

International Roaming BEREC Benchmark Data Report October 2018 – March 2019

Contents

1. Table of Figures	2
1. Structure of the Report	7
2. Introduction	7
3. Regulatory evolution	8
4. Main findings	11
5. Charts.....	19
5.1. Analysis of subscribers and those that use roaming services	20
5.1.1. Domestic average Retail Mobile Revenue per User (ARRPU)	20
5.1.2. Consumption patterns for domestic mobile retail services	23
5.1.3. Consumption patterns for RLAH services (voice, SMS and data).....	28
5.2. The development of Roaming Services	38
5.2.1. Voice roaming services	38
5.2.1.1 Wholesale prices	38
5.2.1.2 Consumption patterns	48
5.2.2. SMS roaming services	65
5.2.2.1 Wholesale prices	65
5.2.2.2 Consumption patterns	75
5.2.3. Data roaming services	84
5.2.3.1 Wholesale prices	84
5.2.3.2 Consumption patterns	94
5.2.4. RoW retail roaming prices.....	103
5.3. Wholesale roaming (outbound): Agreements.....	113
5.4. Rates for unbalanced wholesale roaming traffic.....	117
5.5. MNOs and MVNOs data	122
5.5.1. Domestic average Retail Mobile Revenue per User (ARRPU)	122
5.5.2. Consumption patterns for domestic mobile retail services	125
5.5.3. Consumption patterns for RLAH services (voice, SMS and data).....	139
5.5.4. Cost to the host operator for the provision of wholesale international roaming services.....	151
Annex I: Methodology for the data collection.....	156
Annex II: List of respondents.....	160

1. Table of Figures

Figure 1: Domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q4 18 and Q1 19.....	21
Figure 2: EEA average: domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q2 16 – Q1 19.....	22
Figure 3: Domestic calls made: average number of minutes per month per total number of subscribers, Q4 18 and Q1 19	24
Figure 4: Domestic calls received: average number of minutes per month per total number of subscribers, Q4 18 and Q1 19	25
Figure 5: Domestic SMS services: average number of SMS per month per total number of subscribers, Q4 18 and Q1 19	26
Figure 6: Domestic data services: average consumption per month per total number of subscribers (GB), Q4 18 and Q1 19	27
Figure 7: RLAH, calls made: average number of RLAH minutes per month per total number of roaming subscribers with active RLAH services, Q4 18 and Q1 19.....	29
Figure 8: RLAH, calls received: average number of RLAH minutes per month per total number of roaming subscribers with active RLAH services, Q4 18 and Q1 19.....	30
Figure 9: EEA average number of RLAH minutes per month per total number of roaming subscribers with active RLAH services, Q4 17 – Q1 19.....	31
Figure 10: RLAH, SMS services: average number of SMS per month per total number of roaming subscribers with active RLAH services, Q4 18 and Q1 19.....	32
Figure 11: EEA average number of SMS per month per total number of roaming subscribers with active RLAH services, Q4 17 – Q1 19.....	33
Figure 12: RLAH, data services: average consumption per month per total number of roaming subscribers with active RLAH services (in GB), Q4 18 and Q1 19.....	34
Figure 13: RLAH, data services: EEA average consumption per month per total number of roaming subscribers with active RLAH services (in GB), Q4 17 – Q1 19.....	35
Figure 14: Share of total subscribers with EU/EEA roaming enabled, Q4 18.....	36
Figure 15: Share of total subscribers with EU/EEA roaming enabled, Q1 19.....	37
Figure 16: Average wholesale price per minute for roaming voice calls: charges for balanced and unbalanced traffic (wholesale roaming inbound), Q4 18.....	39
Figure 17: Average wholesale price per minute for roaming voice calls: charges for balanced and unbalanced traffic (wholesale roaming inbound), Q1 19.....	40
Figure 18: Total traffic (wholesale roaming inbound): average wholesale price per minute for roaming voice calls, Q4 17 and Q4 18	41
Figure 19: Total traffic (wholesale roaming inbound): average wholesale price per minute for roaming voice calls, Q1 18 and Q1 19	42
Figure 20: EEA average wholesale price per minute for wholesale roaming voice calls, Q2 07 – Q1 19.....	43
Figure 21: RoW traffic: average wholesale price charged by EEA operators per minute, Q4 18 and Q1 19.....	44
Figure 22: EEA and RoW average wholesale price per minute, Q2 16 – Q1 19 (balanced, unbalanced, total and RoW traffic)	45
Figure 23: Wholesale roaming inbound (voice services): Proportion of balanced/unbalanced traffic within EEA countries, Q4 18.....	46
Figure 24: Wholesale roaming inbound (voice services): Proportion of balanced/unbalanced traffic within EEA countries, Q1 19.....	47

Figure 25: Percentage of total minutes of calls made, Q4 18	49
Figure 26: Percentage of total minutes of calls made, Q1 19	50
Figure 27: EEA percentage and volumes of total minutes of calls made, Q3 16 – Q1 19	51
Figure 28: Roaming calls made: average number of minutes per month per total number of roaming subscribers, Q3 18 – Q1 19.....	52
Figure 29: Roaming calls made: EEA average number of minutes per month per total number of roaming subscribers Q2 16 – Q1 19.....	53
Figure 30: Roaming calls made: traffic Index, Q4 16, Q4 17 and Q4 18*	54
Figure 31: Roaming calls made: traffic Index, Q1 17, Q1 18 and Q1 19*.....	55
Figure 32: EEA average: Roaming calls made traffic, (millions of minutes), Q2 07 – Q1 19	56
Figure 33: Percentage of total minutes of calls received, Q4 2018.....	57
Figure 34: Percentage of total minutes of calls received, Q1 19.....	58
Figure 35: EEA volumes and percentage of total minutes of calls received, Q3 16 – Q1 19	59
Figure 36: Roaming calls received: average number of minutes per month per total number of roaming subscribers, Q3 18 – Q1 19.....	60
Figure 37: Roaming calls received: EEA average number of minutes per month per total number of roaming subscribers, Q2 16 – Q1 19.....	61
Figure 38: Roaming calls received: traffic Index, Q4 16, Q4 17 and Q4 18*	62
Figure 39: Roaming calls received: traffic Index, Q1 17, Q1 18 and Q1 19*	63
Figure 40: EEA roaming calls received traffic, Q2 07 – Q1 19 (millions of minutes)	64
Figure 41: Average wholesale price per roaming SMS, Q4 18 (balanced and unbalanced traffic).....	66
Figure 42: Average wholesale price per roaming SMS, Q1 19 (balanced and unbalanced traffic).....	67
Figure 43: Total traffic: average wholesale price per roaming SMS, Q4 17 and Q4 18.....	68
Figure 44: Total traffic: average wholesale price per roaming SMS, Q1 18 and Q1 19.....	69
Figure 45: EEA average wholesale price per roaming SMS, Q2 07 – Q1 19	70
Figure 46: RoW traffic: average wholesale price charged by EEA operators per SMS (inbound roaming), Q4 18 and Q1 19.....	71
Figure 47: EEA average wholesale price per roaming SMS, Q2 16 – Q1 19 (balanced, unbalanced total and RoW traffic)	72
Figure 48: Proportion of balanced and unbalanced traffic within EEA countries (SMS services), wholesale roaming inbound, Q4 18.....	73
Figure 49: Proportion of balanced and unbalanced traffic within EEA countries (SMS services), wholesale roaming inbound, Q1 19.....	74
Figure 50: Percentage of EEA roaming SMS, Q4 18.....	76
Figure 51: Percentage of EEA roaming SMS, Q1 19.....	77
Figure 52: EEA percentage of SMS sent, Q3 16 – Q1 19.....	78
Figure 53: Average number of SMS per month per total number of roaming subscribers, Q3 18 – Q1 19.....	79
Figure 54: EEA average number of SMS per month per total number of roaming subscribers, Q2 16 – Q1 19	80
Figure 55: Retail SMS traffic Index, Q4 16, Q4 17 and Q4 18*	81
Figure 56: Retail SMS traffic Index, Q1 17, Q1 18 and Q1 19*	82
Figure 57: EEA retail SMS traffic, Q2 07 – Q1 19 (millions of messages).....	83
Figure 58: Average wholesale data price per GB (balanced and unbalanced traffic), Q4 18	85
Figure 59: Average wholesale data price per GB (balanced and unbalanced traffic), Q1 19	86
Figure 60: Total traffic: average wholesale data price per GB, Q4 17 and Q4 18	87

Figure 61: Total data traffic: average wholesale data price per GB, Q1 18 and Q1 19	88
Figure 62: Total traffic: EEA average wholesale data price per GB, Q4 08 – Q1 19	89
Figure 63: RoW traffic: Average wholesale data price charged by EEA operators per GB (inbound roaming), Q4 18 and Q1 19.....	90
Figure 64: EEA average wholesale data price per GB, Q2 16 – Q1 19 (balanced, unbalanced, total traffic, RoW traffic).....	91
Figure 65: Proportion of balanced and unbalanced traffic within EEA countries, data services, wholesale roaming inbound, Q4 18	92
Figure 66: Proportion of balanced and unbalanced traffic within EEA countries, data services, wholesale roaming inbound, Q1 19	93
Figure 67: Percentage of retail data roaming services, Q4 18	95
Figure 68: Percentage of retail data roaming services, Q1 19	96
Figure 69: EEA average: percentage of retail data roaming services, Q3 16 – Q1 19	97
Figure 70: Average data consumption per month per total number of roaming subscribers (in GB), Q4 18 and Q1 19	98
Figure 71: EEA average consumption per month per total number of roaming subscribers (in GB), Q2 16 – Q1 19	99
Figure 72: Retail Data traffic Index, Q4 16, Q4 17 and Q4 18*	100
Figure 73: Retail Data traffic Index, Q1 17, Q1 18 and Q1 19*	101
Figure 74: EEA Retail data traffic, Q2 07 – Q1 19 (millions of GB).....	102
Figure 75: Average retail price per minute for RoW roaming voice calls made, Q4 18 and Q1 19.....	104
Figure 76: EEA average retail price per minute for RoW roaming voice calls made, Q2 16 – Q1 19.....	105
Figure 77: Average retail price per minute for RoW roaming voice calls received, Q4 18 and Q1 19.....	106
Figure 78: EEA average retail price per minute for RoW roaming voice calls received, Q2 16 – Q1 19.....	107
Figure 79: Average retail price for RoW roaming SMS services, Q4 18 and Q1 19.....	108
Figure 80: EEA average retail price for RoW roaming SMS services, Q2 16 – Q1 19	109
Figure 81: Average retail price per GB for RoW roaming data services, Q4 18 and Q1 19	110
Figure 82: EEA average retail data price per GB for RoW roaming data services, Q2 16 – Q1 19.....	111
Figure 83: EEA average retail prices for RoW roaming services, Q2 16 – Q1 19	112
Figure 84: Wholesale averages outbound roaming: Voice: Agreements applying Article 3 Roaming Regulation, Q2 13 – Q1 19	114
Figure 85: Wholesale averages outbound roaming: SMS Agreements applying Article 3 Roaming Regulation, Q2 13 – Q1 19	115
Figure 86: Wholesale EEA average outbound roaming: Data, Agreements applying Article 3 Roaming Regulation, Q2 13 – Q1 19	116
Figure 87: Lowest paid and charged unbalanced rates* for calls made (number of operators), Q4 18 and Q1 19	118
Figure 88: Lowest paid and charged unbalanced rates* for SMS services (number of operators) Q4 18 and Q1 19	119
Figure 89: Lowest paid and charged unbalanced rates* for data services, (number of operators), Q4 18 and Q1 19	120
Figure 90: EEA average: Lowest wholesale roaming prices paid and charged by operators*, Q4 18 and Q1 19	121

Figure 91: MNOs and MVNOs: domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q4 18	123
Figure 92: MNOs and MVNOs: domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q1 19	124
Figure 93: Domestic calls made, average number of minutes per month per total number of subscribers, MNOs and MVNOs, Q4 18.....	126
Figure 94: Domestic calls made, average number of minutes per month per total number of subscribers, MNOs and MVNOs, Q1 19.....	127
Figure 95: Domestic calls received, average number of minutes per month per total number of subscribers, MNOs and MVNOs, Q4 18.....	128
Figure 96: Domestic calls received, average number of minutes per month per total number of subscribers, MNOs and MVNOs, Q1 19.....	129
Figure 97: Domestic SMS, average number of SMS per month per total number of subscribers, MNOs and MVNOs, Q4 18.....	130
Figure 98: Domestic SMS, average number of SMS per month per total number of subscribers, MNOs and MVNOs, Q1 19.....	131
Figure 99: Domestic data services, average consumption per month per total number of subscribers (GB), MNOs and MVNOs, Q4 18	132
Figure 100: Domestic data services, average consumption per month per total number of subscribers (GB), MNOs and MVNOs, Q1 19	133
Figure 101: EEA average mobile services consumption per month per total number of subscribers, Q4 18 and Q1 19	134
Figure 102: MNOs: share of total subscribers with EU/EEA roaming enabled, Q4 18	135
Figure 103: MNOs: share of total subscribers with EU/EEA roaming enabled, Q1 19	136
Figure 104: MVNOs: share of total subscribers with EU/EEA roaming enabled, Q4 18.....	137
Figure 105: MVNOs: share of total subscribers with EU/EEA roaming enabled, Q1 19.....	138
Figure 106: RLAH, calls made: average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q4 18.....	140
Figure 107: RLAH, calls made: average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q1 19.....	141
Figure 108: RLAH, calls received: average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q4 18.....	142
Figure 109: RLAH, calls received: average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q1 19.....	143
Figure 110: RLAH, calls made and calls received: EEA average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q4 17 – Q1 19.....	144
Figure 111: RLAH, SMS services: average number of SMS per month per total number of roaming subscribers, MNOs and MVNOs, Q4 18.....	145
Figure 112: RLAH, SMS services: average number of SMS per month per total number of roaming subscribers, MNOs and MVNOs, Q1 19.....	146
Figure 113: RLAH, SMS services: EEA average number of SMS per month per total number of roaming subscribers, MNOs and MVNOs, Q4 17 – Q1 19.....	147
Figure 114: RLAH, data services: average number of GB per month per total number of roaming subscribers, MNOs and MVNOs, Q4 18.....	148
Figure 115: RLAH, data services: average number of GB per month per total number of roaming subscribers, MNOs and MVNOs, Q1 19.....	149
Figure 116: RLAH, data services: EEA average number of GB per month per total number of roaming subscribers, MNOs and MVNOs, Q4 17 – Q1 19	150

Figure 117: Payment to the host operator for the provision of wholesale voice services (per unit), MVNO, Q4 18 and Q1 19.....	152
Figure 118: Payment to the host operator for the provision of wholesale SMS services (per unit), MVNO, Q4 18 and Q1 19.....	153
Figure 119: Payment to the host operator for the provision of wholesale Data services (per GB), MVNO, Q4 18 and Q1 19.....	154
Figure 120: EEA average of payment to the host operator for the provision of wholesale roaming services (per unit), MVNOs, Q4 18 and Q1 18	155

1. Structure of the Report

The International Roaming BEREC Benchmark Report (the “Report”) on Roaming contains five parts and two annexes. Chapter 2 is an **Introduction** to the Body of European Regulators for Electronic Communications (BEREC) Report and describes BEREC’s work on roaming based on the Roaming Regulation (EU) No. 531/2012, as amended by Regulation (EU) No. 2120/2015 and by Regulation (EU) No. 2017/920. The third Chapter “**Regulatory evolution**” outlines regulatory measures taken to reduce price levels for roaming services within the EU. The key findings of this Report are included in the fourth Chapter, “**Main findings**”. The fifth Chapter “**Charts**” presents the latest available data on the domestic mobile market and international roaming mobile market. “**Annex I: Methodology for the data collection**” provides a detailed description of the methodology for the current data collection. “**Annex II: List of respondents**” includes the list of operators that provided data for this Report. The Report is accompanied by a spreadsheet file enabling an easy and open access to the data included in the Report (published together with the Report) for the user.

2. Introduction

The Report presents the results of the 23rd round of data collection on European international roaming services undertaken by BEREC. The Report covers the period 1 October 2018 – 31 March 2019, i.e. the 4th quarter 2018 and 1st quarter 2019. The Report also includes data from previous rounds of data collection conducted by BEREC and its predecessor, the European Regulators Group (ERG). The earliest data is from the 2nd quarter 2007, when the Roaming Regulation was about to enter into force.

The applicable regulatory framework for this data collection is Roaming Regulation (EU) No. 531/2012, as amended by Regulation (EU) No. 2120/2015¹ and by Regulation (EU) No. 2017/920², applied in the European Union (EU)³, which includes new requirements for the retail and wholesale regulated tariffs for voice, SMS and data roaming.

The assessment of the international roaming market was based on the requirements set out in Article 19 (4) of the Roaming Regulation. In order to assess the competitive developments in the Union-wide roaming markets, BEREC is tasked with regularly collecting data from national regulatory authorities 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. It shall also collect data on the wholesale roaming agreements not subject to the maximum wholesale roaming charges provided for in Articles 7, 9 or 12 and 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 the collected data, BEREC also has to report regularly on the evolution of pricing

¹ Regulation (EU) No. 2120/2015, hereinafter ‘TSM Regulation’, available at: <http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32015R2120>

² Regulation (EU) 2017/920 of the European Parliament and of the Council of 17 May 2017 amending Regulation (EU) No 531/2012 as regards rules for wholesale roaming markets, available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32017R0920>.

³ The amendments are incorporated in the EEA agreement and are therefore applicable in the three EEA/EFTA states Iceland, Liechtenstein and Norway.

and consumption patterns in the Member States for both domestic and roaming services, on the evolution of actual wholesale roaming rates for unbalanced traffic between roaming providers 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 national regulatory authorities (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 European Commission before finalising the data collection templates;
- providing, as far as possible, a common response to the different questions posed during the collection process by operators and NRAs, as BEREC serves as the forum where these questions are commonly debated and addressed.

3. Regulatory evolution

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 ERG.

The 2007 Regulation

In 2005, 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. 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 2007⁴.

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

⁴ In Norway and Iceland the 2007 Regulation was in force from the end of 2007 to the 2nd quarter 2010.

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^{5,6}.

In particular, the Regulation introduced the following measures related to price control, applicable from 1 July 2009 to 30 June 2012:

- an extension of wholesale and retail price regulation for voice services, with yearly decreases in the levels of the caps;
- price regulation of SMS roaming services at both the wholesale and retail level;
- price regulation of data roaming services at the wholesale level.

And from July 2010 to June 2012:

- retail transparency measures to protect consumers from “bill shock” when using data roaming services.

The 2012 Regulation

On 30 May 2012 the Council of the European Union approved the International Roaming Regulation III⁷, which entered into force on 1 July 2012⁸.

The Regulation introduced the following measures, applicable from 1 July 2012:

- an extension of wholesale and retail price regulation for voice and SMS with yearly decreases in the levels of the caps until 30 June 2014, with those caps to remain in force until 30 June 2022 for wholesale services, and until 30 June 2017 for the Eurotariffs, subject to a further review by 30 June 2016;
- an extension of wholesale price regulation for data with yearly decreases in the levels of the caps until 30 June 2014, with those caps to remain in force until 30 June 2022;
- price regulation of data roaming services at the retail level with a yearly decrease in the level of the cap until 30 June 2014, with the cap to remain in force until 30 June 2017, being subject to a further review by 30 June 2016;
- the obligation for mobile network operators (MNOs) to meet all reasonable requests for wholesale roaming access, which comprises direct wholesale roaming access and wholesale roaming resale access under the rules set out in the Roaming Regulation. The Regulation also included provisions on the separate sale of roaming services which entered into force on 1 July 2014;
- extension of safeguard mechanisms. The Regulation requires providers to make available to their customers one or more maximum financial or volume limits on data

⁵ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:167:0012:0023:EN:PDF>.

⁶ From the 3rd quarter 2009 to the 1st 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.

⁷ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:172:0010:0035:EN:PDF>.

⁸ 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.

roaming use during an agreed specified period, subject to the customer's consent to continue ("cut-off mechanism"). The safeguard mechanisms also apply to data roaming services used by roaming customers travelling outside the EU except when the visited network operator in the visited country outside the EU does not allow the roaming provider to monitor its customer usage on a real-time basis. The cut-off limit should, in principle, be made available for all tariffs by default. However, when a customer opts for an offer without a cut-off limit, customers are given the right to be provided with a cut-off limit within one working day at their demand.

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. 2015/2120⁹, 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. 531/2012¹⁰, 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 (e.g. when a Fair Use Policy (FUP) under the conditions of the Roaming Regulation is breached or a data volume limit is exceeded). Moreover, according to Article 6c Roaming Regulation, in specific and exceptional circumstances, with a view to ensuring the sustainability of its domestic charging model, a roaming provider may apply for authorisation to apply a surcharge. The Roaming Regulation lays down detailed rules on the methodology for assessing the sustainability of the abolition of retail roaming surcharges and on the application to be submitted by a roaming provider for the purposes of that assessment. For more information on surcharges in excess of or non-compliance with the FUP and derogation mechanism please see BEREC Guidelines on Regulation (EU) No 531/2012, as amended by Regulation (EU) 2015/2120 and Commission Implementing Regulation (EU) 2016/2286 (Retail Roaming Guidelines)¹¹. 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 and the current Report includes indicators on volumes and revenues for RLAH, RLAH+ (non-compliance with/exceeding the FUP), RLAH+ (derogation) and alternative tariffs offered

⁹ Available at: <http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32015R2120>.

¹⁰ Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012R0531>.

¹¹The BEREC Guidelines on Regulation (EU) No 531/2012, as amended by Regulation (EU) 2015/2120 and Commission Implementing Regulation (EU) 2016/2286 (Retail Roaming Guidelines) are available at: http://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/guidelines/7005-berec-guidelines-on-regulation-eu-no-5312012-as-amended-by-regulation-eu-no-21202015-excluding-articles-3-4-and-5-on-wholesale-access-and-separate-sale-of-services.

by operators. BEREC would like to note that some indicators presented in the following figures and its evolution must be carefully evaluated as before the implementation of the Regulation (EU) No. 2120/2015, it was possible to clearly separate domestic revenues from intra-EEA roaming revenues, since the latter had a separate charging mechanism. However, with the implementation of RLAH, roaming is charged at domestic prices, except for alternative tariffs, and they are included therefore under domestic revenues. Only intra-EEA roaming revenues related to the application of surcharges and revenues from alternative tariffs are now reported under roaming revenues (see more details in Annex I).

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

Regulation (EU) No. 2017/920¹² 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. 531/2012¹³, 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 the current Report includes the lowest charged as proxy wholesale costs for roaming services and those new clauses to prevent permanent roaming introduced in the roaming wholesale agreements.

4. Main findings

Over 154 providers of international roaming services provided information for this Report. This number includes virtually all of the mobile network operators in the EEA countries, 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.

Retail domestic prices (ARRPU) for mobile services

BEREC has analysed the retail domestic prices and found that it is hard to disaggregate the different mobile communications services since they are often provided as part of a bundle of several services, including intra-EEA roaming communications and, in several cases, also non-mobile services. Operators find it difficult to organize 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 examined the alternative of presenting data on the evolution of the average retail revenue per user (ARRPU). However, in the context of the BoR (16) 33 BEREC Report on the wholesale roaming market it was emphasized that the ARRPU depends on many different parameters (volumes, handset subsidies, sensitivity to the number of active SIM cards, etc.). In general, the ARRPU is quite a weak index for comparing domestic price

¹² Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32017R0920>.

¹³ Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012R0531>.

levels. In spite of the limitations and lack of common methodology mentioned above, BEREC has calculated the ARRPU but notes that the results of it should be interpreted with caution. For this calculation BEREC used the data relative to mobile domestic services submitted by operators¹⁴. The domestic monthly ARRPU for Q4 2018 varies considerably between the countries, ranging from 3.67 Euros per month to 30.80 Euros per month, with a weighted EEA average of 10.59 Euros. The Report shows similar outcome for Q1 2019. ARRPU range from 3.55 Euros to 31.61 Euros per month, with a weighted EEA average of 10.26 Euros (Figure 1). BEREC would like to note the caveat that the disproportion between individual ARRPU could also be caused by different methodologies used by operators to allocate the revenues.

Roam Like At Home (RLAH) traffic

BEREC data show clear evidence of seasonal movements, with the Q3 having more traffic than any other quarter of the year. This is visible for the data roaming traffic (Figure 74) and for the roaming calls made (Figure 32) and for the volume of SMS (Figure 57).

In order to deal with the impact of seasonality, BEREC compared data with the same quarter of the previous year. In this sense, data traffic increased by 80.18 %, traffic for calls made by 8.67 %, traffic for calls received grew by 9.08 % and the volume of SMS decreased by 1.56 % in Q1 2019, compared with Q1 2018.

Although international roaming services demonstrate high seasonal variations, the results clearly show that the 2017 update of the Roaming Regulation has significantly contributed to stimulate the demand for roaming services and the development of the international roaming market.

EEA roaming consumption patterns

The introduction of RLAH services, coupled with the growing demand for data services, has changed the international roaming market. A relevant point could be made that the RLAH services enabled a substantial increase in international roaming traffic. In Q1 2019, the minutes generated under RLAH tariffs account for the majority of the voice traffic. 87.25% of minutes of calls made (Figure 26) and 84.42 % (Figure 34) of minutes of calls received were generated by subscribers of RLAH tariffs. For text messages sent while roaming within EEA countries, RLAH tariffs accounted for 89.81 % of the total volume in Q1 2019 (Figure 51). In the same period, around 87.83 % of data traffic was based on the RLAH data tariff while roaming (Figure 68). The average EEA roaming subscriber spent 17.33 minutes per month in calls made in Q1 2019 in comparison to 18.54 minutes in Q1 2018 (Figure 29), a negative variation of about 6.53 % in that period. The number of received call minutes abroad amounted to 14.81 minutes per EEA average roaming subscriber per month in Q1 2019, whereas this was around 15.79 minutes in Q1 2018 (Figure 37). Data roaming consumption ranged from 0.19 (Germany) to 1.55 GB (Estonia) per roaming subscriber per month in Q1 2019, in comparison to the range from 0.13 to 0.72 GB in Q1 2018 (Figure 70).

¹⁴ 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.

Rest of the World (RoW) roaming retail prices

With regard to the 'Rest of World' retail voice roaming calls (Figure 75 and Figure 76), the EEA average RoW tariff for calls made was 52.58 Euro cents in Q4 2018 and 50.36 Euro cents in Q1 2019. The EEA average prices for calls received are given in Figure 77 and Figure 78. Receiving calls when roaming outside the EEA area cost 28.54 Euro cents in Q4 2018 and 26.95 Euro cents in Q1 2019. At the same time, data from the operators reveals that the average price for data consumption outside EEA (Figure 81 and Figure 82) cost 49.27 Euro per GB in Q4 2018 and 43.75 Euro per GB in Q1 2019.

Wholesale roaming rates

At the wholesale level, the voice, SMS and data roaming charges set between operators have declined below the regulated average caps.

The applicable price caps and the related EEA average prices during the data collection period were:

Service at wholesale level (no VAT)	Q4 2018		Q1 2019	
	Price Cap	EEA Average	Price Cap	EEA Average
Wholesale voice (€/minute)	3.2	2.07	3.2	1.97
Wholesale SMS (€/SMS)	1	0.38	1	0.32
Wholesale data (€/GB ¹⁵)	6	2.30	4.5	1.76

Wholesale roaming rates for outgoing calls

At the wholesale level (Figure 18 and Figure 19), the EEA average price was 2.07 Euro cents in Q4 2018 and declined to 1.97 Euro cents in Q1 2019 compared to a cap of 3.2 Euro cents. A reduction in the average EEA wholesale prices for intra-EEA roaming voice calls since 2008 (Figure 20) is observed. BEREC also assessed the prices for balanced and unbalanced traffic (Figure 16 and Figure 17). The EEA average wholesale price for balanced traffic was 2.18 Euro cents during Q4 2018 and declined to 2.01 Euro cents during Q1 2019. Meanwhile, the EEA average payments for unbalanced traffic were at 1.71 Euro cents in Q4 2018 and slightly growth to 1.75 Euro cents in Q1 2019.

Wholesale roaming rates for SMS

At the wholesale level, a reduction in the average EEA SMS price (Figure 43 and Figure 44) to 0.38 Euro cents in Q4 2018 and 0.32 in Q1 2019 is observed compared to a cap of 1 Euro cents respectively. It is worth noting that the lowest wholesale prices in 2018 were recorded in Q2 and Q3 2018 (0.28 Euro cents in both quarters). The average price for balanced traffic was 0.42 Euro cents in Q4 2018 and 0.36 Euro cents in Q1 2019 and the average price for unbalanced traffic was 0.30 Euro cents in Q4 2018 and 0.24 Euro cents in Q1 2019 (Figure 41 and Figure 42).

¹⁵ Conversion of gigabytes to megabytes was done in line with Recital 17 of 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 being equal to 1000 megabytes.

Wholesale roaming rates for data

At the wholesale level, the data cap applying in the EEA is 6 Euro per GB in Q4 2018 and 4.5 Euro per GB in Q1 2019. The EEA average price for wholesale data services fell to 2.30 Euro per GB Q4 2018, compared to 3.98 Euro in Q4 2017 (Figure 60). The prices continued to decline in Q1 2019. The EEA average price for wholesale data services fell to 1.76 Euro per GB in Q1 2019, compared to 2.70 Euro in Q1 2018 (Figure 61). In the context of the wholesale inbound roaming prices, the EEA average price for balanced traffic was 2.45 Euro per GB in Q4 2018 and 1.82 Euro per GB in Q1 2019, whereas the EEA average price for unbalanced traffic was 1.85 Euro per GB in Q4 2018 and 1.59 Euro per GB in Q1 2019 (Figure 58 and Figure 59).

Wholesale roaming agreements (Article 3)

In the case of wholesale agreements based on Article 3 of the Roaming Regulation, only some operators submitted these data. BEREC's International Roaming Compliance Report¹⁶ showed that operators negotiated roaming services at the wholesale level individually and that the provision of such services was based on commercial agreements. Some light MVNOs as well as resellers stated that these services continued to be provided on the basis of the existing contracts with national host MNOs and their wholesale prices stay close to CAP prices of the Roaming Regulation (Figure 84, Figure 85 and Figure 86).

How wholesale costs and prices relate to each other

In the table below, BEREC presents the cost estimates for wholesale roaming services per country. The estimation of the unit cost per service is based on the Axon Consultants cost model¹⁷. However, apart from the Axon's model output per country¹⁸/per service, the unit costs included in the tables below include also an estimation for transit costs (for voice and data services) and an estimation of voice termination costs (for voice service). Axon study does not provide one single result for each type of service, country and year, but provides 72 scenarios (for example for Austria for roaming voice service for 2020 the model calculates 72 different unit costs depending on the combination of parameters/methodological approaches under which the model is run). Therefore, in the tables below, the range of the cost estimates are presented¹⁹.

¹⁶ BEREC International Roaming Compliance Report (Regulation (EU) No 531/512 of the European Parliament and of the Council of 13 June 2012 on roaming) is available at:

http://berec.europa.eu/eng/document_register/subject_matter/berec/reports/1482-berec-international-roaming-compliance-report-regulation-eu-no-531512-of-the-european-parliament-and-of-the-council-of-13-june-2012-on-roaming.

¹⁷ <https://ec.europa.eu/digital-single-market/en/news/finalisation-mobile-cost-model-roaming-and-delegated-act-single-eu-wide-mobile-voice-call>.

¹⁸ 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

¹⁹ Except for SMS services for which there is insignificant differentiation between the various scenarios for which only the max cost estimate is presented.

Wholesale roaming services cost estimates (in €cents/min) in each of the 28 countries for 2018²⁰

	voice min	voice max	SMS max	data min	data max
AT	1.62	1.87	0.13	0.74	1.03
BE	2.05	2.46	0.15	1.89	2.83
BG	1.63	1.78	0.05	0.96	1.78
CY	1.98	2.06	0.18	1.53	1.79
CZ	2.00	2.30	0.10	1.06	1.57
DE	2.18	2.31	0.06	2.16	2.76
DK	1.62	1.66	0.08	0.69	0.97
EE	1.72	1.76	0.32	0.95	1.28
EL	1.88	2.04	0.09	2.15	2.82
ES	1.74	1.86	0.06	1.98	3.45
FI	1.54	1.56	0.13	0.71	1.12
FR	1.70	1.90	0.07	1.53	2.44
HR	1.66	1.73	0.07	1.19	1.88
HU	2.10	2.32	0.11	2.00	2.83
IE	1.73	2.02	0.04	1.57	2.11
IT	1.78	1.91	0.05	1.19	1.59
LT	1.71	1.91	0.05	0.96	1.91
LV	1.65	1.85	0.27	0.68	1.04
MT	2.55	2.72	0.35	2.71	3.44
NL	1.77	1.95	0.07	1.38	2.72
PL	1.53	1.58	0.09	0.61	0.90
PT	1.73	1.90	0.07	1.19	1.96
RO	1.60	1.73	0.07	0.81	1.59
SE	1.81	1.96	0.06	1.05	1.53
SI	1.94	2.05	0.22	1.20	1.71
SK	1.80	1.97	0.06	1.32	1.91
UK	1.89	1.94	0.10	1.56	2.02
NO	2.05	2.26	0.14	1.38	1.97
Average	1.82	1.98	0.12	1.33	1.96

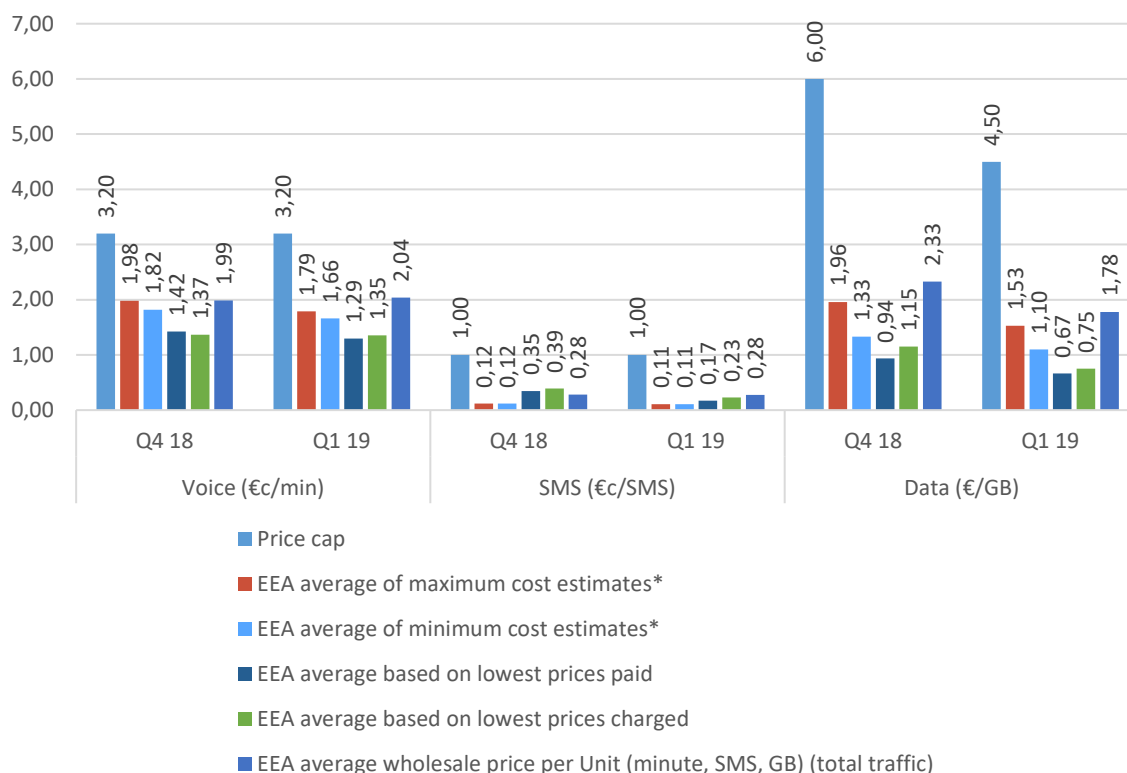
²⁰ These cost estimates include: 1) the total wholesale roaming costs in MS estimated by Axon (including network costs, roaming-specific costs and the impact of seasonality on roaming costs); 2) an estimation for the termination rate that the visited network operator needs to pay the terminating network 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

Wholesale roaming services cost estimates (in €cents/min) in each of the 28 countries for 2019²¹

	voice min	voice max	SMS max	data min	data max
AT	1.5	1.63	0.13	0.61	0.79
BE	1.82	2.15	0.15	1.53	2.37
BG	1.5	1.62	0.04	0.85	1.23
CY	1.79	1.86	0.16	1.3	1.53
CZ	1.77	2.1	0.1	0.9	1.34
DE	1.96	2.12	0.06	1.85	2.09
DK	1.5	1.55	0.08	0.62	0.85
EE	1.57	1.62	0.3	0.8	0.97
EL	1.65	1.78	0.08	1.74	2.13
ES	1.59	1.71	0.05	1.55	2.34
FI	1.44	1.46	0.13	0.63	1.11
FR	1.57	1.74	0.07	1.3	1.96
HR	1.53	1.62	0.07	0.85	1.4
HU	1.86	2.02	0.11	1.66	2.4
IE	1.55	1.69	0.04	1.22	1.8
IT	1.62	1.72	0.05	1.03	1.31
LT	1.55	1.68	0.05	0.78	1.23
LV	1.52	1.71	0.27	0.61	0.84
MT	2.34	2.52	0.31	2.04	2.72
NL	1.59	1.74	0.07	1.17	1.98
PL	1.43	1.45	0.09	0.57	0.71
PT	1.59	1.67	0.06	0.98	1.4
RO	1.46	1.57	0.07	0.73	1.13
SE	1.65	1.84	0.06	0.86	1.19
SI	1.75	1.81	0.2	1	1.39
SK	1.64	1.86	0.06	1.01	1.4
UK	1.75	1.82	0.1	1.3	1.61
NO	1.85	2.03	0.13	1.2	1.72
Average	1.66	1.79	0.11	1.1	1.53

²¹ 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

BEREC compared the lowest wholesale prices for the unbalanced traffic in Q4 2018 and Q1 2019 against the estimated unit costs for 2018 and 2019 ²².



The evidence from the estimates of the EEA wholesale rates for the outgoing calls and data services shows that EEA average of the maximum unit cost estimates for 2018 and 2019 are lower than but close to the EEA average wholesale prices. EEA average wholesale rate for SMS services is more than twice the EEA average of Axon's unit cost estimates.

Further information on unit cost estimates can be found in the BEREC supplementary analysis on wholesale roaming costs²³.

MNOs and MVNOs

For both quarters (Q4'18 and Q1'19), the ARRPU of MNOs is higher than MVNOs (Figure 91 and Figure 92). Roaming consumption is lower for MVNOs' subscribers than for those of MNOs (Figure 106 to Figure 115). It is also worth noting that payments made by MVNOs to

²² Prices are calculated from the lowest unbalanced rates submitted by the operators and expressed as simple average

* 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).

²³ 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

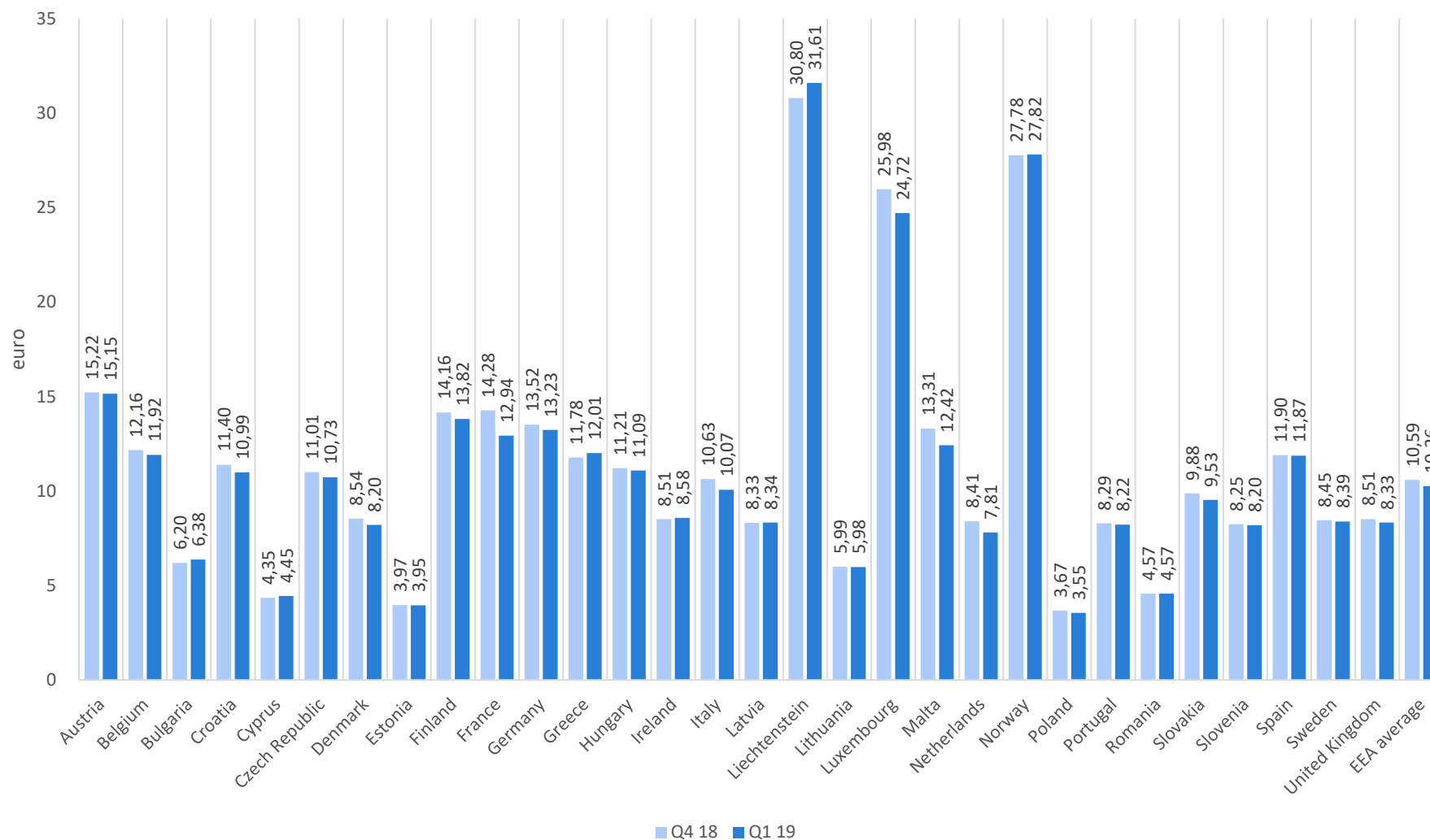
the host operators for wholesale roaming service for all services are higher than the average wholesale prices (Figure 117 to Figure 120).

5. Charts

5.1. Analysis of subscribers and those that use roaming services

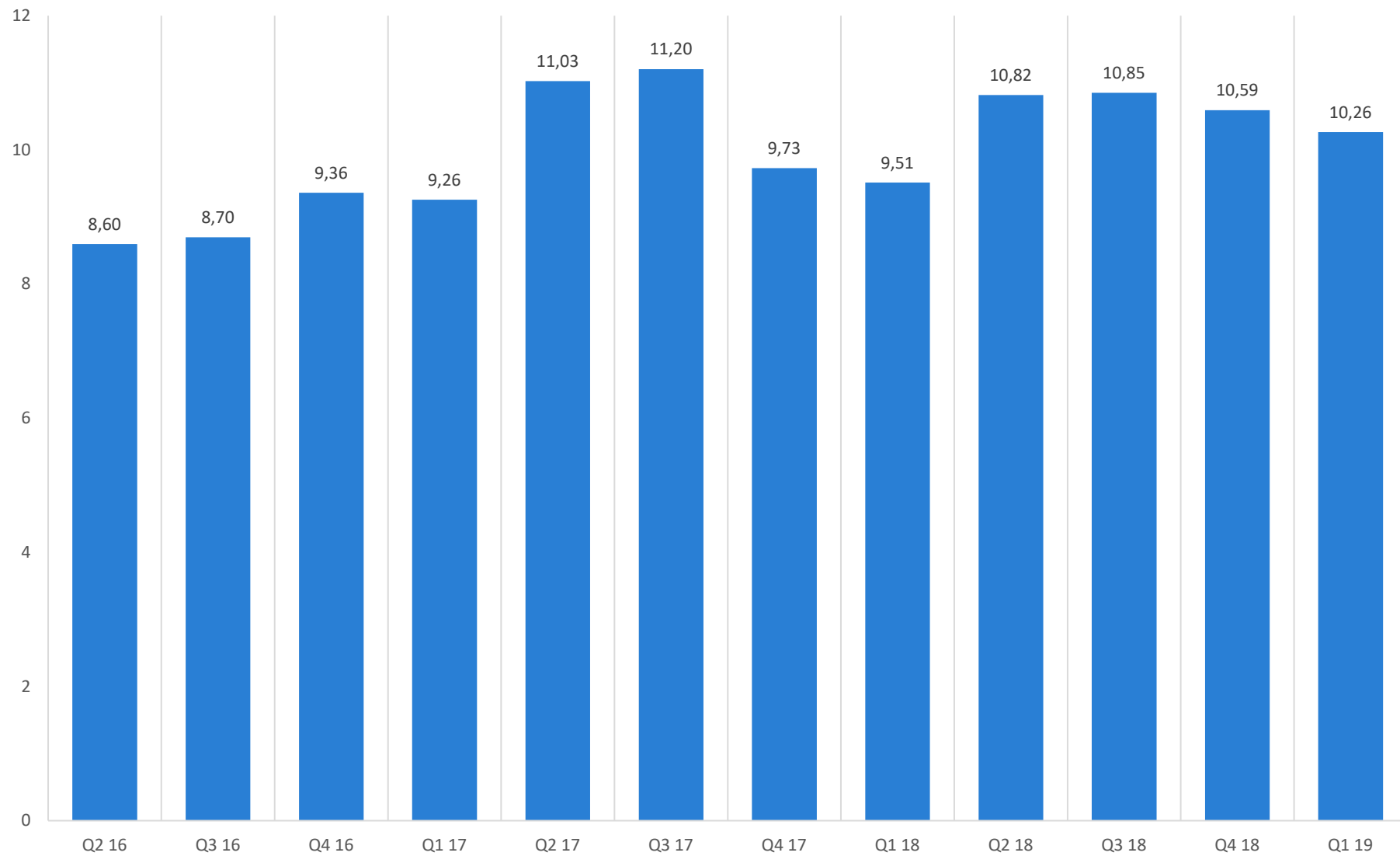
5.1.1. Domestic average Retail Mobile Revenue per User (ARRPU)

Figure 1: Domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q4 18 and Q1 19



Portugal: 1 of the 3 MNOs listed in the annex was not able to estimate domestic mobile revenues and therefore the ARRPU was calculated using the data of the 2 remaining MNOs and of the 3 MVNOs.

Figure 2: EEA average: domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q2 16 – Q1 19



5.1.2. Consumption patterns for domestic mobile retail services

Figure 3: Domestic calls made: average number of minutes per month per total number of subscribers, Q4 18 and Q1 19

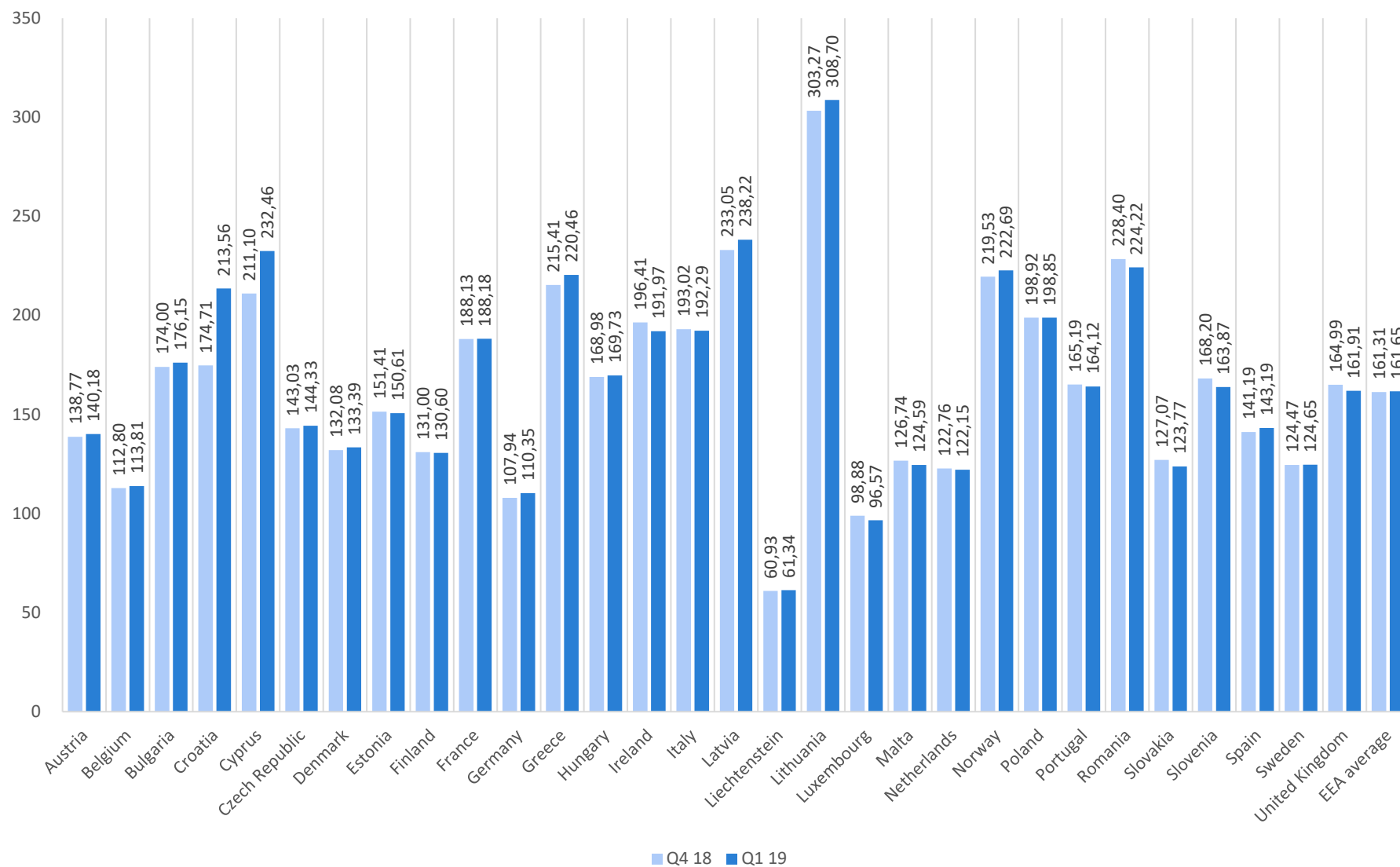


Figure 4: Domestic calls received: average number of minutes per month per total number of subscribers, Q4 18 and Q1 19

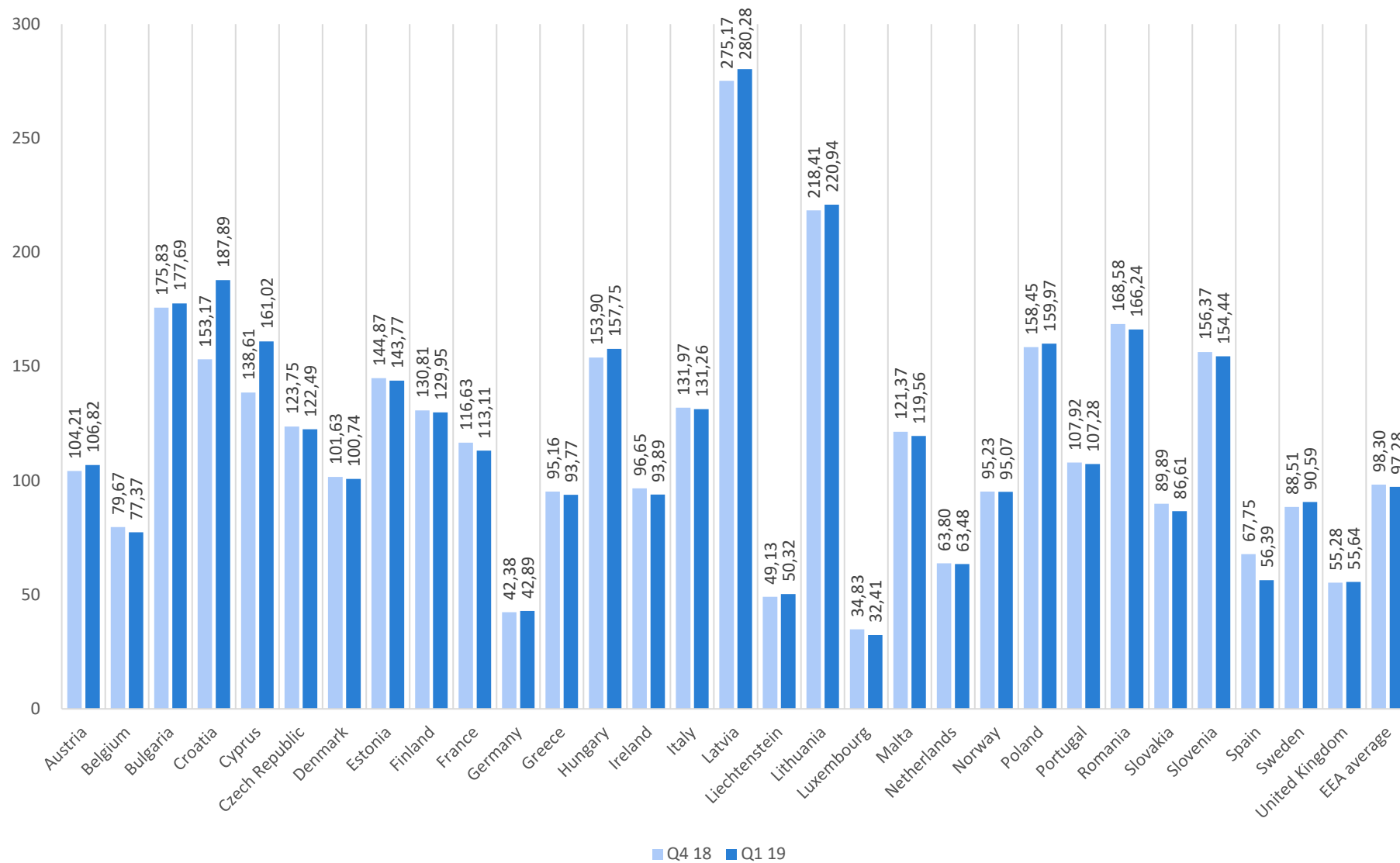


Figure 5: Domestic SMS services: average number of SMS per month per total number of subscribers, Q4 18 and Q1 19

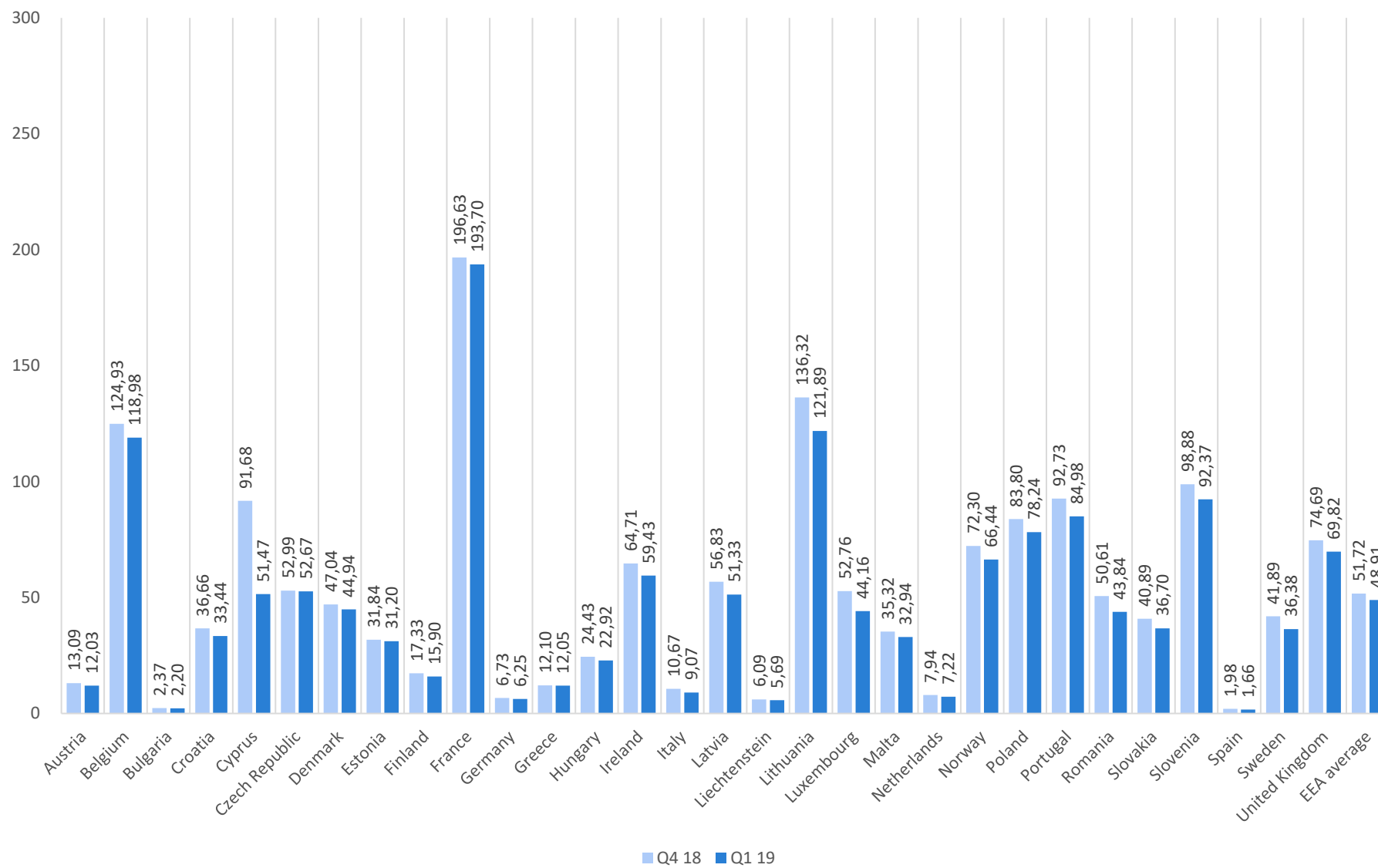
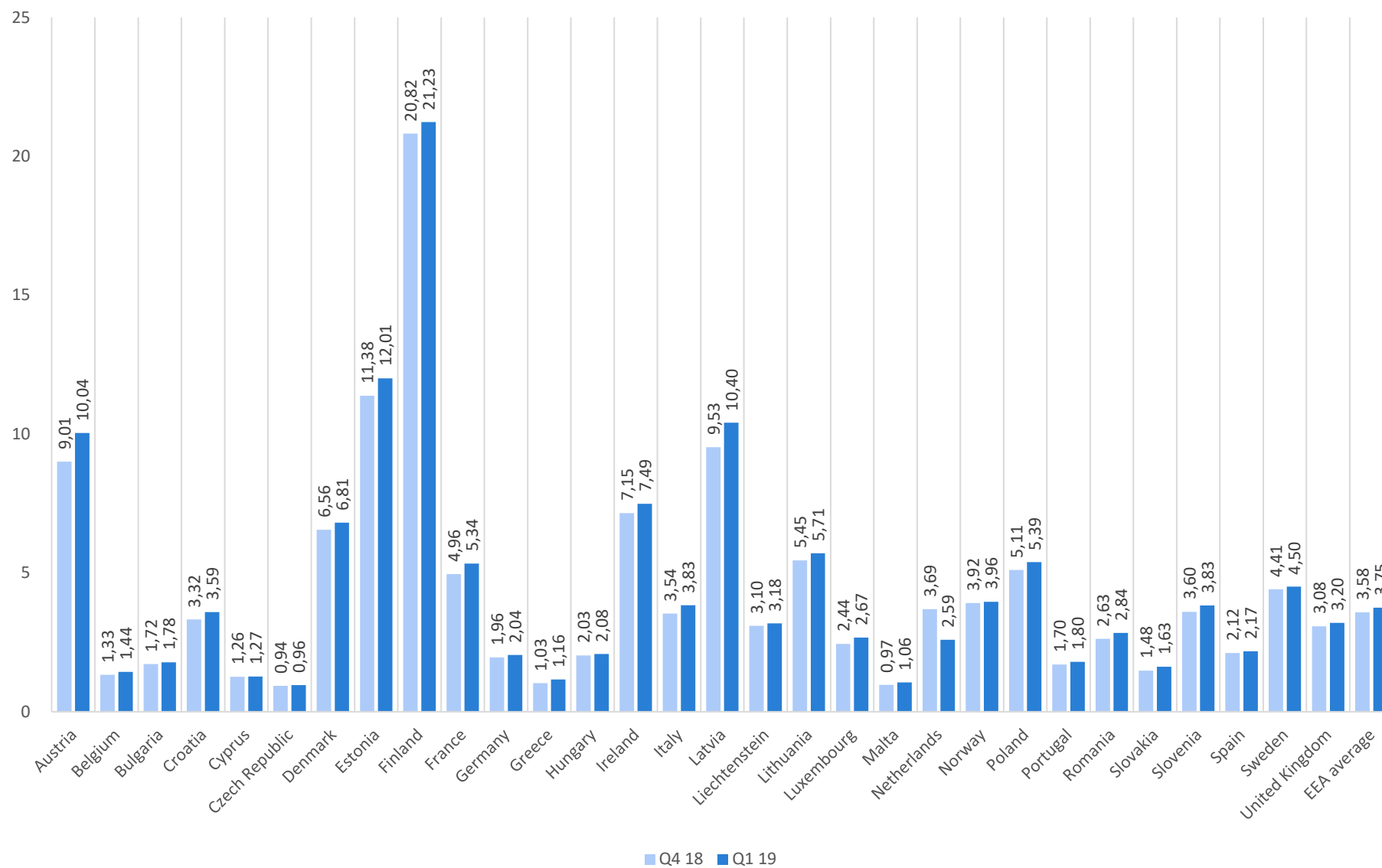


Figure 6: Domestic data services: average consumption per month per total number of subscribers (GB), Q4 18 and Q1 19



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

Figure 7: RLAH, calls made: average number of RLAH minutes per month per total number of roaming subscribers with active RLAH services, Q4 18 and Q1 19

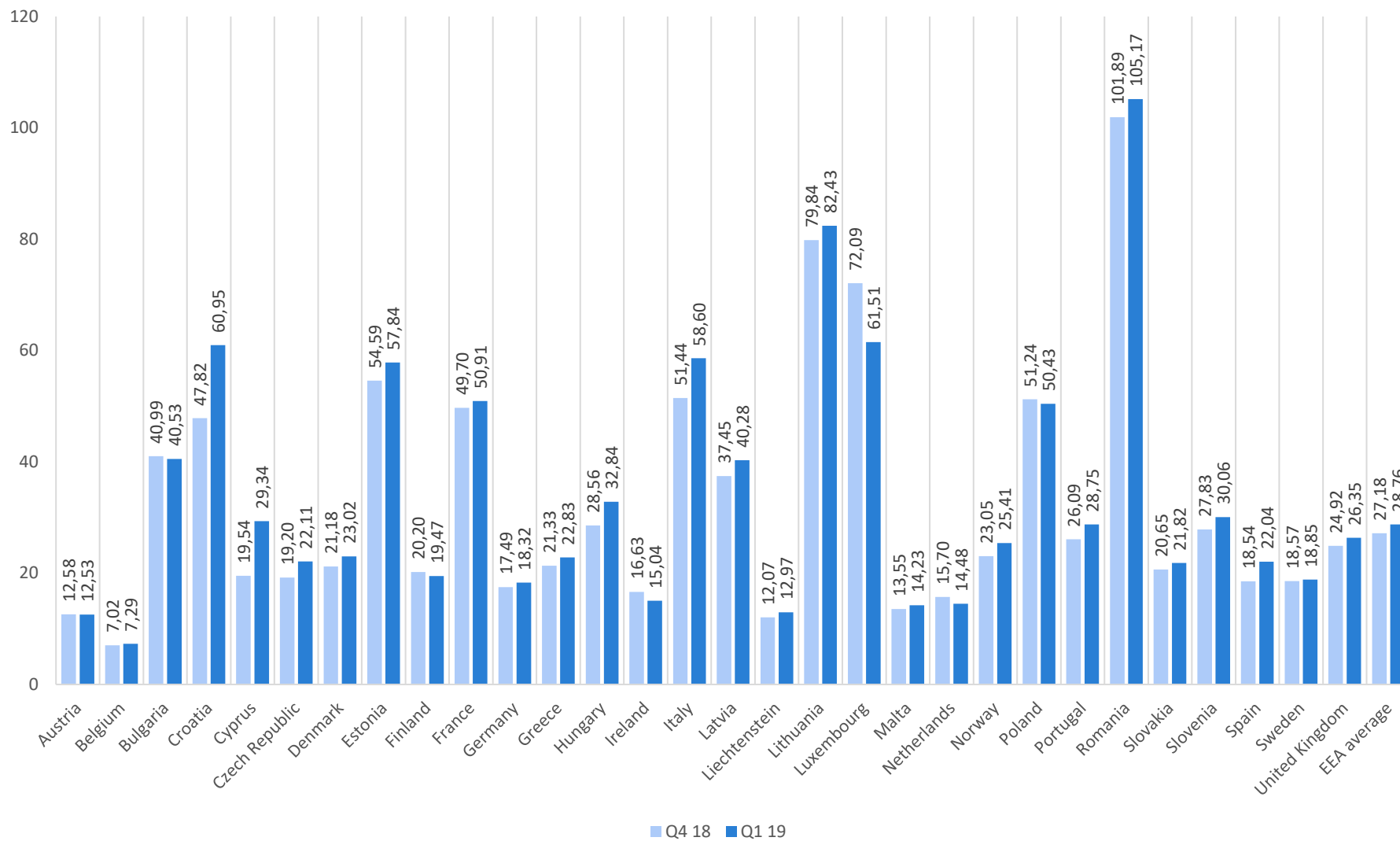


Figure 8: RLAH, calls received: average number of RLAH minutes per month per total number of roaming subscribers with active RLAH services, Q4 18 and Q1 19

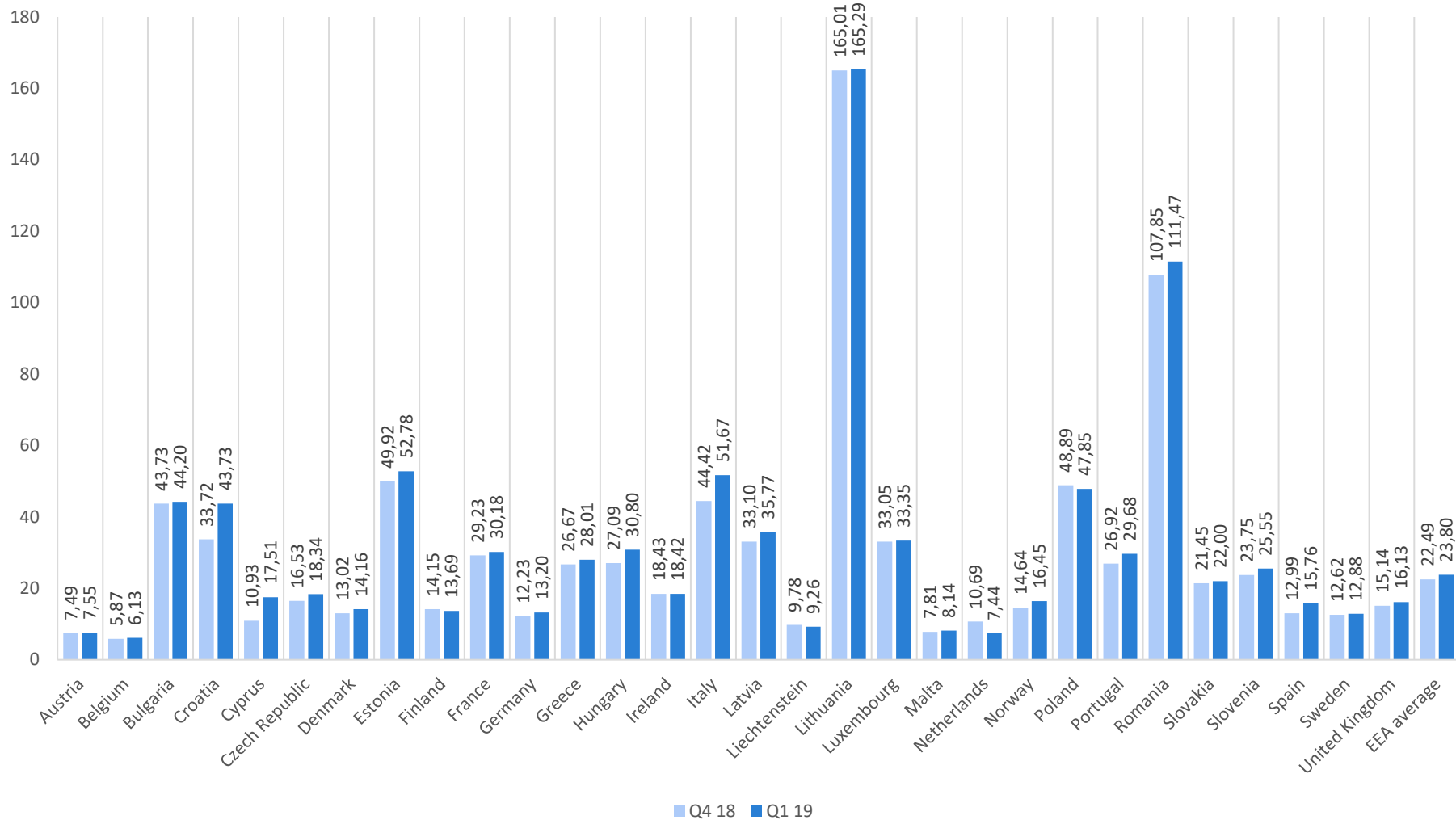
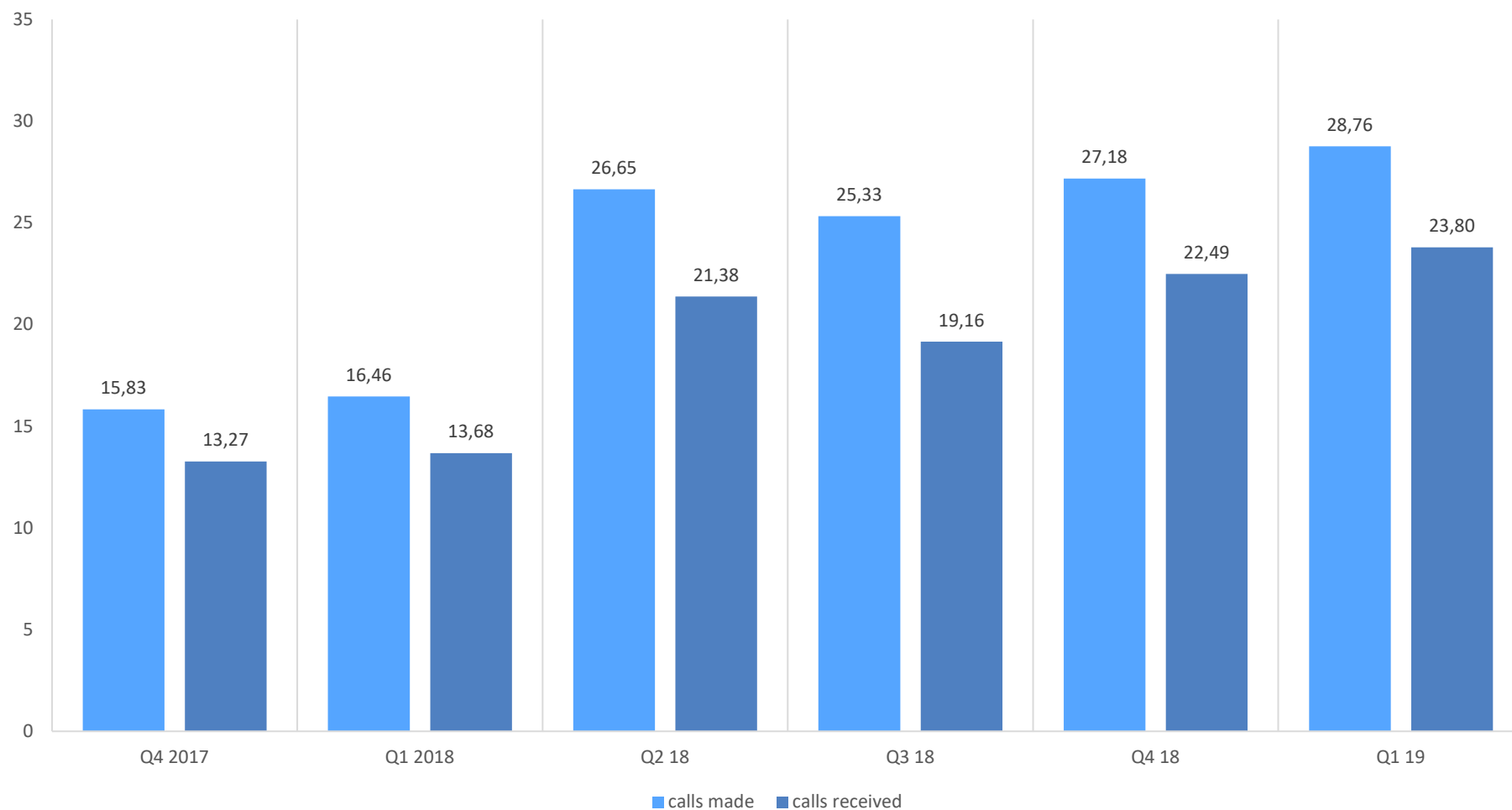


Figure 9: EEA average number of RLAH minutes per month per total number of roaming subscribers with active RLAH services, Q4 17 – Q1 19



BEREC changed the way it presents consumption patterns for RLAH services in order to make it easier to interpret. Indicator since Q2 18 has been calculated by dividing RLAH volumes by number of active subscribers with RLAH services that were roaming at least once in the concerned period in the EEA. This is to ensure that period to period changes in the indicator are not influenced by subscribers with different tariff plans. For correct interpretation of the trend, reader should take into account that Q4 17 and Q1 18 is calculated by dividing RLAH volumes by number of all active subscribers that were roaming at least once in the concerned quarter in the EEA.

Figure 10: RLAH, SMS services: average number of SMS per month per total number of roaming subscribers with active RLAH services, Q4 18 and Q1 19

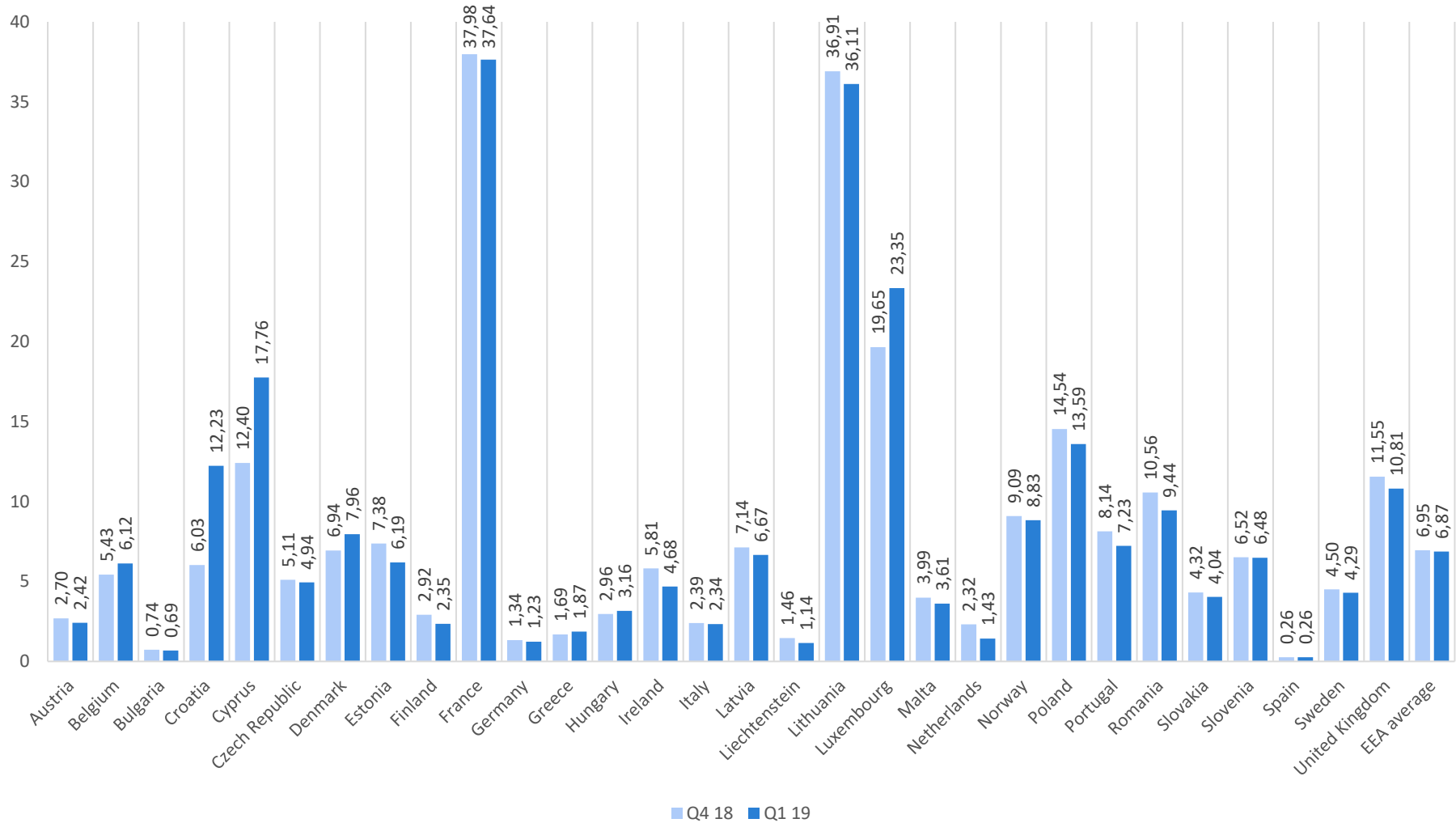
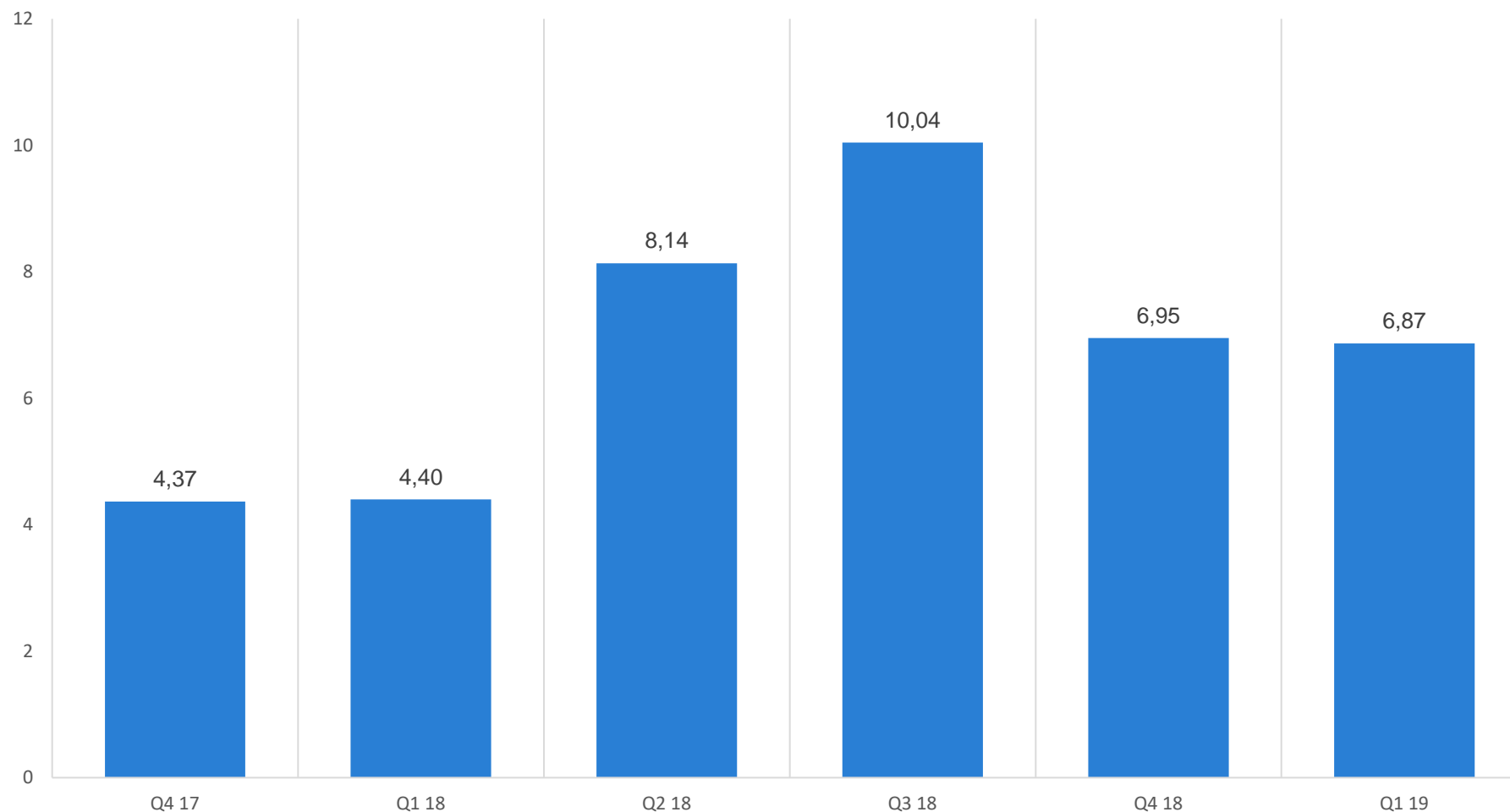


Figure 11: EEA average number of SMS per month per total number of roaming subscribers with active RLAH services, Q4 17 – Q1 19



BEREC has changed the way it presents consumption patterns for RLAH services in order to make it easier to interpret. Indicator since Q2 18 has been calculated by dividing RLAH volumes by number of active subscribers with RLAH services that were roaming at least once in the concerned period in the EEA. This is to ensure that period-to-period changes in the indicator are not influenced by subscribers with different tariff plans. For correct interpretation of the trend, the reader should take into account that Q4 17 and Q1 18 are calculated by dividing RLAH volumes by the number of all active subscribers that were roaming at least once in the concerned quarter in the EEA.

Figure 12: RLAH, data services: average consumption per month per total number of roaming subscribers with active RLAH services (in GB), Q4 18 and Q1 19

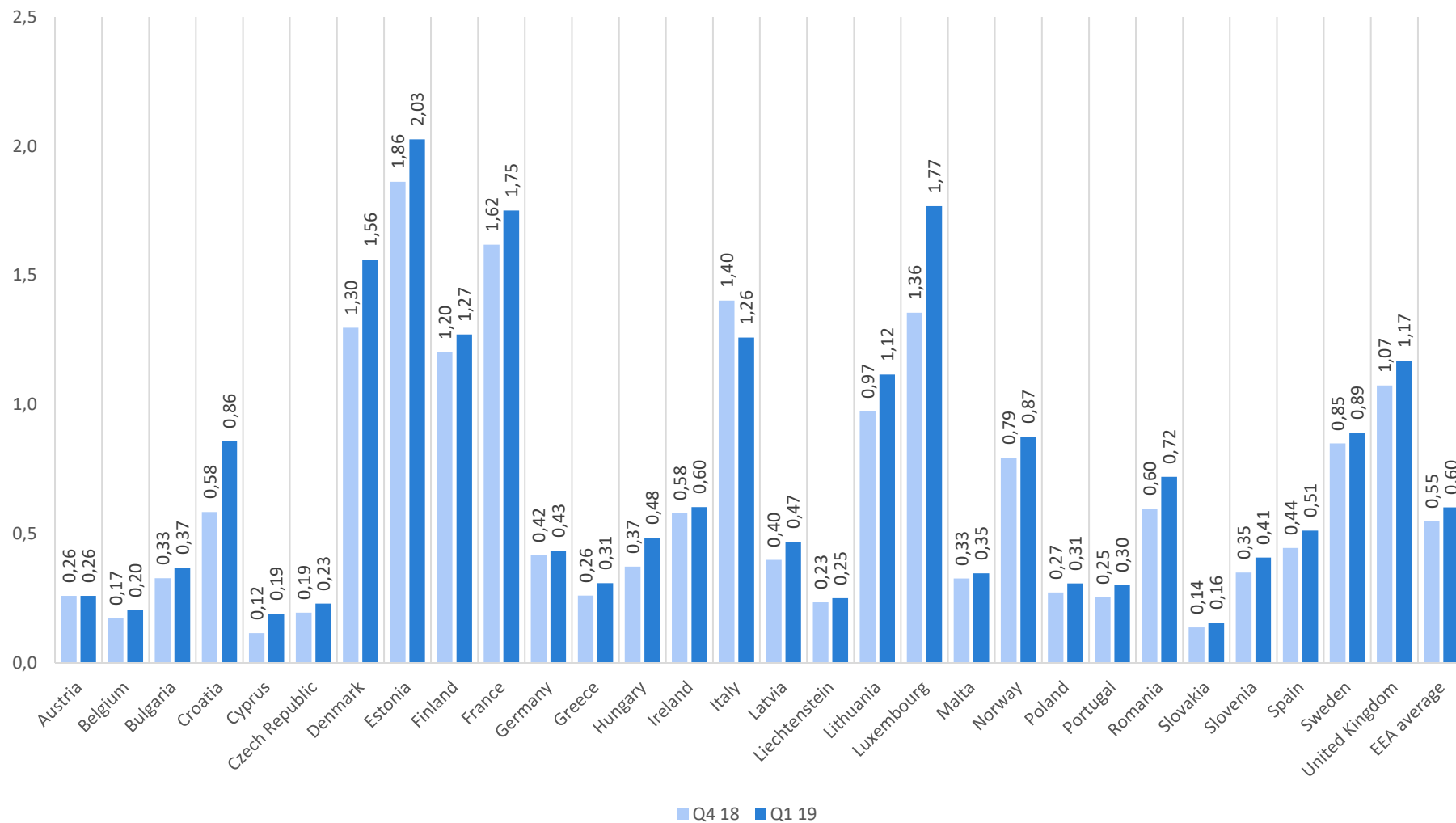
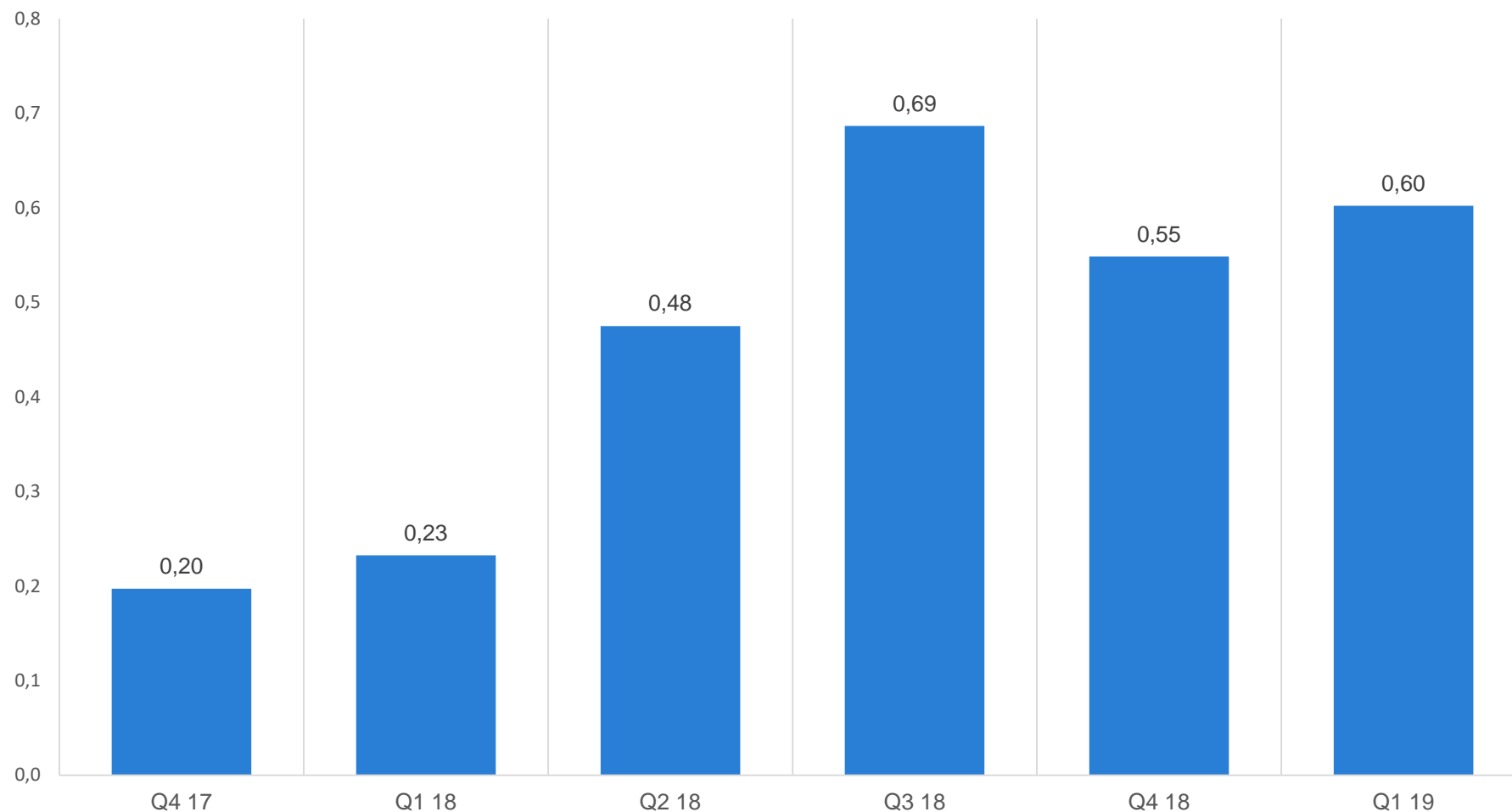


Figure 13: RLAH, data services: EEA average consumption per month per total number of roaming subscribers with active RLAH services (in GB), Q4 17 – Q1 19



BEREC has changed the way it presents consumption patterns for RLAH services in order to make it easier to interpret. Indicator since Q2 18 has been calculated by dividing RLAH volumes by number of active subscribers with RLAH services that were roaming at least once in the concerned period in the EEA. This is to ensure that period-to-period changes in the indicator are not influenced by subscribers with different tariff plans. For correct interpretation of the trend, the reader should take into account that Q4 17 and Q1 18 are calculated by dividing RLAH volumes by the number of all active subscribers that were roaming at least once in the concerned quarter in the EEA.

Figure 14: Share of total subscribers with EU/EEA roaming enabled, Q4 18

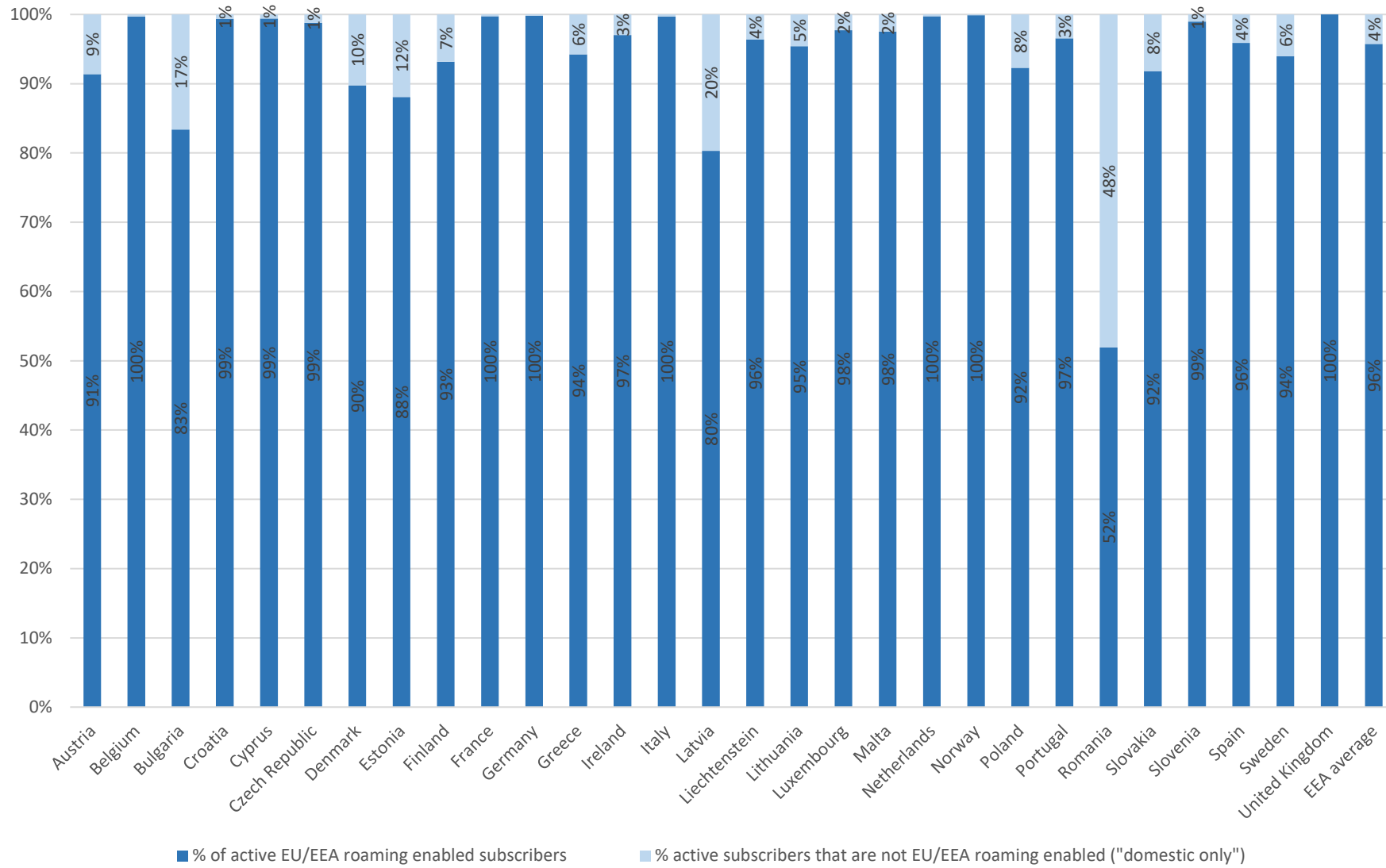
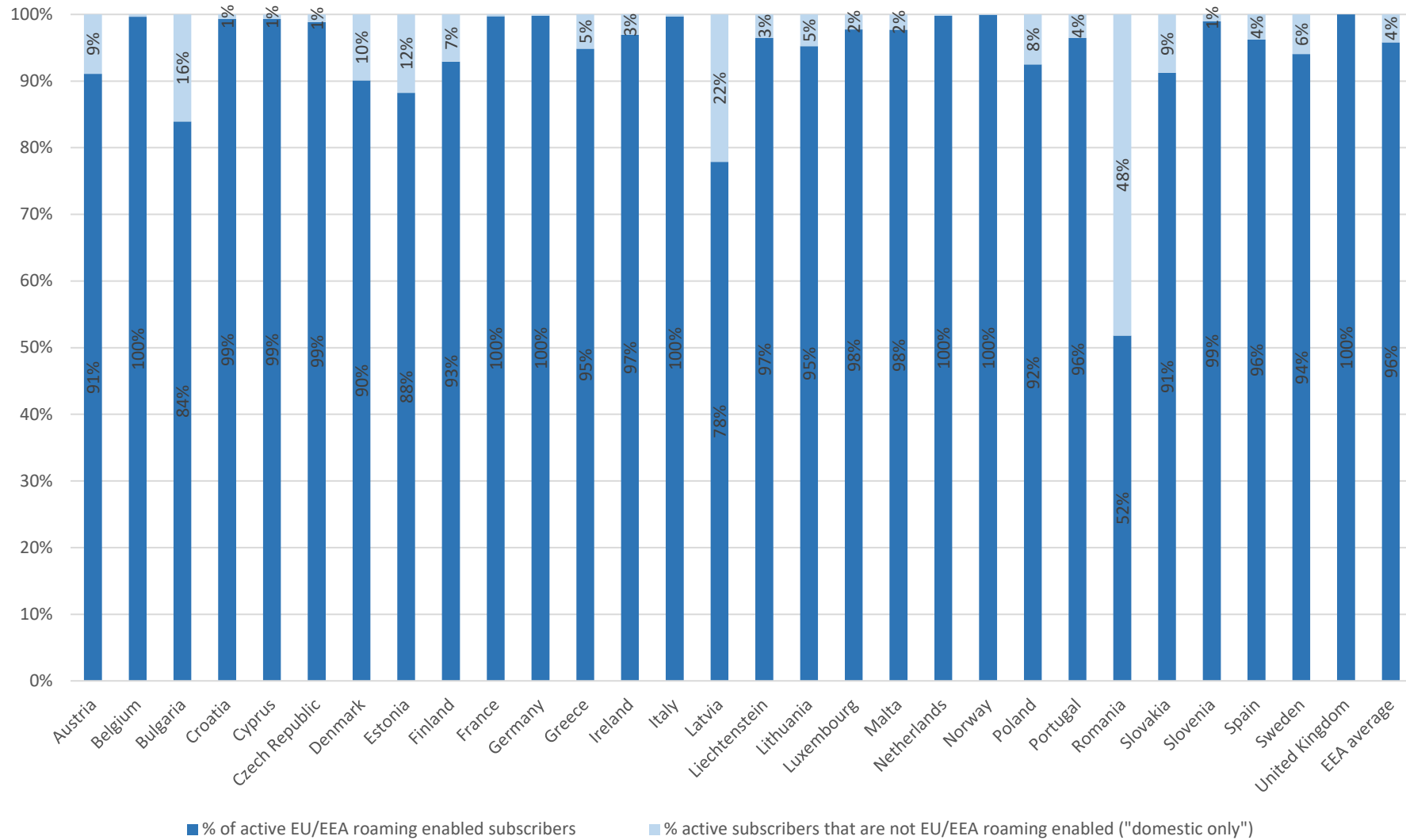


Figure 15: Share of total subscribers with EU/EEA roaming enabled, Q1 19

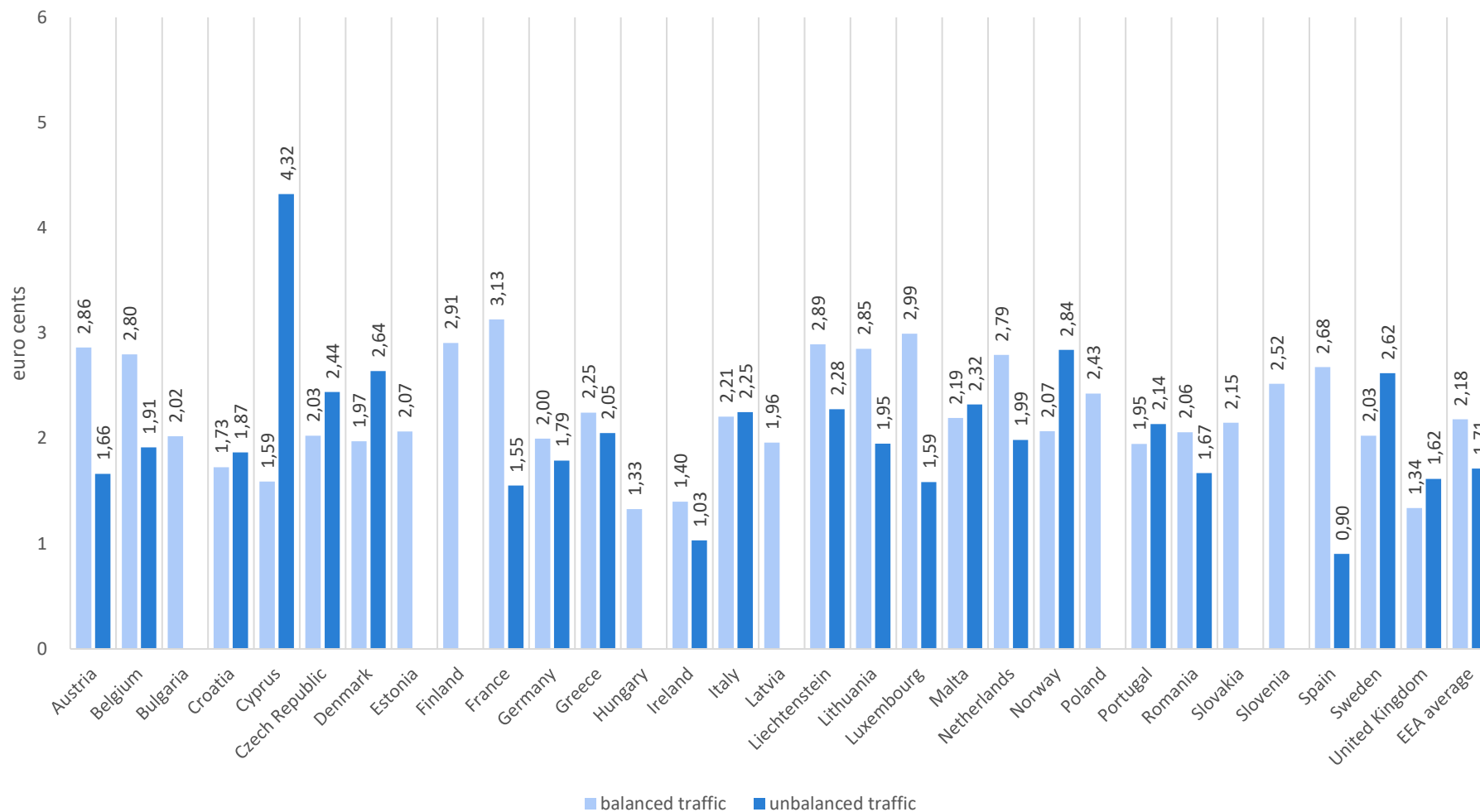


5.2. The development of Roaming Services

5.2.1. Voice roaming services

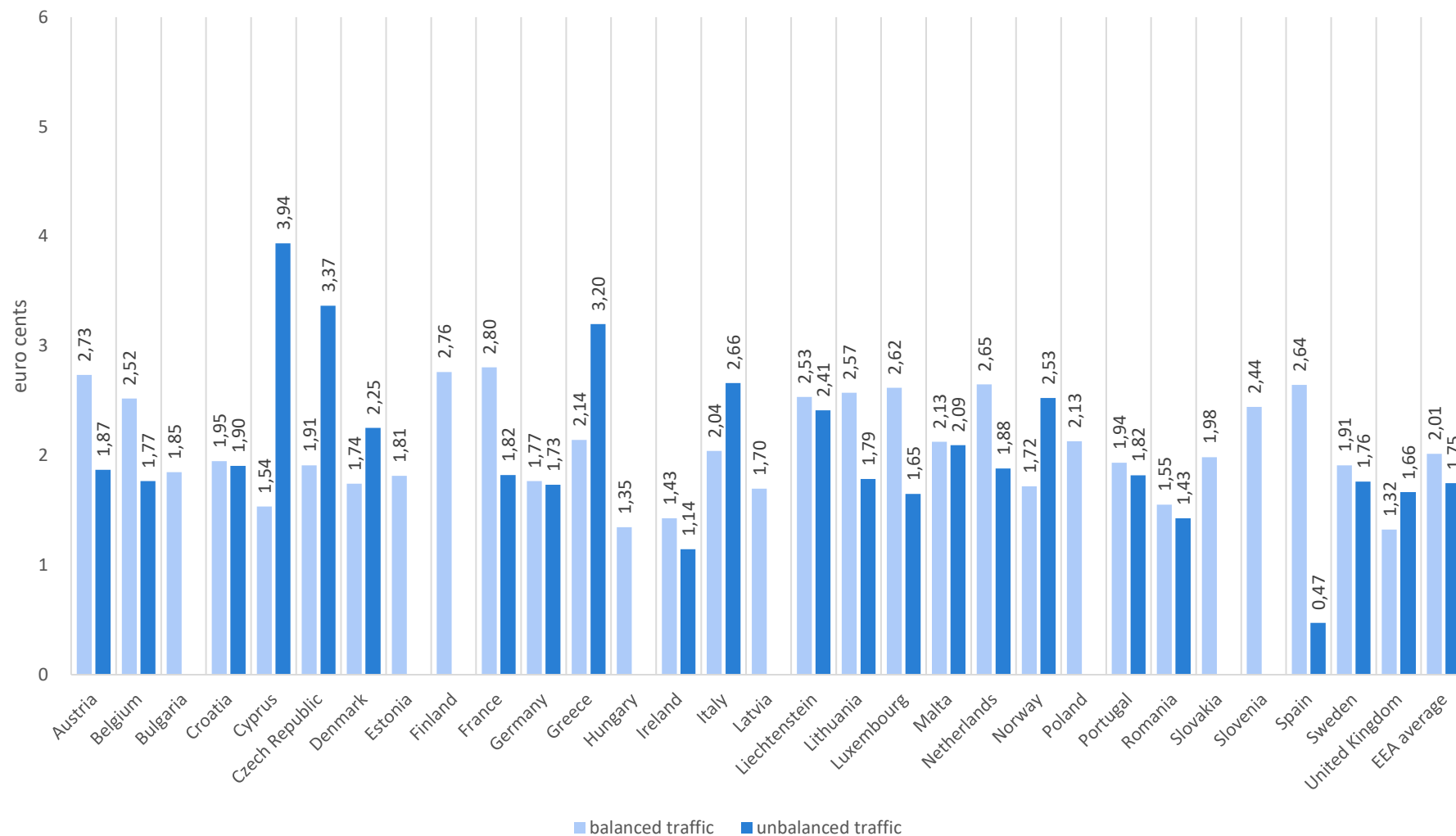
5.2.1.1 Wholesale prices

Figure 16: Average wholesale price per minute for roaming voice calls: charges for balanced and unbalanced traffic (wholesale roaming inbound), Q4 18



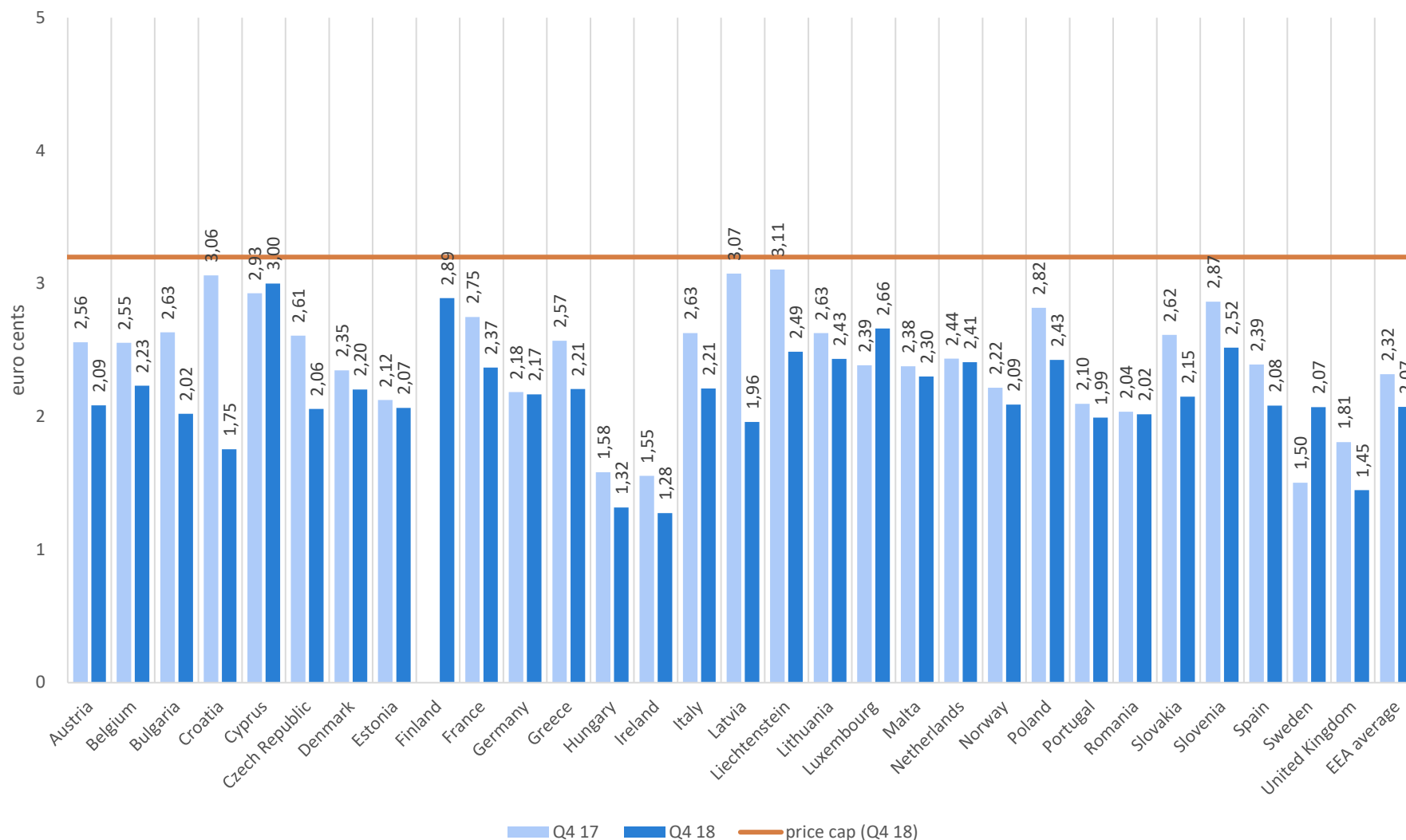
Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the estimates (non-disaggregated) in Figure 18 and Figure 19.

Figure 17: Average wholesale price per minute for roaming voice calls: charges for balanced and unbalanced traffic (wholesale roaming inbound), Q1 19



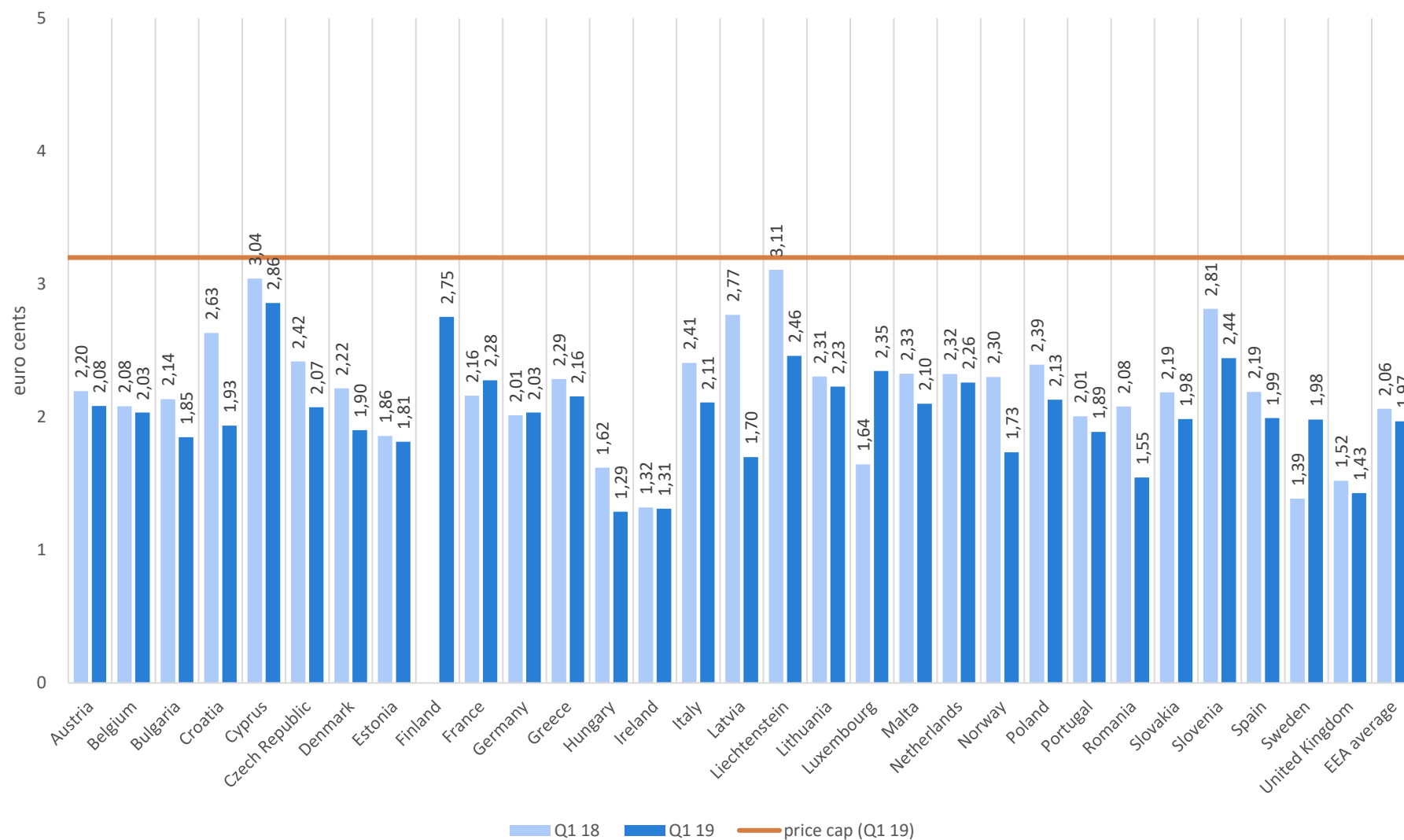
Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the estimates (non-disaggregated) in Figure 18 and Figure 19

Figure 18: Total traffic (wholesale roaming inbound): average wholesale price per minute for roaming voice calls, Q4 17 and Q4 18



Portugal: the number of operators that reported data for calculating these estimates is different from the number of operators that reported data for calculating the estimates (disaggregated for balanced and unbalanced traffic) in Figure 16 and Figure 17

Figure 19: Total traffic (wholesale roaming inbound): average wholesale price per minute for roaming voice calls, Q1 18 and Q1 19



Portugal: the number of operators that reported data for calculating these estimates is different from the number of operators that reported data for calculating the estimates (disaggregated for balanced and unbalanced traffic) in Figure 16 and Figure 17

Figure 20: EEA average wholesale price per minute for wholesale roaming voice calls, Q2 07 – Q1 19

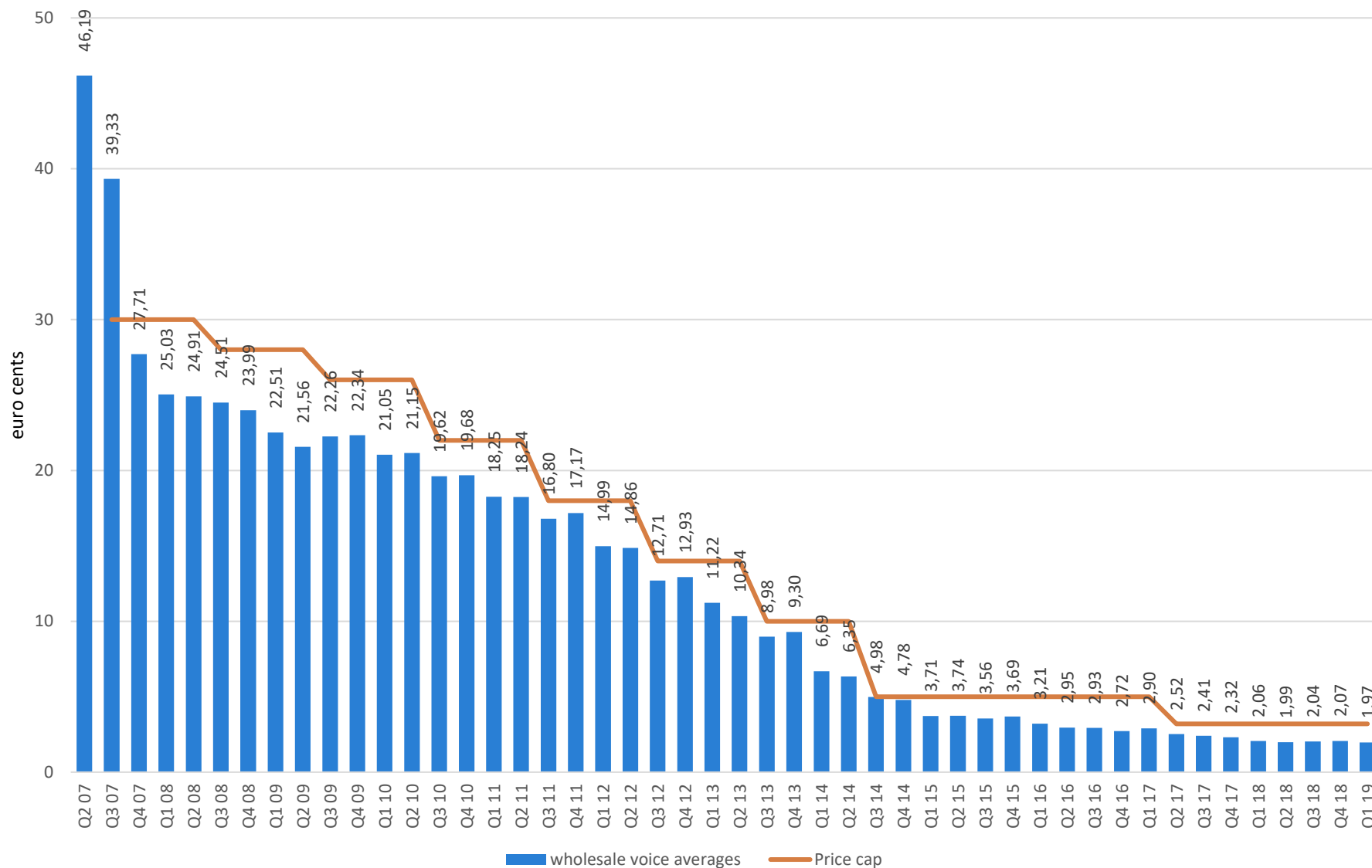


Figure 21: RoW traffic: average wholesale price charged by EEA operators per minute, Q4 18 and Q1 19

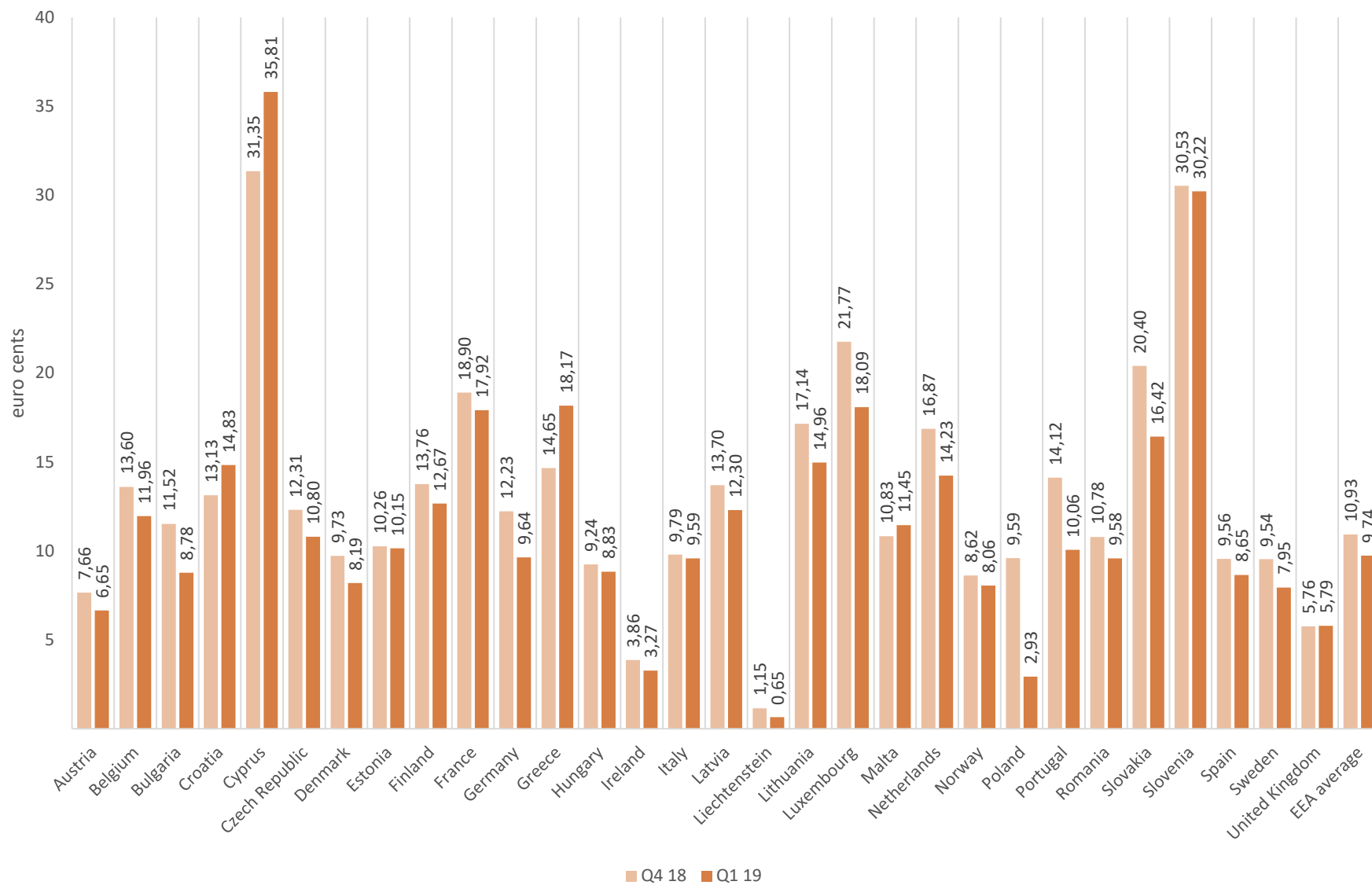


Figure 22: EEA and RoW average wholesale price per minute, Q2 16 – Q1 19 (balanced, unbalanced, total and RoW traffic)

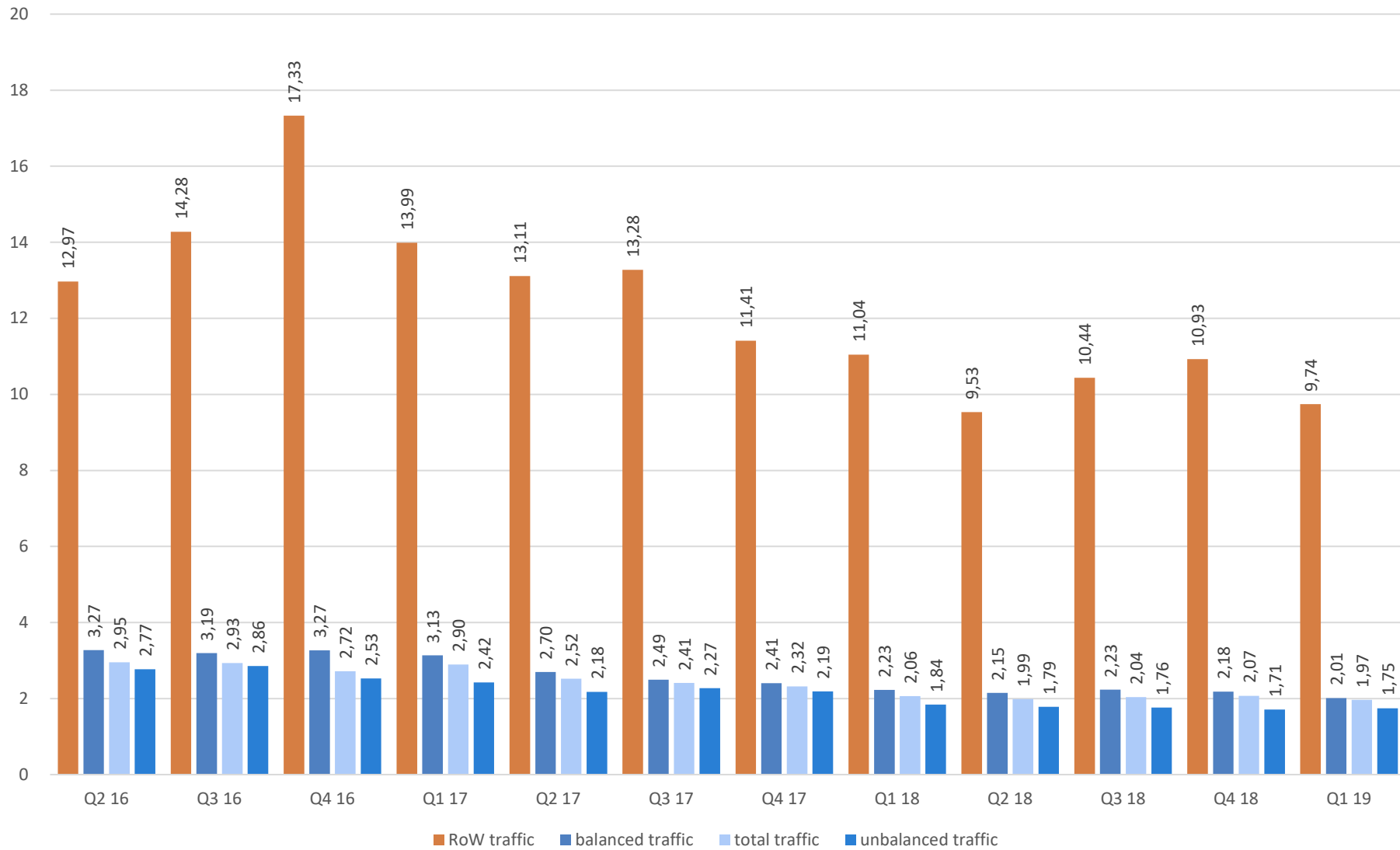
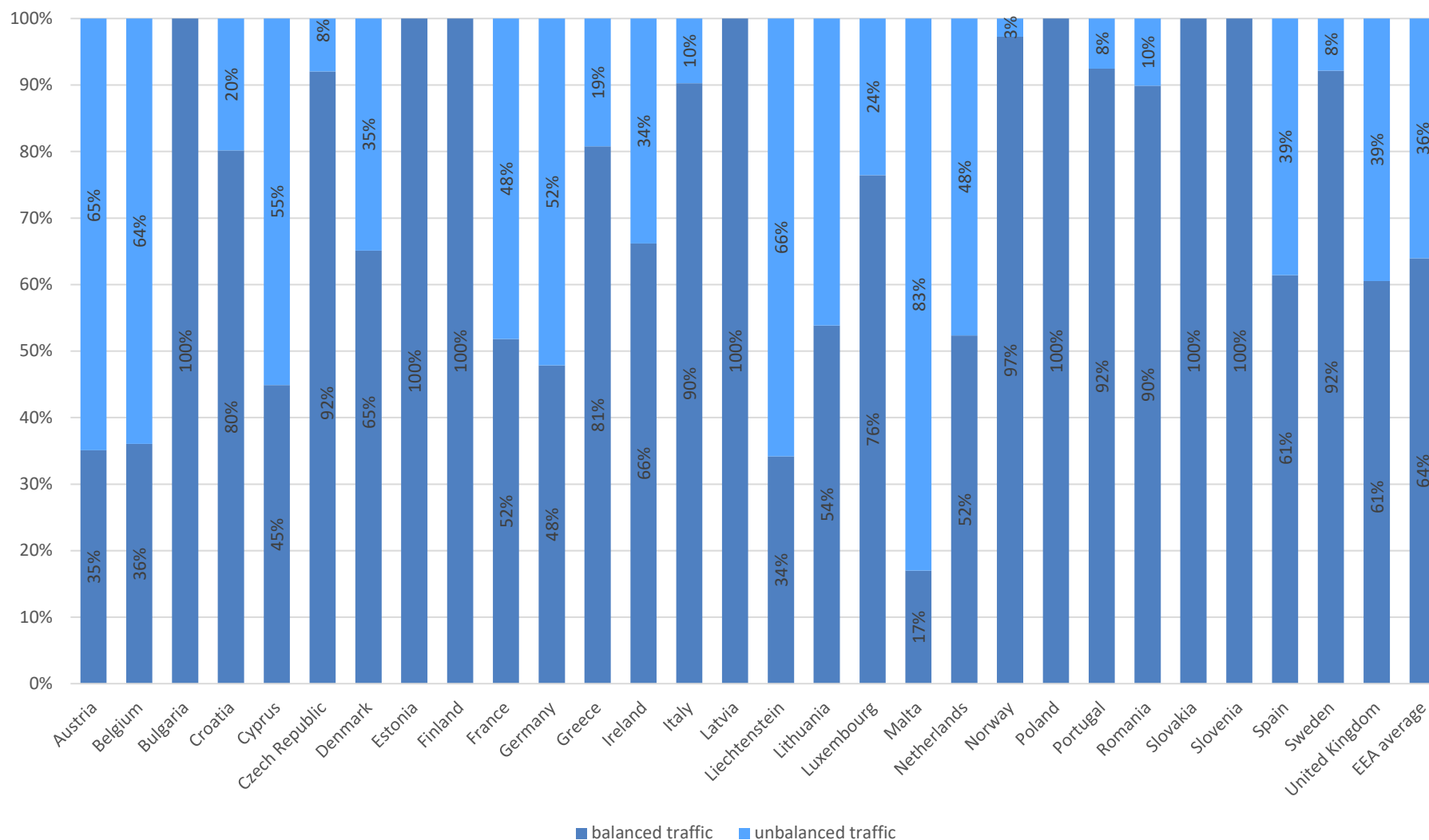
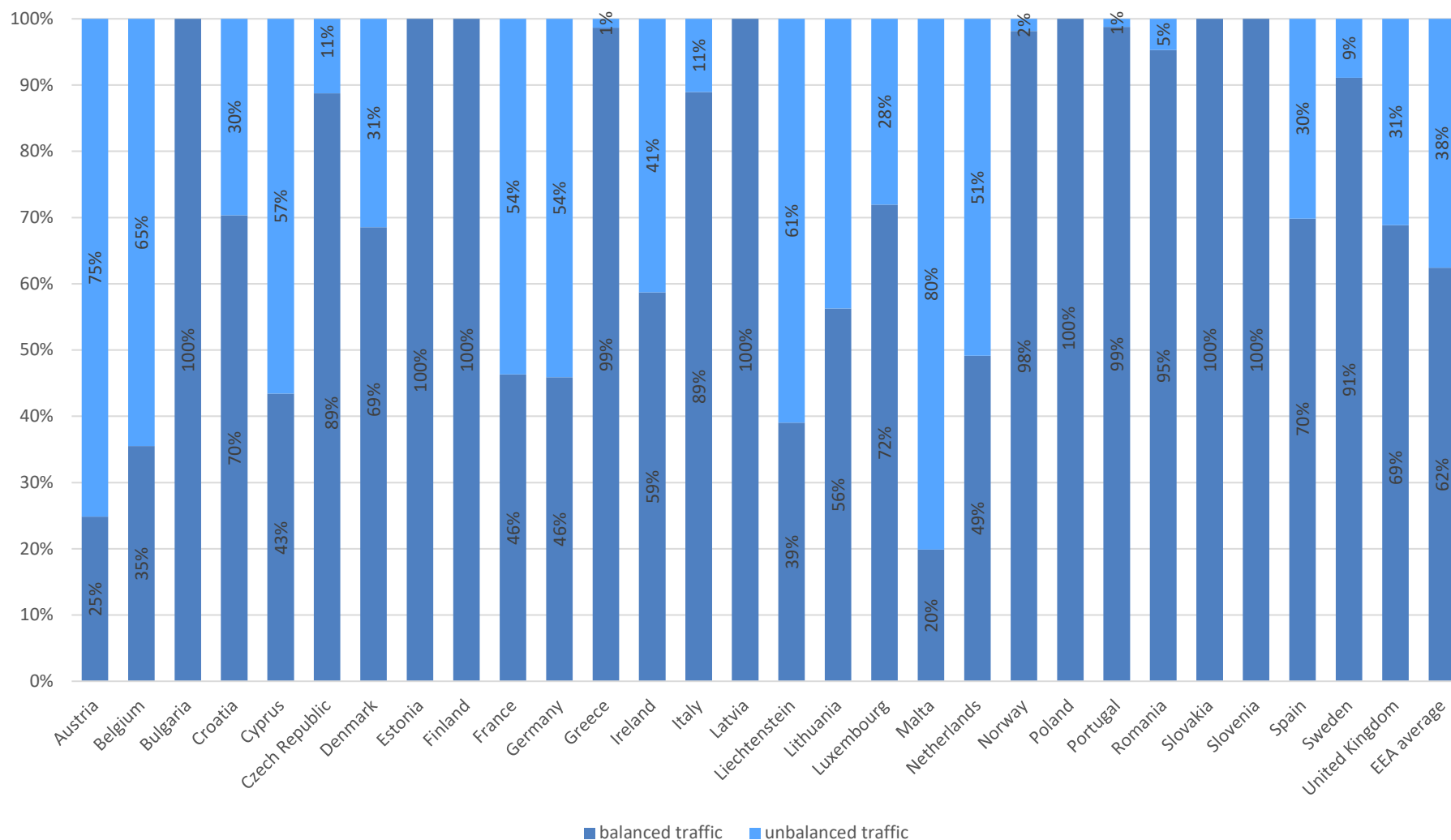


Figure 23: Wholesale roaming inbound (voice services): Proportion of balanced/unbalanced traffic within EEA countries, Q4 18



Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the non-disaggregated estimates (Figures 23 – 24).

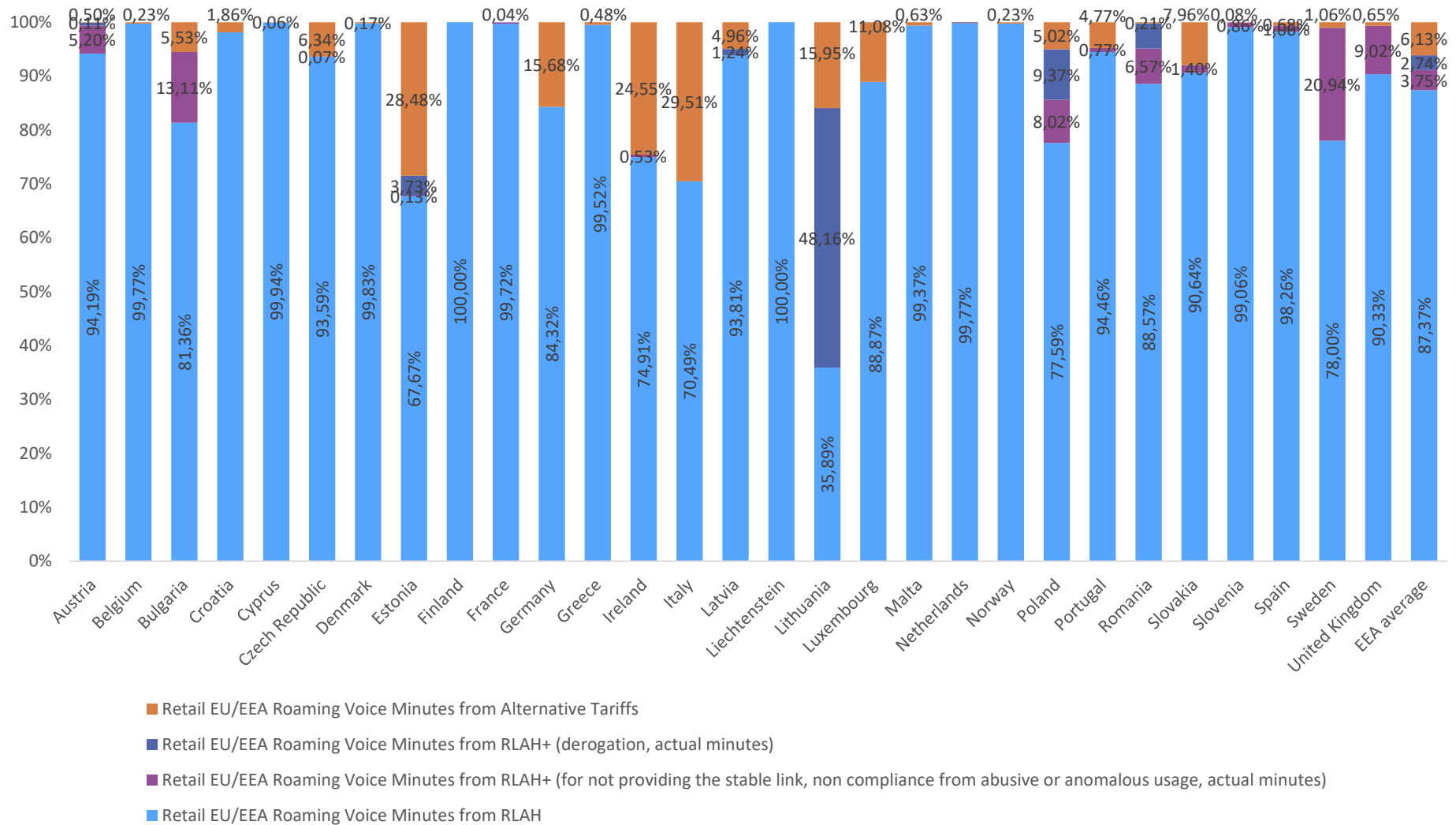
Figure 24: Wholesale roaming inbound (voice services): Proportion of balanced/unbalanced traffic within EEA countries, Q1 19



Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the non-disaggregated estimates (Figures 23 – 24).

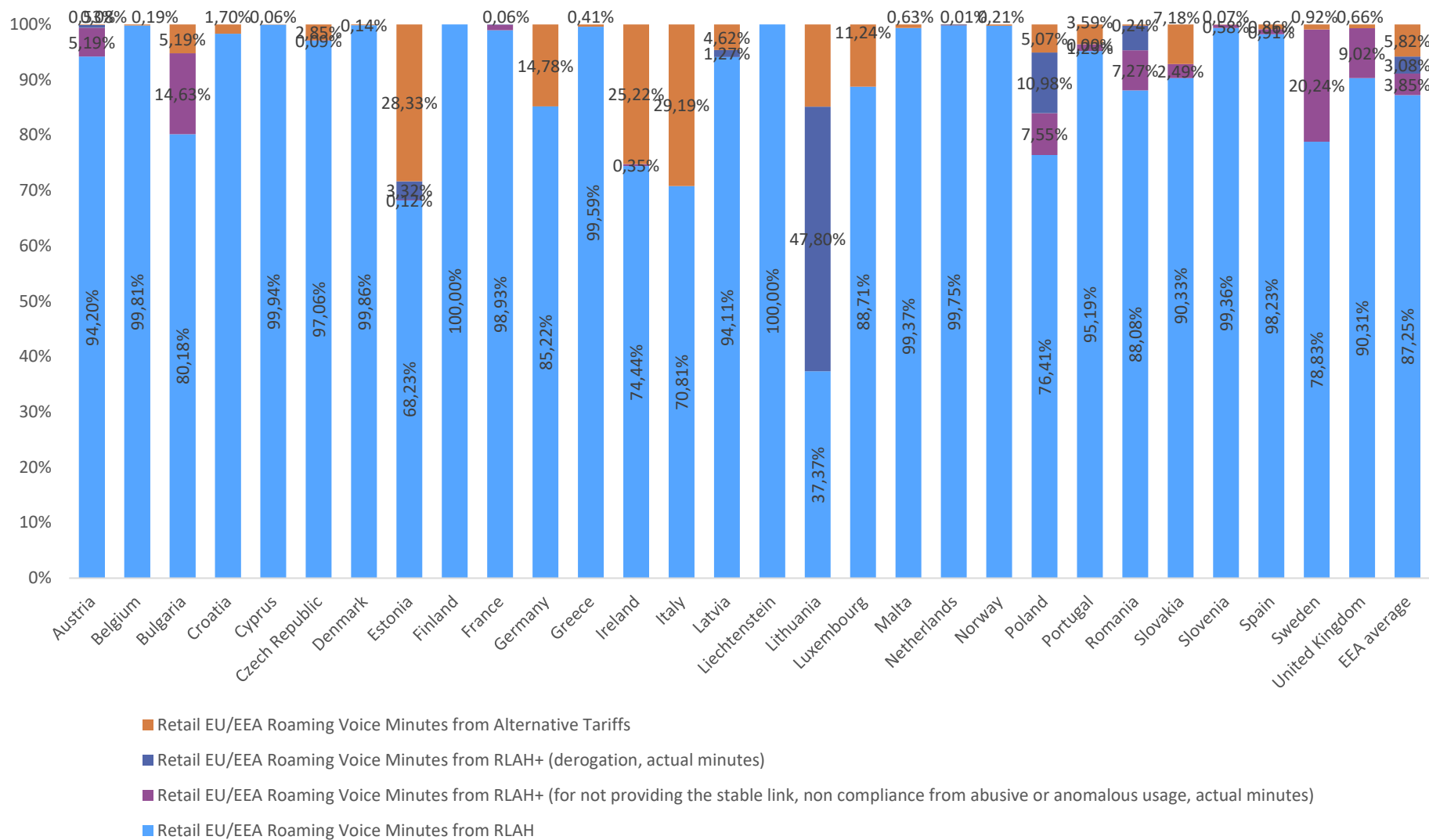
5.2.1.2 Consumption patterns

Figure 25: Percentage of total minutes of calls made, Q4 18



Finland: RLAH+ (derogation) and Alternative tariffs are not reported due to confidentiality reasons. RLAH+ (derogation) and Alternative tariffs data have been taken into account when calculating EEA average.

Figure 26: Percentage of total minutes of calls made, Q1 19



Finland: RLAH+ (derogation) and Alternative tariffs are not reported due to confidentiality reasons. RLAH+ (derogation) and Alternative tariffs data have been taken into account when calculating EEA average.

Figure 27: EEA percentage and volumes of total minutes of calls made, Q3 16 – Q1 19

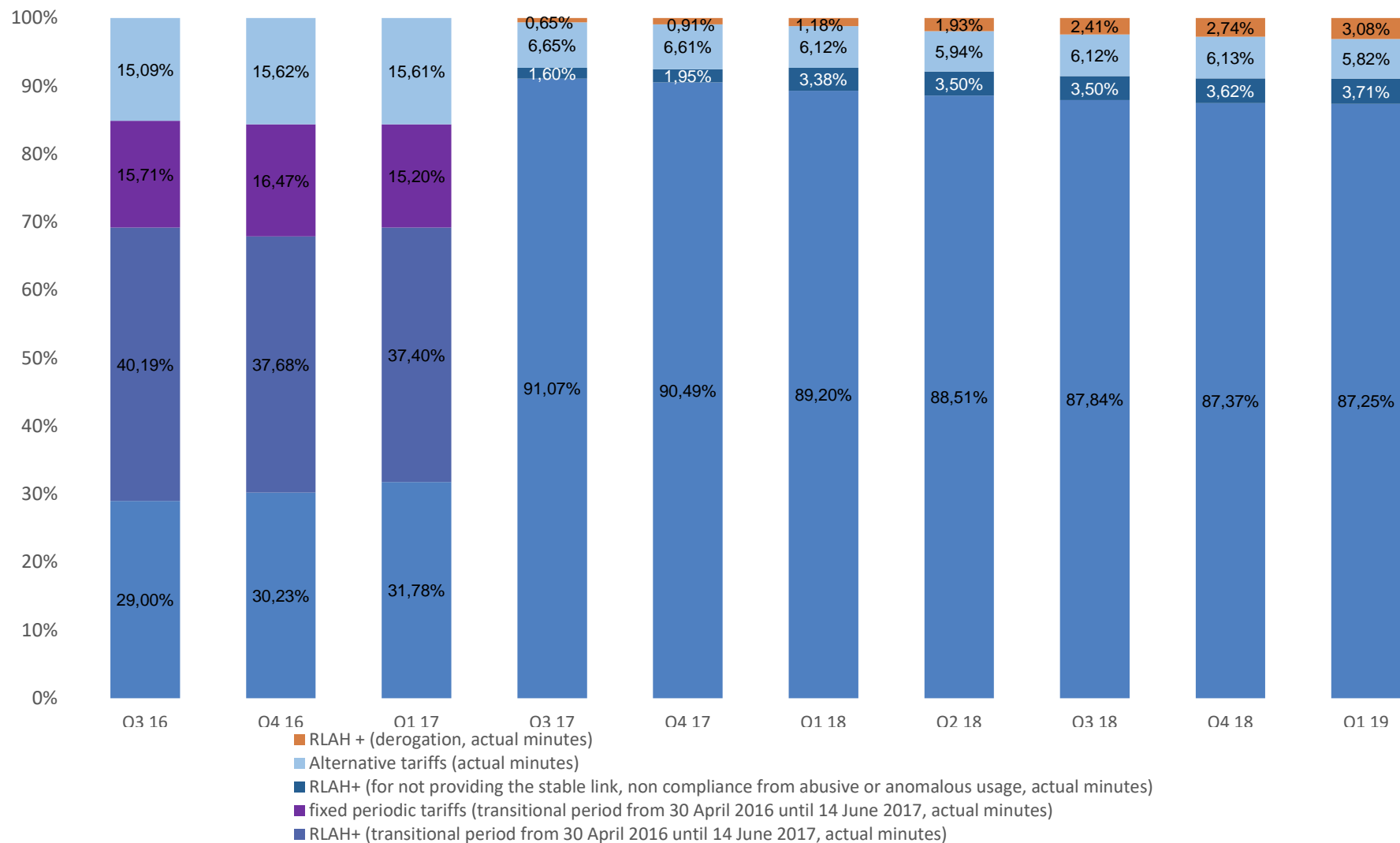


Figure 28: Roaming calls made: average number of minutes per month per total number of roaming subscribers, Q3 18 – Q1 19

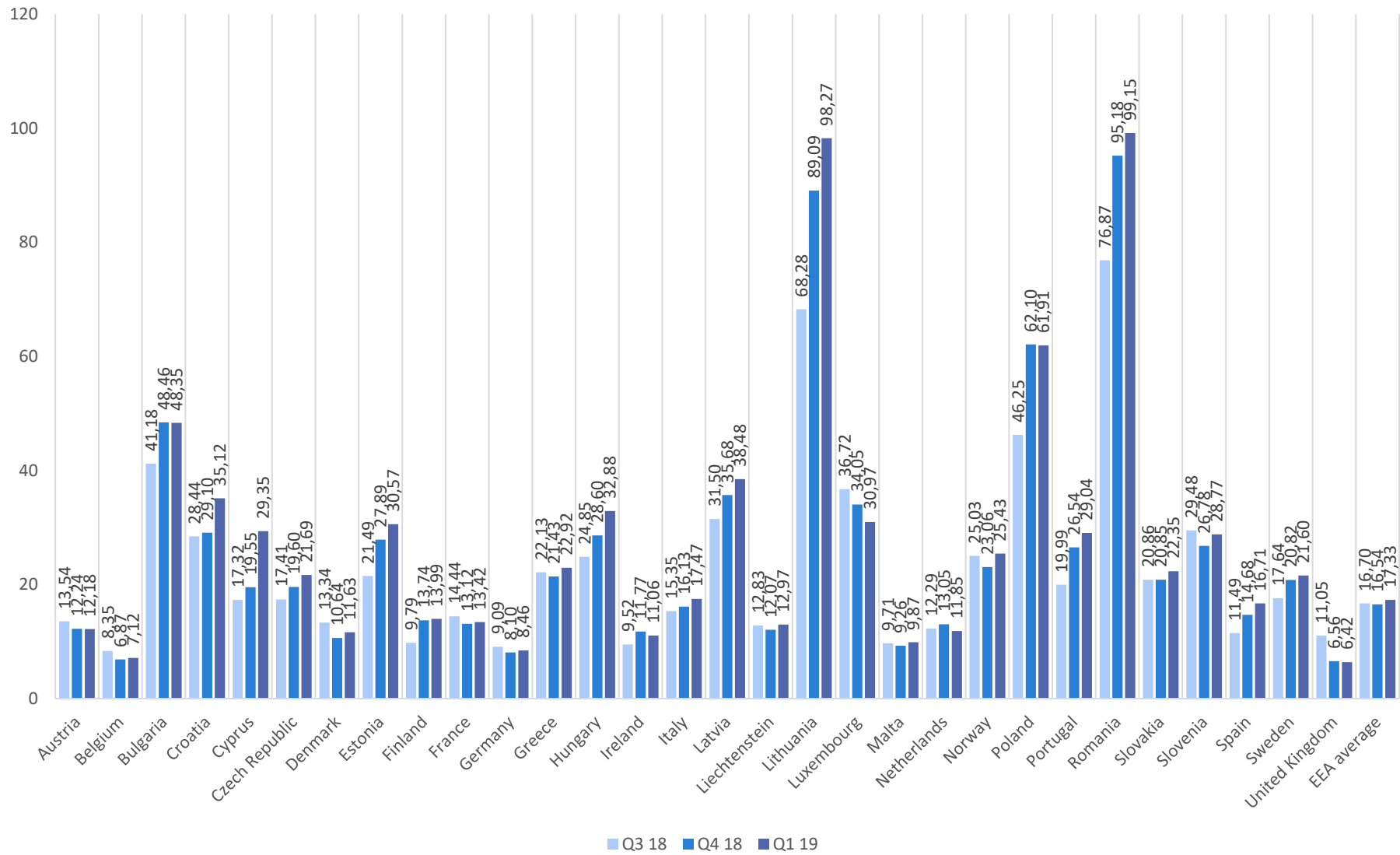


Figure 29: Roaming calls made: EEA average number of minutes per month per total number of roaming subscribers Q2 16 – Q1 19

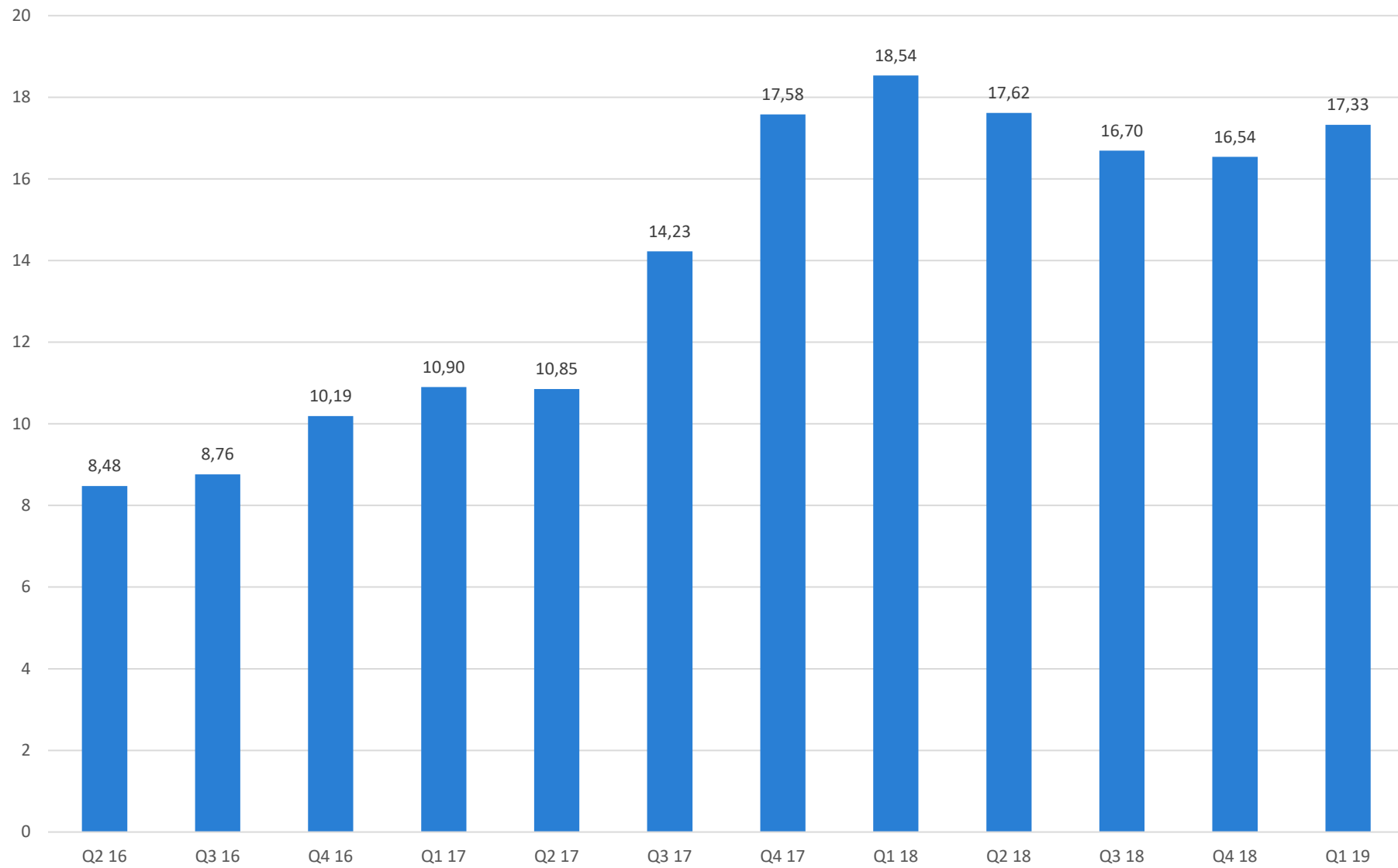
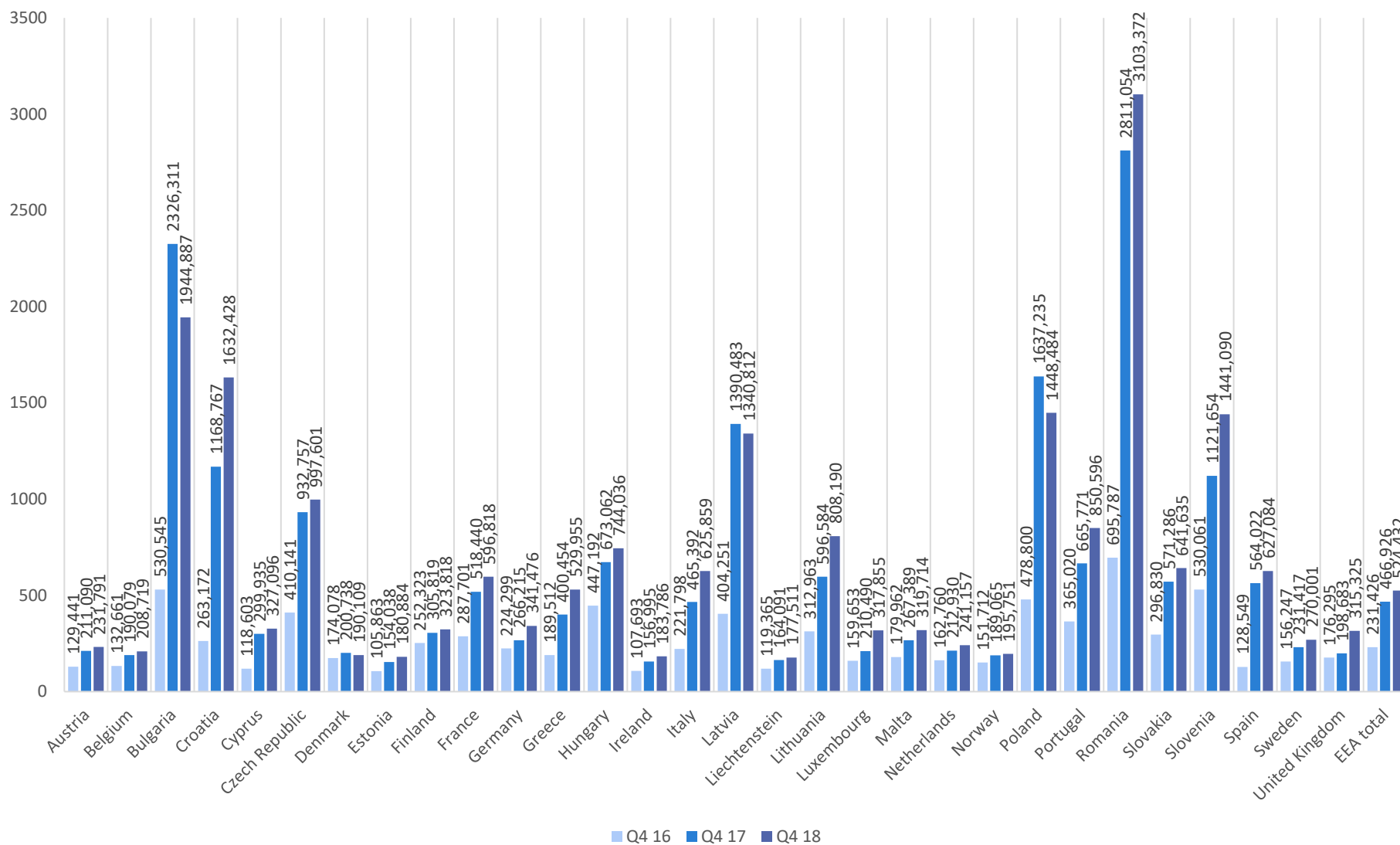
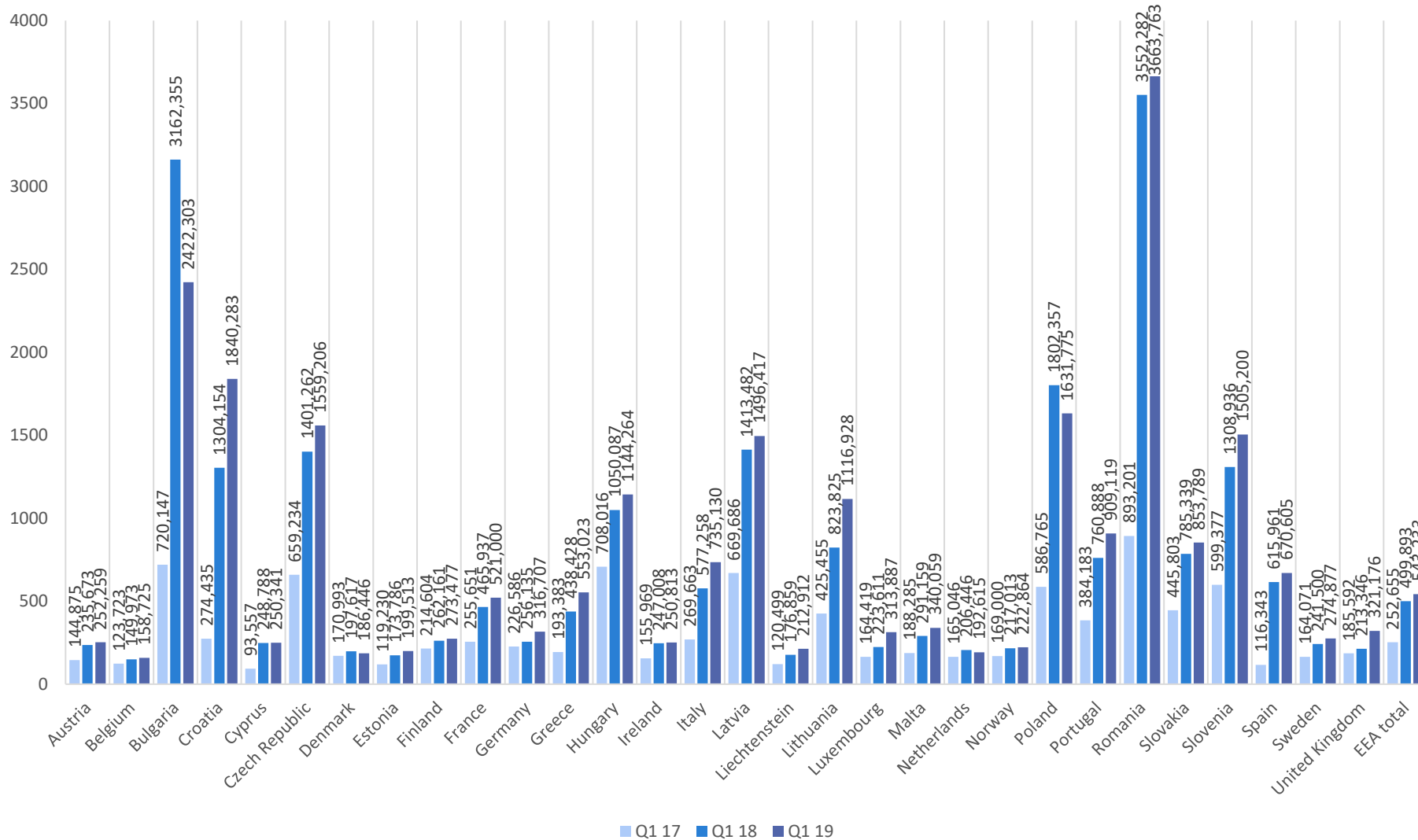


Figure 30: Roaming calls made: traffic Index, Q4 16, Q4 17 and Q4 18*



*Reference period: Croatia: Q4 13=100, Liechtenstein: Q2 13 = 100

Figure 31: Roaming calls made: traffic Index, Q1 17, Q1 18 and Q1 19*



*Reference period: Croatia: Q3 14=100

Figure 32: EEA average: Roaming calls made traffic, (millions of minutes), Q2 07 – Q1 19

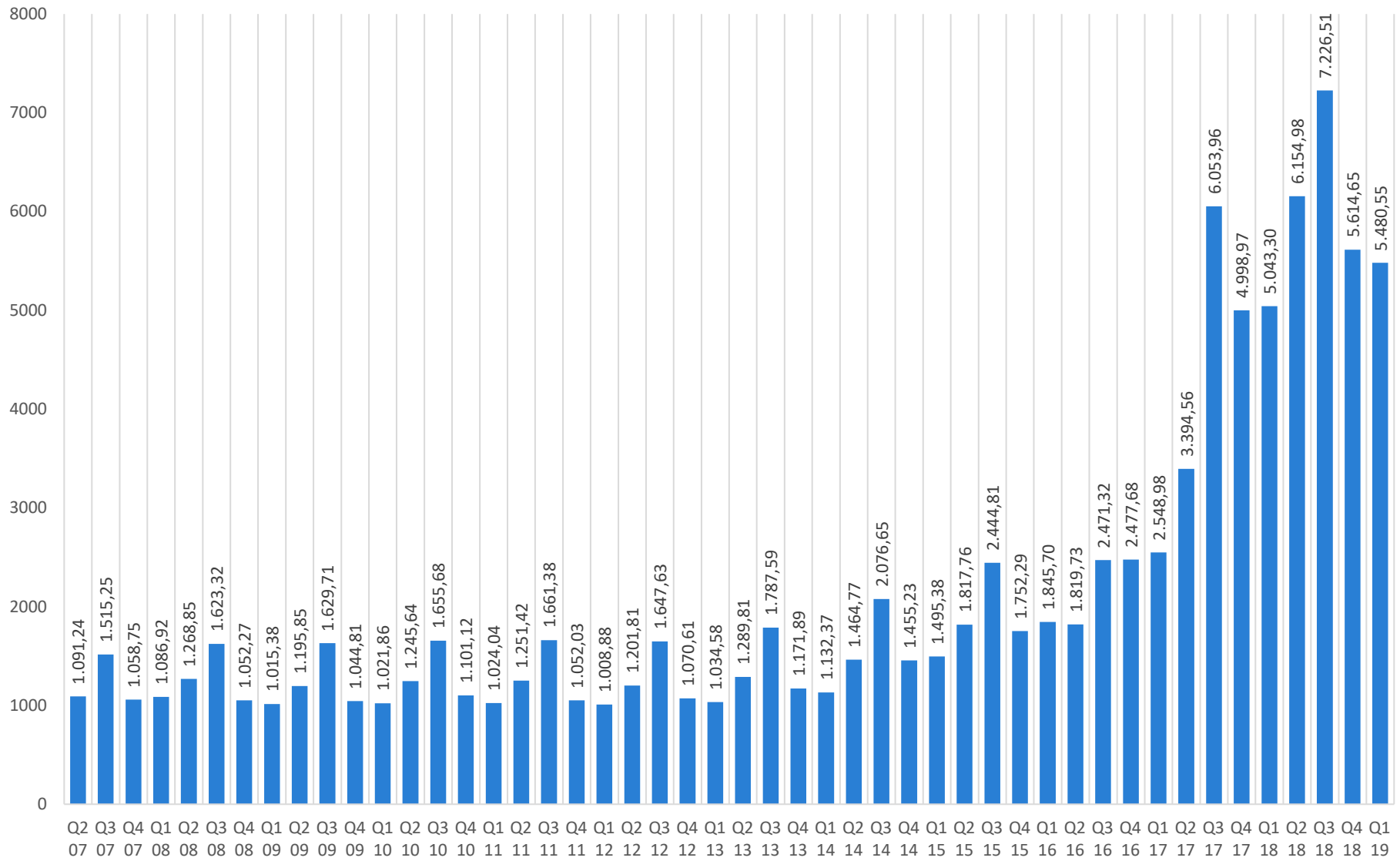
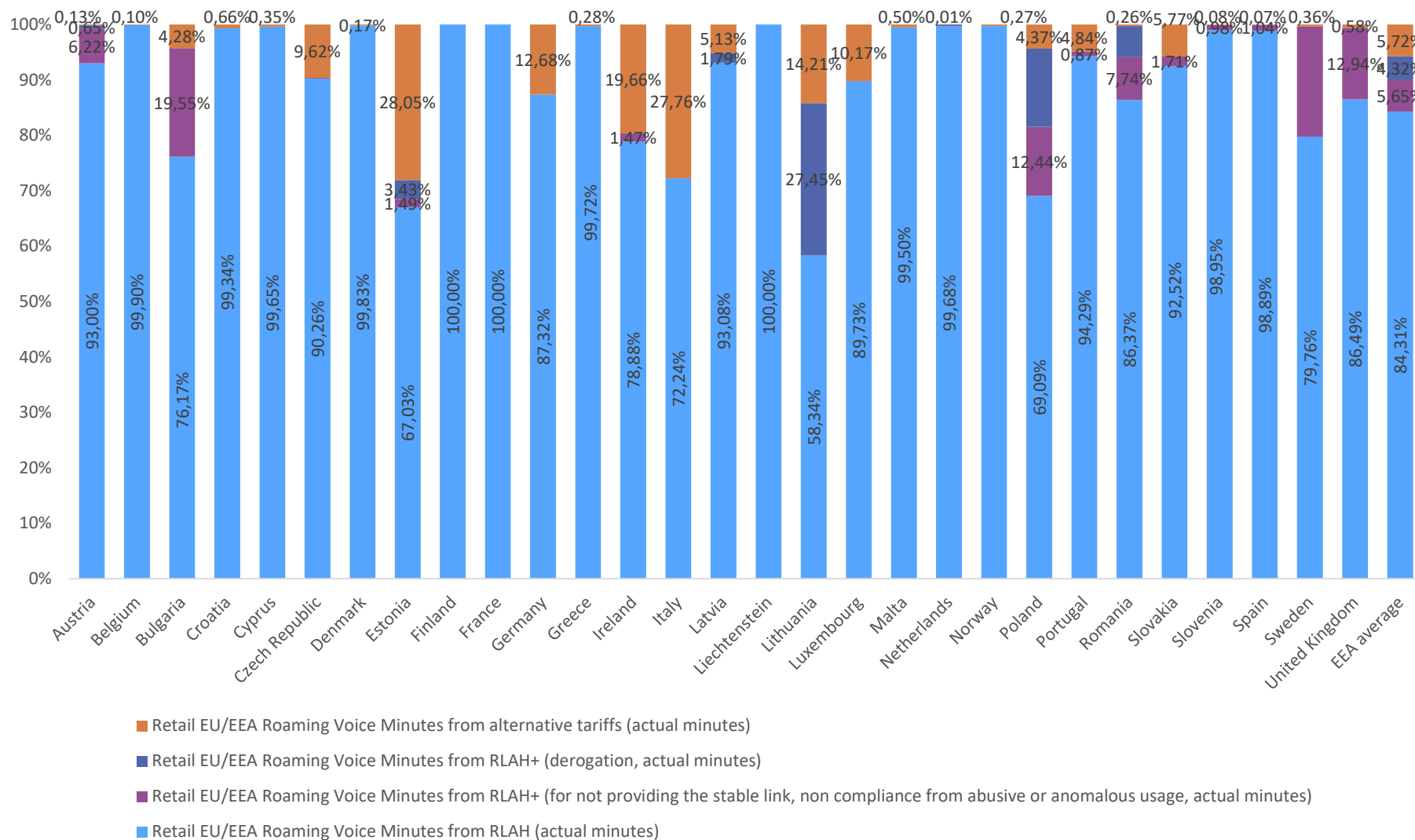
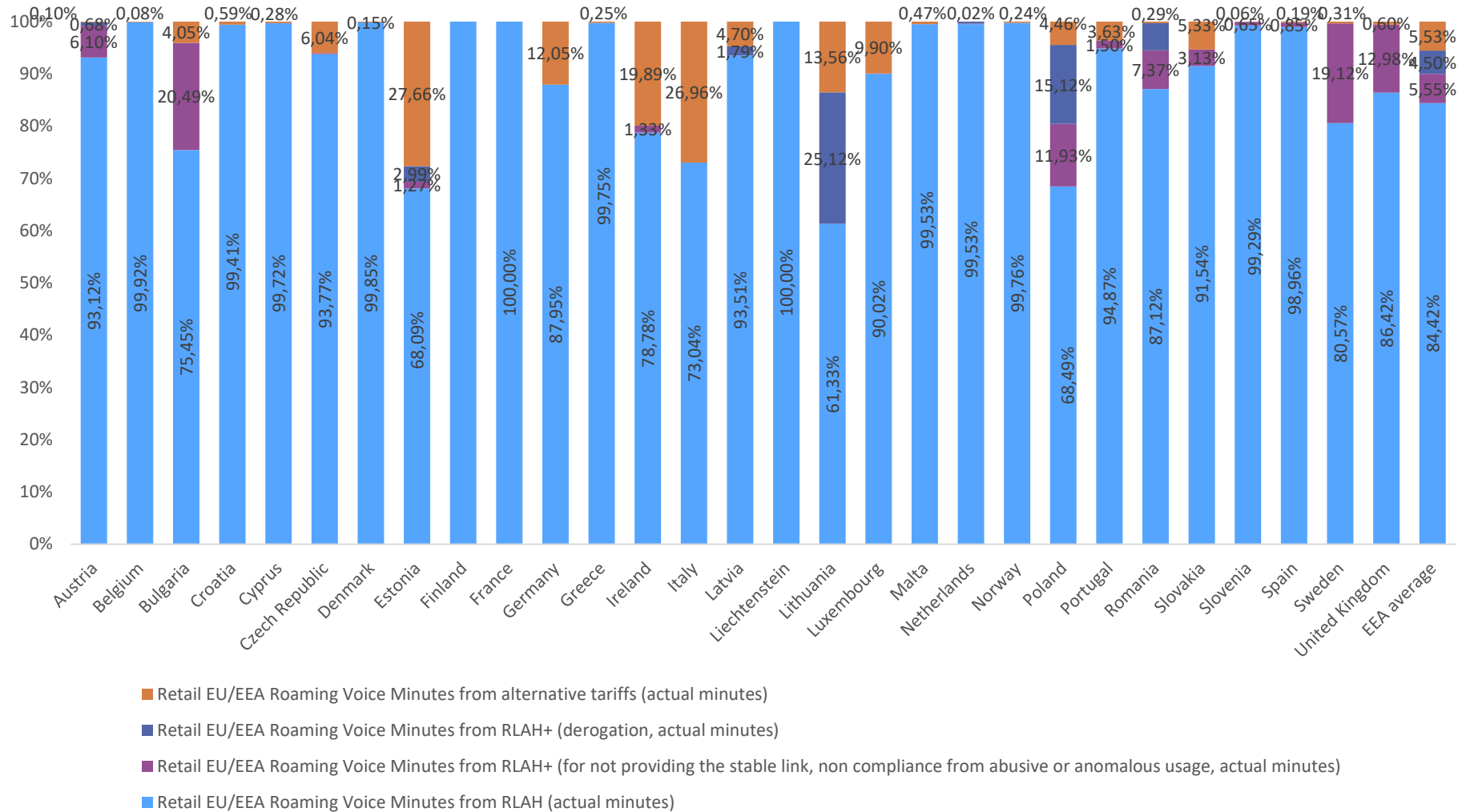


Figure 33: Percentage of total minutes of calls received, Q4 2018



Finland: RLAH+ (derogation) and Alternative tariffs are not reported due to confidentiality reasons. RLAH+ (derogation) and Alternative tariffs data have been taken into account when calculating EEA average.

Figure 34: Percentage of total minutes of calls received, Q1 19



Finland: RLAH+ (derogation) and Alternative tariffs are not reported due to confidentiality reasons. RLAH+ (derogation) and Alternative tariffs data have been taken into account when calculating EEA average.

Figure 35: EEA volumes and percentage of total minutes of calls received, Q3 16 – Q1 19

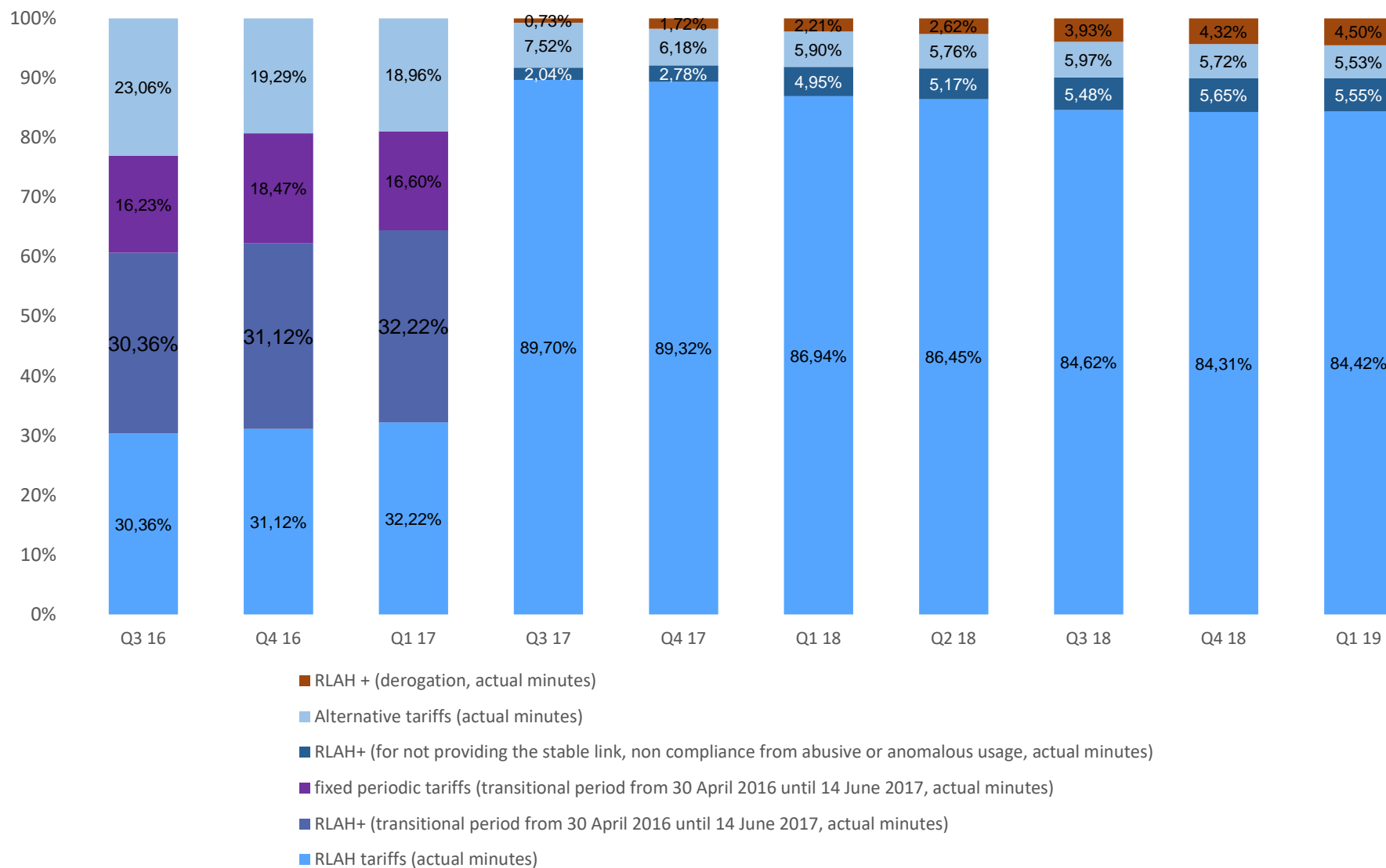


Figure 36: Roaming calls received: average number of minutes per month per total number of roaming subscribers, Q3 18 – Q1 19

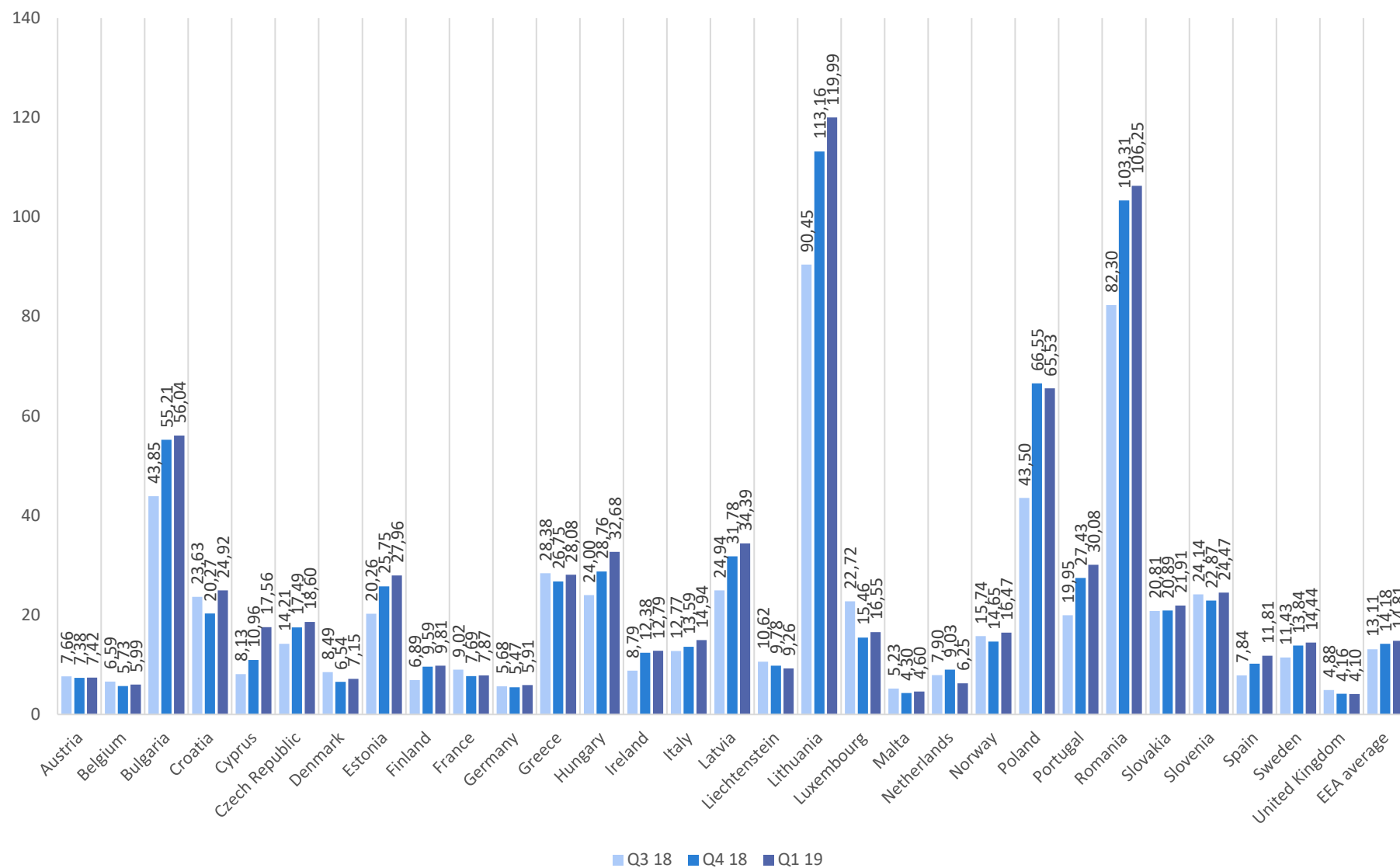


Figure 37: Roaming calls received: EEA average number of minutes per month per total number of roaming subscribers, Q2 16 – Q1 19

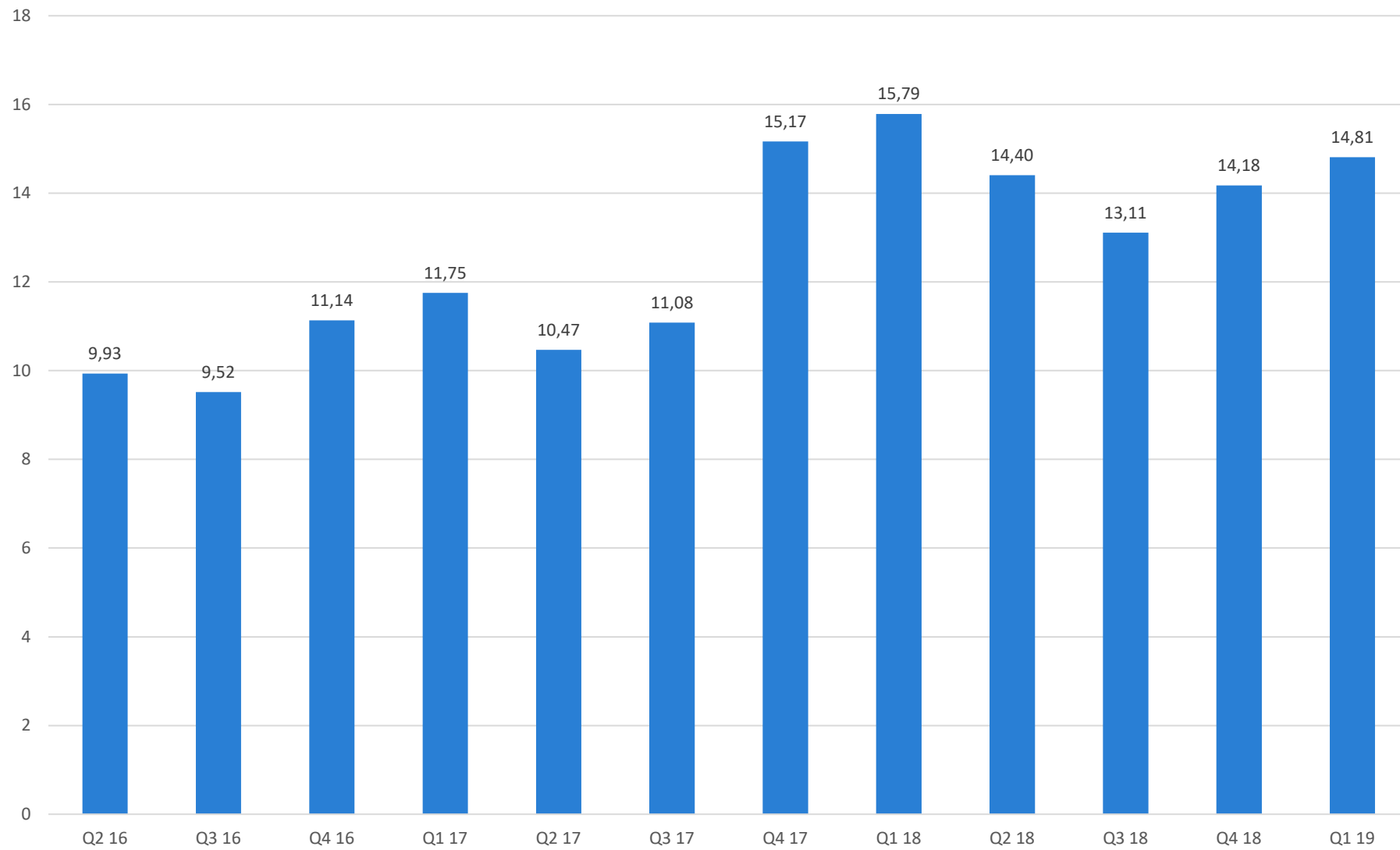
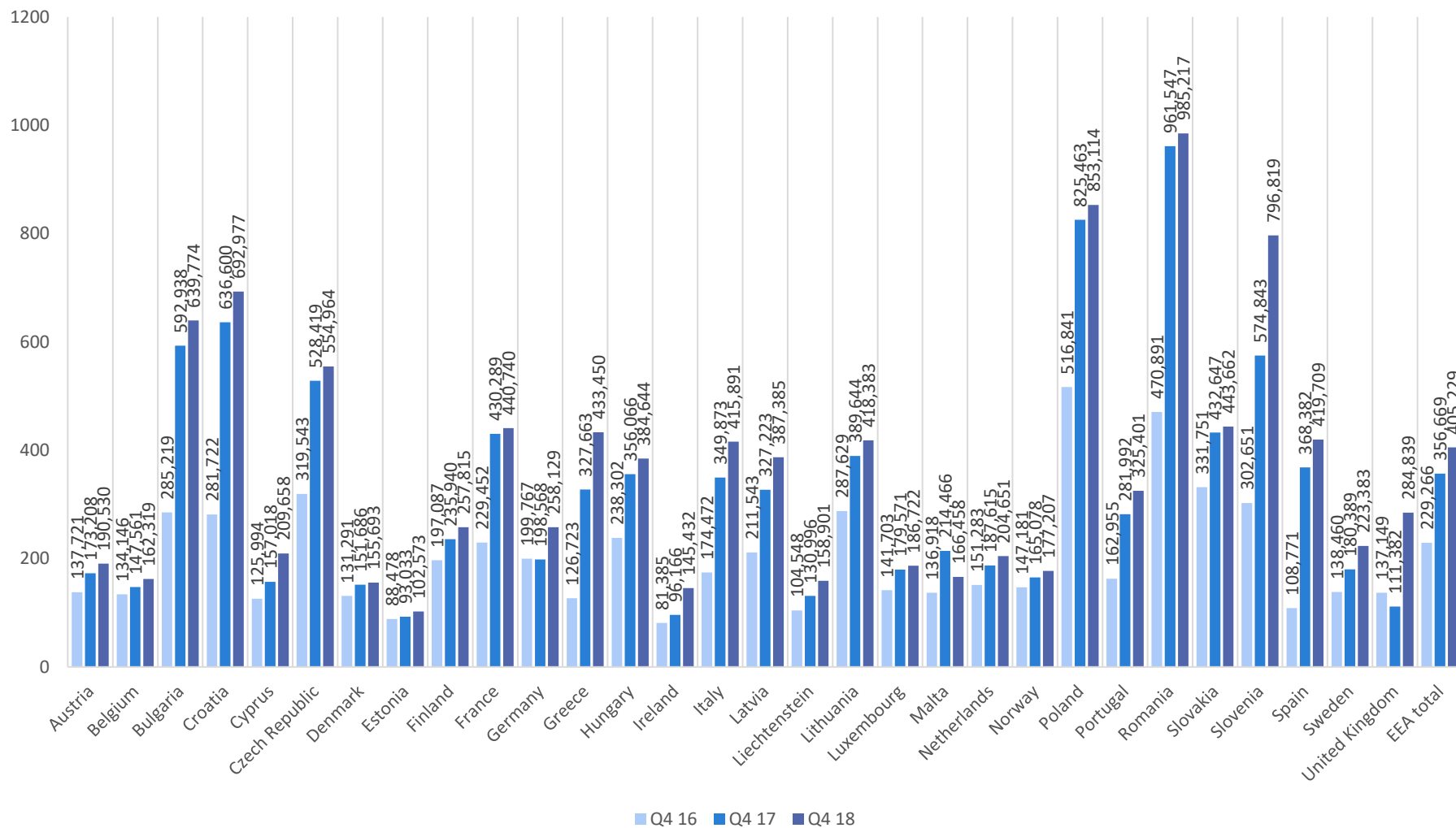
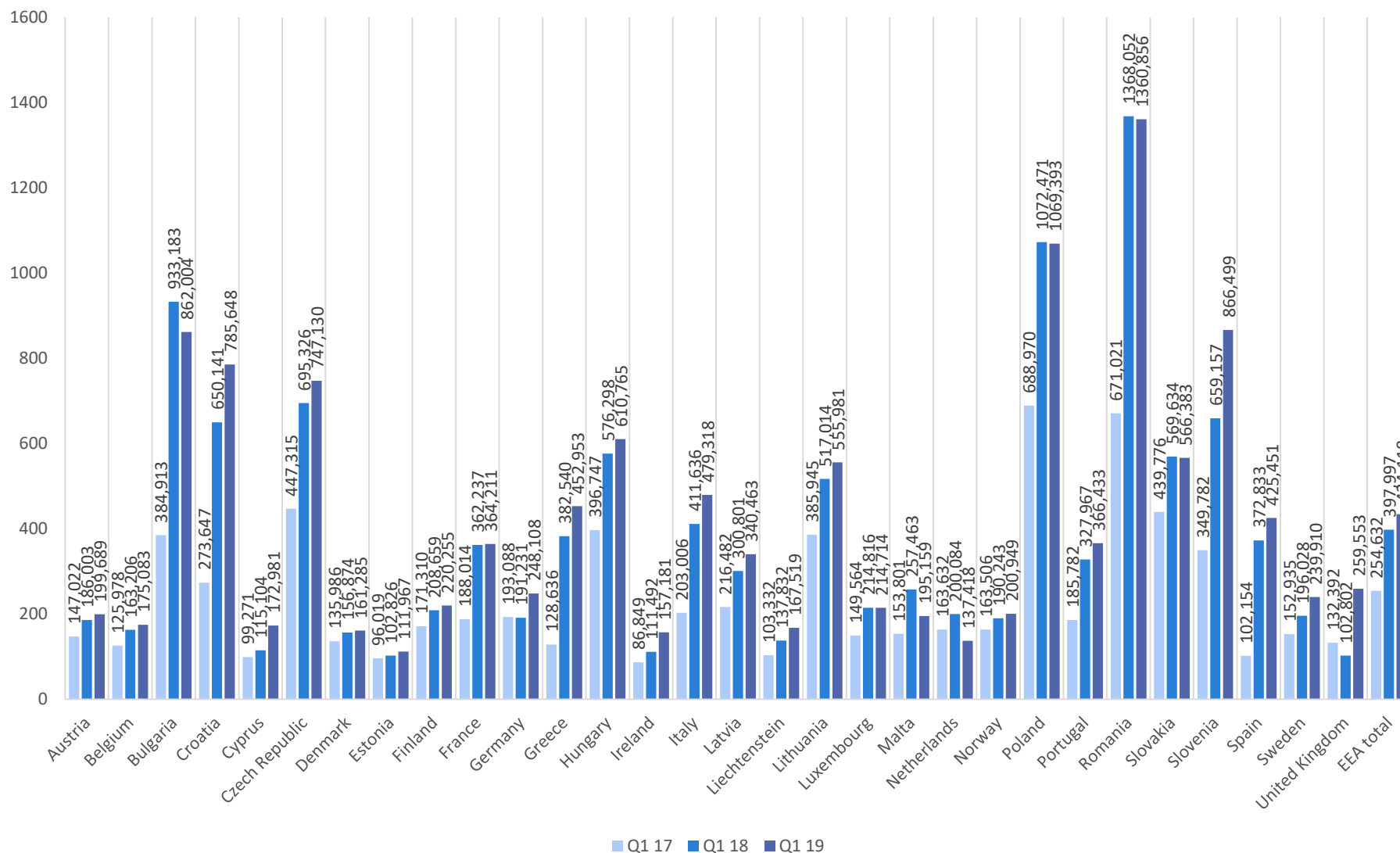


Figure 38: Roaming calls received: traffic Index, Q4 16, Q4 17 and Q4 18*



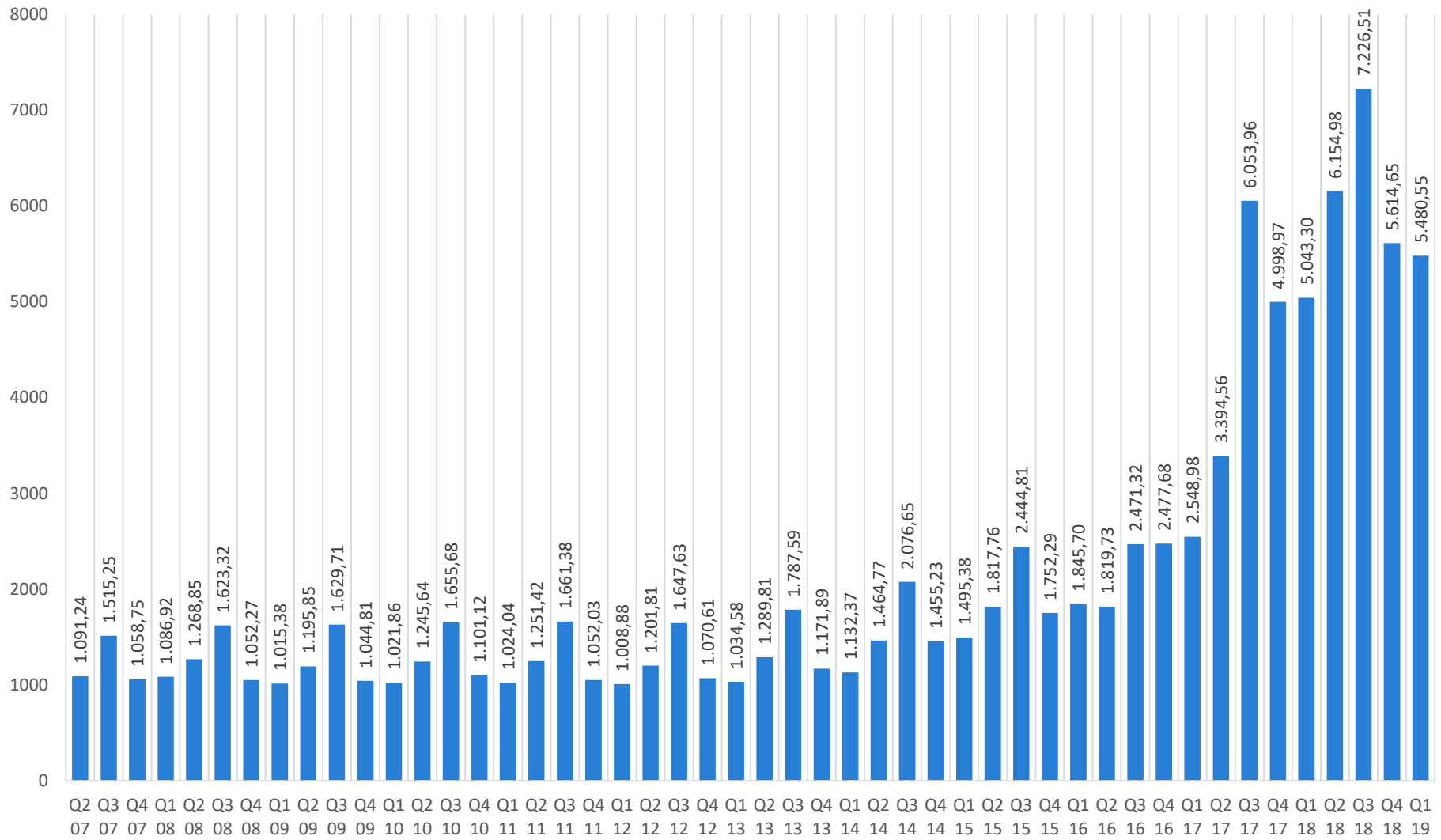
*Reference period: Croatia: Q2 14=100, Liechtenstein: Q2 13 = 100

Figure 39: Roaming calls received: traffic Index, Q1 17, Q1 18 and Q1 19*



*Reference period: Croatia: Q3 14=100

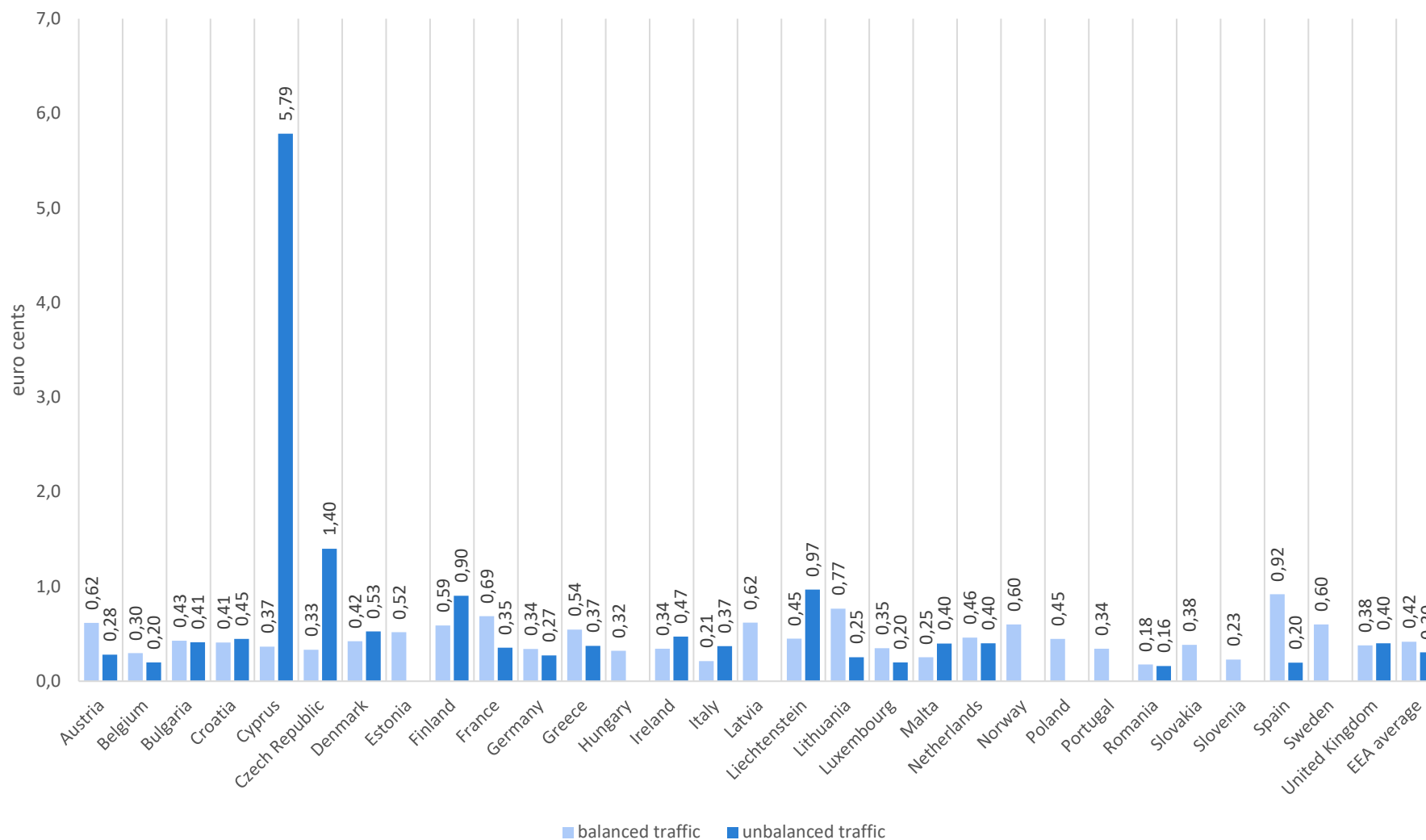
Figure 40: EEA roaming calls received traffic, Q2 07 – Q1 19 (millions of minutes)



5.2.2. SMS roaming services

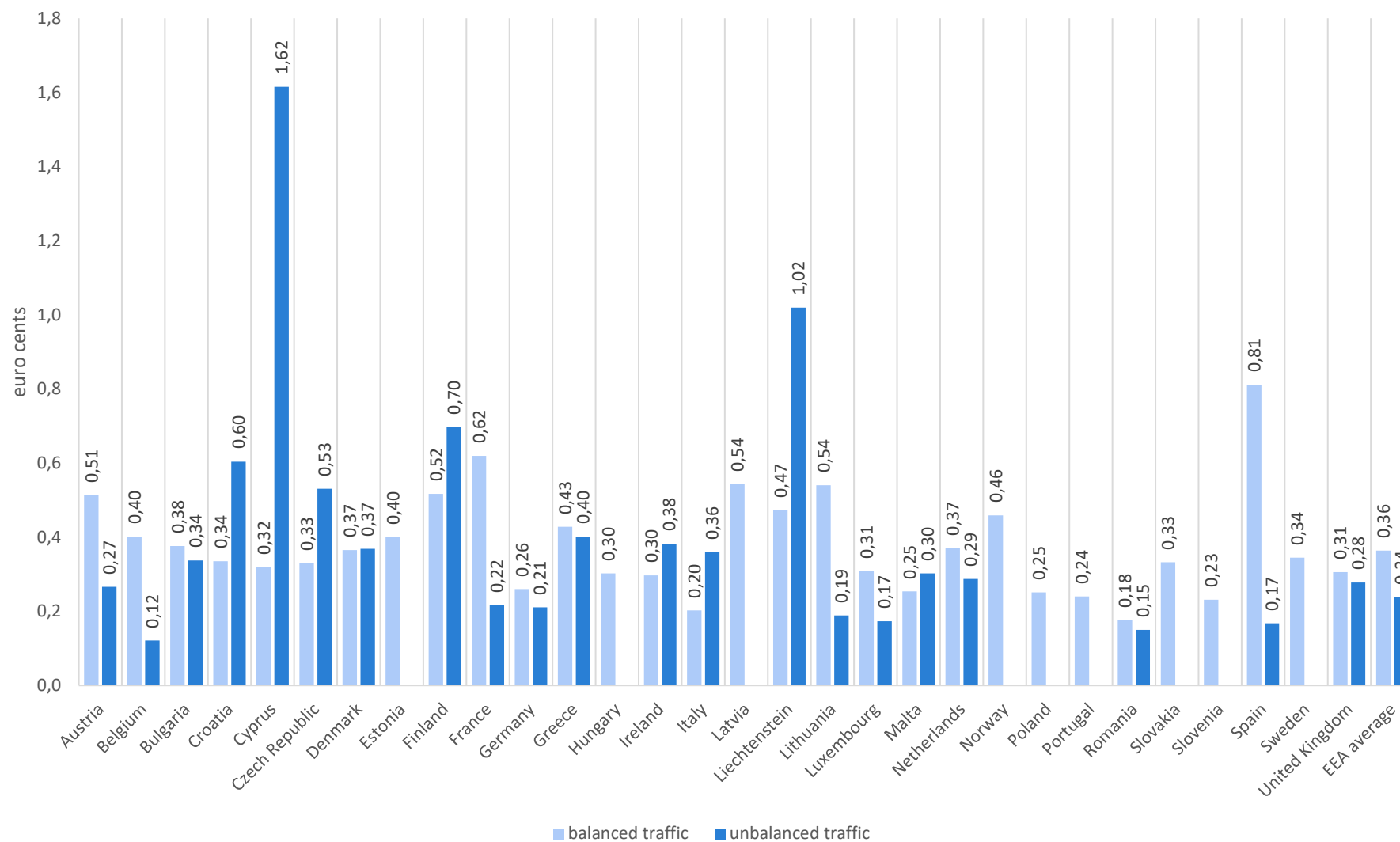
5.2.2.1 Wholesale prices

Figure 41: Average wholesale price per roaming SMS, Q4 18 (balanced and unbalanced traffic)



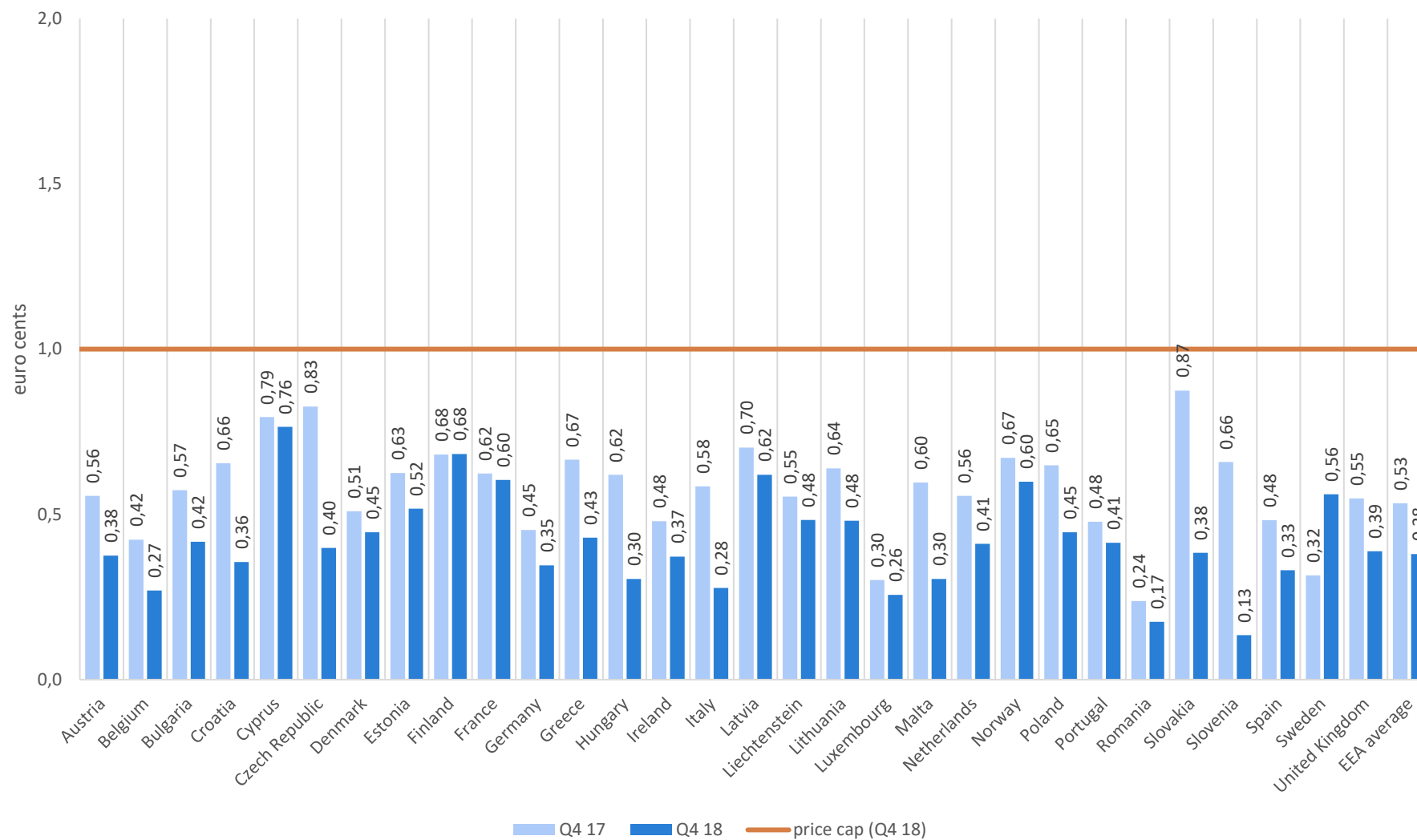
Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the estimates (non-disaggregated) in Figure 43 and Figure 44.

Figure 42: Average wholesale price per roaming SMS, Q1 19 (balanced and unbalanced traffic)



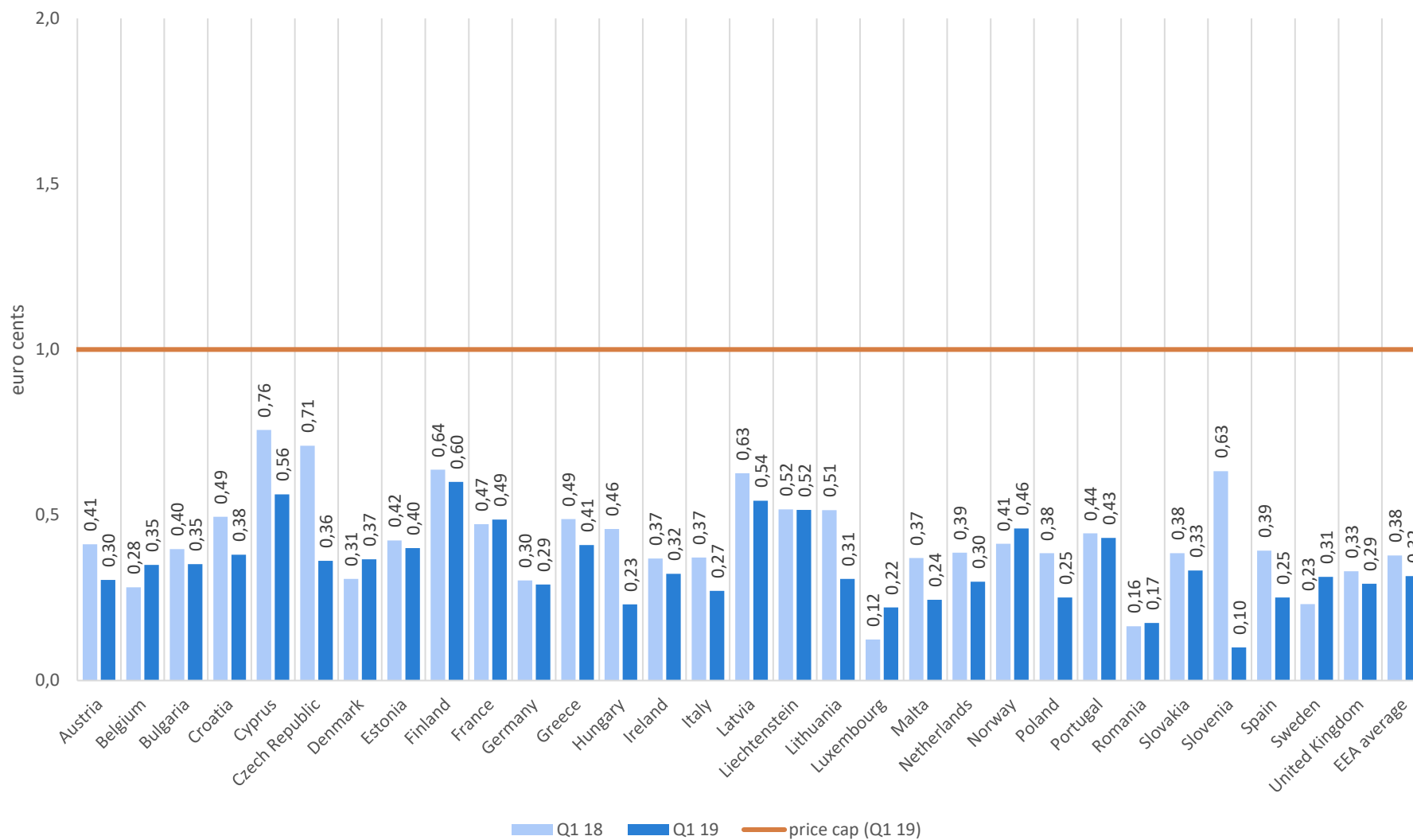
Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the estimates (non-disaggregated) in Figure 43 and Figure 44.

Figure 43: Total traffic: average wholesale price per roaming SMS, Q4 17 and Q4 18



Portugal: the number of operators that reported data for calculating these estimates is different from the number of operators that reported data for calculating the estimates (disaggregated for balanced and unbalanced traffic) in Figure 41 and Figure 42.

Figure 44: Total traffic: average wholesale price per roaming SMS, Q1 18 and Q1 19



Portugal: the number of operators that reported data for calculating these estimates is different from the number of operators that reported data for calculating the estimates (disaggregated for balanced and unbalanced traffic) in Figure 41 and Figure 42.

Figure 45: EEA average wholesale price per roaming SMS, Q2 07 – Q1 19

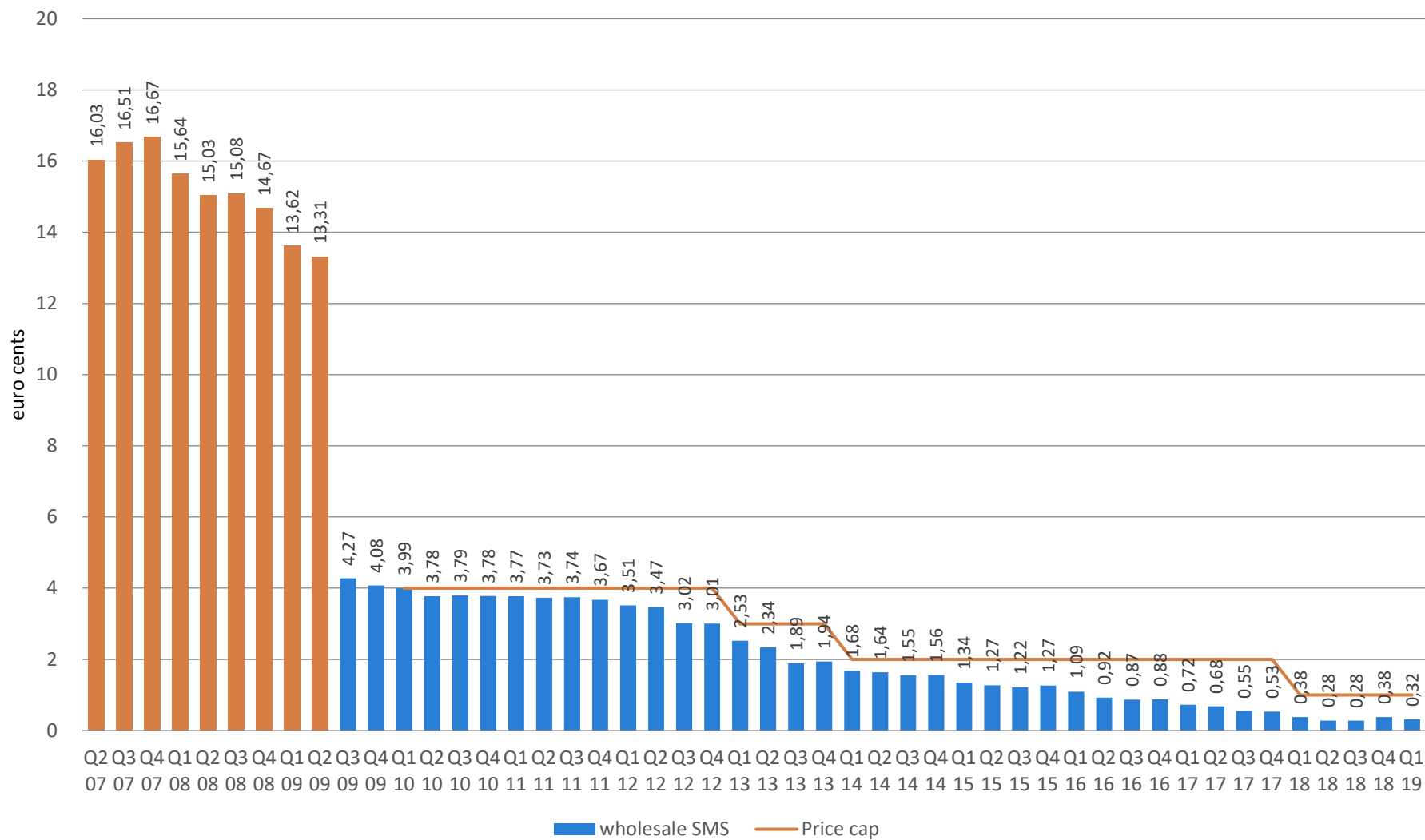


Figure 46: RoW traffic: average wholesale price charged by EEA operators per SMS (inbound roaming), Q4 18 and Q1 19

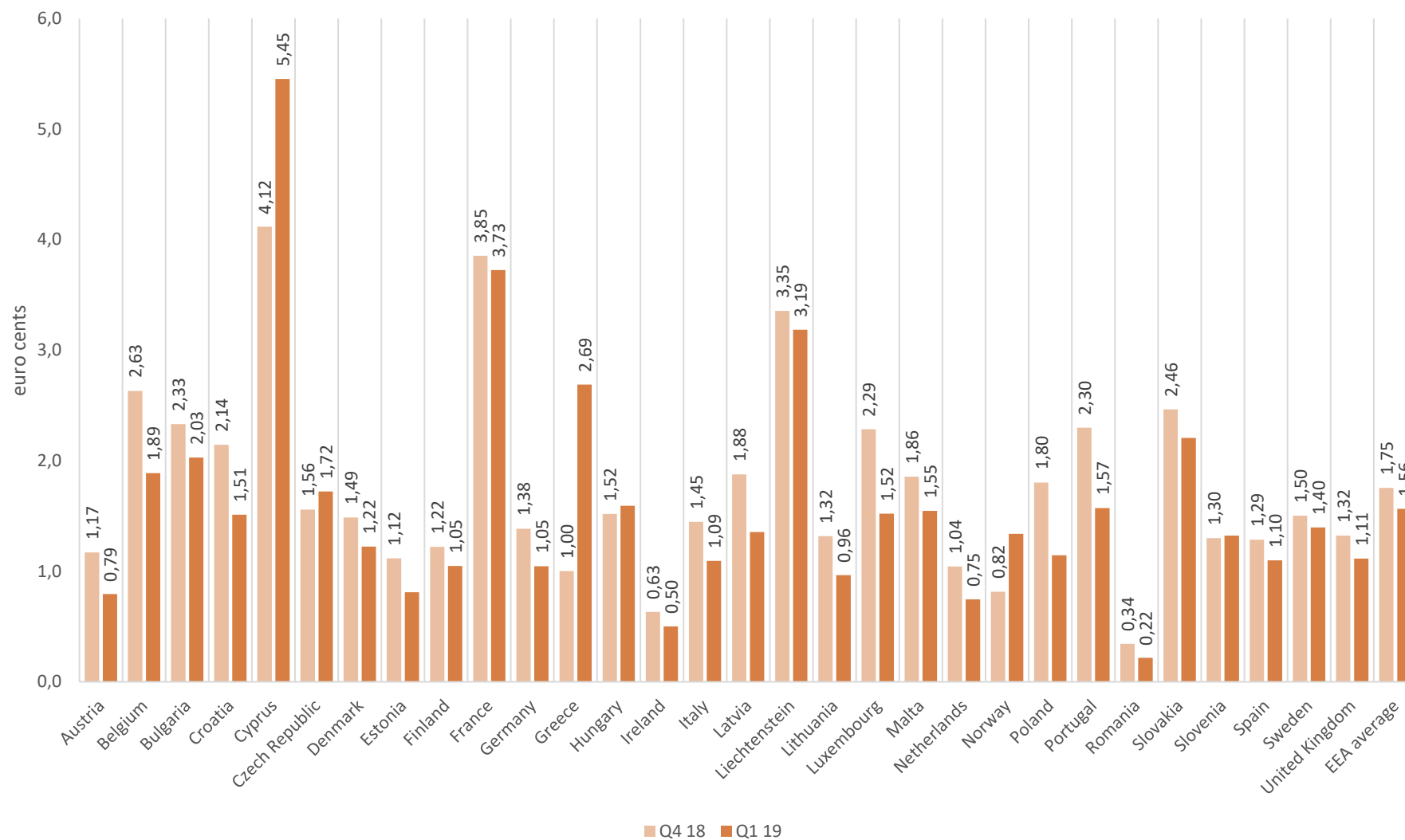


Figure 47: EEA average wholesale price per roaming SMS, Q2 16 – Q1 19 (balanced, unbalanced total and RoW traffic)

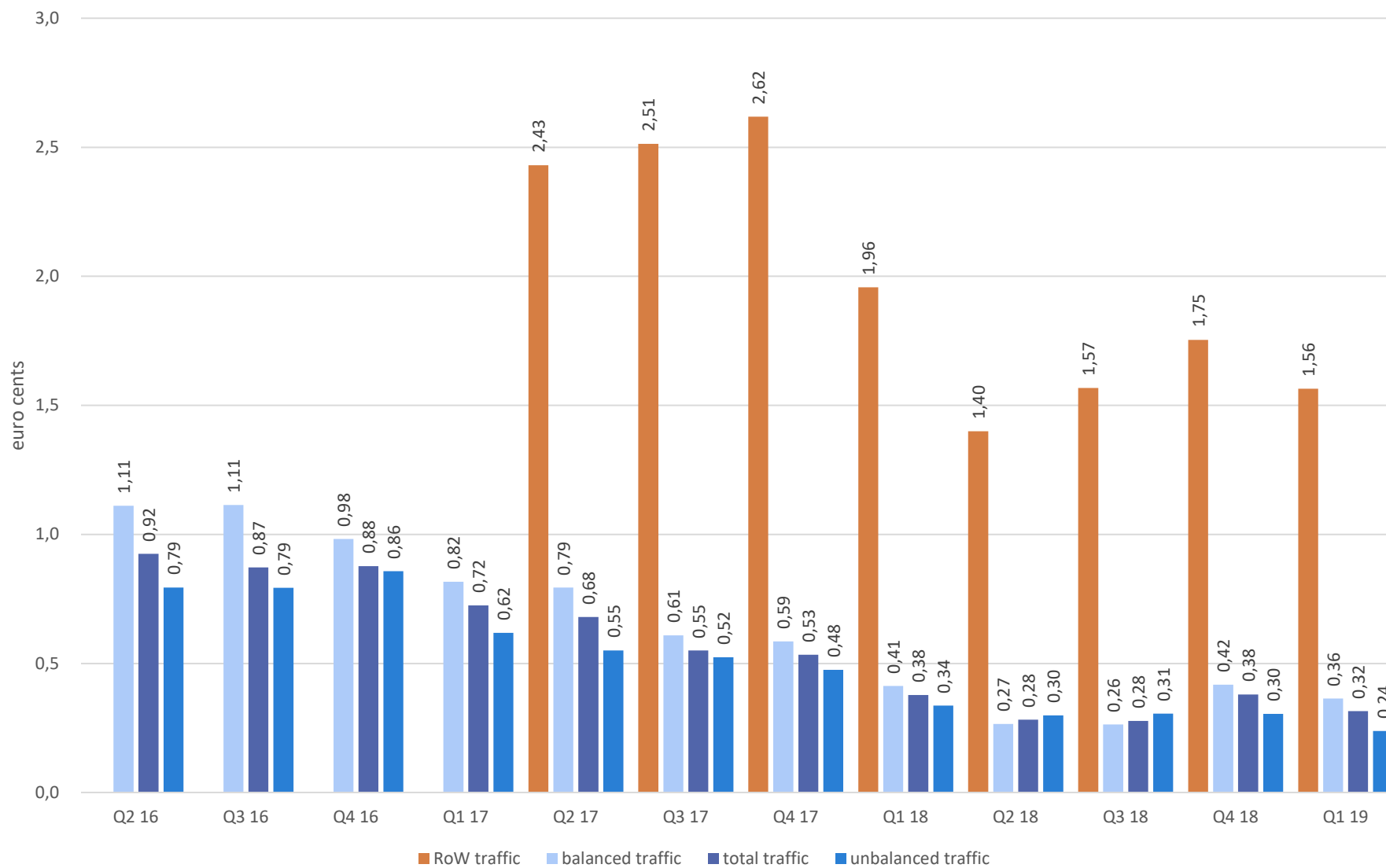
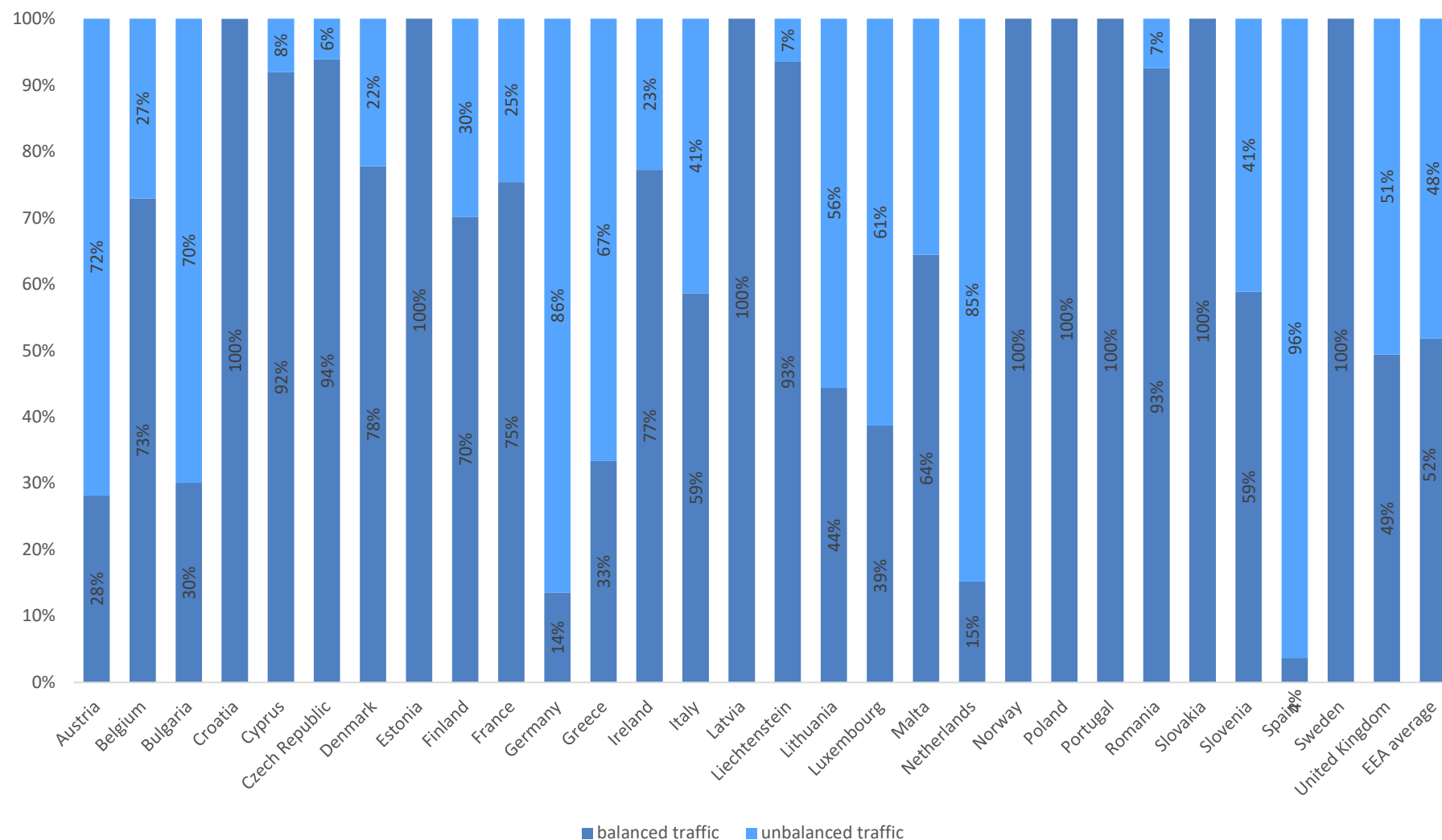
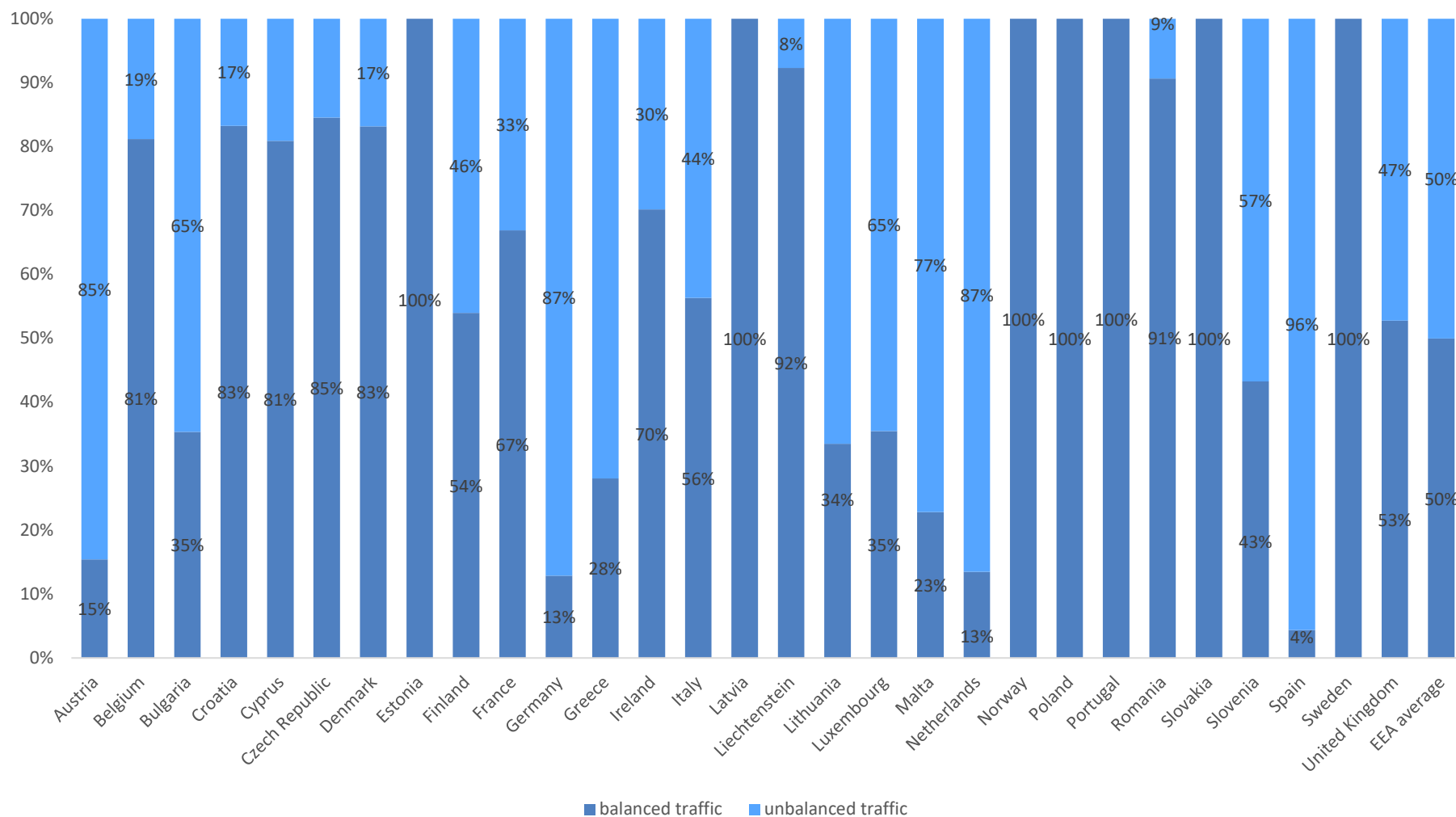


Figure 48: Proportion of balanced and unbalanced traffic within EEA countries (SMS services), wholesale roaming inbound, Q4 18



Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the non-disaggregated estimates (Figures 48 – 49).

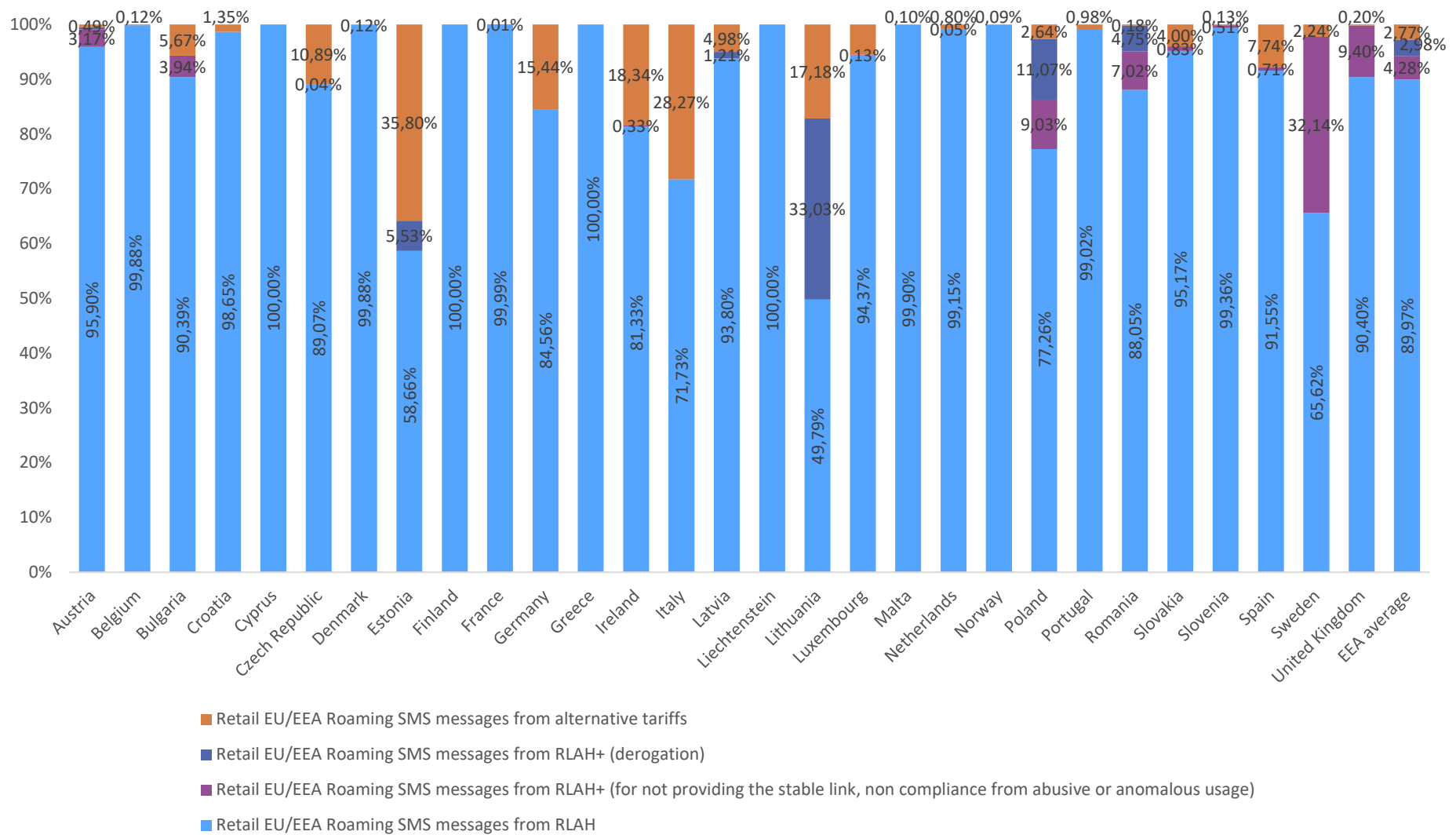
Figure 49: Proportion of balanced and unbalanced traffic within EEA countries (SMS services), wholesale roaming inbound, Q1 19



Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the non-disaggregated estimates.

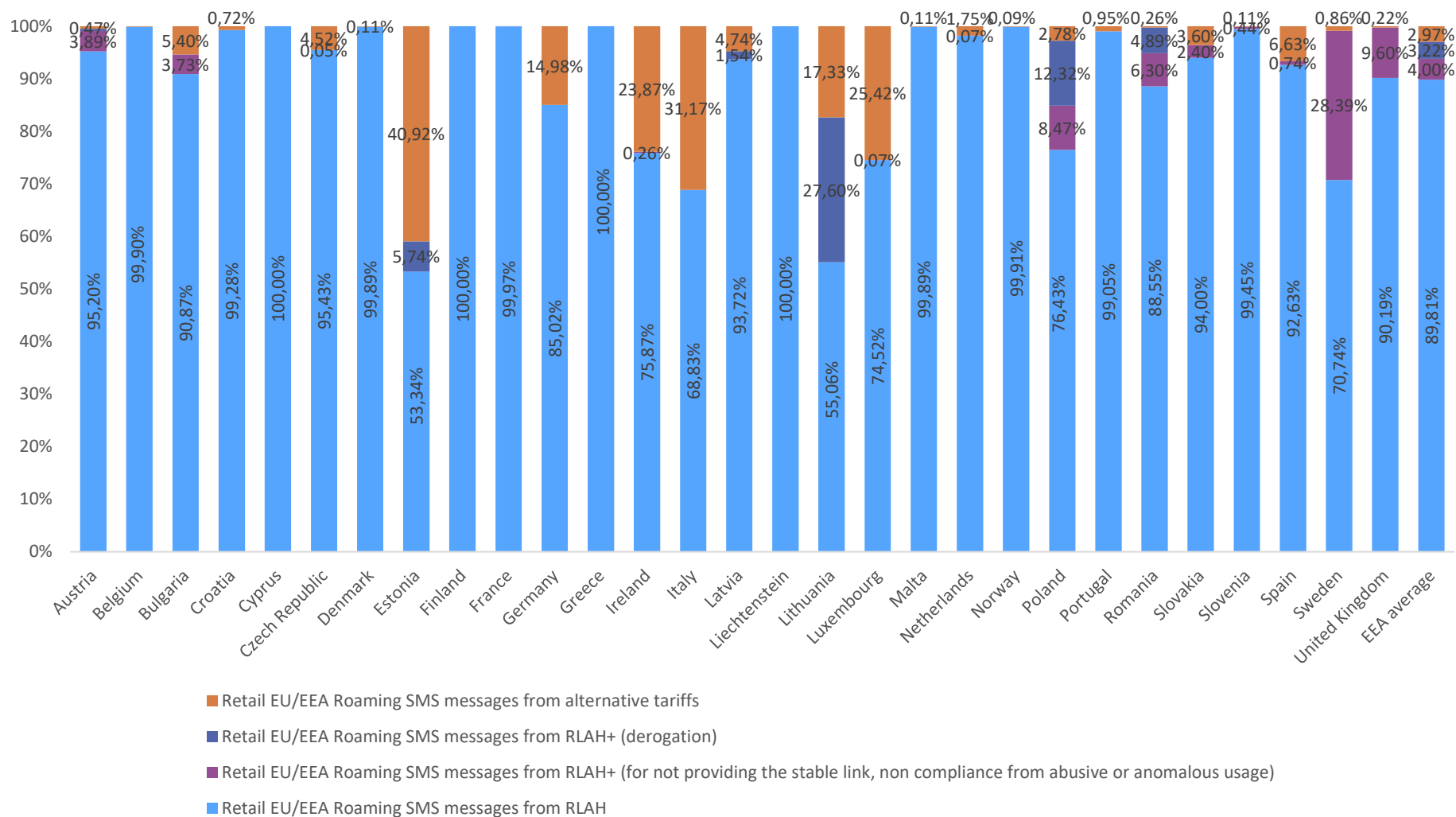
5.2.2.2 Consumption patterns

Figure 50: Percentage of EEA roaming SMS, Q4 18



Finland: RLAH+ (derogation) and Alternative tariffs are not reported due to confidentiality reasons. RLAH+ (derogation) and Alternative tariffs data have been taken into account when calculating EEA average.

Figure 51: Percentage of EEA roaming SMS, Q1 19



Finland: RLAH+ (derogation) and Alternative tariffs are not reported due to confidentiality reasons. RLAH+ (derogation) and Alternative tariffs data have been taken into account when calculating EEA average.

Figure 52: EEA percentage of SMS sent, Q3 16 – Q1 19

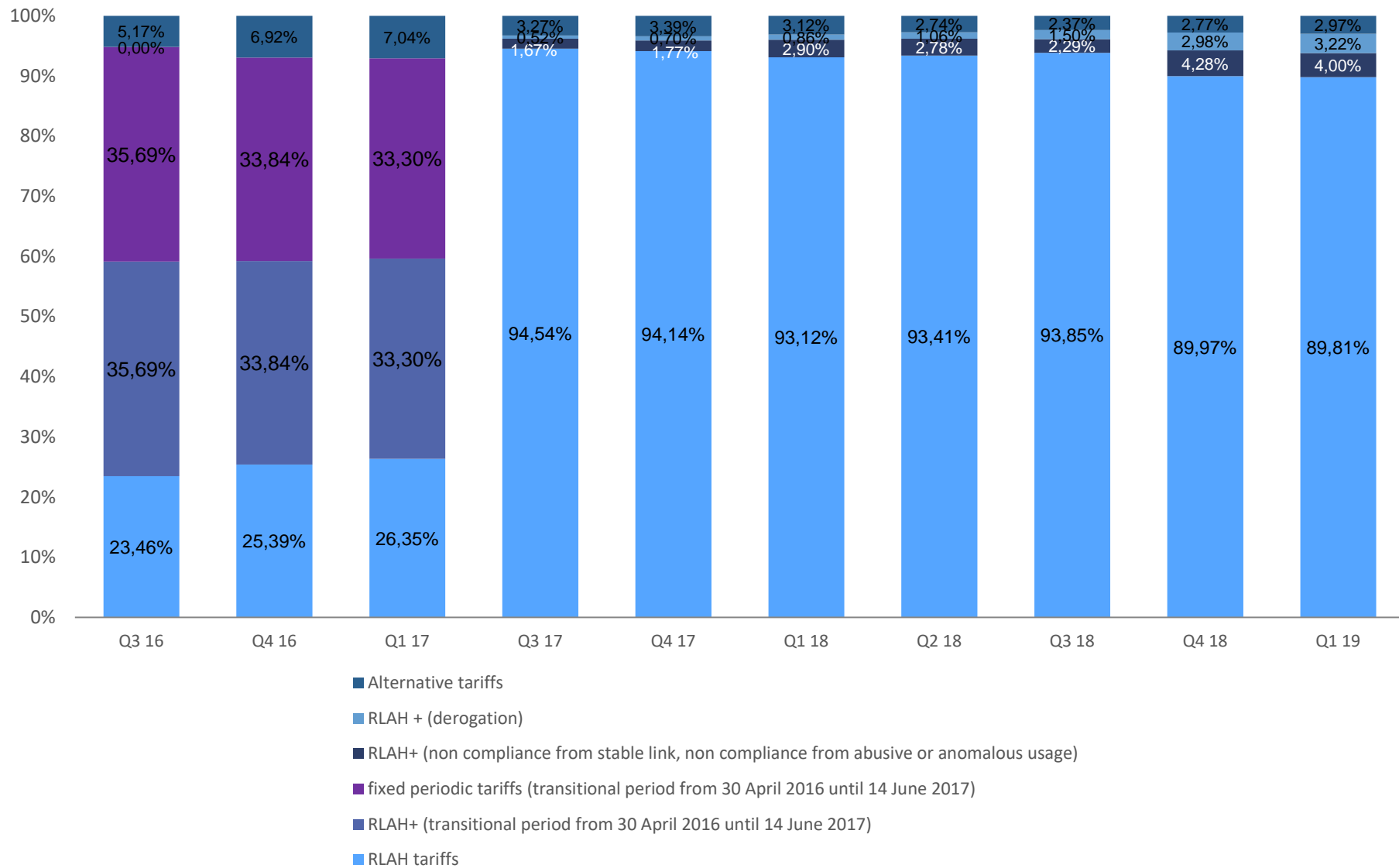


Figure 53: Average number of SMS per month per total number of roaming subscribers, Q3 18 – Q1 19

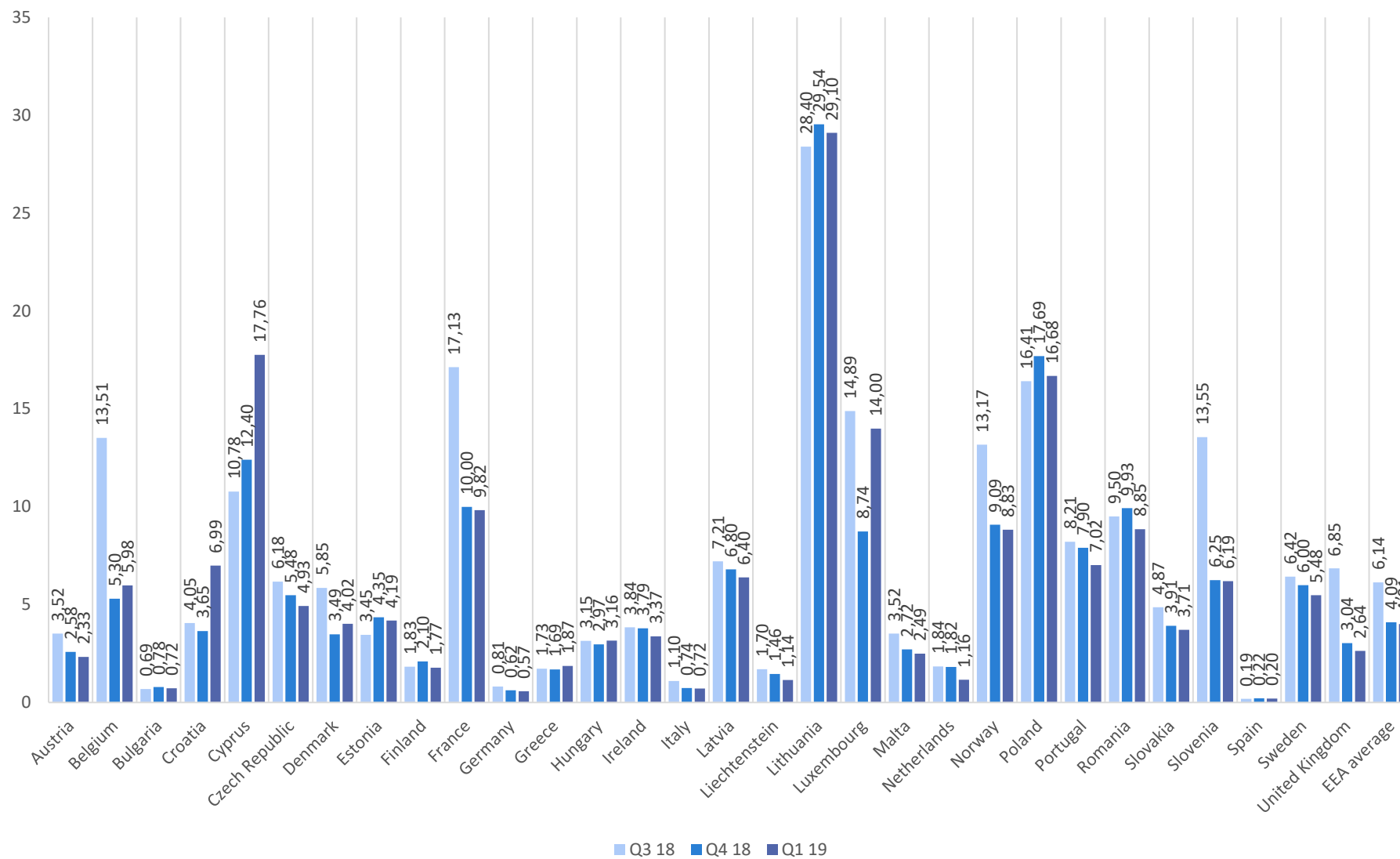


Figure 54: EEA average number of SMS per month per total number of roaming subscribers, Q2 16 – Q1 19

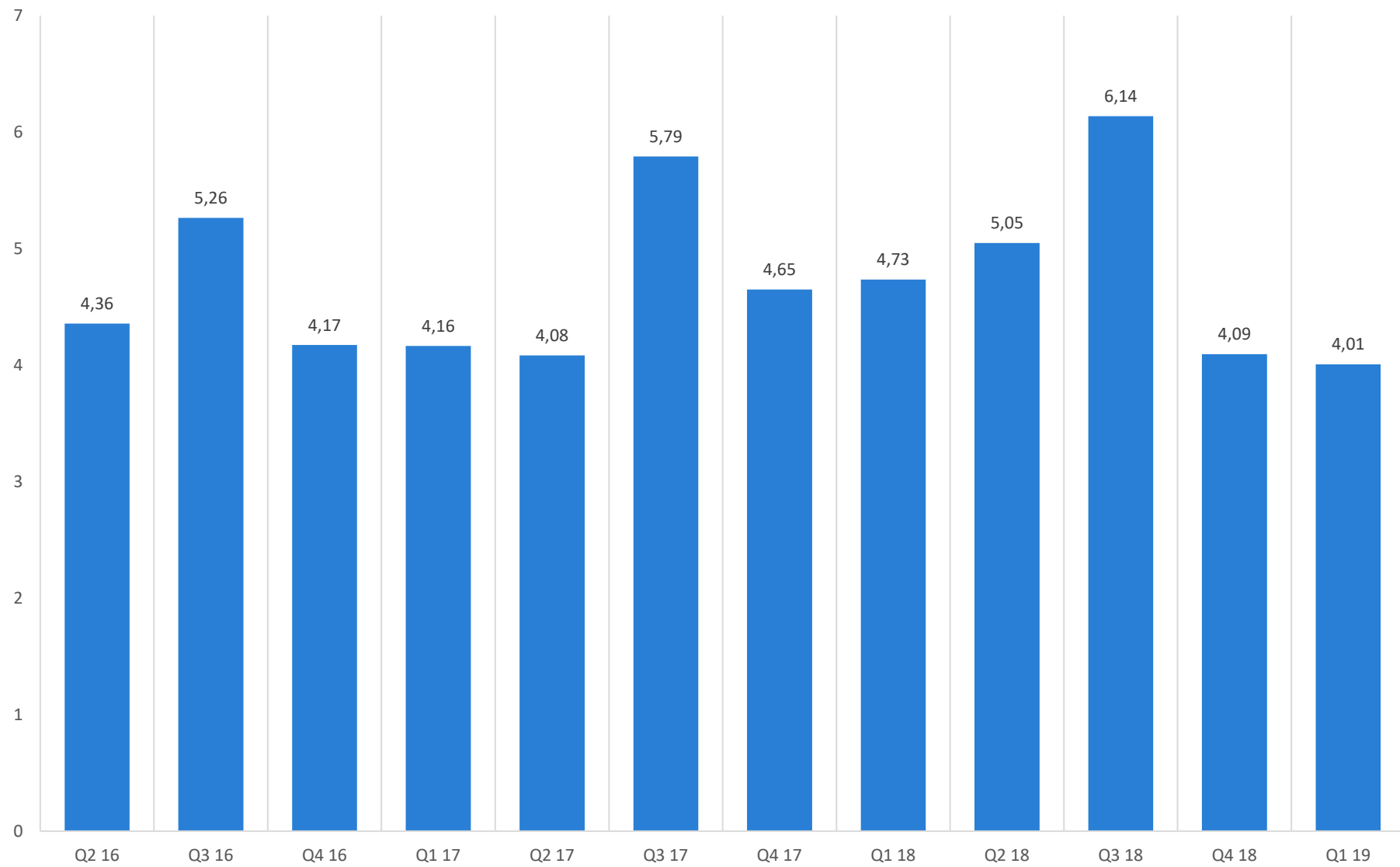
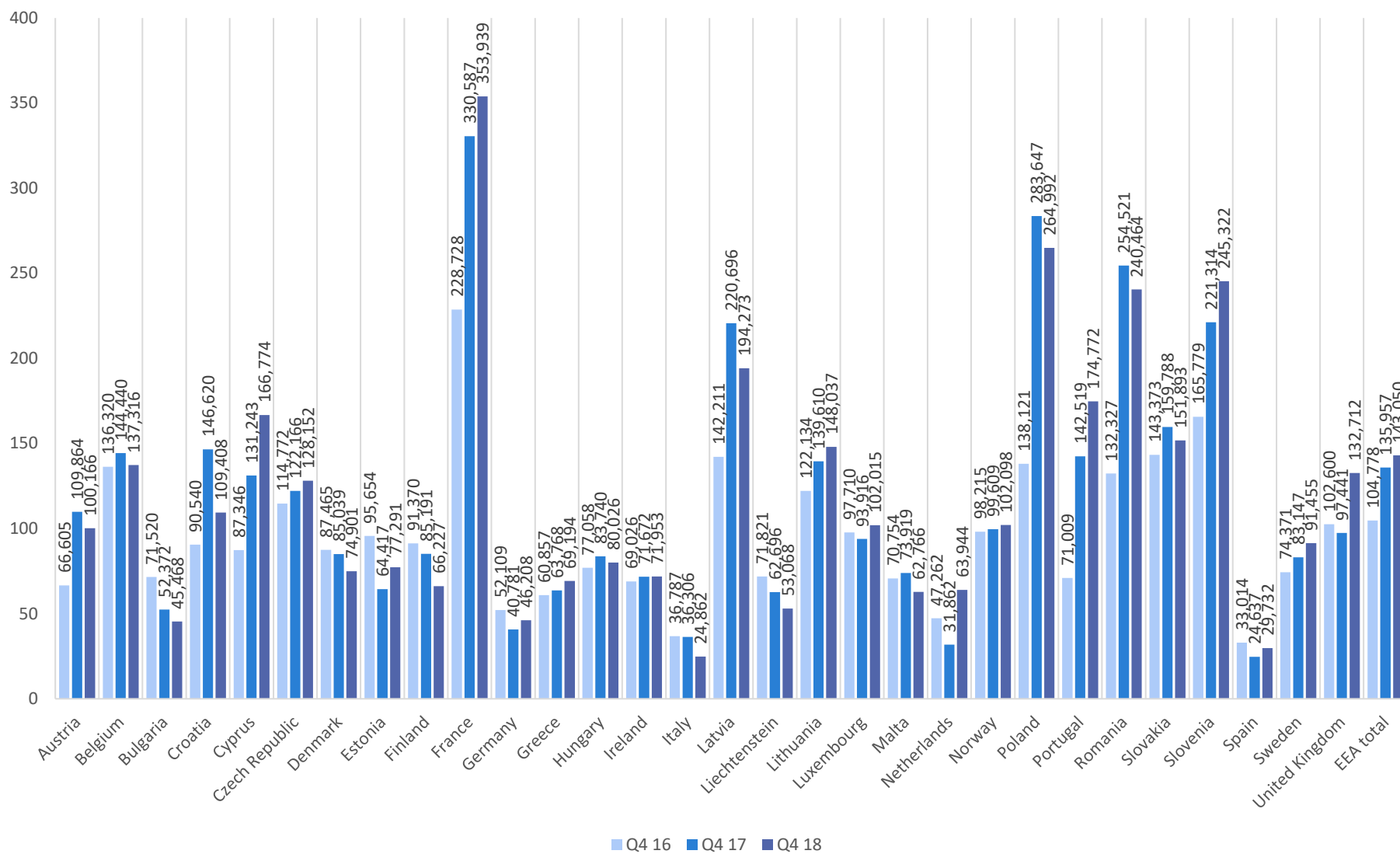
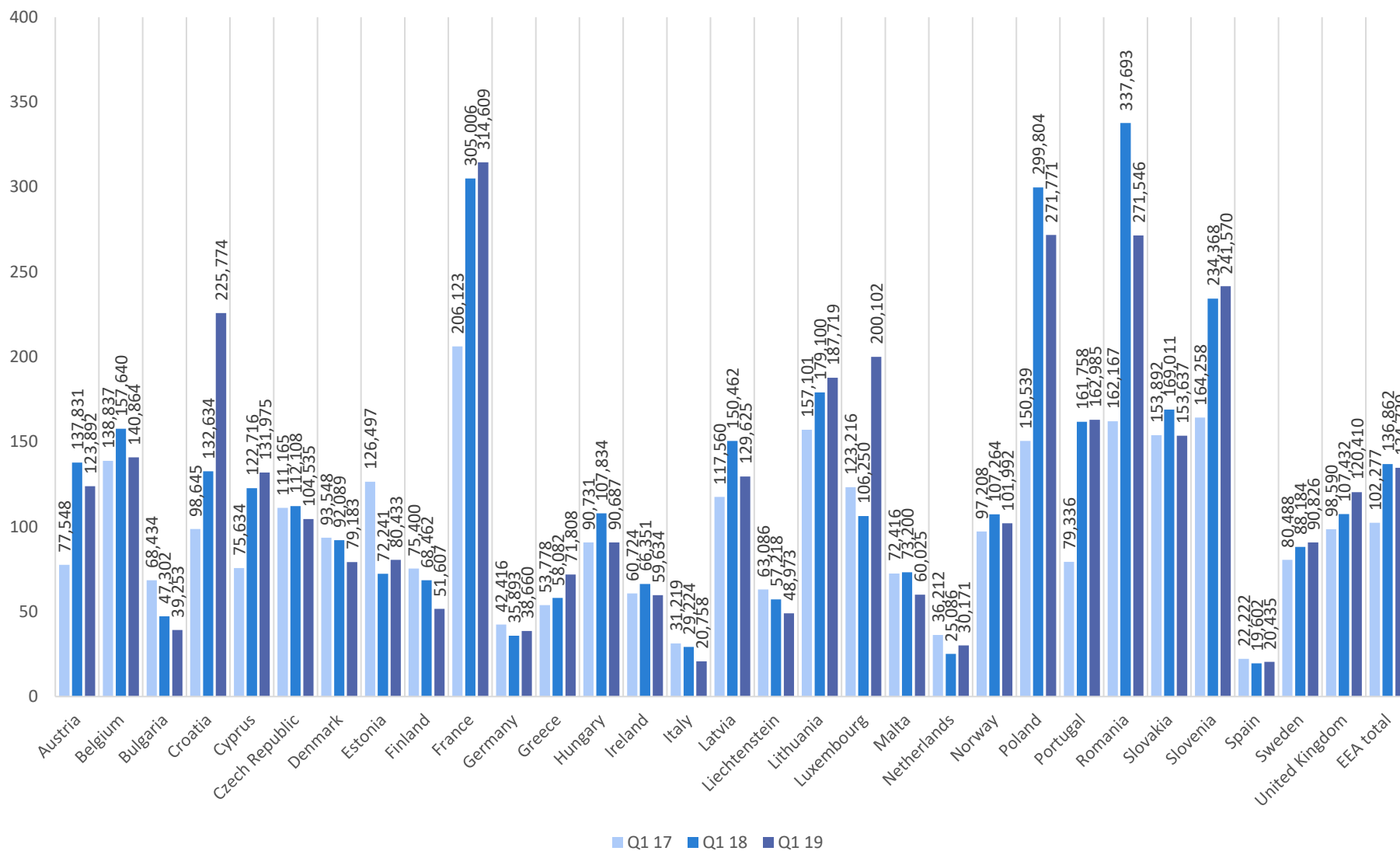


Figure 55: Retail SMS traffic Index, Q4 16, Q4 17 and Q4 18*



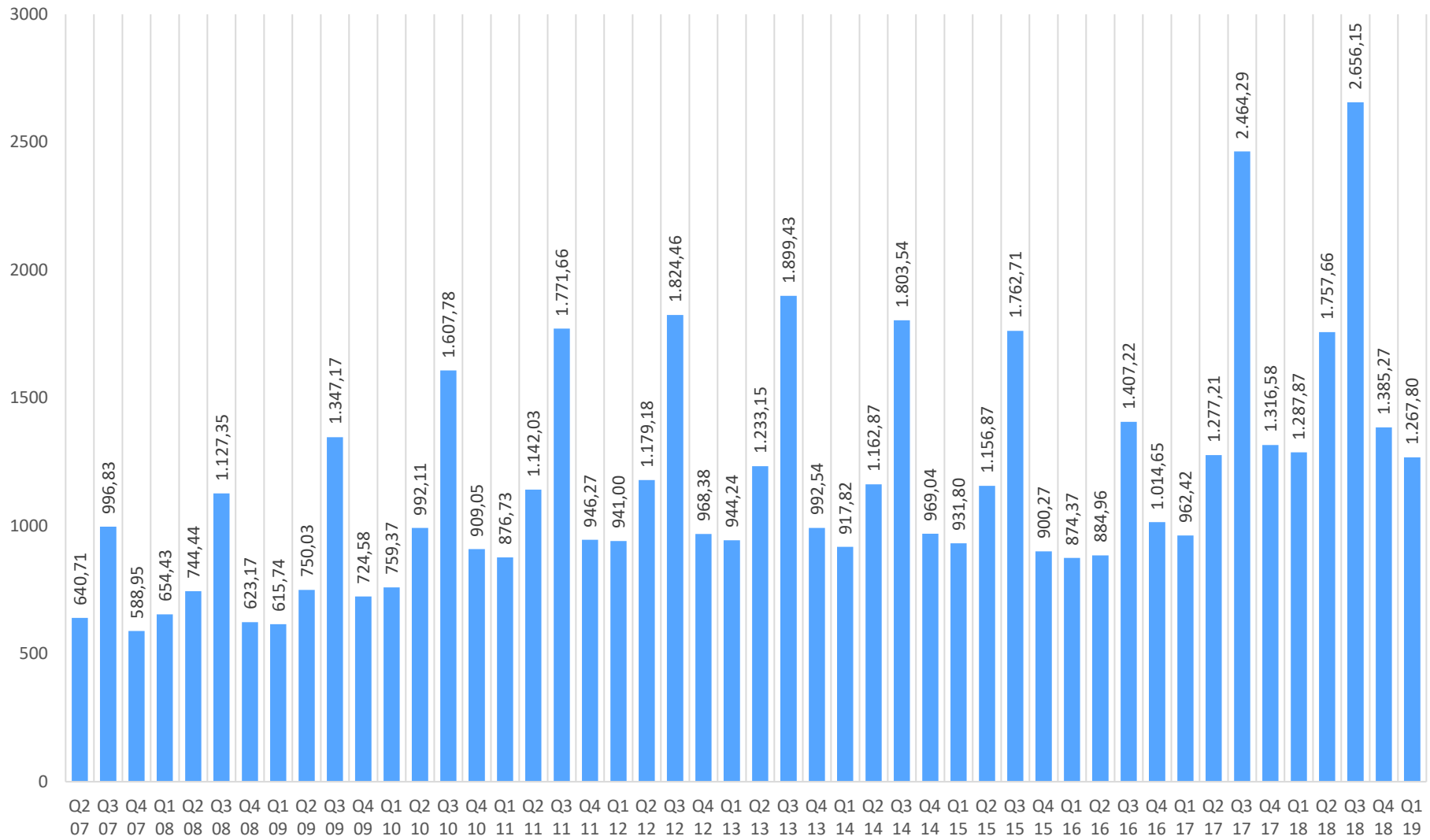
*Reference period: Q2 12 = 100, Croatia: Q2 14= 100, Liechtenstein: Q2 13=100

Figure 56: Retail SMS traffic Index, Q1 17, Q1 18 and Q1 19*



*Reference period: Q3 12= 100, Croatia: Q3 13= 100

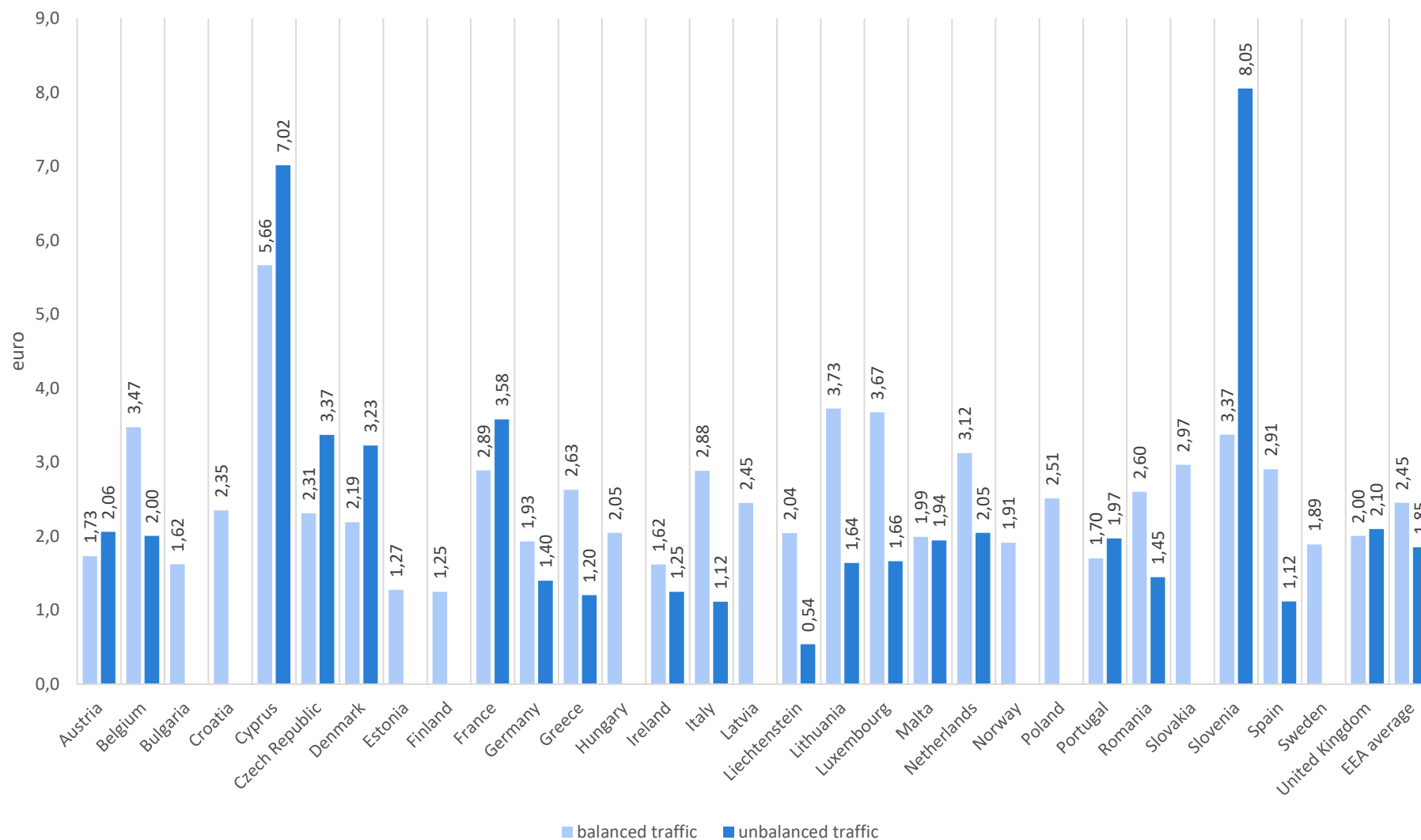
Figure 57: EEA retail SMS traffic, Q2 07 – Q1 19 (millions of messages)



5.2.3.Data roaming services

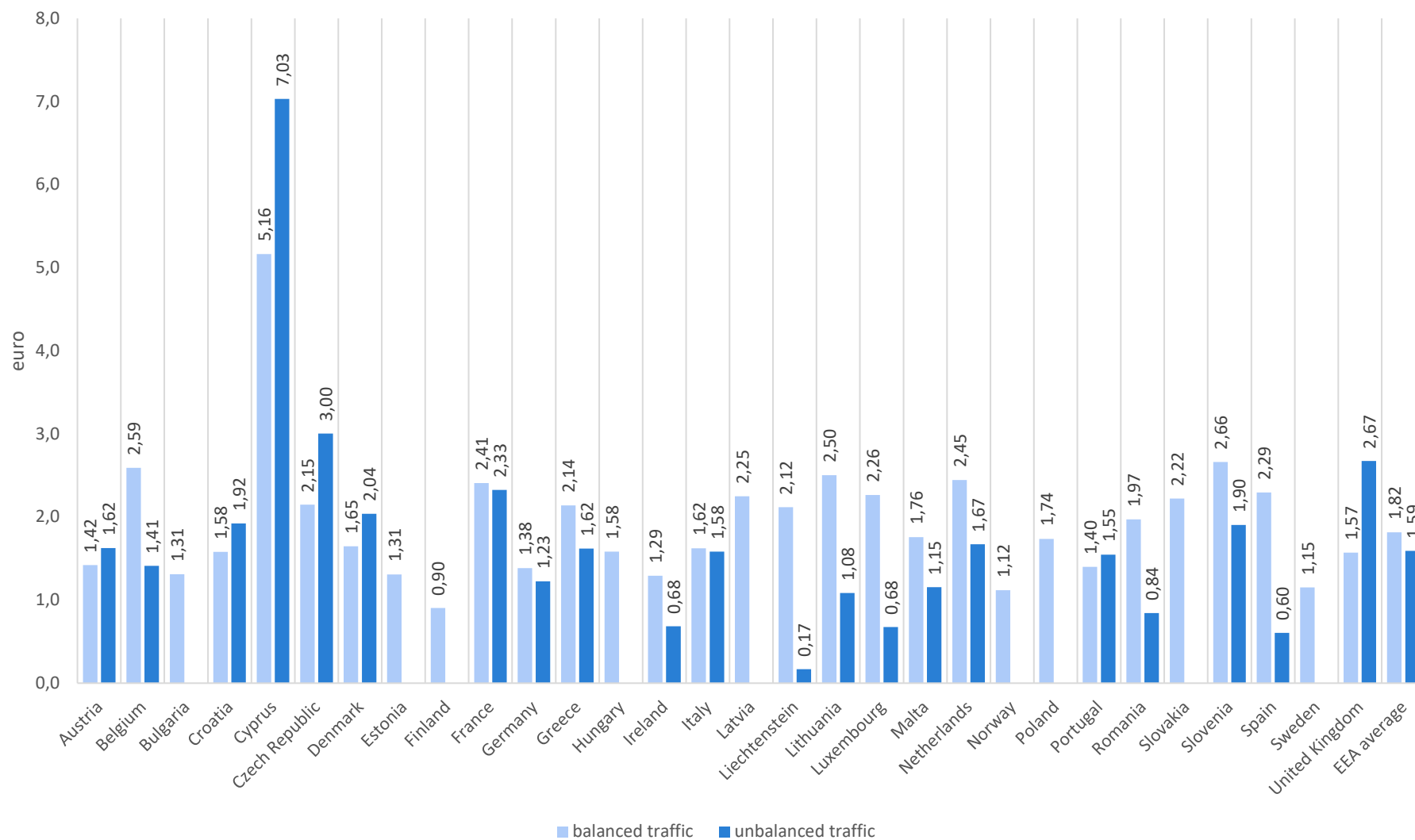
5.2.3.1 Wholesale prices

Figure 58: Average wholesale data price per GB (balanced and unbalanced traffic), Q4 18



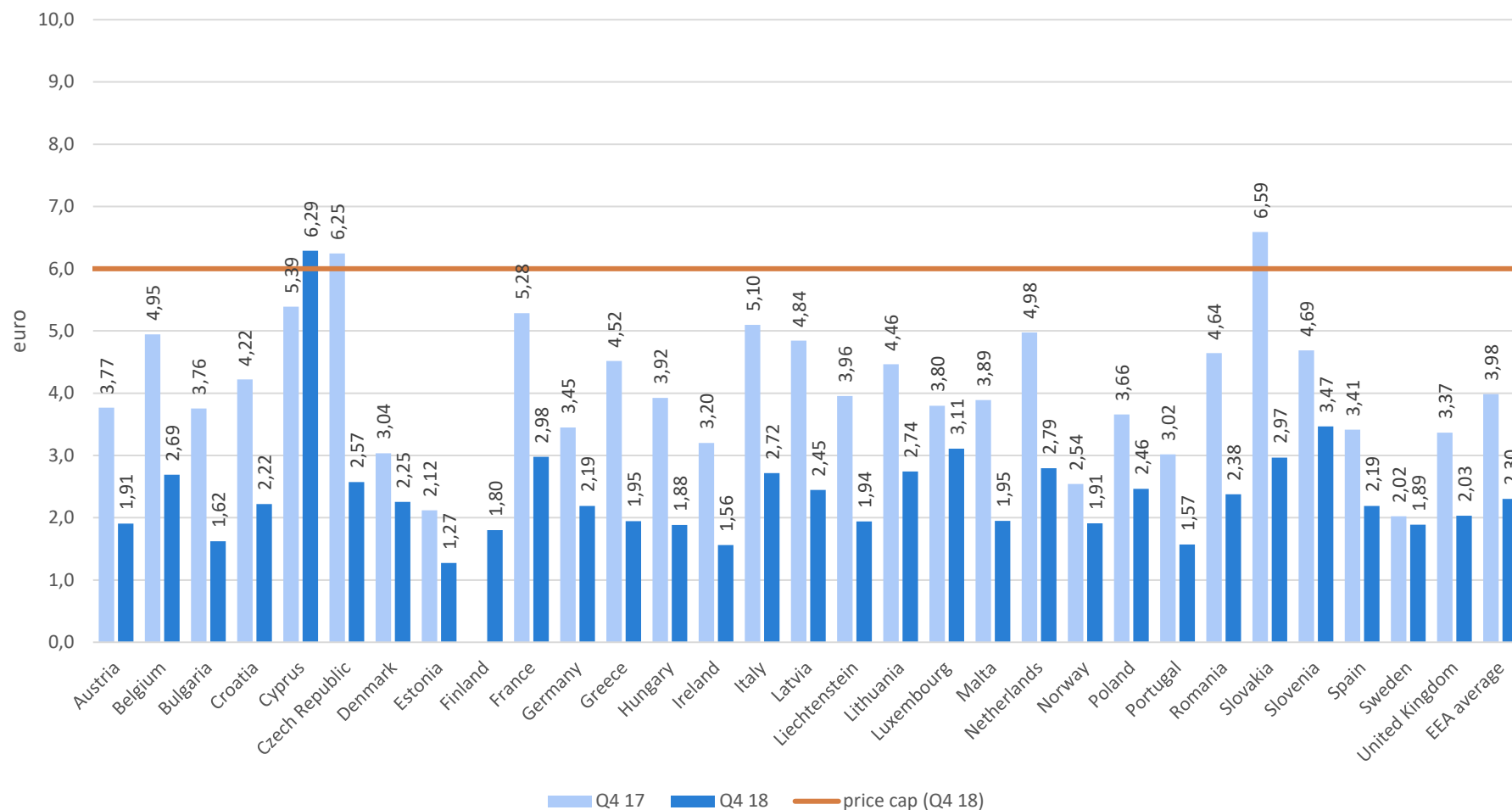
Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the estimates (non-disaggregated) in Figure 60 and Figure 61.

Figure 59: Average wholesale data price per GB (balanced and unbalanced traffic), Q1 19



Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the estimates (non-disaggregated) in Figure 60 and Figure 61.

Figure 60: Total traffic: average wholesale data price per GB, Q4 17 and Q4 18

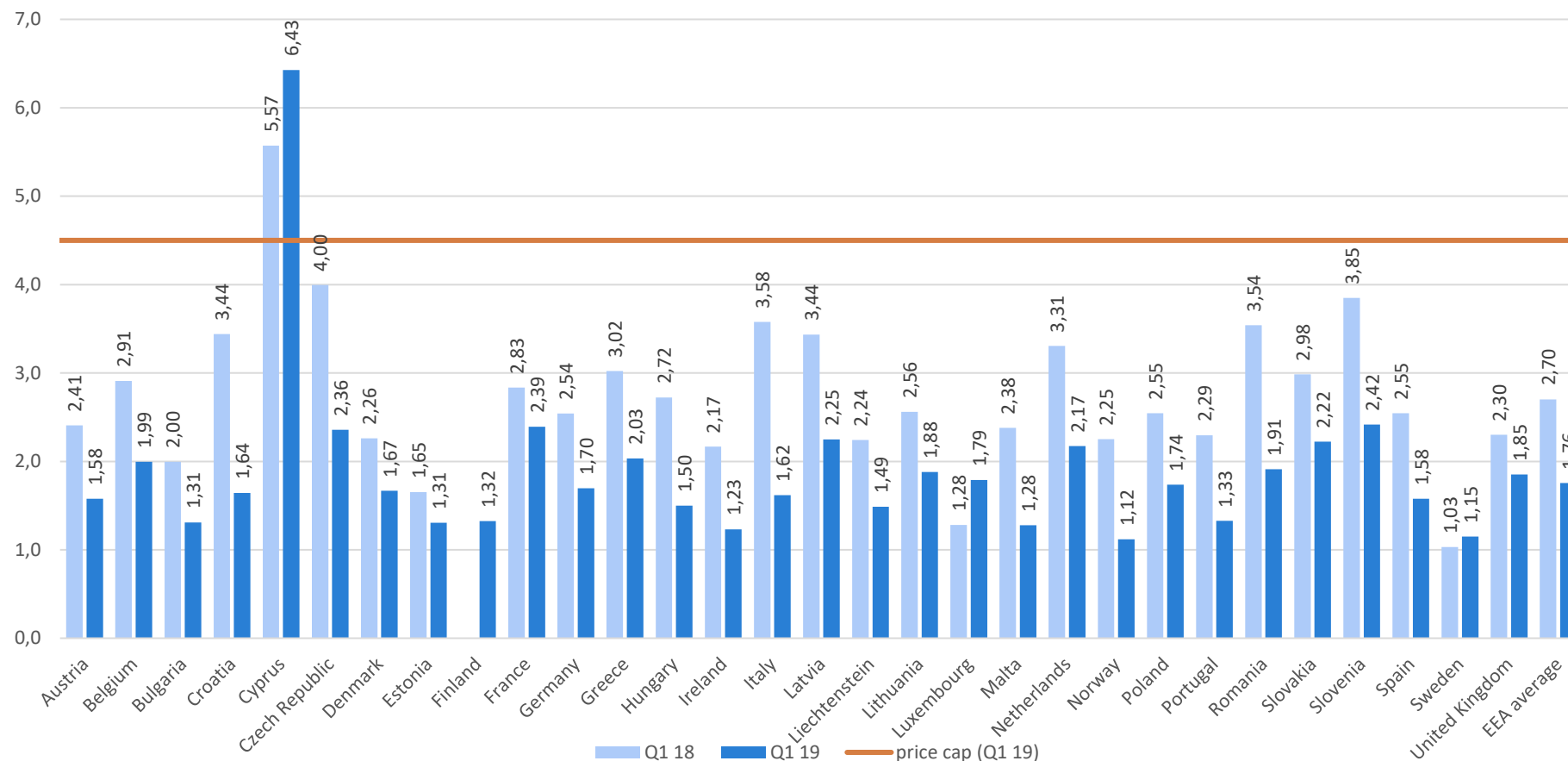


Portugal: the number of operators that reported data for calculating these estimates is different from the number of operators that reported data for calculating the estimates (disaggregated for balanced and unbalanced traffic) in Figure 58 and Figure 59.

Cyprus: The discrepancy is due to the fact the wholesale data reported by operators corresponds to the actual period used, but the revenues reported by the operators are the revenues received (not billed)

EEA average (Q4 2019) excludes: Cyprus

Figure 61: Total data traffic: average wholesale data price per GB, Q1 18 and Q1 19



Portugal: the number of operators that reported data for calculating these estimates is different from the number of operators that reported data for calculating the estimates (disaggregated for balanced and unbalanced traffic) in Figure 58 and Figure 59.

Cyprus: The discrepancy is due to the fact the wholesale data reported by operators corresponds to the actual period used, but the revenues reported by the operators are the revenues received (not billed)

EEA average (Q1 2019) excludes: Cyprus

Figure 62: Total traffic: EEA average wholesale data price per GB, Q4 08 – Q1 19

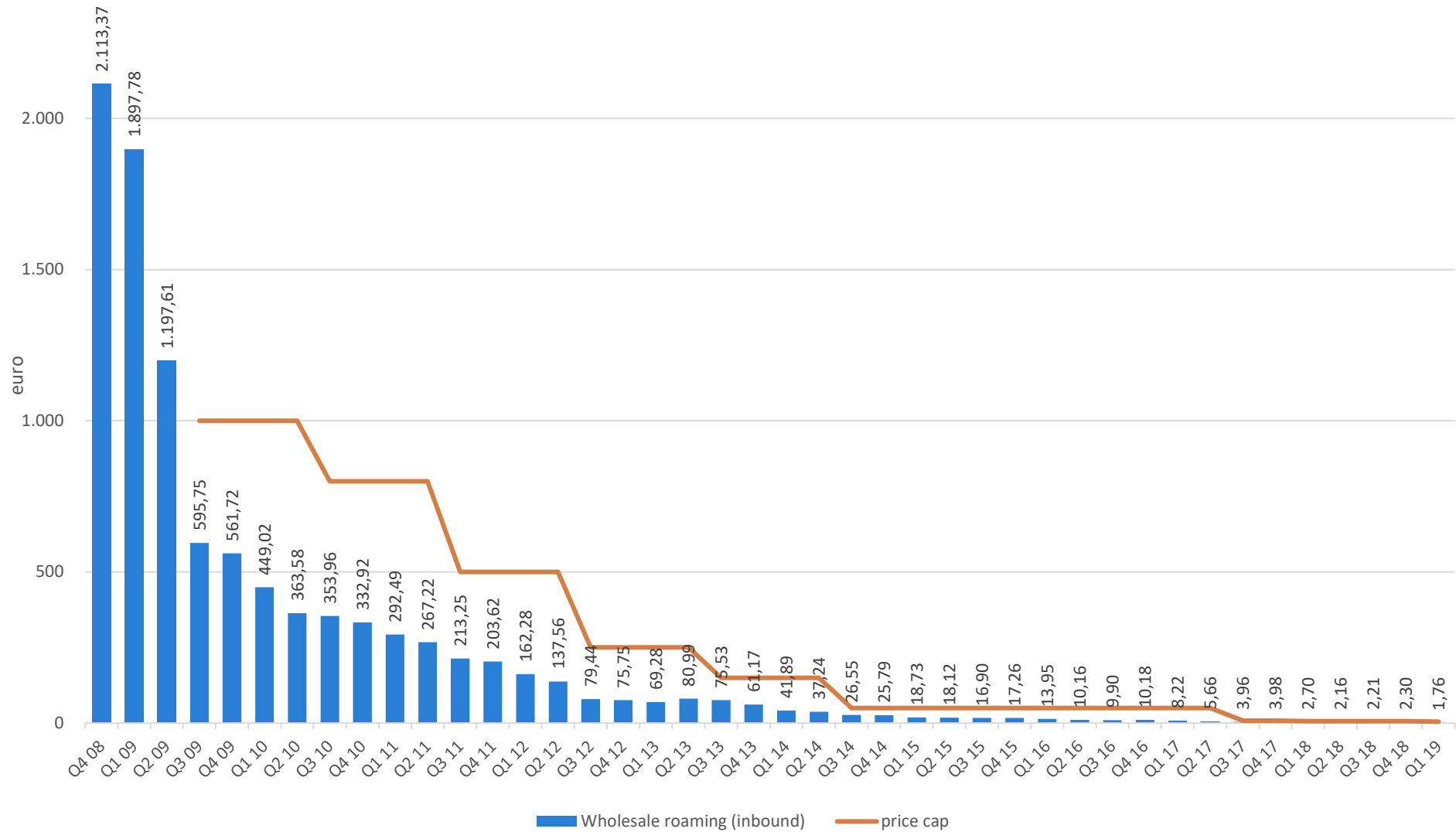


Figure 63: RoW traffic: Average wholesale data price charged by EEA operators per GB (inbound roaming), Q4 18 and Q1 19

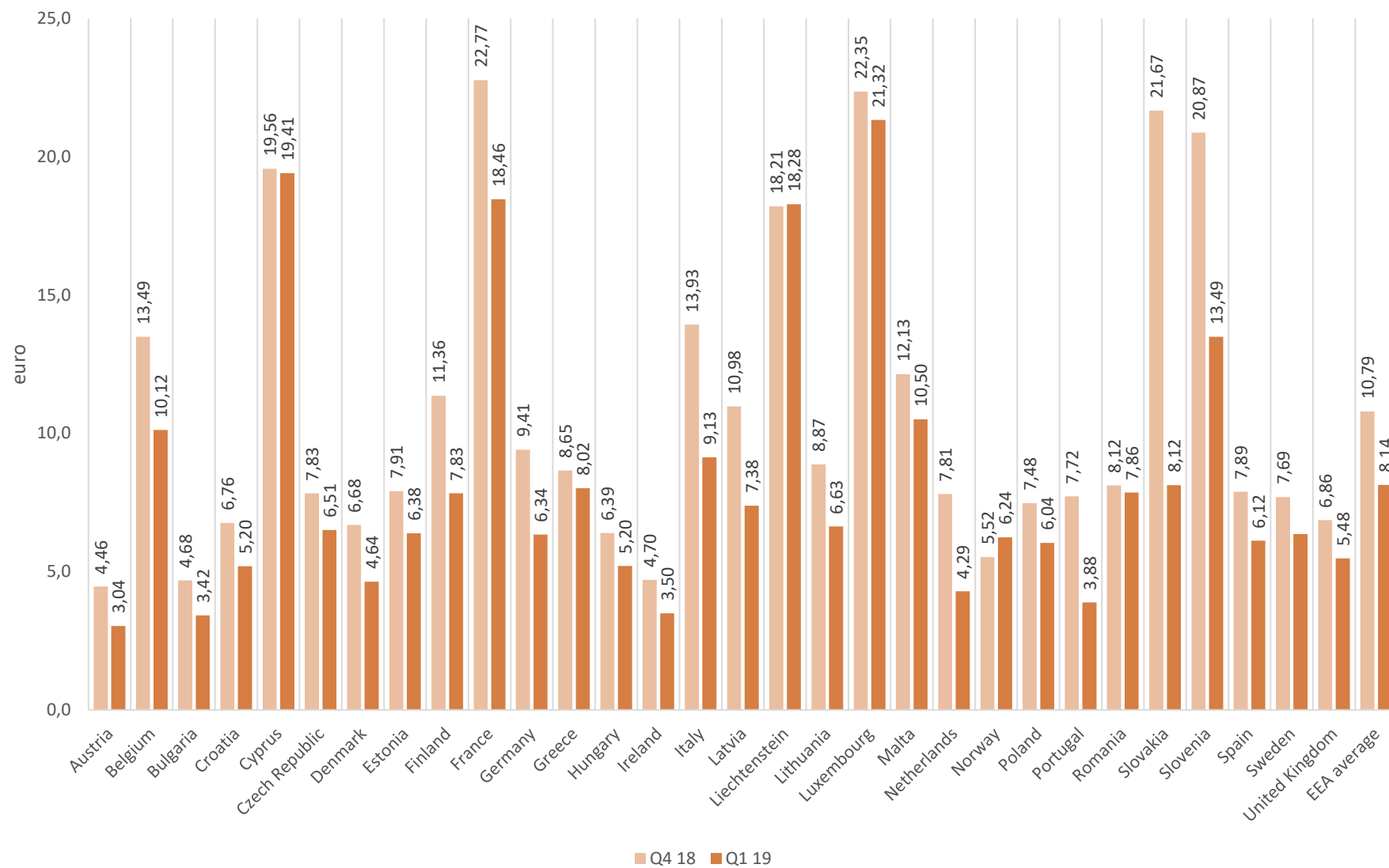


Figure 64: EEA average wholesale data price per GB, Q2 16 – Q1 19 (balanced, unbalanced, total traffic, RoW traffic)

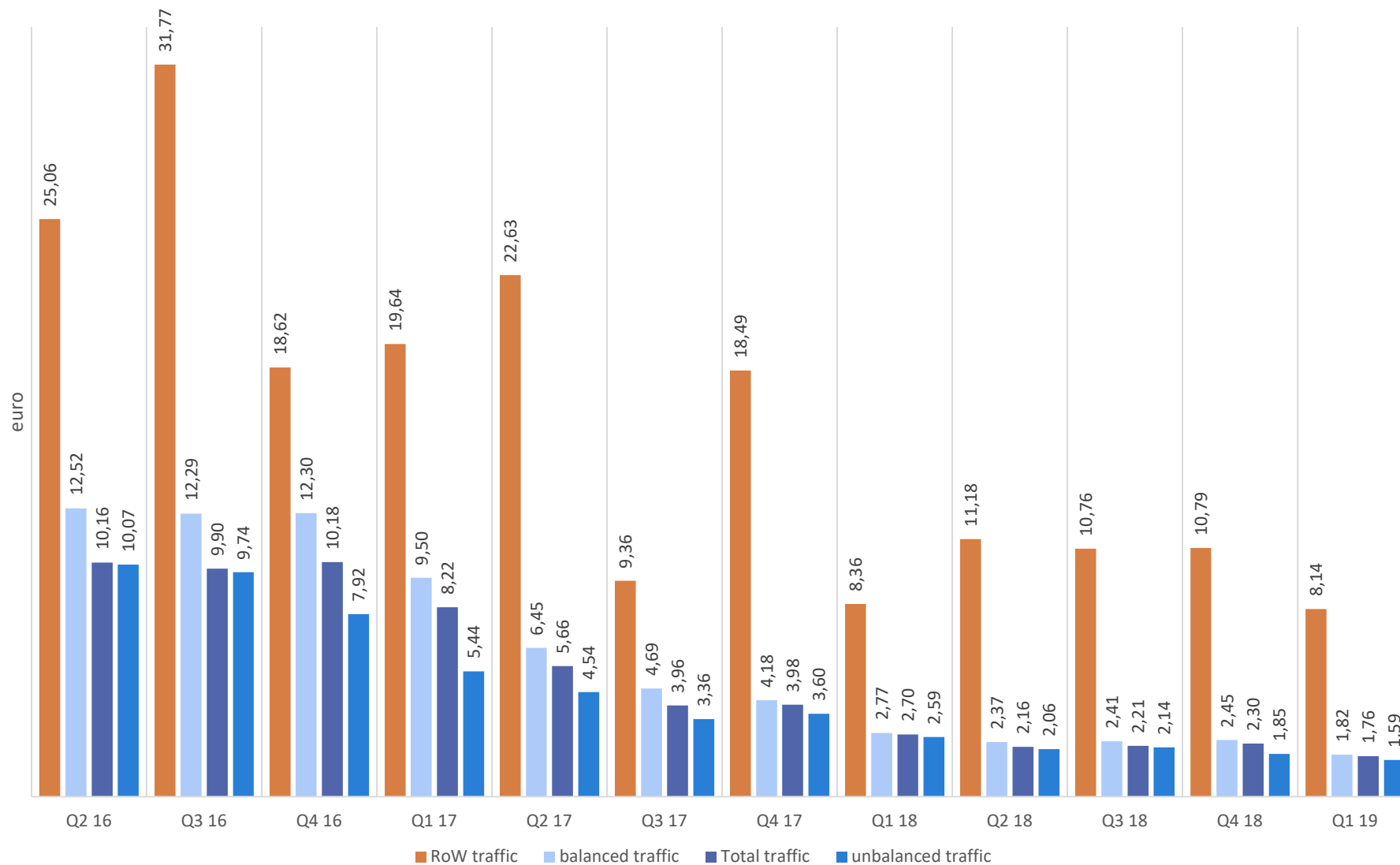
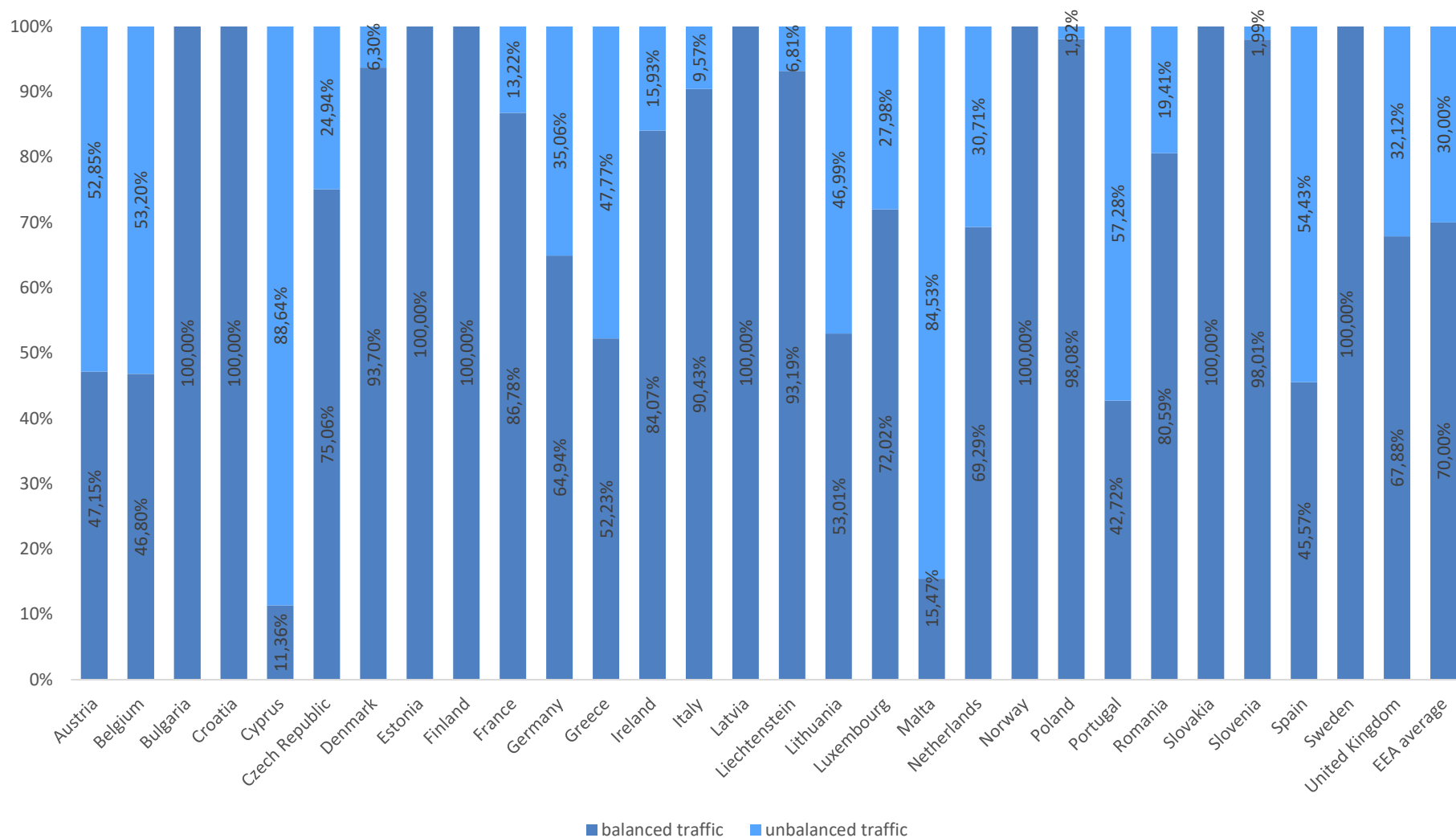
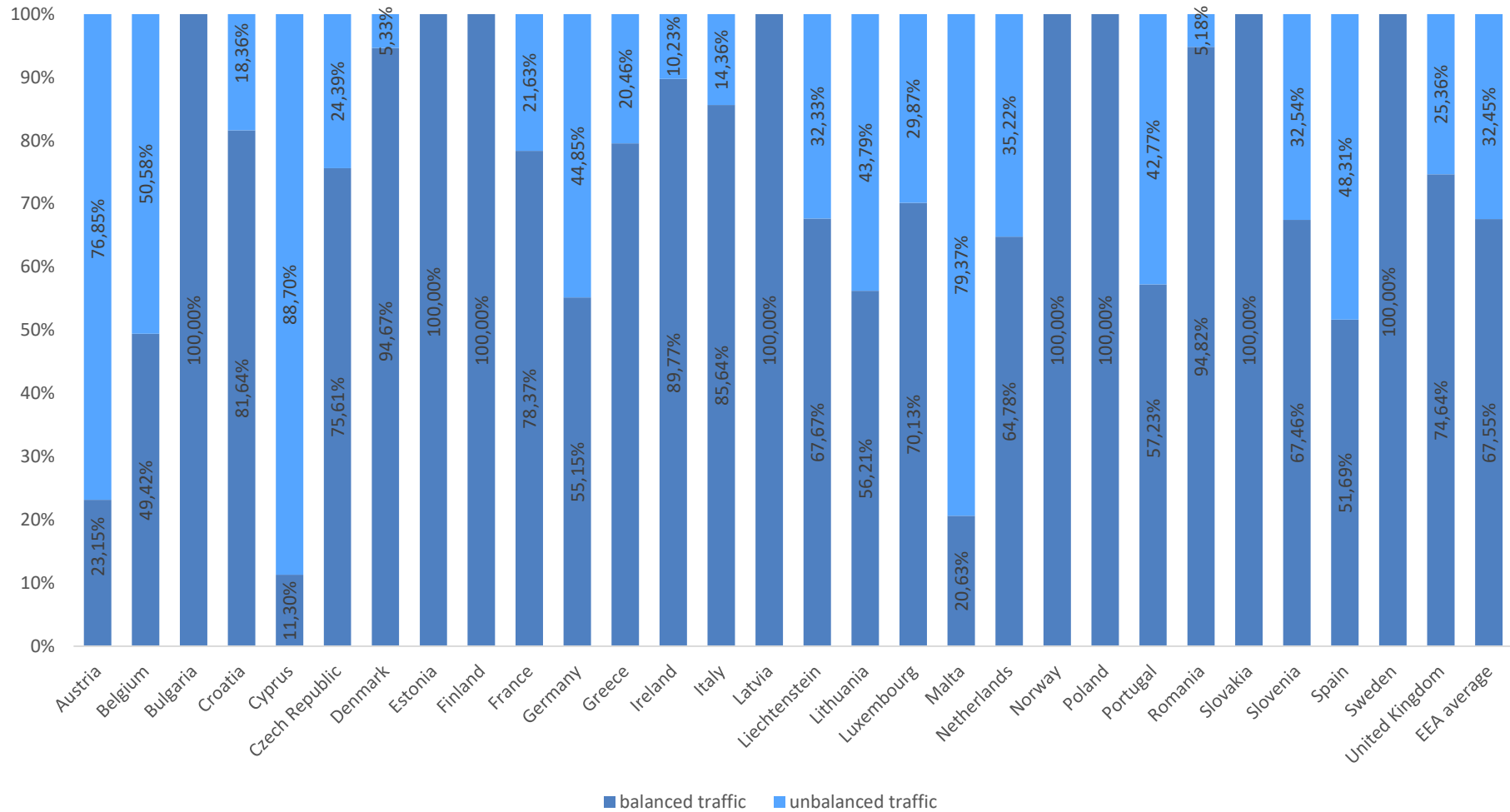


Figure 65: Proportion of balanced and unbalanced traffic within EEA countries, data services, wholesale roaming inbound, Q4 18



Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the non-disaggregated estimates (Figures 65- 66).

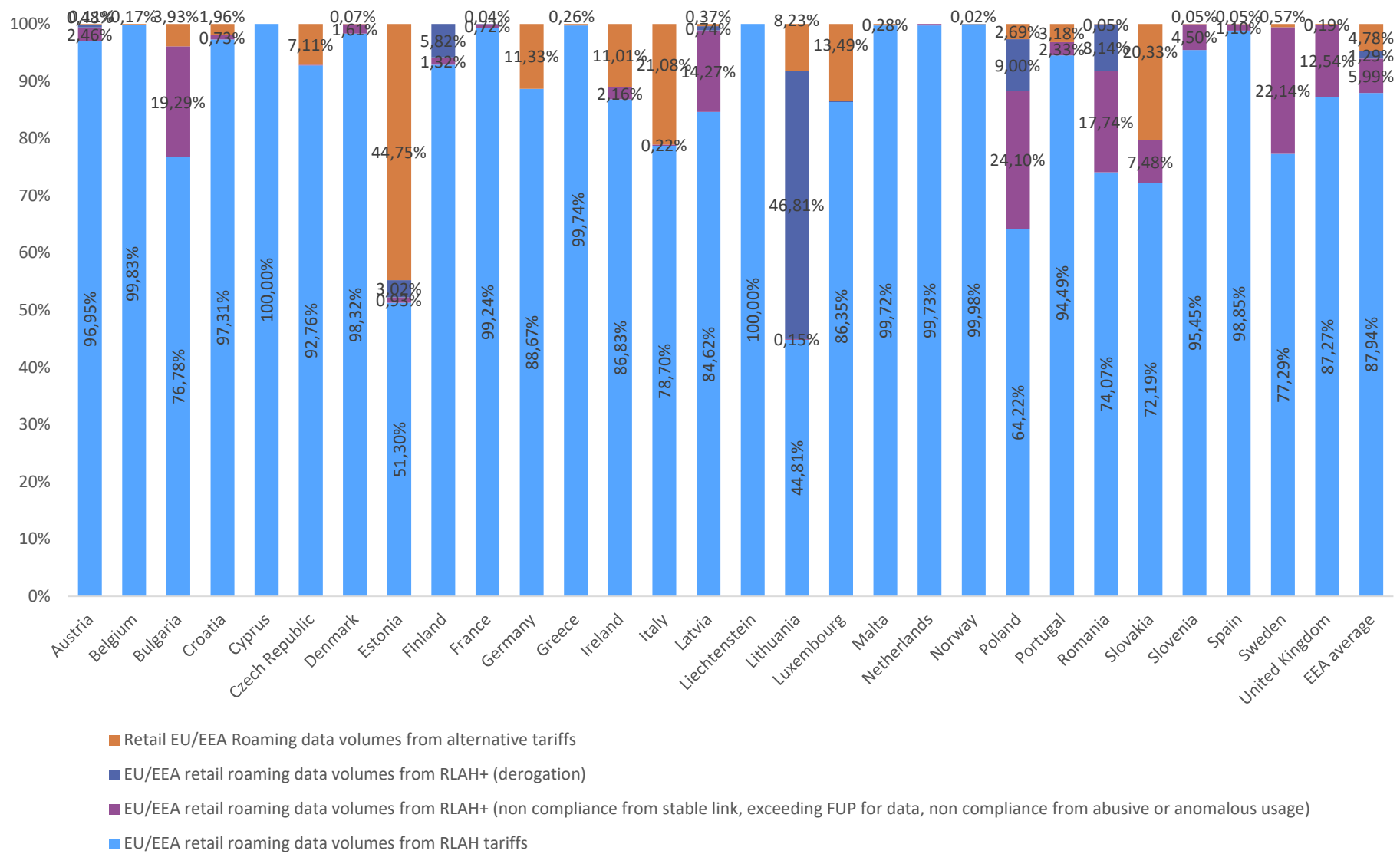
Figure 66: Proportion of balanced and unbalanced traffic within EEA countries, data services, wholesale roaming inbound, Q1 19



Portugal: the number of operators that reported data for calculating these estimates (disaggregated for balanced and unbalanced traffic) is different from the number of operators that reported data for calculating the non-disaggregated estimates (Figures 65- 66).

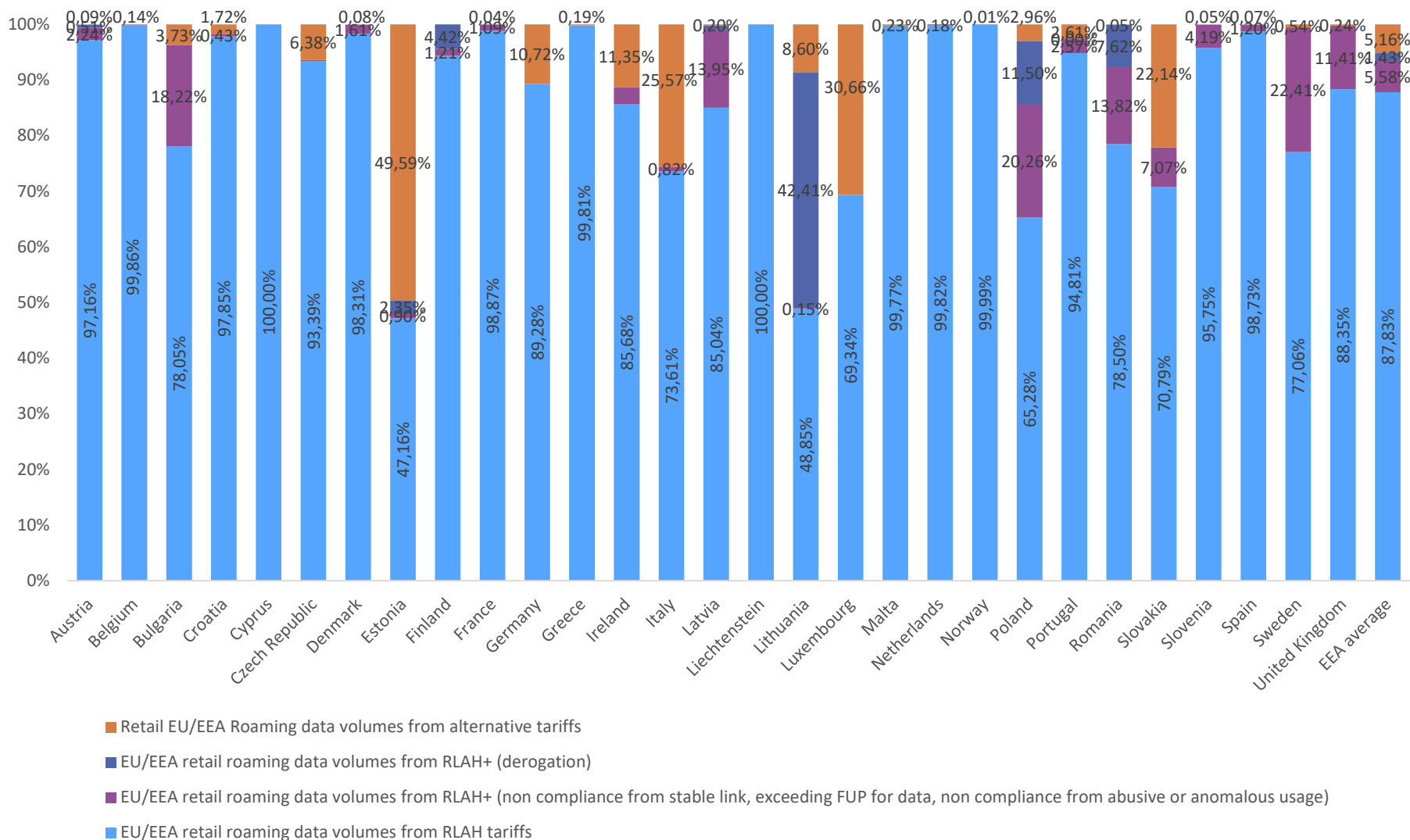
5.2.3.2 Consumption patterns

Figure 67: Percentage of retail data roaming services, Q4 18



Finland: Alternative tariffs are not reported due to confidentiality reasons. Alternative tariffs data have been taken into account when calculating EEA average.

Figure 68: Percentage of retail data roaming services, Q1 19



Finland: Alternative tariffs are not reported due to confidentiality reasons. Alternative tariffs data have been taken into account when calculating EEA average.

Figure 69: EEA average: percentage of retail data roaming services, Q3 16 – Q1 19

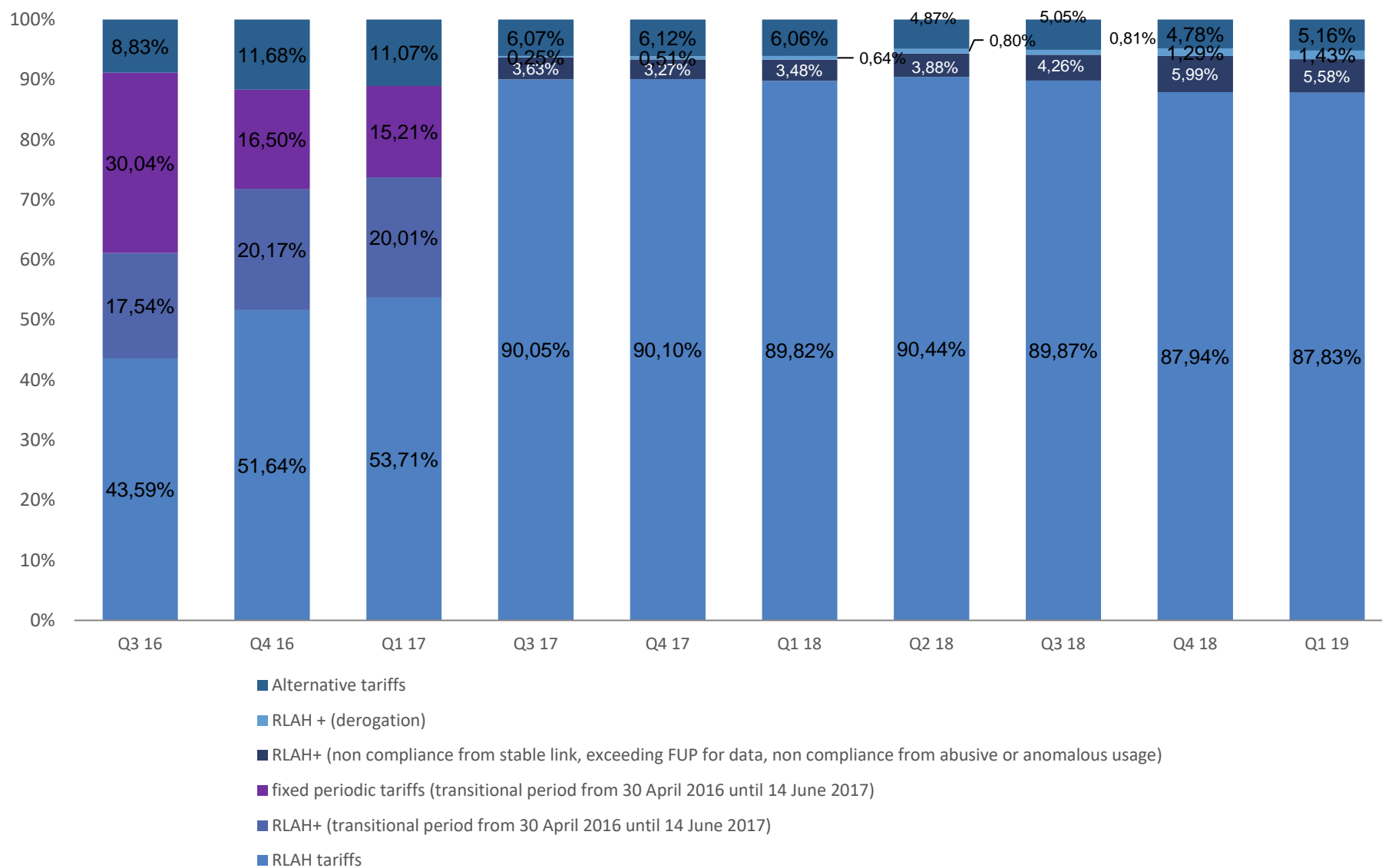


Figure 70: Average data consumption per month per total number of roaming subscribers (in GB), Q4 18 and Q1 19

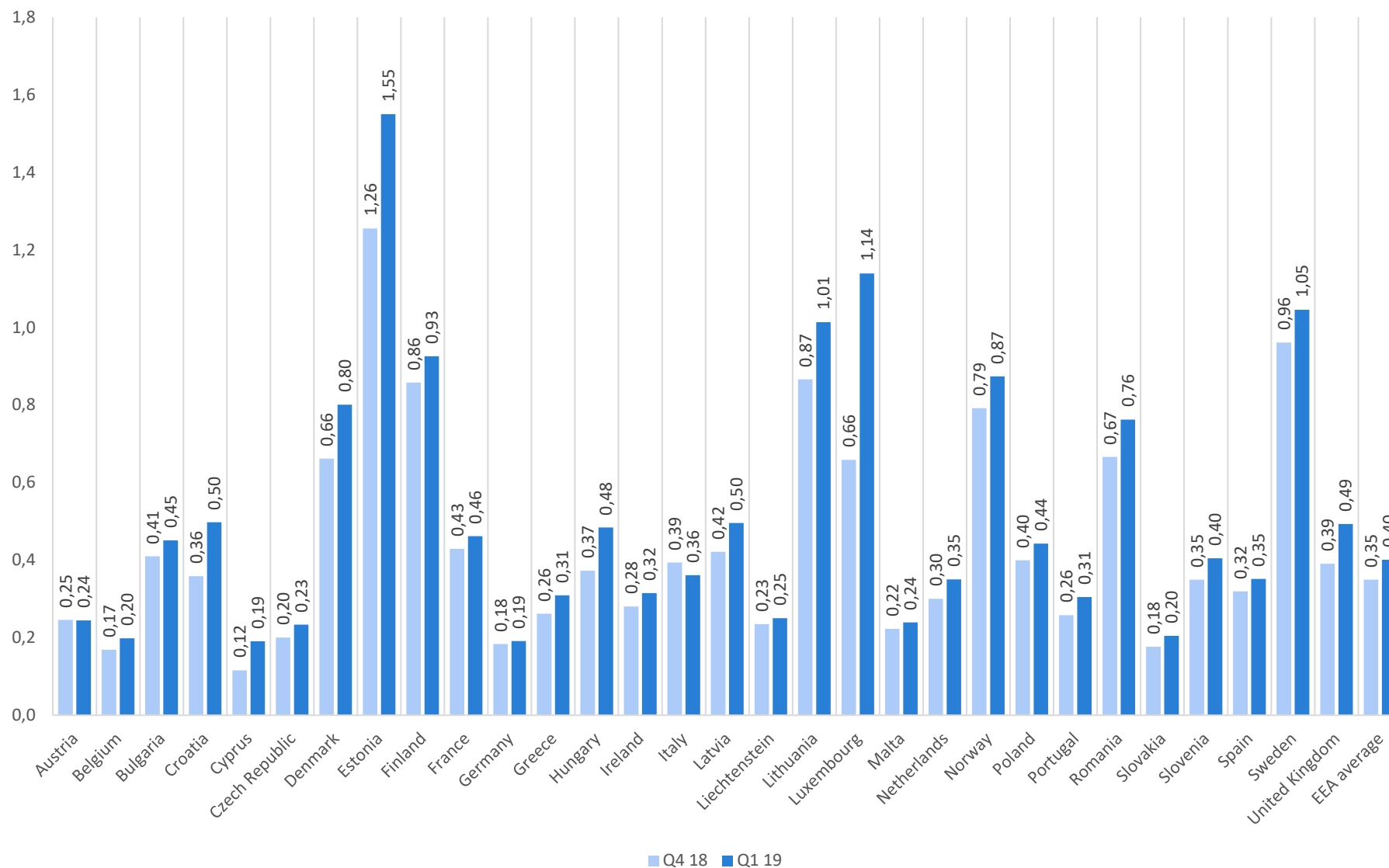


Figure 71: EEA average consumption per month per total number of roaming subscribers (in GB), Q2 16 – Q1 19

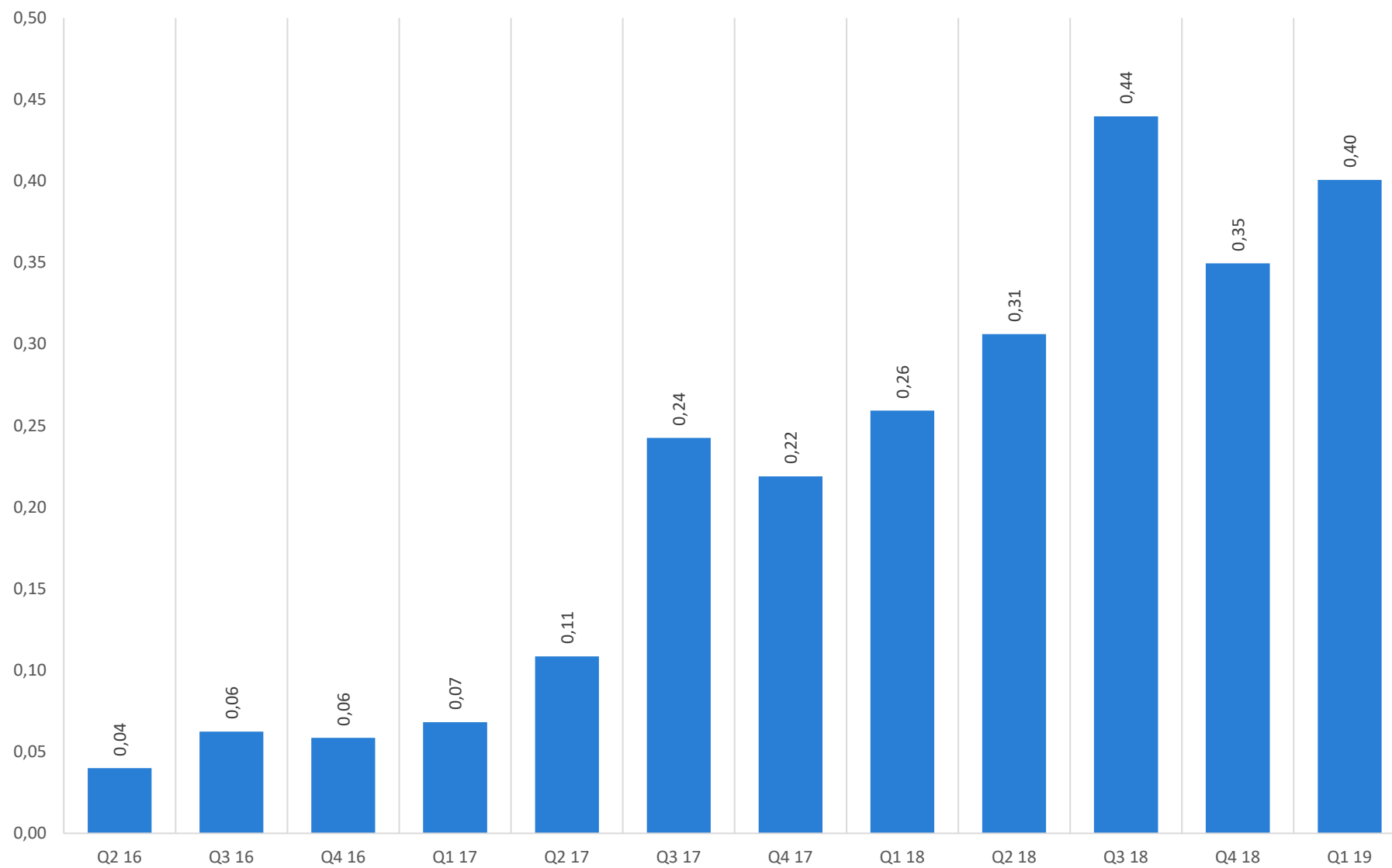
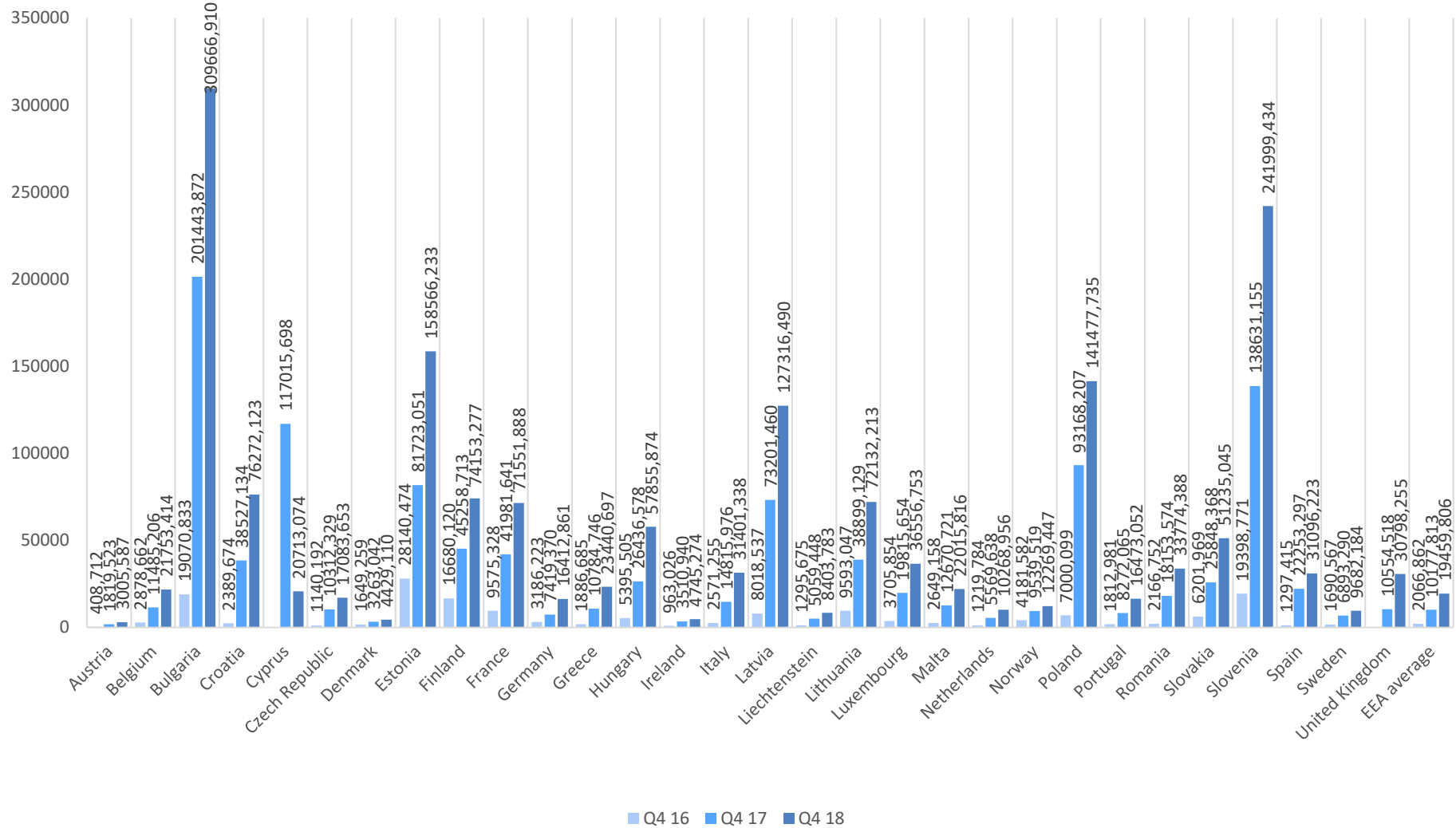
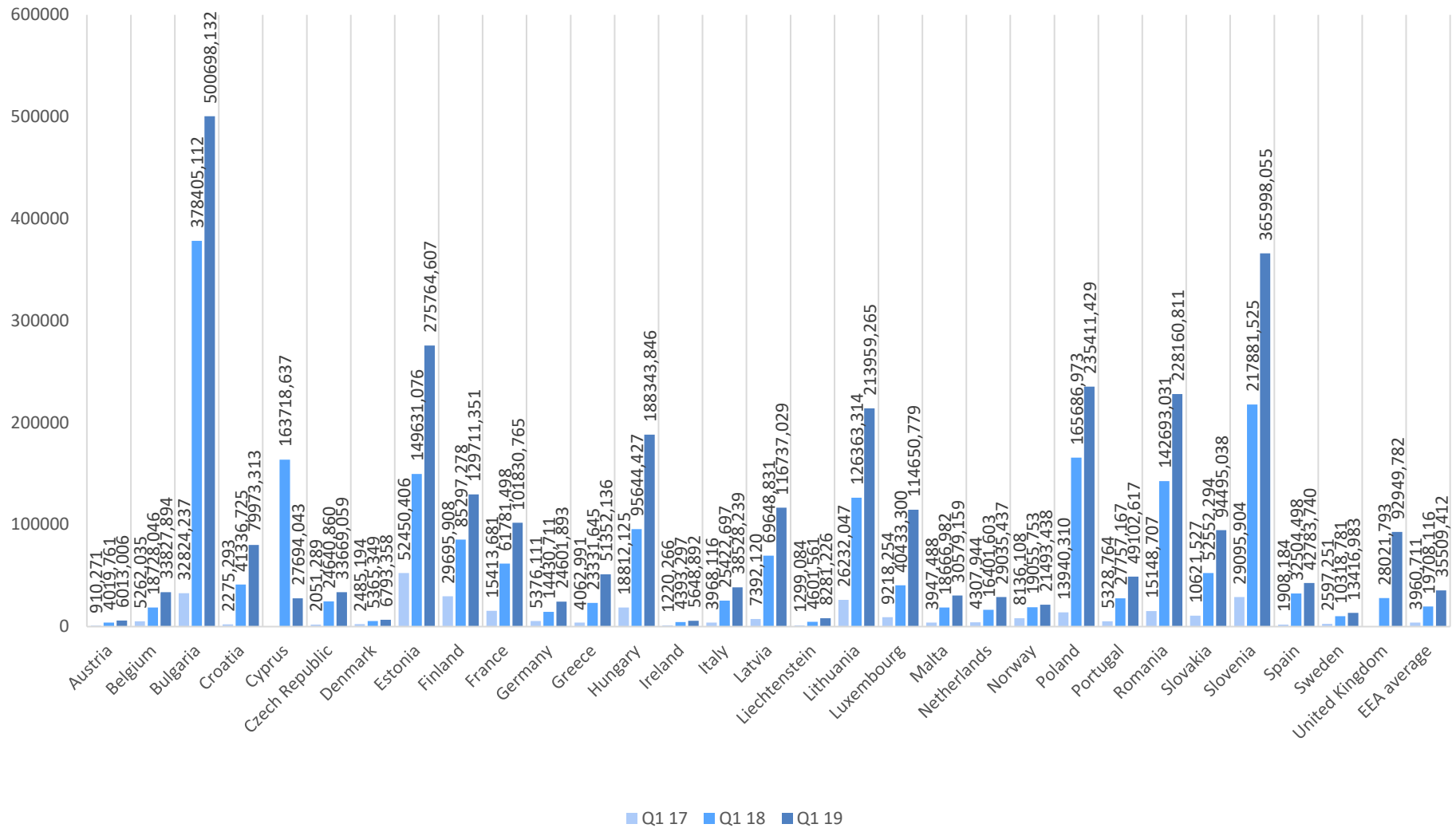


Figure 72: Retail Data traffic Index, Q4 16, Q4 17 and Q4 18*



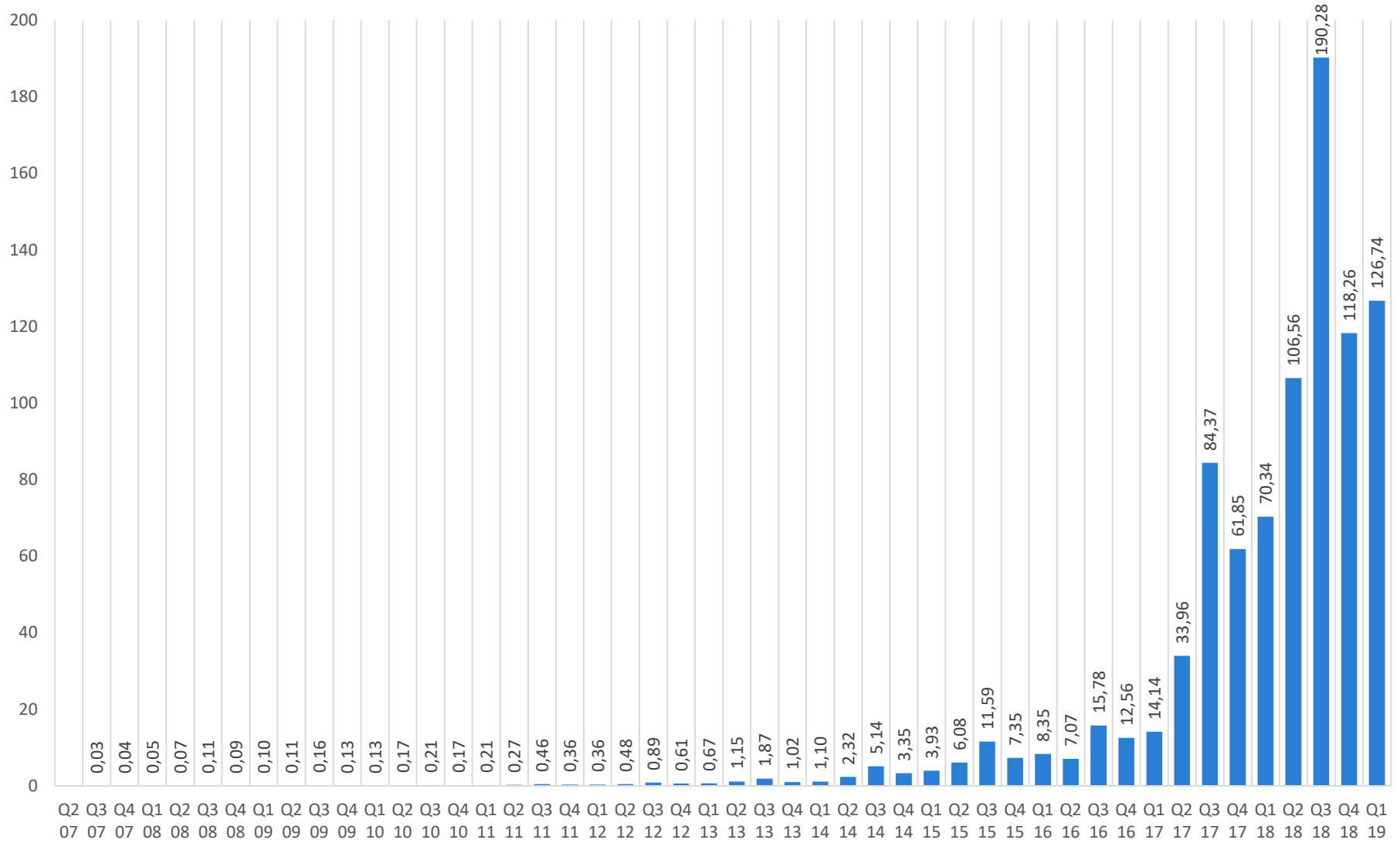
*Reference period: Q2 12= 100, Croatia: Q2 14= 100, Liechtenstein: Q2 13 = 100

Figure 73: Retail Data traffic Index, Q1 17, Q1 18 and Q1 19*



*Reference period: Q3 12= 100, Croatia: Q3 14= 100

Figure 74: EEA Retail data traffic, Q2 07 – Q1 19 (millions of GB)



5.2.4.RoW retail roaming prices

Figure 75: Average retail price per minute for RoW roaming voice calls made, Q4 18 and Q1 19

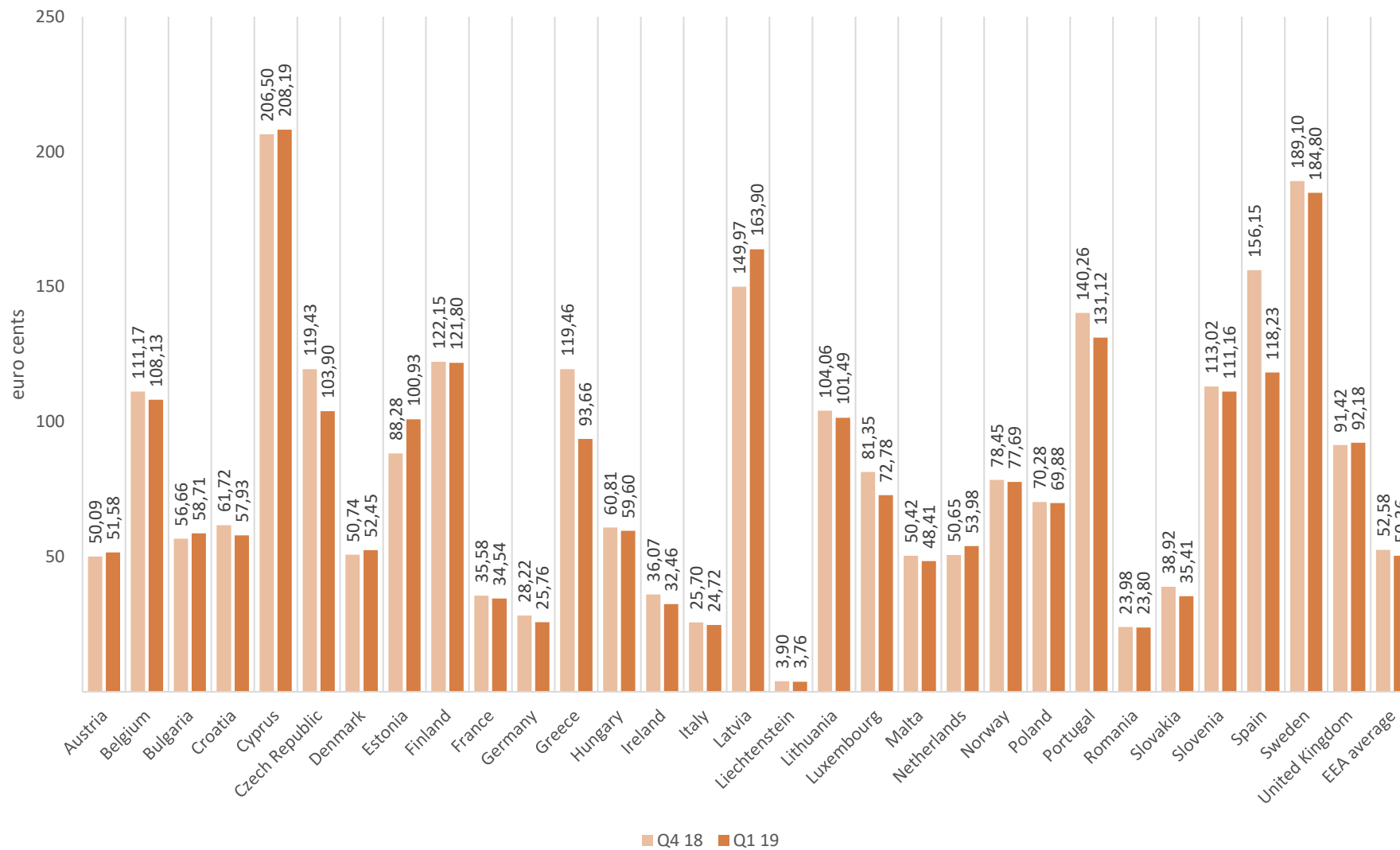


Figure 76: EEA average retail price per minute for RoW roaming voice calls made, Q2 16 – Q1 19

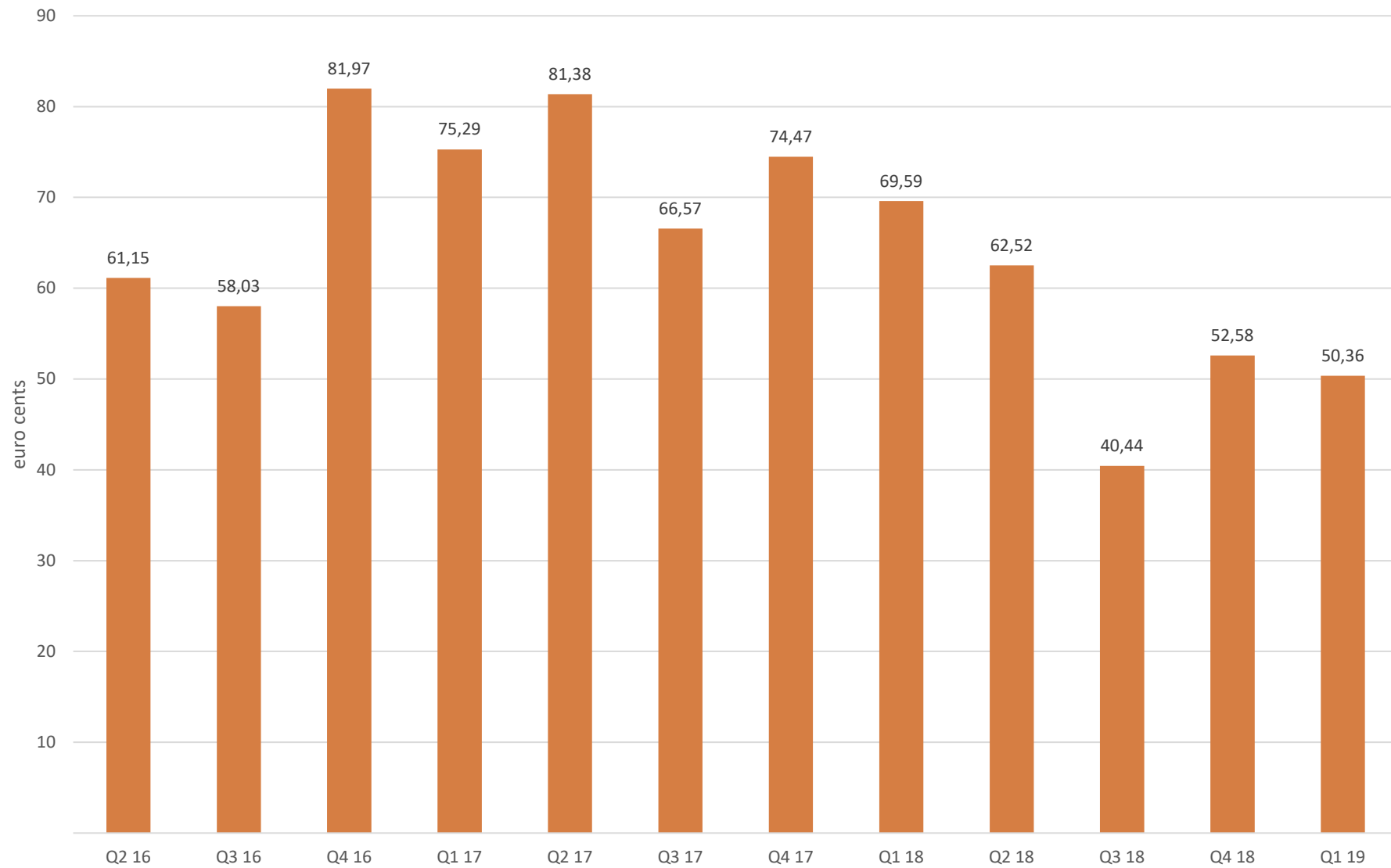


Figure 77: Average retail price per minute for RoW roaming voice calls received, Q4 18 and Q1 19

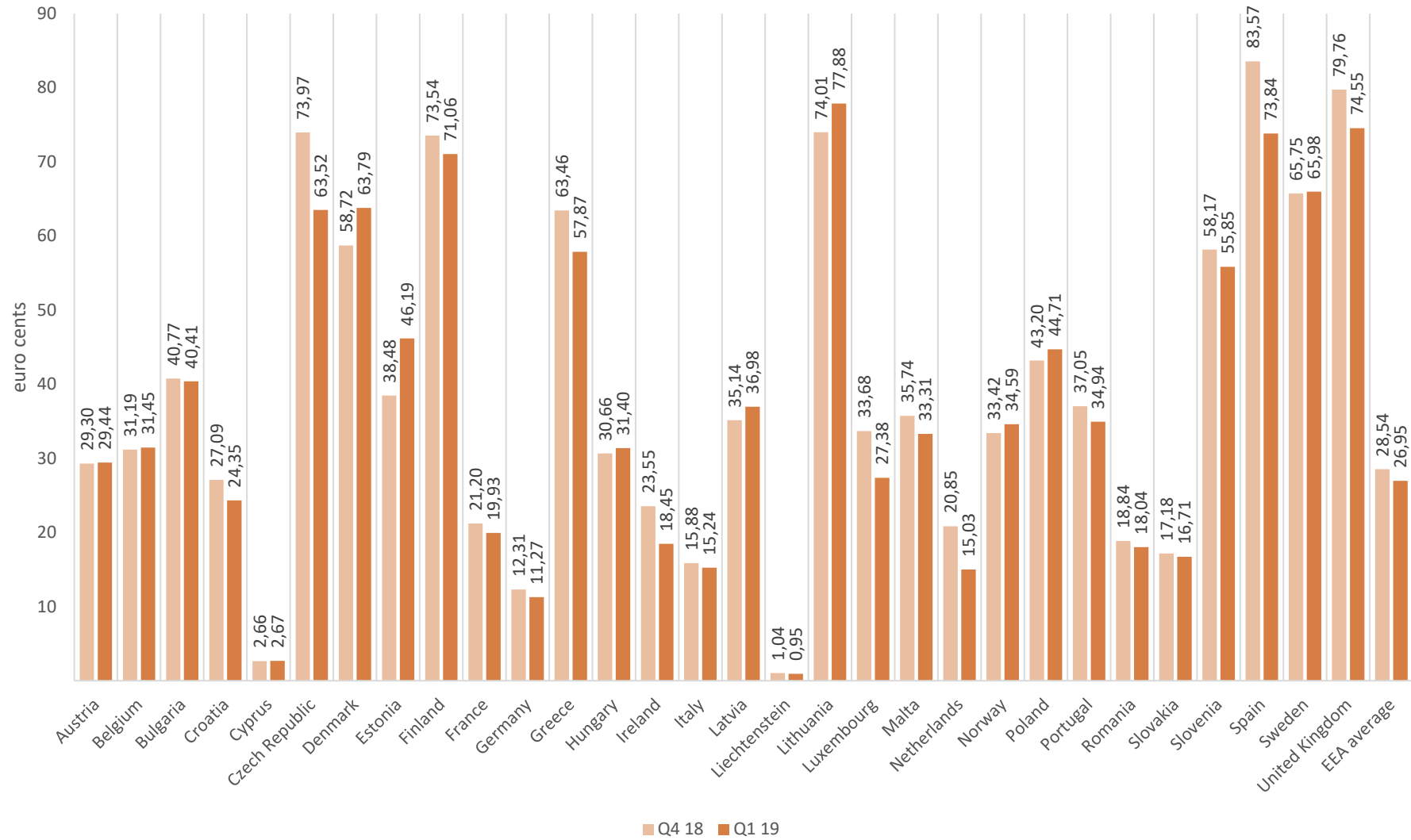


Figure 78: EEA average retail price per minute for RoW roaming voice calls received, Q2 16 – Q1 19

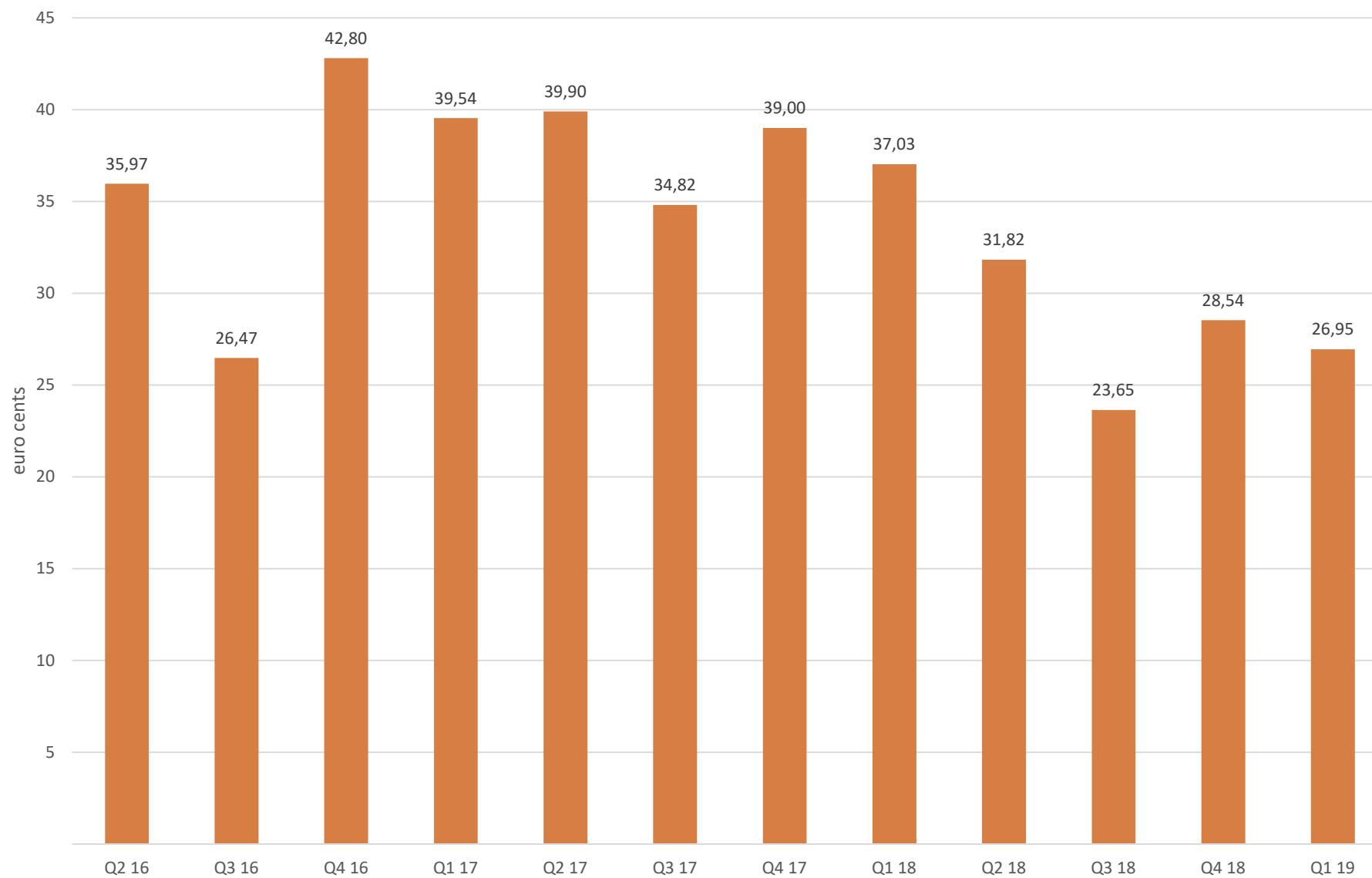


Figure 79: Average retail price for RoW roaming SMS services, Q4 18 and Q1 19

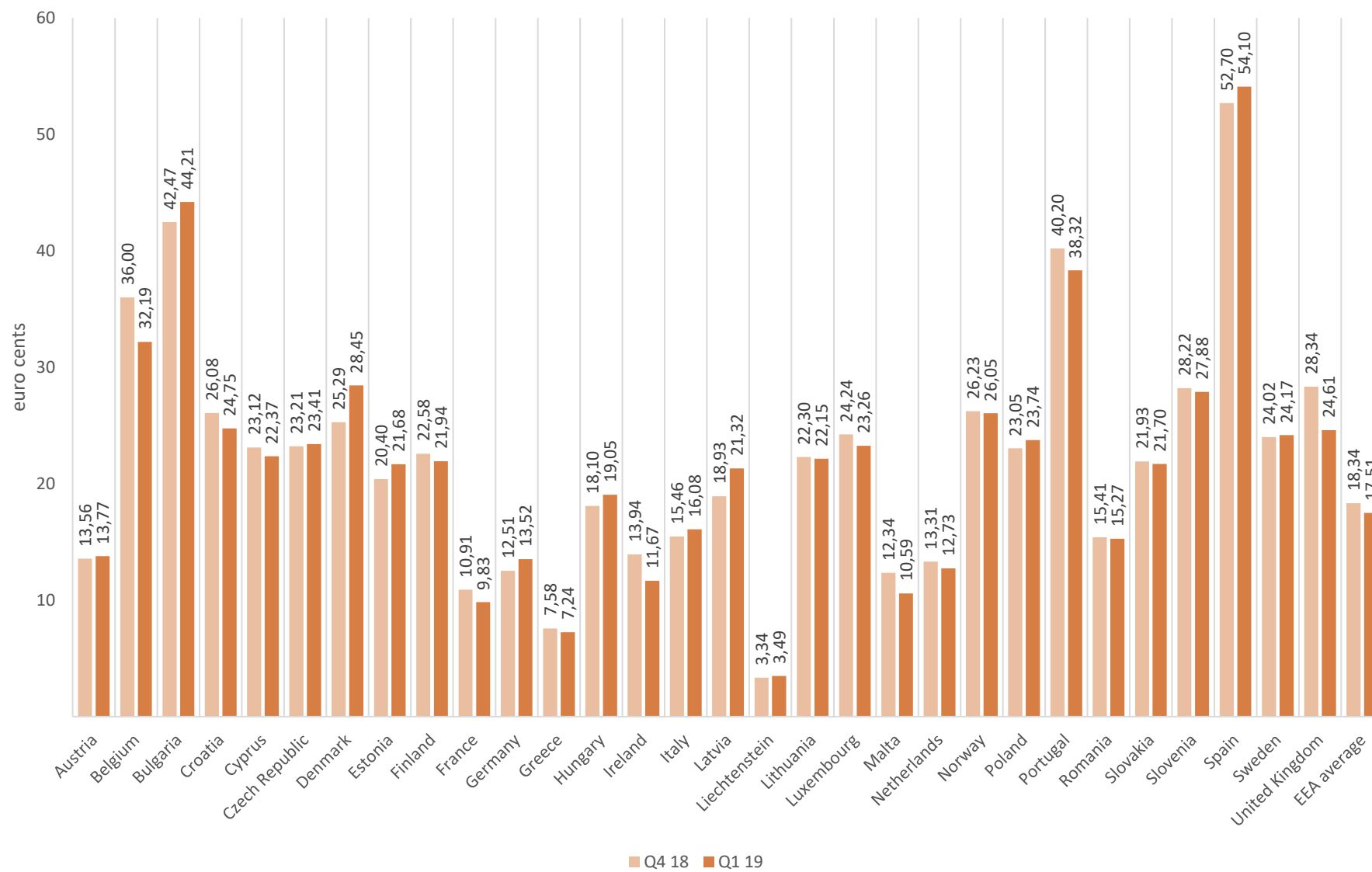


Figure 80: EEA average retail price for RoW roaming SMS services, Q2 16 – Q1 19

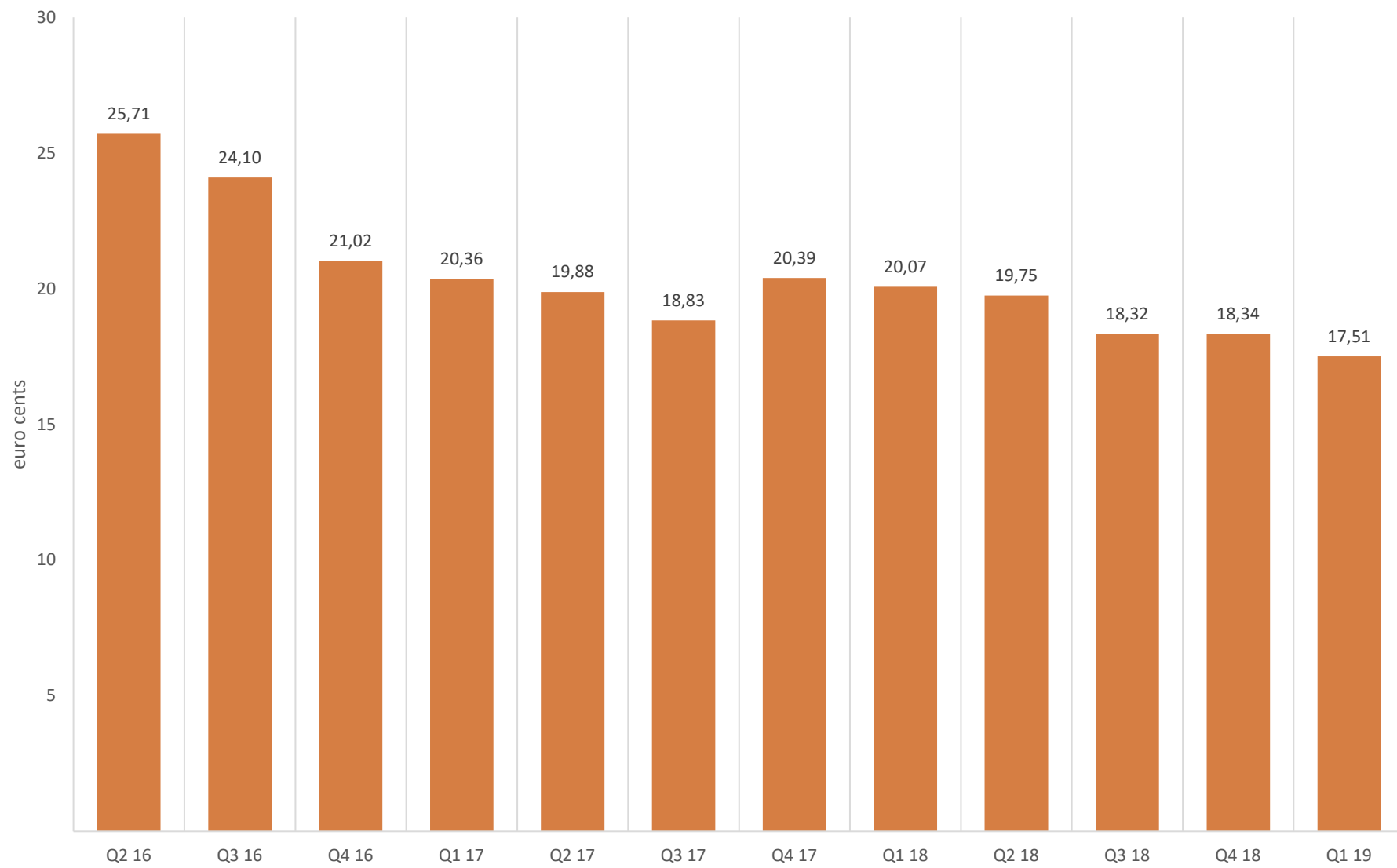


Figure 81: Average retail price per GB for RoW roaming data services, Q4 18 and Q1 19

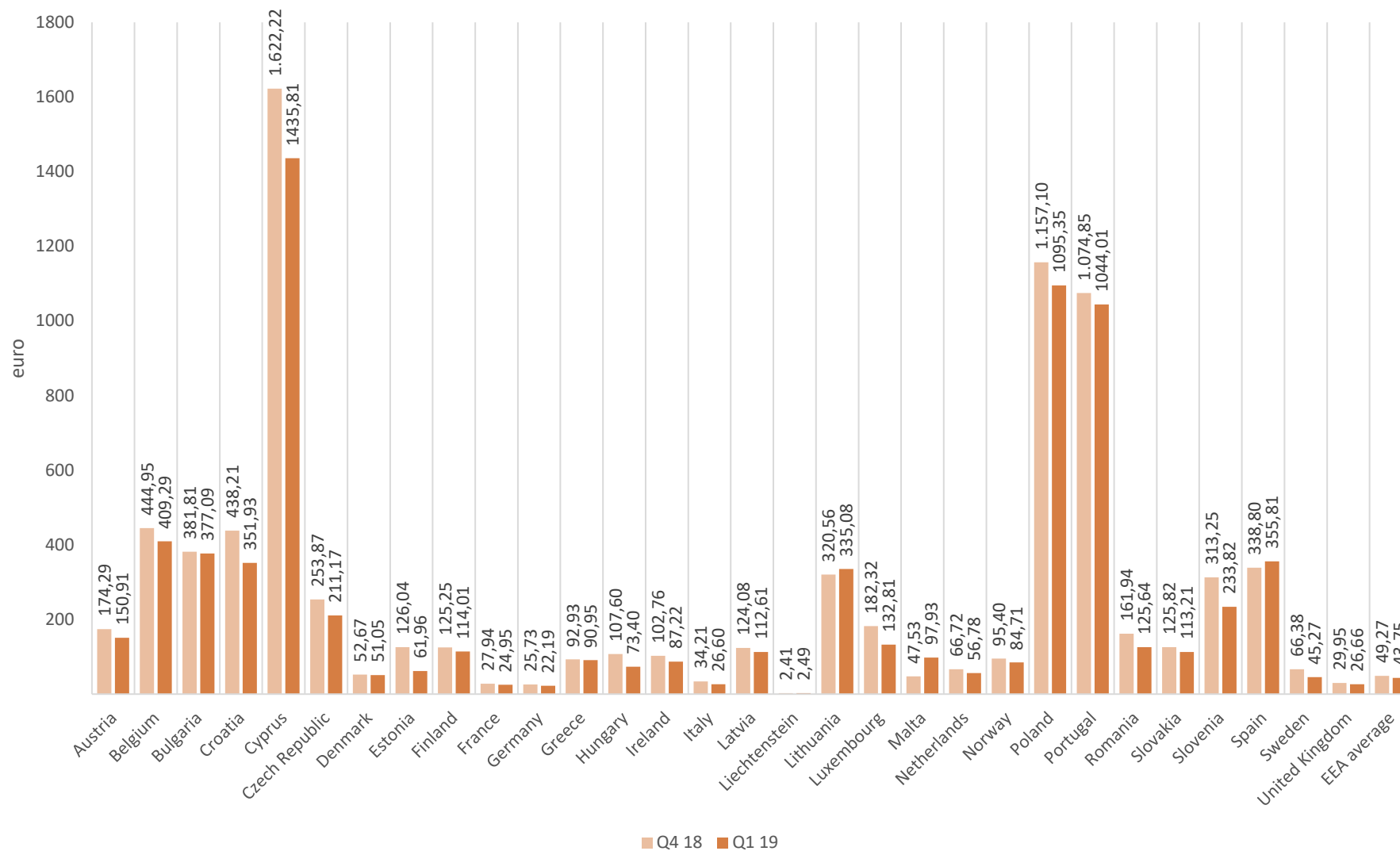


Figure 82: EEA average retail data price per GB for RoW roaming data services, Q2 16 – Q1 19

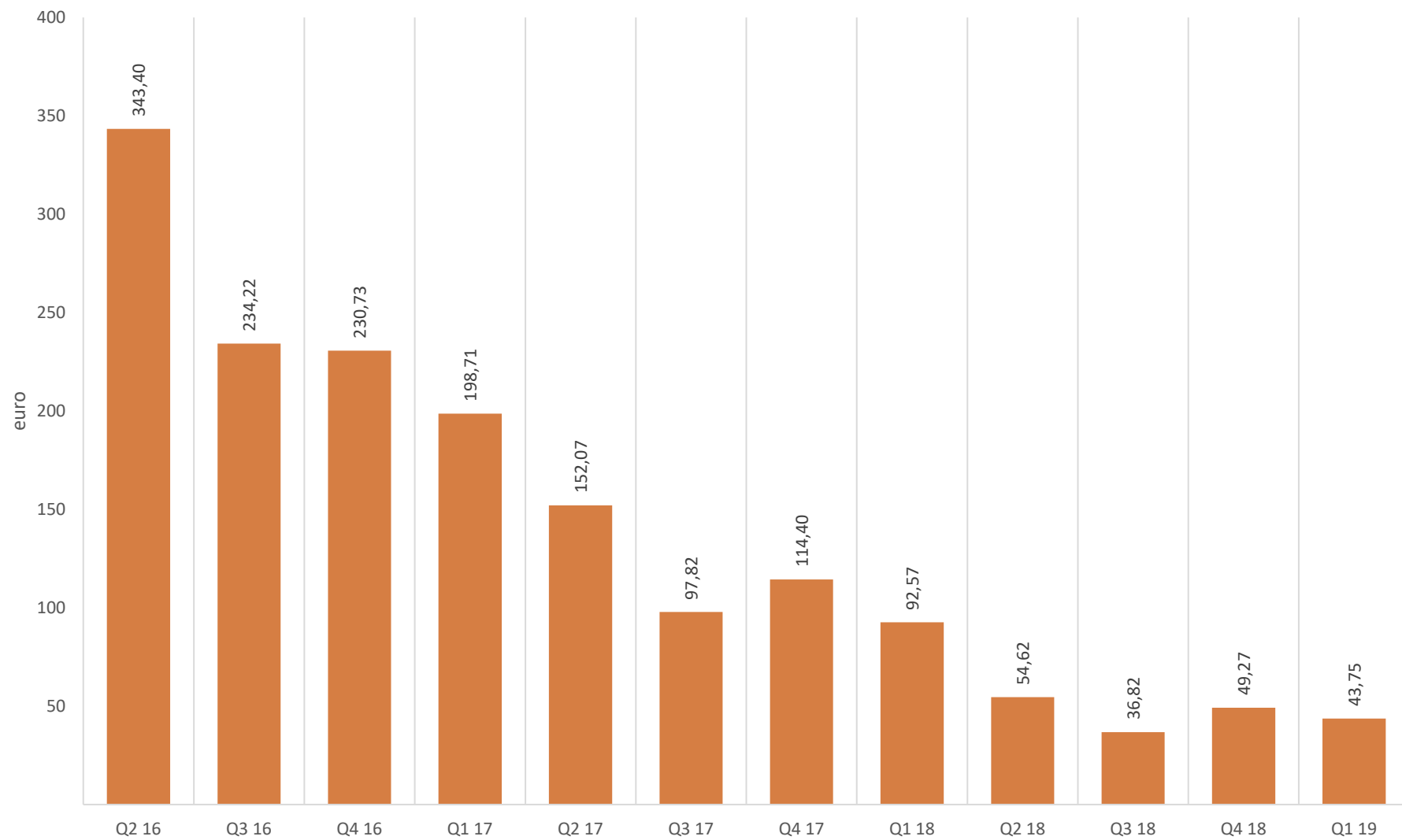
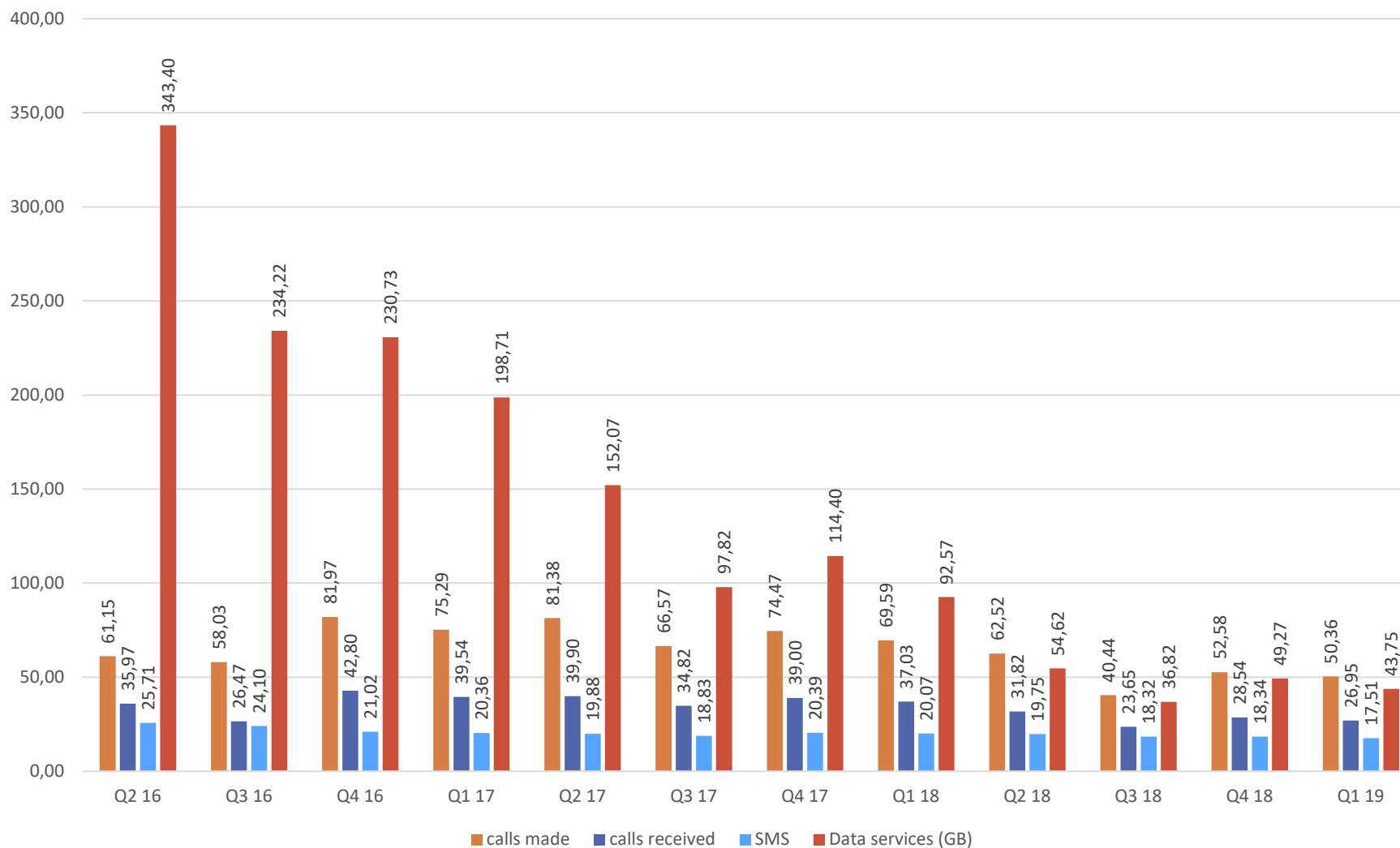


Figure 83: EEA average retail prices for RoW roaming services, Q2 16 – Q1 19



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

5.3. Wholesale roaming (outbound): Agreements

Figure 84: Wholesale averages outbound roaming: Voice: Agreements applying Article 3 Roaming Regulation, Q2 13 – Q1 19

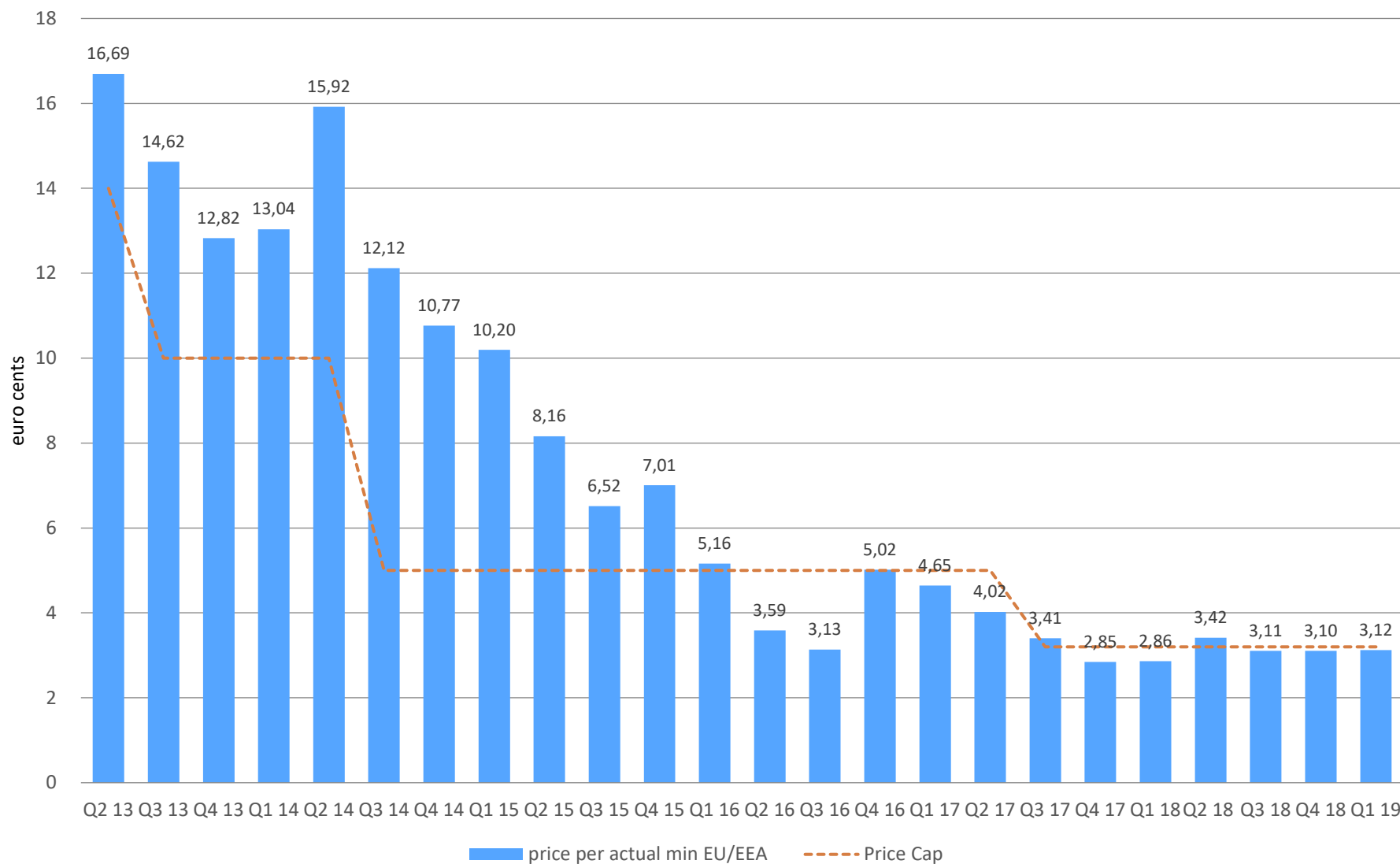


Figure 85: Wholesale averages outbound roaming: SMS Agreements applying Article 3 Roaming Regulation, Q2 13 – Q1 19

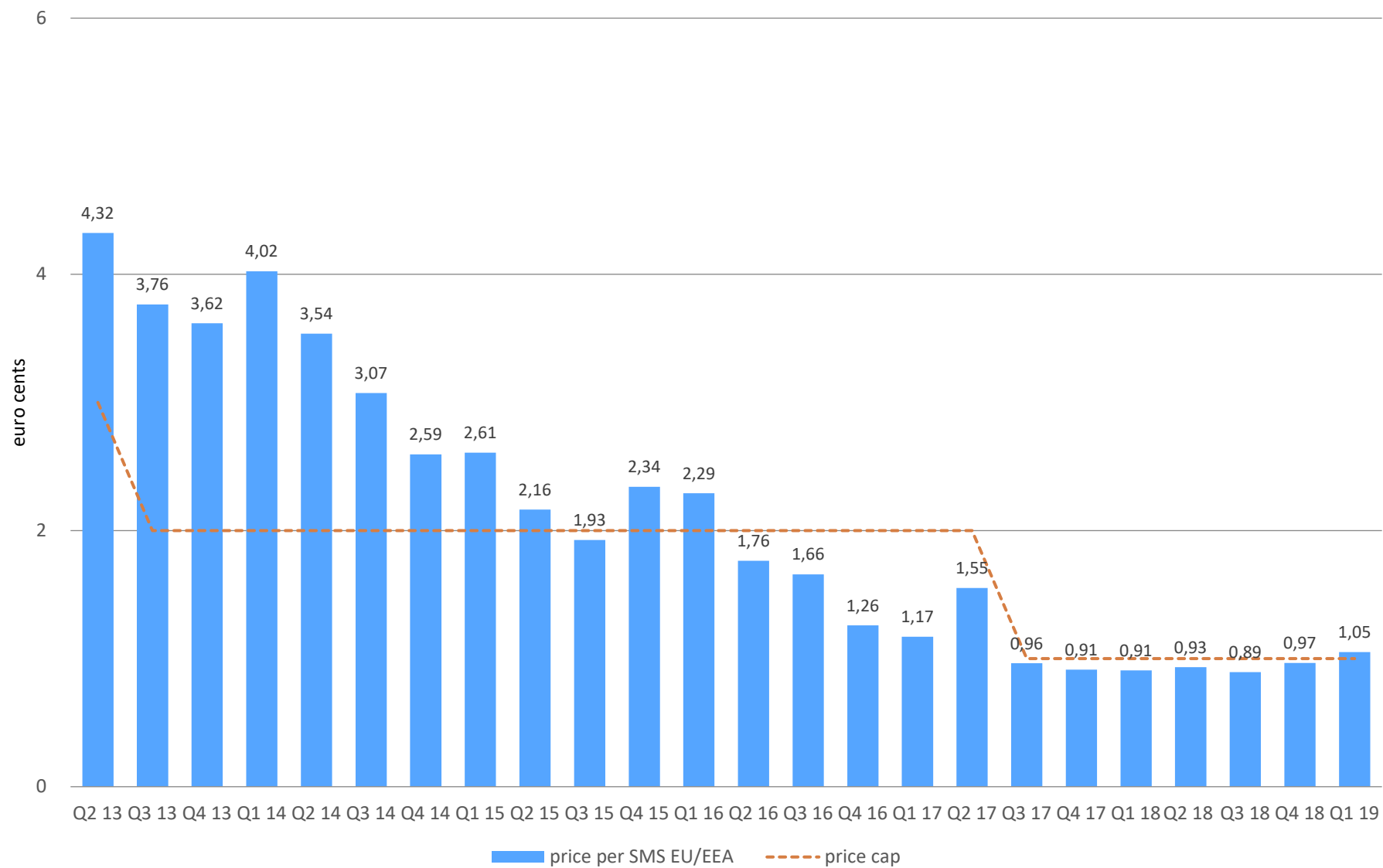
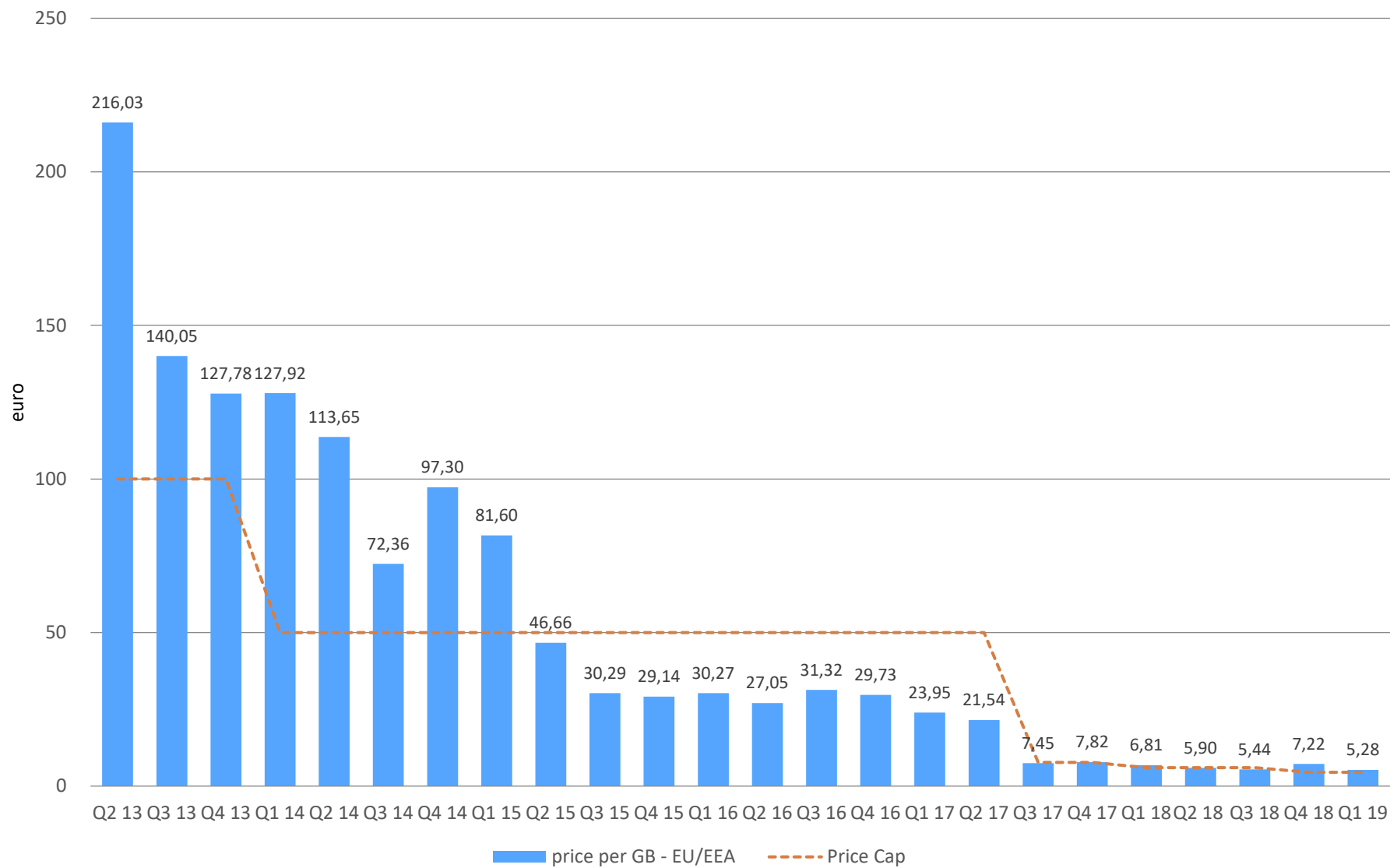
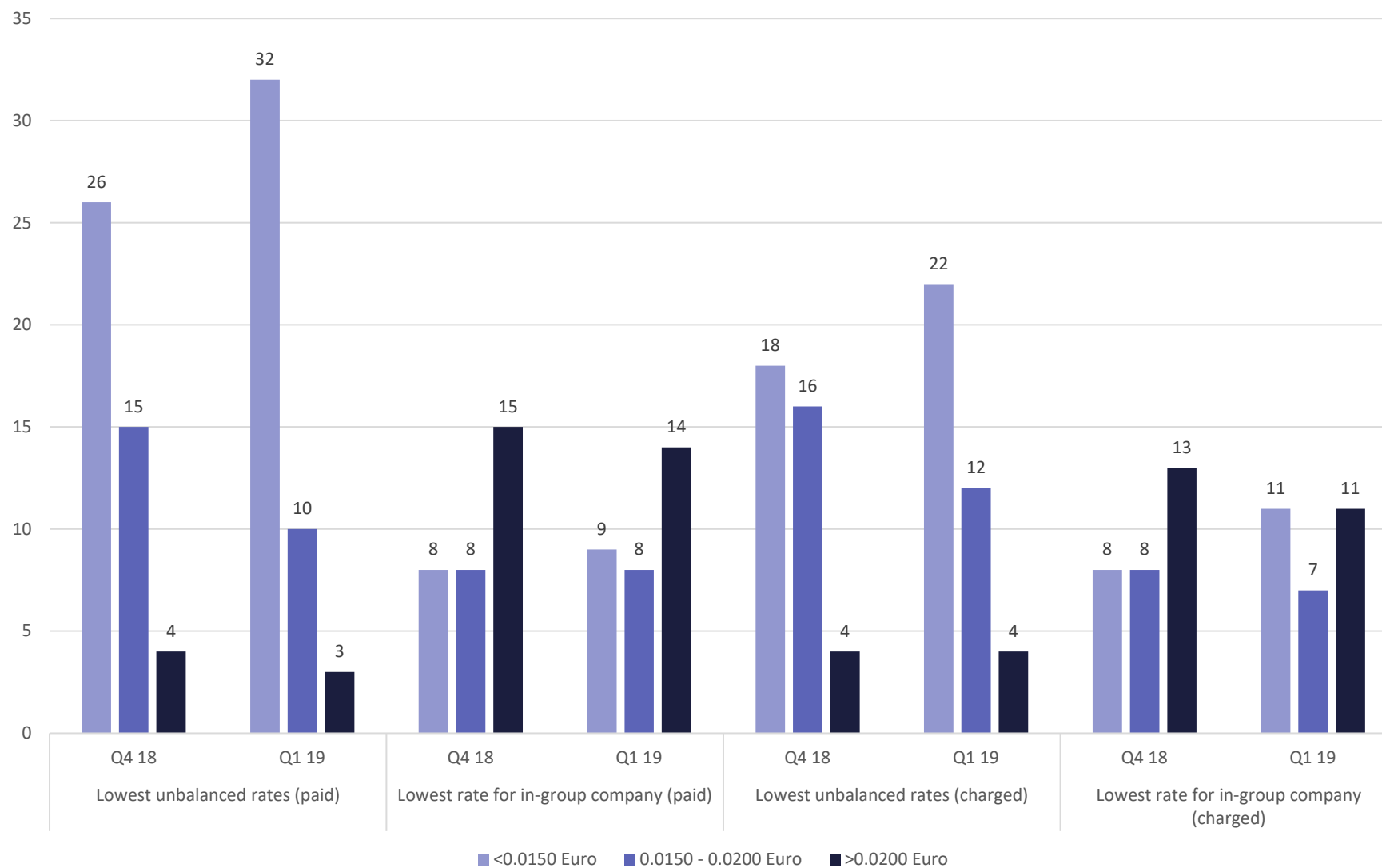


Figure 86: Wholesale EEA average outbound roaming: Data, Agreements applying Article 3 Roaming Regulation, Q2 13 – Q1 19



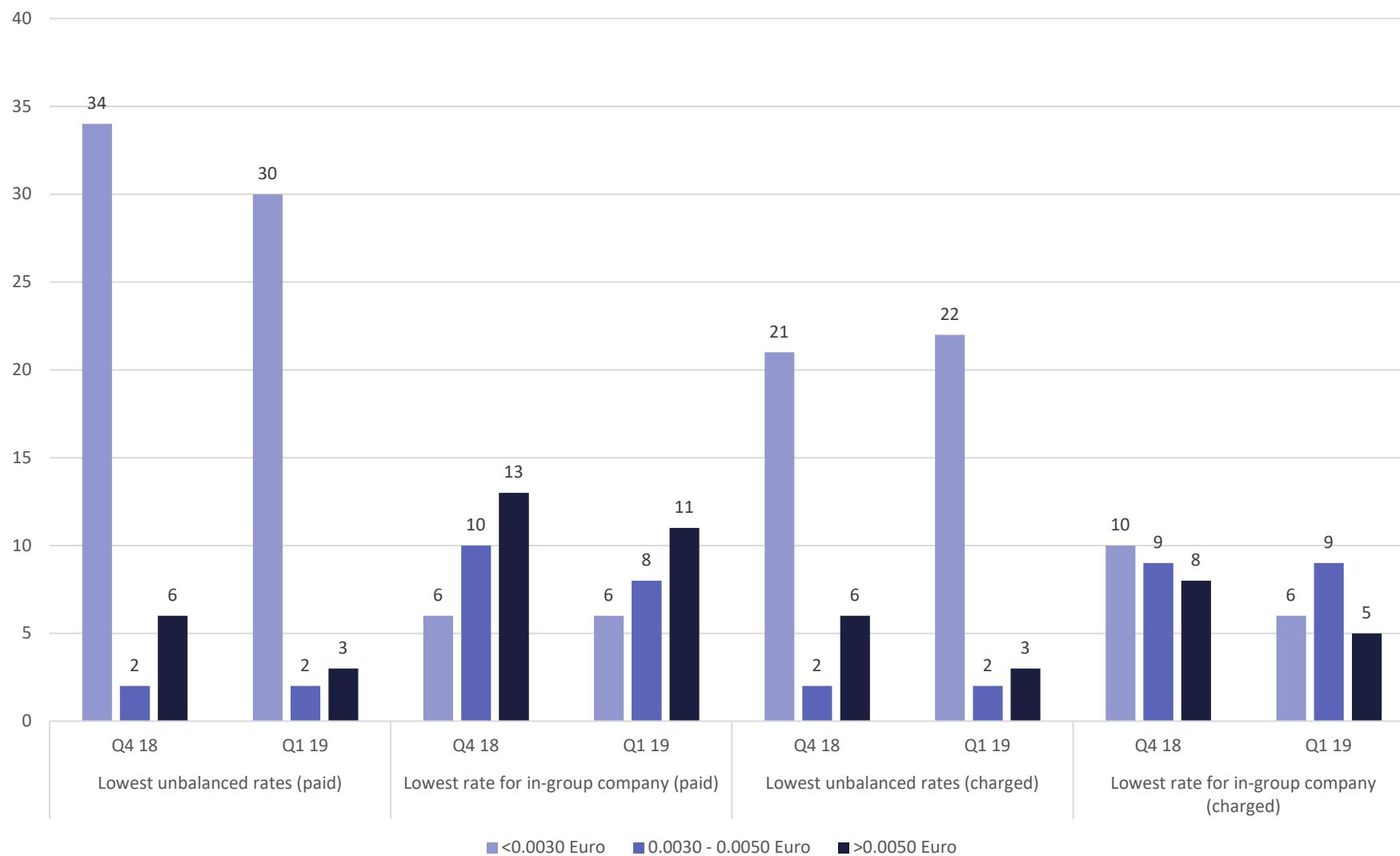
5.4. Rates for unbalanced wholesale roaming traffic

Figure 87: Lowest paid and charged unbalanced rates* for calls made (number of operators), Q4 18 and Q1 19



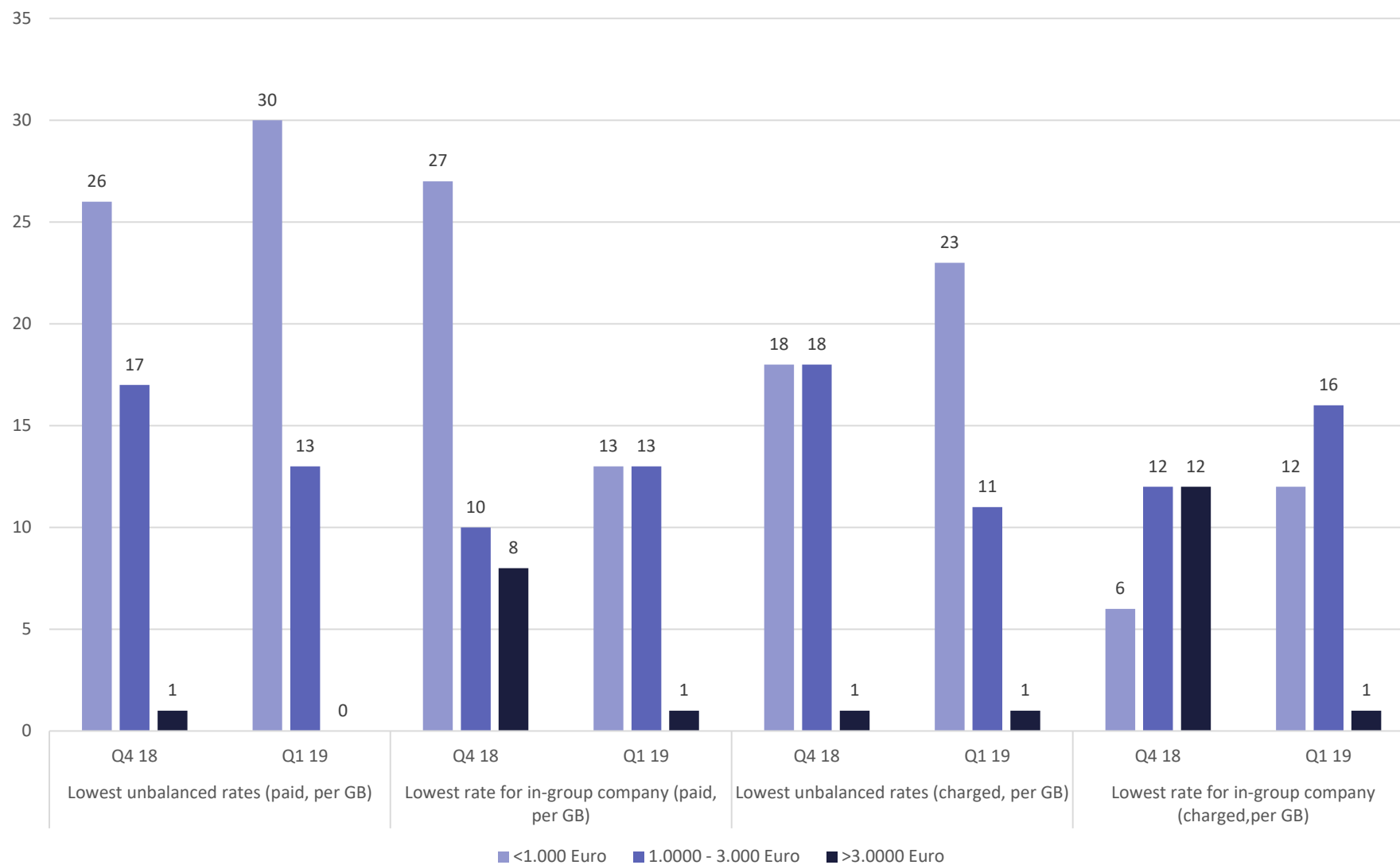
*The rates are calculated on the basis of costs/charges per unit (per minute), source: BEREC estimates based on operators' data

Figure 88: Lowest paid and charged unbalanced rates* for SMS services (number of operators) Q4 18 and Q1 19



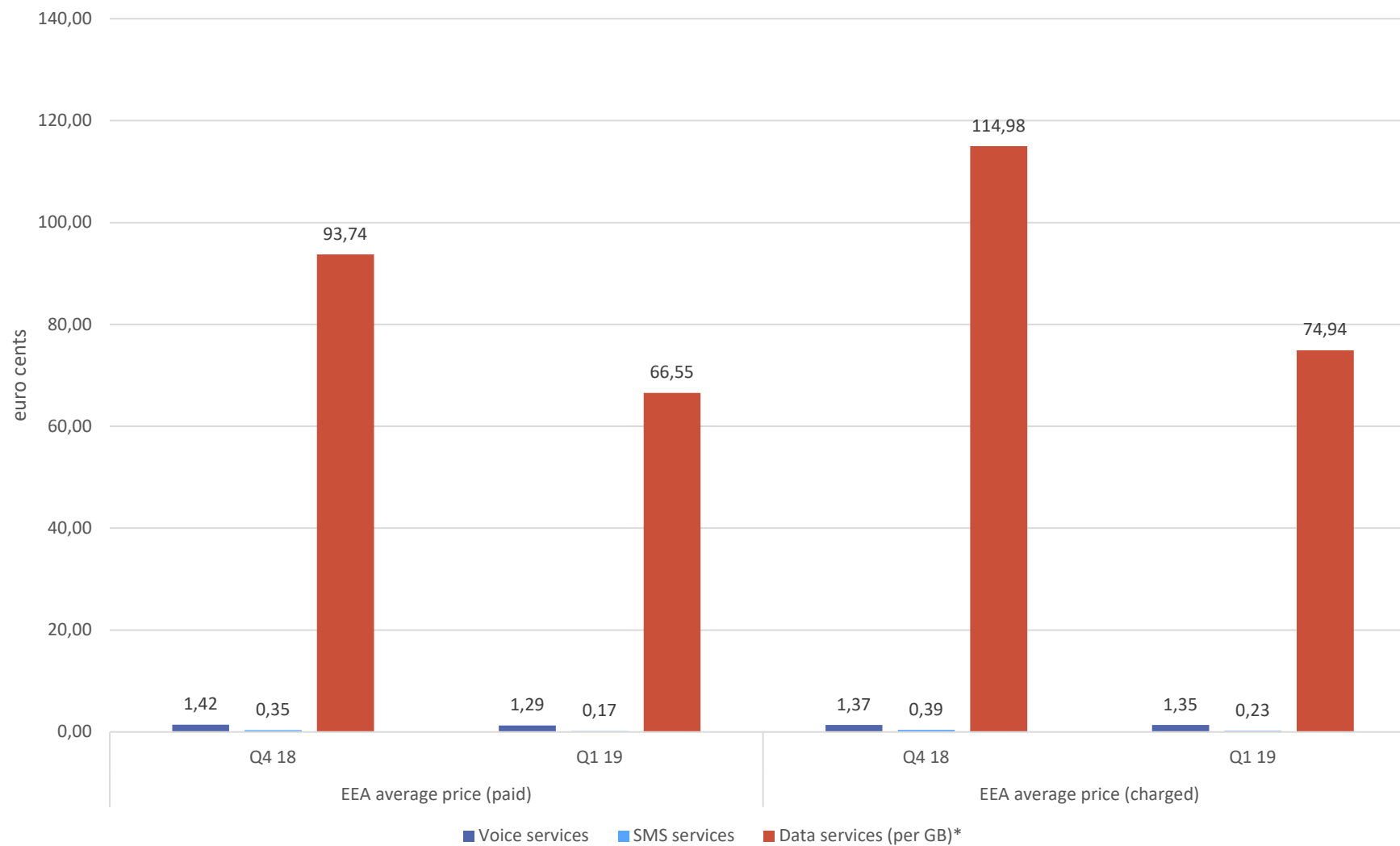
*The rates are calculated on the basis of costs/charges per unit (per SMS), source: BEREC estimates based on operators' data

Figure 89: Lowest paid and charged unbalanced rates* for data services, (number of operators), Q4 18 and Q1 19



*The rates are calculated on the basis of costs/charges per unit (per GB), source: BEREC estimates based on operators' data

Figure 90: EEA average: Lowest wholesale roaming prices paid and charged by operators*, Q4 18 and Q1 19

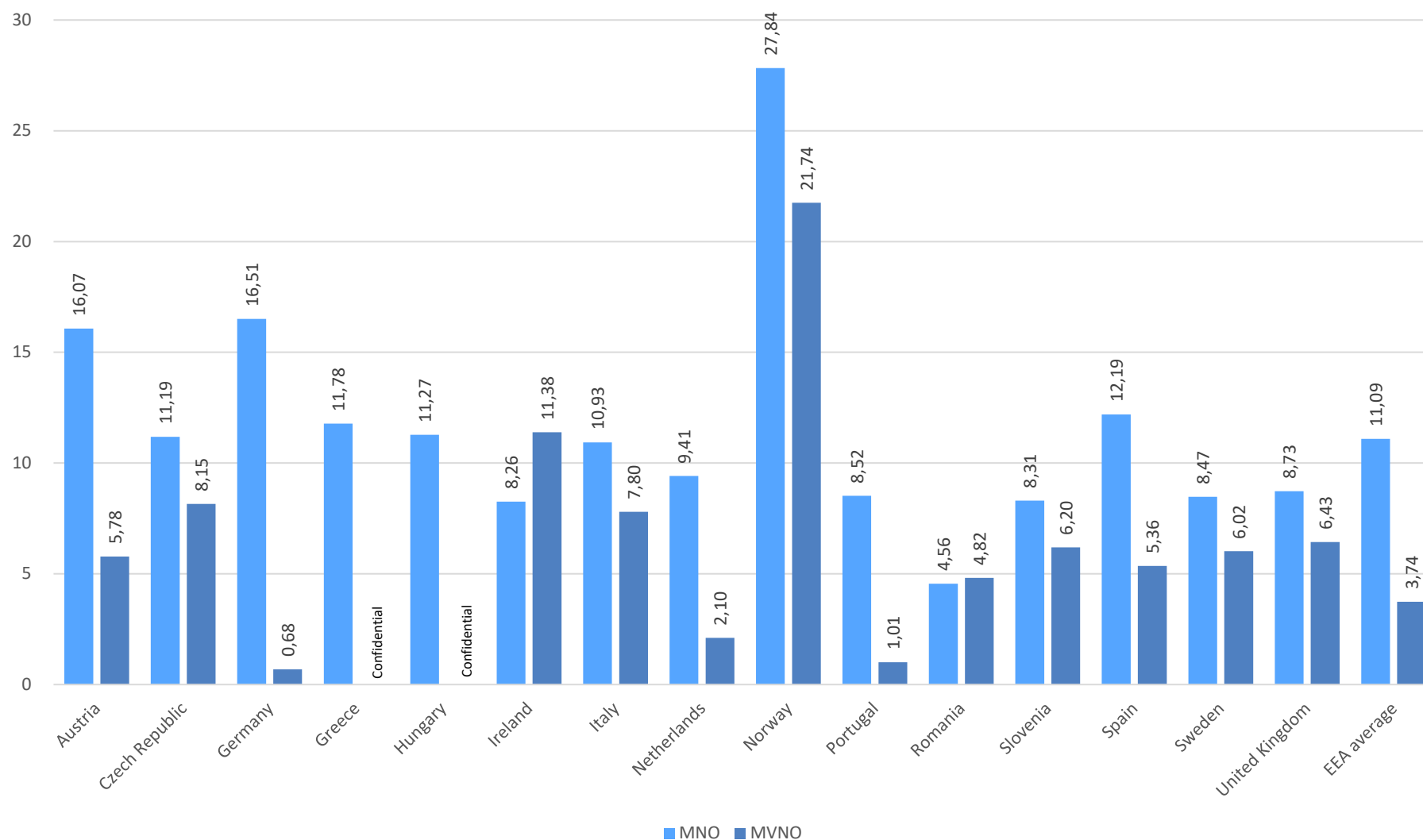


*The prices calculated based on the average of the 5 lowest unbalanced rates provided by each operator.
Sample: MNOs from the EEA countries.

5.5. MNOs and MVNOs data

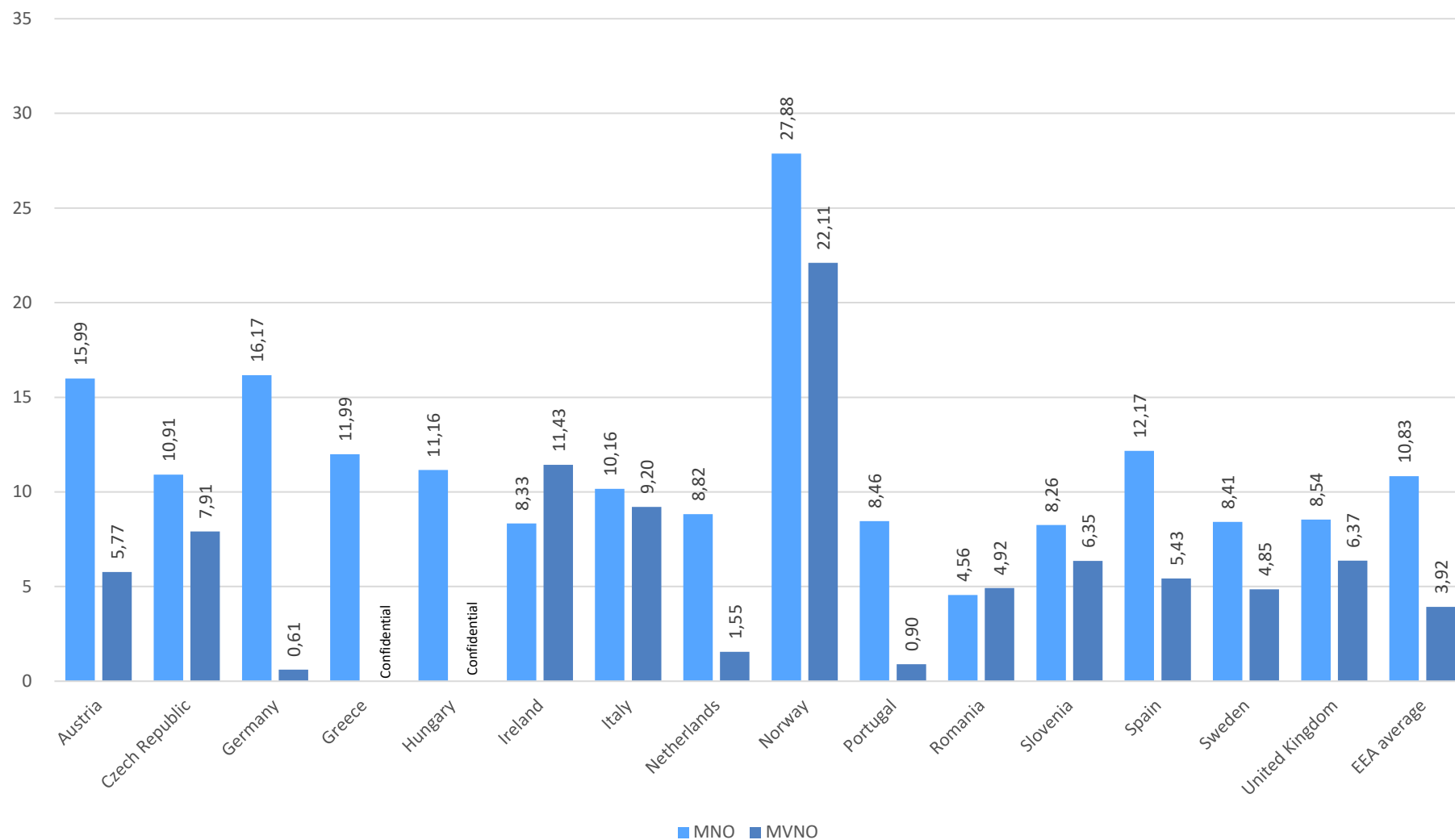
5.5.1. Domestic average Retail Mobile Revenue per User (ARRPU)

Figure 91: MNOs and MVNOs: domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q4 18



Portugal: 1 of the 3 MNOs listed in the annex was not able to estimate domestic mobile revenues and therefore the ARRPU was calculated using the data of the 2 remaining MNOs.

Figure 92: MNOs and MVNOs: domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU), Q1 19



Portugal: 1 of the 3 MNOs listed in the annex was not able to estimate domestic mobile revenues and therefore the ARRPU was calculated using the data of the 2 remaining MNOs.

5.5.2. Consumption patterns for domestic mobile retail services

Figure 93: Domestic calls made, average number of minutes per month per total number of subscribers, MNOs and MVNOs, Q4 18

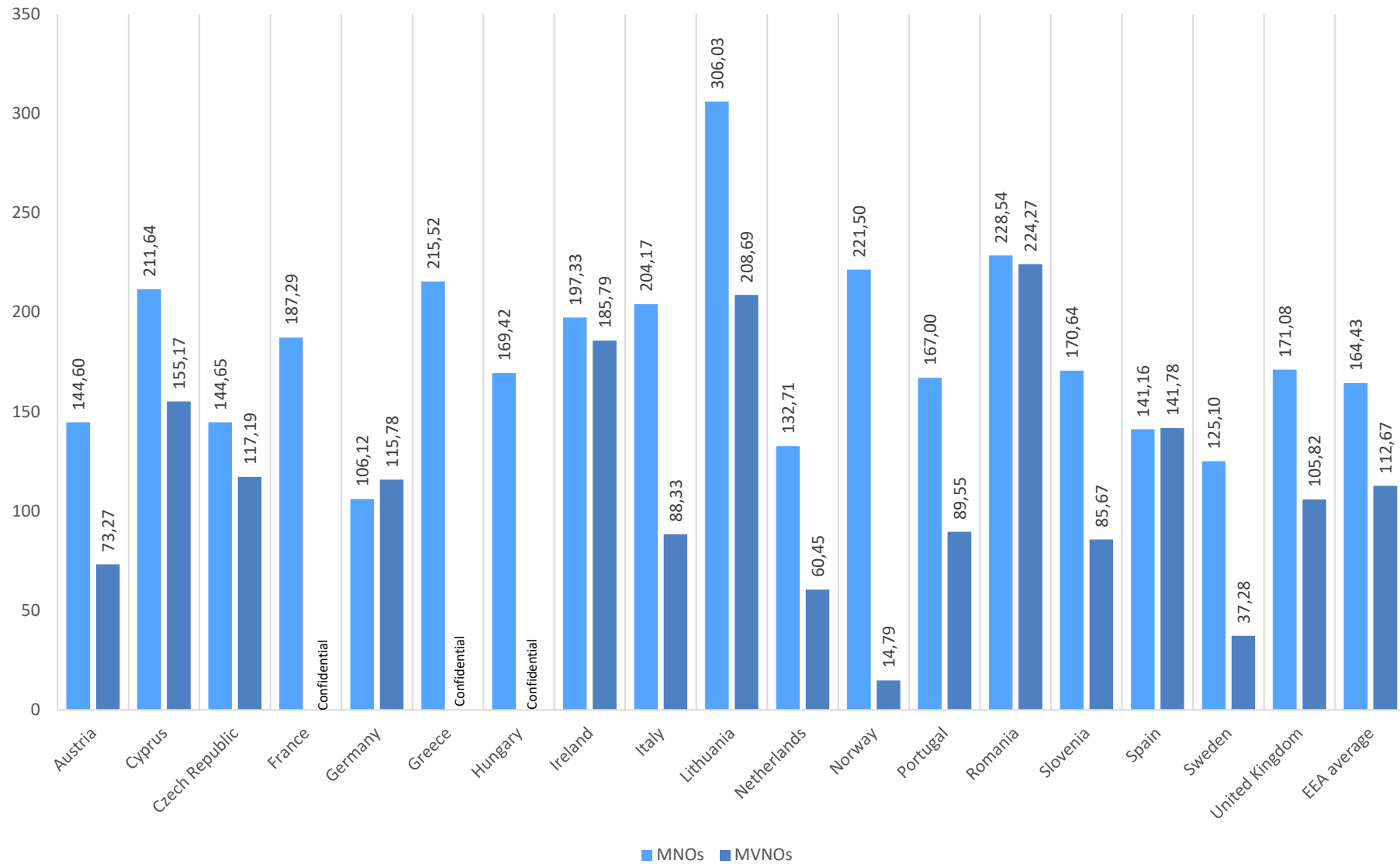


Figure 94: Domestic calls made, average number of minutes per month per total number of subscribers, MNOs and MVNOs, Q1 19

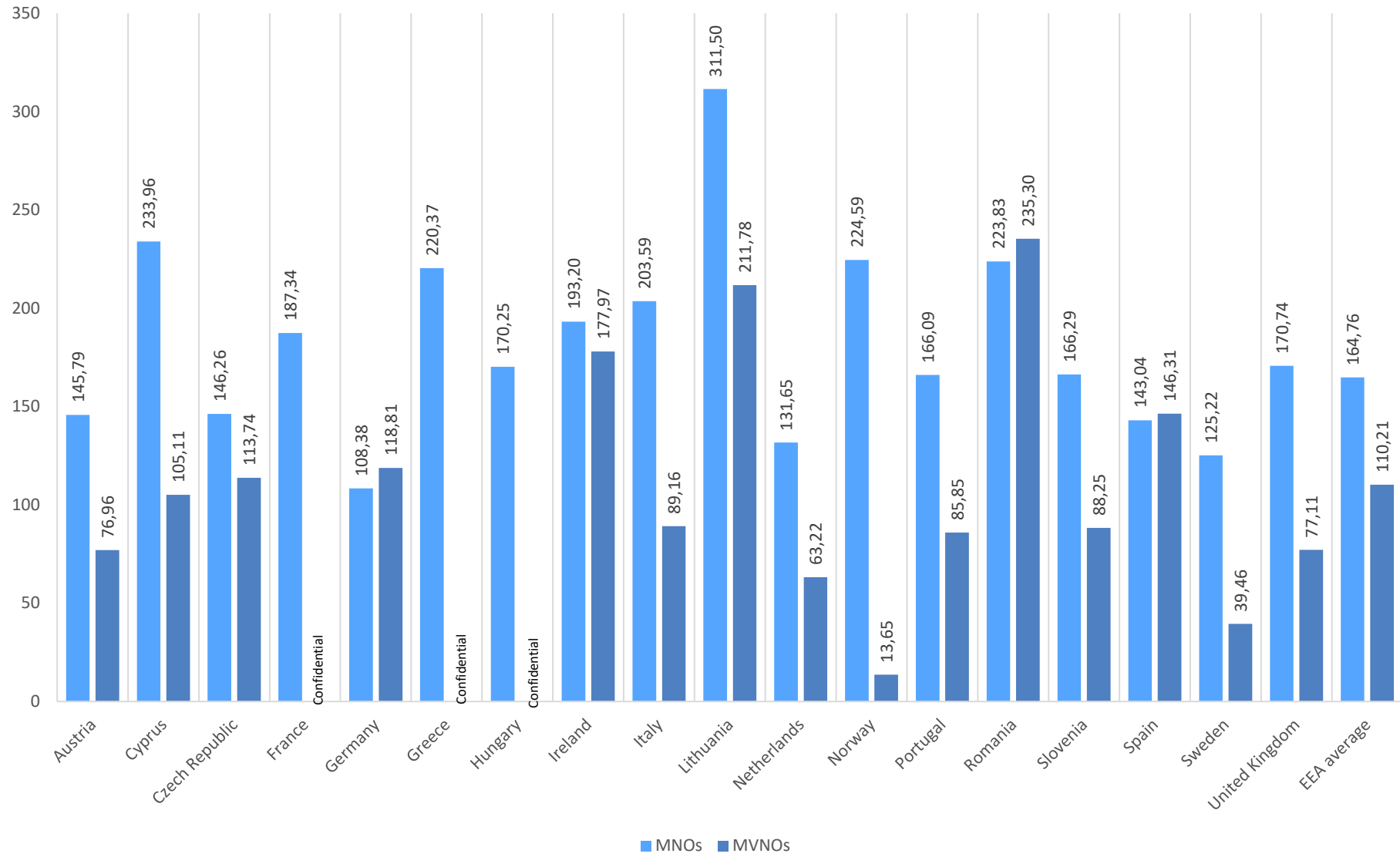


Figure 95: Domestic calls received, average number of minutes per month per total number of subscribers, MNOs and MVNOs, Q4 18

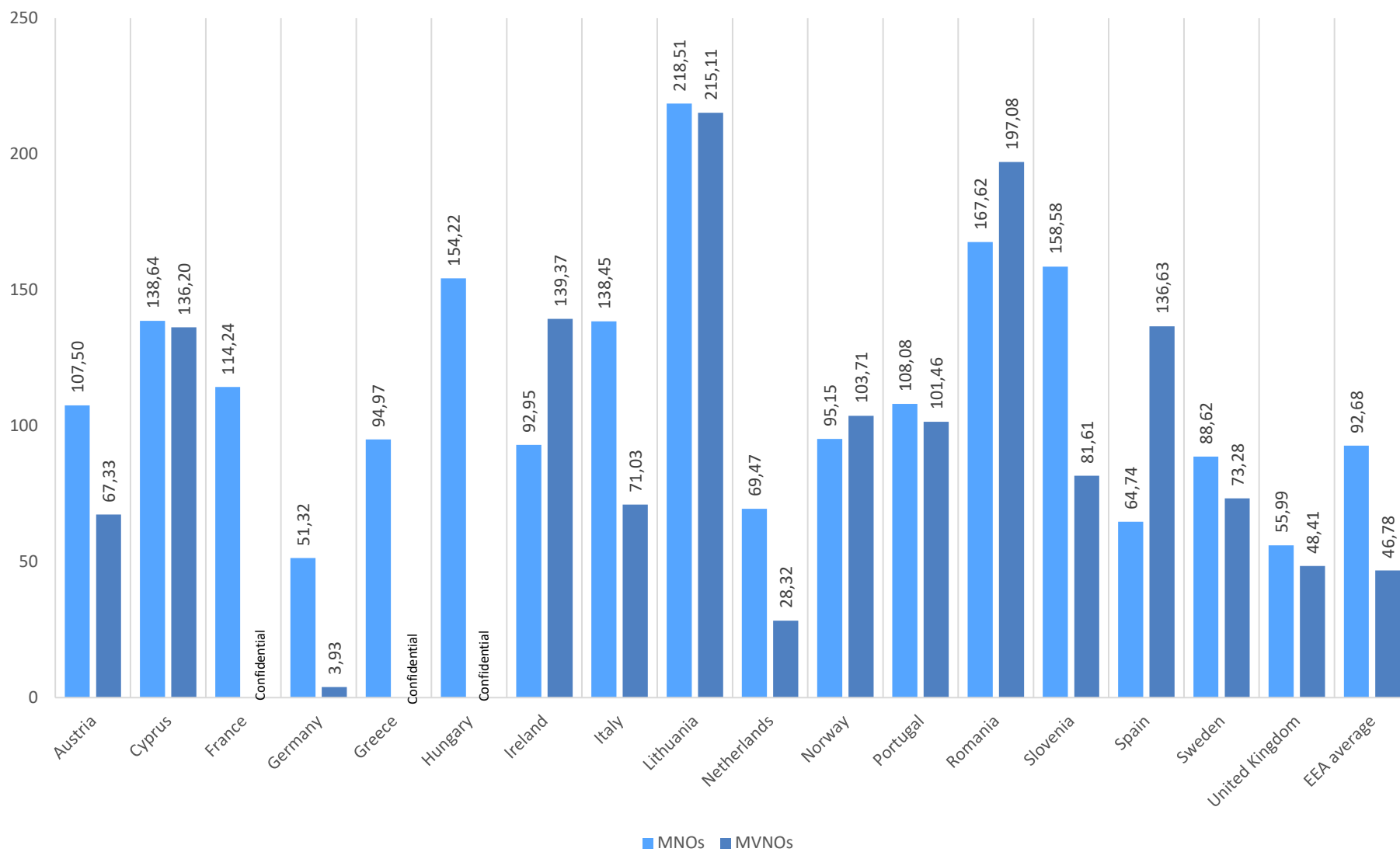


Figure 96: Domestic calls received, average number of minutes per month per total number of subscribers, MNOs and MVNOs, Q1 19

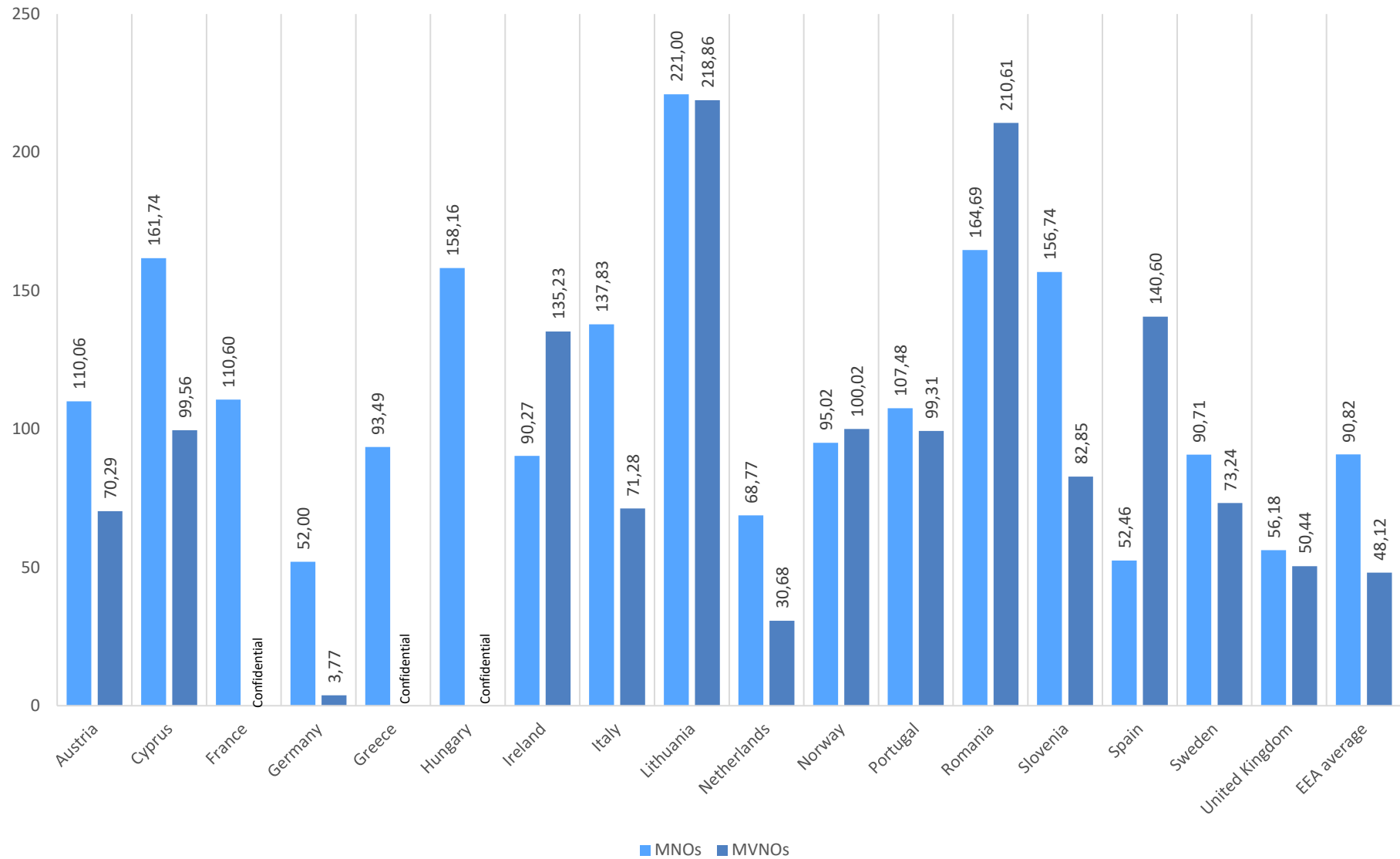


Figure 97: Domestic SMS, average number of SMS per month per total number of subscribers, MNOs and MVNOs, Q4 18

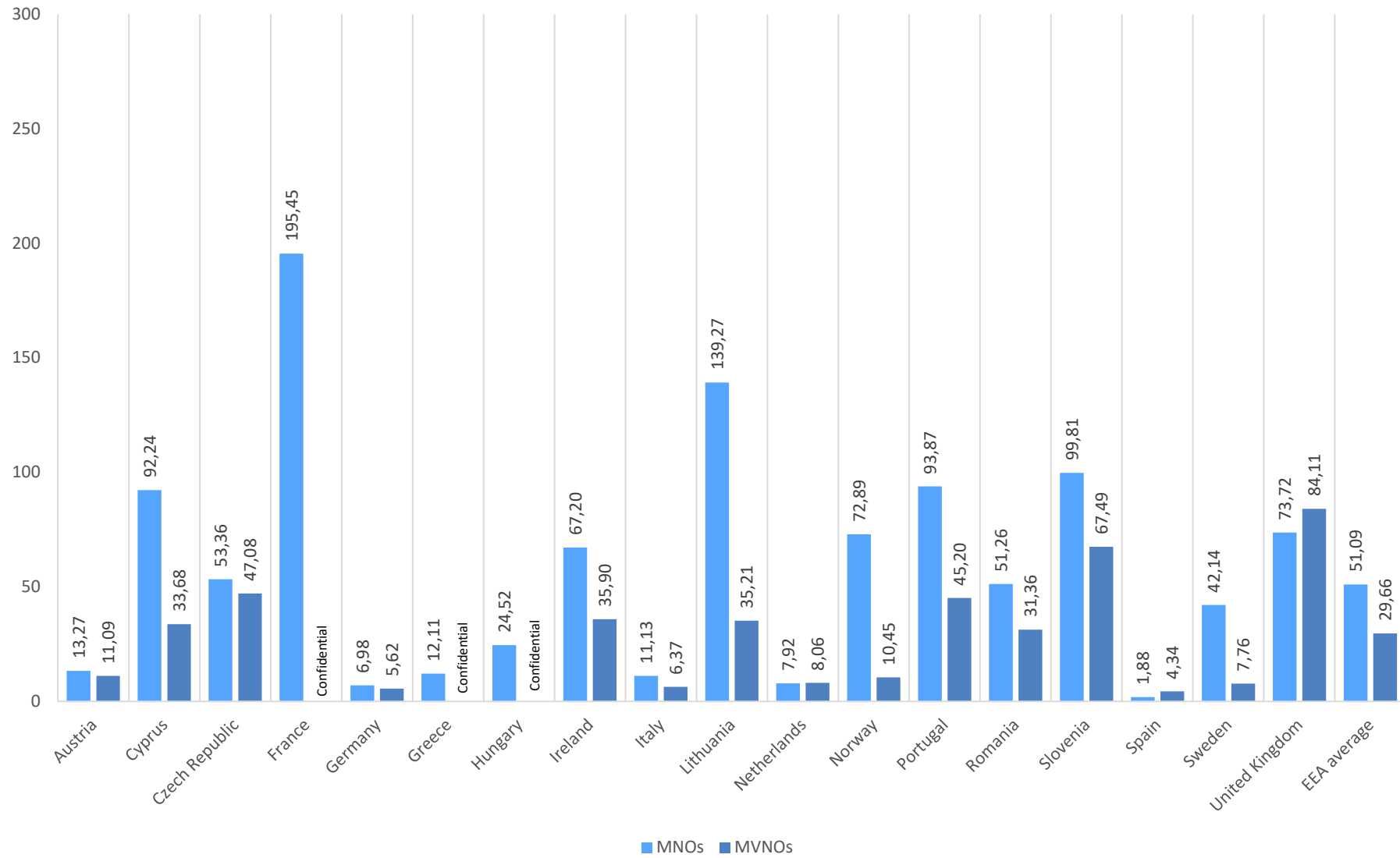


Figure 98: Domestic SMS, average number of SMS per month per total number of subscribers, MNOs and MVNOs, Q1 19

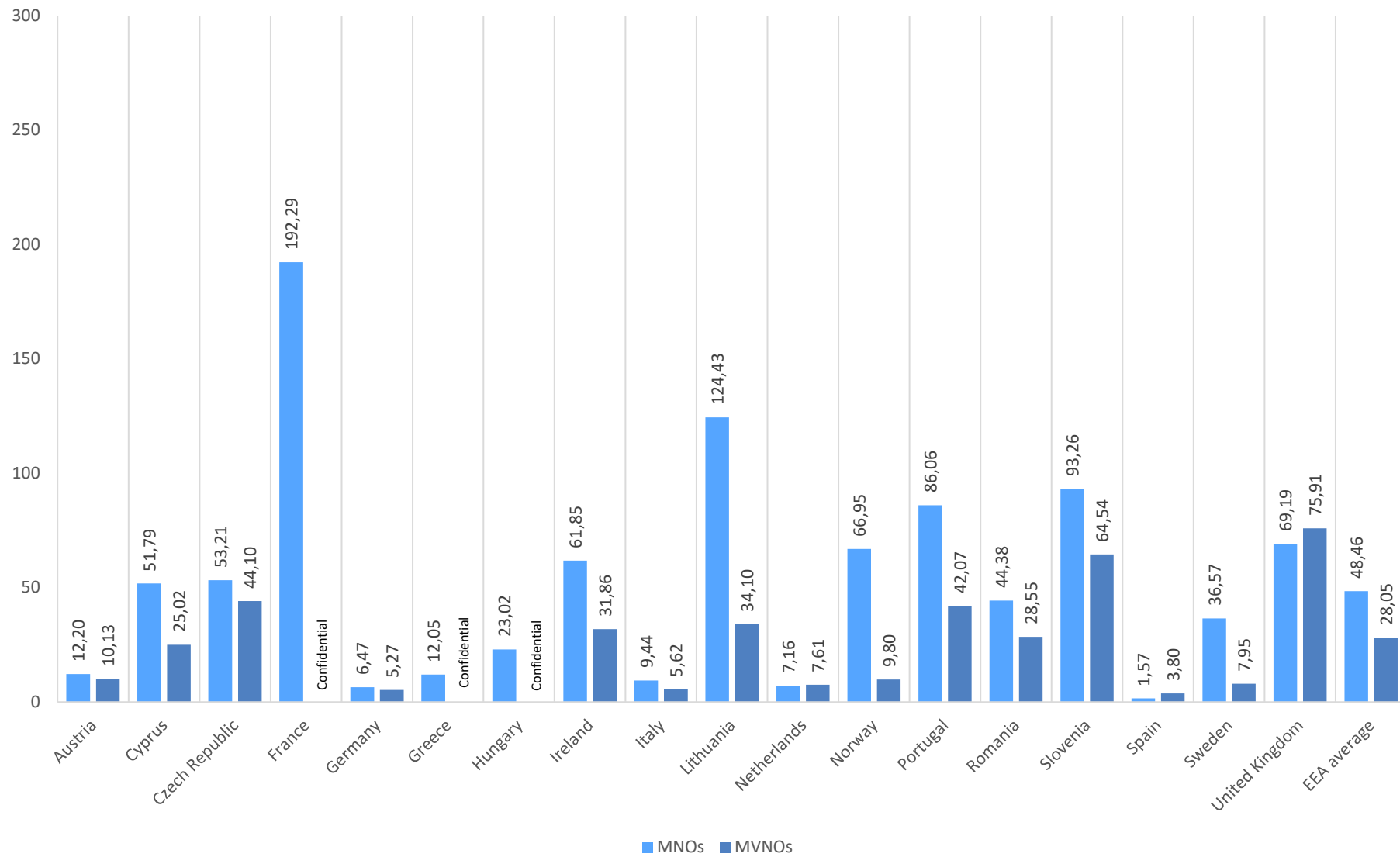


Figure 99: Domestic data services, average consumption per month per total number of subscribers (GB), MNOs and MVNOs, Q4 18

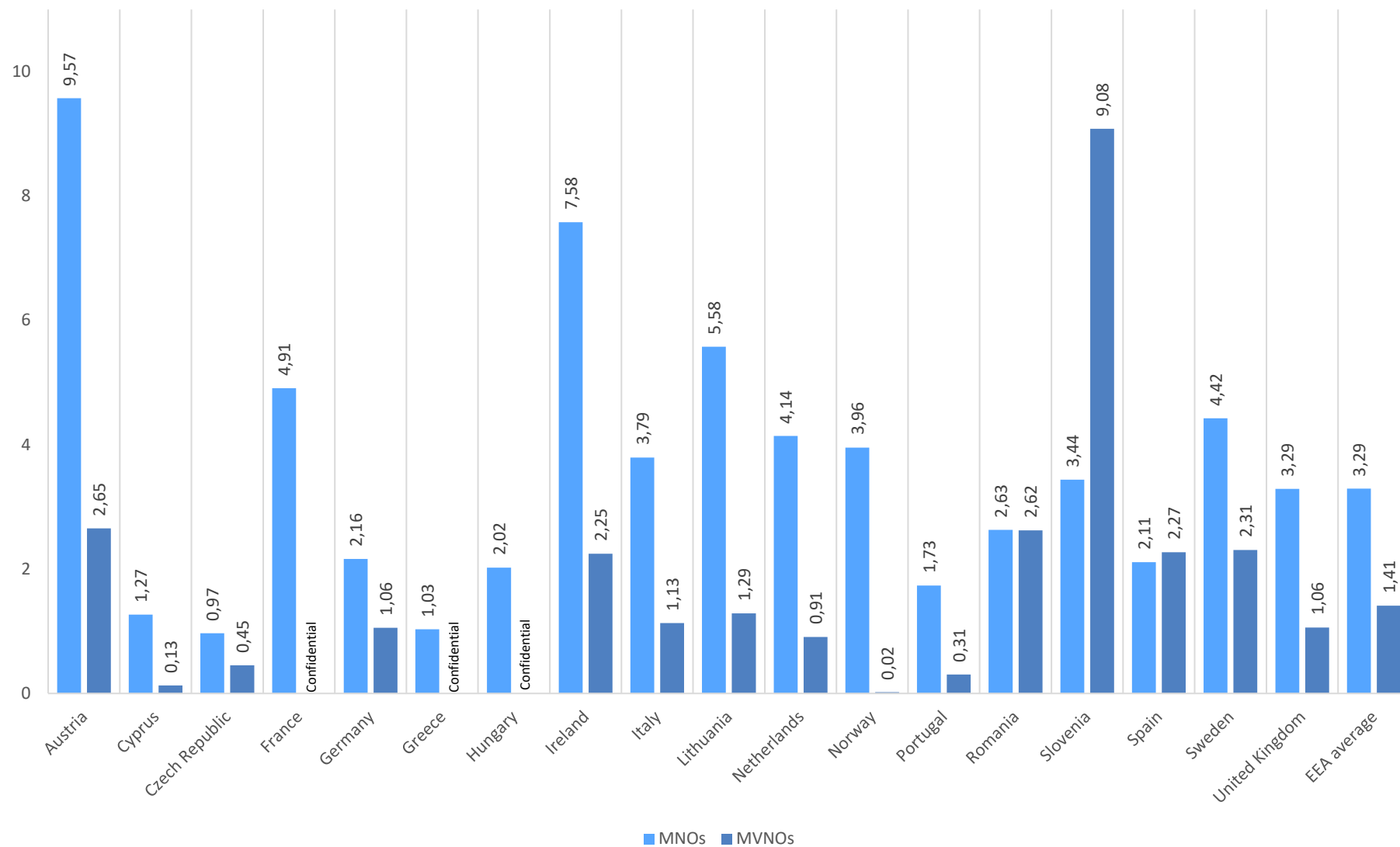


Figure 100: Domestic data services, average consumption per month per total number of subscribers (GB), MNOs and MVNOs, Q1 19

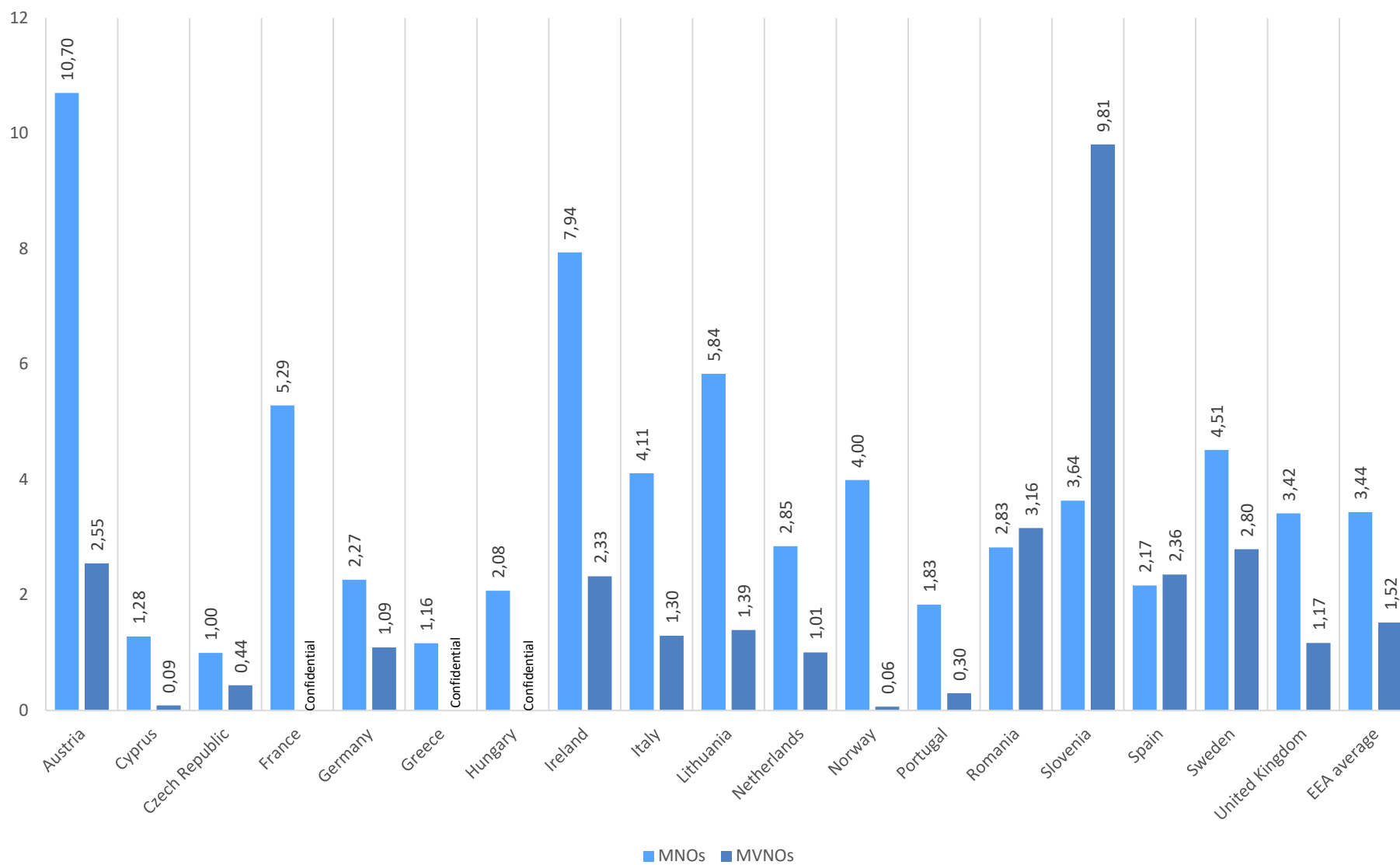


Figure 101: EEA average mobile services consumption per month per total number of subscribers, Q4 18 and Q1 19

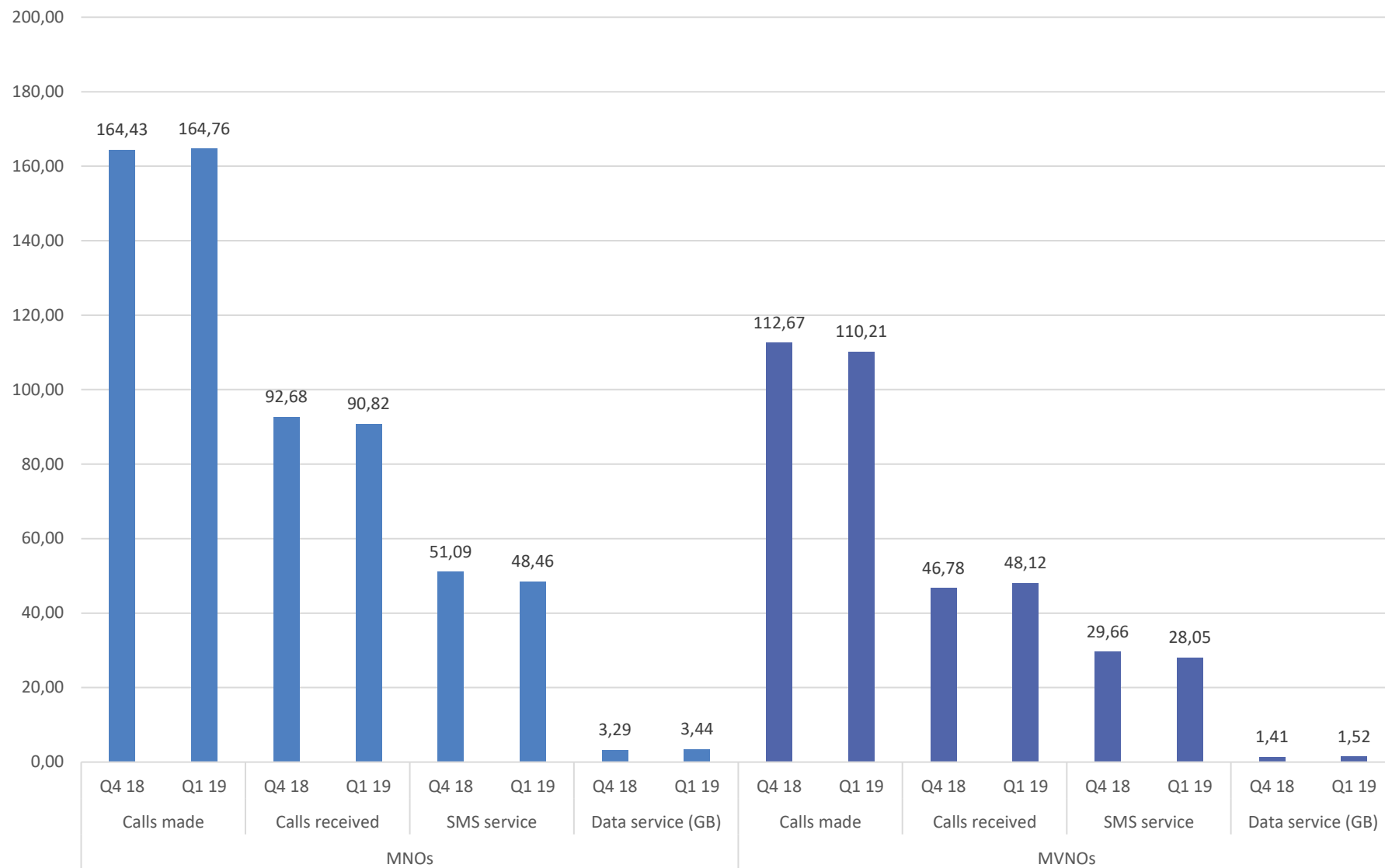


Figure 102: MNOs: share of total subscribers with EU/EEA roaming enabled, Q4 18

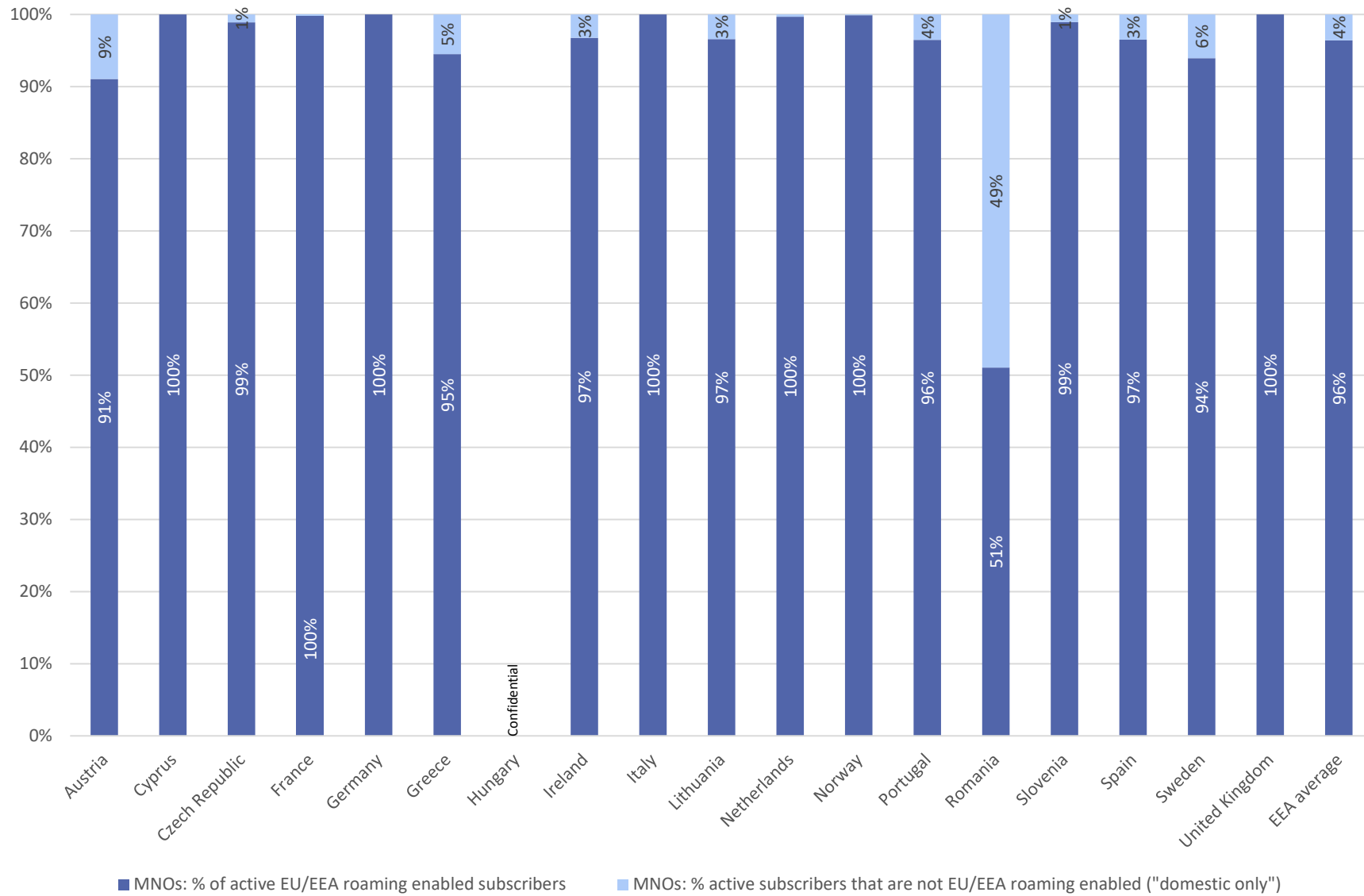


Figure 103: MNOs: share of total subscribers with EU/EEA roaming enabled, Q1 19

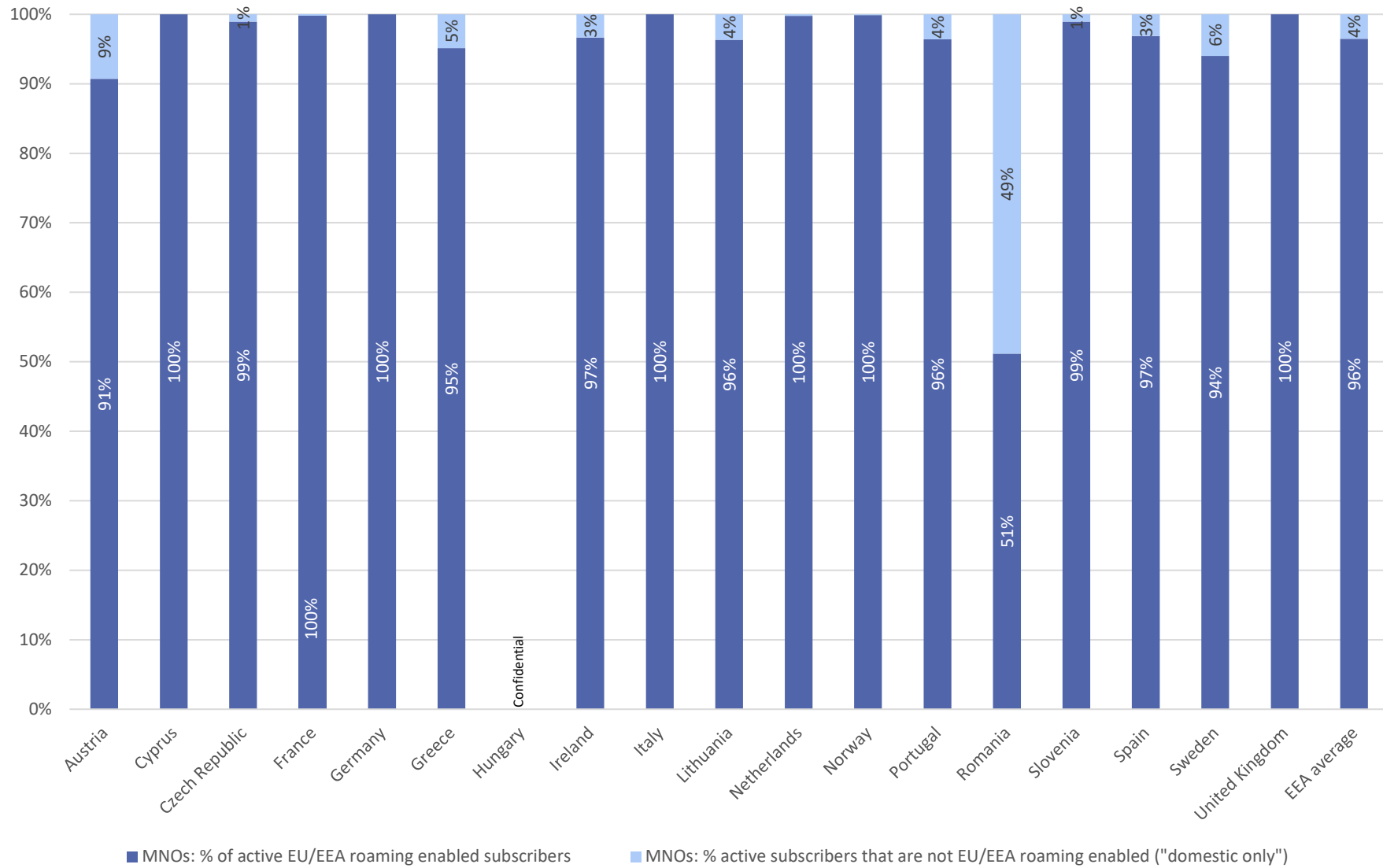


Figure 104: MVNOs: share of total subscribers with EU/EEA roaming enabled, Q4 18

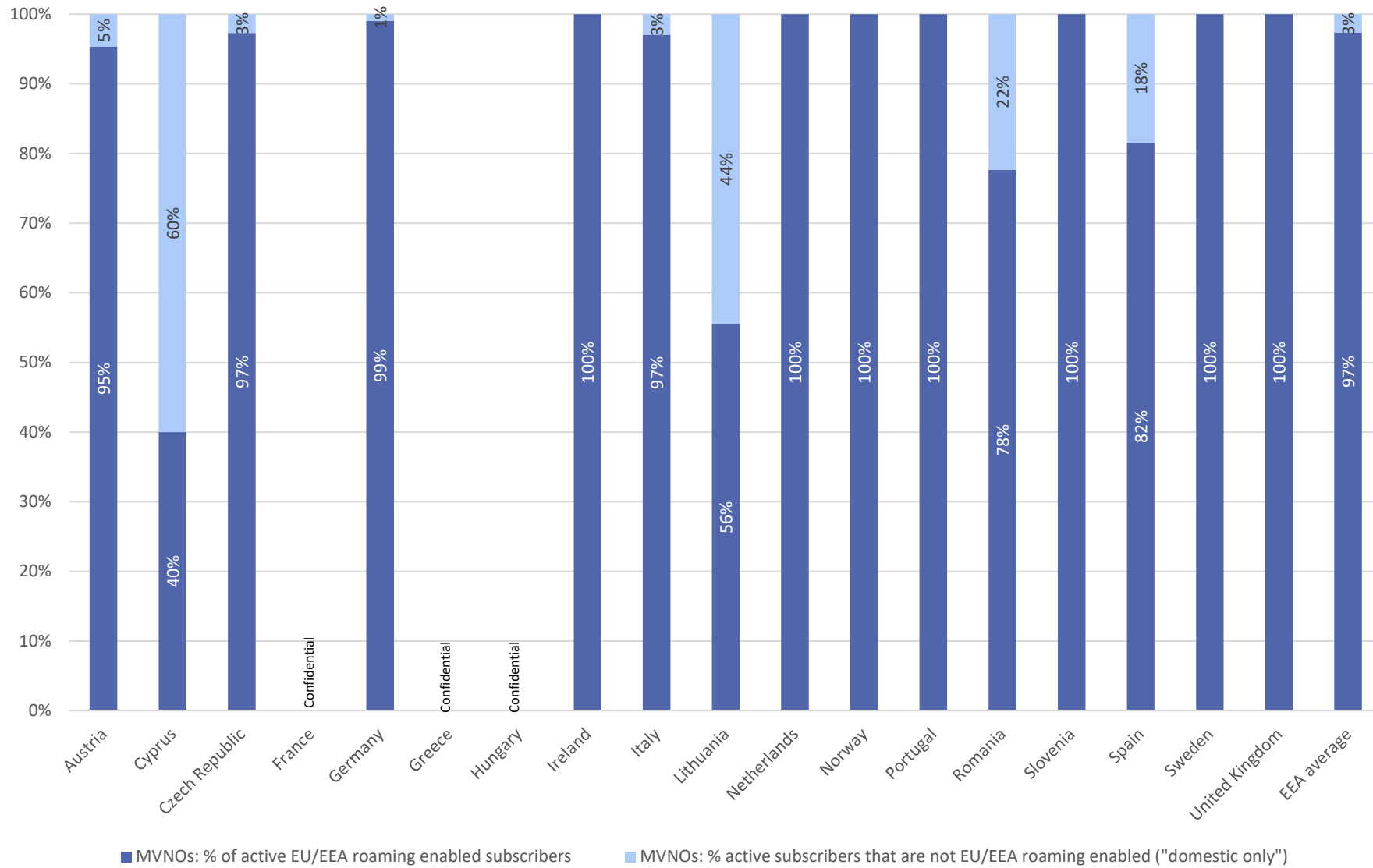
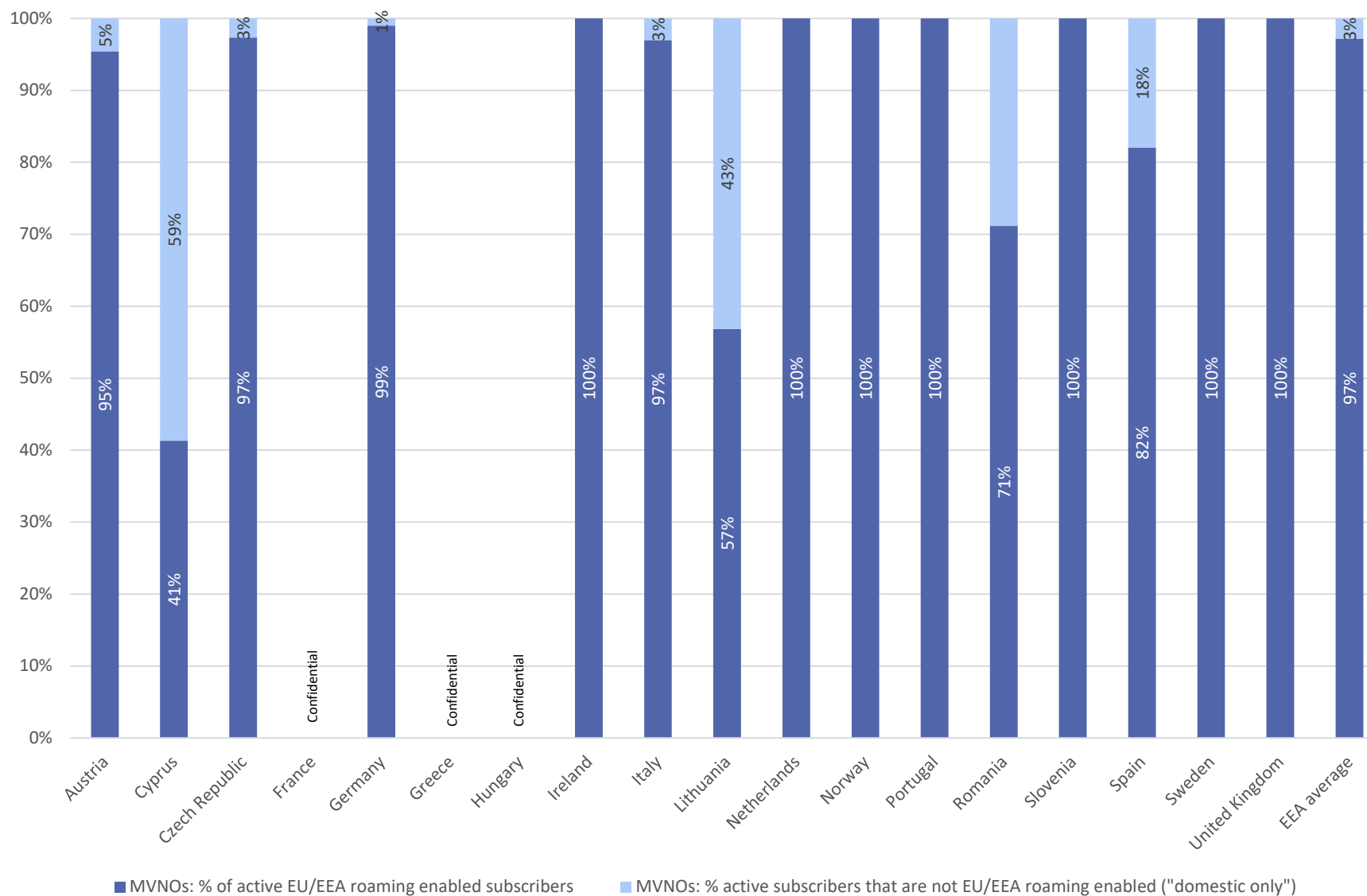


Figure 105: MVNOs: share of total subscribers with EU/EEA roaming enabled, Q1 19



5.5.3. Consumption patterns for RLAH services (voice, SMS and data)

Figure 106: RLAH, calls made: average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q4 18

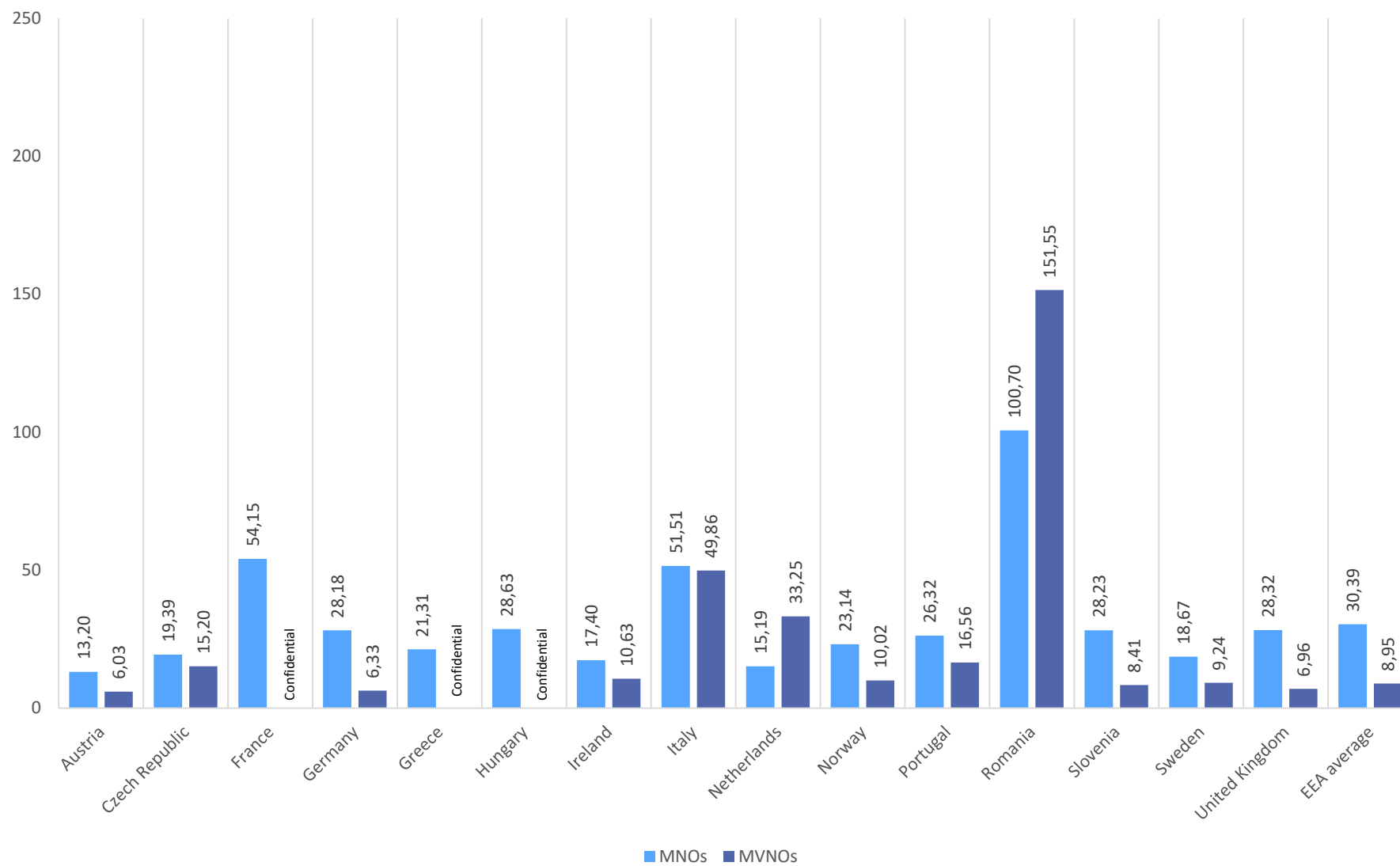


Figure 107: RLAH, calls made: average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q1 19

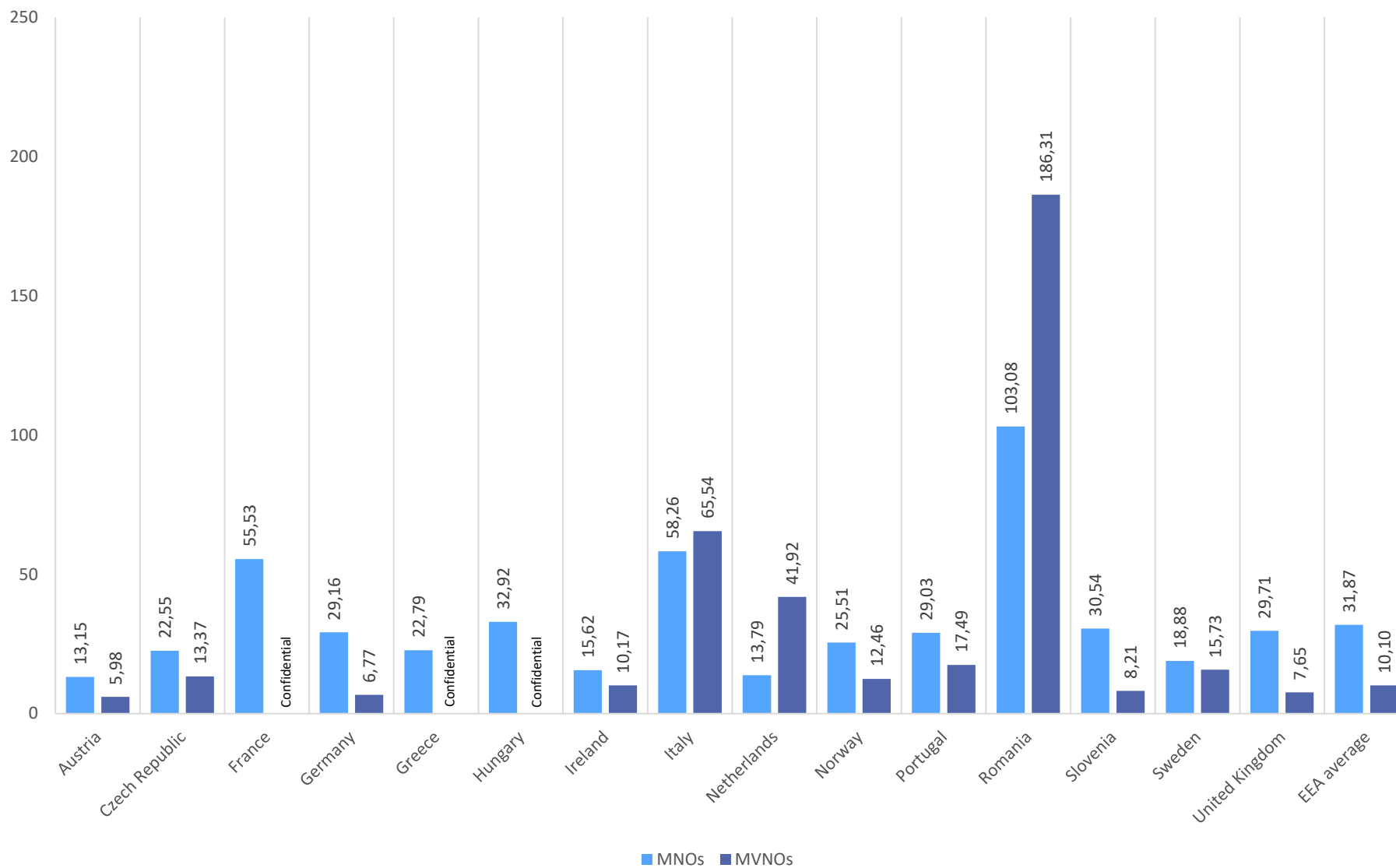


Figure 108: RLAH, calls received: average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q4 18

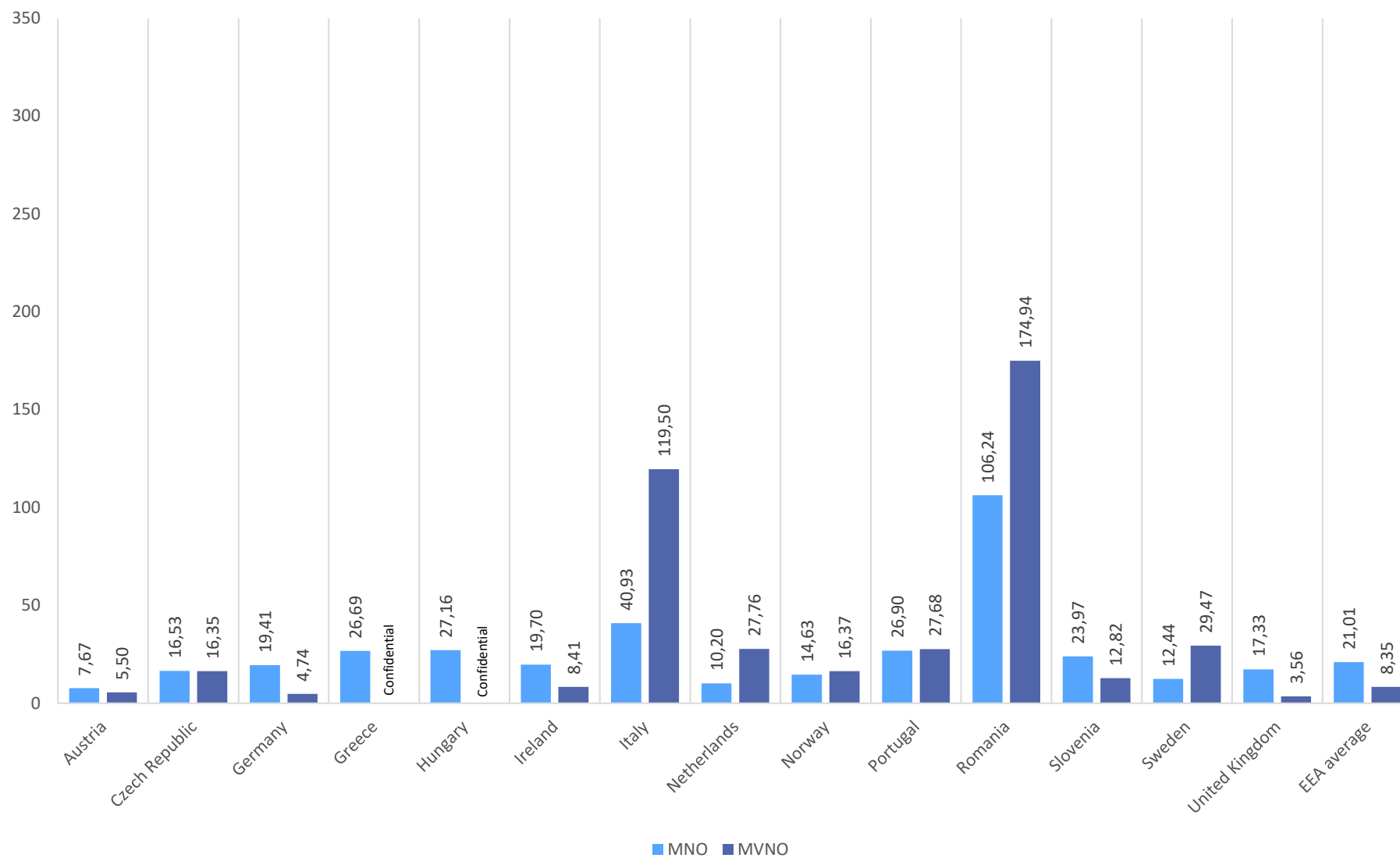


Figure 109: RLAH, calls received: average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q1 19

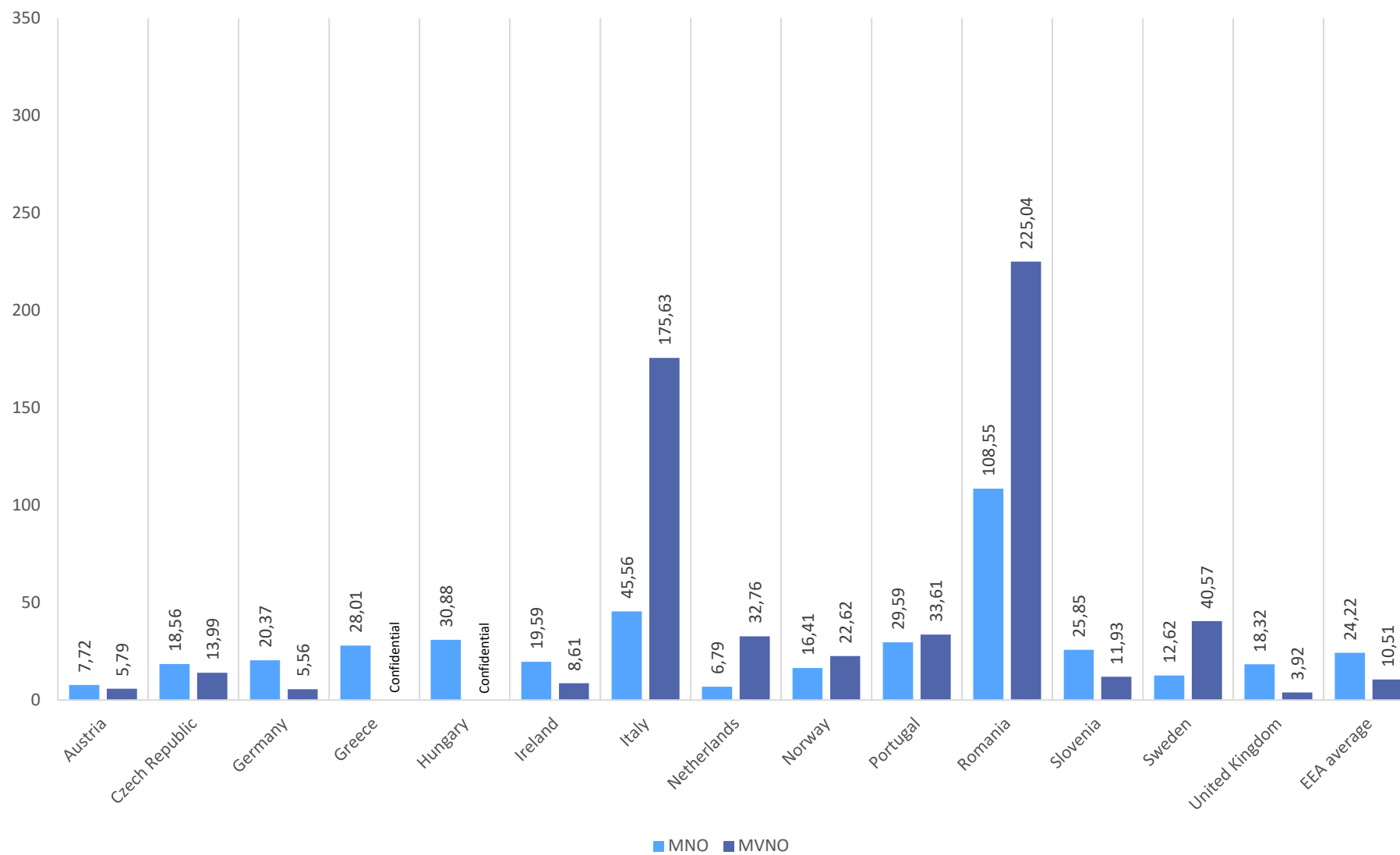
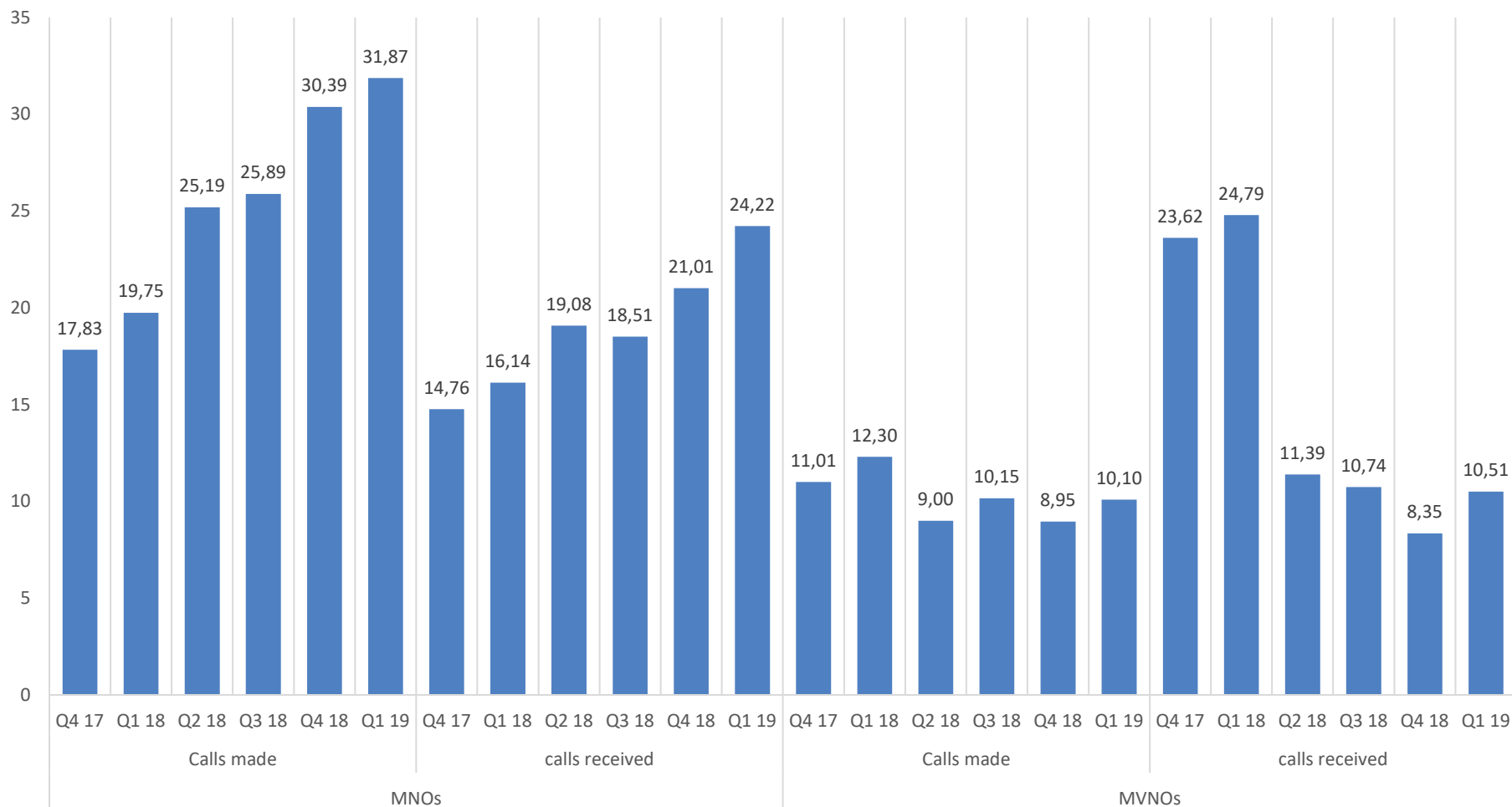


Figure 110: RLAH, calls made and calls received: EEA average number of RLAH minutes per month per roaming subscribers, MNOs and MVNOs, Q4 17 – Q1 19



BEREC has changed the way it presents consumption patterns for RLAH services in order to make it easier to interpret. The indicator for Q2 18 and Q3 18 is calculated by dividing RLAH volumes by the number of active subscribers with RLAH services that were roaming at least once in the concerned period in the EEA. This is to ensure that period-to-period changes in the indicator are not influenced by subscribers with different tariff plans. For correct interpretation of the trend, the reader should take into account that Q4 17 and Q1 18 is calculated by dividing RLAH volumes by the number of all active subscribers that were roaming at least once in the concerned quarter in the EEA.

Figure 111: RLAH, SMS services: average number of SMS per month per total number of roaming subscribers, MNOs and MVNOs, Q4 18

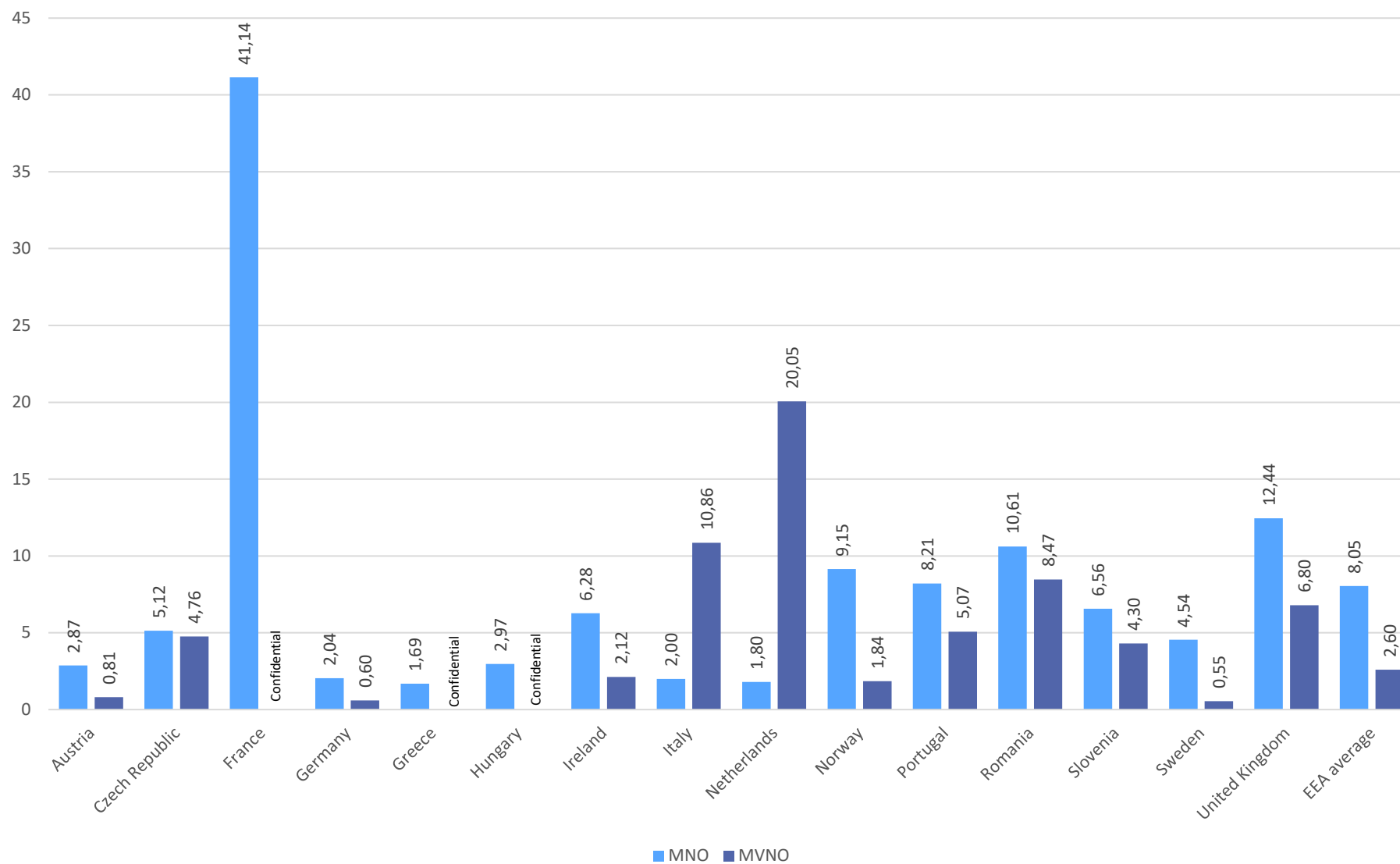


Figure 112: RLAH, SMS services: average number of SMS per month per total number of roaming subscribers, MNOs and MVNOs, Q1 19

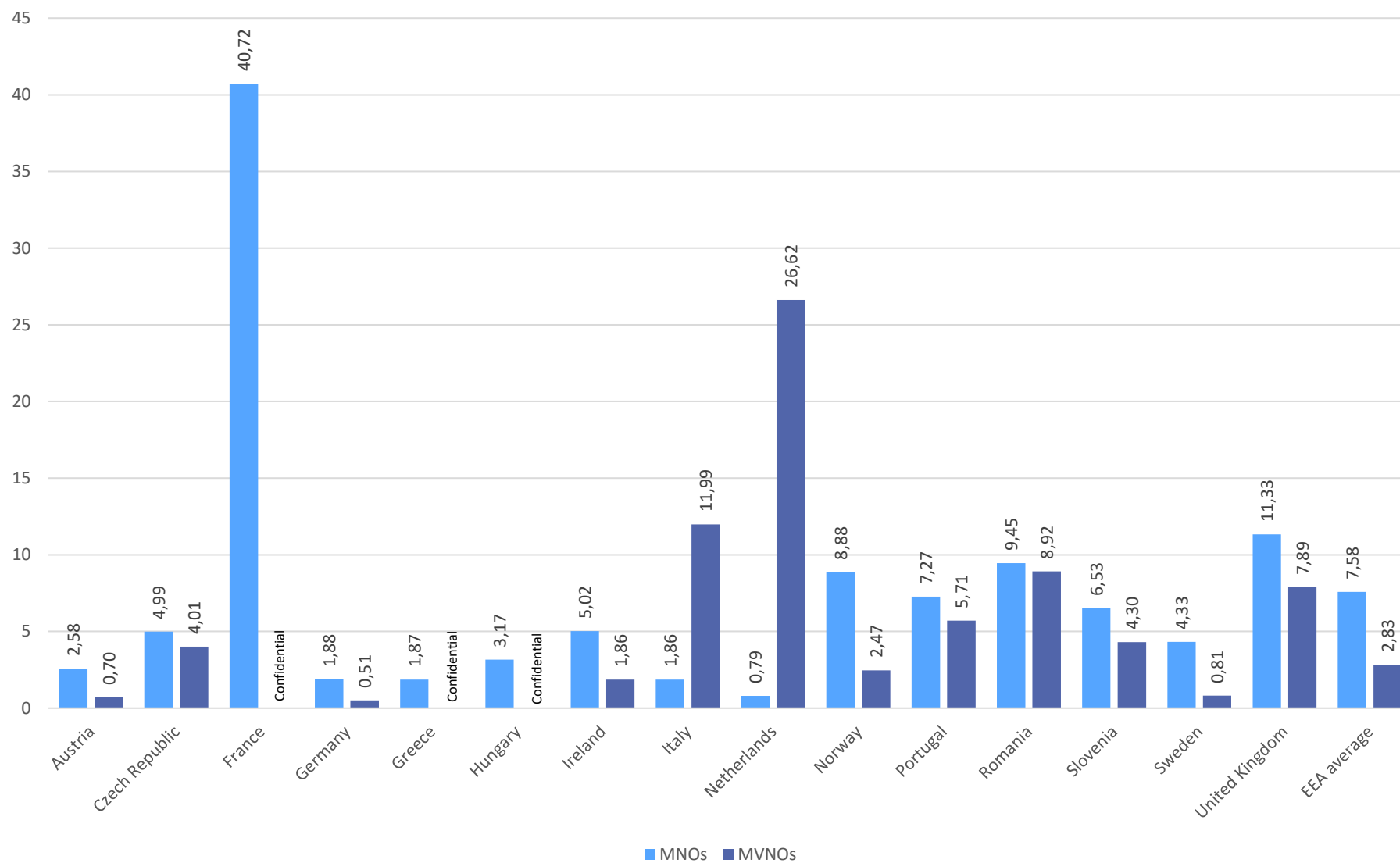
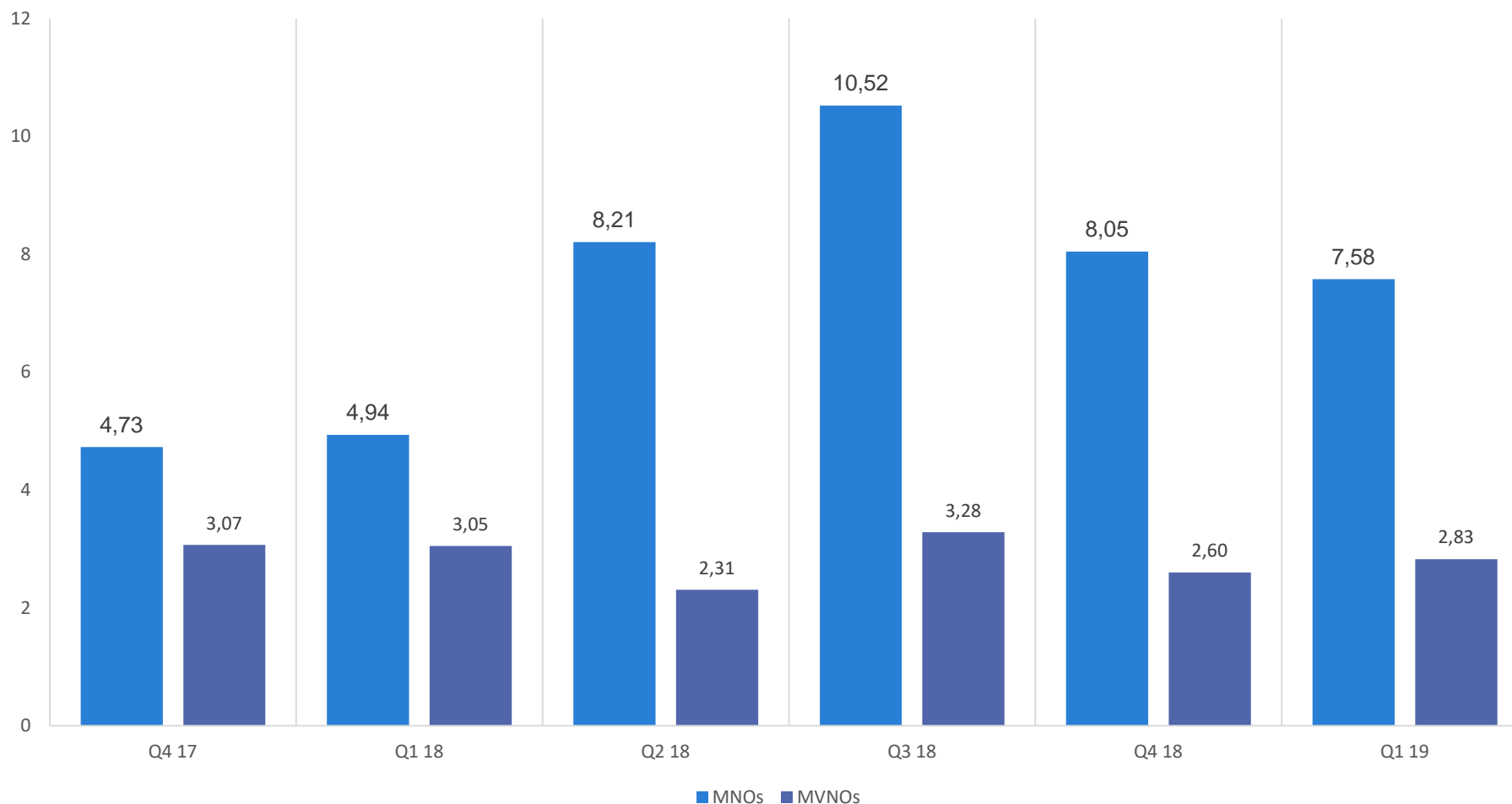


Figure 113: RLAH, SMS services: EEA average number of SMS per month per total number of roaming subscribers, MNOs and MVNOs, Q4 17 – Q1 19



BEREC has changed the way it presents consumption patterns for RLAH services in order to make it easier to interpret. The indicator for Q2 18 and Q3 18 is calculated by dividing RLAH volumes by the number of active subscribers with RLAH services that were roaming at least once in the concerned period in the EEA. This is to ensure that period-to-period changes in the indicator are not influenced by subscribers with different tariff plans. For correct interpretation of the trend, the reader should take into account that Q4 17 and Q1 18 is calculated by dividing RLAH volumes by the number of all active subscribers that were roaming at least once in the concerned quarter in the EEA.

Figure 114: RLAH, data services: average number of GB per month per total number of roaming subscribers, MNOs and MVNOs, Q4 18

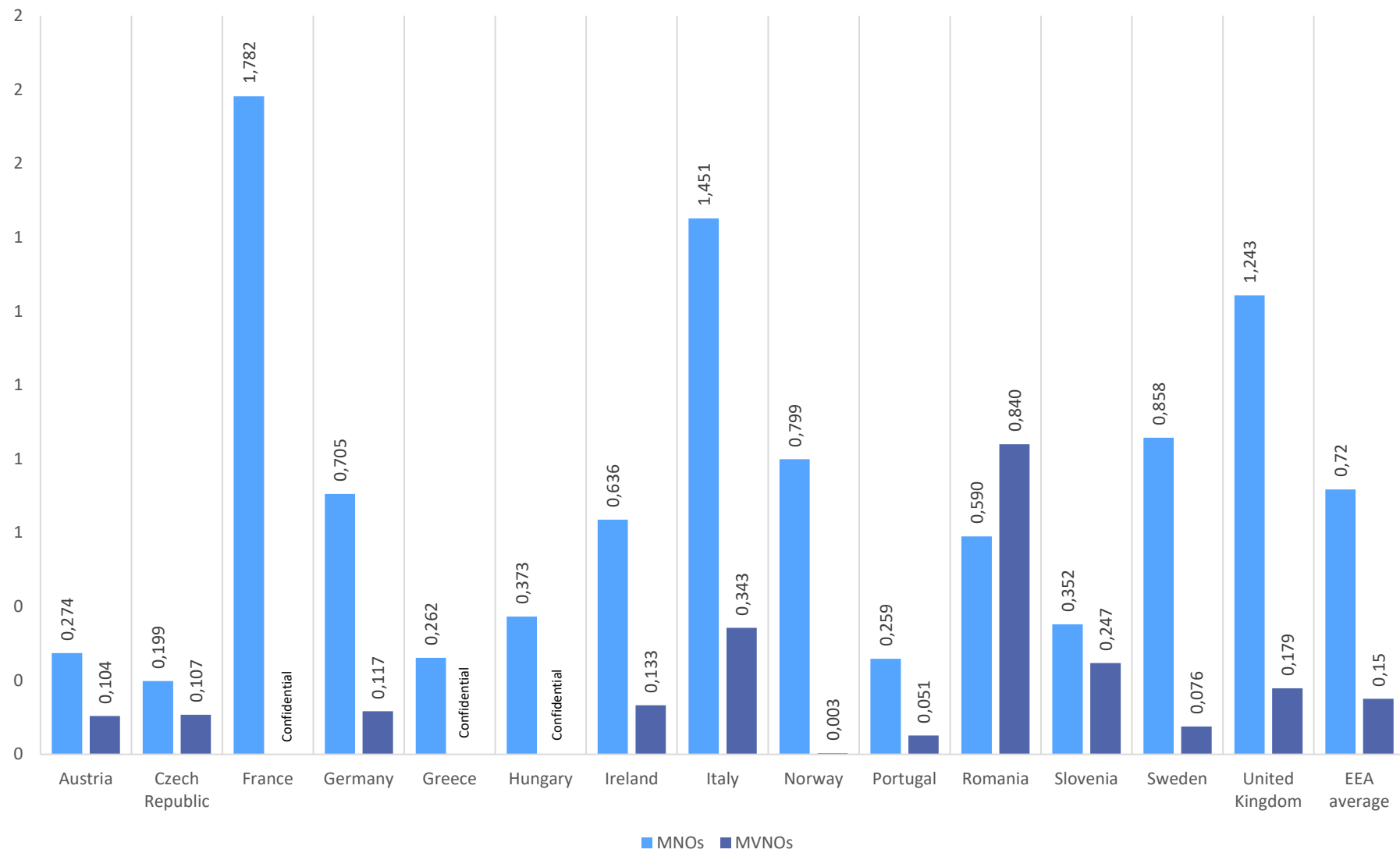


Figure 115: RLAH, data services: average number of GB per month per total number of roaming subscribers, MNOs and MVNOs, Q1 19

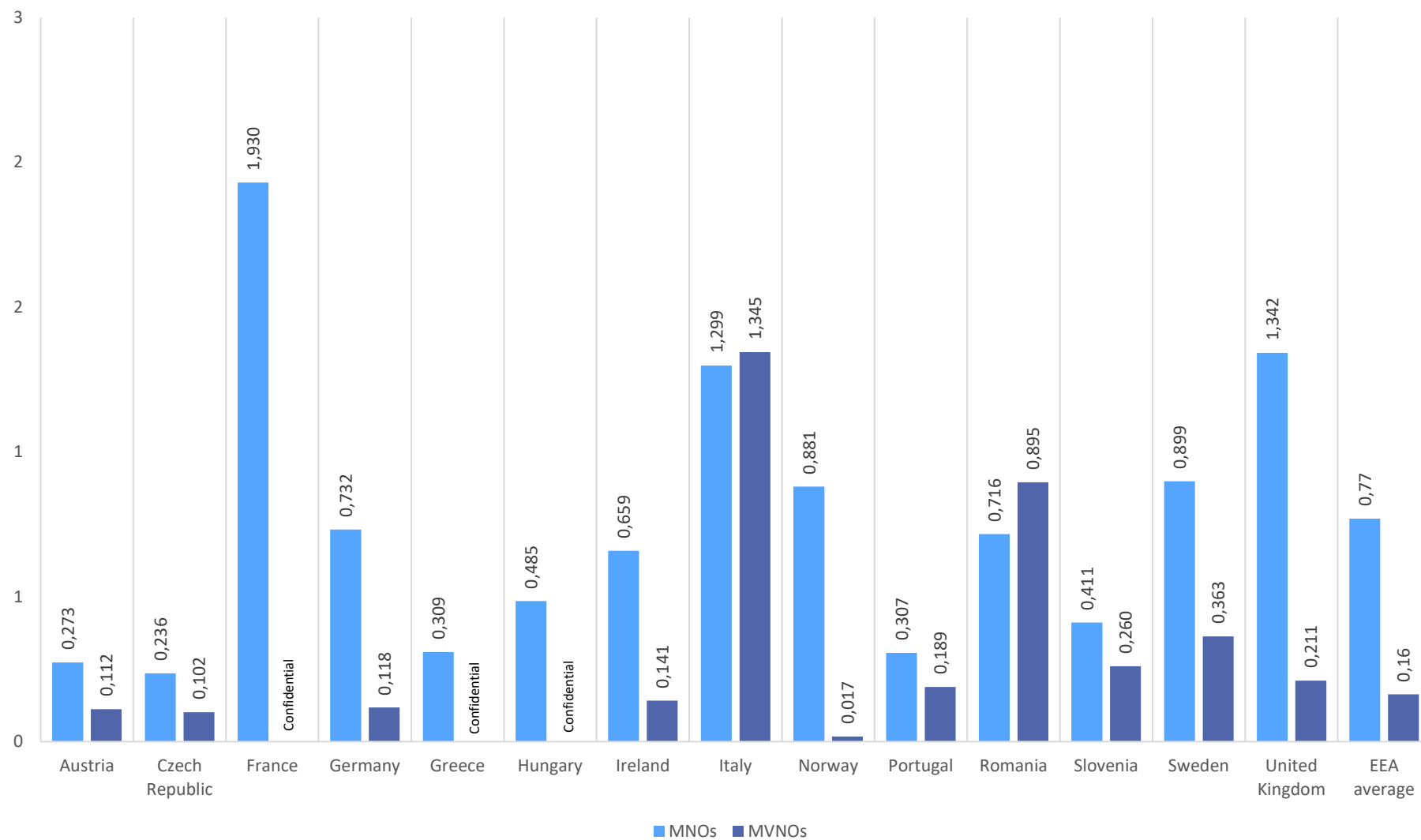
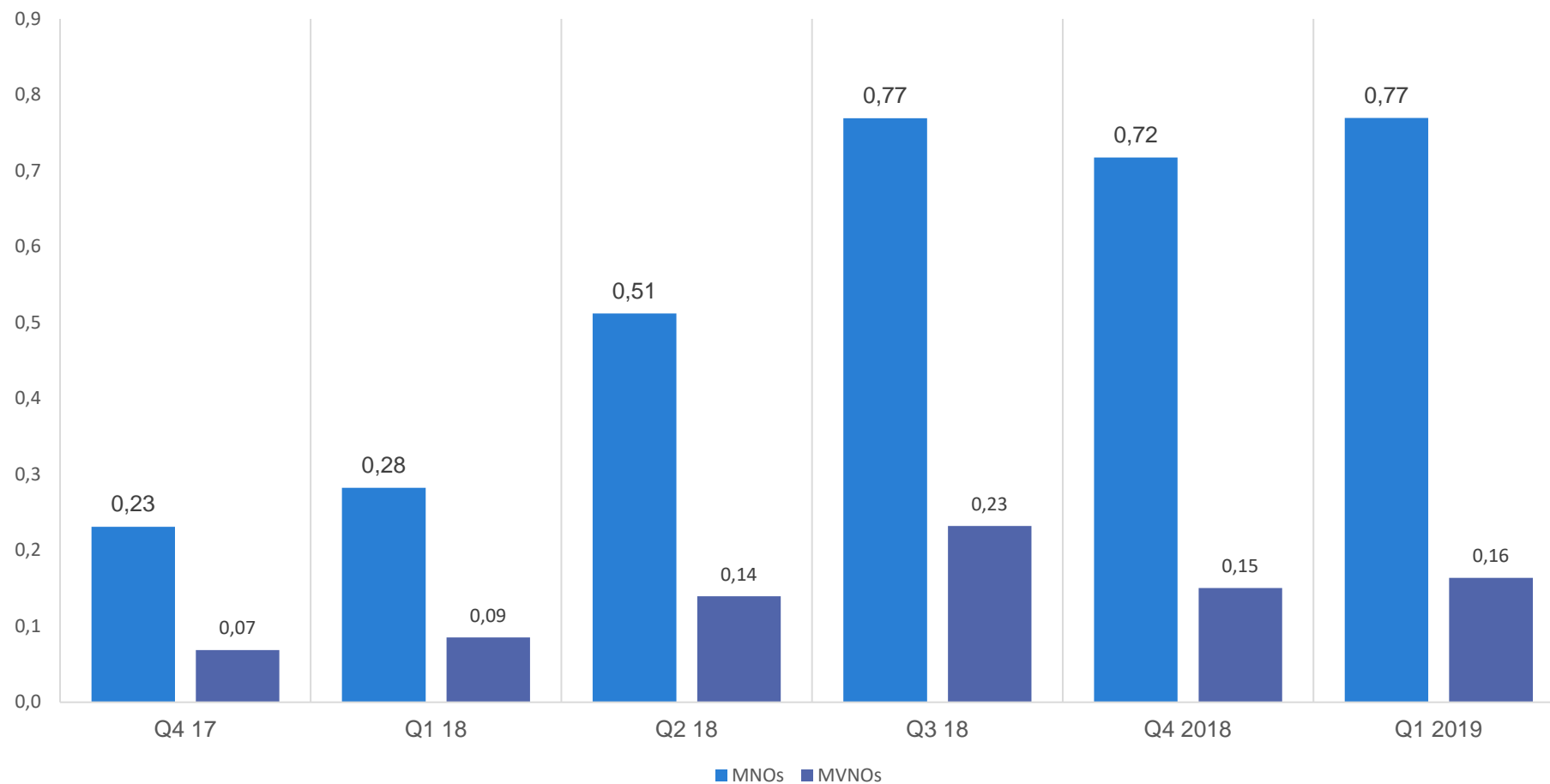


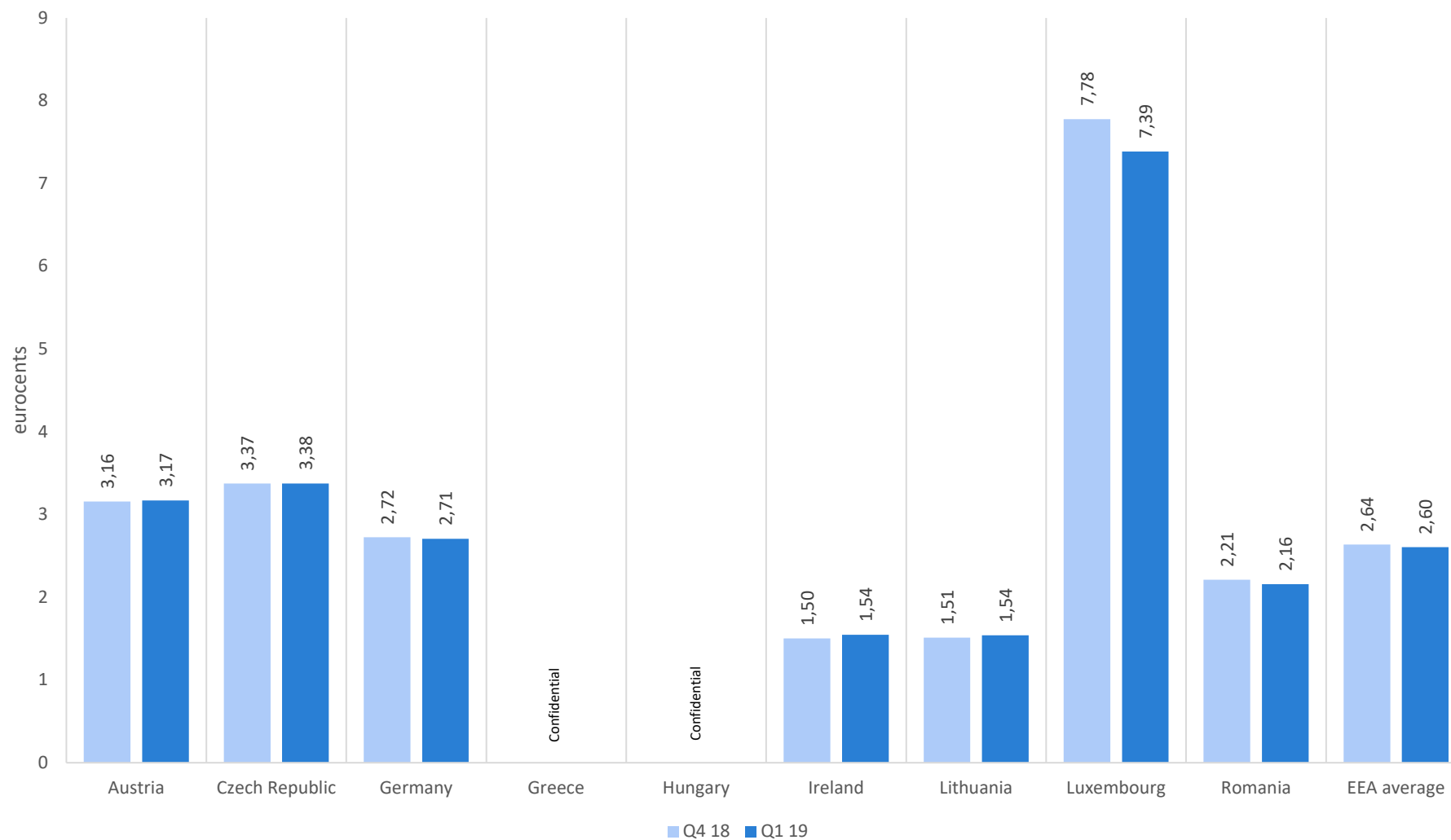
Figure 116: RLAH, data services: EEA average number of GB per month per total number of roaming subscribers, MNOs and MVNOs, Q4 17 – Q1 19



BEREC has changed the way it presents consumption patterns for RLAH services in order to make it easier to interpret. The indicator for Q2 18 and Q3 18 is calculated by dividing RLAH volumes by the number of active subscribers with RLAH services that were roaming at least once in the concerned period in the EEA. This is to ensure that period-to-period changes in the indicator are not influenced by subscribers with different tariff plans. For correct interpretation of the trend, the reader should take into account that Q4 17 and Q1 18 is calculated by dividing RLAH volumes by the number of all active subscribers that were roaming at least once in the concerned quarter in the EEA.

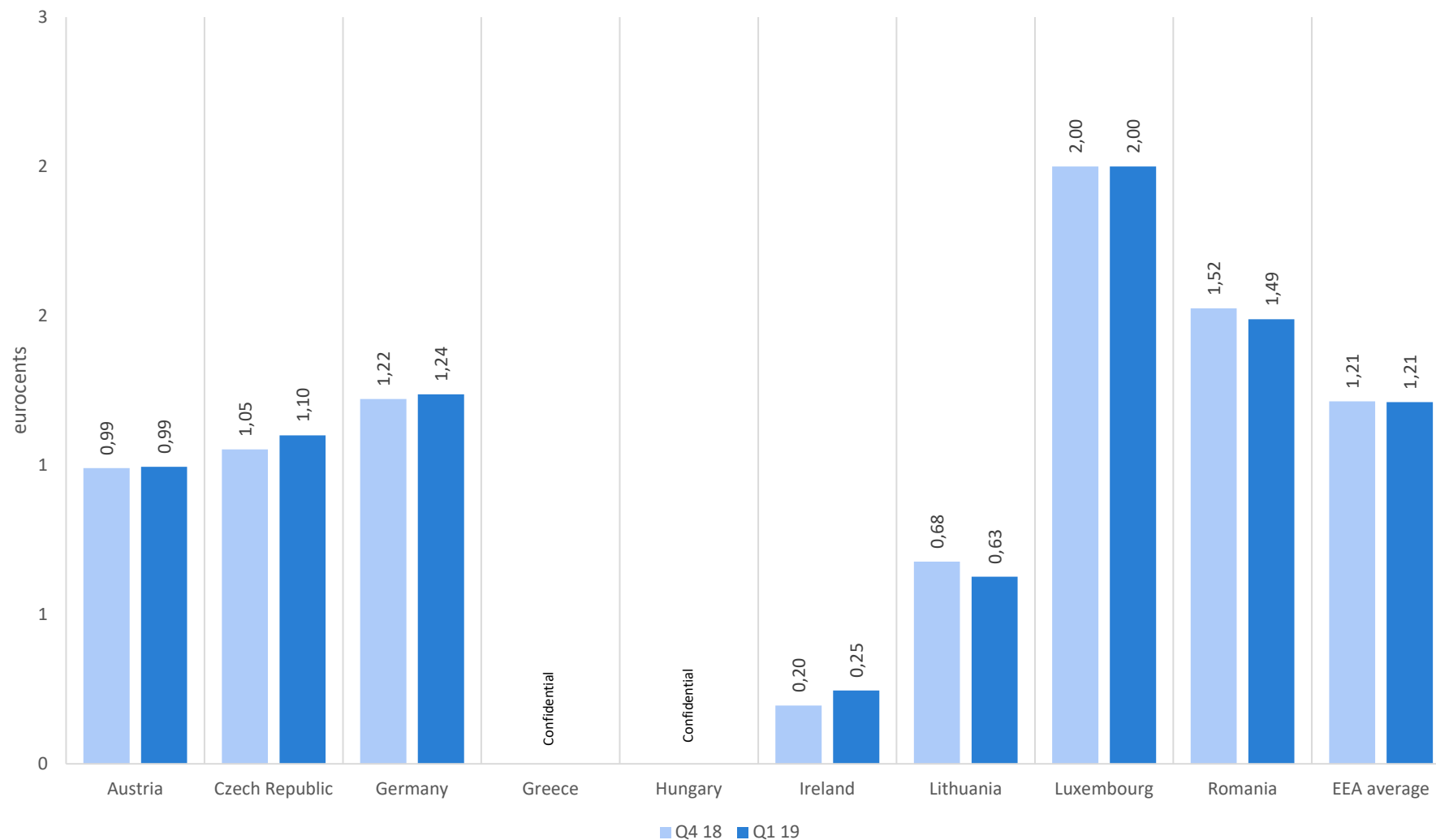
5.5.4. Cost to the host operator for the provision of wholesale international roaming services

Figure 117: Payment to the host operator for the provision of wholesale voice services (per unit), MVNO, Q4 18 and Q1 19



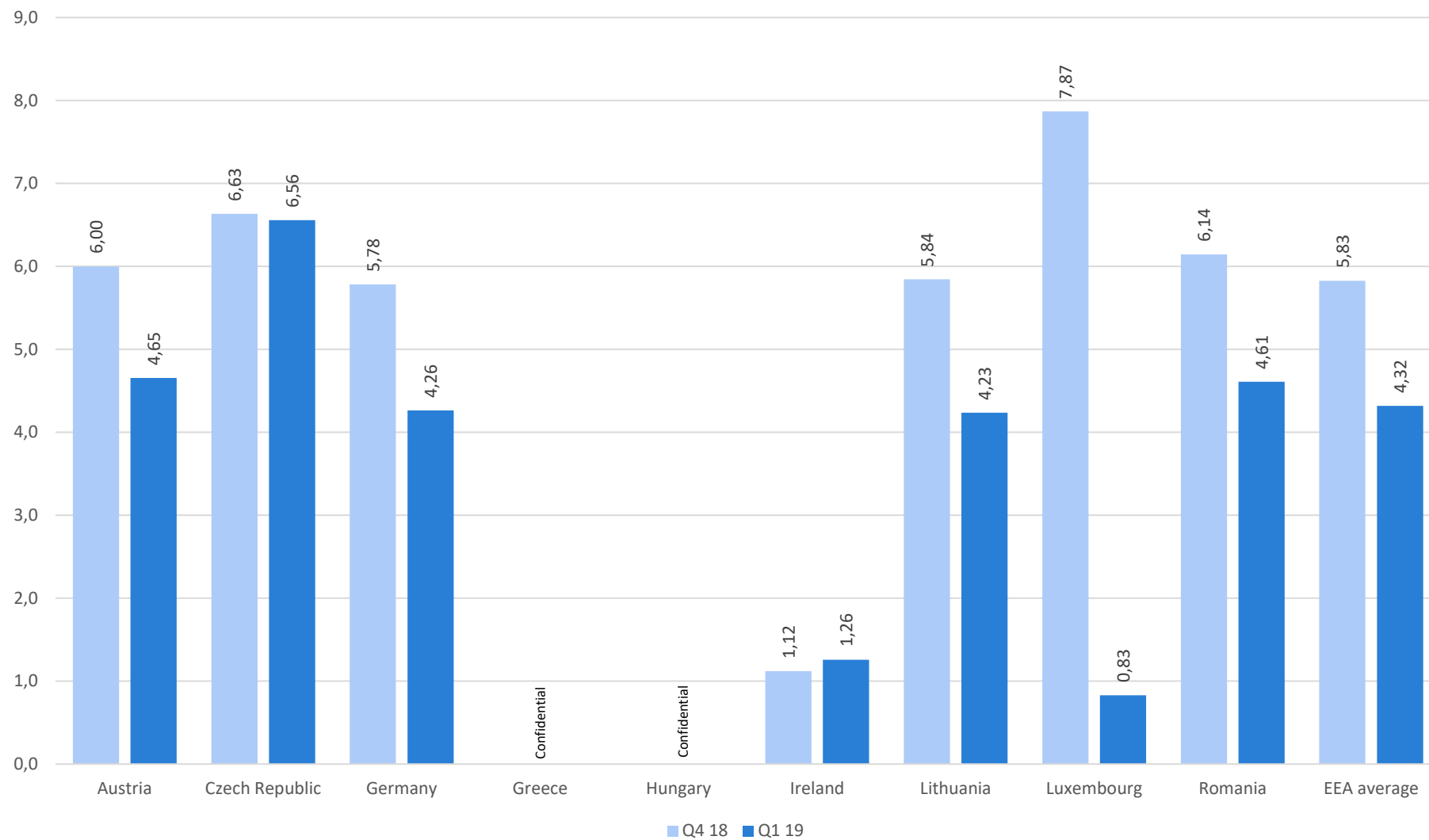
*The rates are calculated on the basis of costs/charges per unit (per minute)

Figure 118: Payment to the host operator for the provision of wholesale SMS services (per unit), MVNO, Q4 18 and Q1 19



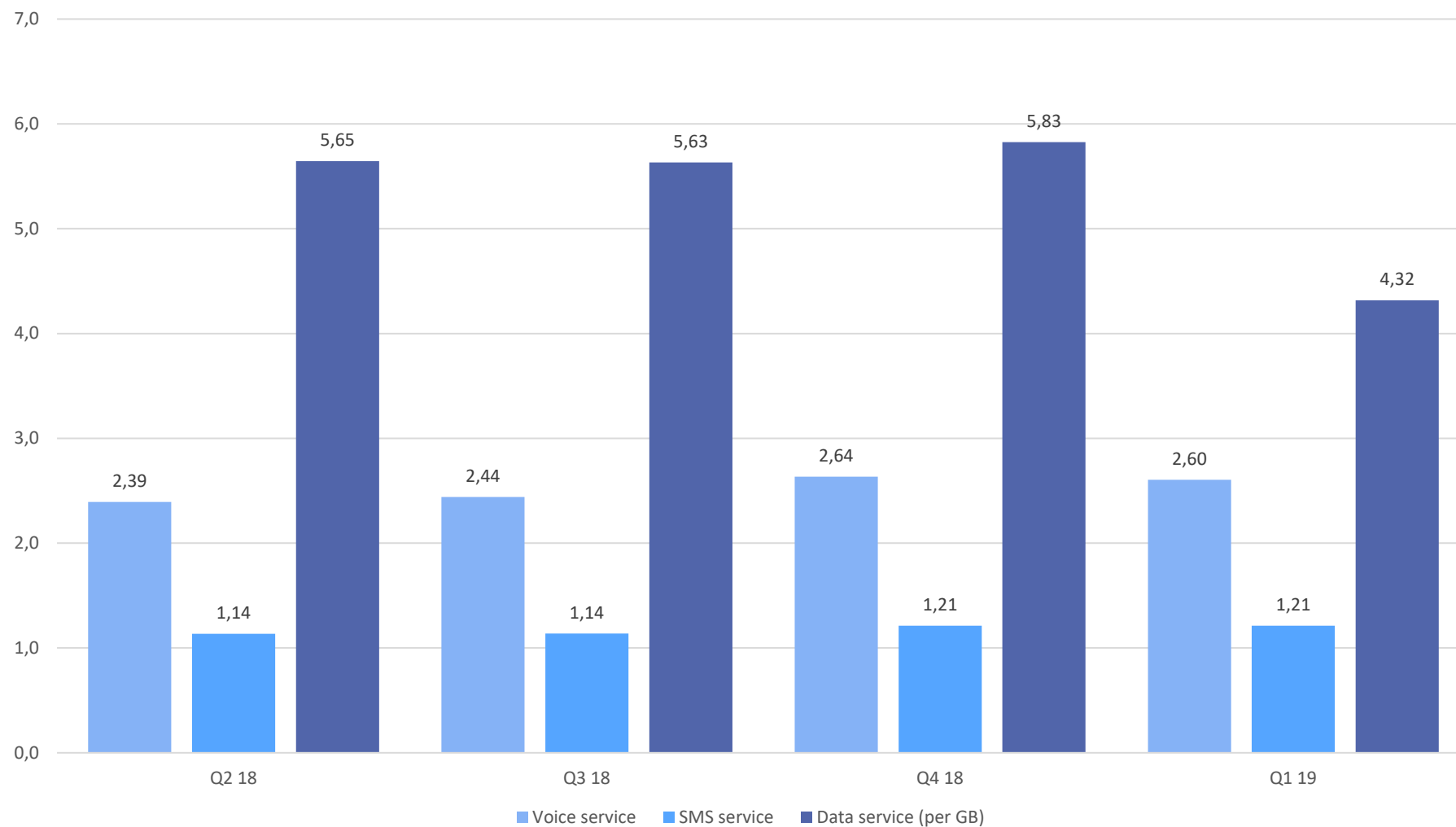
*The rates are calculated on the basis of costs/charges per unit (per SMS)

Figure 119: Payment to the host operator for the provision of wholesale Data services (per GB), MVNO, Q4 18 and Q1 19



*The rates are calculated on the basis of costs/charges per unit (per GB)

Figure 120: EEA average of payment to the host operator for the provision of wholesale roaming services (per unit), MVNOs, Q4 18 and Q1 18



Voice and SMS services: prices are expressed in Euro cents

Data services: prices are expressed in Euro

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 for a number of reasons. Particularly relevant are the following reasons:

- Differences in the methods used by operators 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 operators 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 calls 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”).

The results presented in the Report should be taking into account the operators’ problems with data reporting. In particular, the comparability of the intra-EEA roaming revenues, before and after the introduction of the Roam Like at Home rules, must be carefully analysed, as well as

the evolution of the domestic mobile revenues and of the intra-EEA roaming data (for traffic and for revenues), in terms of the different types of roaming tariffs.

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. Therefore, the following EEA averages may not be directly comparable:

- voice services: 16 – 19;
- SMS services: 41 – 44;
- data services: 58 – 61.

The assessment of the international roaming market was based on the requirements set out in Article 19 (4) of the Roaming Regulation. In order to assess the competitive developments in the Union-wide roaming markets, BEREC is tasked with collecting data regularly from national regulatory authorities (NRAs) on the development of retail and wholesale charges for regulated voice, SMS and data roaming services. On the basis of the collected data, BEREC is also obliged to report regularly on the evolution of pricing and consumption patterns in the Member States for both domestic and roaming services and the evolution of actual wholesale roaming rates for unbalanced traffic between roaming providers.

With effect from 15 June 2017, roaming providers shall not levy any surcharge in addition to the domestic retail price on roaming customers in any Member State for any regulated roaming service (Article 6a Roaming Regulation). With the abolition of retail roaming surcharges in the Union, the same tariff conditions apply for the use of mobile services while roaming abroad in the Union and at home (i.e. in the country of the mobile subscription of the customer), subject to the conditions set out in a FUP (Fair Use Policy). Accordingly, wherever regulated roaming services are offered, the implementation of “Roam Like at Home” (RLAH) allows the customer to use services while travelling in other EEA Member States in the same way as in their home country, i.e. that RLAH tariff effectively includes roaming services in the domestic bundle.

Where roaming customers exceed the FUP, they may be required by the roaming provider to pay a surcharge for the consumption of any further regulated roaming service. However, Article 6e (1) Roaming Regulation limits the amount of any such surcharge.

Moreover, according to Article 6c Roaming Regulation, in specific and exceptional circumstances, with a view to ensuring the sustainability of its domestic charging model, a roaming provider may apply for authorisation to apply a surcharge. The Roaming Regulation lays down detailed rules on the methodology for assessing the sustainability of the abolition of retail roaming surcharges and on the application to be submitted by a roaming provider for the purposes of that assessment.

Due to the complexity of tariffs offered by operators, the current BEREC Benchmark Report includes an assessment of these tariffs with respect to consumption patterns.

BEREC is further called on to report about the evolution of actual wholesale roaming rates for unbalanced traffic between roaming providers, a requirement which is reflected in the current BEREC Benchmark Report.

Finally, BEREC also reports about the evolution of pricing and consumption patterns in the Member States for domestic services.

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 company 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 operator 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 at the national operators' level as well as the use of different reporting systems by operators.

At the wholesale level, operators 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, operators 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 operators changed, which may cause an apparent changes in volumes and revenues between quarters.

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 Euro zone.

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 billed minutes of voice calls or billed 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 para. 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.

The International Roaming Traffic Index reflects the changes in volumes between different periods.

Annex II: List of respondents

Operators that provided data for the period 1 April 2018 – 30 September 2018:

Austria

A1 Telekom Austria
 ATK
 HoT Telekom
 Hutchison 3G Austria
 LTK
 Lycamobile
 Mass Response
 Porsche Smart Mobility
 RTK
 Russmedia
 Smartspace
 T-Mobile Austria

Belgium

Proximus
 Telenet Group
 Orange Belgium

Bulgaria

Bulgarian Telecommunication Company
 (Vivacom)
 Telenor Bulgaria
 A1 Bulgaria

Croatia

Hrvatski Telekom
 Vipnet
 Tele2

Cyprus

Cablenet
 Cyta
 MTN Cyprus
 Primetel

Czech Republic

O2 Family
 Air Telecom
 ČEZ Prodej
 DH Telecom
 O2 Czech Republic
 SAZKA
 TERMS

Tesco Mobile ČR
 T-Mobile Czech Republic

Vodafone Czech Republic

Denmark

Hi3G Denmark
 TDC
 Telenor
 TeliaDanmark

Estonia

AS EMT
 Elisa Eesti
 OÜ Top Connect
 TELE 2 Eesti

Finland

Ålands Telekommunikation
 DNA
 Elisa Corporation
 Telia Finland
 European Mobile Operator (MOI)

France

Bouygues Telecom
 EI Telecom
 Free Mobile
 Lycamobile
 Orange Caraïbe
 Orange France
 SFR
 SRR

Germany

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

Greece

COSMOTE Mobile
 Vodafone Panafon
 Wind HellasTelecommunications

CYTA HELLAS TILEPIKINONIAKI SA

Hungary

Telenor Magyarország
Magyar Telekom
Vodafone Magyarország
UPC Mobile

Iceland

Nova
Síminn
Vodafone Iceland

Ireland

Eircom Limited
Hutchison 3G Ireland
Tesco Mobile Ireland
Vodafone Ireland

Italy

Digi Italy
ERG Mobile
Fastweb
Tre
Lycamobile
Poste Mobile
Tim
Tiscali
Vodafone
Wind

Latvia

Bite Latvia
Latvijas Mobilais Telefons
Tele2

Liechtenstein

Salt (Liechtenstein)
Telecom Liechtenstein
Swisscom (Schweiz)

Lithuania

Bitė Lietuva
Eurocom
Omnitel
Tele2
Teledema

Luxembourg

POST

Tango
Orange Communications Luxembourg

Malta

Melita Mobile,
Mobisile Communications (GO Mobile)
Vodafone Malta

Netherlands

KPN
Lebara
Lycamobile Distribution
Tele2 Netherlands
T-Mobile Netherlands
Vodafone Libertel

Norway

Lycamobile
Telenor
Telia Norge

Poland

P4
Polkomtel
T-Mobile Polska
Orange Polska

Portugal

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

Romania

Orange Romania
RCS&RDS
Vodafone Romania
Lycamobile
Telekom Romania Communications
Telekom Romania Mobile Communications
Digital Cable Systems

Slovak Republic

O2 Slovakia
Orange Slovensko
Slovak Telekom
SWAN Mobile

Slovenia

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

Spain

Digi Spain
Euskaltel
Orange
TelefónicaMóviles de España
Vodafone
Yoigo

Sweden

Hi3G Access
Telenor Sverige
Telia Company
Tele2 Sverige

United Kingdom

Vodafone UK
O2 UK
Everything Everywhere
Three UK
Tesco Mobile