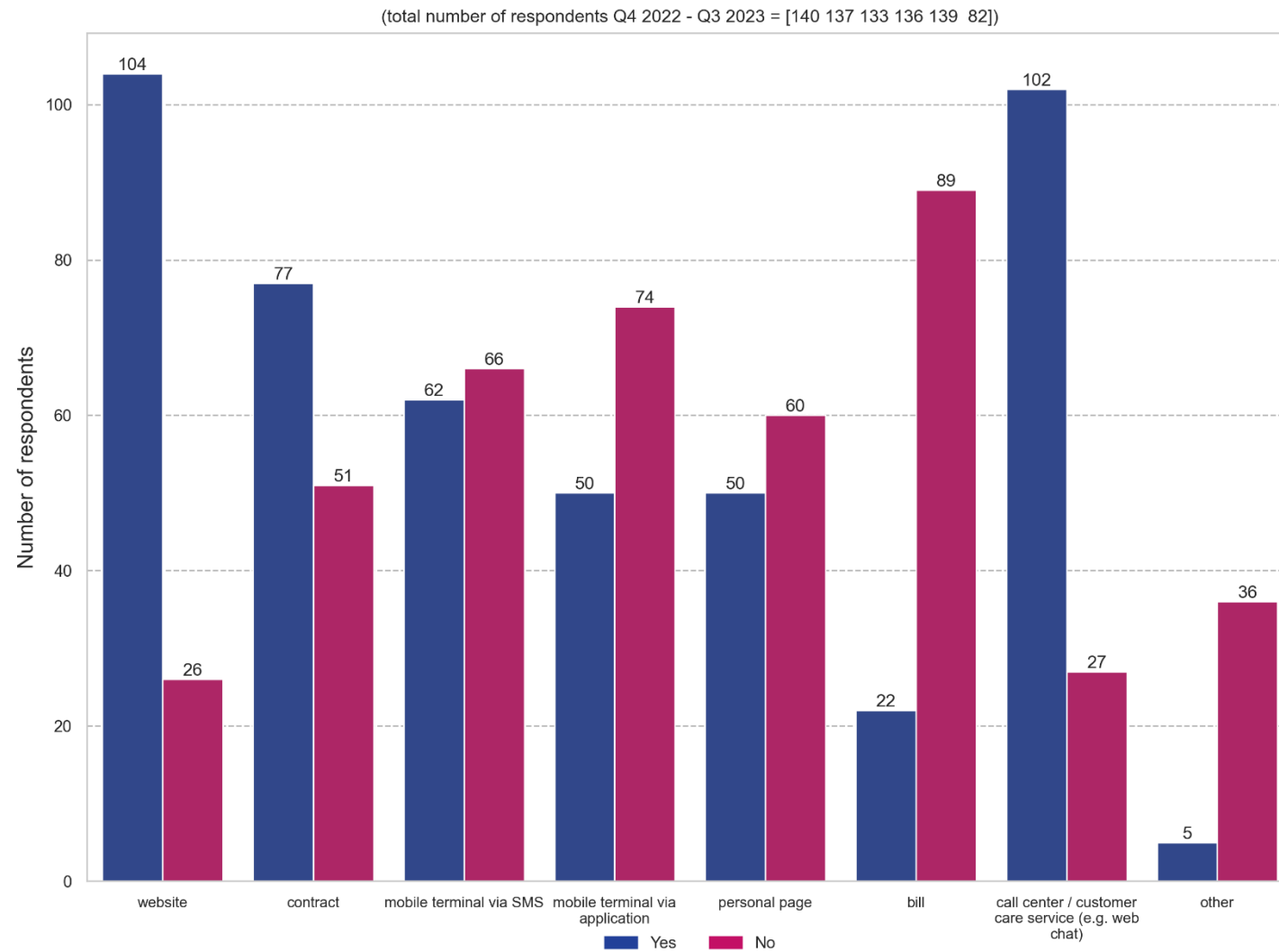


Figure 51 compares how many respondents use different channels to provide information about roaming limits to subscribers with an open data bundle FUP.

Figure 52: Where information about roaming limits is provided on websites

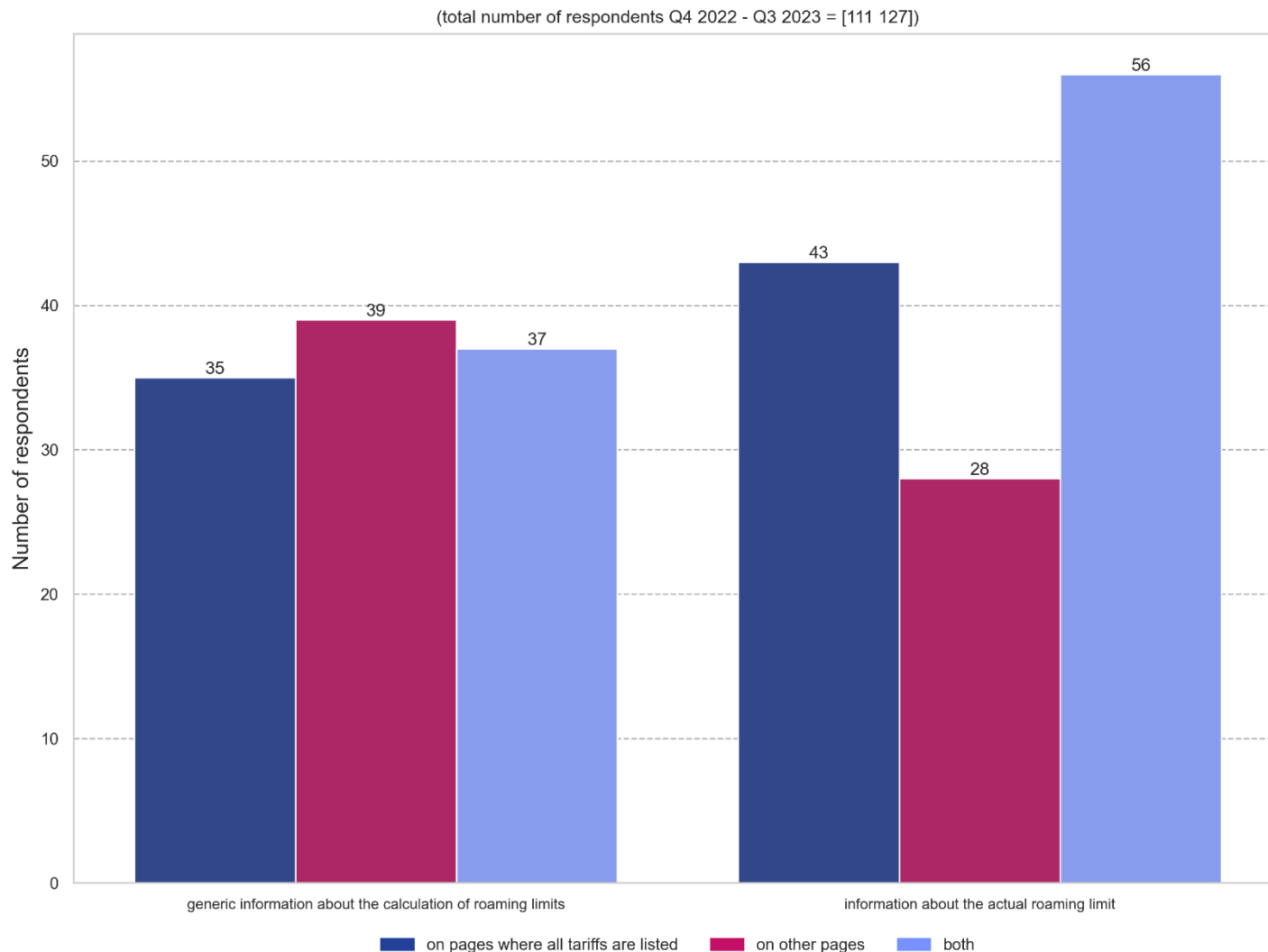


Figure 52 compares the number of respondents that provide information about roaming limits either on dedicated pages where all tariffs are listed or on other pages on their website, or on both types of pages.

#### **5.6.4. Non-EU/EEA destinations**

Figure 53: Inclusion of consumption in non-EU/EEA destinations as part of the RLAH FUP

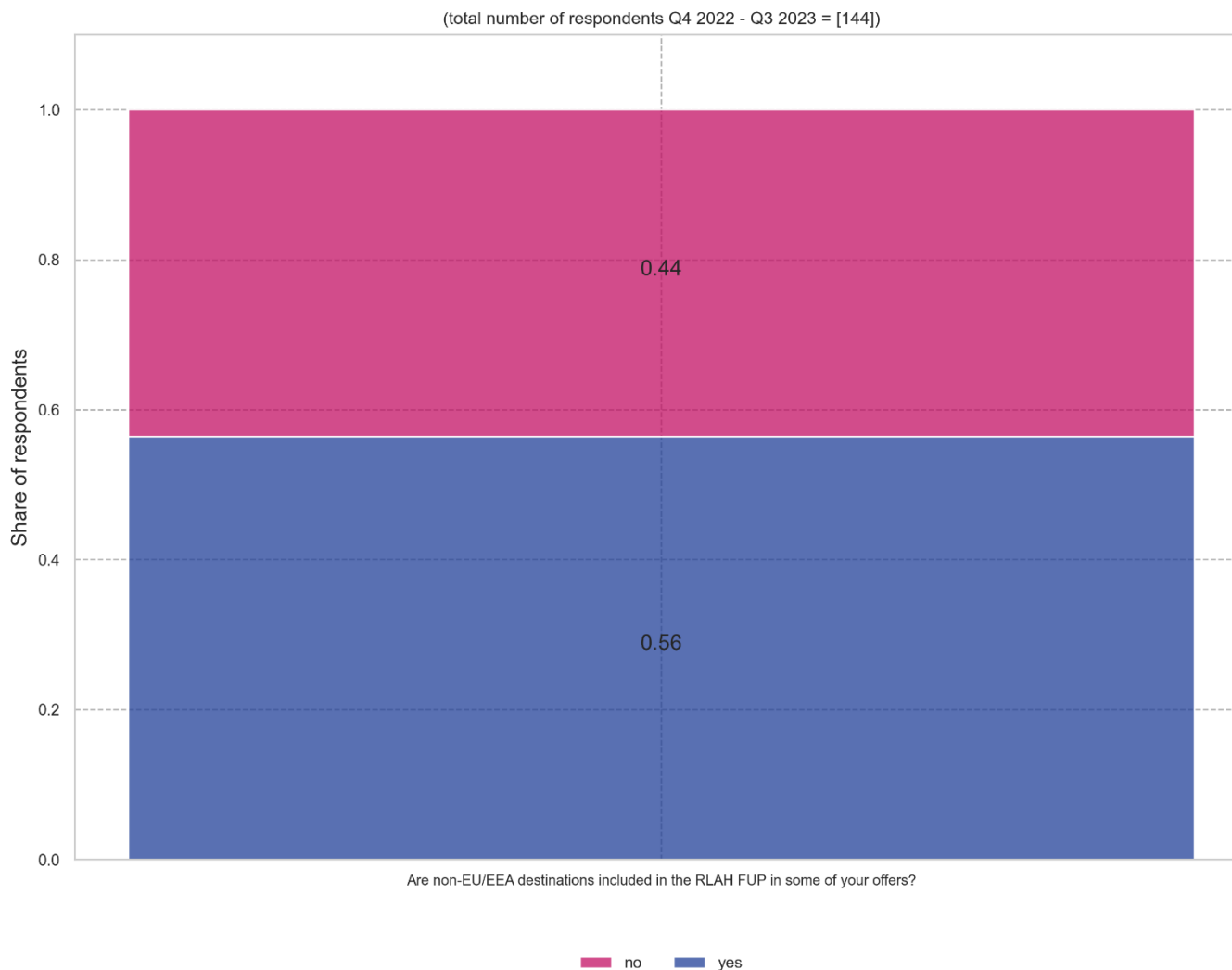


Figure 53 depicts how many respondents include the consumption of subscribers in non-EU/EEA destinations as part of the RLAH FUP in some of their offers. For example, for those providers responding “Yes”, if their subscriber has a FUP for 10 GB and consumes 5GB while roaming outside the EEA, this subscriber only has 5GB left before exhausting their FUP for roaming in the EEA.

### **5.6.5. Alternative tariffs**

Figure 54: Percentage of roaming providers offering alternative tariffs (based on data collected by BEREC for TACR report in 2018 – 2023)

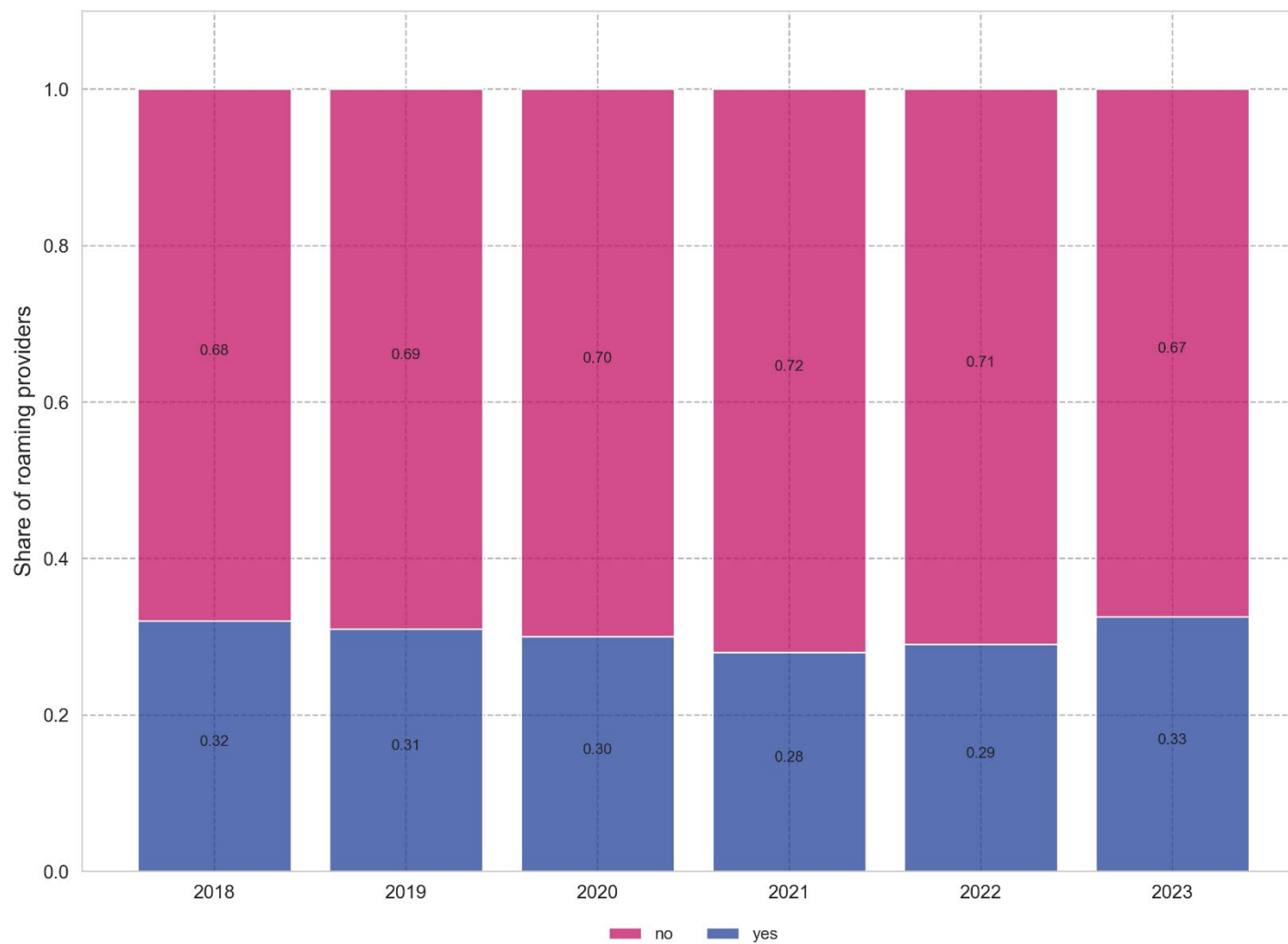


Figure 54 depicts the percentage of respondents offering alternative tariffs between 2018 and 2023.

Figure 55: Types of roaming packages (daily/weekly/monthly/other) offered by respondents (based on data collected by BEREC for TACR report in 2018 – 2023)

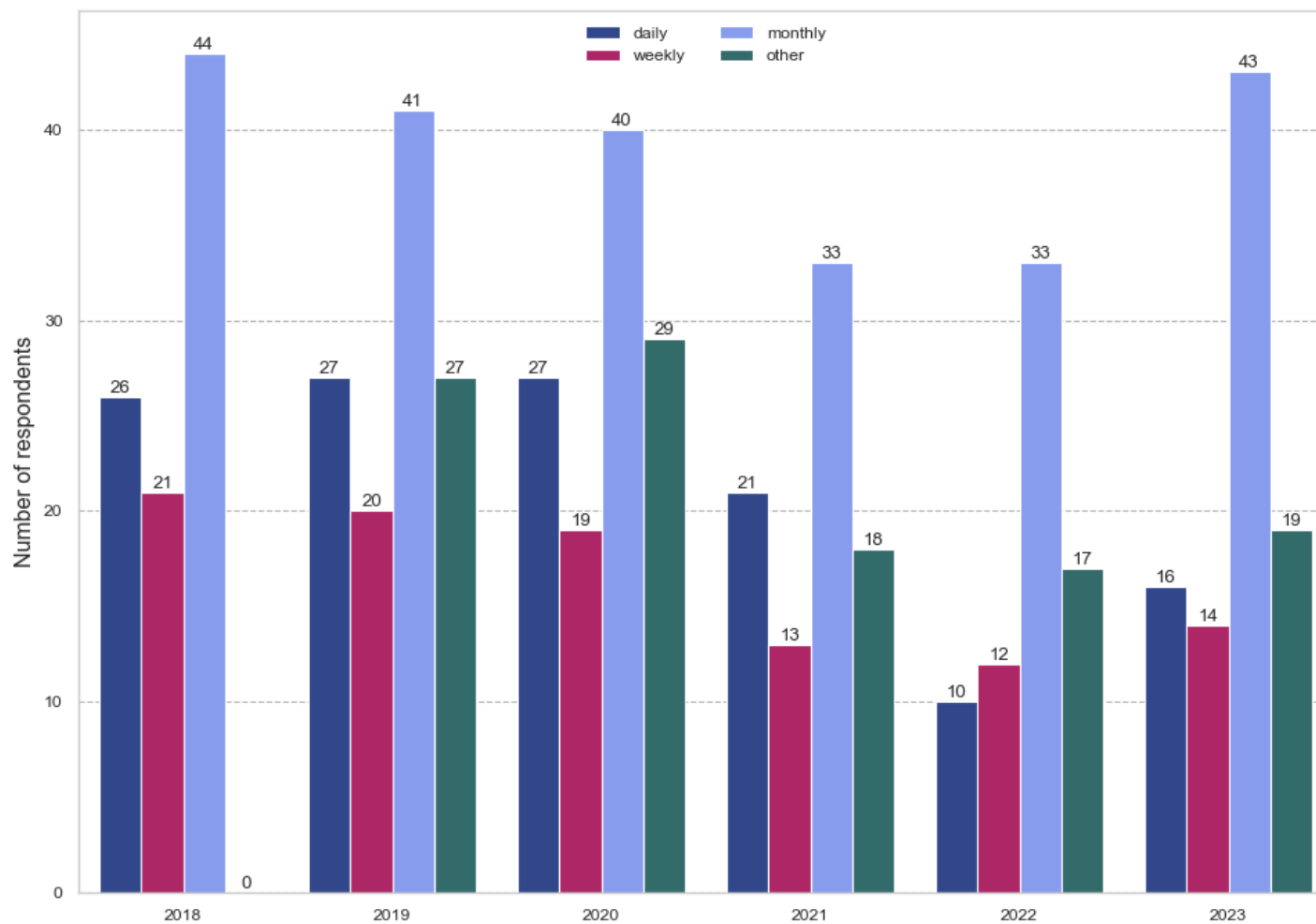


Figure 55 depicts the number of respondents offering daily, weekly, monthly or other types of roaming packages between 2018 and 2023.

Figure 56: Number of roaming providers that inform end users with alternative tariffs about the different issues

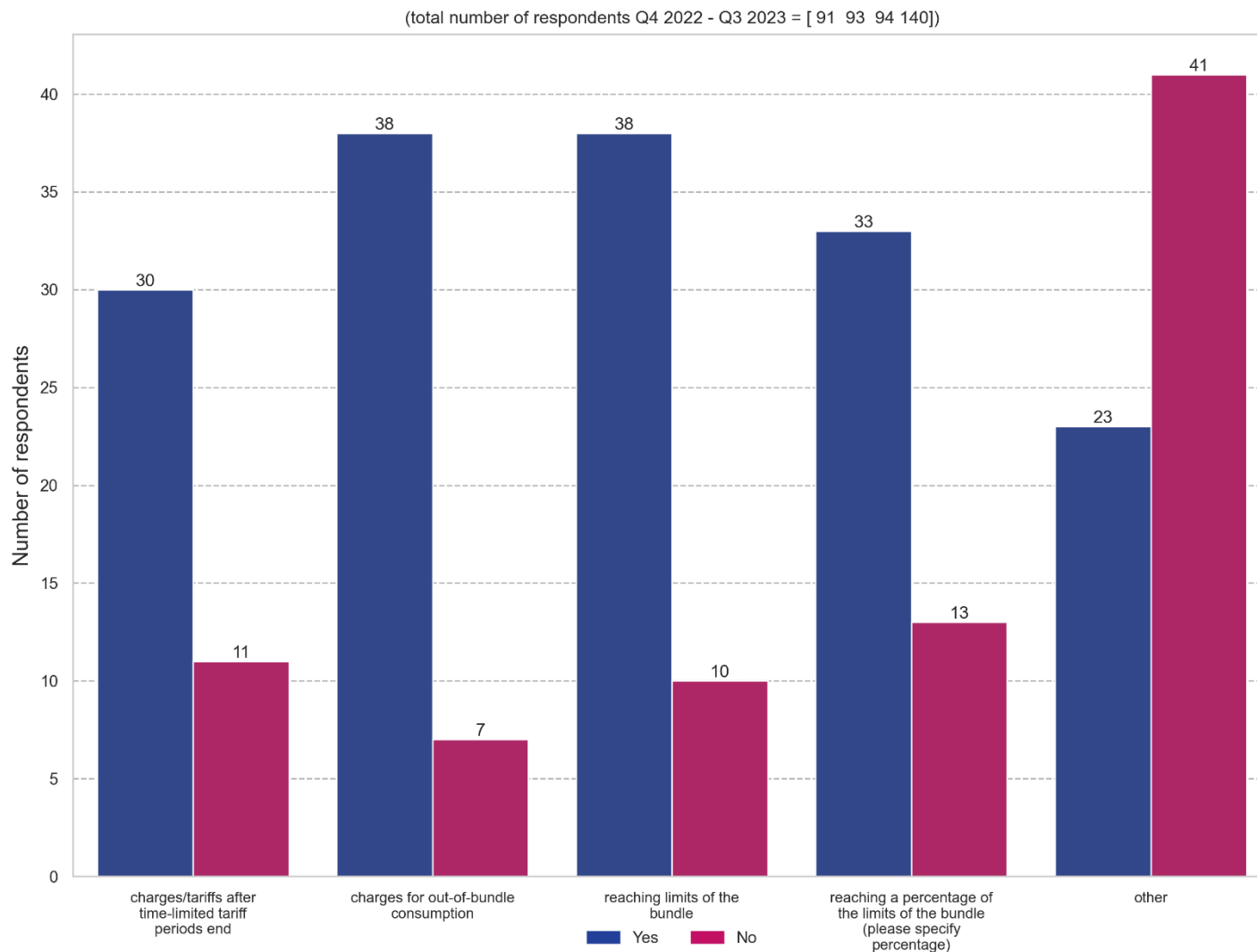


Figure 56 depicts the number of respondents that inform end users with alternative tariffs about charges, reaching limits, and other issues related to roaming.



Figure 57: Surcharges for alternative tariffs in EEA vs. non-EEA destinations

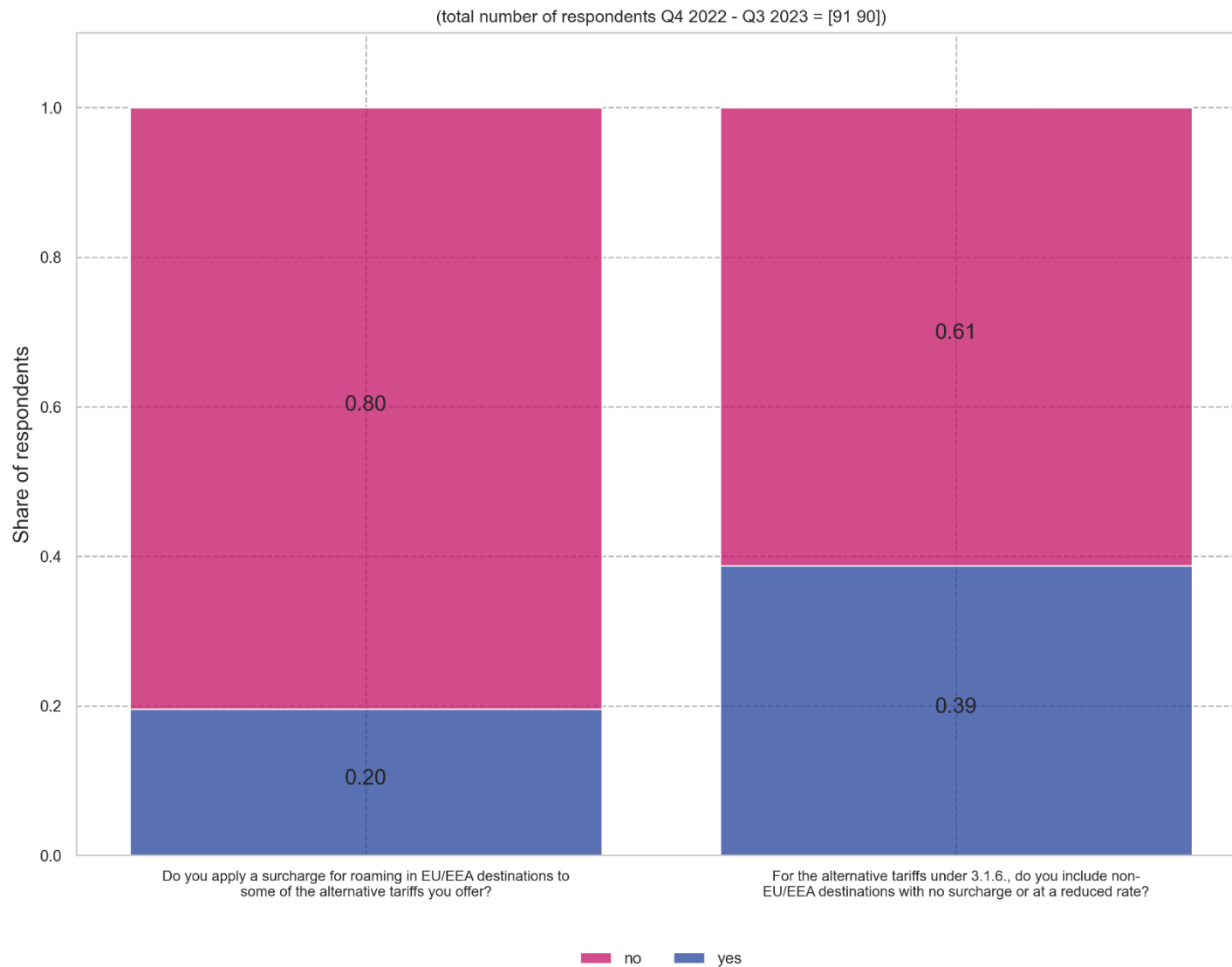


Figure 57 depicts the percentage of respondents that apply surcharges for alternative tariffs in EEA vs. non-EEA destinations.

### **5.6.6. Information provided**

Figure 58: Number of operators that provide information about alternative tariffs/switching between tariffs through different channels

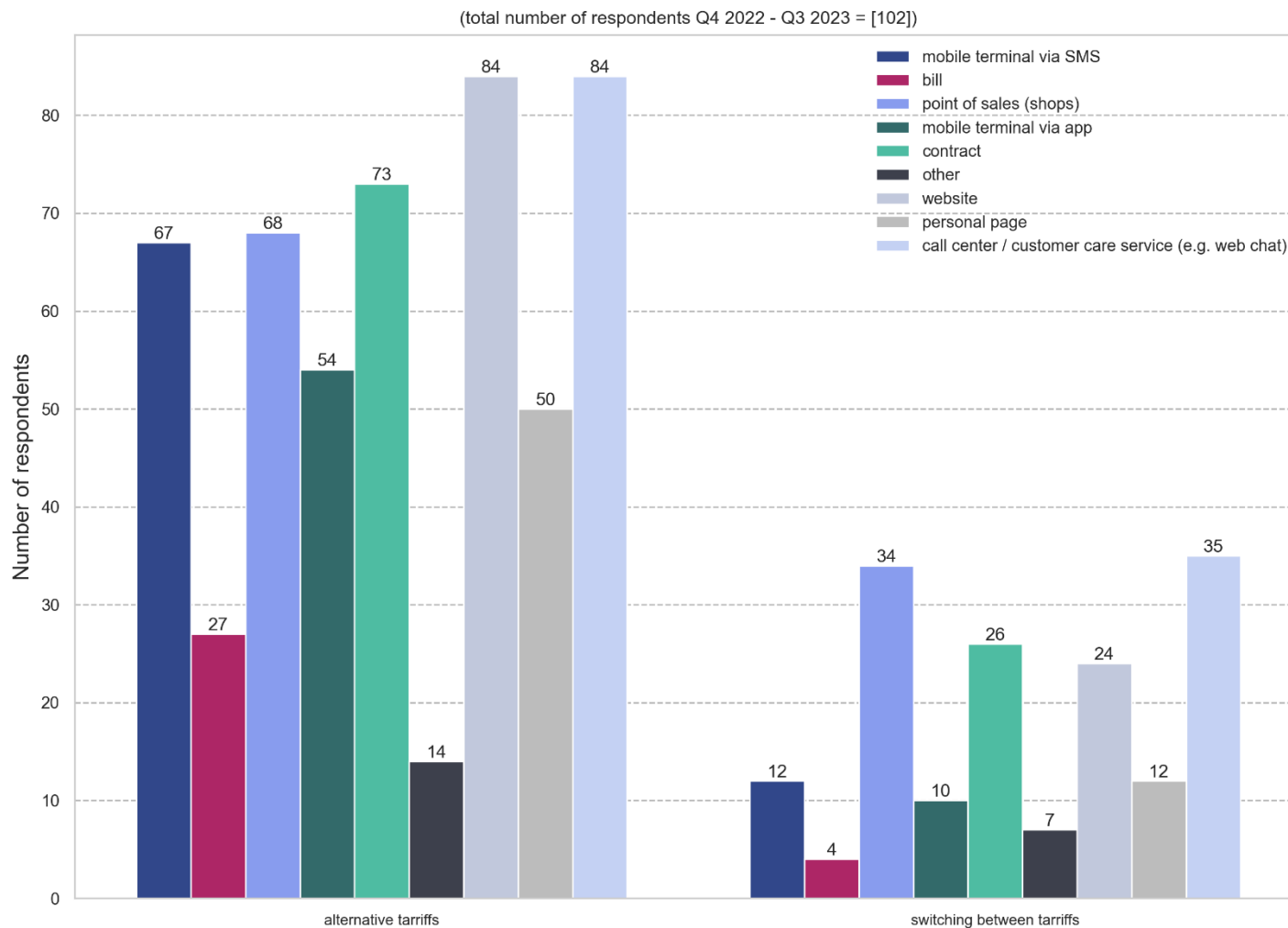


Figure 58 depicts the number of roaming providers (MNOs and MVNOs) that provide information about alternative tariffs/switching between tariffs through different channels.

Figure 59: Number of operators that provide different types of QoS information on a per-network basis

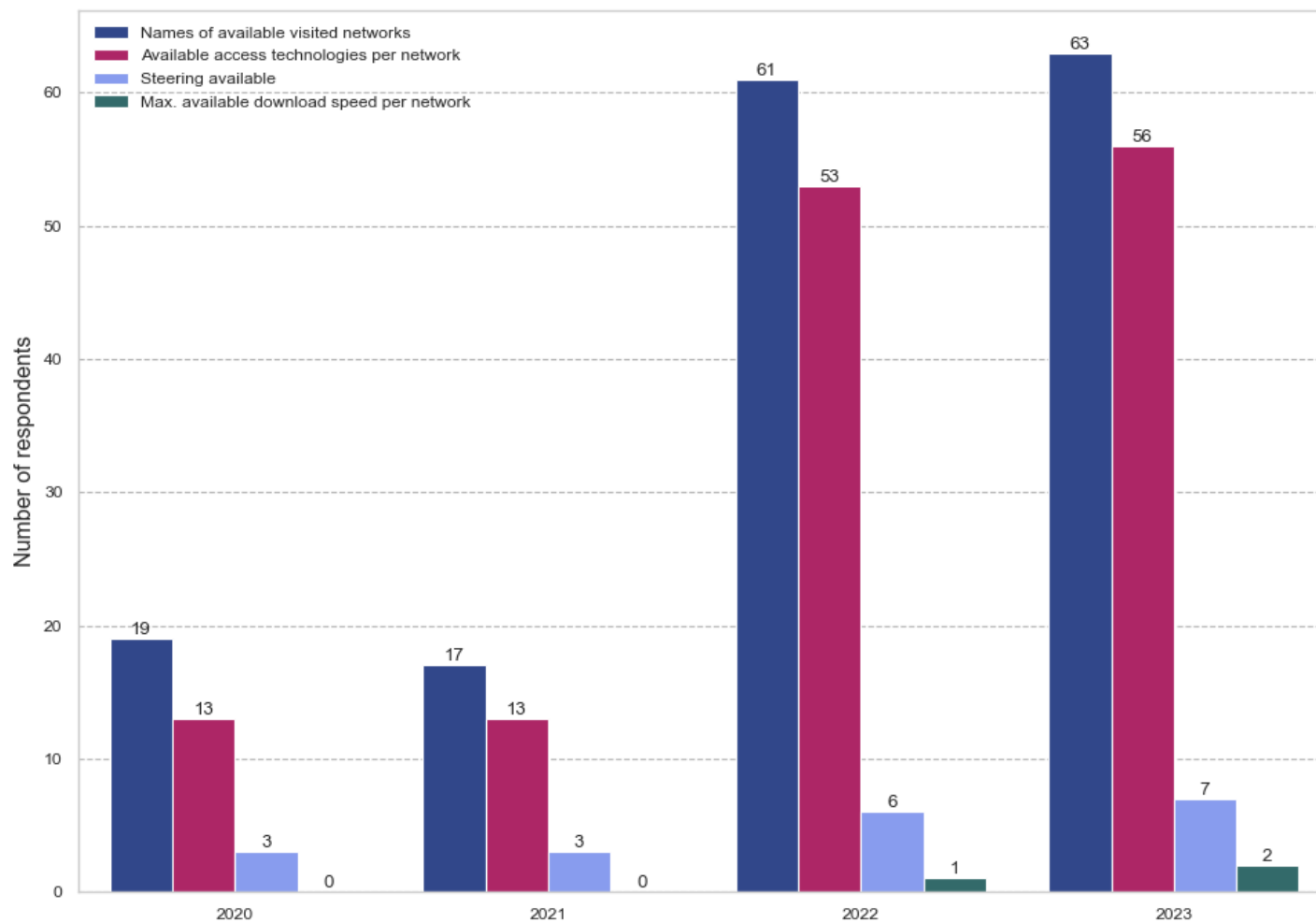


Figure 59 depicts the number of roaming providers (MNOs and MVNOs) that provide QoS-related information within the roaming context on a per-network basis over the period between 2020 and 2023. This includes information on the names of available visited networks, on the available access technologies per network, on the availability of steering and on the maximum available download speed per network.

Figure 60: Type of information provided on VAS charges in a roaming context

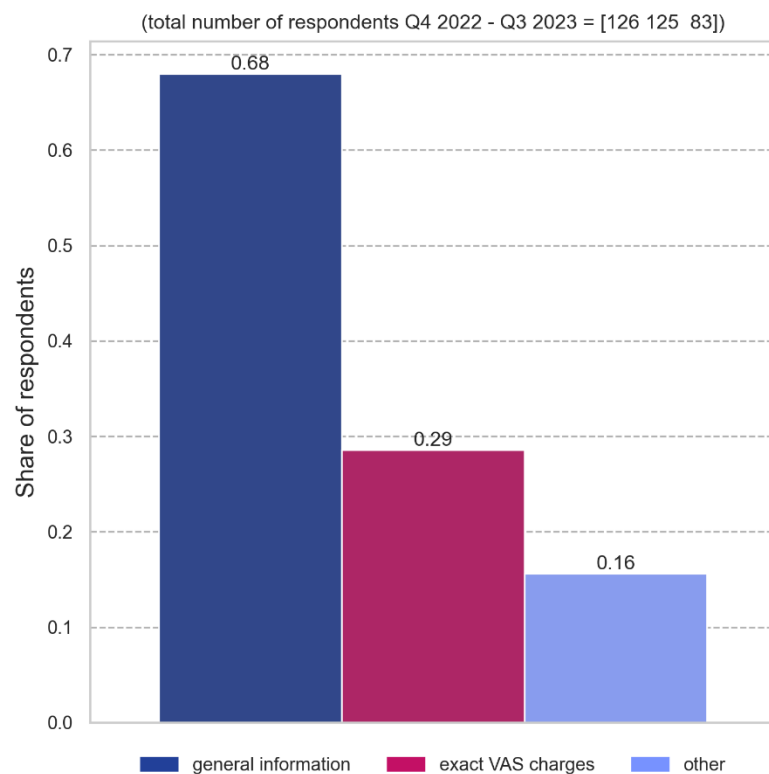
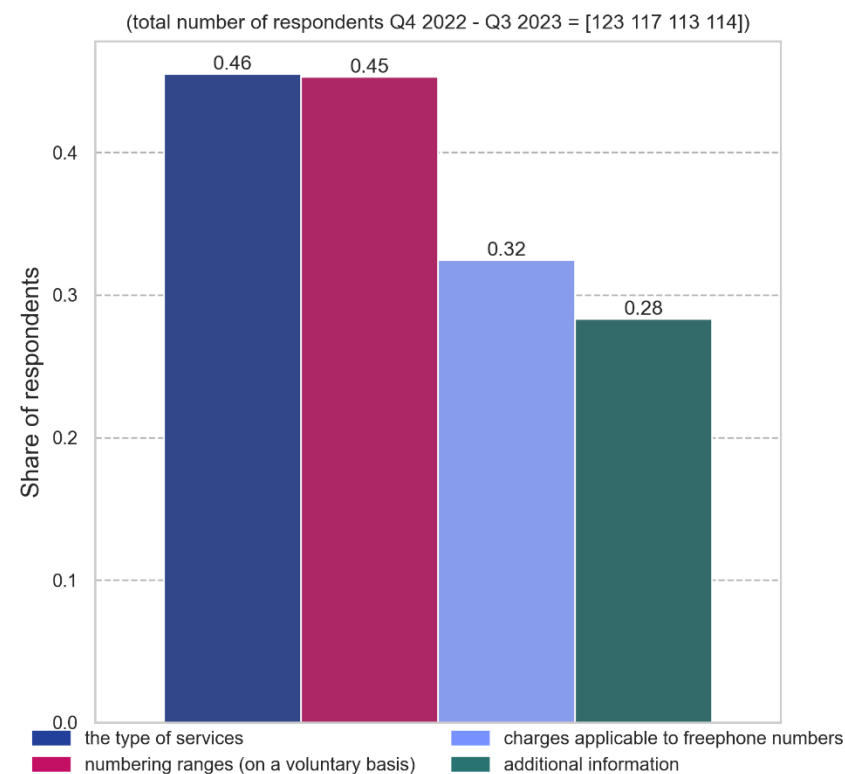


Figure 61: Type of information not related to charges provided on VAS while roaming



Figures 60 and 61 represent the share of roaming providers (MNOs and MVNOs) that provide different types of information on VAS in a roaming context. This includes the types of information provided on charges (Figure 60) and information on the type of services, the numbering ranges, the charges applicable to freephone information and additional information (Figure 61). Shares do not add up to 1 because several answers were possible.

### **5.6.7. Cut-off limits**

Figure 62: Types of cut-off limits offered by roaming providers

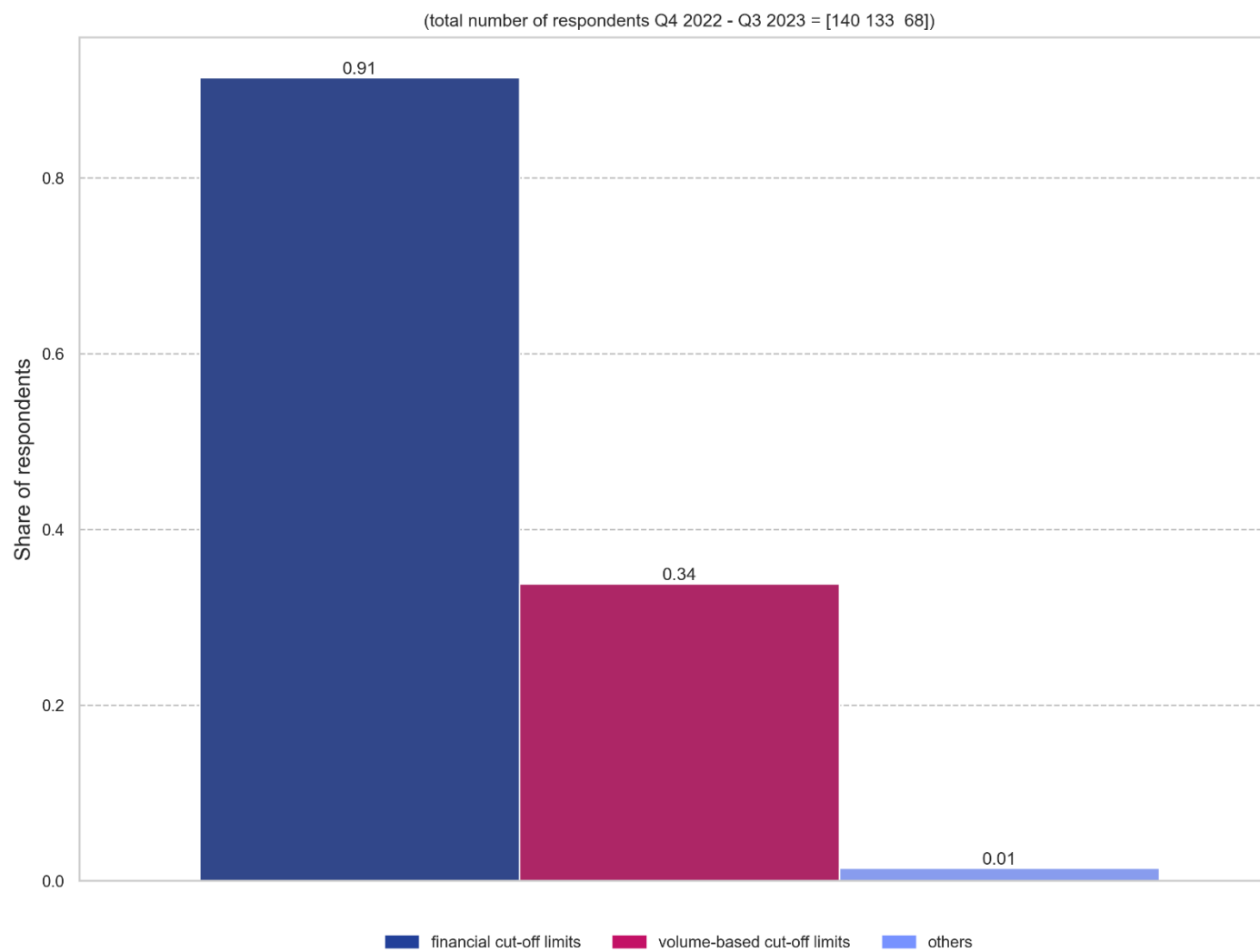


Figure 62 depicts the share of roaming providers (MNOs and MVNOs) that offer financial cut-off limits, volume-based cut-off limits or other cut-off limits.

Figure 63: Share of roaming providers which provide different types of information on cut-off limits

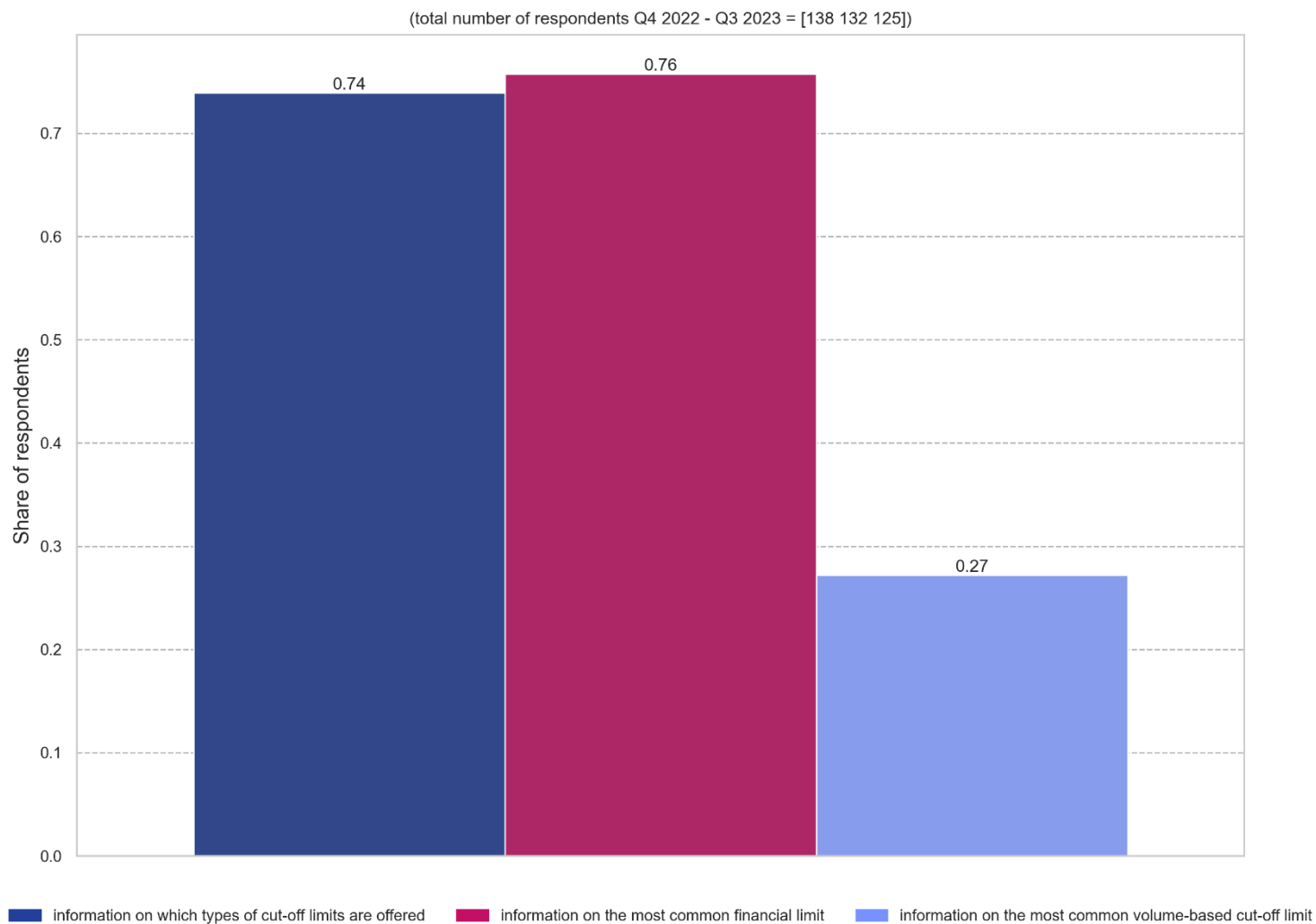


Figure 63 depicts the share of roaming providers (MNOs and MVNOs) that provide information on the types of cut-off limits they offer, on the most common financial limit or on the most common volume-based limit.



Figure 64: Structure of cut-off limits

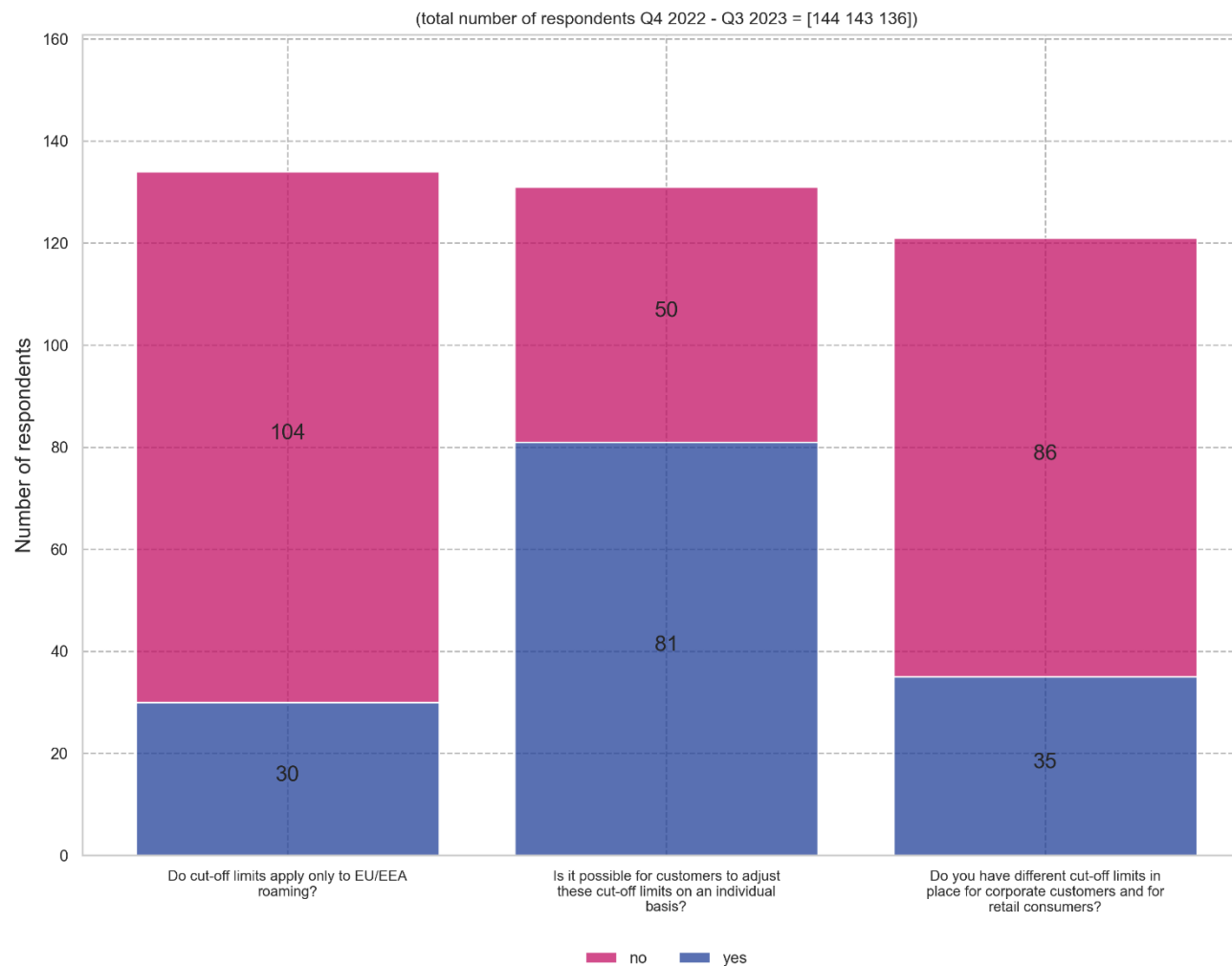


Figure 64 depicts the number of roaming providers (MNOs and MVNOs) that offer cut-off limits, the number of respondents allowing their subscribers to adjust these cut-off limits individually and the number of respondents which have different cut-off limits for corporate customers and retail consumers.

Figure 65: Charges for roaming in non-terrestrial networks included in the financial limits

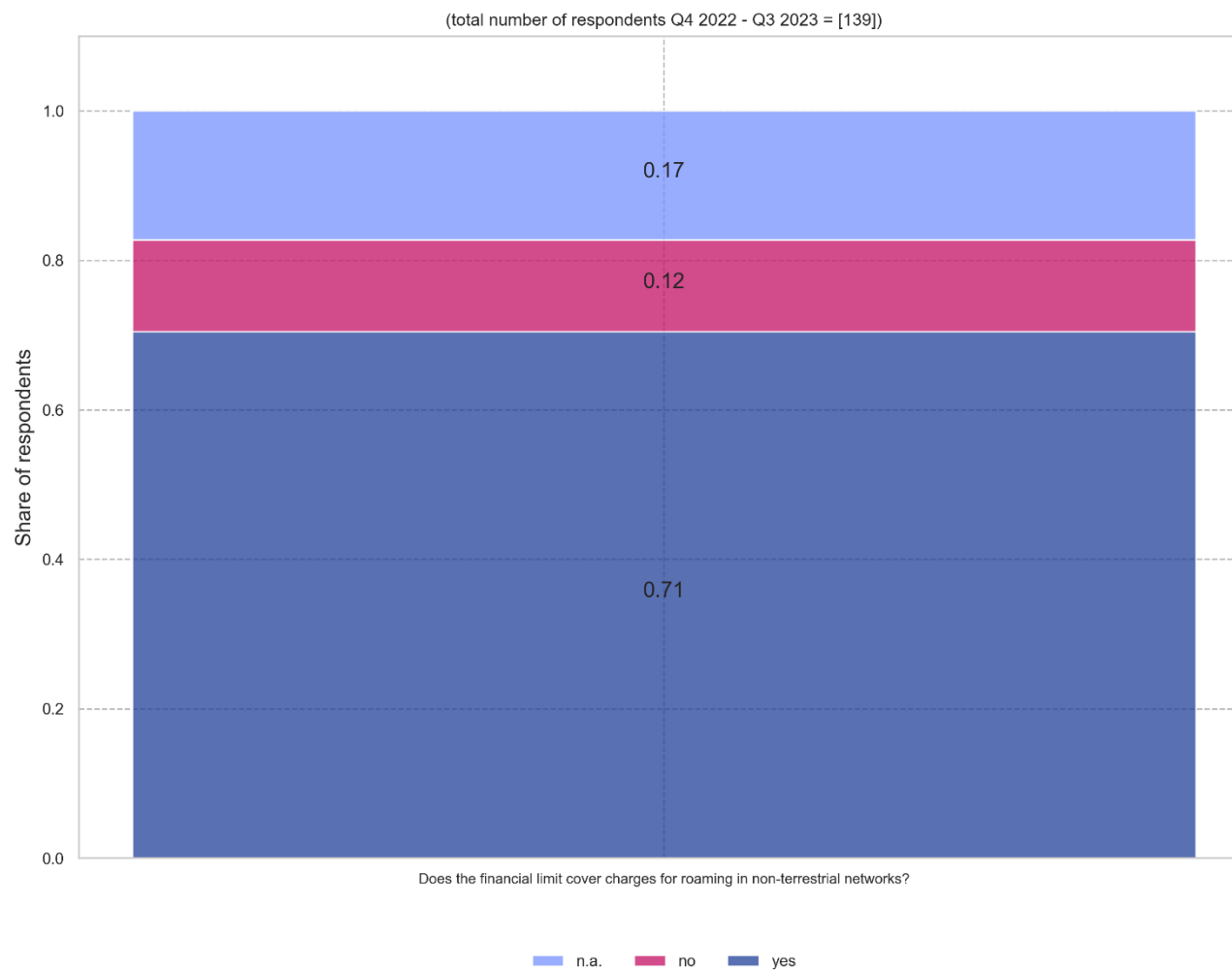


Figure 65 depicts the share of roaming providers (MNOs and MVNOs) that include charges for roaming in non-terrestrial networks in the financial limits for roaming.

#### **5.6.8. Non-EU/EEA destinations, inadvertent roaming and non-terrestrial networks**

Figure 66: Non-EU/EEA destinations, inadvertent roaming and non-terrestrial networks

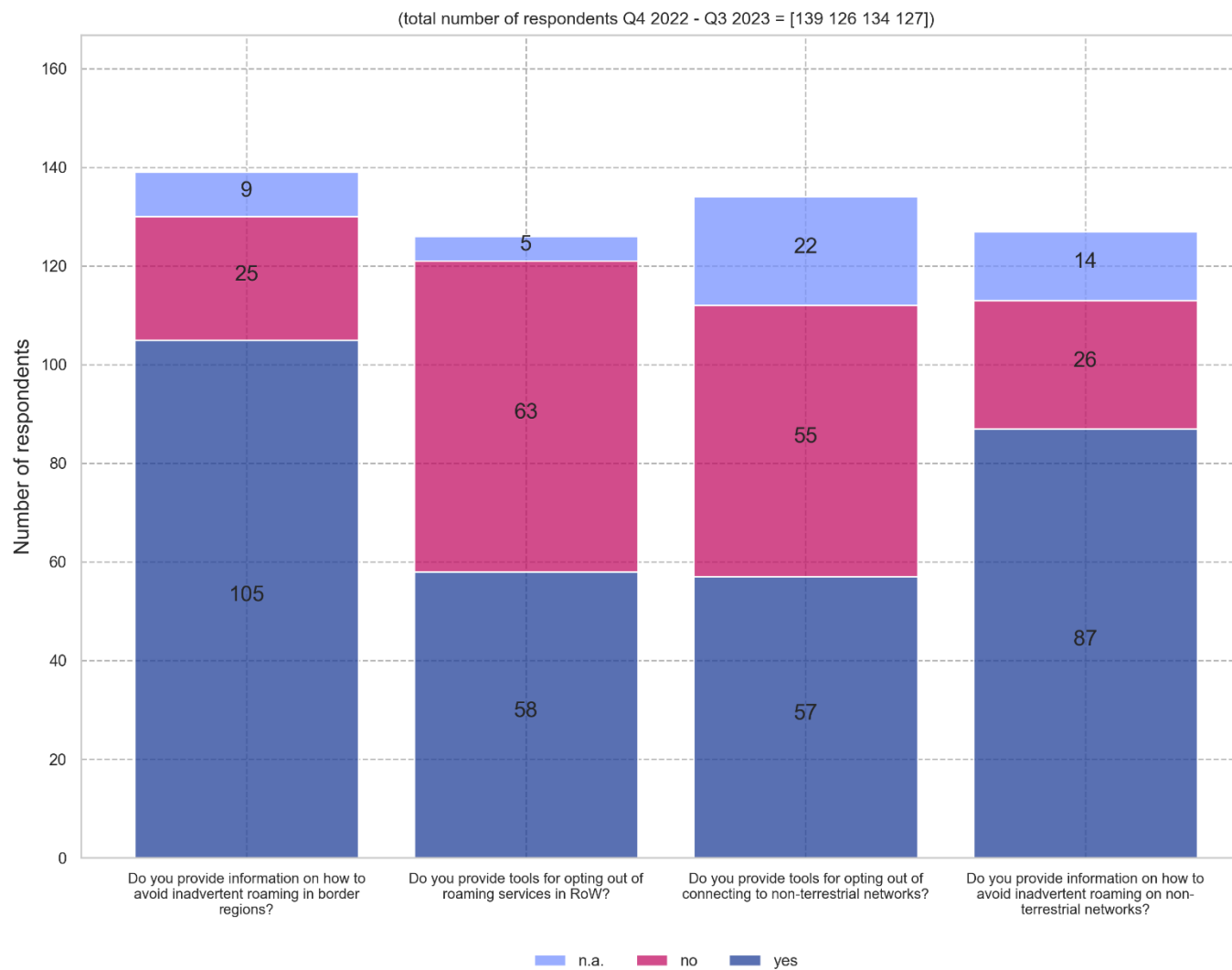


Figure 66 depicts the number of roaming providers (MNOs and MVNOs) that provide information and tools to help customers avoid inadvertent roaming outside EU/EEA and via non-terrestrial networks

Figure 67: Measures implemented to protect consumers from paying for inadvertent roaming in the EU/EEA

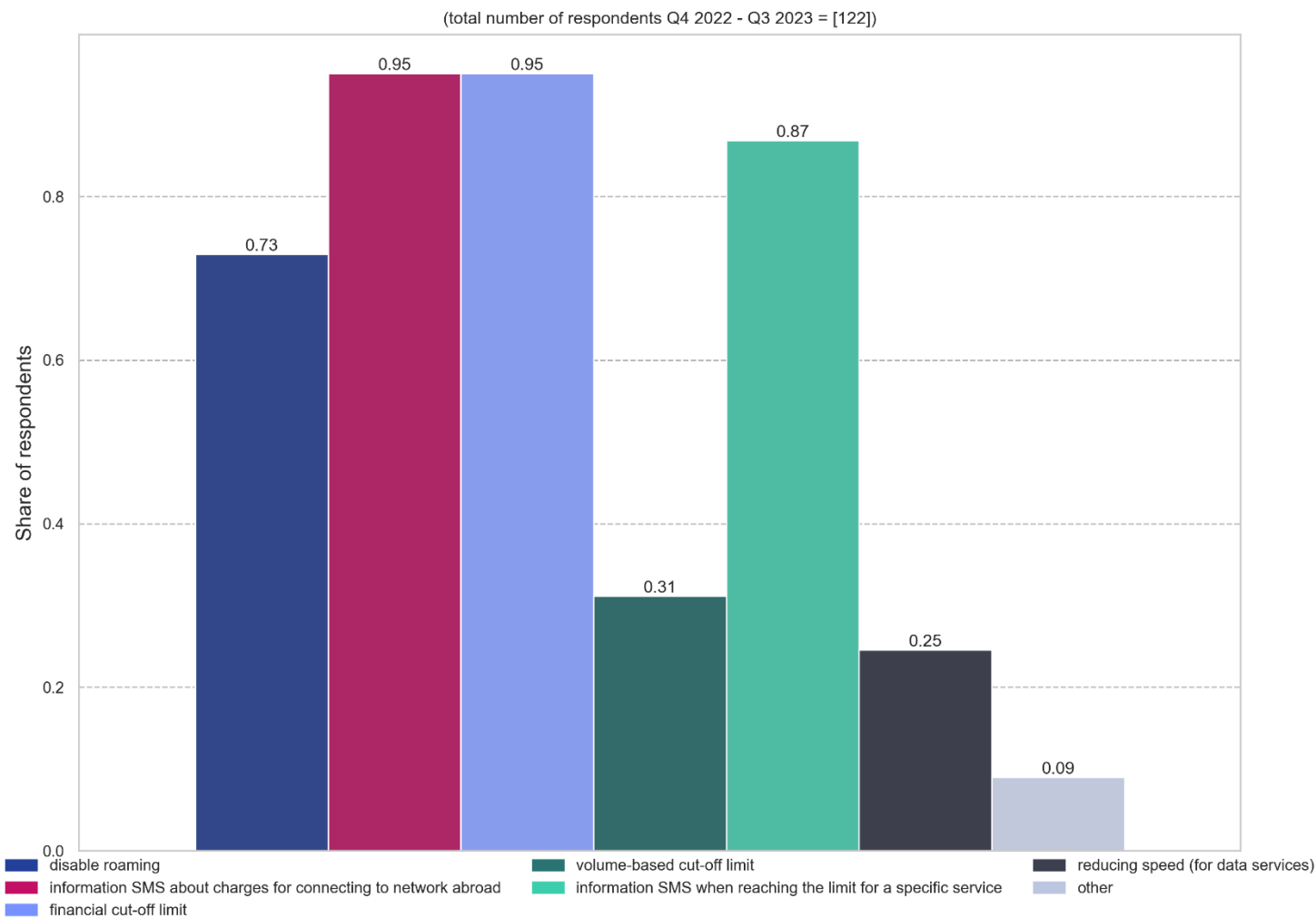


Figure 67 depicts the share of roaming providers (MNOs and MVNOs) that have implemented different types of measures to protect consumers from paying for inadvertent roaming in the EU/EEA. These measures include information SMS about charges or limits, volume-based or financial cut-off limits, the possibility to disable roaming, reduced speed for data services and other measures.

### **5.6.9. Welcome SMS**

Figure 68: Share of providers offering different types of information in the EU/EEA Welcome SMS

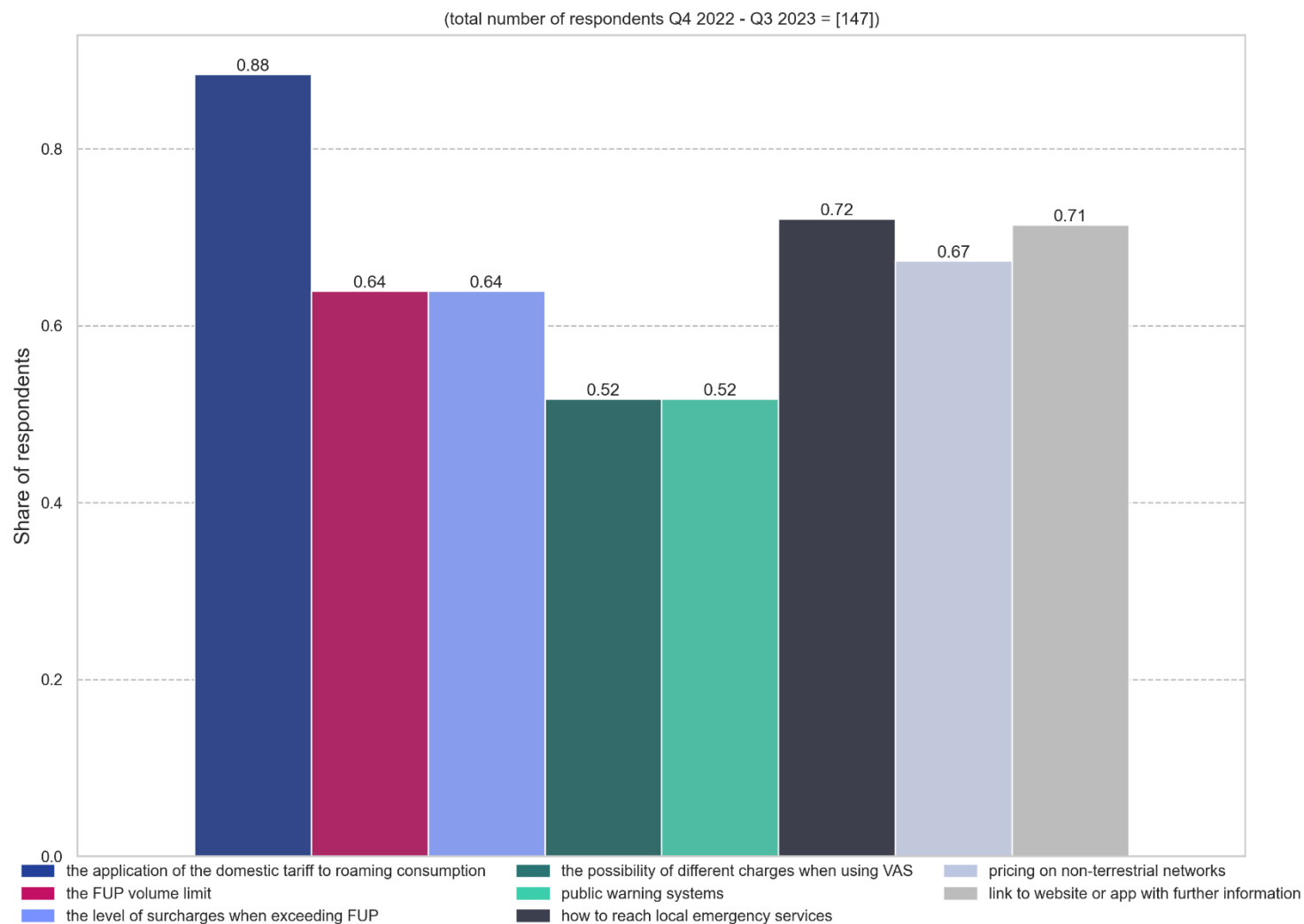


Figure 68 depicts the percentage of roaming providers (MNOs and MVNOs) offering different types of information in the EU/EEA Welcome SMS, e.g. related to charges or accessing emergency services.

Figure 69: Share of providers offering different types of information in the RoW Welcome SMS

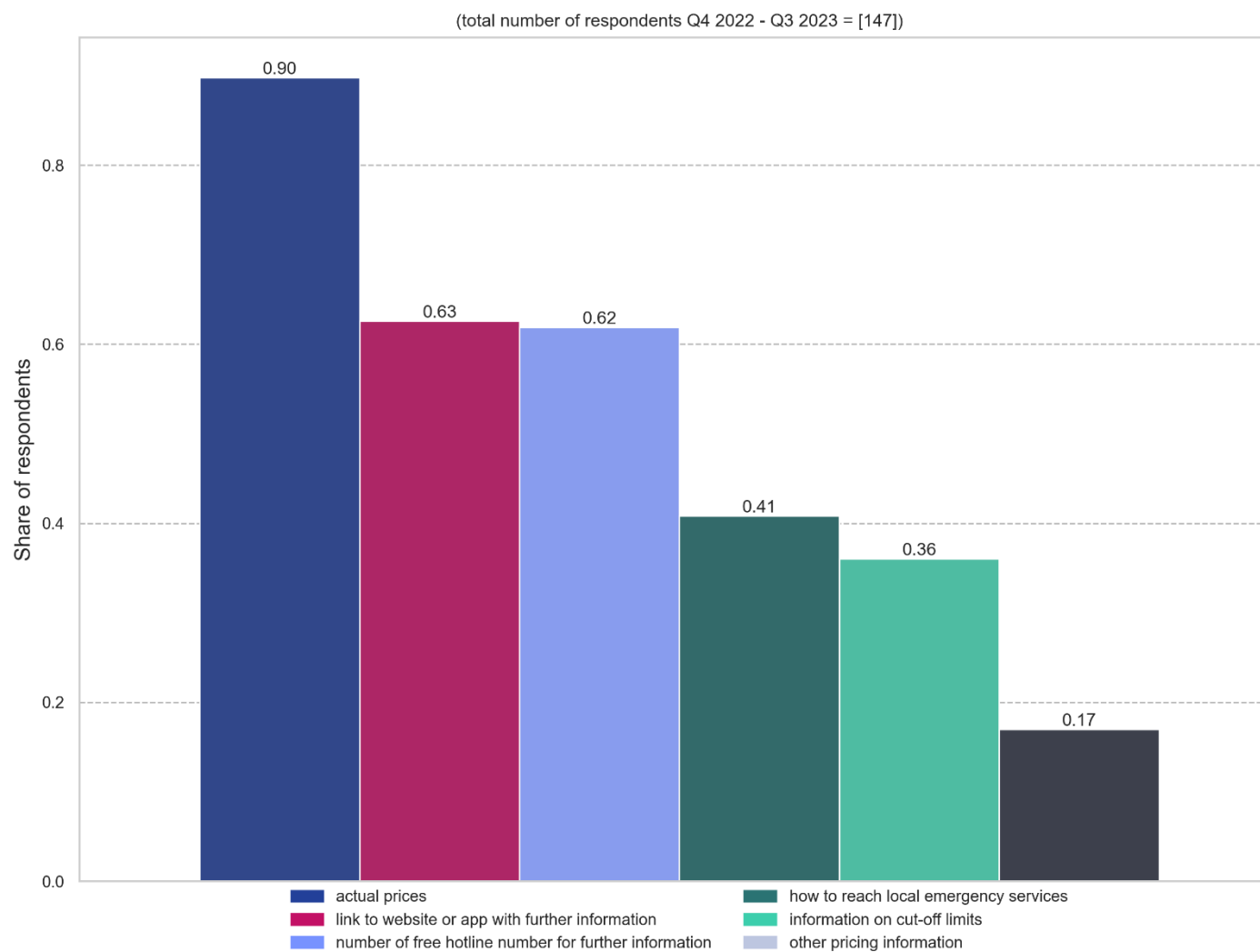


Figure 69 depicts the percentage of roaming providers (MNOs and MVNOs) offering different types of information in the RoW Welcome SMS, e.g. related to charges, the possibility to obtain further information, or emergency services.



**5.6.10. Transparency of wholesale offers regarding QoS**

Figure 70: Problems of access seekers with gaining access to network technologies for roaming offers

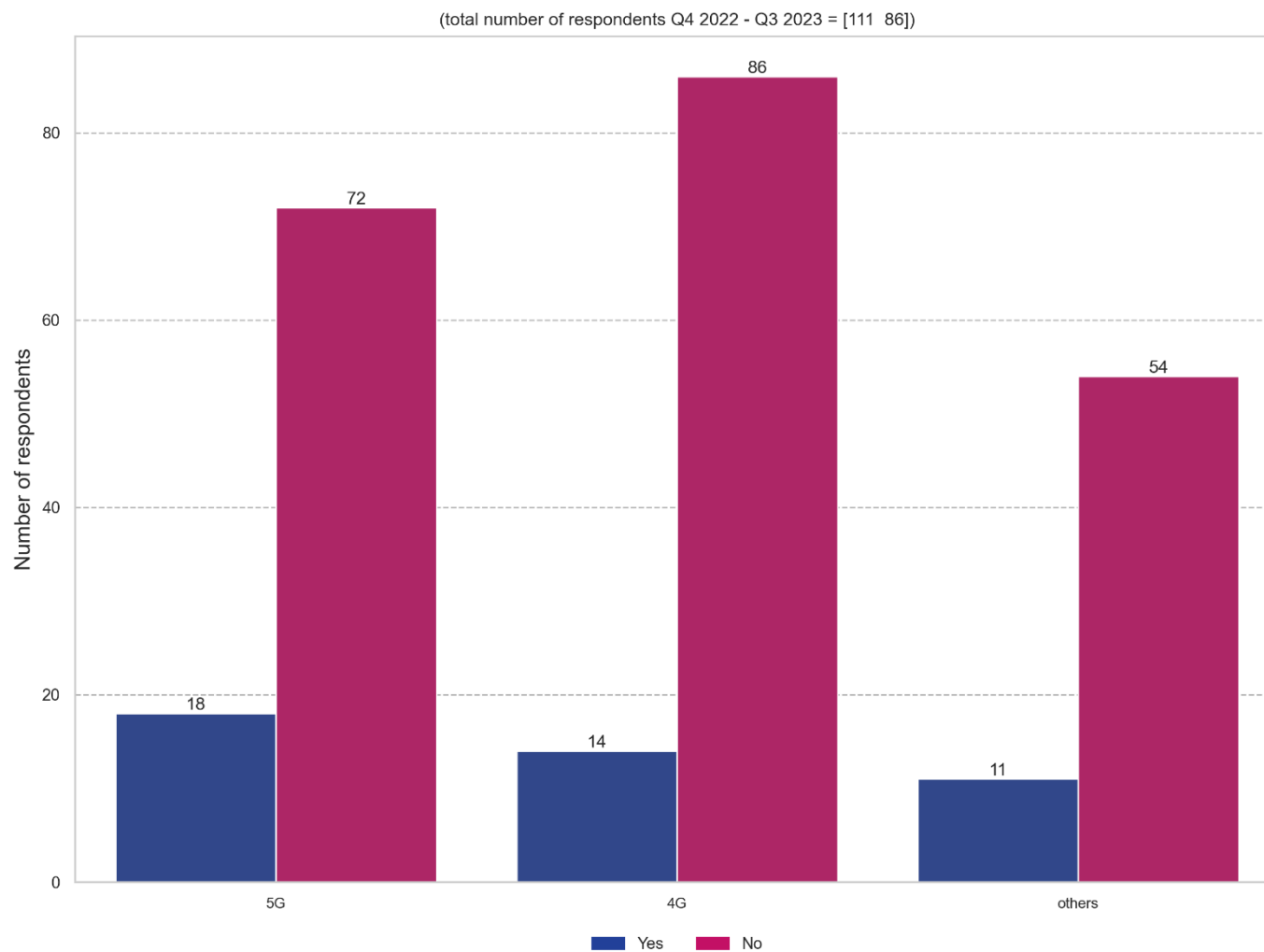


Figure 70 depicts the number of roaming providers (MNOs and MVNOs) that have encountered problems with gaining access to different network technologies (5G, 4G or others) for roaming offers.

Figure 71: Implementation problems of access seekers with network technologies for roaming offers

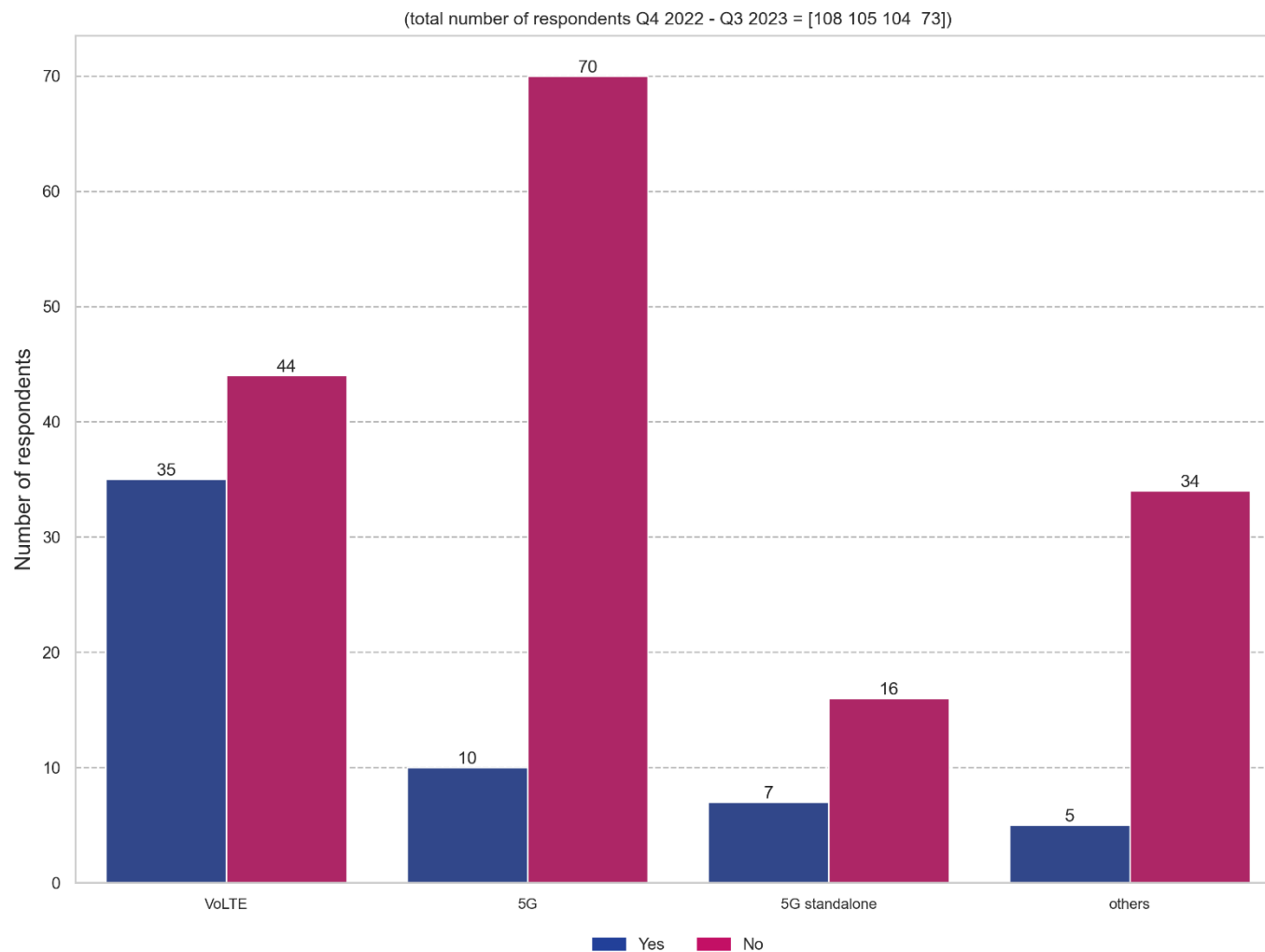


Figure 71 depicts the number of roaming providers (MNOs and MVNOs) that have encountered implementation problems with VoLTE, 5G, 5G standalone, and other network technologies.

Figure 72: Number of respondents with a certain percentage of EU/EEA outbound roaming agreements including operational VoLTE or VoNR services

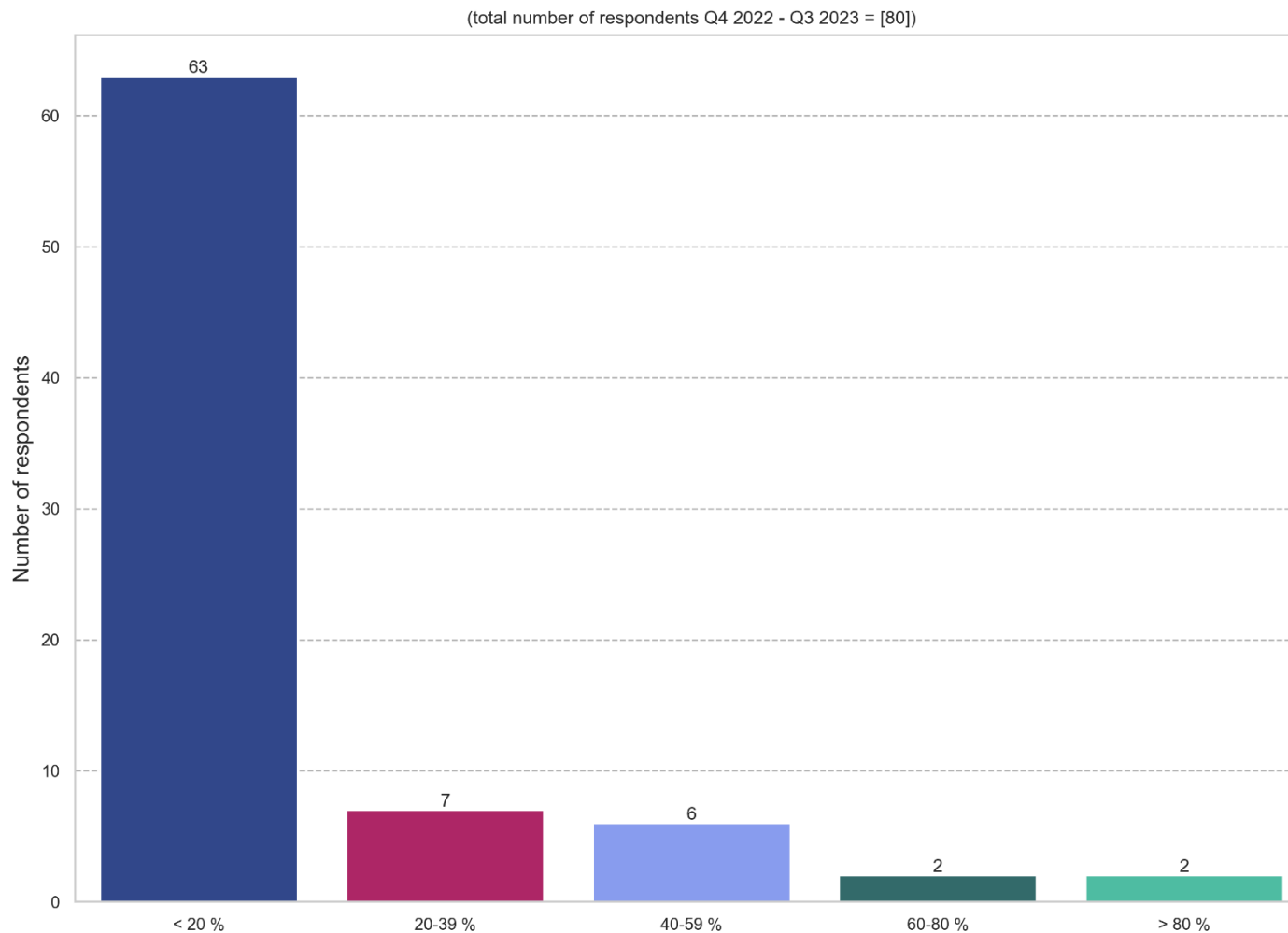


Figure 72 depicts the number of roaming providers (MNOs and MVNOs) whose outbound roaming agreements include operational VoLTE and VoNR services up to a certain threshold (< 20%, 20-39%, 40-59%, 60-80%, > 80%).

**5.6.11. Agreements on pricing**

Figure 73: Agreements on technology and pricing (total number of respondents Q4 2021 – Q3 2022 = a) 90, b) 97)

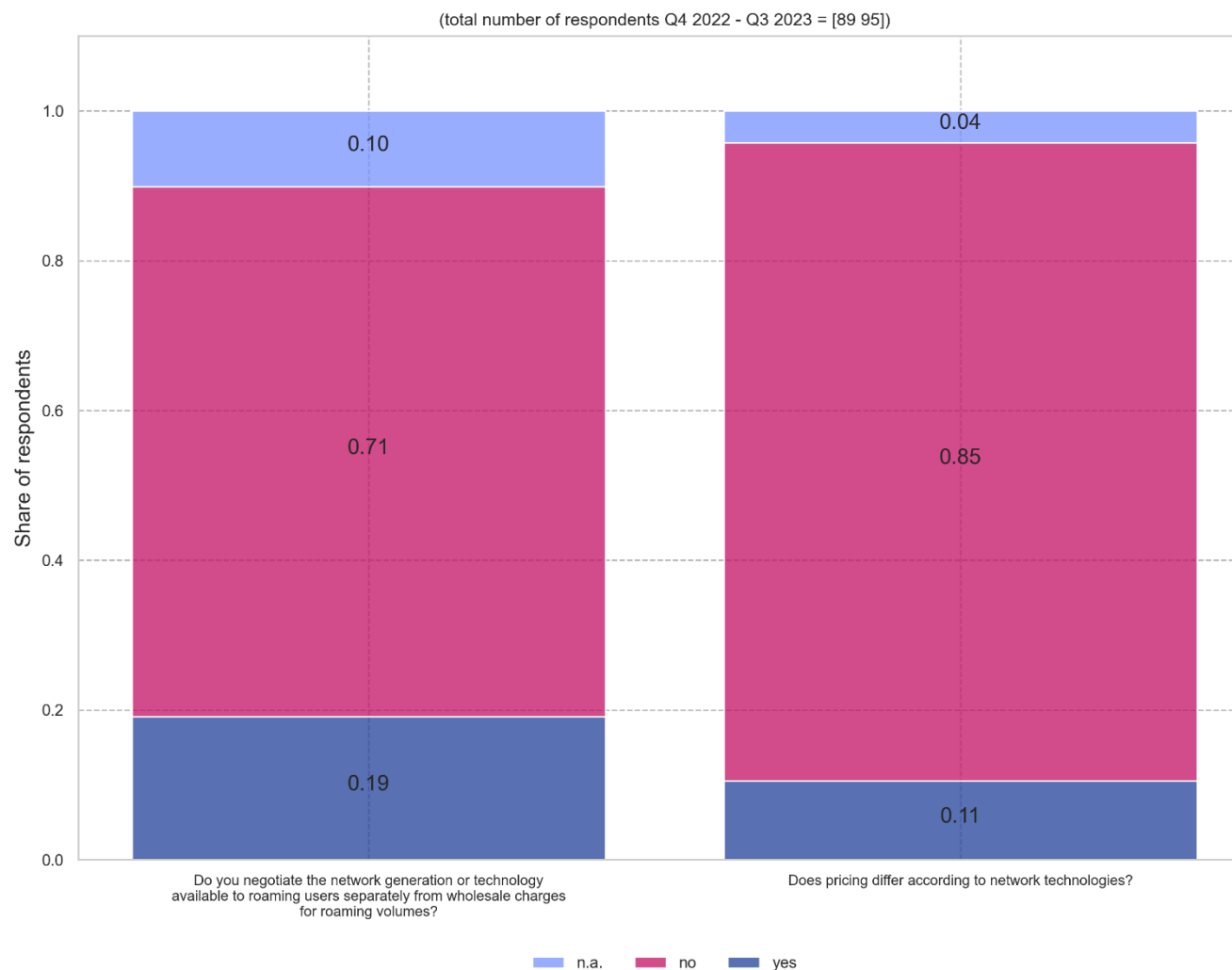


Figure 73 depicts the percentage of roaming providers (MNOs and MVNOs) that negotiate the network generation and technology agreements separately from wholesale charges agreement for roaming volumes. It also represents the percentage of operators that indicate differences in pricing according to the network technology.

Figure 74: Mechanisms used for reaching agreements on roaming prices

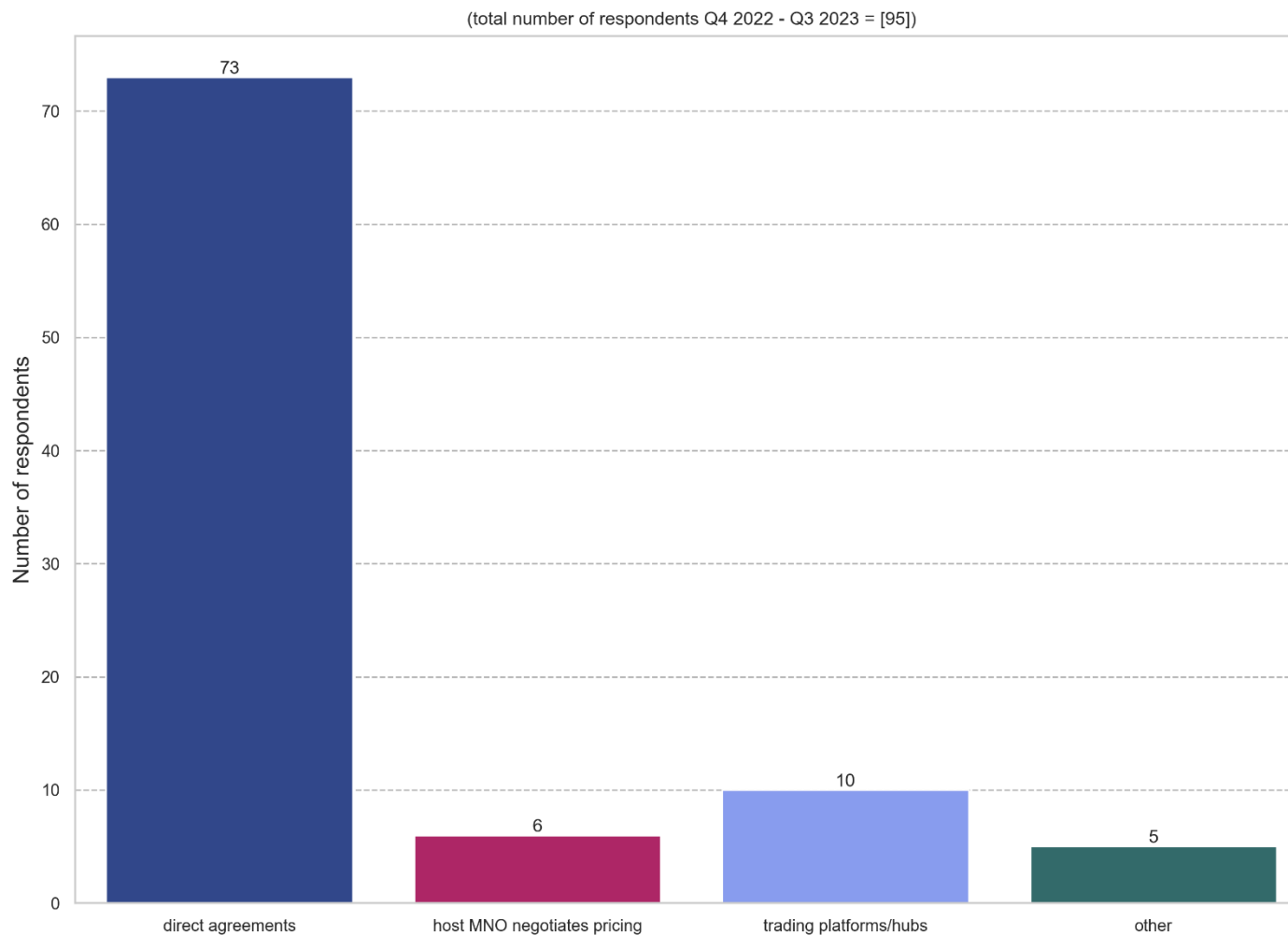


Figure 74 depicts the number of roaming providers (MNOs and MVNOs) that use direct agreements, trading platforms/hubs or other mechanisms, or rely on their host MNO to reach agreements on roaming prices.

Figure 75: Other pricing schemes used by respondents

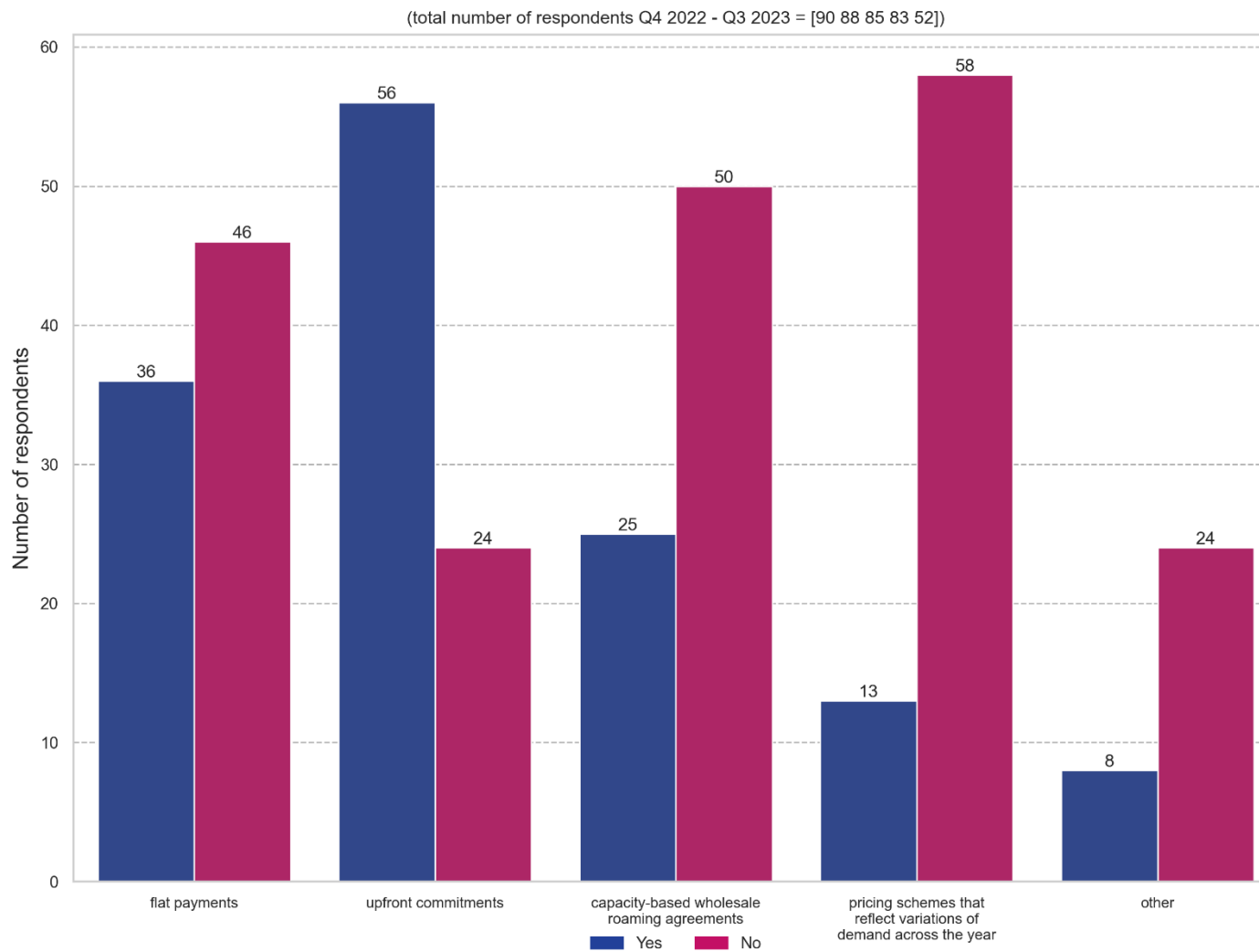


Figure 75 depicts the number of roaming providers (MNOs and MVNOs) that use different types of pricing schemes. This includes flat payments, upfront commitments, capacity-based wholesale roaming agreements, pricing schemes that reflect variations of demand across the year, or others.



Figure 76: Obstacles encountered at a wholesale level

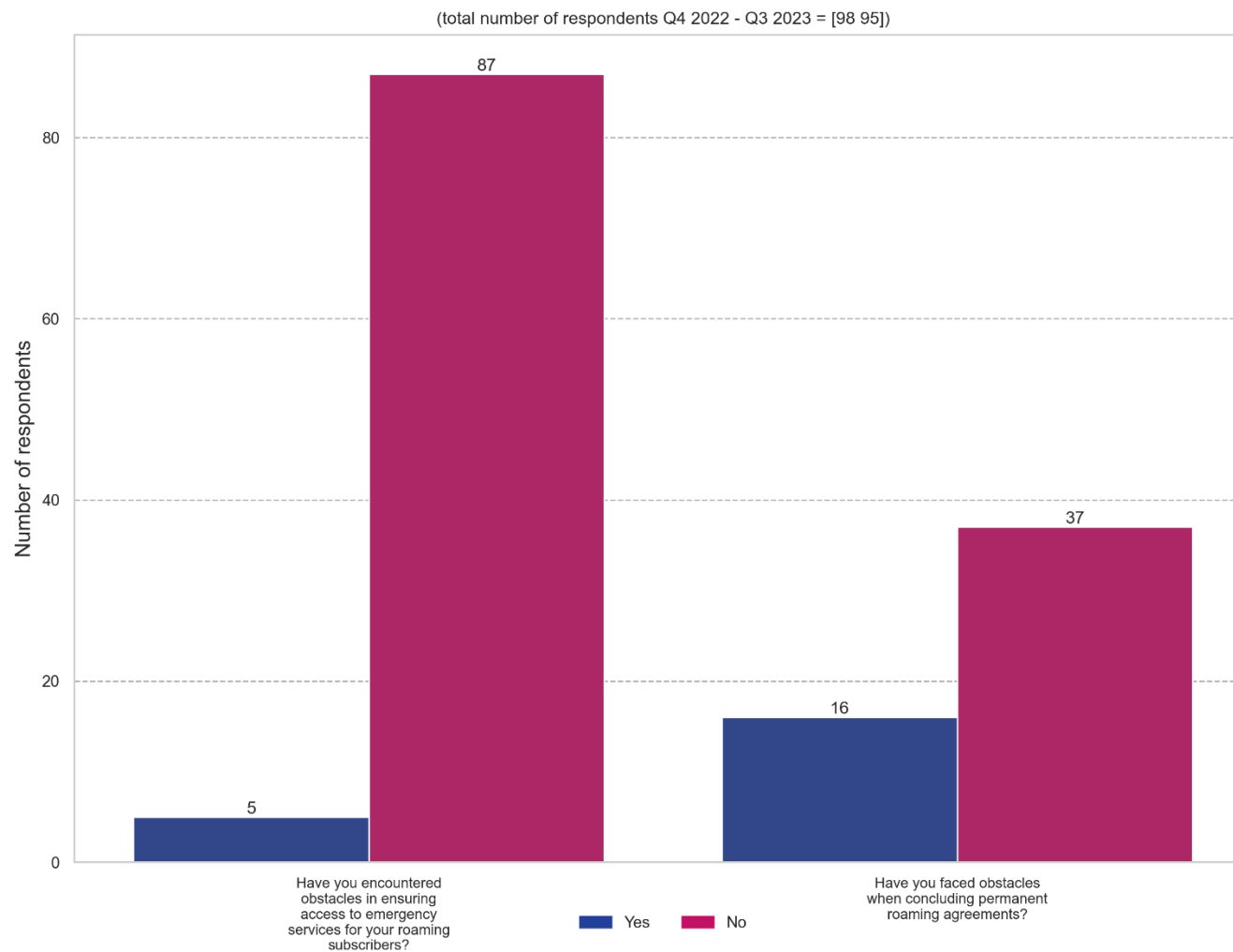


Figure 76 depicts the number of roaming providers (MNOs and MVNOs) that have encountered obstacles in ensuring access to emergency services for their subscribers as well as when concluding permanent roaming agreements.

Figure 77: Special wholesale contracts/agreements for services provided by connected objects/devices

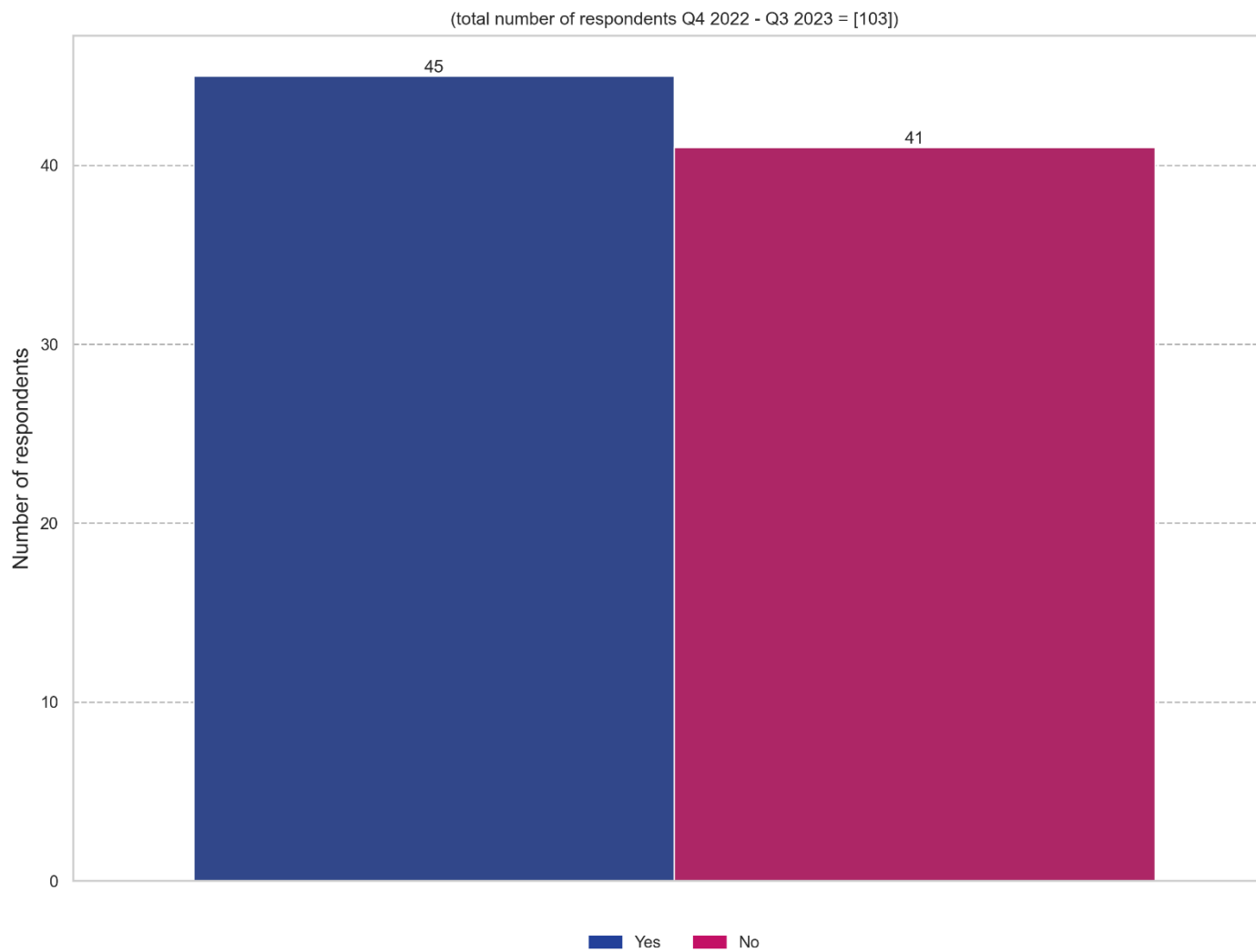


Figure 77 depicts the number of roaming providers (MNOs and MVNOs) that have special wholesale contracts/agreements for services provided by connected objects/devices.

**5.6.12. Applications for sustainability surcharges**

Figure 78: Applications for sustainability surcharges received and granted by NRAs, (total number of respondents Q4 2022 – Q3 2023 = 29)

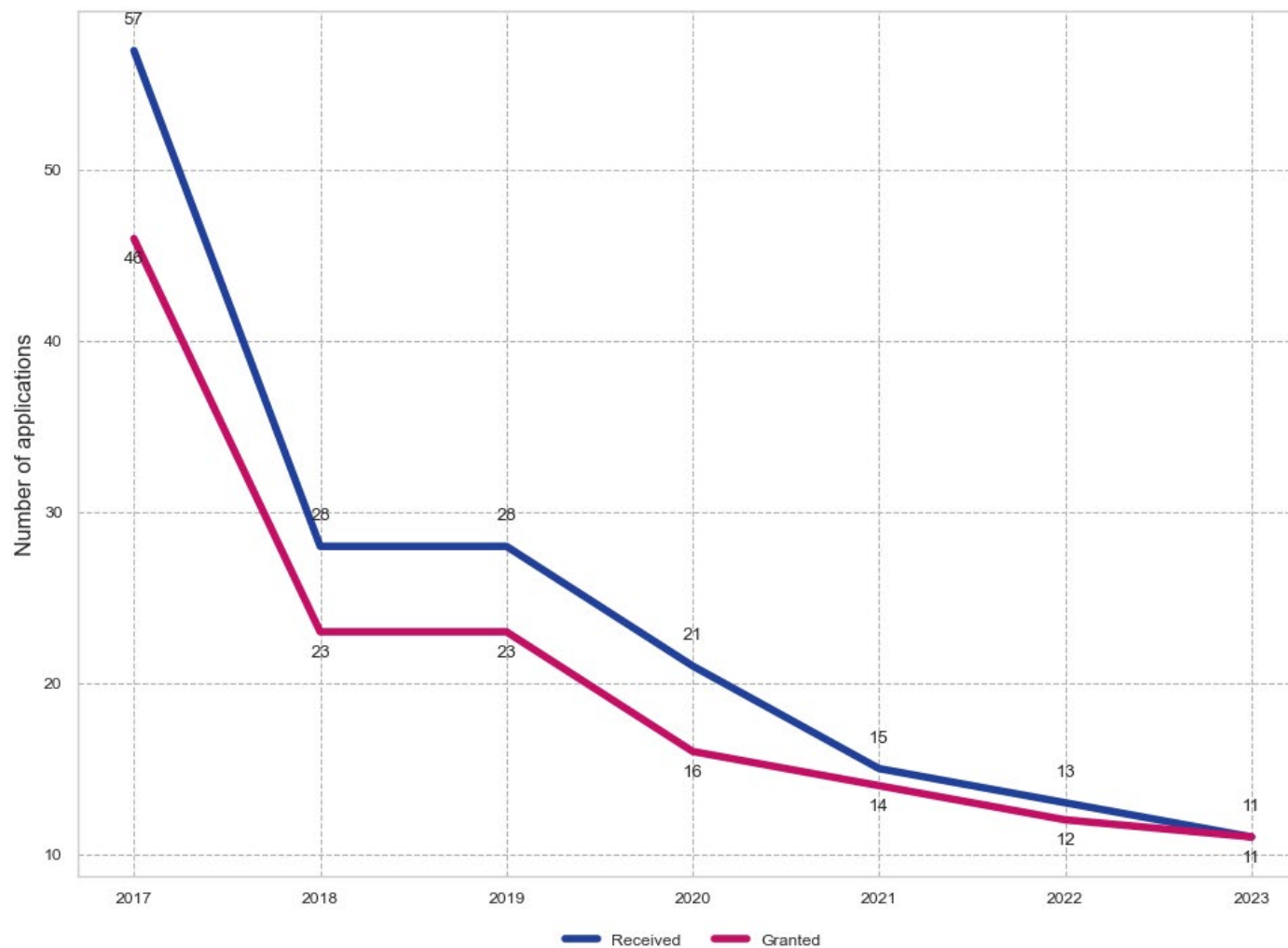


Figure 78 depicts the number of applications for sustainability surcharges received and granted by NRAs over the period between 2017 and 2023.

**5.6.13. Complaints on transparency issues received by NRAs**

Figure 79: Number of complaints received by NRAs per country (total number of respondents Q4 2022 – Q3 2023 = 29)

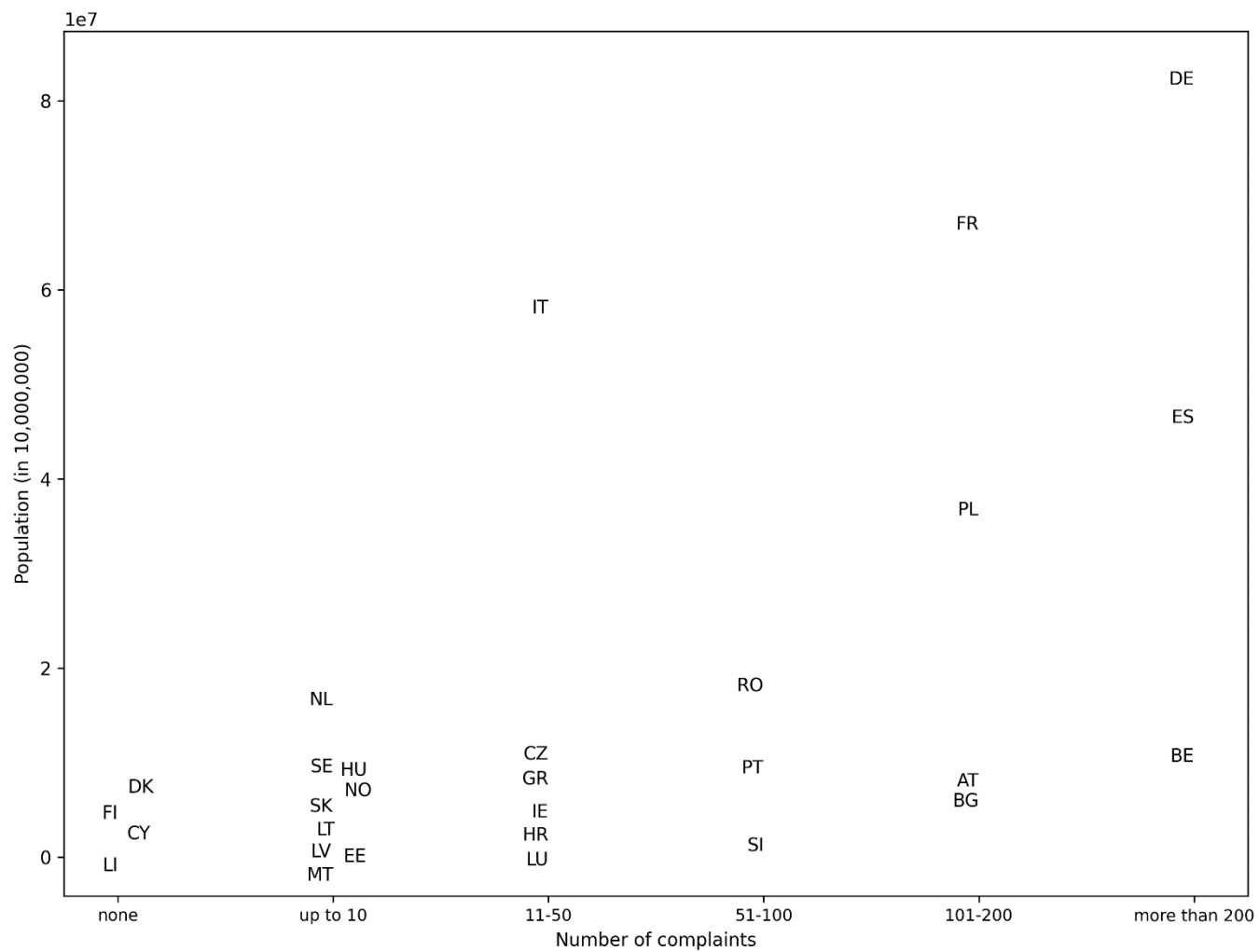


Figure 79 shows which NRAs received complaints within a certain range during the reporting period Q4 2022 – Q3 2023.

Figure 80: Number of NRAs that received complaints from end users on specific issues (total number of respondents Q4 2022 – Q3 2023 = 25)

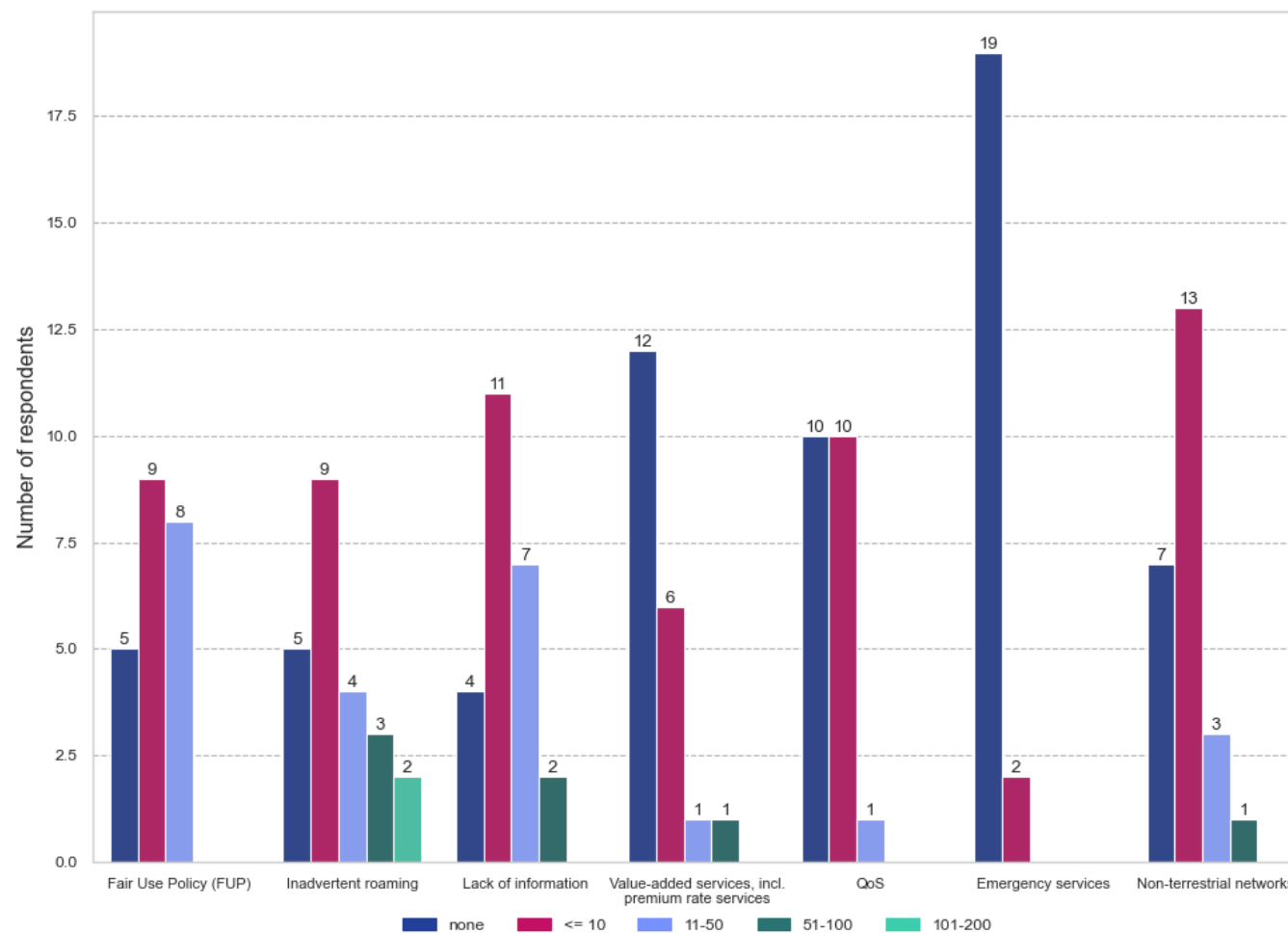


Figure 80 depicts the number of NRAs that received complaints on different issues within a certain range (up to 10 complaints, between 11-50 complaints, between 51-100 complaints or between 101-200 complaints).

Figure 81: Complaints from end users received by NRAs regarding FUP related issues (total number of respondents Q4 2022 – Q3 2023 = 24)

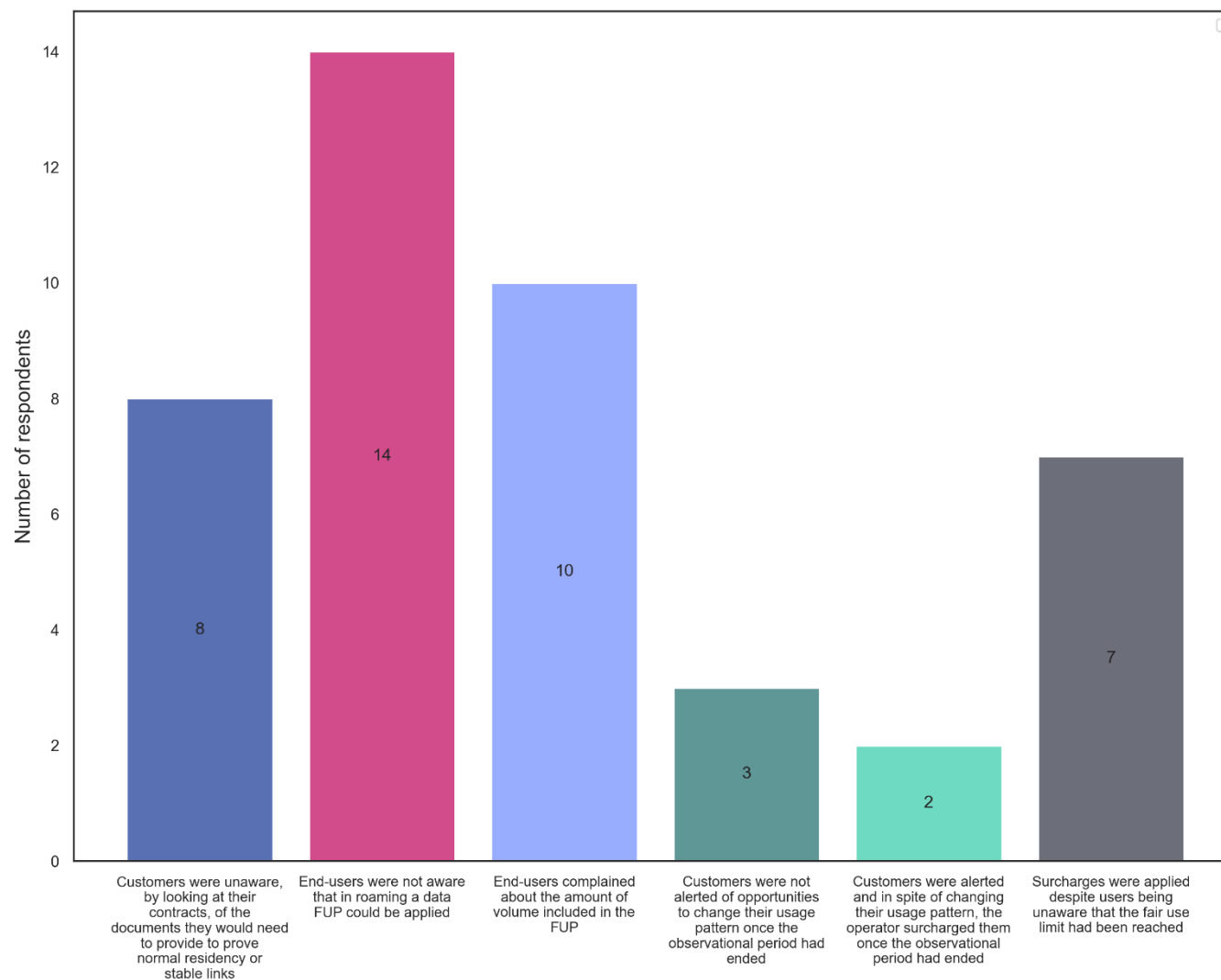


Figure 81 depicts the number of NRAs that received complaints on different FUP related issues.



Figure 82: Complaints from end users received by NRAs regarding inadvertent roaming (total number of respondents Q4 2022 – Q3 2023 = 26)

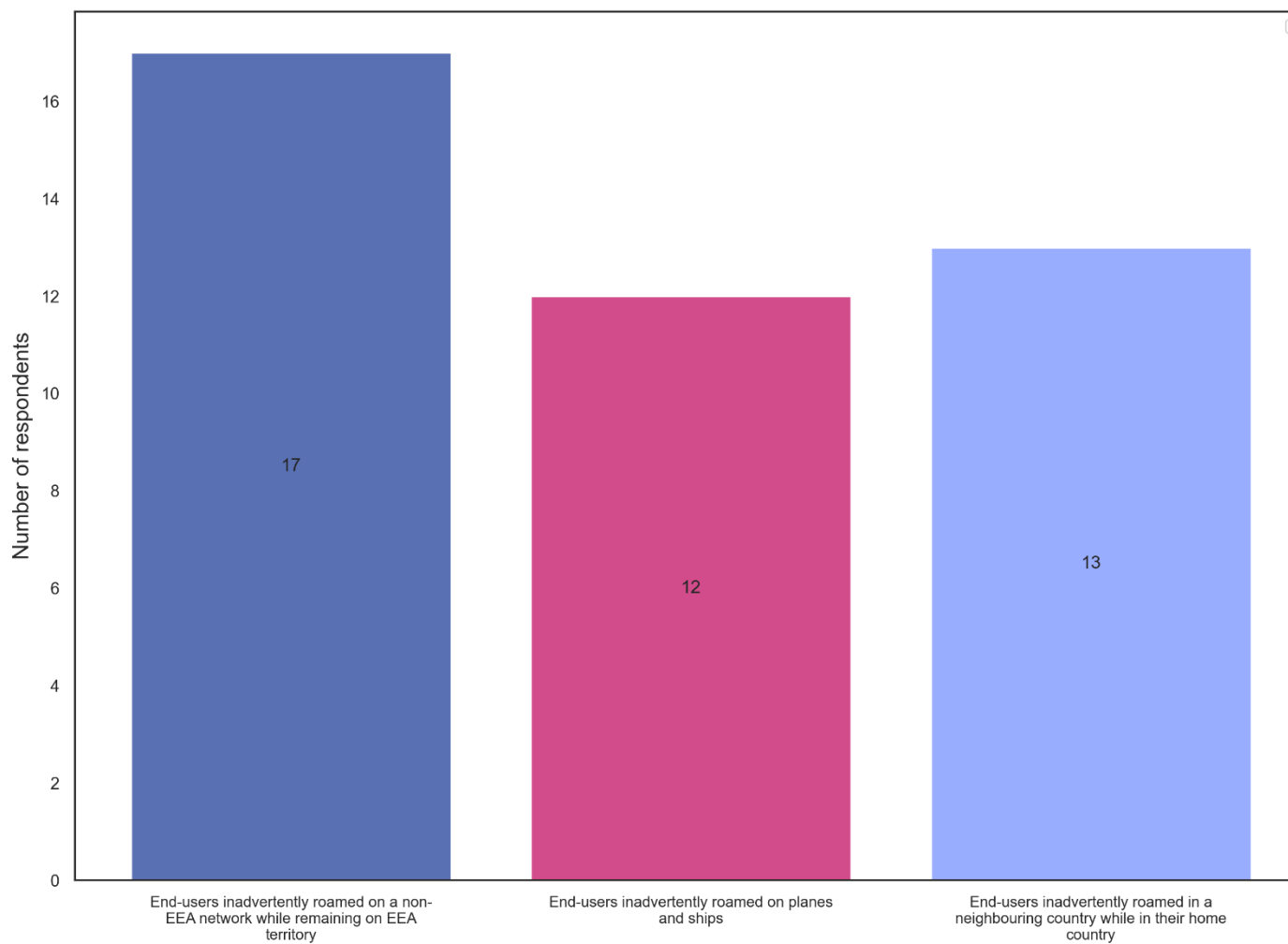


Figure 82 depicts the number of NRAs that received complaints regarding inadvertent roaming

Figure 83: Complaints from end users received by NRAs regarding a lack of information about tariffs and conditions (total number of respondents Q4 2022 – Q3 2023 = 24)

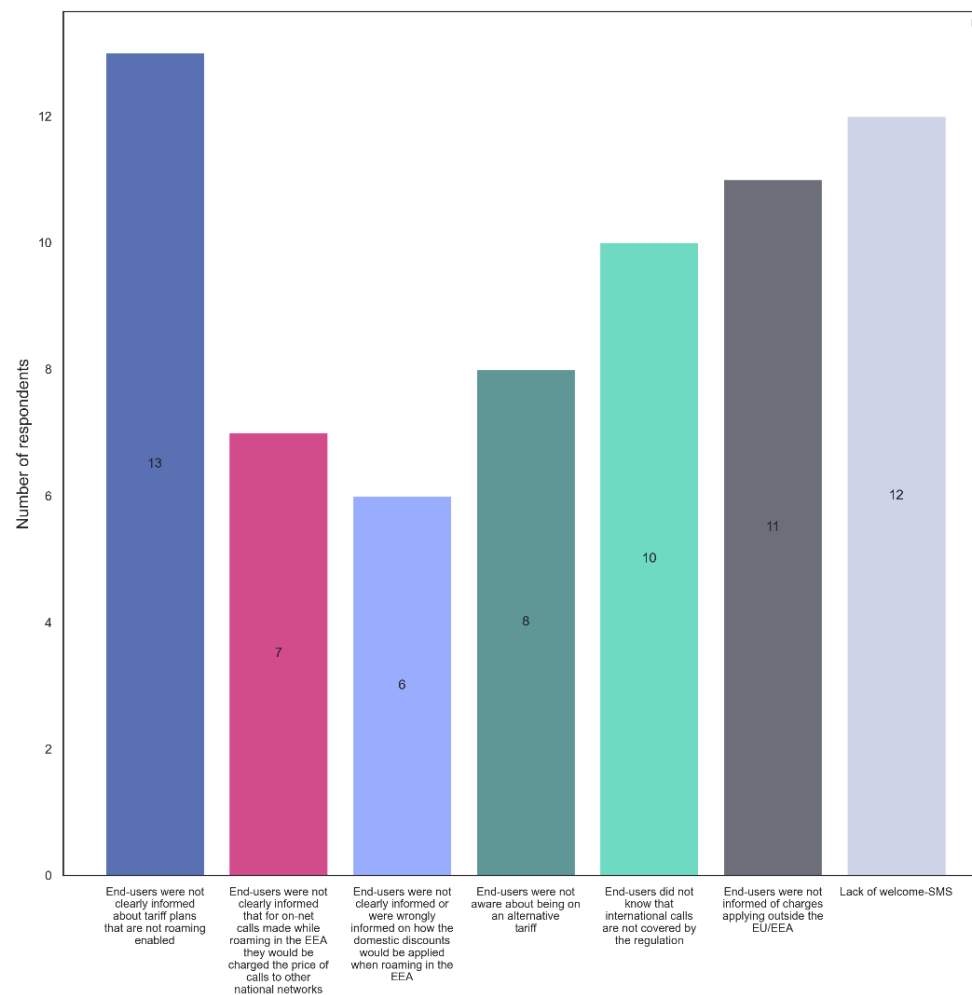


Figure 83 depicts the number of NRAs that received complaints regarding a lack of information about tariffs and conditions.

Figure 84: Complaints from end users received by NRAs regarding the application of RLAH tariffs (total number of respondents Q4 2022 – Q3 2023 = 26)

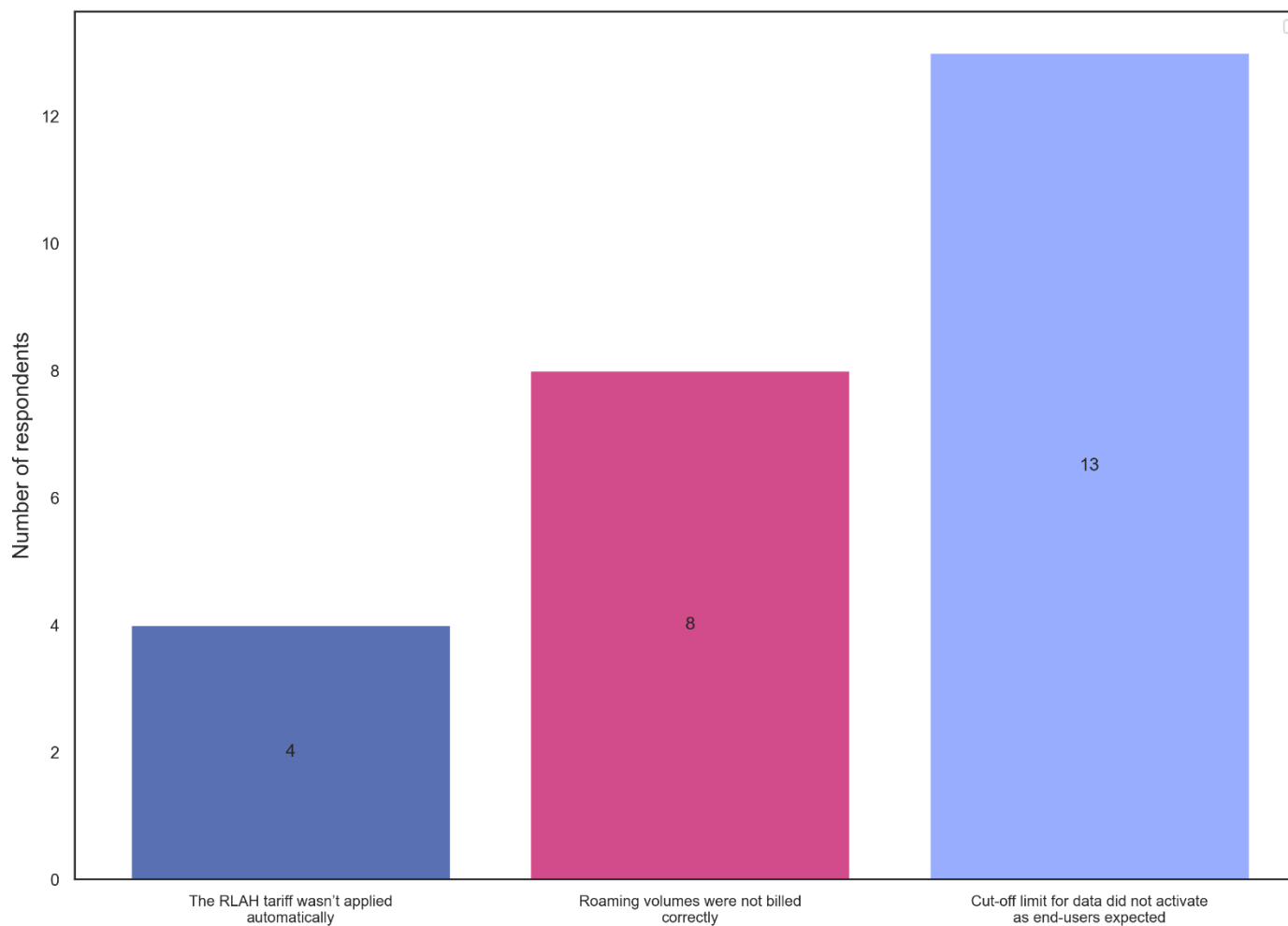


Figure 84 depicts the number of NRAs that received complaints regarding the application of RLAH tariffs.

Figure 85: Complaints from end users received by NRAs regarding VAS (total number of respondents Q4 2022 – Q3 2023 = 23)

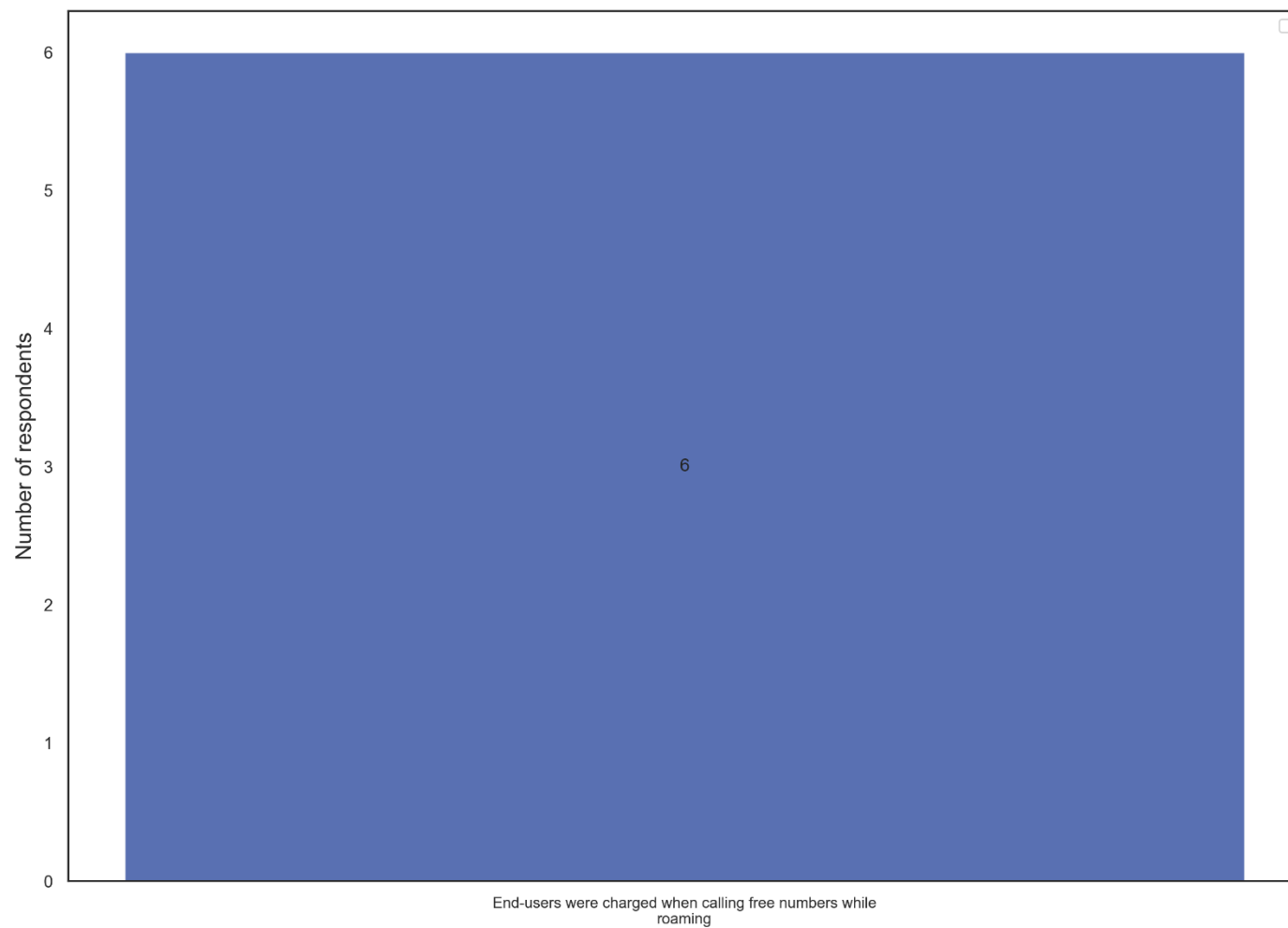


Figure 85 depicts the number of NRAs that received complaints regarding Value Added Services (VAS).

Figure 86: Complaints from end users received by NRAs regarding roaming on non-terrestrial networks (total number of respondents Q4 2022 – Q3 2023 = 26)

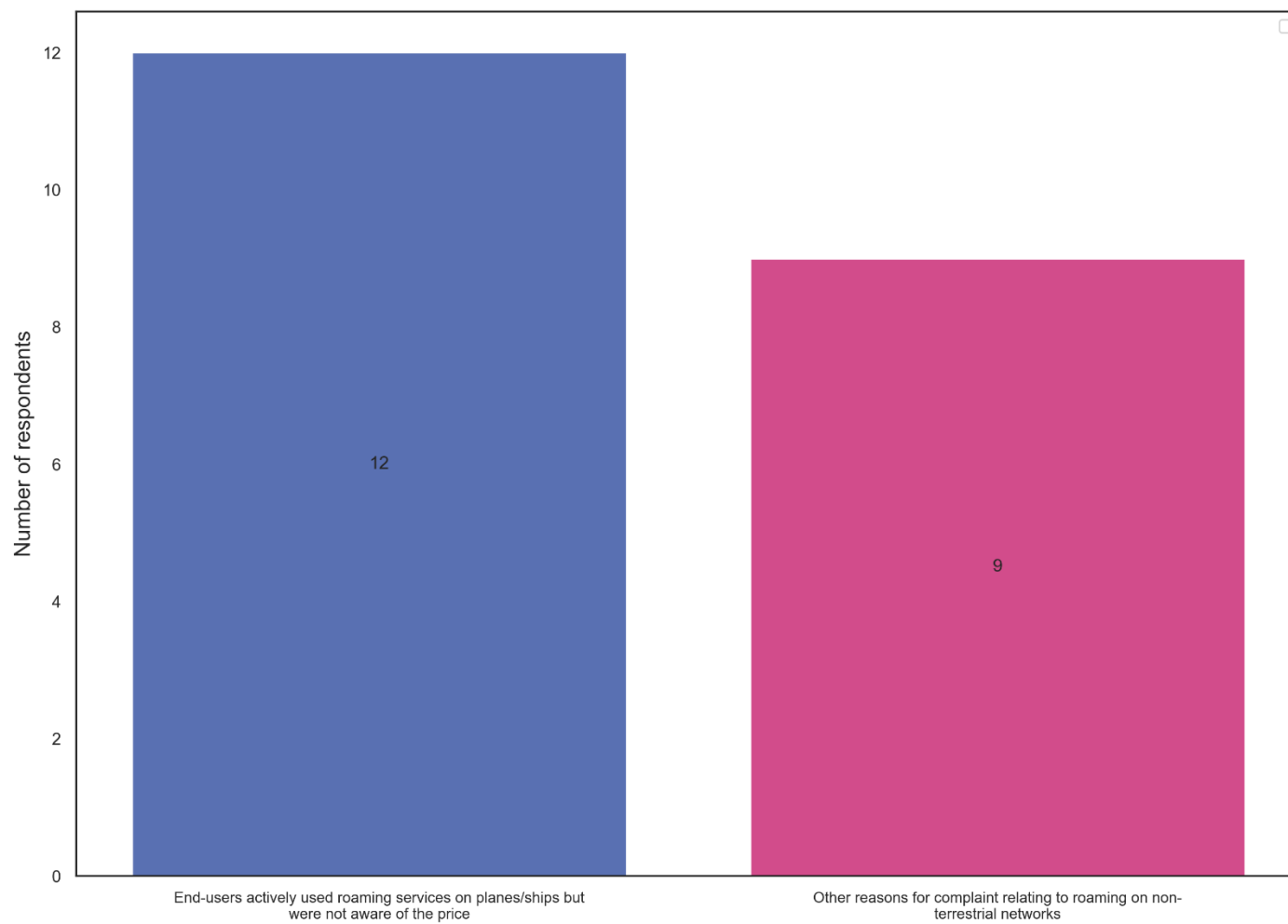


Figure 86 depicts the number of NRAs that received complaints regarding roaming on non-terrestrial networks.

Figure 87: Complaints from end users received by NRAs regarding QoS (total number of respondents Q4 2022 – Q3 2023 = 25)

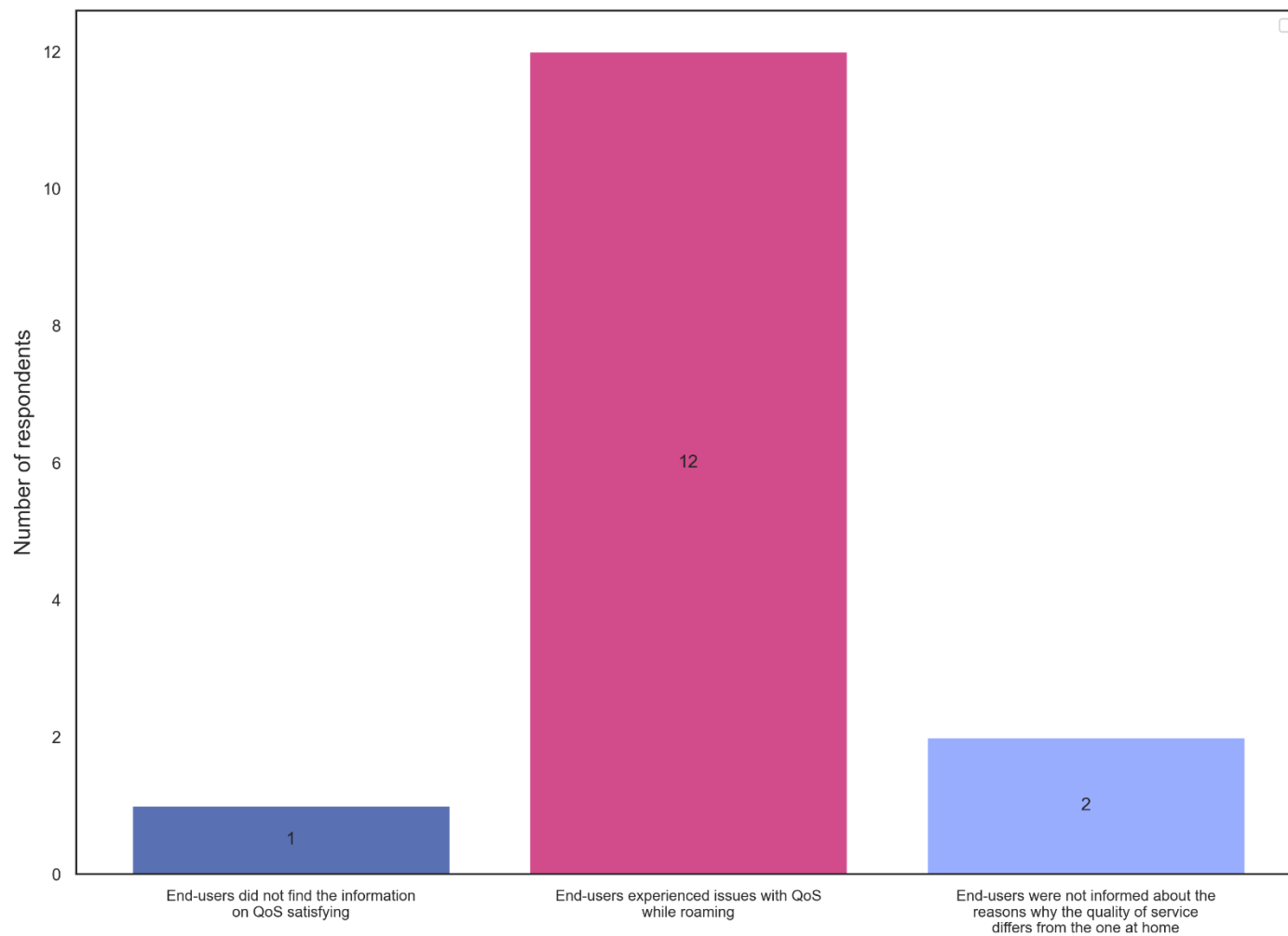


Figure 87 depicts the number of NRAs that received complaints regarding QoS related issues.

Figure 88: Complaints from end users received by NRAs regarding access to emergency services and other complaints (total number of respondents Q4 2022 – Q3 2023 = 25)

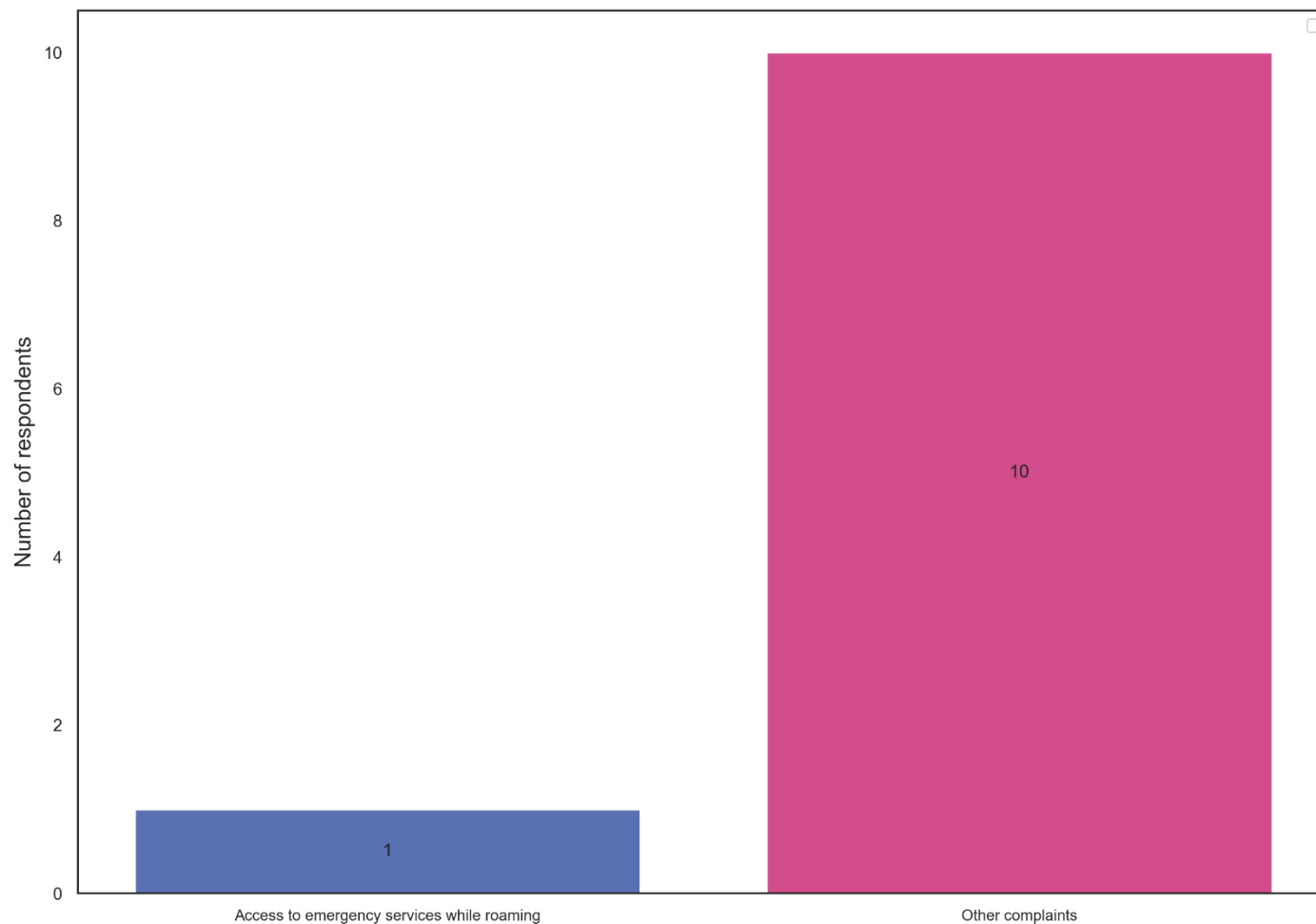


Figure 88 depicts the number of NRAs that received complaints regarding access to emergency services and other complaints that do not fall in to the previous categories.

## Annex I: Methodology for the data collection

Because of the broad scope and complexity of the new requirements stemming from the Roaming Regulation, new key indicators have been developed for the data collection. In addition, while the results are derived from the same questionnaire, the methodology used for some data from these new key indicators can differ between countries or roaming providers for a number of reasons. Particularly relevant are the following reasons:

- Differences in the methods used by roaming providers to allocate volumes for the different roaming services: comparability of data between different tariffs is affected by a number of reporting criteria, including roaming consumption from the volumes in the domestic mobile tariff plan (RLAH), the use of roaming services in excess of the limits of the FUP or if roaming is not periodic (RLAH+, non-compliance from abusive or anomalous usage);
- Difficulties in estimating the actual revenues for the roaming services and the mobile domestic services: as most of the roaming providers provide domestic bundled services, it is therefore difficult to allocate revenues to the different domestic individual services (e.g.: fixed voice, mobile, internet, TV);
- Difficulties in differentiating between domestic-only and intra-EEA: due to the introduction of Roam Like at Home rules, it has become difficult to determine the part of the domestic revenues only relative to intra-EEA roaming communications for these bundled tariff plans. For these tariffs, it is only possible to separate the revenues relative to the roaming surcharge applied (e.g. when the roaming Fair Use Policy is exceeded).

In consideration of these difficulties, the report made use of the following assumptions:

- all revenues resulting from bundles that include mobile services are allocated to domestic services regardless of whether the mobile service is provided in the domestic network (domestic service) or in a visited network (roaming service). Thus, the domestic revenues now include the intra-EEA roaming component from RLAH tariffs. Any other type of revenue (such as those originating from fixed telephone service or fixed internet service, sale of mobile devices, the initial one-time charge for a new/renewed subscription, subscription fees to other non-telecommunication services, etc.) should not be contained, despite the difficulties in allocating the revenues only relative to mobile services. Revenues from international mobile calls/SMS may also be included;
- the retail intra-EEA roaming revenues are only relative to the revenues resulting from the roaming surcharges (the domestic price component of the roaming service is excluded from the “retail intra-EEA roaming revenues”) and were included in the “Retail domestic revenues”).

While the measurement of balanced and unbalanced traffic should include volumes and revenues from all operators per country, such information is currently only available for a limited number of NRAs. For some countries, even if a data set is available, not all operators are included. The results related to the EEA average wholesale prices should be subject to



cautious interpretation, because some countries were not able to submit comparable data on balanced/unbalanced and total traffic.

Considering the aforementioned difficulties in obtaining reliable and comparable data, for some indicators, there is a limited number of countries which have opted for not supplying the data relative to those indicators. This is not at all unusual for a comprehensive data collection of this type. In most cases, the NRA was able to work with each roaming provider to resolve or alleviate the problem. In other cases, where system upgrades are necessary to comply with the new format of the data collection, the roaming provider was asked to provide the best possible estimate currently available and to complete upgrades in time to provide high quality data for the next data collection. Some NRAs expressed major data quality challenges as well as the use of different reporting systems by roaming providers.

At the wholesale level, roaming providers often receive discounts based on variables like volume of traffic, calculated at the end of a 12-month period. When providing data for these reports, roaming providers may estimate the effect of such discounts on data for each quarter. Because the actual discount may vary from the estimate, there may be an apparently 'anomalous' result for the quarter when the discount is actually applied. This should be kept in mind when comparing wholesale figures for different quarters in the same year.

In a few cases, the number of roaming providers changed, which may cause apparent changes in volumes and revenues between quarters. A list of contributing roaming providers is included in the Annex of each Report.

When wholesale prices are above the price caps, in most cases the reason is that the average price to comply with the Regulation is the annual price and not a quarterly one, and in such cases some quarters compensate for others. Another reason may also be inaccuracies in reporting for the data collection itself.

For ease of comparison, the euro is used throughout this Report. Within the EEA, currency fluctuations between the euro and other national currencies are likely to have affected the average prices reported for EEA countries outside the Eurozone.

Conversion of gigabytes to megabytes was done in line with Recital 17 of the Regulation (EU) 2017/920 of the European Parliament and of the Council of 17 May 2017 amending Regulation (EU) No 531/2012, which results in 1 gigabyte (GB) being equal to 1000 megabytes (MB). Operators may apply a different formula, which may slightly affect the accuracy of data.

All retail prices included in the charts exclude VAT. They are an average of prices paid by postpaid and prepaid tariff plan customers. All averages are based on actual minutes of voice calls or actual GB of data, unless expressly stated otherwise.

With regard to wholesale roaming resale access according to Article 3 (4) of the Roaming Regulation, MNOs may charge fair and reasonable prices for components not covered by paragraph 3. Prices may thus be higher than the price caps given in Article 7 (1), Article 9 (1) and Article 12 (1). Some data also include volumes and tariffs coming from roaming in non-EU countries in Europe. It should also be noted that the average wholesale roaming voice tariff for agreements applying Article 3 of the Roaming Regulation might be above the cap because the calculation is based on actual minutes (the Regulation permits to invoice 30 seconds for calls that are shorter).

The EU Roaming Regulation also applies to the EEA EFTA States Norway, Iceland and Liechtenstein and this Report includes indicators from Norway and Liechtenstein.

BEREC notes that some operators and NRAs with regard to the definition of the indicators for active SIM cards (prepaid, postpaid and corporate) misunderstood the definition. This issue mainly happened due to the new template and the new indicators introduced for the data collection. Unfortunately, BEREC within the deadlines could not solve this issue. This means, that some respondents did not report the corporate customers also under prepaid and postpaid SIM cards. This circumstance leads to misleading conclusions for some countries (increase of volumes per subscriber, ARRPUS, etc.), as the denominator for active SIM card was underestimated.

Specifically regarding data on connected objects/devices, it is worth mentioning that roaming providers may draw on different methodologies to differentiate between connected objects/devices and mobile subscribers. In addition, as permanent roaming is defined bilaterally by roaming providers during wholesale negotiations, the data provided for permanent roaming may refer to different types of usage.

As for the data previously included in the Transparency and Comparability Report, it is worth noting that a comparison of different years was introduced for the first time in this Report.

## Annex II: Regulatory evolution

The ERG initially worked on the long-standing issue of high prices for international roaming services. Following its creation in January 2010, BEREC took over responsibility for this work from the ERG.

### *The 2007 Regulation*

In 2005, the ERG undertook a study on international roaming that concluded that the EC Regulatory Framework did not provide the necessary tool-kit for NRAs to tackle the problems identified. The ERG wrote to the European Commission in December 2005 highlighting its concerns.

After significant debate, the first Regulation on international roaming services was published on 29 June 2007. The primary provisions capped wholesale and retail charges for voice calls under Eurotariff and set a number of transparency provisions to help ensure that consumers were well informed. The provisions of the Regulation entered into force at different times, with retail and transparency provisions taking full effect by the end of September 2007 and wholesale provisions calculated annually from the end of August 2007<sup>14</sup>.

### *The 2009 amended Regulation*

On 22 April 2009, the European Parliament (EP) adopted Regulation (EC) No. 544/2009 at first reading, with a view to amending Regulation (EC) No. 717/2007. Subsequently, on 8 June 2009, the Council of EU Telecoms Ministers formally adopted the new EU roaming rules approved by the European Parliament. The definitive text of Regulation (EC) No. 544/2009 was published in the Official Journal of the European Union on 29 June 2009.<sup>15,16</sup>

In particular, the Regulation introduced measures related to price regulation of voice and SMS roaming services at both retail and wholesale levels, and data roaming services at wholesale level, applicable from 1 July 2009 to 30 June 2012.

From July 2010 to June 2012, additional retail transparency measures to protect consumers from “bill shock” when using data roaming services were introduced.

### *The 2012 Regulation*

On 30 May 2012 the Council of the European Union approved the International Roaming Regulation III,<sup>17</sup> which entered into force on 1 July 2012.<sup>18</sup>

The Regulation introduced the retail and wholesale roaming measures applicable from 1 July 2012, including wholesale and retail price regulation for voice, SMS and data roaming services, with wholesale caps for all roaming services and retail caps for data roaming services

<sup>14</sup> In Norway and Iceland the 2007 Regulation was in force from the end of 2007 to the 2<sup>nd</sup> quarter 2010.

<sup>15</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:167:0012:0023:EN:PDF>.

<sup>16</sup> From the 3<sup>rd</sup> quarter 2009 to the 1<sup>st</sup> quarter 2010, Regulation 544/2009 applied in the EU while the first Roaming Regulation (EC) No. 717/2007 remained in force in Norway, Iceland and Liechtenstein, with slightly higher voice caps, no SMS caps and no wholesale data cap.

<sup>17</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:172:0010:0035:EN:PDF>.

<sup>18</sup> With regard to the EEA EFTA countries, it must be noted that the Roaming Regulation applies in these countries as from 7 December (Norway and Liechtenstein) and 21 December (Iceland) 2012.

decreasing on an annual basis. In addition, the obligation for mobile network operators (MNOs) to meet all reasonable requests for wholesale roaming access was introduced and the safeguard mechanisms were extended.

### ***The 2012 Regulation as amended by Regulation (EU) No. 2120/2015***

On 3 April 2014, the European Parliament took up the position, within the framework of the procedure for the adoption of a Regulation for a European Single Market for Electronic Communications (TSM Regulation), to abolish retail roaming surcharges in order to allow customers to “Roam Like at Home” (RLAH) with a fair use limit.

Regulation (EU) No. 2015/2120,<sup>19</sup> adopted by the European Parliament on 27 October 2015 and published in the Official Journal of 26 November 2015, includes amendments to Roaming Regulation No. 531/2012,<sup>20</sup> the main one being the principle of Roam Like At Home, i.e. requiring roaming providers not to levy any surcharge in addition to the domestic retail price on roaming customers as of 15 June 2017 (RLAH tariffs).

However, there are several cases where the roaming provider is allowed to apply surcharges and the possibility for a roaming provider to apply for authorisation to apply a surcharge was created. Furthermore, similar to the provisions set out in the third Roaming Regulation, roaming providers can also offer alternative roaming tariffs as an alternative to RLAH and customers may deliberately choose those alternative tariffs.

It should further be mentioned that the Roaming Regulation also established a transitional period, from the 30 April 2016 to 14 June 2017, where operators could apply a surcharge in addition to the domestic price for the provision of retail roaming regulated services.

The amendments to the Roaming Regulation resulted in an update of the BEREC Benchmark Report, which from this period onwards included indicators on volumes and revenues for RLAH, RLAH+ (non-compliance with/exceeding the FUP), RLAH+ (derogation) and alternative tariffs offered by operators.

### ***The 2012 Regulation as amended by Regulation (EU) No. 2017/920***

Regulation (EU) No. 2017/920<sup>21</sup> adopted by the European Parliament on 17 May 2017 and published in the Official Journal of 9 June 2017 includes amendments to Roaming Regulation No. 531/2012,<sup>22</sup> the main one regarding new wholesale prices for voice, SMS and data services that entered into force on 15 June 2017. Also, its amendments included new provisions for wholesale agreements to prevent permanent roaming and the requirement to collect data about the evolution of actual wholesale roaming rates for unbalanced traffic between providers of roaming services, and on the relationship between retail prices, wholesale charges and wholesale costs for roaming services.

The amendments to the Roaming Regulation resulted in an update of the BEREC Benchmark Report, and from that period onwards, the Report included the lowest charged as proxy wholesale costs for roaming services and those new clauses to prevent permanent roaming

<sup>19</sup> Available at: <http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32015R2120>.

<sup>20</sup> Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012R0531>.

<sup>21</sup> Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32017R0920>.

<sup>22</sup> Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012R0531>.

introduced in the roaming wholesale agreements. In 2019, an additional section in the questionnaire was introduced which requested data on roaming for connected objects/devices.

### ***Recast of the Roaming Regulation by Regulation (EU) 2022/612***

To further reduce the burden of MVNOs and roaming providers in outbound roaming countries, the price regulation of roaming services was extended and a glide path was introduced to further reduce the caps for voice, SMS and data roaming services.

In addition to confirming the measures contained in the previous Roaming Regulation, the 2022 Roaming Regulation on the one hand extended the transparency measures aiming by requiring roaming providers to inform end users when roaming on non-terrestrial networks, as well as including information on potential additional charges which can be incurred when using value-added services. Additionally, the requirement was introduced to offer the same QoS to roaming subscribers as available to them at home, provided the network technologies and generations necessary to do so are available in visited country. Finally, a requirement to provide information about local options in the Welcome SMS was added due to the lack of harmonisation of means of access to emergency services for disabled end users,

With the recast of the Roaming Regulation, the roaming data collection also underwent several changes. In particular, the previously separate International Roaming Benchmark Report (IRBMK) and the Transparency and Comparability Report (TACR) were merged into one report. With regard to the data previously collected for the IRBMK, the distinction between group and non-group wholesale roaming volumes and revenues, billed RoW minutes, local break-out, and roaming volumes on a per-country basis were removed from the scope of the data collection.

In accordance with the requirements of the Roaming Regulation, new indicators were added for corporate subscribers (in addition to prepaid and postpaid subscribers), wholesale volumes and revenues on trading platforms, and retail revenues as well as wholesale volumes and revenues for roaming on non-terrestrial networks. The data on non-terrestrial wholesale charges per unit were included in this report. Other criteria will be included from the next report onwards.

In addition, one section to be completed on a voluntary basis was introduced to allow for monitoring roaming developments in the Western Balkan region. The data provided for this section may be published in the future.

With regard to the data previously collected for the TACR, new sections were added regarding transparency measures on the wholesale level, and the offer of 5G roaming services was requested at a more detailed, country-specific level. Additional questions were introduced regarding, amongst other things, financial cut-off limits, fair use policies, and wholesale offers for connected objects/devices. The questionnaire circulated among NRAs no longer requested data on the availability of information available to end users on the websites of NRAs and on information facilitating the comparison of tariffs. Instead, a section on regulatory practice as well as a section on provider complaints were added.

## Annex III: List of respondents

Operators that provided data for the period 1 October 2022 – 30 September 2023:

### Austria

A1 Telekom Austria  
Cubic Telecom  
Dialog Telekom  
HoT Telekom  
Hutchison 3G Austria  
Kabelplus  
LTK  
Lycamobile  
Mass Response  
MTEL  
Porsche Smart Mobility  
RMTS  
T-Mobile Austria

### Belgium

Proximus  
Telenet Group  
Orange Belgium  
Lyca Mobile  
Voo  
Mobile Vikings

### Bulgaria

Vivacom Bulgaria  
Yettel Bulgaria  
A1 Bulgaria

### Croatia

Hrvatski Telekom  
A1 Hrvatska  
Telemach

### Cyprus

Cablenet  
Cyta  
EPIC  
Primetel

### Czech Republic

ČEZ Prodej

O2 Czech Republic

Tesco Mobile ČR

T-Mobile Czech Republic

Vodafone Czech Republic

SAZKAmobil

### Denmark

Hi3G Denmark

Nuuday

Telenor

TeliaDanmark

Telmore

Eesy

Yousee

Relatel

TDC Erhverv

### Estonia

Telia Estonia

Elisa Eesti

TELE 2 Eesti

### Finland

DNA

Elisa Corporation

Telia Finland

Ålcom

### France

Orange France

SFR

Bouygues Telecom

Free Mobile

Orange Caraïbes

SRR

BTBD

Lycamobile

Coriolis

La Poste Mobile

**Germany**

Telekom Deutschland GmbH  
 Telefónica Germany GmbH & Co. OHG  
 Vodafone GmbH  
 1&1  
 Freenet

**Greece**

COSMOTE Mobile  
 Vodafone Panafon  
 Nova

**Hungary**

Yettel Magyarország Zrt.  
 Magyar Telekom Nyrt.  
 Vodafone Magyarország Zrt.  
 Digi Kft.

**Ireland**

Eircom Limited  
 Three Ireland (Hutchison) Limited  
 Lycamobile Ireland Limited  
 Tesco Mobile Ireland  
 Vodafone Ireland  
 Virgin Media Ireland Limited

**Italy**

Daily Telecom  
 Digi Italy  
 Iliad Italia S.p.A.  
 Fastweb  
 Irideos  
 Kena Mobile  
 Lycamobile  
 Nextus  
 Optima Italia  
 Poste Pay  
 Rabona  
 Tim  
 Tiscali  
 Vianova  
 Vodafone  
 Wind Tre S.p.A.

**Latvia**

Bite Latvia  
 LatvijasMobilaisTelefons  
 Tele2

**Liechtenstein**

Salt (Liechtenstein)  
 Telecom Liechtenstein  
 Swisscom (Schweiz)

**Lithuania**

Telia Lietuva  
 Tele2  
 Bite Lietuva  
 Teledema

**Luxembourg**

POST  
 Proximus Luxembourg  
 Orange Communications Luxembourg

**Malta**

Epic Communications Ltd  
 GO plc  
 Melita Ltd

**Netherlands**

Budget Mobiel  
 KPN  
 Lebara  
 Lycamobile  
 Oido Netherlands (T-Mobile Netherlands)  
 Vodafone Libertel  
 youfone

**Norway**

Ice  
 Chilimobil  
 Fjordkraft  
 Lycamobile  
 Telenor  
 Telia Norge

**Poland**

P4  
 Polkomtel  
 T-Mobile Polska  
 Orange Polska  
 Lycamobile  
 Premium Mobile

**Portugal**

NOS Comunicações, S.A.  
MEO – Serviços de Comunicações e Multimédia, S.A.  
Vodafone Portugal – Comunicações Pessoais, S.A.  
NOWO Communications, S.A.  
Lycamobile Portugal, Lda

**Romania**

Orange România  
Orange Romania Communications  
RCS & RDS  
Telekom Romania Mobile Communications  
Vodafone Romania  
Lycamobile

**Slovak Republic**

O2 Slovakia  
Orange Slovensko  
Slovak Telekom  
4ka

**Slovenia**

TELEKOM SLOVENIJE, D.D.  
A1 Slovenija d.d.  
TELEMACH D.O.O.  
T-2 d.o.o.  
HOT mobil, telekomunikacije in storitve d.o.o.

**Spain**

Aire Networks  
Digi Spain Telecom, S. L.  
Orange Espagne, S. A. Unipersonal  
Telefónica Móviles de España, S. A.  
Vodafone Espana, S. A. Unipersonal  
Xfera Móviles, S. A. Unipersonal (Yoigo)

**Sweden**

Hi3G Access  
Telenor Sverige  
Telia Company  
Tele2 Sverige