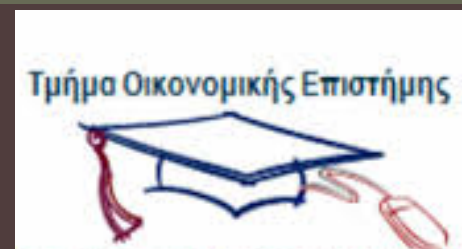


ΟΙΚΟΝΟΜΙΚΑ ΤΩΝ ΘΑΛΑΣΣΙΟΚΟΙΝΩΝΙΩΝ ΚΑΙ ΤΩΝ ΔΙΚΤΥΩΝ



ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ
UNIVERSITY OF PIRAEUS



Μάρκος Τσελεκούνης

Αναπληρωτής Καθηγητής
Πανεπιστημίου Πειραιώς

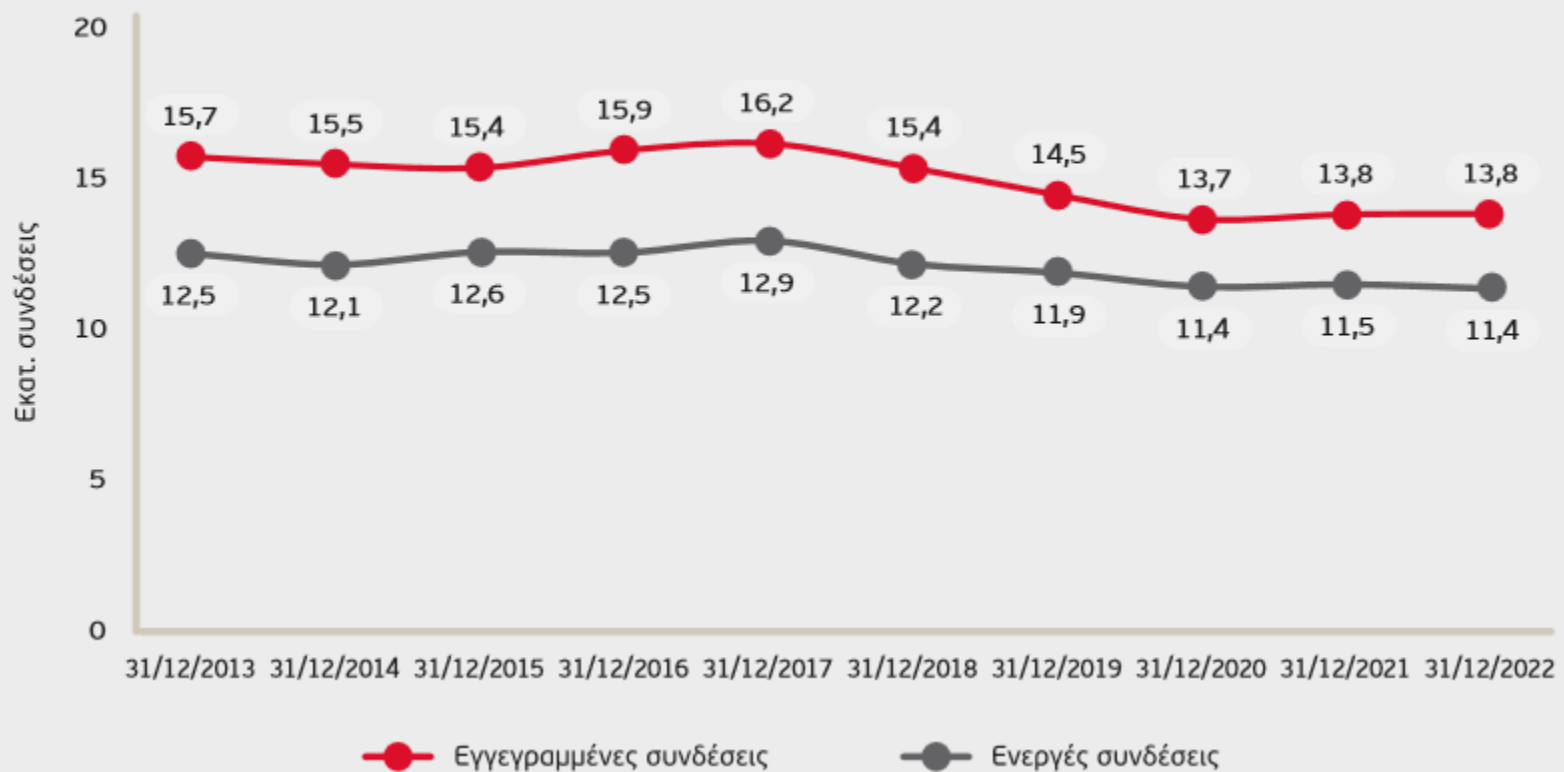
mtselek@unipi.gr

<http://www.unipi.gr/unipi/en/mtselek.html>

MOBILE TELEPHONY

THE GREEK RETAIL MARKET

Διάγραμμα 1.29: Συνδέσεις/συνδρομές κινητής τηλεφωνίας



MOBILE TELEPHONY

THE GREEK RETAIL MARKET

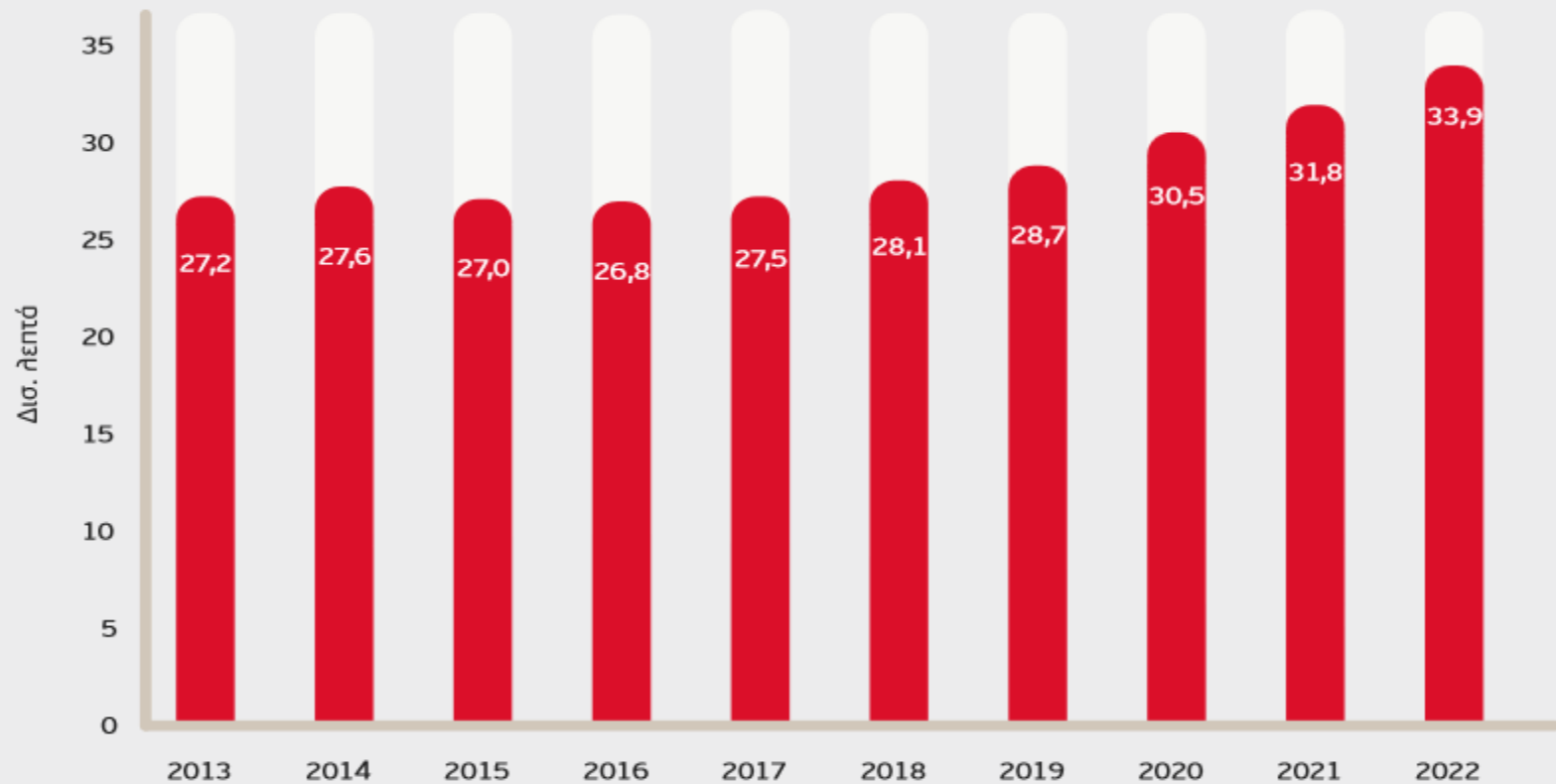
Διάγραμμα 1.30: Εξέλιξη αριθμού συνδέσεων κινητής τηλεφωνίας (καρτοκινητή και συμβόλαιο)



MOBILE TELEPHONY

THE GREEK RETAIL MARKET

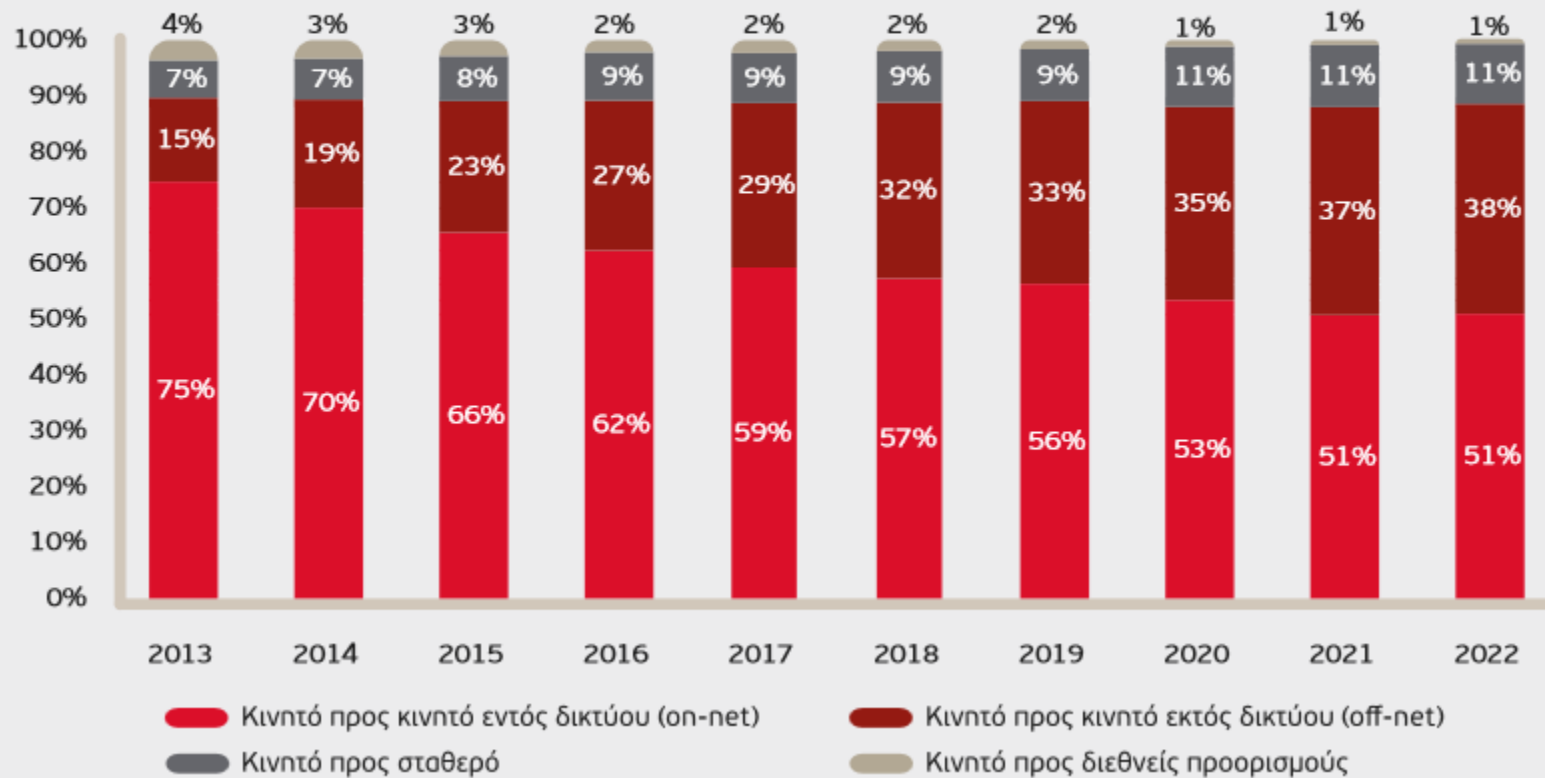
Διάγραμμα 1.33: Όγκος φωνητικών κλήσεων που εκκινούν από κινητό τηλέφωνο



MOBILE TELEPHONY

THE GREEK RETAIL MARKET

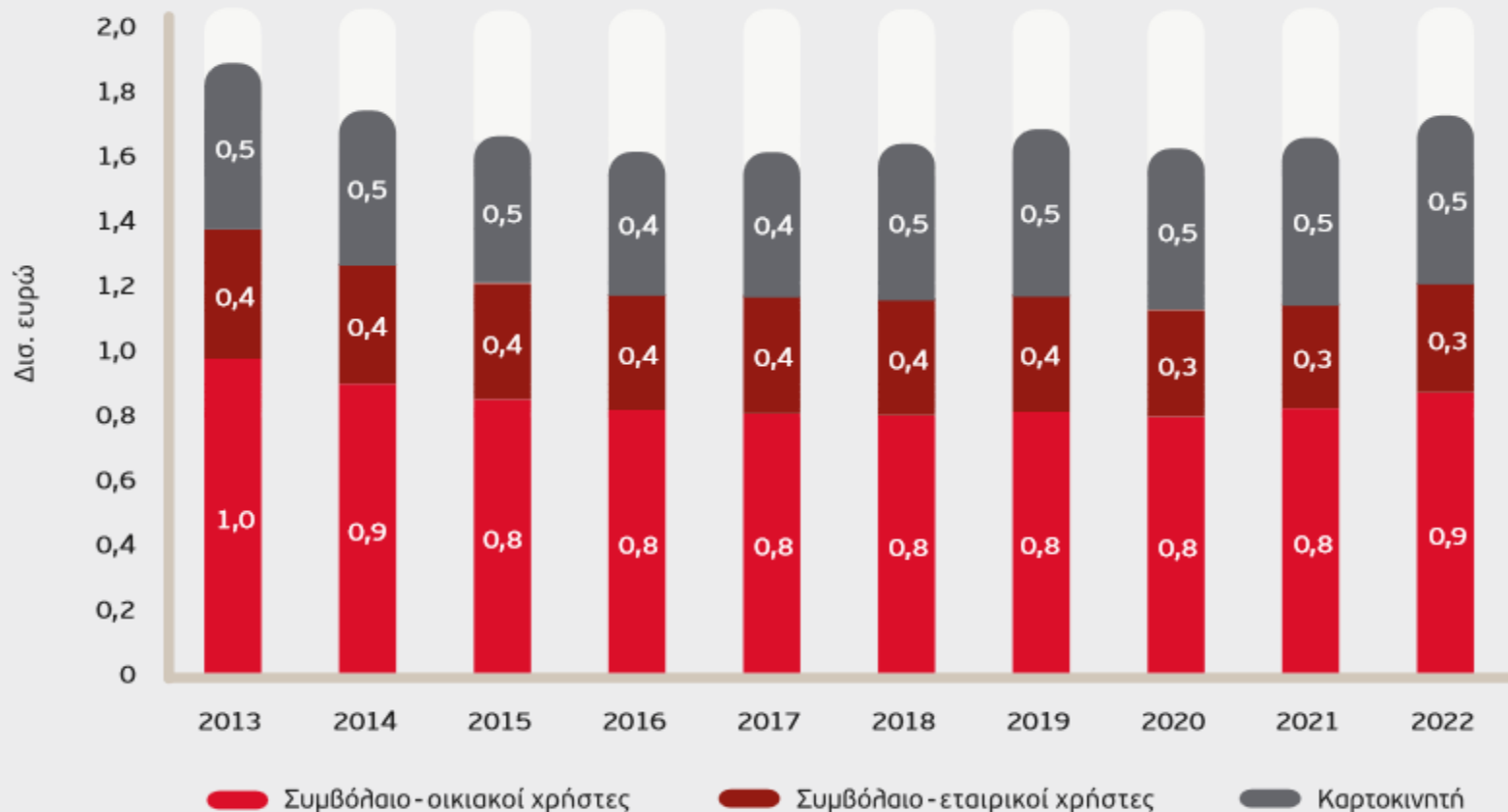
Διάγραμμα 1.35: Ποσοστιαία κατανομή του όγκου των βασικών τύπων κλήσεων



MOBILE TELEPHONY

THE GREEK RETAIL MARKET

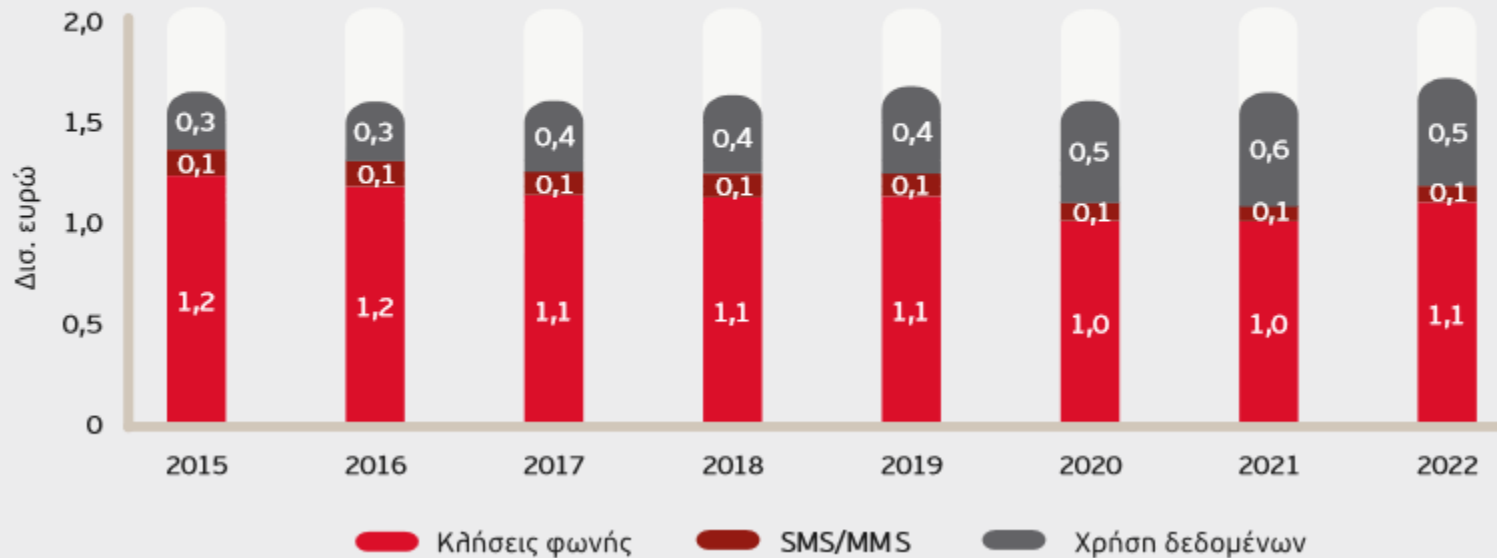
Διάγραμμα 1.42: Λιανικά έσοδα από χρήστες υπηρεσιών φωνής και δεδομένων δικτύων κινητών επικοινωνιών



MOBILE TELEPHONY

THE GREEK RETAIL MARKET

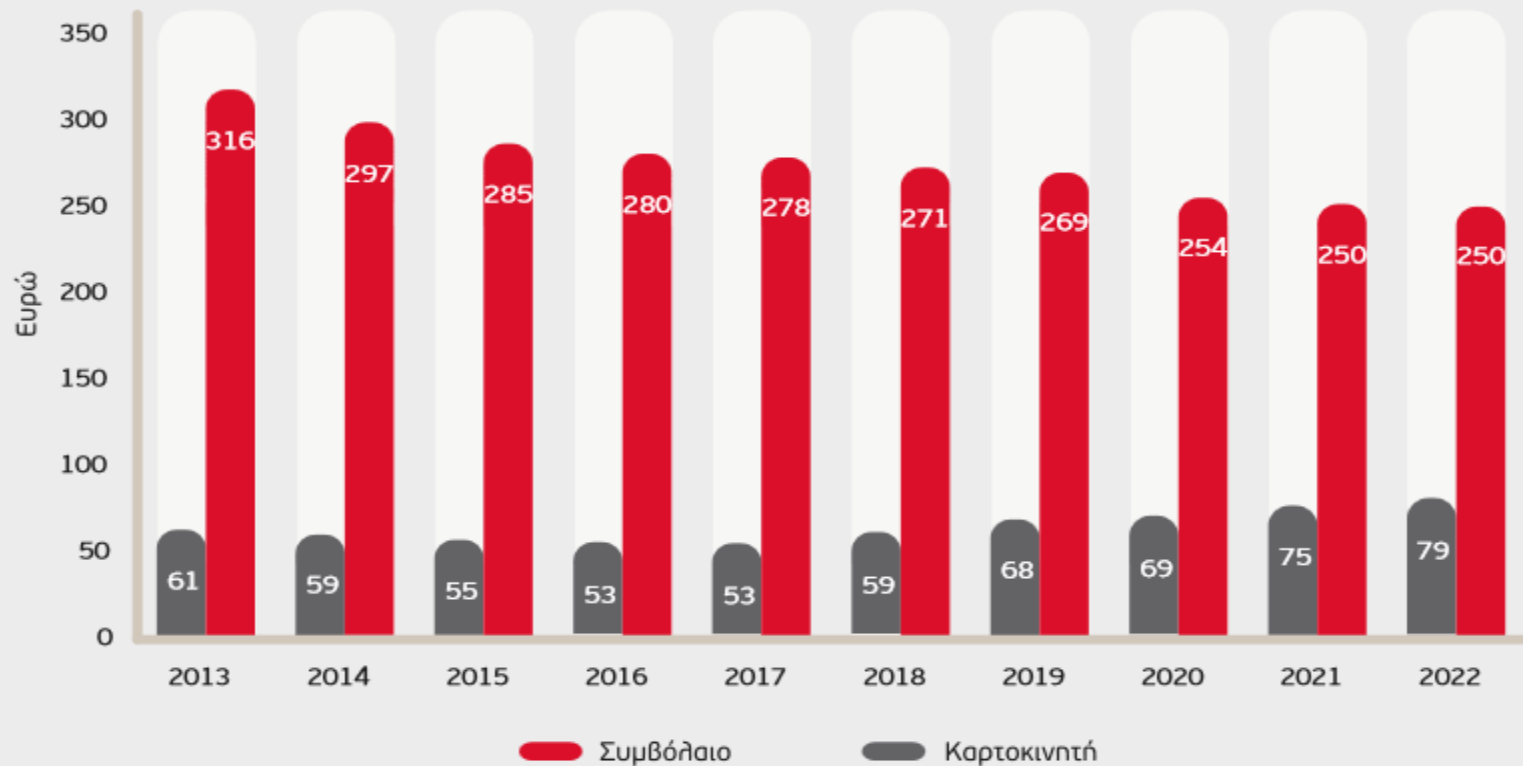
Διάγραμμα 1.43: Προέλευση θιανικών εσόδων



MOBILE TELEPHONY

THE GREEK RETAIL MARKET

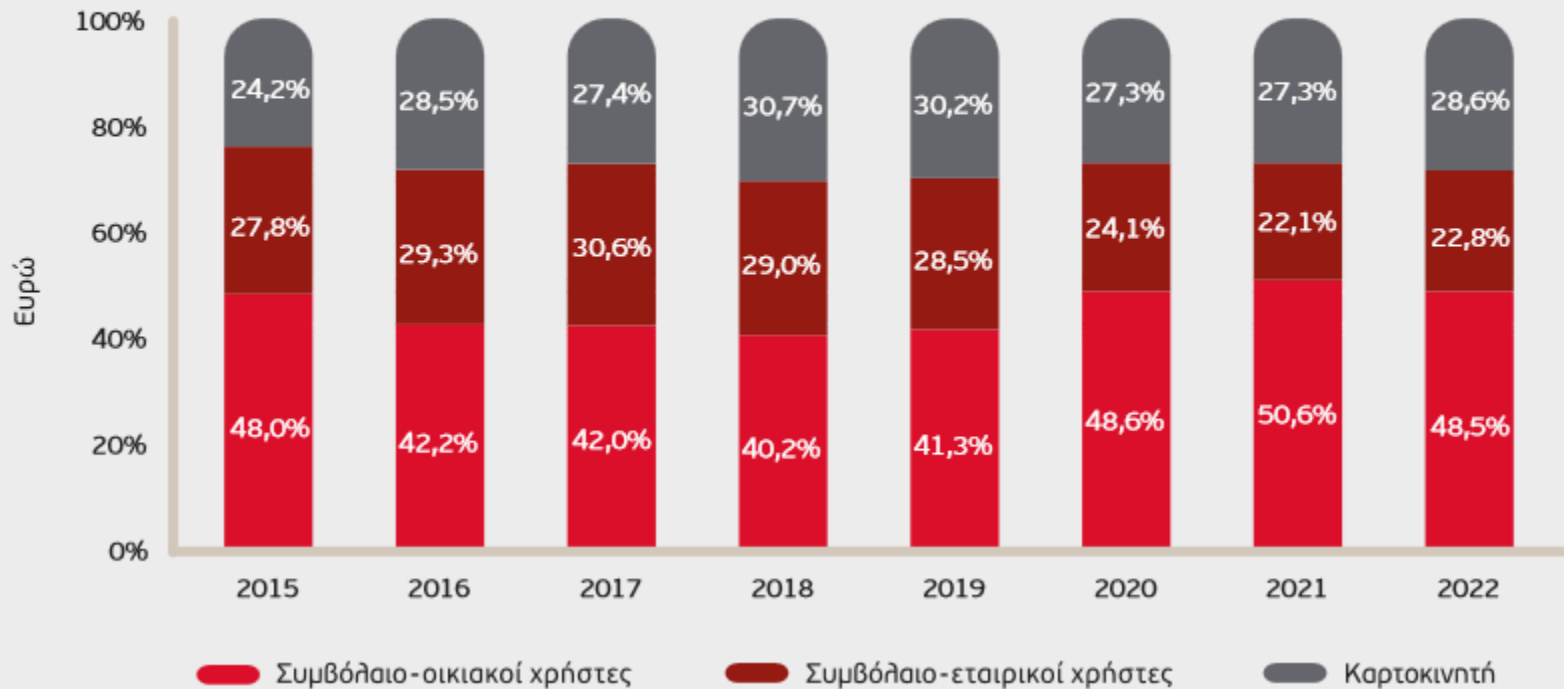
Διάγραμμα 1.45: Μέσο ετήσιο έσοδο ανά σύνδεση κινητής τηλεφωνίας



MOBILE TELEPHONY

THE GREEK RETAIL MARKET

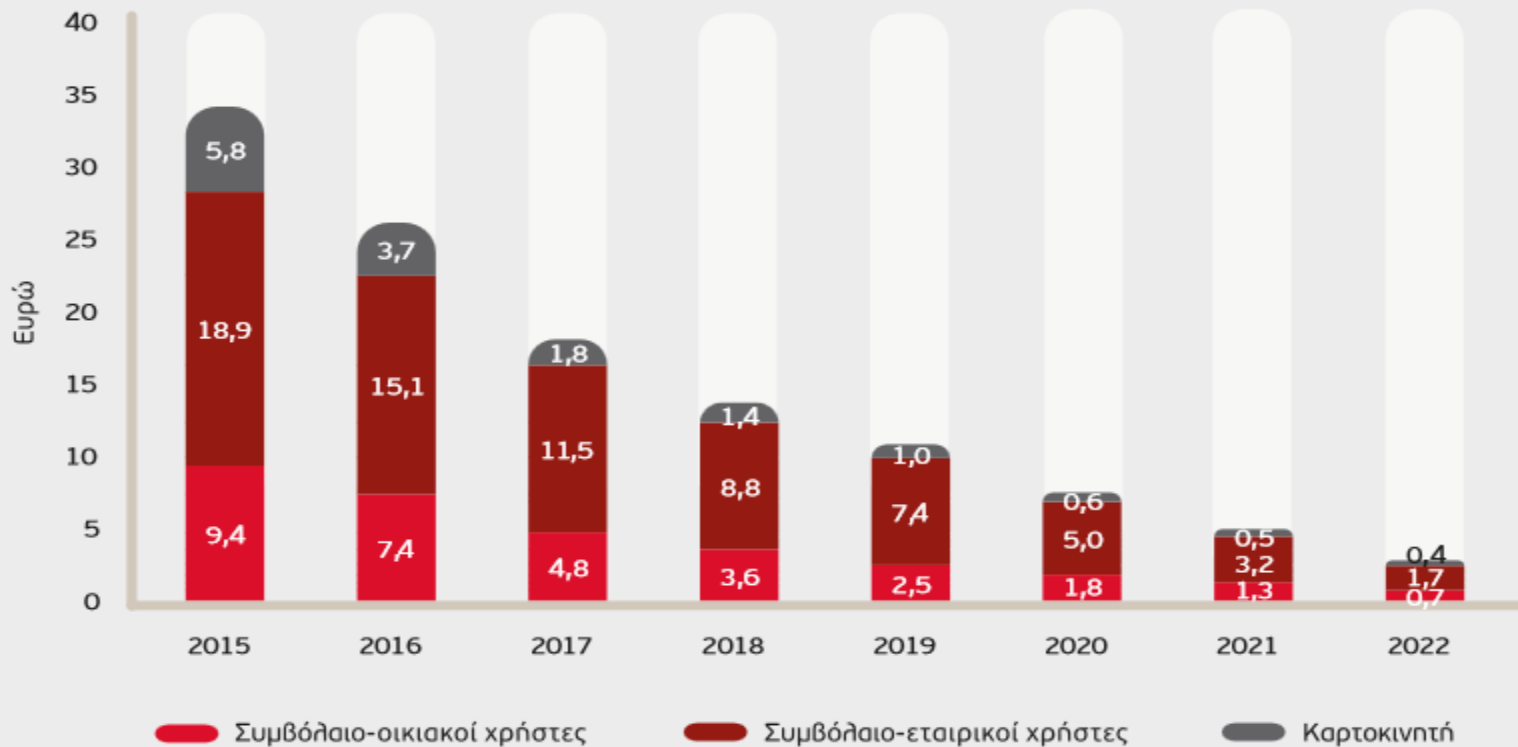
Διάγραμμα 1.46: Κατανομή ηλεκτρονικών εσόδων από τη χρήση δεδομένων ανά κατηγορία χρήστη



MOBILE TELEPHONY

THE GREEK RETAIL MARKET

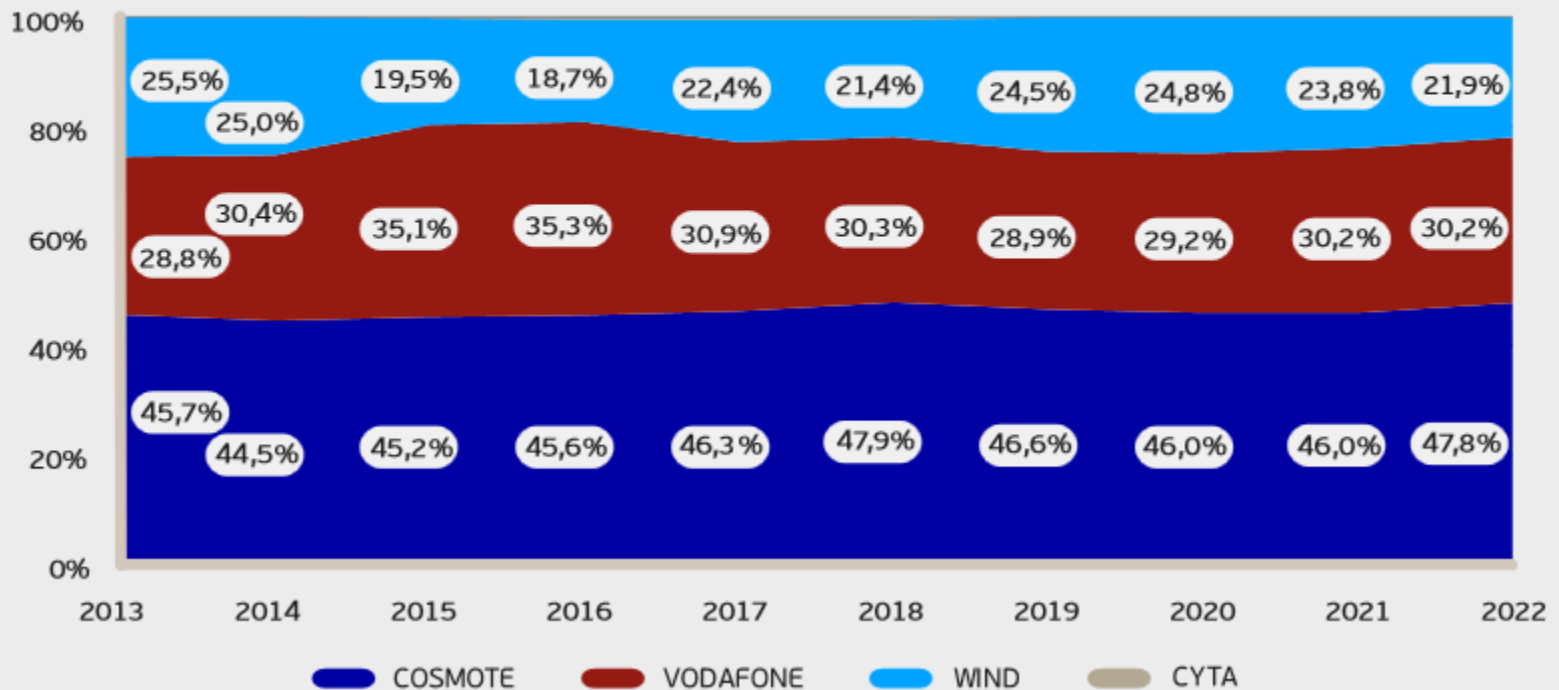
Διάγραμμα 1.47: Μέσο έσοδο ανά GB ανά κατηγορία χρήστη



MOBILE TELEPHONY

THE GREEK RETAIL MARKET

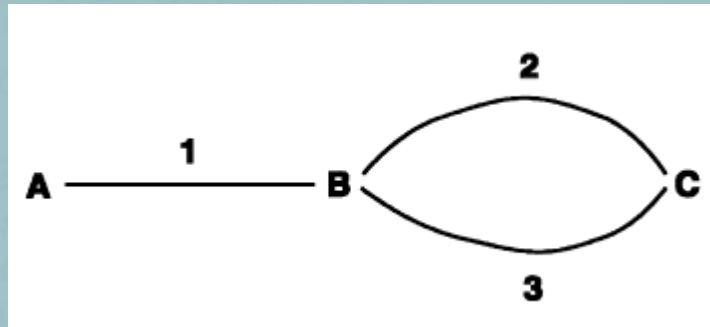
Διάγραμμα 1.32: Μερίδια ΕΚΤ ως προς τις εγγεγραμμένες συνδέσεις



ONE-WAY ACCESS NETWORKS

INTRODUCTION

- One firm owns a critical input for the production of the final product

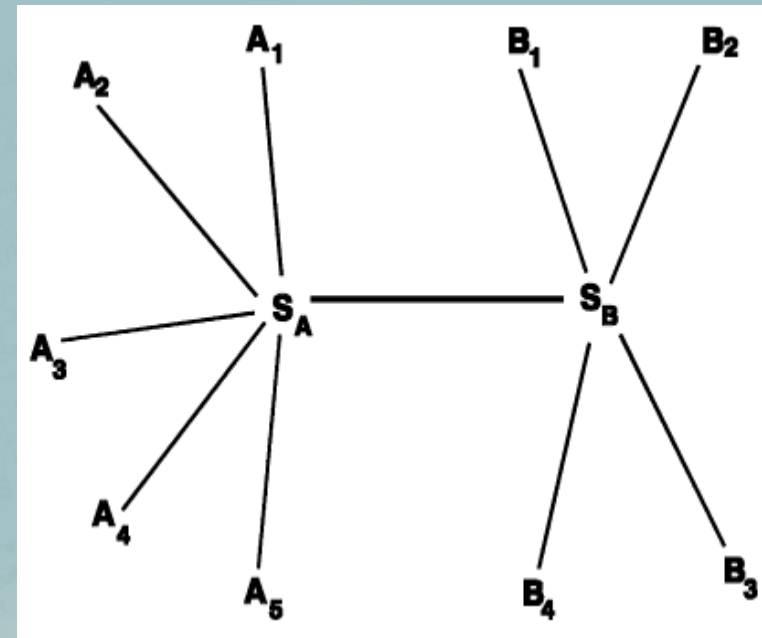


- Imagine that the access network is owned by firm 1
- Firms 2 and 3 sell the final services to consumers
- The provision of the final service is not possible without accessing the critical input
- Raise many regulatory and competition issues
- The problem exacerbates if firm 1 is vertically integrated

TWO-WAY ACCESS NETWORKS

INTRODUCTION

- Each firm owns its access network
- A gateway $S_A S_B$ connects two different switches S_A and S_B , which are the central nodes of two star networks
- “off-net” services
 - Services originated in one network and terminated in the other, thus they require the use of the gateway $S_A S_B$
 - Complementarity issues are raised
- “on-net” services
 - Services originated and terminated in the same network



TWO-WAY ACCESS NETWORKS

MOBILE TELEPHONY

- The mobile telephony market can be studied as a two-way access network industry
- In most cases, each operator has built its own network
- This means that firms are facilities-based competitors
- Operators have a mutual incentive to interconnect their networks in order to serve calls originated on their networks and terminated on competing networks
- Although each operator is a monopolist over its subscribers' access lines, it needs access to the other firms' networks in order to terminate its "off-net" calls
- Is there any need to regulate termination charges (or access prices or interconnection charges) ???

TWO-WAY ACCESS NETWORKS

THEORETIC APPROACHES

- The economic literature on two-way interconnection provides ambiguous results concerning the impact of negotiated termination charges on the competition outcome in an unregulated access market
- The seminal papers of this literature are those of Laffont, Rey & Tirole (RAND, 1998) and Armstrong (EconJ, 1998)
- They show that interconnection charges between two unregulated competing networks can be used to facilitate collusive outcomes
- Under linear retail tariffs, high interconnection charges reduce each network's incentives to lower retail price in order to increase market share

TWO-WAY ACCESS NETWORKS

THEORETIC APPROACHES

- The reason is that if either network decreases its retail price, its subscribers will make more calls which triggers a net outflow of calls
- With termination charges above marginal cost, the incentive to decrease retail prices is reduced and the retail competition is softened
- This implies that networks find it profitable to collude over the access charge in an unregulated market
- Does it mean that competition authorities and telecom regulators should intervene in the market?

TWO-WAY ACCESS NETWORKS

THEORETIC APPROACHES

- The benchmark model of LRT-A is based on many assumptions
 1. Network operators set linear retail prices
 2. There are two symmetric unregulated networks which compete in a standard Hotelling framework (hence, full consumer participation is also assumed)
 3. The termination charges are uniform (i.e., per-minute and usage-based) and reciprocal (i.e., symmetric networks charge as much for terminating a call originated on the rival network as they pay for terminating a call on the rival network)
 4. The demand for calls is homogeneous (i.e., all consumers have the same demand for calls)

TWO-WAY ACCESS NETWORKS

THEORETIC APPROACHES

- The benchmark model of LRT-A is based on many assumptions
 5. The retail pricing is non-discriminatory (i.e., network operators charge their subscribers the same retail price either if a call originated on a network will be terminated on the same network ("on-net call") or on a competing network ("off-net call"),
 6. Only callers receive utility from a call (caller-pays principle)
 7. There is a balanced calling pattern (i.e., the percentage of on-net calls is equal to the fraction of consumers subscribing to this network, which implies that for equal marginal prices, flows in and out of a network are balanced even if market shares are not)

TWO-WAY ACCESS NETWORKS

LITERATURE REVIEW

Tselekounis, M., & Varoutas, D. "Two-way interconnection, competition and investment incentives: A survey of the economic literature", 11th Conference of Telecommunication, Media and Internet Techno-Economics (CTTE), June 2012, Athens, Greece

TWO-WAY ACCESS NETWORKS

LITERATURE REVIEW

TABLE I. CLASSIFICATION OF THE REVIEWD PAPERS ACCORDING TO THEIR UNDERLYING ASSUMPTIONS

		SYMMETRIC OPERATORS (MATURE MARKET)		ASYMMETRIC OPERATORS (EARLY STAGES OF DEREGULATION PROCESS)	
		LINEAR TARIFFS	TWO-PART TARIFFS	LINEAR TARIFFS	TWO-PART TARIFFS
BENCHMARK ASSUMPTIONS (iii)-(vii)		[1], [2], [33], [34], [35]	[1], [35], [37]	[5]	[6], [7], [35], [37], [39]
TERMINATION-BASED DISCRIMINATION	ONLY CALLERS PAY	[15]	[14], [15], [16], [17]		[18], [19], [38]
	CALLERS&RECEIVERS DERIVE UTILITY BUT ONLY CALLERS PAY	[20]	[21]	[22]	[22]
	BOTH DERIVE UTILITY-BOTH PAY	[23], [24], [25], [26], [30]	[23], [24], [25], [26], [27], [30]		[28]
CONSUMER HETEROGENEITY			[8], [9], [10], [11], [12], [35]		[13]
NETWORK EXTERNALITIES (PARTIAL PARTICIPATION)			[8], [31], [32]		

TWO-WAY ACCESS NETWORKS

LITERATURE REVIEW - CONCLUSIONS

- Conclusions
 - The collusive outcome seems to be robust in asymmetric markets, as well as, under call externalities
 - In many cases, the collusive outcome can be achieved even with two-part tariffs
 - The detrimental effect of a collusive outcome on competition can be exacerbated when asymmetries in the market call for non-reciprocal access prices
 - There are only few papers proposing different **regulatory** settings that prevent network operators from using the termination charges as an effective tool for collusion
 - Network operators can also agree on termination charges above marginal cost in order to soften competition over *investments*
 - This collusive behaviour makes operators to under-invest which leads to both static and dynamic inefficiencies
 - The relationship between access regulation, competition and investment incentives has been investigated in very few ways

REGULATORY INTERVENTION

MOBILE TERMINATION RATES (MTR)

- Each network operator has an SMP position (i.e., a monopoly) for termination on its own network
- Collusion and exclusion are always a possibility
- Regulators intervene in the market of wholesale voice call termination on individual mobile networks by setting the termination rates
- The regulation of MTRs along with the structure of mobile telephony market (e.g., facilities-based competition) has led to high penetration rates and significant investment in new technologies (e.g., LTE)
- MTRs significantly affects the pricing and offering strategies of the operators

REGULATORY INTERVENTION

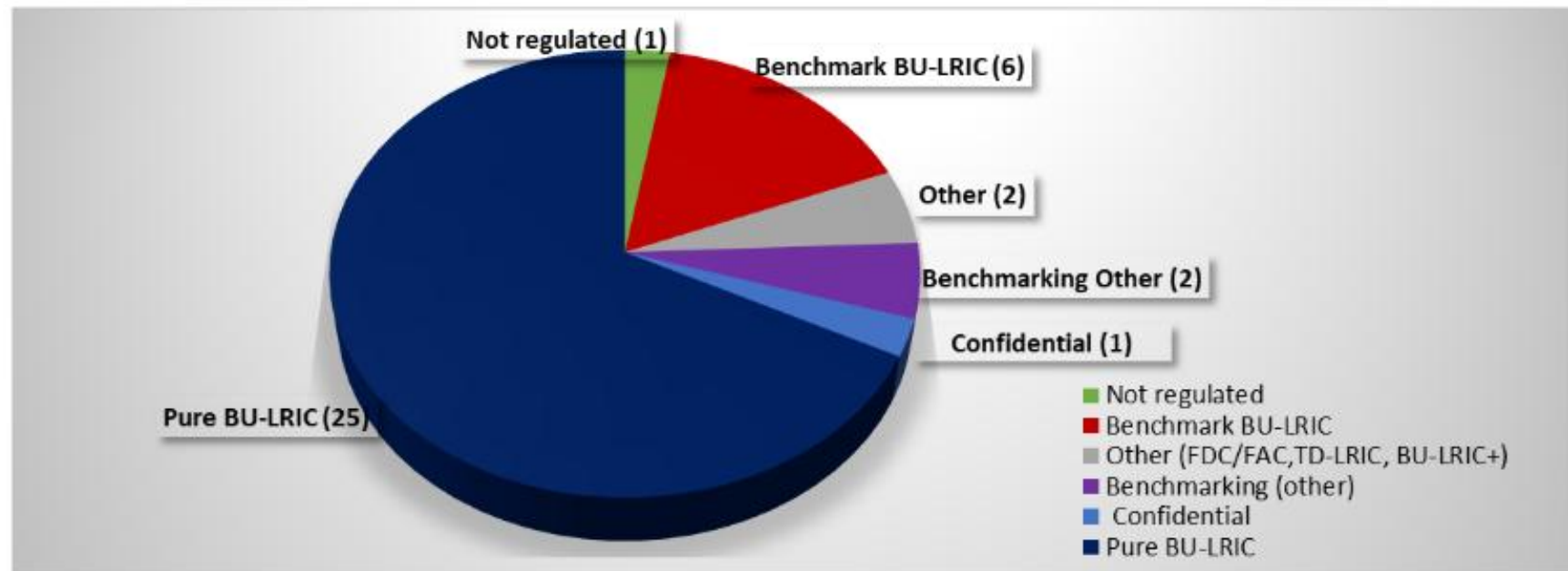
MOBILE TERMINATION RATES (MTR)

- EC recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (07/05/2009)
- The costs of termination services should be calculated on the basis of forward-looking long-run incremental costs (LRIC)
- LRIC models include only those “avoidable” costs which are caused by the provision of a defined increment (would not be sustained if the service was no longer produced)
- It is justified to apply a pure LRIC approach
 - Includes only avoidable costs, where the relevant increment is the wholesale call termination service
 - Allows the recovery of all fixed and variable costs (as the fixed costs are assumed to become variable over the long run)
 - Excludes joint and common costs

REGULATORY INTERVENTION

REGULATORY MODEL – MTR CALCULATION

Figure 18 Cost accounting models used by NRAs



Source: NRAs, BEREC

REGULATORY INTERVENTION

REGULATORY MODEL – MTR CALCULATION

Annex 8 Regulatory models implemented to calculate MTRs

Table 8

Jul-21	COST ACCOUNTING MODEL			Period 1 to 5 is not applicable (NA ¹⁷) for EU countries				
	Model	Rate status	When a tariff adopted by a final decision and meeting the standards of the TR Recommendation has been or will be firstly applied?	Period 1 - From 01/07/2021 until 31/12/2021	Period 2 - From 01/01/2022 until 30/06/2022	Period 3 - From 01/07/2022 until 31/12/2022	Period 4 - From 01/01/2023 until 30/06/2023	Period 5 - From 01/07/2023 until 31/12/2023
AL	Benchmark BU-LRIC	adopted	16.06.2020	0.9026	0.9026	0.9026	0.9026	0.9026
AT	Pure BU-LRIC	adopted		NA	NA	NA	NA	NA
BE	Pure BU-LRIC	adopted	01.01.2013	NA	NA	NA	NA	NA
BG	Pure BU-LRIC	adopted	01.12.2016	NA	NA	NA	NA	NA
CH		not regulated	not applicable					
CY	Pure BU-LRIC	adopted	01.01.2018	NA	NA	NA	NA	NA
CZ	Pure BU-LRIC	adopted	01.07.2013	NA	NA	NA	NA	NA
DE	Pure BU-LRIC	adopted	01.01.2020	NA	NA	NA	NA	NA
DK	Pure BU-LRIC	adopted		NA	NA	NA	NA	NA
EE	Benchmark BU-LRIC	adopted	18.12.2020	NA	NA	NA	NA	NA
EL	Pure BU-LRIC	adopted	01.01.2013	NA	NA	NA	NA	NA
ES	Pure BU-LRIC	adopted	05.10.2012	0.6400	0.5500	0.5500	0.4000	0.4000
FI	Other (FDC/FAC)	adopted		NA	NA	NA	NA	NA
FR	Pure BU-LRIC	adopted	01.01.2013	NA	NA	NA	NA	NA
HR	Pure BU-LRIC	adopted	01.01.2015	0.5977	NA	NA	NA	NA
HU	Pure BU-LRIC	adopted	01.07.2021	0.4823	0.4700	0.4700	0.4000	0.4000
IE	Pure BU-LRIC	adopted	01.09.2016	NA	NA	NA	NA	NA
IS	Benchmark BU-LRIC	adopted		0.6778	0.4966	0.4966	NA	NA

REGULATORY INTERVENTION

REGULATORY MODEL – MTR CALCULATION

Jul-21	COST ACCOUNTING MODEL			Period 1 to 5 is not applicable (NA ¹⁷) for EU countries				
	Model	Rate status	When a tariff adopted by a final decision and meeting the standards of the TR Recommendation has been or will be firstly applied?	Period 1 - From 01/07/2021 until 31/12/2021	Period 2 - From 01/01/2022 until 30/06/2022	Period 3 - From 01/07/2022 until 31/12/2022	Period 4 - From 01/01/2023 until 30/06/2023	Period 5 - From 01/07/2023 until 31/12/2023
IT	Pure BU-LRIC	adopted	01.07.2013	0.6700	NA	NA	NA	NA
LI	Benchmark (BU-LRIC)	adopted	01.01.2021	0.7014				
LT	Benchmark (BU-LRIC)	adopted	01.04.2016	NA	NA	NA	NA	NA
LU	Pure BU-LRIC	adopted	18.01.2021	NA	NA	NA	NA	NA
LV	Pure BU-LRIC	adopted	26.04.2017	0.8868				
ME	Other (TD-LRIC)	adopted		0.6200				
MK	Pure BU-LRIC	adopted	2010	1.0234	1.0234	1.0234		
MT	Pure BU-LRIC	adopted		NA	NA	NA	NA	NA
NL	Pure BU-LRIC	adopted	01.07.2017	0.5810	0.5810	0.5810	0.5810	0.5810
NO	Pure BU-LRIC	adopted	01.07.2015	0.3170				
PL	Pure BU-LRIC	adopted	01.07.2013	NA	NA	NA	NA	NA
PT	Pure BU-LRIC	adopted	31.12.2012	NA	NA	NA	NA	NA
RO	Benchmark BU-LRIC	adopted	01.04.2014	NA	NA	NA	NA	NA
RS	Benchmarking (other)			1.2163				
SE	Pure BU-LRIC	adopted	01.07.2013	0.1686	0.1686	0.1686	NA	NA
SI	Pure BU-LRIC	adopted	01.08.2020	NA	NA	NA	NA	NA
SK	Pure BU-LRIC	adopted	01.08.2019	NA	NA	NA	NA	NA
TR	Confidential							
XK*	Benchmarking (other)	adopted		0.9460	0.8460			

REGULATORY INTERVENTION

REGULATORY MODEL – MTR CALCULATION

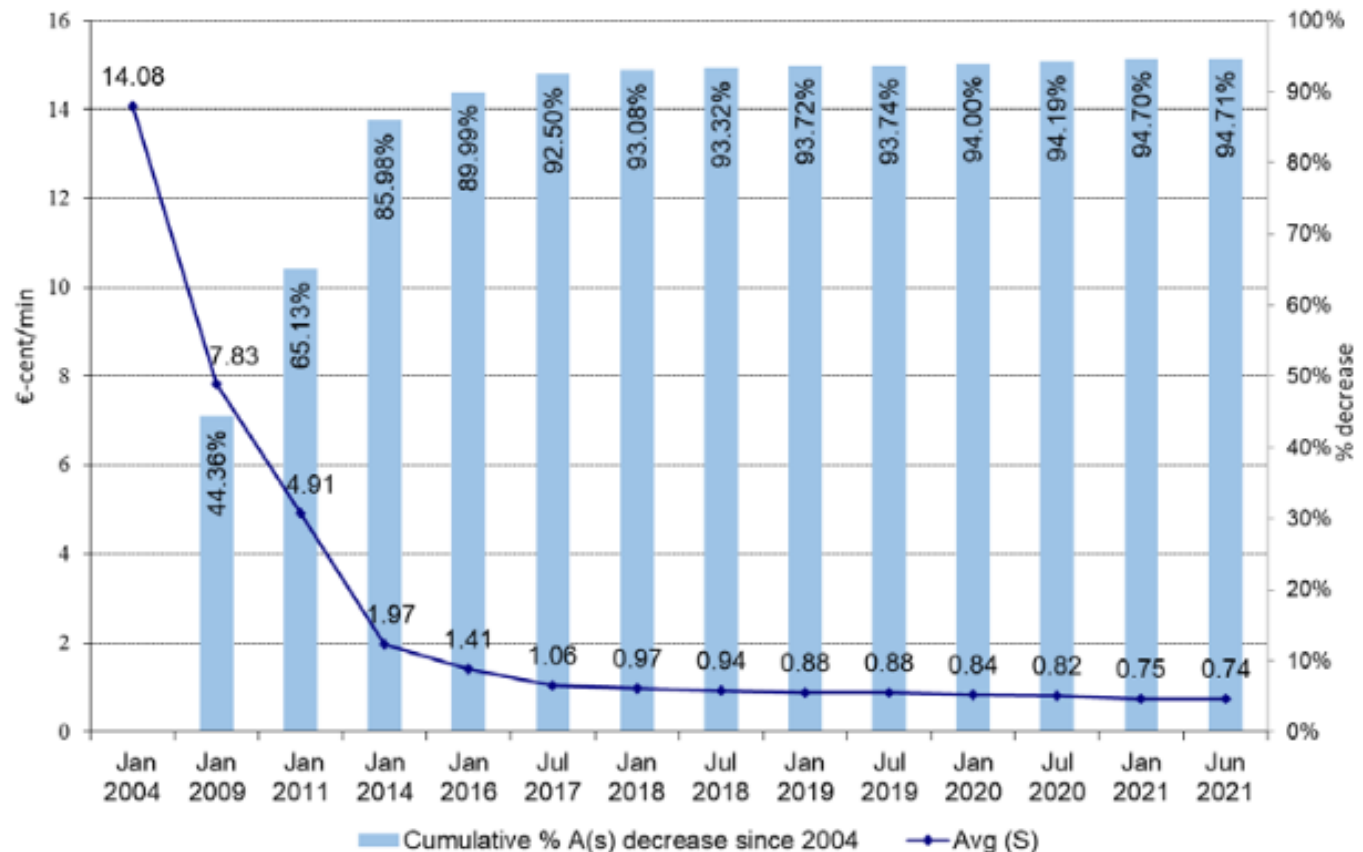
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AT	Austria
BE	Belgium
BG	Bulgaria
CH	Switzerland
CY	Cyprus
CZ	Czech Republic
DK	Denmark
DE	Germany
EE	Estonia
EL	Greece
ES	Spain
FI	Finland
FR	France
HR	Croatia
HU	Hungary
IE	Ireland
IS	Iceland
IT	Italy
LI	Liechtenstein
LT	Lithuania
LV	Latvia
LU	Luxembourg
ME	Montenegro
MK	The Republic of North Macedonia
MT	Malta
NL	Netherlands
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
RS	Serbia
SE	Sweden
SI	Slovenia
SK	Slovakia
TR	Turkey
XK*	Kosovo*

COUNTRY	1 EURO
AL	122,9773
BG	1,9558
CH	1,0978
CZ	25,6380
DK	7,4542
HR	7,5284
HU	354,5500
IS	149,0200
LI	1,0978
MK	61,5619
NO	10,0934
PL	4,5208
RO	4,9240
RS	117,5740
SE	10,1414
TR	10,1297

REGULATORY INTERVENTION

MTR IN EUROPE (JAN 2004 - JAN 2018)

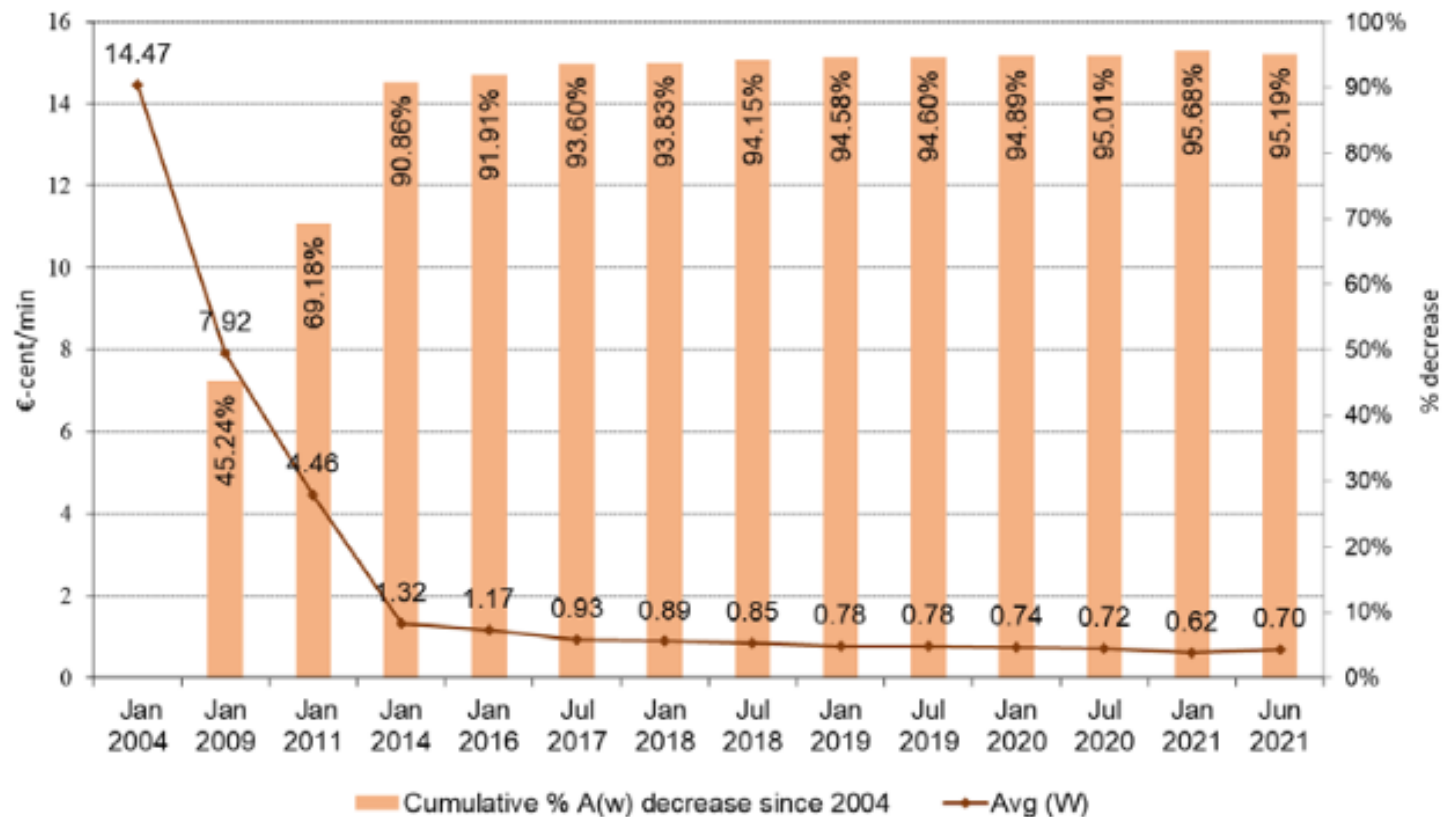
Figure 15 European MTRs simple average and cumulative decline



REGULATORY INTERVENTION

MTR IN EUROPE (JAN 2004 - JAN 2018)

Figure 16 European MTRs weighted average and cumulative decline

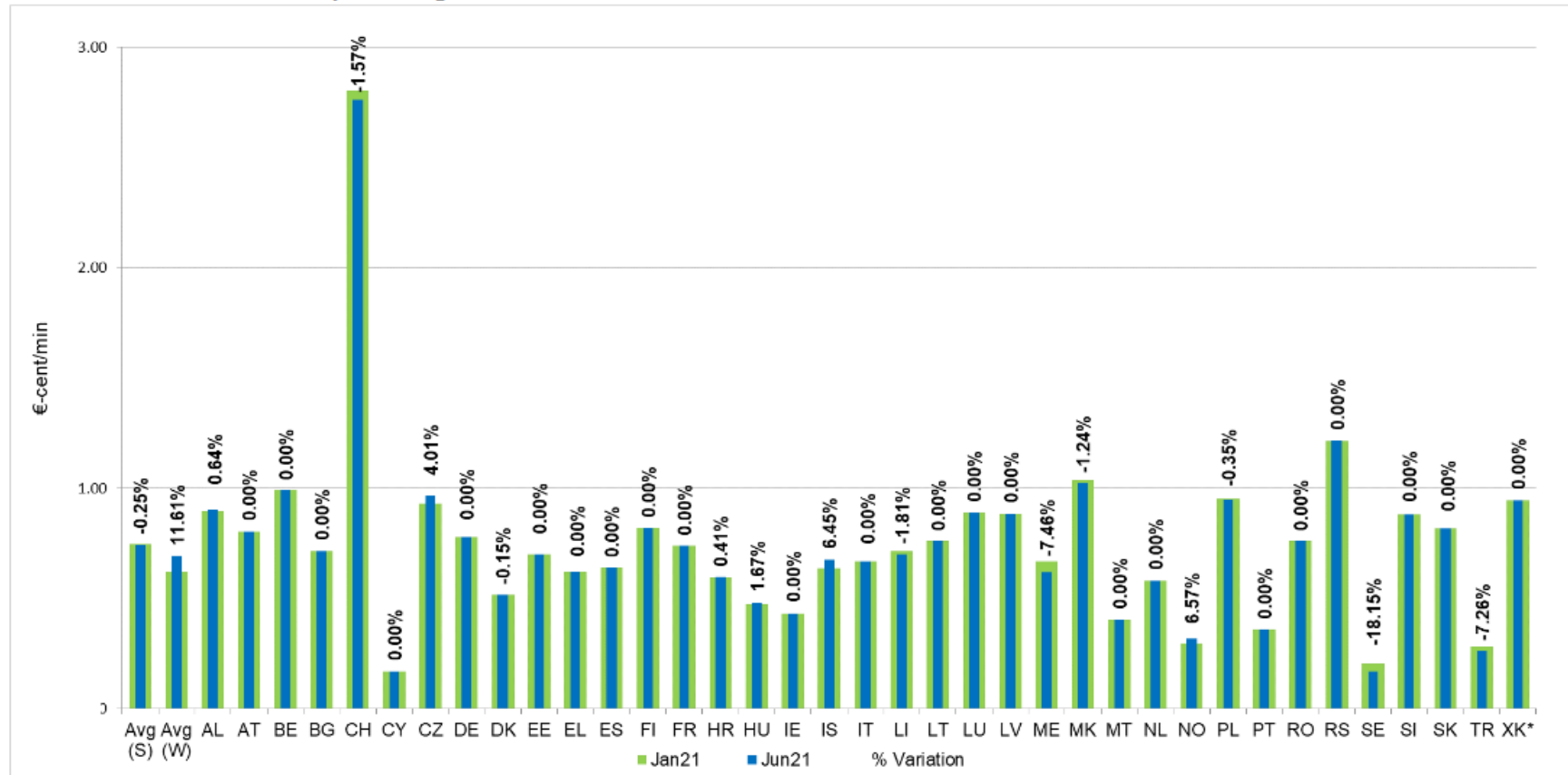


REGULATORY INTERVENTION

MTR IN EUROPE (JAN 2019)

Variation of MTRs per country (from January 2021 to 30 June 2021)

Figure 12 Variation in eurocents and percentages

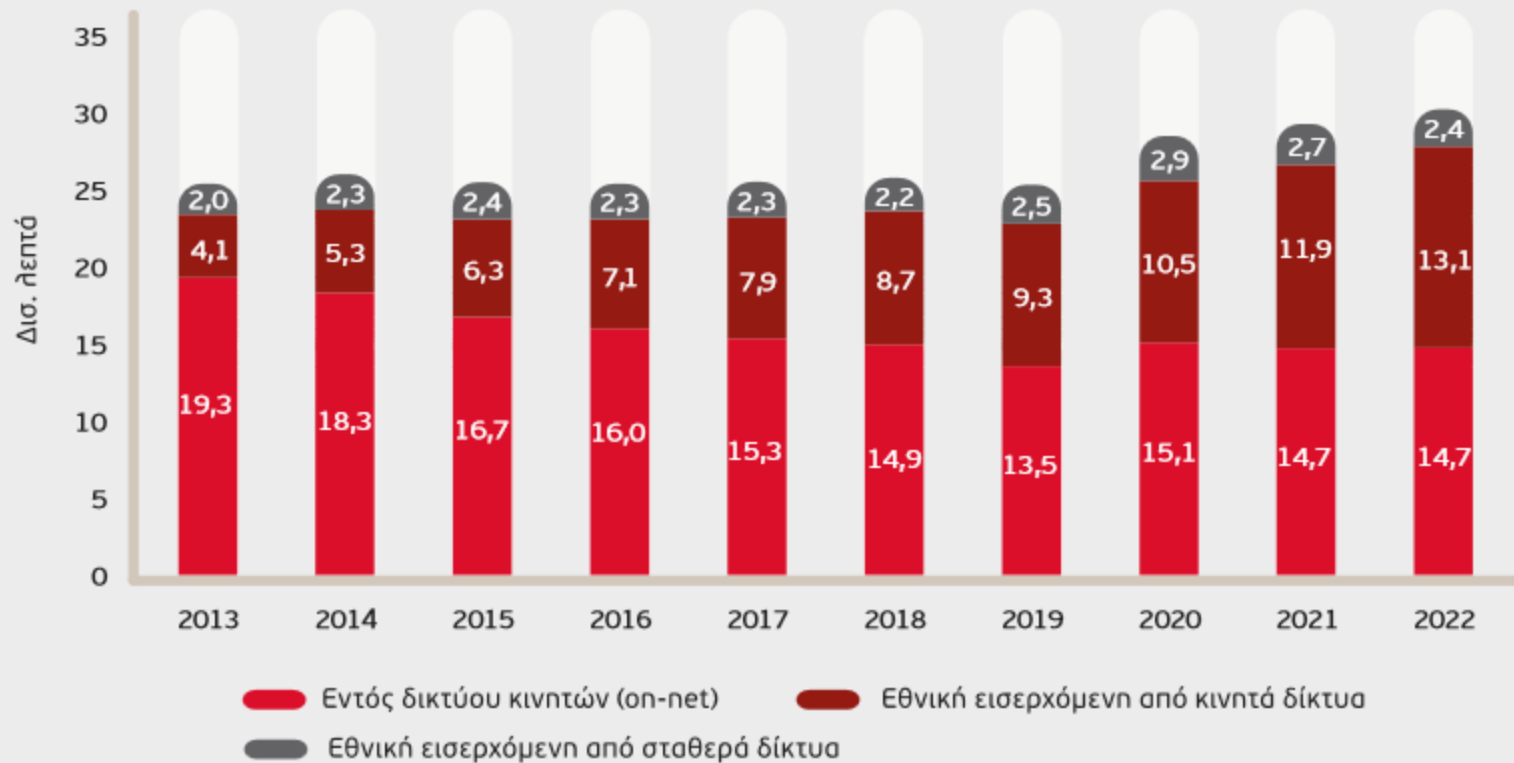


Source: NRAs, BEREC

REGULATORY INTERVENTION

MTRs IN GREECE

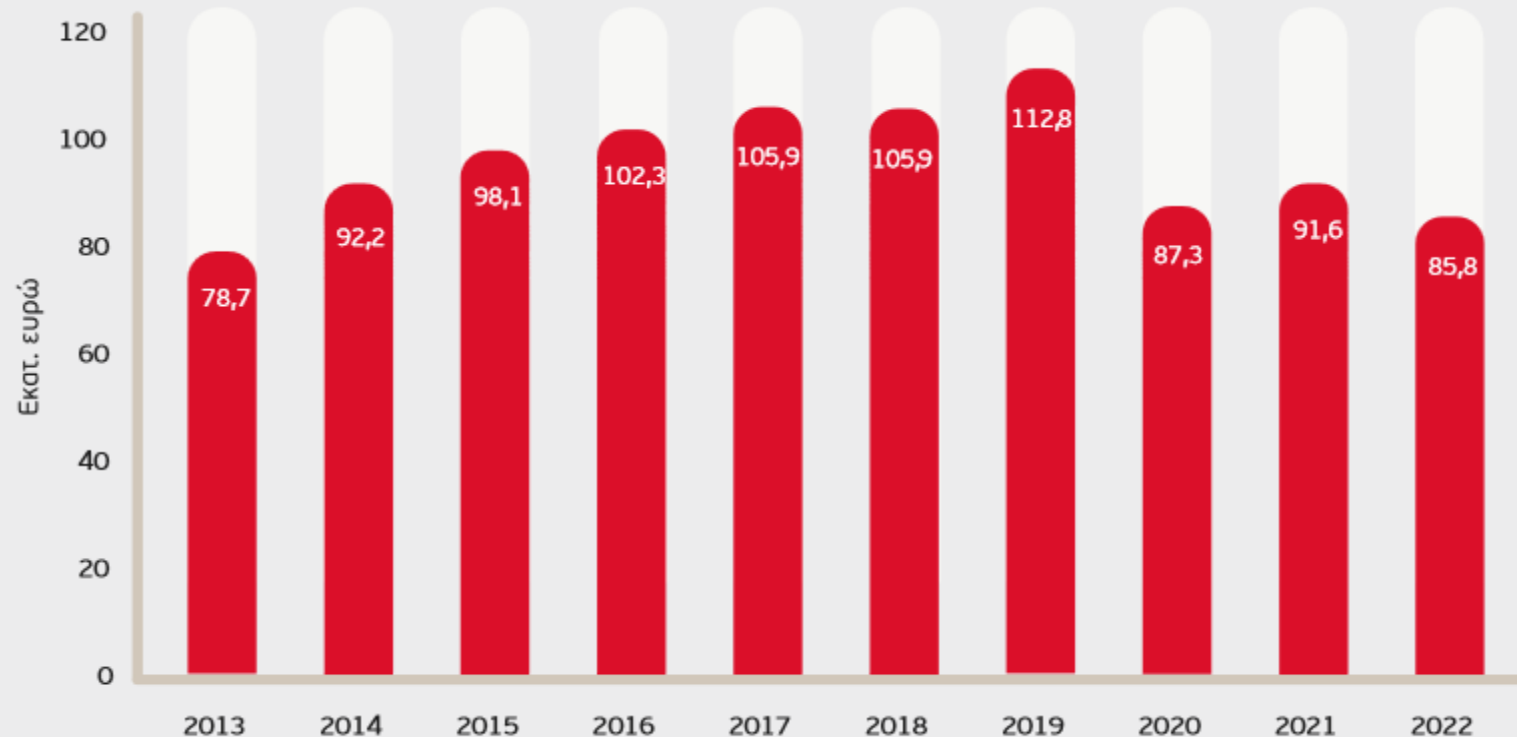
Διάγραμμα 1.50: Φωνητικές κλήσεις που τερματίζουν σε κινητά εντός Ελλάδας



REGULATORY INTERVENTION

MTRs IN GREECE

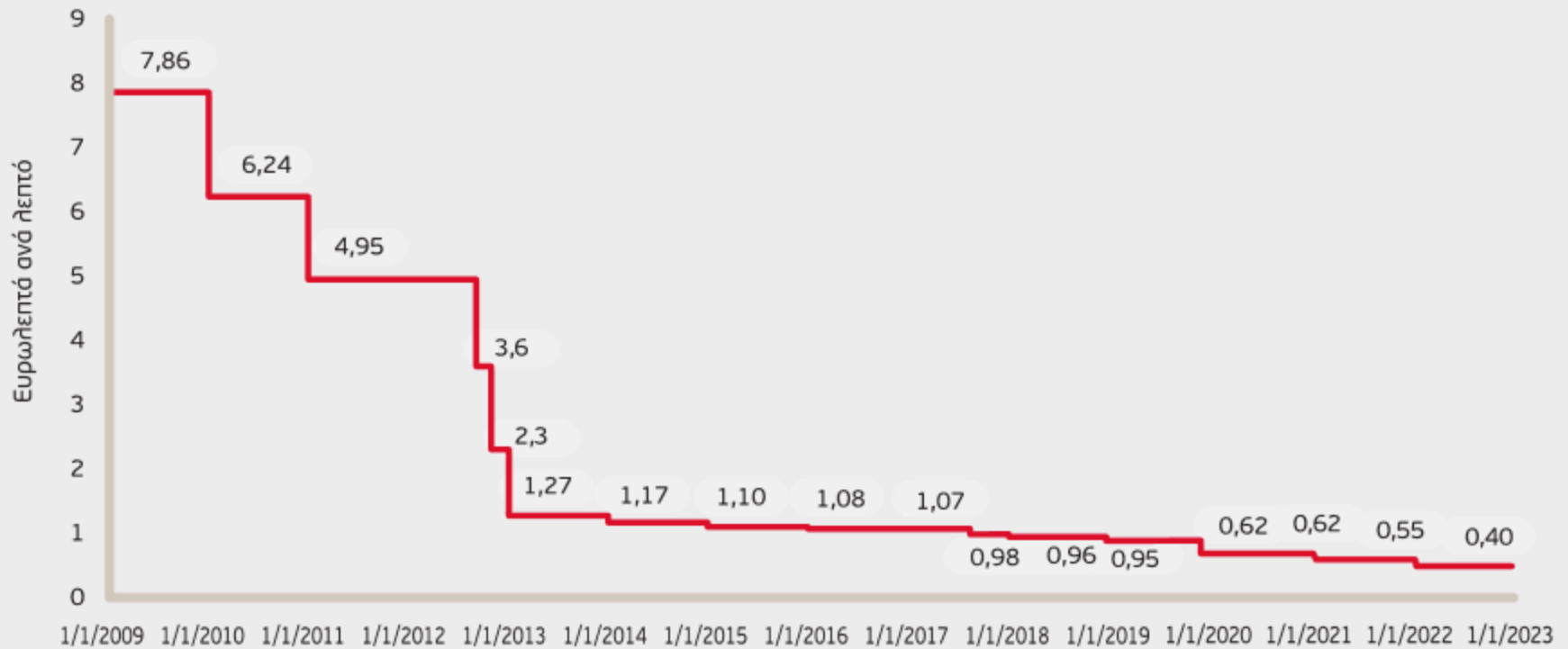
Διάγραμμα 1.51: Έσοδα από τερματισμό φωνητικών κλήσεων σε κινητά από σταθερά και κινητά εντός Ελλάδας



REGULATORY INTERVENTION

MTRs IN GREECE

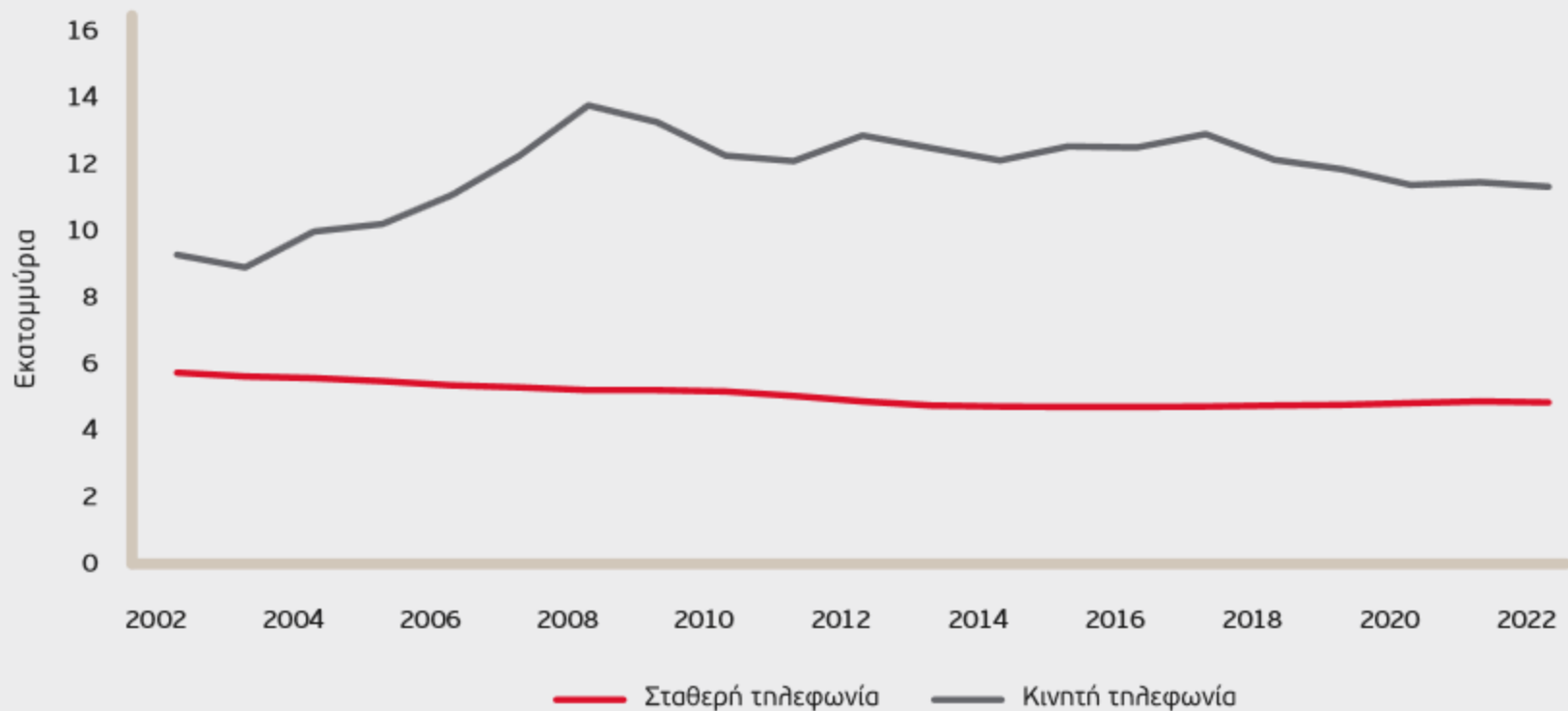
Διάγραμμα 1.52: Εξέλιξη τελών τερματισμού σε δίκτυα κινητής τηλεφωνίας



MOBILE TELEPHONY

FIXED VS MOBILE – THE CASE OF GREECE

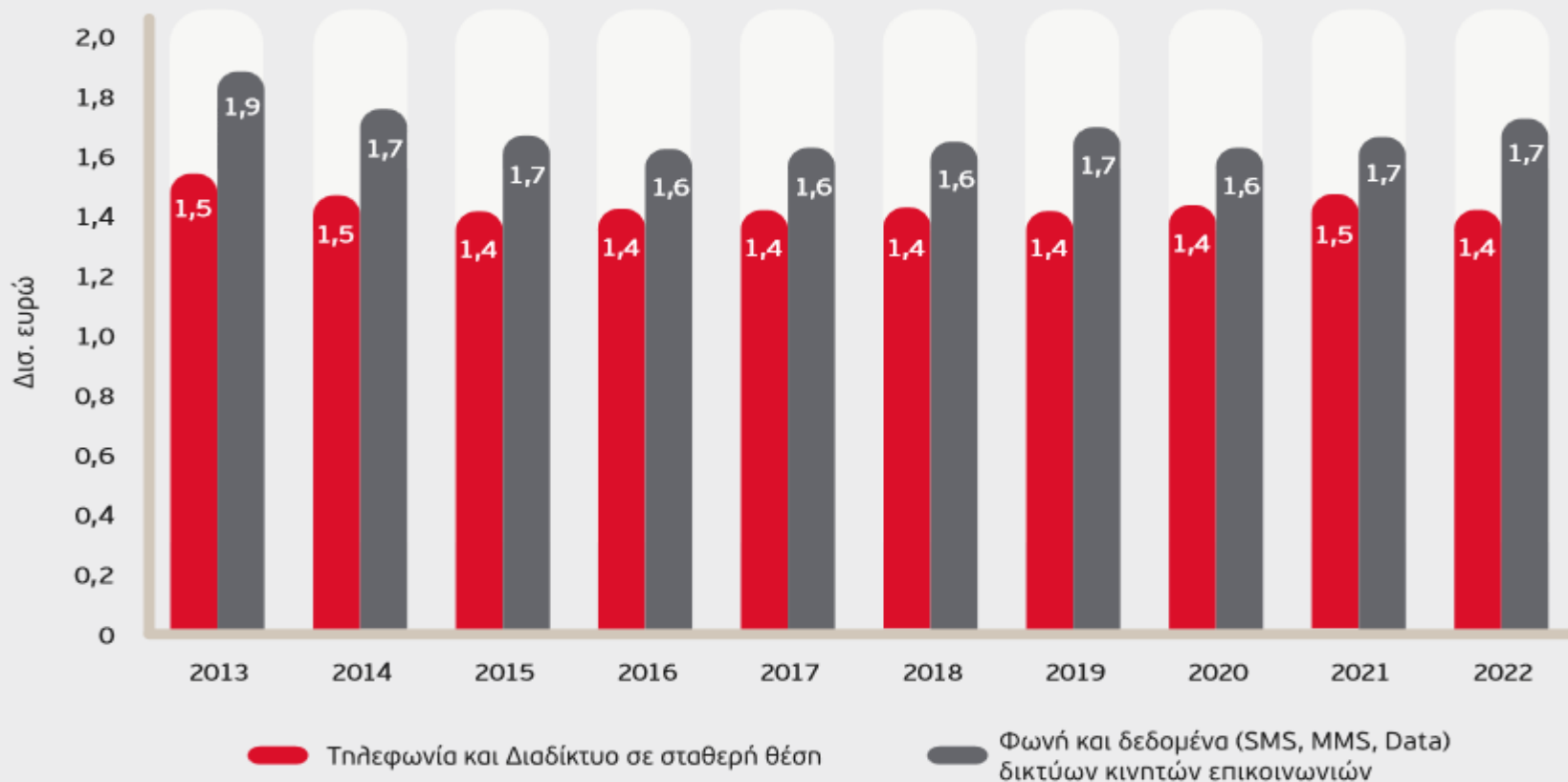
Διόγραμμα 1.54: Εξέλιξη συνδέσεων σταθερής και κινητής τηλεφωνίας



MOBILE TELEPHONY

FIXED VS MOBILE – THE CASE OF GREECE

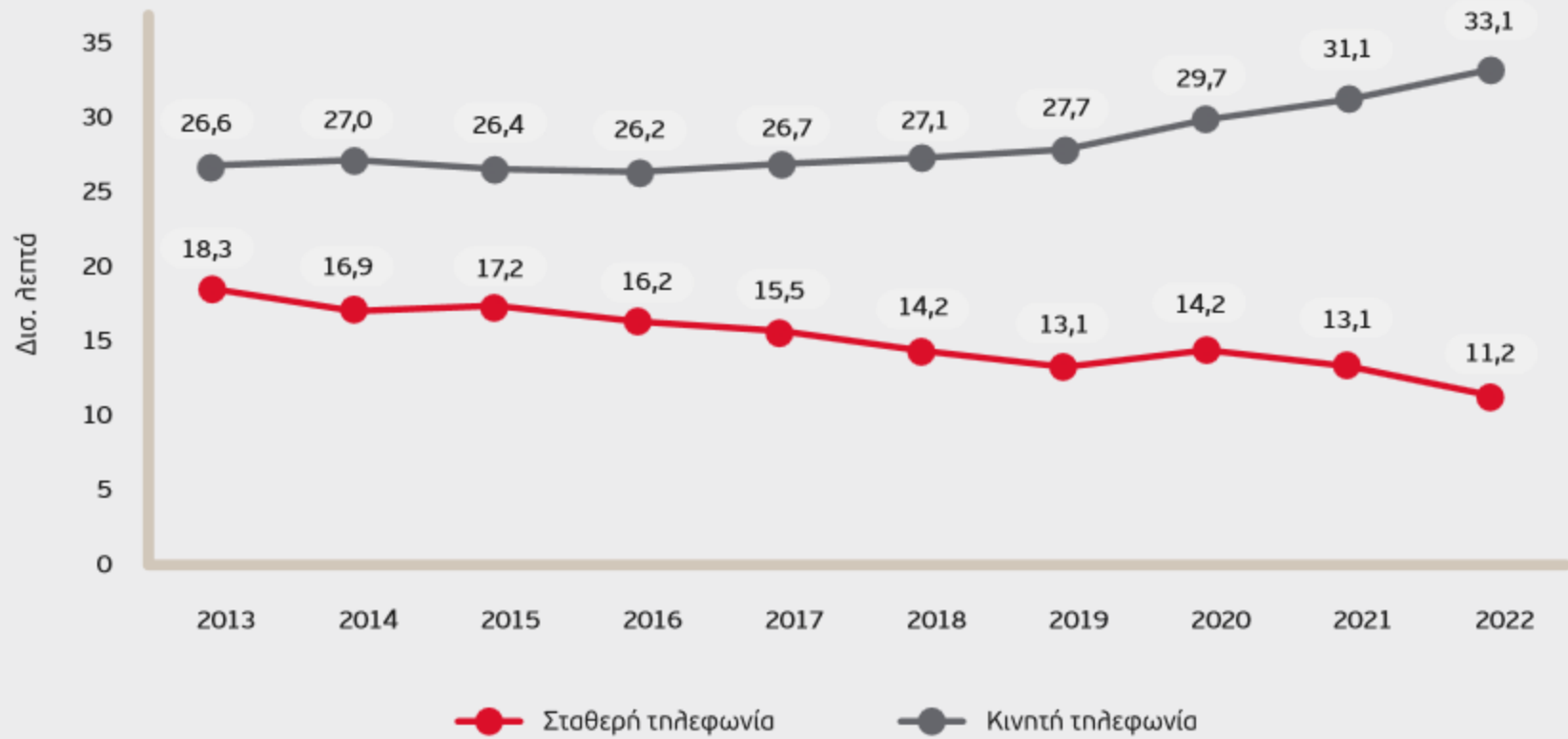
Διάγραμμα 1.55: Εξέλιξη λιανικών εσόδων



MOBILE TELEPHONY

FIXED VS MOBILE – THE CASE OF GREECE

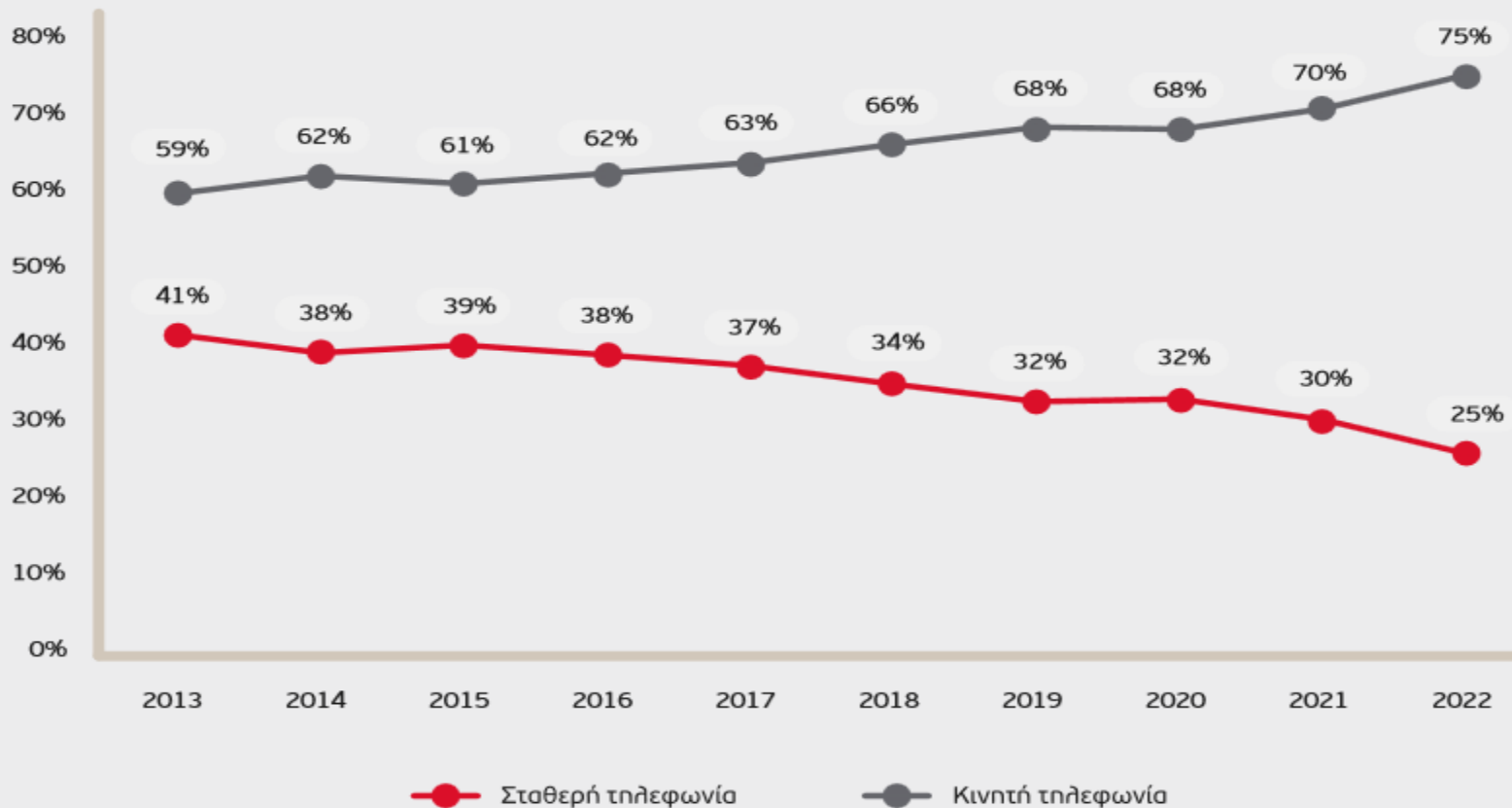
Διάγραμμα 1.56: Όγκος των βασικών τύπων κλήσεων από σταθερό και κινητό τηλέφωνο



MOBILE TELEPHONY

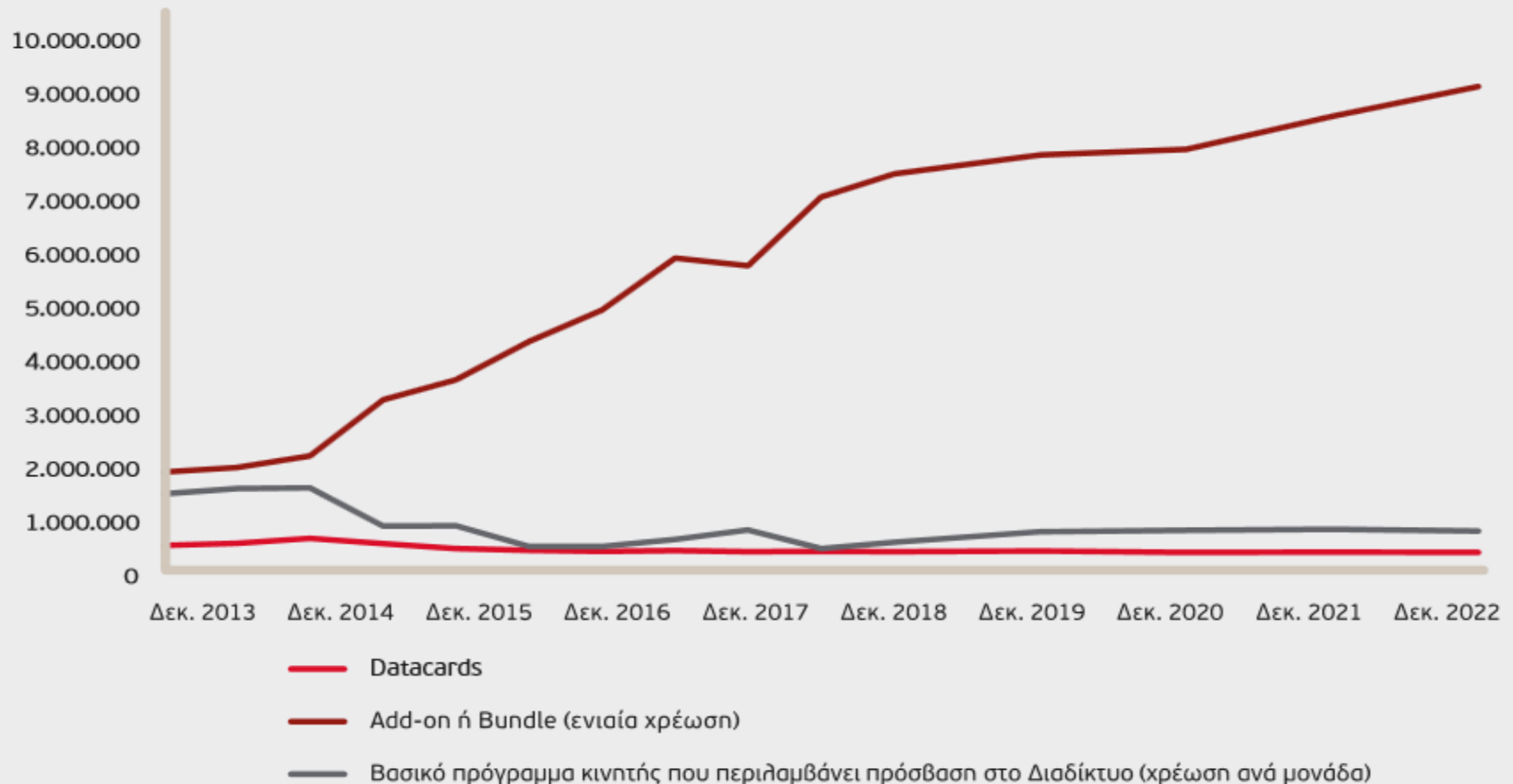
FIXED VS MOBILE – THE CASE OF GREECE

Διάγραμμα 1.57: Μερίδια σταθερής και κινητής τηλεφωνίας (βάσει του εξερχόμενου όγκου των βασικών τύπων κλήσεων)



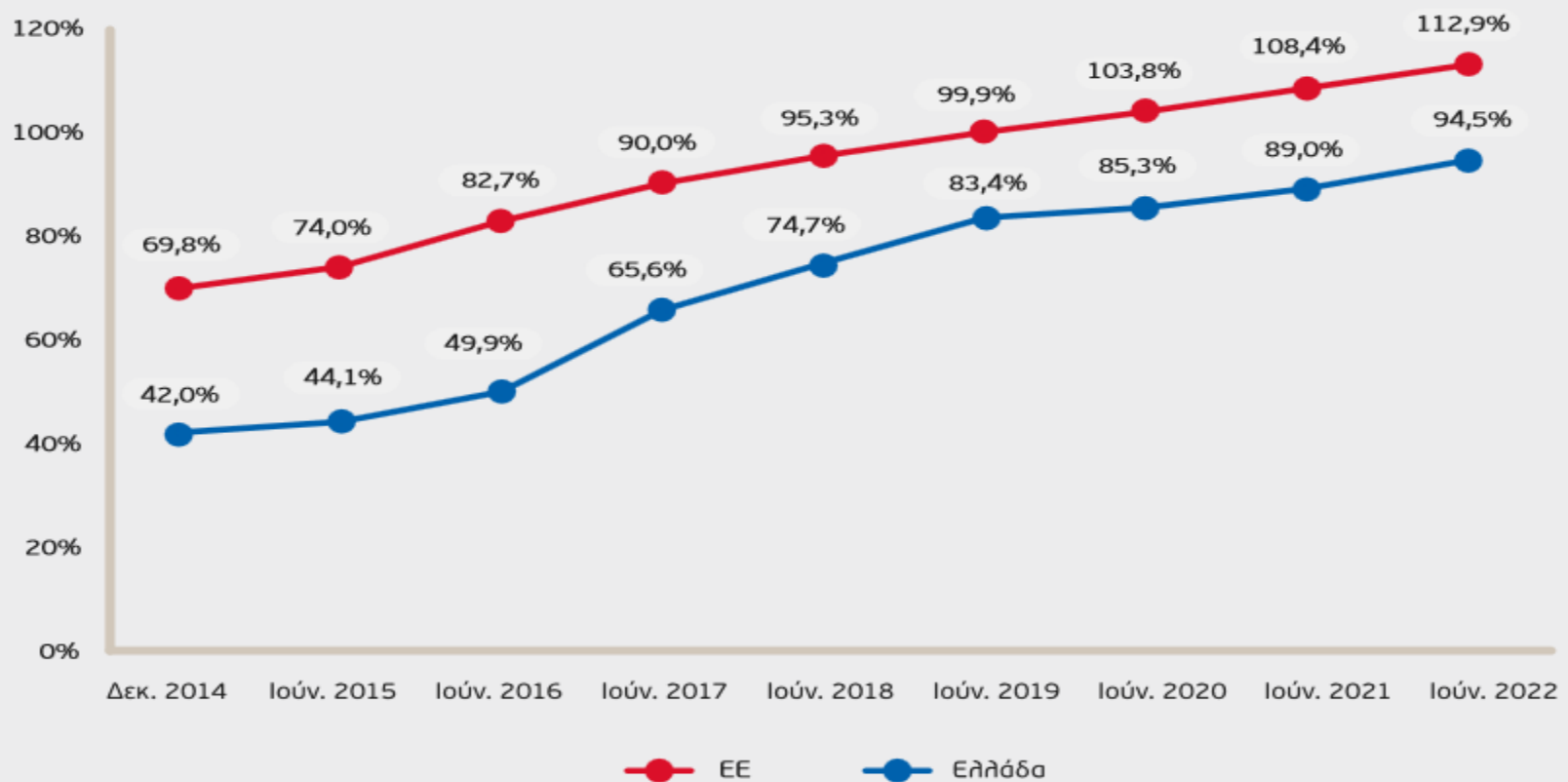
MOBILE BROADBAND PENETRATION IN GREECE

Διάγραμμα 1.69: Εξέλιξη συνδέσεων κινητής με χρήση Διαδικτύου



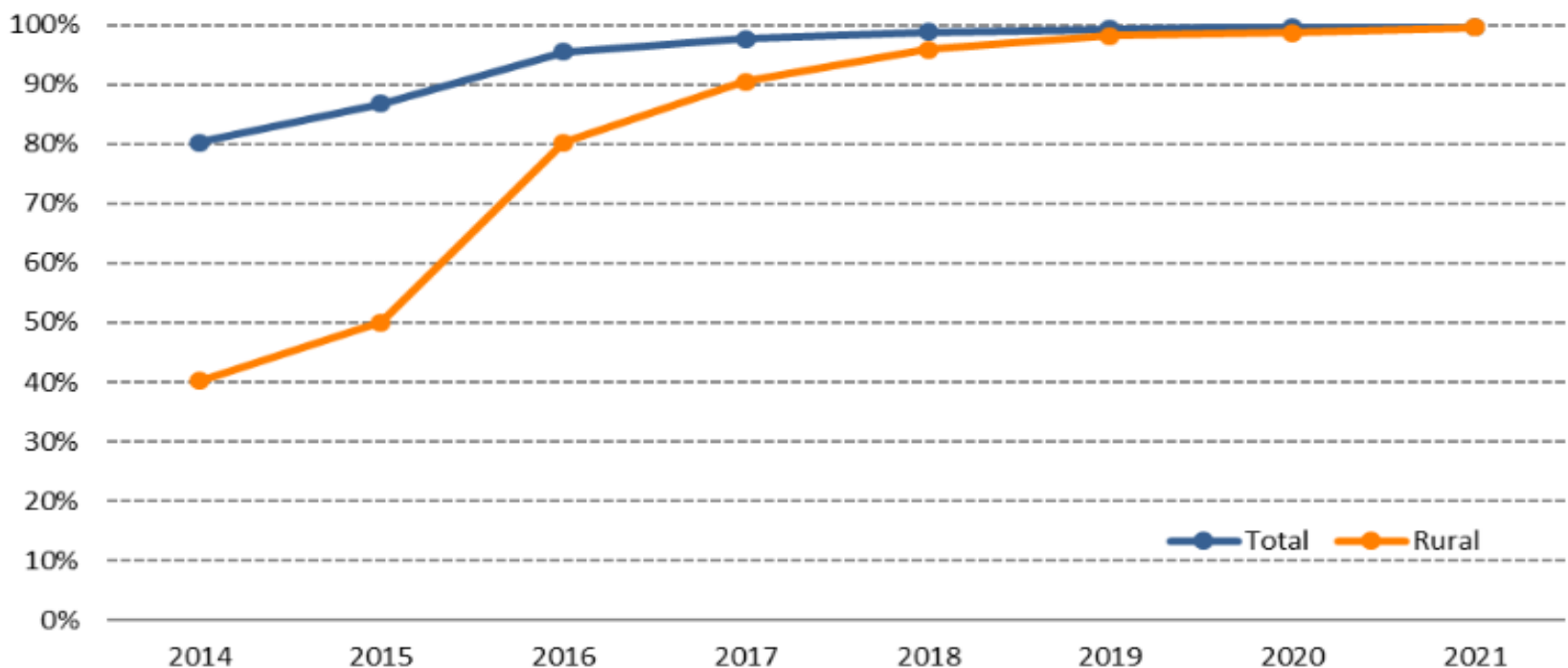
MOBILE BROADBAND GREECE VS EU

Διάγραμμα 1.124: Εξέλιξη της κινητής ευρυζωνικής διείσδυσης σε Ελλάδα και ΕΕ
(συνδέσεις ανά 100 κατοίκους)



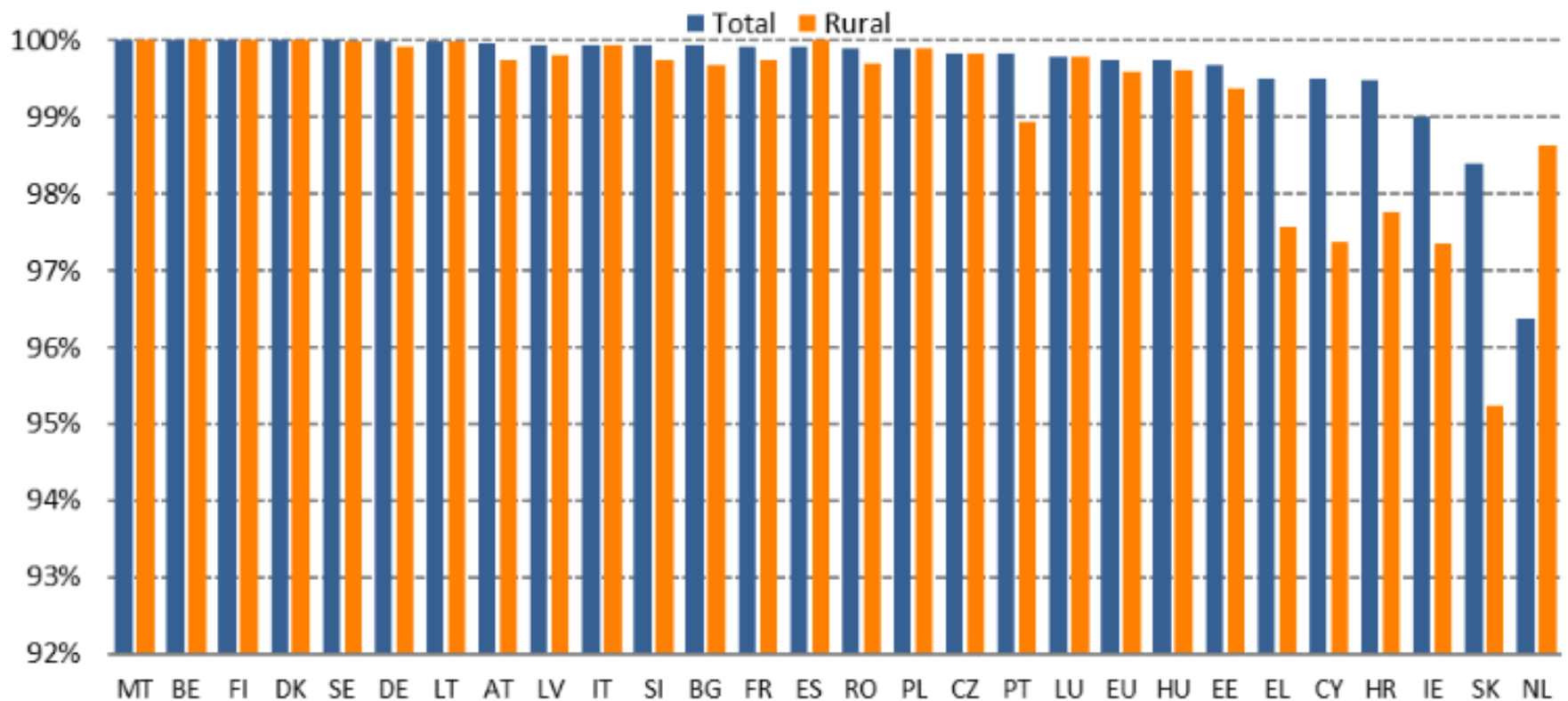
MOBILE BROADBAND 4G COVERAGE IN EUROPE

Figure 23 4G mobile coverage in the EU (% of populated areas), 2014-2021



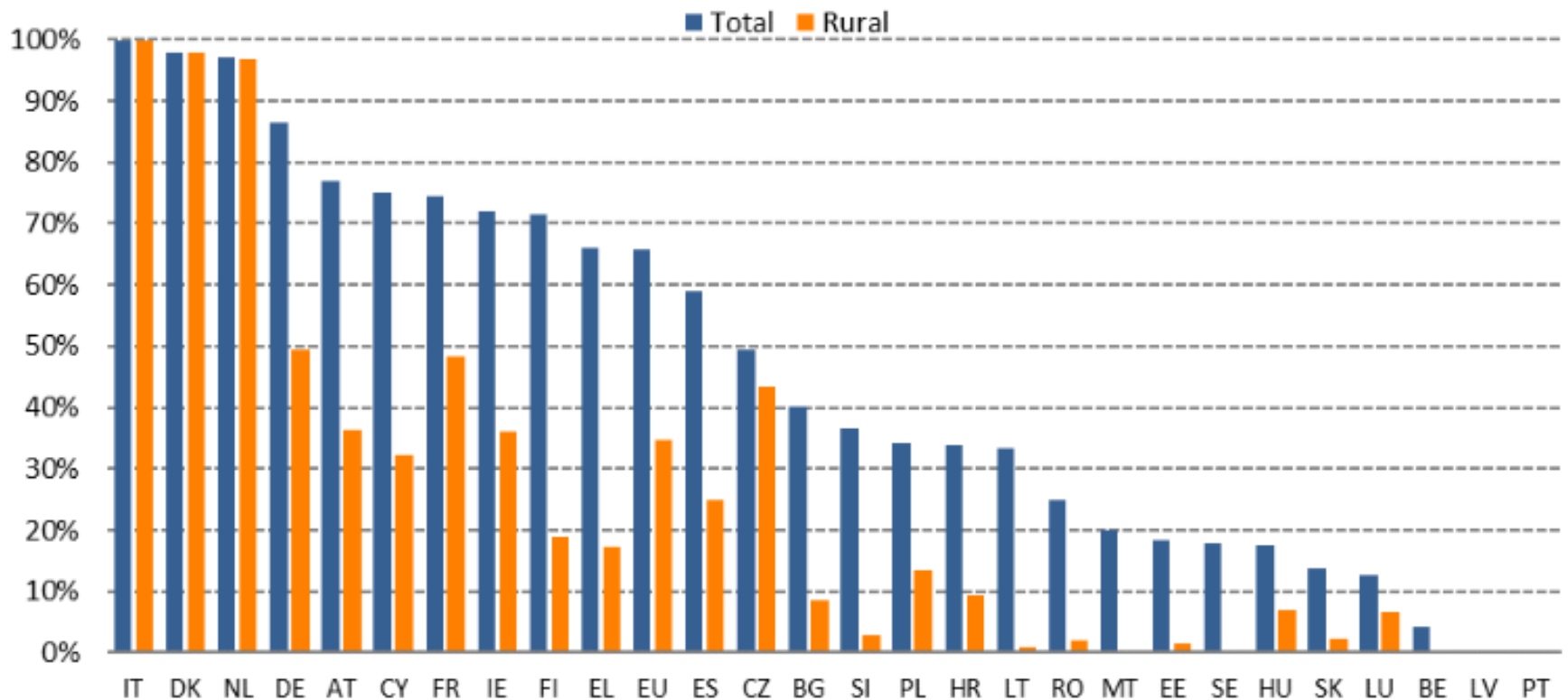
MOBILE BROADBAND 4G COVERAGE IN EUROPE

Figure 24 4G mobile coverage (% of populated areas), mid-2021



MOBILE BROADBAND 5G COVERAGE IN EUROPE

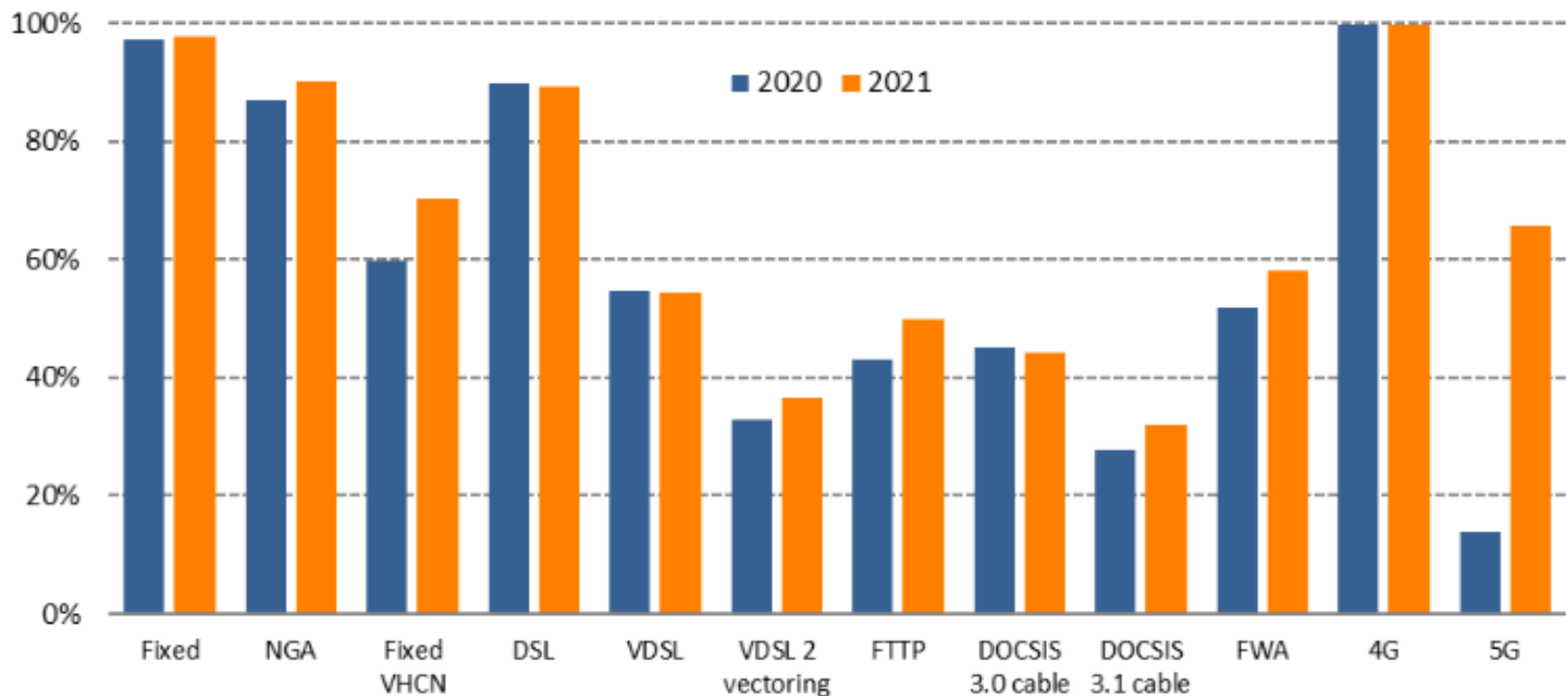
Figure 26 5G mobile coverage (% of populated areas), mid-2021



MOBILE BROADBAND

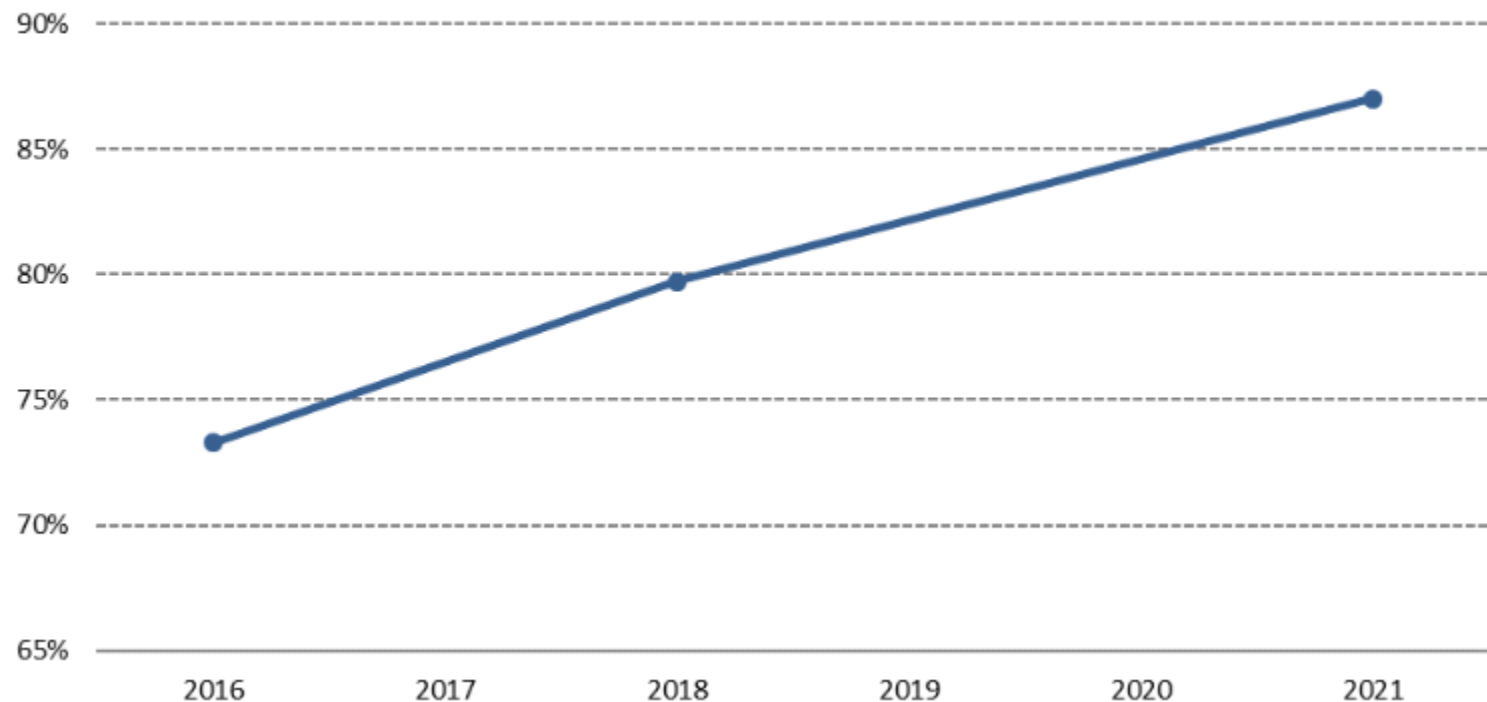
TOTAL COVERAGE COVERAGE IN EUROPE

Figure 15 Total coverage by technology at EU level (% of households, % of populated areas for 4G and 5G), 2020-2021



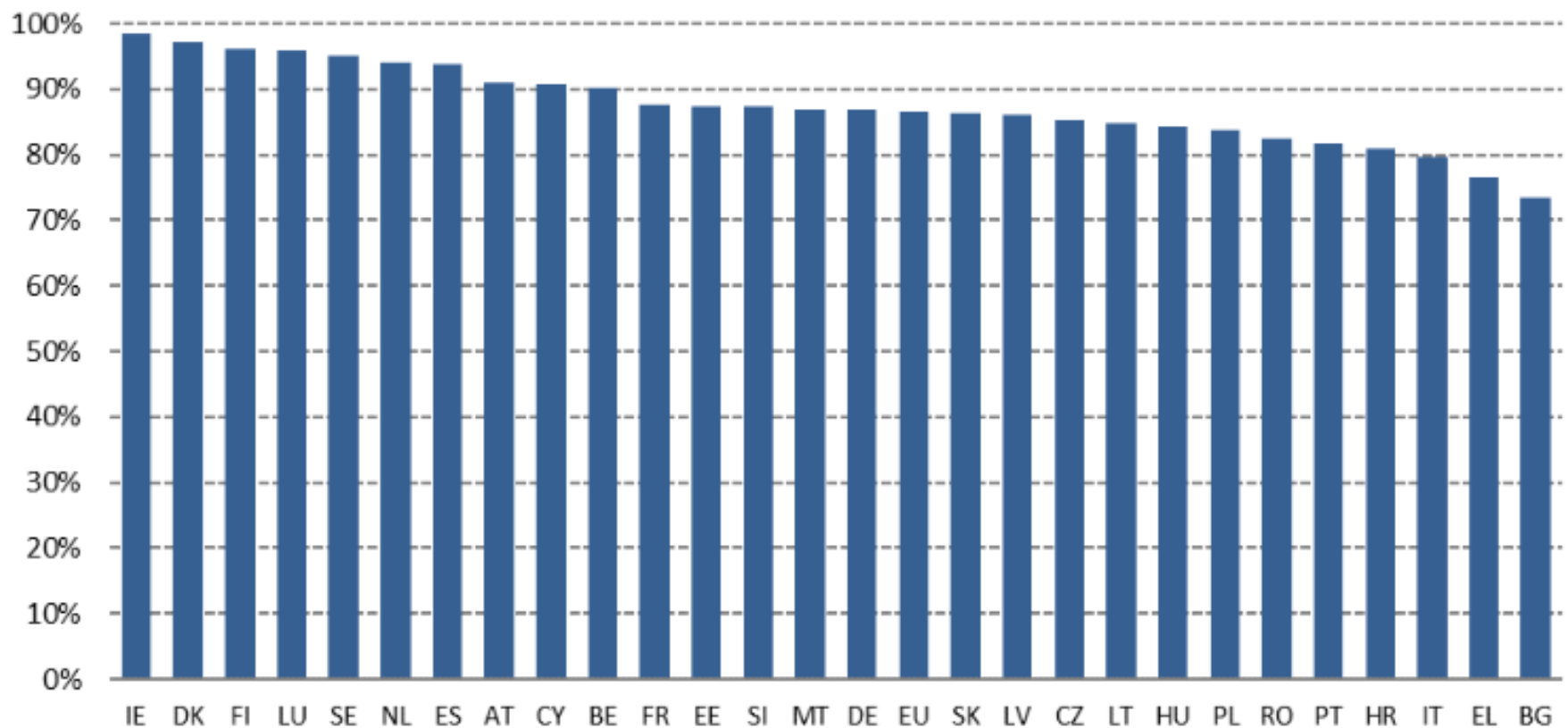
MOBILE BROADBAND COMPLEMENT OR SUBSTITUTE TO FIXED ?

Figure 36 Mobile broadband penetration in the EU (% of individuals), 2016-2021³⁸



MOBILE BROADBAND COMPLEMENT OR SUBSTITUTE TO FIXED ?

Figure 37 Mobile broadband penetration (% of individuals), 2021³⁹



MOBILE BROADBAND COMPLEMENT OR SUBSTITUTE TO FIXED ?

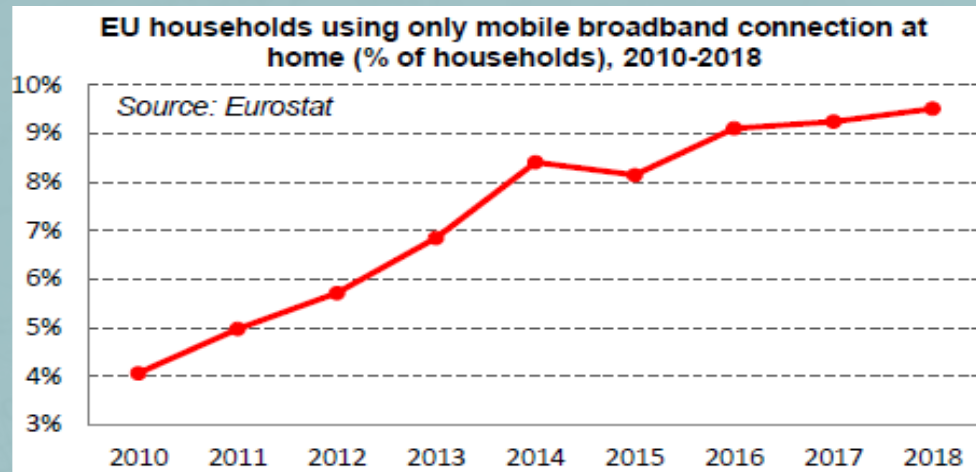
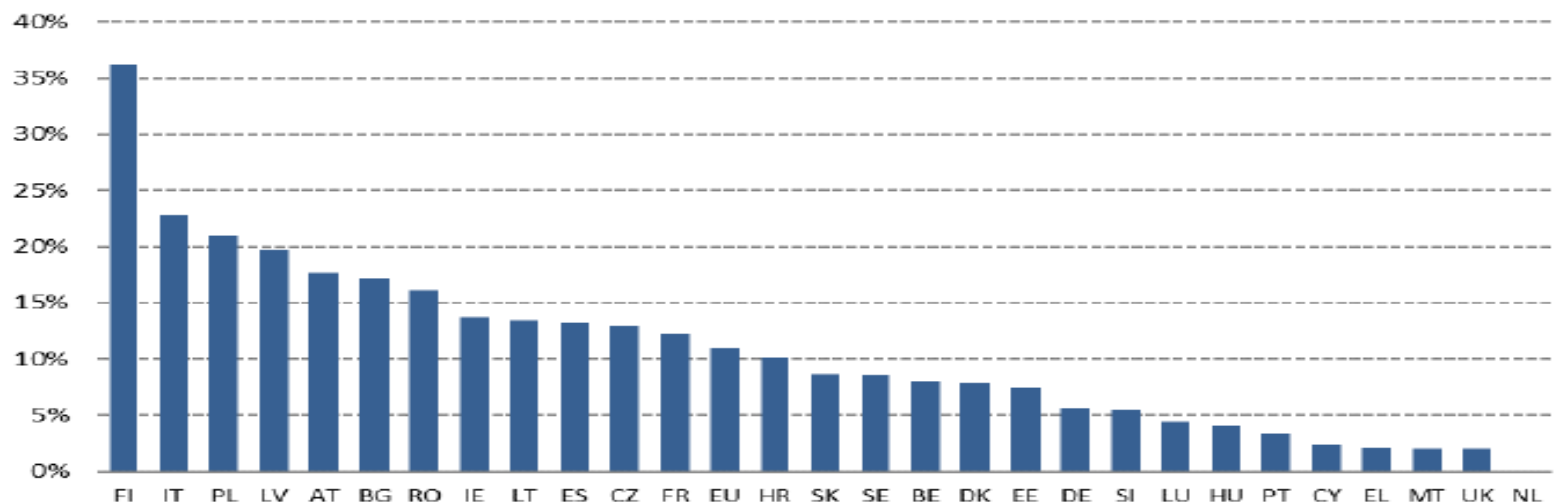


Figure 26 Households using only mobile broadband at home (% of households), 2019



MOBILE BROADBAND

COMPLEMENT OR SUBSTITUTE TO FIXED ?

- In 2021, 87% of people used a mobile device to access the internet (up from 73% in 2016), which corresponds to the number of regular internet users (87% of people in 2021)
- Mobile broadband is widely used in every Member State; national penetration rates vary between 73% in Bulgaria and 98% in Ireland
- Mobile broadband is, however, still mainly complementary to fixed broadband, when it comes to subscriptions for households
- Europeans primarily use fixed technologies at home to access the internet (even if using a mobile device)
- In 2021, 13% of EU households accessed the internet only through mobile technologies
- Finland (34% of households), Latvia (24%), Poland (23%), Romania (22%) and Bulgaria (21%) were the leaders in mobile-only access

Q & A



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