

Final report for consultation

Fixed and mobile
termination rates in
Ireland

26 June 2012

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1 Executive summary

ComReg's current regulation of fixed termination rates (FTRs) and mobile termination rates (MTRs) is subject to review, and it is considering what price control obligations in relation to termination rates it will impose on fixed and mobile operators that have been found to have significant market power (SMP) in their respective markets. In line with other European nations, ComReg is aiming to set rates for a multi-year regulatory period.

The European Commission (EC) Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC) asks for termination rates to be set based on long-run incremental costs (LRIC) excluding a mark-up for common costs ("pure LRIC"). This Recommendation aims to address:

- Fundamental competitive distortions, substantial transfers between fixed and mobile markets and consumers, significant payments from smaller to larger competitors and high retail prices for originating calls and correspondingly lower usage rates, thus decreasing consumer welfare. (*Paragraph (3) in the Recommendation*)
- The regulatory uncertainty created by a lack of harmonisation in the application of cost accounting principles for setting termination rates, which may deter potential investors and imposes a regulatory burden on operators active in several countries (*Recital (4) in the Recommendation*).

Where relevant, ComReg can adapt its approach to the situation of the Irish market, but it must still take utmost account of the EC Recommendation. Our analysis of the Irish-specific market factors has confirmed that the issues identified by the EC are generally present in Ireland.

We collected a variety of quantitative and qualitative information from fixed and mobile operators in Ireland. We analysed this quantitative information to identify possible effects of reducing termination rates to the levels likely to be seen in the EC's recommended pure LRIC approach. We also considered quantitative survey information about the consumers of fixed and mobile communications in Ireland, collected by ComReg in 2011. This information helps to explain the impact on different operators, different services, user segments, age groups and social groups in Ireland.

In Ireland there are four mobile operators with radio networks (Vodafone, O2, Meteor and H3G Ireland). There are also a number of virtual operators that do not have radio networks, but appear as distinct operators because they have a separate mobile number range and interconnect point(s). There is one main fixed operator (eircom) and a number of smaller fixed operators with a residential, business or broad customer focus (UPC, Vodafone, BT Ireland, etc.). Mobile penetration in Ireland is assessed as being over 100% of the population, due to the combined effects of both inactive subscriptions and dual-SIM users. There may also be foreign visitors with Irish mobile phone subscriptions. Fixed-line penetration in domestic households is currently

around 70% to 80% (depending on age and social group), meaning that there is a sizeable proportion of the population that does not subscribe to such services: most of these people will be ‘mobile-only’ telephony users.

At current mobile and fixed termination rates, there is a significant net flow of revenues from fixed networks to mobile networks. There are also revenue flows between mobile operators, as mobile termination rates represent both outbound costs and inbound revenues for mobile operators. Depending on the usage profiles of mobile network customers, their operators may be net beneficiaries or net payers on cross-network mobile–mobile traffic, although these revenue flows are confined to the mobile players.

Some mobile operators and some mobile service packages include free or low-price on-net minutes (i.e. discounted compared to the price of an off-net mobile–mobile call). For this type of traffic, the mobile operator is not a net payer or receiver of termination charges (there is no internal interconnection transfer charge) but instead the operator must recover the costs of conveying the call from elsewhere (other services, monthly subscription fees, etc.). Free and discounted on-net tariffs create what is known as a tariff-mediated network externality. This is the benefit that particular subscribers gain from being on a network on which they can call a larger pool of other on-net subscribers free of charge (or at a discounted rate). However, there is a disadvantage for off-net subscribers, as their calls to the other network subscribers are subject – at a wholesale level – to a per-minute call termination charge. An analogous situation exists between fixed players, but the revenue flows are a smaller proportion of overall fixed-line revenues compared to those in the mobile sector, and network call bundles that include calls to any fixed network are common in the marketplace. In the situation where an operator is a net recipient of termination revenues, it should prefer high rates (and *vice versa* for an operator that is a net payer).

Competition exists at the retail level in Ireland. There is also an effect known as the ‘waterbed effect’ in which if the price of one particular service is reduced, the price of other competitive services may increase so that the operator can aim to achieve similar revenues to fully recover its fixed and variable costs in the long run. It may be claimed that if termination rates are reduced significantly (e.g. to pure LRIC levels) then other prices may have to rise – this is not unexpected as it is the waterbed effect in action. However, not all prices will rise as call termination rates are reduced. This is because the market is two-sided and some groups of consumers and some networks benefit more from the reduction in their direct usage costs (due to lower termination rates) than they suffer from the specific prices which may have to rise. Lower off-network termination charges also encourage ‘any-network’ tariffs, which are also easier for all consumers to understand.

There are also non-uniform prices across segments and user types. This is particularly so in the mobile sector where, based on data from the mobile operators in Ireland, we have found that very high mobile users (e.g. those making more than 500 minutes of calls per month) typically pay the lowest effective average cost per minute of usage. These users would also be high-spending customers. Using the same data, we also found that prepaid users often pay a high price per minute

(e.g. those topping up infrequently or with low value recharges, who therefore do not benefit from promotions or bonuses offered to large value recharges) [3<....].

Mobile operators also incur costs for new handset subsidies, especially for the latest smartphone devices, because the upfront charges paid by users do not often cover the full cost of the handset. It may be expected that connection or subscription charges could rise as termination rates are reduced. However, there is evidence that there is a significant stock of spare working mobile handsets in Ireland, and so it is unlikely that any user will be forced to disconnect from the mobile network because they cannot obtain the latest smartphone handset below cost, or indeed any mobile handset for free, borrowed or second-hand. SIM-only packages are also widely available in Ireland for customers who wish to join a mobile network without buying a new handset.

Information from ComReg's consumer analysis is important in understanding potential effects on consumer groups. Older residents are more likely to be fixed-line users; only 1% of households where those aged 65+ live are mobile-only, whereas 36% of under-30 households are mobile-only. However, mobile-only households are not strongly concentrated in lower income social segments of society.

These points mean that the burden of possible price rises does not have to fall on the most vulnerable users, and indeed that there are specific vulnerable user groups who may actually benefit from a significant reduction in termination rates, such as elderly fixed-only users.

Lower termination rates can benefit competition in the area of calls between networks. Interconnection is after all designed to be the platform to facilitate many-to-many communication. Relatively few mobile and fixed retail packages in Ireland include unlimited calls to off-net mobile networks. However, these offers are beginning to emerge as mobile termination rates decline, both in Ireland and overseas. The circumstances surrounding the launch of MNO Free Mobile in France highlight the attractiveness of simple any-network high-usage offers. The prices of add-ons that eircom offers for its fixed-line packages vary depending on whether they include calls to eMobile/Meteor or to the other mobile operators; similarly, Vodafone's fixed-line service bundles include calls to Vodafone mobiles but not to other mobile networks. Other fixed operators have only recently begun to offer calls to mobile numbers as part of their fixed-line subscription bundles. These increasing developments indicate that high off-net mobile termination rates will be a barrier to simpler any-network tariffs and larger any-network bundles of usage; these offers with an attractive price for a generous bundle of minutes were not available in the past when mobile termination rates were much higher.

We investigated a range of price control methods¹ based on a number of assessment criteria² drawn from ComReg's statutory objectives and also taking into account the Irish-specific market factors identified above.

¹ No price control, fair and reasonable prices, bill and keep, receiving party pays, cost orientation based on LRAIC+ and cost orientation based on pure LRIC.

A number of conclusions were drawn from the first part of the assessment:

- The ‘no price control’ and the ‘fair and reasonable prices’ approaches were rejected because of their poor assessment against the criteria.
- The ‘bill and keep’ and ‘receiving party pays’ approaches, although obtaining more favourable assessments, were also rejected because while not excluded by the EC Recommendation, they may not be consistent with the EC directives (and in the case of receiving party pays, which is a retail tariffing method, ComReg may not have the power to create it).
- Price control methods based on cost orientation have attractive economic and competitive effects.

Based on these conclusions, we then examined cost orientation methodologies in more detail to make our recommendation regarding which of the cost orientation remedies (long-run average incremental cost with mark-up for common costs (LRAIC+) or pure long-run incremental cost (LRIC)) and which methodology to set prices (based on a cost model or a benchmark) should be used.

LRAIC+ and pure LRIC each have their advantages, but we consider that pure LRIC has a better fit with the assessment criteria and the Irish market for both fixed and mobile termination. We concluded that pure LRIC:

- is fully in line with the EC Recommendation of 7 May 2009
- may have a better allocative efficiency (depending on the size of the call externality)
- has a greater positive impact on mobile–mobile and fixed–mobile competition and should therefore improve dynamic efficiency (e.g. by removing tariff-mediated network externality and cross-subsidies between fixed and mobile markets and by supporting (higher) usage bundles, including off-net mobile calling).

Our six recommendations to ComReg are as follows:

- Price control for MTRs should be based on cost orientation at pure LRIC, and the methodology to be used in the short term should be based on a benchmark of pure LRIC-based MTRs from other Member States; in the longer term, we recommend that ComReg either continues with the benchmark methodology or develops a pure LRIC model with industry input. Either of these two methods should produce a similar cost result, given the range of pure LRIC values currently observed elsewhere in Europe.
- Price control for FTRs should be based on cost orientation at pure LRIC, and the methodology used should be to adapt the existing ComReg time-division multiplexing (TDM) and next-

² Competition (fixed–fixed, mobile–mobile, fixed–mobile, efficiency (allocative, productive, dynamic), taking utmost account of the EC Recommendation, equity, ease of selection and implementation of the approach, and transparency and regulatory certainty.

generation network (NGN) fixed core network cost model so that it can calculate the pure LRIC of fixed termination.

- Regulation of FTRs at pure LRIC leaves some shared voice and common network costs unrecovered. We recommend that these NGN-based, efficiently incurred, unrecovered costs are recovered from all fixed origination services (including on-net retail origination), so as to avoid a distortion between on-net retail call and carrier pre-select (CPS) call cost recovery. This cost recovery should consider the totality of unrecovered costs and the totality of originated traffic on the fixed network, because fixed operators do not typically measure all traffic types for all customers.
- The same symmetric rates should be used for all mobile network operators (MNOs), based on the costs of an efficient-scale operator; because all MNOs have been active for seven years or more, it is unlikely that any of them will face objectively higher costs.
- All mobile virtual network operators (MVNOs) with SMP should be regulated at the same symmetric MTR as MNOs, unless they can show that their efficiently incurred costs are objectively and exogenously higher than those of their network host.
- The same symmetric rates should be used for all fixed network operators (FNOs), based on the costs of an efficient-scale operator, in order to minimise distortions in the market.

2 Introduction

In May 2009, the European Commission issued its Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (referred to as ‘the Recommendation’ throughout this report).³ The Recommendation sets out a specific method for national regulatory authorities (NRAs) to apply when setting cost-based interconnection regulation for both fixed and mobile termination markets.

In order to prepare for future regulatory decisions on the setting of interconnect charges in Ireland, ComReg is seeking to establish robust economic, principled and practical criteria on which to base its upcoming activities in this area. The criteria must take utmost account of the EC Recommendation as well as factors specific to the Irish market. Analysys Mason has been commissioned to provide independent input to guide ComReg in choosing an approach for regulating the interconnection services of SMP operators in the coming period.

The scope of the study was as follows:

- to work with ComReg, and take input from Irish industry parties, to establish the key economic and practical aspects
- to research, investigate and conclude on these economic and practical aspects, with a view to reaching a recommendation on the approach that ComReg should take in this area
- to prepare a report containing principles and methodologies relevant to setting FTRs and MTRs in Ireland
- to consider the impact on retail competition and consumers (taking into account ComReg’s duties towards internal market development, competition and consumer benefits)
- to support ComReg before and after public consultation on the issue.

This document is the initial report for consultation.

2.1 Legal basis and regulatory framework

According to the EC Recommendation, ComReg should follow a specific cost-based methodology for setting wholesale fixed and mobile termination rates. However, the EC Recommendation allows for two potential exceptions to this approach:

- using an interim method, based on an alternative approach to bottom-up long-run incremental cost (BU-LRIC), until 1 July 2014 in the case of less well-resourced NRAs
- continuing with an alternative method in the case of limited resources, on the condition that the resulting cost-based prices do not exceed the average of the termination rates set by NRAs implementing the recommended cost methodology.

³ Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC).

ComReg's regulatory objectives are similar to those of many other European regulators:

- to promote competition⁴ (choice, price and quality,⁵ no distortion or restriction of competition⁶)
- to seek development of the internal market⁷ (development of consistent regulatory practice⁸)
- to promote the interests of users within the Community.⁹

The regulation of wholesale interconnection rates affects all of these objectives – initially through its effects on inter-operator competition.

2.2 Link with MVCT and FVCT market reviews

ComReg is currently conducting market analysis in Market 3 (fixed voice call termination) and Market 7 (mobile voice call termination).¹⁰ This report draws conclusions on the degree to which consistency should be sought in the costing principles that could be applicable for a potential cost-based regulation of Market 3 and Market 7. The *principles* to be applied to fixed and mobile interconnection costing could be consistent, but it is unlikely that the cost *result* coming out would also be similar – the structural differences in fixed and mobile network costs mean that even with identical principles, the cost results can be quite different. Understanding the likely impact of applying consistent or different principles in Market 3 and Market 7 is a relevant part of our investigation.

2.3 Methodology used to assess the possible regulatory approaches

Figure 2.1 below shows the methodology we have used to assess the possible regulatory approaches, and indicates where each step is described in this report. The methodology is based on assessment criteria that reflect ComReg's statutory objectives while taking into account specific factors in the Irish fixed and mobile markets.

⁴ Communications Regulation Acts 2002 to 2011, Section 12 (1) (a) (i).

⁵ Communications Regulation Acts 2002 to 2011, Section 12 (2) (a) (i).

⁶ Communications Regulation Acts 2002 to 2011, Section 12 (2) (a) (ii).

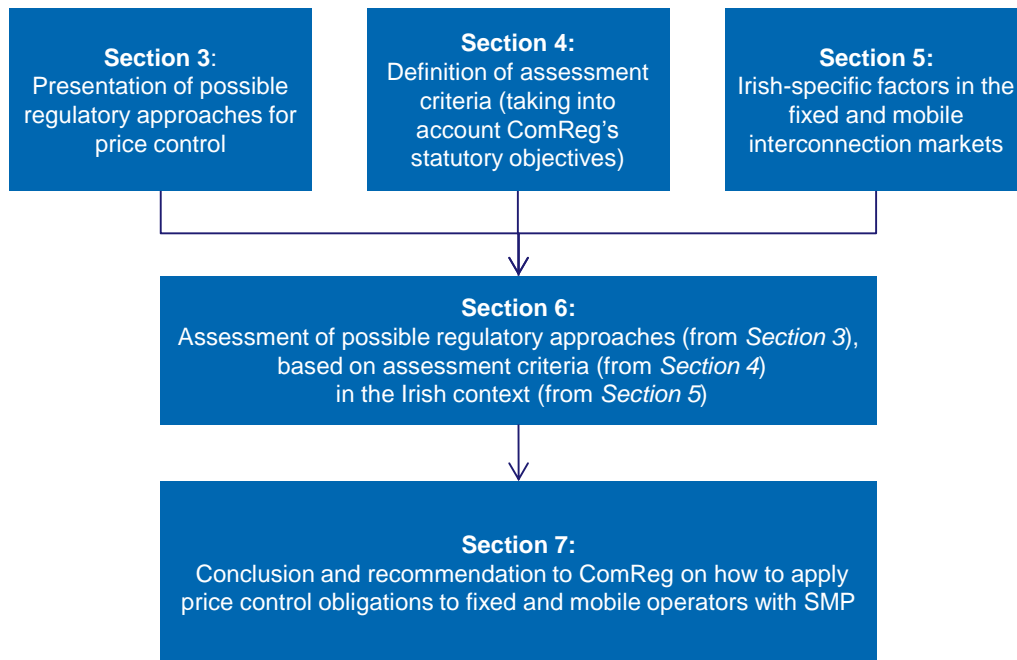
⁷ Communications Regulation Acts 2002 to 2011, Section 12 (1) (a) (ii).

⁸ Communications Regulation Acts 2002 to 2011, Section 12 (2) (b) (iv).

⁹ Communications Regulation Acts 2002 to 2011, Section 12 (1) (a) (iii).

¹⁰ Commission Recommendation of 17 December 2007 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services (OJ L 344, 28.12.2007, p.65).

Figure 2.1: Assessment methodology [Source: Analysys Mason, 2012]



This report is therefore structured as follows:

- Section 3 describes the possible regulatory approaches (i.e. principles and methodologies) that ComReg could consider using, including the approach recommended by the EC
- Section 4 defines the key economic and practical criteria used to assess the options against ComReg's various statutory objectives
- Section 5 discusses the Irish-specific market factors that may or may not lead to Ireland deciding to follow a different approach from the one recommended by the EC
- Section 6 assesses the various possible regulatory approaches
- Section 7 concludes with the recommended approaches for mobile and fixed termination.

The report also includes a number of annexes containing supplementary material:

- Annex A to Annex L are confidential annexes presenting information specific to the main players in the market, received in response to a request under Section 13D of the Communications Regulations Acts 2002-2011
- Annex M briefly describes the most important methodological choices to be made in the case of a price control based on a bottom-up cost model.

3 Possible regulatory approaches: principles and methodologies

The EC Recommendation sets out a specific set of principles and methodologies to be applied:

- a cost-orientation principle
- a bottom-up modelling methodology, based on
 - incremental costing principles
 - an economic depreciation method for cost recovery, verified with top-down operator data
 - efficient, modern network assets comprising NGN core and/or 2G+3G in the mobile access layer
 - ‘pure’ incremental costing of termination traffic as the last increment, excluding common cost mark-ups
 - efficient scale operations
- the application of the symmetry principle; that is, the termination rate should be applied symmetrically to all players in the market (subject to objectively justifiable cost differences).

While ComReg has a duty to take ‘utmost account’ of the EC Recommendation, it also has duty to assess whether there are objective reasons why Ireland should apply a different approach, and if so what route to follow. In order to guide ComReg on this issue, Section 3.1 first describes various possible regulatory principles to setting price controls for wholesale termination in Ireland:

- no price control
- ‘fair and reasonable’ prices
- bill and keep
- receiving party pays
- cost orientation.

Section 3.2 then compares two possible methods of implementing the cost-orientation approach:

- benchmarking
- cost modelling.

Section 3.3 discusses the principle of symmetry.

Finally, Section 3.4 looks at an aspect that was not addressed by the EC Recommendation but might still be important: the impact on one-sided SMP services such as wholesale origination of a potential move to pure LRIC for wholesale termination.

3.1 Possible regulatory price-setting principles

This section describes the various possible regulatory price-setting principles for the price control of fixed and mobile voice call termination.

3.1.1 No price control

In the ‘No price control’ approach, the regulator would leave operators to set the price of termination at the level of their choice. This would allow market forces (including but not restricted to each operator’s competitive advantages and any countervailing powers) to be exploited by all operators in their own interests. In this situation, ComReg would have no influence over the rates of termination in the market.

It should be noted that this approach would not only directly contradict the EC Recommendation by not adopting a cost-orientation obligation but:

- would not address the competition problems identified in the Market Analysis
- would not be not appropriate given the SMP finding
- would contradict previous ComReg decisions to impose a price control remedy on SMP operators.

This option is therefore an inferior one and included solely to provide a ‘baseline’ comparison for the other regulatory approaches.

3.1.2 ‘Fair and reasonable’ SMP remedy

An alternative would be to impose a requirement that prices for termination should be “fair and reasonable”. The term “fair and reasonable” comes from the UK Communications Act 2003¹¹ and so is not directly applicable in the Irish context. However, we believe it provides a useful analogy here.

This method can be used to provide a light touch ‘anchor’ to another price set by a regulator. For instance, in the UK Ofcom¹² has proposed this approach for regulating smaller¹³ mobile communication providers (MCPs), based on ‘fair and reasonable’ terms and conditions, “including the level of charges”¹⁴ which it requires “to be at the same level as those set for the four national MCPs which are subject to a charge control.”¹⁵ If an MCP believes its mobile call termination

¹¹ Section 74(2)(b)(i), “(2) The conditions that may be set by virtue of section 73(2) also include such conditions imposing obligations on a person providing facilities for the use of application programme interfaces or electronic programme guides as OFCOM consider to be necessary for securing— (b) that the facility for using those interfaces or guides is provided on terms which— (i) are fair and reasonable”.

¹² Wholesale mobile voice call termination, Market Review, Volume 2 – Main consultation, 1 April 2010, available at: http://stakeholders.ofcom.org.uk/binaries/consultations/wmctr/summary/wmvct_consultation.pdf.

¹³ All mobile communication providers except for the four national ones.

¹⁴ Wholesale mobile voice call termination, Market Review, Volume 2 – Main consultation, op. cit., paragraph 7.151.

¹⁵ Ibid, paragraph 8.23.

(MCT) charges should differ from those of the four national MCPs, in theory this is possible, but the MCP would be expected to “provide sufficient justification that its charges were fair and reasonable, possibly including, among other things, sufficient cost information as may be necessary for an assessment.”¹⁶ In practice, Ofcom’s approach to resolving several previous disputes on this issue makes it clear that to obtain a higher rate would require a very strong case indeed. Ofcom reiterated this view in 2011, indicating in a statement¹⁷ that “[they] have held the view for several years that CPs can set fair and reasonable FTRs by basing them on BT’s charges an approach known as reciprocal charging.”

This method can have the characteristics of ‘light-touch’ regulation, as it reduces the regulator’s direct involvement in setting prices, until a dispute arises (at which point the regulator’s involvement may become significant). To some extent, successful application of this approach relies on the ability of the regulator to refer to previous ‘fair and reasonable’ decisions and ex-post outcomes, and the degree to which ‘fair and reasonable’ is pre-defined.

It should be noted that this approach:

- would be likely to be effective only in the presence of some detailed data on costs to which it can refer (i.e. it would only be a complementary approach, not a comprehensive one)
- would not be very efficient as it could result in case-by-case interventions on SMP-type competition problems which would be more adequately and efficiently dealt with through ex-ante remedies
- would generate regulatory uncertainty, resulting in a variety of possible disputes
- would contradict previous ComReg decisions to impose a price control remedy on SMP operators.

This option is therefore also an inferior one and included solely to ensure that the list of possible approaches is comprehensive.

3.1.3 Bill and keep

In this approach, the call-originating operator bills the calling party and does not pay anything to the call-terminating operator. It effectively amounts to the termination charge being set at zero, with all operators keeping everything they bill to their own customers. This approach was notably used in France between mobile operators prior to 2005.

The main advantage of ‘bill and keep’ is that it is simple and transparent, as operators do not have to pay anything to one another, although in its recent consultation Ofcom identified possible difficulties with implementation.¹⁸ As pointed out by the “Study on the future of interconnecting

¹⁶ Ibid, paragraph 8.24.

¹⁷ *Fair and reasonable charges for fixed geographic call termination*, Statement published on 27 April 2011, paragraph 1.4, available at: <http://stakeholders.ofcom.org.uk/consultations/fair-reasonable-charges/statement/>

¹⁸ Wholesale mobile voice call termination, Market Review, Volume 2 – Main consultation, op. cit., paragraph 7.47 and 7.55.

charging methods”¹⁹ by TERA/Hogan Lovells, there is a question about whether bill and keep is in accordance with the EC framework, especially Article 13 of the Access Directive²⁰ which states that an operator should be able to recover its costs when providing the service of interconnection.²¹ Furthermore, this approach would introduce a significant and potentially disruptive change from previous regulation of voice termination, and could possibly increase the volume of unsolicited phone calls/spam as calling parties would no longer have to pay a termination charge on these calls. There may also be other consequences notably in relation to non-geographic and premium rate payments which rely on the existence of an interconnect payment system for settling charges between originating and terminating operators. Conversely, it has been suggested²² that a benefit of bill and keep is the removal of the need to bill for interconnection, saving the operators wholesale department costs.

We note that the EC Recommendation does not necessarily argue against a bill and keep approach, as it notes in Recital 20 that “When regulating wholesale termination charges, NRAs should neither preclude nor inhibit operators from moving to alternative arrangements for the exchange of terminating traffic in the future to the extent that these arrangements are consistent with a competitive market.”²³

In addition, Section 6.1.2 of the accompanying Explanatory Note to the EC Recommendation notes that bill and keep could have potential merits such as “(obviating) the need for regulatory intervention”, “(resolving) the termination bottleneck”, “(leading) to lower retail prices for call origination”, “(increasing) usage due to the price elasticity of demand”, “(facilitating) the development of innovative offers, e.g. flat-rate offers promoting increased usage”, “decreasing transaction and measurement costs” and “(taking) account of the call externality”.²⁴ We see that at least the first two of these potential merits are demonstrably true.

The Explanatory Note to the EC Recommendation also mentions some potential drawbacks of a move to bill and keep, including “(causing) distortionary behaviour, (bringing) arbitrage opportunities, (leading) to inefficient traffic routing and inefficient network utilisation. For instance, a potentially problematic issue might be inefficient routing of traffic from operators not participating in the Bill and Keep scheme.”²⁴

¹⁹ Study on the future of interconnecting charging methods, 23 November 2010, TERA consultants partnering with Hogan Lovells, available at: http://ec.europa.eu/information_society/policy/ecomms/doc/library/ext_studies/2009_70_mr_final_study_report_F_101123.pdf

²⁰ DIRECTIVE 2002/19/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive), available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:108:0007:0020:EN:PDF>.

²¹ We note, however, that Recital 20 of the Access Directive also states that the method of cost recovery should be appropriate to the circumstances taking account of the need to promote efficiency and sustainable competition and maximise consumer benefits.

²² During discussions with one of the Irish network operators, it was suggested that bill and keep would have merits if the cost to bill for interconnection exceeded the pure LRIC rate being collected.

²³ Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC), Recital (20).

²⁴ Explanatory Note to the Commission Recommendation of 7 May 2009 {C(2009) 3359 Final}.

As the Explanatory Note to the EC Recommendation concludes, a move to bill and keep would have merits, but the balance between merits and drawbacks needs to be carefully considered.

3.1.4 Receiving party pays (RPP)

In this retail pricing approach the call terminating operator bills the receiving party while the originating party operator bills the calling party. This approach is used by operators in the USA. Partial examples in Europe include:

- inbound international roaming where the receiving party pays principle applies for calls received abroad
- special mobile plans tariffs equivalent to a permanent re-routing from a fixed number where the mobile owner pays the difference between MTR and FTR.

Receiving party pays (RPP) is compatible with ‘bill and keep’ at a wholesale level but also with low symmetrical wholesale charges between all operators (fixed and mobile). From an economic point of view, this approach directly internalises the call externality.²⁵ RPP allows retail prices to directly reflect and internalise the call externalities (i.e. the benefits of receiving a call).

In a market such as Ireland where customers are not used to such incoming call charges (except when using international roaming), RPP would be likely to evoke a negative response from customers initially, as also described by Ofcom for the UK market in the Annex to its consultation on wholesale mobile voice call termination.²⁶ As a result even if there were bill and keep at the wholesale level, RPP might not be adopted by operators²⁷ (instead, they might choose to reflect the charge in other retail prices such as subscription costs or in voucher expiry (mimicking subscription charges)). It should be noted, however, that international experience such as in the USA shows that RPP can be accepted by customers once they become accustomed to it.

We note that the EC Recommendation does not necessarily prohibit the type of wholesale termination charging arrangements that would be required for a RPP approach (i.e. ‘bill and keep’ or low symmetrical wholesale charges), as in Recital 20 it notes that “When regulating wholesale termination charges, NRAs should neither preclude nor inhibit operators from moving to alternative arrangements for the exchange of terminating traffic in the future to the extent that these arrangements are consistent with a competitive market.”²⁴

In addition, the accompanying Explanatory Note to the EC Recommendation notes in Section 6.1.4 that RPP could have potential merits such as “avoiding the deficiencies of the CPP system, e.g. high termination rates resulting from the monopoly on termination markets and which thus produce negative competitive consequences both at the wholesale and retail level.” The

²⁵ The call externality is the utility derived by the receiver of the call.

²⁶ Wholesale mobile voice call termination, Market Review, Volume 3 – Supporting annexes, 1 April 2010, paragraph A13.58, available at: http://stakeholders.ofcom.org.uk/binaries/consultations/wmctr/annexes/wmvct_annexes.pdf.

²⁷ This was the case in France when prior to 2005, bill and keep was used between mobile operators without RPP being adopted by the operators.

accompanying Explanatory Note to the EC Recommendation also notes some potential drawbacks to a move to RPP, including “meeting resistance from customers unwilling to meet the termination charge.”

As the accompanying Explanatory Note to the EC Recommendation concludes, a move to RPP would have merits but the balance between merits and drawbacks needs to be carefully considered. We note finally that, as RPP is a retail pricing mechanism, ComReg may not have the power to impose it on the market.

3.1.5 Cost orientation

The EC Recommendation notes that “in the light of the ability and incentives of terminating operators to raise prices substantially above cost, cost orientation is considered the most appropriate intervention to address this concern over the medium term.”²⁸

The next section discusses in greater detail the possible methodologies that could be applicable to a cost orientation obligation.

3.2 Possible methodologies applicable to a cost orientation obligation

The EC Recommendation indicates in Recital (7) that “Recital 20 of Directive 2002/19/EC notes that the method of cost recovery should be appropriate to the particular circumstances.”²⁶ It then discusses two possible methodologies:

- cost modelling²⁹
- benchmarking.³⁰

The rest of this section describes these two methodologies including some of their variants.

3.2.1 Cost modelling

Characteristics of a cost model used for price control

When building a cost model, three main characteristics need to be determined:

- How should assets be valued: at historical or current cost, or based on the modern-equivalent technology?
- Should the model be bottom-up (BU), built starting from the traffic, subscribers and technologies used, and then calculating the assets needed in the network modelled to handle

²⁸ Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC), Recital (7).

²⁹ Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC), Recital (10).

³⁰ Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC), Recital (22).

these requirements, or should it be top-down (TD), starting from the operator's asset base and accounts?

- Which accounting methodology allocation and increment should be used: fully allocated cost (FAC) or a forward-looking methodology, which includes long-run average incremental cost with mark-up (LRAIC+), LRAIC, LRIC+ or pure LRIC?

These three characteristics can be combined as shown in Figure 3.1.

Figure 3.1: Possible methodologies for cost modelling [Source: Analysys Mason, 2012]

	Historical costs		Current costs or MEA	
	Bottom-up	Top-down	Bottom-up	Top-down
Fully allocated cost	n/a ³¹	Historical cost accounting (HCA)	n/a	Current cost accounting (CCA)
Forward looking incremental cost	n/a	n/a	BU LRAIC+ / BU LRAIC / BU LRIC+ / BU pure LRIC	TD LRAIC TD LRAIC+

Historical cost accounting (HCA) is based on the financial statements of an operator and therefore includes its historical asset base, whether efficiently incurred or not. Moreover, the use of historical costs to value the operator's assets may reflect conditions at the time of acquisition, which can be very different from conditions today and may have undesirable effects in the context of regulatory price setting (e.g. it could cost significantly more/less to replace the asset with its *current or modern equivalent* asset, which sets under-/over-costed incentives to use the regulated asset). In HCA depreciation, the capital expenditure recorded in the fixed asset register (the gross book value, GBV) is depreciated over the defined financial lifetime of the asset at a uniform rate – a constant depreciation charge per year. As a result, the asset net book value (NBV) decreases linearly over the lifetime as depreciation accumulates, and the corresponding cost of capital employed (the cost of tying up the remaining capital book value) also decreases linearly.

In current cost accounting (CCA) depreciation, the straight-line depreciation calculation is modified to take into account the changes in replacement cost for an asset. As the asset price decreases (e.g. due to technology evolution) CCA depreciation is front-loaded if the replacement cost of the asset is declining (and its historically higher investment cost must be recovered earlier as the current price declines). In other words CCA re-values the operator's assets at their current costs, assuming similar-aged assets and the same technology. The MEA approach uses the costs of the modern-equivalent asset for providing the same service. This is sometimes more challenging to define as it may imply a quite different technology (e.g. the modern-equivalent method of deploying fixed access might be considered to be passive optical fibre rather than multiple copper pairs).

³¹ A technical bottom-up HCA model is sometimes built alongside the regulatory bottom-up forward-looking model in order to allow reconciliation to historical accounting costs. This might be used to cross-check the results of the bottom-up model vs. historical costs but is not used to set regulated prices as it would conflict with the forward looking, efficient, and economic cost principles.

Top-down (TD) LRAIC or LRAIC+ starts from an existing ‘top-down’ network cost base and determines ‘incremental’ costs. The “+” indicates the presence of a mark-up, typically for common costs. There may also be top-down efficiency adjustments and potential MEA cost adjustments. This method can be useful for an operator to determine its own cost base, but is not necessarily the best modelling approach to determine the costs of an efficient operator for transparent regulatory purposes. In addition, it can be difficult to use a TD model to calculate a “pure LRIC” (small, final increment) cost, and the EC Recommendation asks for a BU model (with the possibility of hybrid calibration).

Bottom-up (BU) Long Run Average Incremental cost (LRAIC) or Long Run Incremental Cost (LRIC) (without, or with mark-ups, often indicated as a “+”) models provide the most commonly used approach for determining the costs of an efficient operator. As the network is built from the bottom up, starting with the traffic carried by the operator modelled, only the assets required to handle this traffic (in a forward-looking situation) are taken into account, and so inefficiencies are excluded. The level of efficiency can, however, be ‘selected’ through the choice of technologies modelled and assets used (for example: only modern equivalent assets such as Ethernet backhaul or TDM backhaul, possibly with a migration from one to the other) and various other parameters such as maximum utilisation factors. The main differences between these BU methodologies are as follows:

- **LRAIC**: as an average cost, it considers a large increment (e.g. all traffic services provided by the operator) and allocates the incremental cost of traffic to these services, using ‘average traffic routing factors’. Each service, including voice termination, therefore receives a share of intra-traffic network common costs
- **LRAIC+**: in addition to the LRAIC, LRAIC+ includes one or more common cost mark-ups to network costs, for example for overhead costs
- **Pure LRIC**: a small increment model (where each individual service is considered as an increment). The EC Recommendation states that a regulator should calculate the incremental cost of only wholesale voice termination as the traffic-sensitive costs of a full network (that provides all services) *minus* the traffic-sensitive costs of a network that provides all services except wholesale termination
- **LRIC+**: in addition to the LRIC, LRIC+ includes one or more common cost mark-ups.

Further details on methodological options for BU LRAIC/LRIC+ cost modelling are provided in Annex M.

3.2.2 Benchmarking

Within each of the cost orientation benchmark options, it is possible to base the benchmark on the *prices* decided by other regulators or the *costs* resulting from the modelling analysis others have conducted.

Benchmarking of prices

Benchmarking of prices allows a complete set of EU termination rates at a specific point in time to be used as the reference data for the benchmark, but it involves a dependency on the glide paths adopted by these other regulators. As a result the benchmark may change if the included regulators amend their decision or only issue new figures on (say) an annual basis. If different regulators take different views (e.g. on the use of pure LRIC and LRAIC+), then it may be necessary to select only countries that use the chosen cost basis to form part of the benchmark price set.

ComReg has extensive experience of price-based benchmarks for recent mobile termination rates. In summary:

- this benchmarking activity avoided the need for complex and time-consuming cost modelling
- however, this benchmarking activity (as it was defined) created the need for complex and time-consuming re-calculation and re-negotiation of benchmarks every six months and was not able to take account of any market specific factors.

It is possible to use either a *direct* benchmark of price (unadjusted, except for currency exchange rates), or an *adjusted* benchmark (adjusted for factors such as usage, coverage, investment levels, weighted average cost of capital (WACC), etc.).

For the remainder of this report, we consider *direct* benchmarking as the relevant methodology (with an *adjusted* benchmark being a somewhat challenging second-order refinement to the direct benchmark outcome).

Benchmarking of costs

Benchmarking costs, rather than prices, offers flexibility to the regulator to determine its own prices and glide path, and hence brings greater regulatory certainty because the glide path can be announced at the start for the whole duration of the regulatory period.

Benchmarking of costs can be attempted in order to obtain a proxy result for the cost of termination in Ireland. There are two ways of achieving this:

- *Direct* benchmarking of cost results published by (or known from) other EU regulators, and assuming that economic cost characteristics are broadly comparable with Ireland (e.g. usage levels, investment levels, weighted average cost of capital (WACC), etc.). This is unadjusted, but may, for example, require currency exchange conversions.
- Performing an *adjusted* benchmark (adjusted for factors such as usage, investment levels, WACC, etc.) to attempt to adapt each reference cost result to the Irish context. This is a much more complex benchmark calculation, made more complicated in the case of pure LRIC results because of the variety of interactions between underlying factors (usage, investments, coverage, etc.) and the pure LRIC outcome.

For the remainder of this report, we consider *direct* benchmarking as the relevant methodology (with an *adjusted* benchmark being a more challenging second-order refinement to the direct benchmark outcome).

As an example, it is possible to observe the modelled pure LRIC in 2014 or 2015 in a number of other EU countries. In the case of mobile voice termination, pure LRIC results have been published of the order of EURO.01, which would make averaging relatively easy and, in our opinion, reasonably robust. In the case of fixed networks, there are fewer similar pure LRIC results to observe across the EU, and therefore more care is required in developing such a benchmark.

3.3 Symmetry

The European Regulators Group (ERG)³² has a Common Position on symmetry of fixed call termination rates and symmetry of mobile call termination rates whereby “*termination rates should normally be symmetric and asymmetry requires an adequate justification*”.

The EC Recommendation is also strongly in favour of symmetry in voice termination charges among operators of a given type (fixed, mobile) in a given country.

The EC Recommendation states that “*when imposing price control and cost-accounting obligations [...], NRAs should set termination rates based on the costs incurred by an efficient operator. This implies that they would also be symmetric*”,³³ reiterating on the next page that “*NRAs should ensure that termination rates are implemented at a cost-efficient, symmetric level by 31 December 2012.*”³⁴ It offers some limited flexibility for new mobile entrants to benefit from a higher termination charge during a transitional period, but “*any such period should not exceed four years after market entry.*”³⁵

It should be noted, however, that this is subject to specific circumstances specified in the EC Recommendation, including:

- the NRA having determined that there are impediments in the retail market to market entry and expansion³⁵
- there being exogenous factors giving rise to objective cost differences.³⁶

Relevant in the case of Ireland are H3G, Tesco Mobile MVNO, and new MVNOs such a Lycamobile. An MNO wishing to have a higher MTR would need to justify its request against the

³² Now known as BEREC.

³³ Commission Recommendation of 7 May 2009 on the *Regulatory Treatment of Fixed and Mobile Termination Rates in the EU* (2009/396/EC), Article 1.

³⁴ Commission Recommendation of 7 May 2009 on the *Regulatory Treatment of Fixed and Mobile Termination Rates in the EU* (2009/396/EC), Article 11.

³⁵ Commission Recommendation of 7 May 2009 on the *Regulatory Treatment of Fixed and Mobile Termination Rates in the EU* (2009/396/EC), Article 10.

³⁶ Commission Recommendation of 7 May 2009 on the *Regulatory Treatment of Fixed and Mobile Termination Rates in the EU* (2009/396/EC), Article 9.

specific circumstances listed above. A MVNO wishing to have a higher MTR than its network host would also have to justify that their efficiently incurred costs are objectively and exogenously higher than those of their network host. Assuming a cost-oriented MTR is set at the level of an efficient operator achieving a minimum efficient scale, it is not clear how an MVNO could justify higher costs than the ones of its network host (whose costs would have been modelled at an efficient level and include the same and more network components used by the MVNO).

Some of the approaches described above could adopt the additional characteristic of imposing symmetry in rates between operators. This is notably the case for ‘fair and reasonable’ SMP remedy and for both cost orientation approaches (cost modelling and benchmarking). However, this does not apply to the ‘no price control’ approach where asymmetry would likely result from the bargaining between operators. Symmetry is present, but trivial, in the case of ‘bill and keep’ and in the case of ‘receiving party pays’ if based on ‘bill and keep’.

Several variants of symmetry in rates could be defined:

- symmetry between FTRs or between MTRs in line with the EC Recommendation
- symmetry between (i.e. equal) mobile and fixed termination rates (noting that this may be unrealistic, as fixed and mobile network cost bases are somewhat different).

3.4 Treatment of common costs not recovered in pure LRIC

This section discusses one of the possible implications of a cost-orientation approach based on pure LRIC.

The EC recommends that a pure LRIC approach is used in the costing and pricing of termination on mobile and fixed networks. Under such an approach, common costs are not recovered from terminating traffic. This is in contrast to the previous position taken in a number of EU countries, where either some form of fully allocated/distributed cost (FAC/FDC) or a marked-up long-run incremental cost (LRAIC+ or LRIC+) was used. In the latter approach, the mark-ups cover common costs and, depending on the increment definition, may be substantial. In addition, the price set reflects the full cost of carriage of the traffic for an efficient operator – i.e. if all prices were calculated using LRIC+ then the full costs of the carriage of a call would be recovered (over time) for an efficient operator. A change to “pure LRIC” (or any rate below LRIC+) means that this is no longer true. In essence, the terminating operator does not cover its own total average (incremental + share of common costs) costs for the inbound traffic, but can recover the unrecovered common costs from the price it charges for outbound (originating) services (retail or wholesale):

- For operators that do not sell origination – either for wholesale line rental (WLR)/carrier pre-select (CPS) in fixed, or for MVNO/national roaming in mobile – the originating traffic is their own retail traffic (on-net or off-net).

- For operators that do sell origination – either as a regulated service (e.g. CPS) or an unregulated service (e.g. MVNO) – the originating traffic can include their own retail traffic and that of the wholesale customers.

As a result of pure LRIC for wholesale termination, the prices of wholesale origination traffic may need to change. The EC Recommendation does not discuss this issue.³⁷ The rest of this section discusses the following potential options for setting the origination price:

- pure LRIC
- LRIC+
- LRIC+ plus additional mark-ups for (some) of the unrecovered common costs.

3.4.1 Pure LRIC

A situation in which wholesale origination services (CPS/WLR or MVNO/national roaming) are also set at “pure LRIC” termination prices would begin a spiral of decline for the originating operator, as it would be selling both originating and terminating calls (including, in effect, end-to-end calls) for less than its average cost of production, without recovering any of the common costs. This is expropriation, and unsustainable in the long run, given that the retail arm of the originating operator (whose costs would include the common costs) would be at a disadvantage to those buying origination (whose costs, i.e. the interconnect charges, would not include the common costs). In our view pure LRIC is therefore not appropriate for origination.

3.4.2 LRIC+

A situation in which wholesale origination customers are charged current LRIC+ prices (and pure LRIC only for termination) would also begin a spiral of decline for the originating operator, because the retail arm of the originating operator would be at a material disadvantage to the CPS or MVNO operators that are charged for only a fraction of the common costs. For example, the CPS operators’ costs would be CPS origination (LRIC+) and termination (pure LRIC), the sum of which is less than the total cost (including common cost) of the end-to-end call. As a result, the party selling wholesale origination would lose its ability to recover its full costs. Therefore, where termination is set at pure LRIC, we also consider that LRIC+ is also not appropriate for origination.

3.4.3 LRIC+ plus additional mark-ups for the unrecovered (termination) common costs

Additional mark-ups to recover the unrecovered common costs could be applied in a number of ways, of which the most straightforward are:

- across originating calls
- allocating all or part of the additional common cost to other (i.e. non-voice) services.

³⁷ In recent comments letters in French and Dutch cases, the EC expressed preference for these common costs not to be recovered via other wholesale charges.

Across originating calls

The most straightforward way in which the revenues can be balanced without distorting the market or compromising the competitive position of the wholesale operator (and in fact all infrastructure builders) is for the price of wholesale origination (CPS and MVNO, albeit that MVNO is usually unregulated) to rise to compensate for no recovery of common costs through termination.

In essence, there are two ways to do this:

- *Either* recover all of the unrecovered cost of “termination” (including on-net termination) over all “originating” calls (including on-net calls) – this treats all “originating” calls (both retail and CPS/CS) equally
- *Or* just recover the unrecovered cost of off-net termination to CPS and WLR users, over CPS and WLR originating calls (i.e. not including on-net calls).

We note that these methods might give slightly different results due to the different calling patterns of retail and CPS subscribers. The first method may be easier to adopt, given the data available. The second method requires knowledge of the destination of inbound traffic and whether these are CPS or WLR subscribers which may not currently be analysed, and also has difficulty in treating any call-by-call call selection (CS) costs consistently (as these users may make some retail and some CS calls, a fraction of their common costs are able to be recovered from retail calls).

The amount by which the unit price of wholesale origination will need to rise depends on the level of traffic, but if the total minutes originated (whichever definition is used) is equal to the total minutes terminated (again, whichever definition is used), then the (retail/wholesale) origination unit price will need to rise by approximately the difference between the LRAIC+ unit price and the pure LRIC unit price. Asymmetrical volumes between origination and termination (e.g. due to international and mobile-to-fixed/fixed-to-mobile imbalances) may change the size of the required unit price adjustment.

Broadly speaking, this approach of uplifted origination charges is unlikely to introduce significant distortions in the market for fixed to fixed calls (the wholesale cost of an end to end fixed call bought as CPS origination and termination would change by only a small amount, depending on the relative volumes of origination and termination). However, there is one exception: CPS operators with a mix of calls to predominantly non-EU international destinations may suffer slightly as a result of this change because they will pay a higher origination rate, but not necessarily benefit from a correspondingly lower termination rate.

Allocating all or part of the additional common cost to other services

All or part of the common costs not included in the pure LRIC could be recovered through non voice services (e.g. broadband access, leased lines – possibly including non-SMP services) or even non-traffic services (such as WLR). This is a possible choice, and worthy of more detailed study, but at first sight it does raise a number of difficulties:

- The complexity is material, but it is achievable.
- It is costly for the regulator and the industry as a large number of regulatory pricing decisions might need to be reopened. This is particularly a concern if the other services have been price-regulated using different models.
- The operator selling origination may not be in a position to increase retail prices in areas where it does not have SMP, either due to competitive constraints or due to a universal service obligation (USO) price cap.
- Depending on how much of the at-risk common costs (i.e. the difference between LRAIC+ and pure LRIC for termination) is voice platform specific, it could give a rather similar result to the simpler method above i.e. the method of recovering common costs across originating calls.
- The portion of the common costs which is common to all voice services (e.g. the common switching costs) should not be recovered from non-voice services such as broadband access or leased lines.
- The simplest solution for setting origination prices, where termination is set using a “pure LRIC” approach, is to increase the unit price of all regulated origination services. The prices of unregulated origination services (such as MVNO) should also be expected to rise through commercial negotiation. The time required for such negotiations could be a factor in deciding whether to use a glide path.

4 Key economic and practical criteria for assessing the various regulatory approaches

4.1 Definition of the assessment criteria

The regulatory approaches described in Section 3 could all theoretically be used to determine the price of fixed and mobile voice call termination in Ireland. To determine how appropriate they might be in the Irish context, we have investigated them using a standardised set of assessment criteria.

We based our definition of the assessment criteria on ComReg’s statutory objectives, as shown in Figure 4.1 below.

Figure 4.1: Link between ComReg’s statutory objectives and the assessment criteria applied by Analysys Mason [Source: Analysys Mason, 2012]

ComReg’s statutory criteria		Criteria applied by Analysys Mason	
Promotion of competition	Ensuring no distortion or restriction of competition	Competition	Fixed–fixed
			Mobile–mobile
			Fixed–mobile
	Encouraging efficient investment and innovation	Efficiency	Allocative
Productive			
Dynamic			
Contributing to development of an internal market		Taking utmost account of the EC Recommendation	
Promoting interests of end users		Equity	
Other issues		Ease of decision and implementation of the approach	
		Transparency and regulatory certainty	

The first of ComReg’s statutory objectives is to promote competition by ensuring no distortion or restriction of competition and by encouraging efficient investment and innovation. In order to fulfil its obligations, ComReg therefore needs to take account of the impact of the possible approaches on:

- **competition** between operators: fixed–fixed, mobile–mobile, mobile–fixed
- **efficiency** measures: allocative, productive and dynamic.

The second of ComReg’s statutory objectives is to contribute to development of the internal market. In order to fulfil its obligations, ComReg therefore needs to **take utmost account of the EC Recommendation** of 7 May 2009 on voice termination.

The third of ComReg’s statutory objectives is to promote the interests of end users. In order to fulfil its obligations, ComReg therefore needs to take account of the impact of the possible approaches on:

- **equity** or fairness towards different groups.

In addition, ComReg’s statutory objectives mention the need for it “to ensure that measures taken by it are proportionate having regard to the objectives”. In order to fulfil its obligations, ComReg therefore needs to consider the remaining criteria:

- the **ease of deciding on and implementing** the proposed approach: what time and resources are required and what difficulties will be encountered by both the regulator and operators during the decision process and implementation of the approach
- the **transparency** of the price-setting process and the corresponding **regulatory certainty** for operators.

We have combined all of these criteria in a table that is used in Section 6 to assess the different approaches in the context of the Irish market (as discussed in Section 5 below). Figure 4.2 summarises the criteria used to assess the possible regulatory approaches.

Figure 4.2: Assessment table for regulatory approaches [Source: Analysys Mason, 2012]

Criteria		No price control	Fair and reasonable	Bill and keep	RRP	Cost orientation	
						LRAIC+	Pure LRIC
Need to take utmost account of the EC Recommendation							
Efficiency	Allocative						
	Productive						
	Dynamic						
Competition	F–F						
	M–M						
	F–M						
Equity							
Ease of decision and implementation of the approach							
Transparency/regulatory certainty							

The rest of this section discusses in greater detail the key economic guiding principles from which seven of the criteria are derived.

4.2 Additional information on efficiency criteria

This section discusses how the various types of efficiency measure can be affected by the levels of MTRs and FTRs.

Telecoms services markets are characterised by interdependencies and externalities, arising from the fact that those services are consumed within a network, not in isolation. There is a theoretical level of termination rates which maximises economic efficiency,³⁸ and this level should inform any regulatory decision with regard to termination rates. The traditional economic finding³⁹ is that it is cost-oriented termination rates that maximise efficiency.⁴⁰ Departures from such cost orientation may be justified by the presence of network and call externalities, which recommend over-charging and under-charging respectively.⁴¹

Traditionally, there are three types of efficiency that are seen to be important for maximising economic welfare:

- **allocative efficiency:** distributing goods and services in the way that maximises welfare
- **productive efficiency:** maximising the amount produced using a given set of resources
- **dynamic efficiency:** finding the optimal rate of innovation and investment, such that productive efficiency improves over time.

Between these efficiency measures, considerations of both cost minimisation and welfare maximisation are taken into account, both at a point in time and over a period of time. However, it is acknowledged by economists that it is only possible to achieve all three types of efficiency simultaneously under the assumption of a neo-classical perfectly competitive market: in a real-world situation there has to be a trade-off. This equates to a trade-off between the optimal efficiency-promoting regulation in a static (allocative or productive) and dynamic sense.

The rest of this section presents the three types of efficiency in the context of telecoms services, and assesses how these will be affected by MTR and FTR levels.

³⁸ Resources are optimally allocated such that every person benefits and waste is minimised.

³⁹ Using insights from the “workhorse model” of network competition in which networks maximise their network surplus by charging call prices equal to the perceived marginal cost and use the subscription fee as their method of competition for customers.

⁴⁰ *Network competition with income effects* (Tangeras, 2011).

⁴¹ *Nonlinear Pricing of Telecommunications with Call and Network Externalities* (Hahn, 2001).

4.2.1 Allocative efficiency

The EC Recommendation indicated the promotion of efficient production and consumption (i.e. allocative efficiency) as one of the goals of the move to a pure incremental approach. Indeed, the EC Recommendation indicated that “An incremental cost approach which allocates only efficiently incurred costs that would not be sustained if the service included in the increment was no longer produced (i.e. avoidable costs) promotes efficient production and consumption [...]”.⁴²

Pursuing allocative efficiency is a fundamental aim of the further regulation of MTRs and FTRs in Ireland, and is achieved by an allocatively efficient set of prices that recover the operators’ costs. Both marginal and common costs need to be recovered from the multiple services offered by network industries such as telecoms which have intrinsically large network and business common costs. Ideally, common costs would be recovered more from services with lower price elasticity and less from services with high elasticity. However, elasticity estimates are difficult to find and neither ComReg nor the Irish network operators have robust information on elasticities.

Allocative efficiency is affected by three important effects in telecoms services: network externalities (the benefit gained by (subsidising) more subscribers to the network); call externalities (the benefit you gain when someone calls you); and price differentiation (the ability of operators to (imperfectly) target a more efficient recovery of common costs on users or groups of users with differentiated prices).

In terms of allocative efficiency, the arguments for and against higher/lower MTRs and FTRs are balanced on these points in particular: (lack of) knowledge of elasticities; and the existence of various externality effects leading to various benefits from higher/lower MTRs and FTRs. In the case of FTRs, the wholesale divisions of eircom and BT also set wholesale origination rates but not retail prices. It is therefore the pricing departments of retail fixed operators which may need to consider allocative efficiency for fixed consumers.

Allocative efficiency in the case of a single product/service market

Allocative efficiency can be defined as a condition that is achieved when resources are efficiently allocated such that the maximum possible welfare can be achieved from their use. Such an allocation of the resources will be Pareto efficient, and as such it is impossible to increase the utility of any one individual without having a negative impact on the utility of another.

In the case of a single product/service market with perfect competition,⁴³ allocative efficiency can be seen to have been achieved where Demand meets Supply (see Figure 4.3); that is, the price that

⁴² Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC), Recital (15).

⁴³ A market structure in which the following conditions are met: no product differentiation; all firms are price takers; there is perfect knowledge; there is free entry and exit. Under such assumptions, price discrimination is impossible as any operator that increased its prices would be automatically priced out of the market.

the consumer pays for an additional unit of a good or service (which represents its valuation or marginal utility of the good or service) is equal to the cost of production of that additional unit. Allocative efficiency is a necessary criterion for welfare maximisation as it ensures that overall benefits to consumers and producers are maximised.

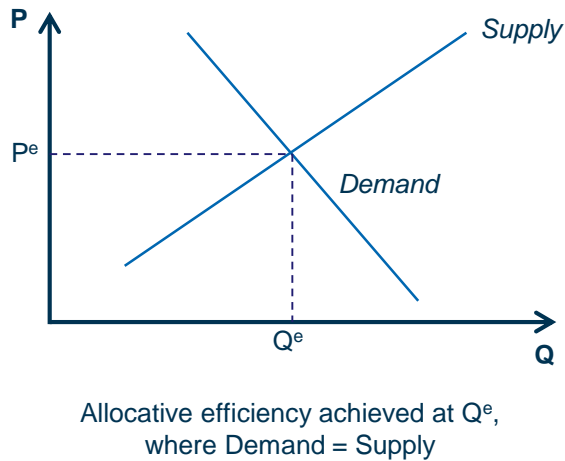


Figure 4.3: Illustration of allocative efficiency in the case of a single product/service market with perfect competition [Source: Analysys Mason, 2012]

In markets where not all of the conditions for perfect competition are met, the market will not naturally move to the equilibrium point where Demand=Supply, because a firm with some market power will charge excessive price and restrict output in order to maximise its profits. In this case, an operator can move towards greater allocative efficiency through various forms of price discrimination affecting retail tariff/subscription structure. This is because price determination allows a firm to increase its profits without restricting output and total welfare. It should be noted, however, that this will be at the cost of a transfer of consumer surplus to producer surplus. In addition, price discrimination is difficult to achieve in practice (e.g. customers have an incentive to understate their willingness to pay in order to maximise their welfare).

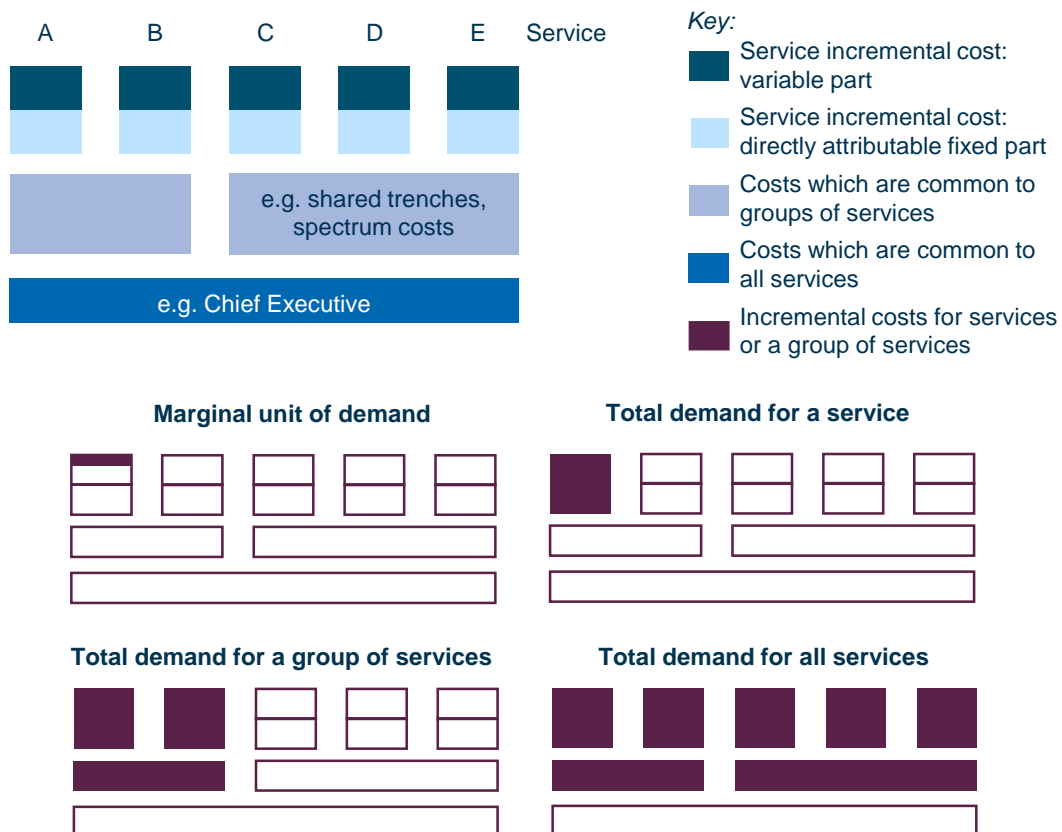
While the above discussion of a one-product/one-service market is useful in terms of establishing what is meant by allocative efficiency, telecoms services are more complex and so we need to understand how the allocative efficiency principles apply in the case of a market with more than one product or service.

Allocative efficiency in the case of a market with more than one product/service

The main difference between a market with a single product/service and one with multiple products/services is that the costs of the firms in the market are made up of costs incremental to the products/services and of common costs. This differentiation can exist at multiple levels, as shown in Figure 4.4:

- services A and B have their own incremental costs and share some common costs
- services C, D and E have their own incremental costs and share some common costs
- both groups (A–B) and (C–D–E) share common costs.

Figure 4.4: Incremental and common costs [Source: Analysys Mason, 2012]



Whilst the demand would be maximised by pricing each service at the incremental cost, the common costs would not be recovered, and so there is a question of how the common costs should be recovered from different services. In markets with more than one good or service, the market can move towards a state of allocative efficiency when common costs are allocated so that a higher proportion of such costs are recovered from those goods or services with lower price elasticity; that is, those goods for which consumers are less sensitive to the resulting price increases (Ramsey-Boiteux).

For the purpose of this analysis, the two principal groups of products/services between which common costs must be allocated include:

- retail services (including voice, SMS, data, IPTV, etc.)
- wholesale voice services, including termination (for fixed and mobile) and origination (for fixed).

This means there are three types of common cost for operators to recover:

- costs common to retail services
- costs common to retail and wholesale services
- costs common to wholesale services.

► *Allocation of costs common to retail services*

In situations where operators have some level of market power, they can engage in price discriminatory behaviour in order to allocate their retail costs across services such that some have higher prices in order to subsidise others. The goal of such behaviour is that those consumers with the highest willingness to pay will take on more of the costs. However, the operators are unlikely to have the ability to perfectly price discriminate, such that they can set the price for each consumer based on their individual willingness to pay. It is more likely that the most operators can do is to separate the market into consumer groups, such as business vs. residential subscribers or smartphone users vs. basic phone users.

Although such price discriminatory behaviour increases welfare, in a non-perfectly competitive market it will do so at the expense of consumers who lose (some fraction of) their consumer surplus.

► *Allocation of costs common to retail and wholesale services*

The problem of choosing welfare-maximising prices for an operator's retail and wholesale services could theoretically also be solved using "Ramsey pricing", which is sometimes proposed as a regulatory approach. The general result is that customer groups have to carry a share of the common costs that is inversely related to their demand elasticity, with the heaviest burden (i.e. more of the common costs) placed on the least price-sensitive customers.

However, while theoretically appealing as a price-setting tool, this approach requires specific knowledge about demand elasticities that neither operators nor the regulator are likely to possess.⁴⁴ While the approach as a whole is therefore not able to be used by regulators, there are insights that could be applied to price setting. The most interesting of these is that, *from the point of view of allocative efficiency*, more common costs should be allocated to less demand-elastic services. These might possibly include wholesale termination, although competition and equity concerns could arise between fixed and mobile operators as well as between operators of different sizes (intra-fixed and intra-mobile). There are further problems with the application of the theory of Ramsey pricing in the real world; although it may lead to an optimal outcome with regard to efficiency, the competition and equity issues that arise could outweigh these benefits.

The applicability of Ramsey pricing to termination services has been the object of opposing views between the EC, European NRAs and the ERG⁴⁵ on one side, and some operators on the other.

Even if a greater allocation of common costs to wholesale termination did lead to higher allocative efficiency (assuming that wholesale termination is a less elastic service) for customers of those networks which are net recipients of termination revenues, this would not be the case for customers of those networks which are net payers. Furthermore, this would not fit with the EC

⁴⁴ As part of the preparation of this study, data was collected from the industry. However, no operator in Ireland had any data on elasticity.

⁴⁵ Now known as BEREC.

Recommendation, which states that termination rates at a national level should be calculated based on the forward-looking pure LRIC of an efficient operator,⁴⁶ i.e. no allocation of common costs whatsoever to wholesale termination.

The EC's goal is for implementation of this EC Recommendation to result in dynamic competition benefits arising principally from two sources: the ability to compete with low off-net tariffs, and a greater fraction of the mobile operators' revenues being derived from the competitive retail market. According to the EC, this should save customers money, and encourage investment and innovation across the entire telecoms sector.

In the ERG's response to the consultation on the EC Recommendation,⁴⁷ it stated that:

"The pure LRIC approach is likely to perform well against the allocative efficiency criterion and is also likely to lead to the absolute level of termination rates falling across Member States (although relative differences will remain and may in fact increase)."^{48,49}

Recently, European regulators such as Ofcom have set termination rates in line with this EC Recommendation according to the pure LRIC methodology. They believe that this will:

- promote efficiency
- promote sustainable competition in the retail mobile market
- confer the greatest possible benefits on end users of public electronic communication services.

Some mobile operators have used the Ramsey pricing argument alongside the concept of the "waterbed effect"⁵⁰ and its implications for allocative efficiency to oppose the EC Recommendation and to advance arguments in favour of high MTRs. These operators believe that, due to the waterbed effect, a reduction in MTRs would result in an increase in other charges (e.g. mobile-originated calls or subscriptions), thereby potentially reducing the number of subscriptions. They believe this may lead to an ambiguous welfare effect, which may include welfare losses and welfare transfers. The extent of these transfers would be dependent on the rate at which MTR reductions were passed through into changes in other prices, and the shape of the demand and cost curves.⁵¹

Some mobile operators have supported their view of the impact of the waterbed effect using arguments from various economic studies:

⁴⁶ Deviation from such an efficient cost level is permissible, if based on objective cost differences outside the control of operators.

⁴⁷ *IRG/ERG Response to Public Consultation on Termination Rates* (BEREC, previously known as ERG, 2008).

⁴⁸ We provide our assessment of pure LRIC against the allocative efficiency criteria in Section 6.2.

⁴⁹ We agree with the view of the ERG here that pure LRIC will result in lower termination rates, and that relative differences are likely to remain or could increase.

⁵⁰ This refers to the notion that a reduction in termination rates would bring about higher prices for subscribers, as operators would recover their costs by increasing retail prices.

⁵¹ *The "Waterbed" effect and price regulation* (Schiff, 2008).

- Genakos and Valletti⁵² found evidence that such a waterbed effect is strong, but not complete⁵³ and, as such, excess profits on termination would not be fully competed away. Furthermore, they showed that it is not only competition and market saturation, but also their interaction, which may determine the overall impact on prices of the waterbed effect. The strength of the waterbed effect increases as competition becomes more intense, especially in markets with high levels of penetration.
- In Schiff's analysis⁵¹ of the waterbed effect under perfect competition, he demonstrated that such a competitive environment would drive the prices for a mobile subscription down to the per-customer marginal cost of service provision, thereby giving subscribers a subsidy that was equal to their termination revenues. Thus a reduction in the termination rate and any resulting reduction in termination revenues would increase the cost of a mobile subscription.

► *Allocation of costs common to wholesale services*

The problems of the application of Ramsey pricing to common costs for retail and wholesale services are exacerbated when attempting to use the method for those costs common only to wholesale services, as it is even less likely that the elasticities will be revealed. In the majority of cases, and due to the practical issues associated with Ramsey pricing, these costs are recovered using equi-proportionate mark-up (EPMU).

Impact of externalities on allocative efficiency

Until now, we have considered the termination market without the existence of externalities. This is an unrealistic assumption, and so in this section we consider externalities and their impact on allocative efficiency.

Externalities are third-party (or spill-over) effects arising from the production and/or consumption of products and services but which do not have a direct impact on the production or consumption decisions. Externalities can result in market inefficiencies, as the price structure does not take into account the full social costs and benefits of the services without regulatory intervention. With regard to telecoms networks, there are three specific externality types that it is important to consider:

- network externalities (the benefit I gain from you choosing to join any network)
- call externalities (the benefit I gain from receiving a call you choose to make)
- so-called tariff-mediated network externalities (the benefit subscribers to one network gain from being able to make calls to other members of the same network at lower prices, if there is price discrimination between on-net and off-net calls); these are discussed in Section 4.3, as they arise endogenously and can create competition issues.

⁵² Testing the "Waterbed" Effect in Mobile Telephony (Genakos and Valletti, 2008).

⁵³ Empirically, while they found that a 10% fall in mobile termination rates resulted in a 10% rise in mobile retail prices, accounting measures of profits are positively correlated with mobile termination rates.

The existence of network and call externalities suggests that the market forces that lead to allocative efficiency may not in fact lead to the most socially efficient outcome. The reason for this is that externalities may result in a divergence between the *private* cost and benefit and the *social* cost and benefit of a good, such that the supply and demand curves to which the market reacts are not the true society supply and demand curves. Hence the good or service in question may be under- or over-produced. In Figure 4.5, a positive externality⁵⁴ is considered, such that there are benefits to society that are not taken into consideration. The market will resolve to Q^i , although the point at which allocative efficiency would be achieved is at Q^* .

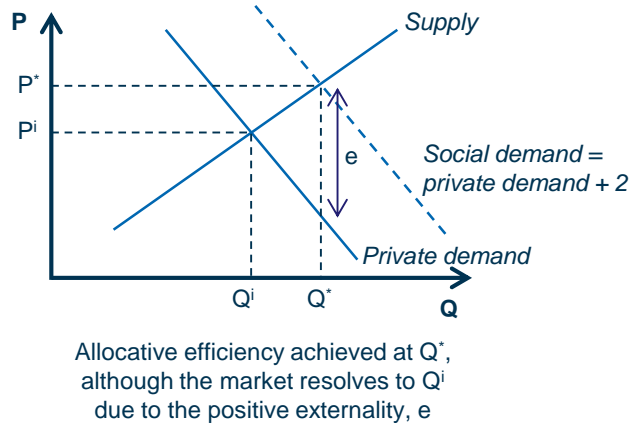


Figure 4.5: The effect of a positive externality
[Source: Analysys Mason, 2012]

Network externalities

Network externalities occur when, as the number of users on a network increases, the value of that network to other users increases. The value that consumers derive from telecoms services is a positive function of how many consumers are connected through the network. If the market is unsaturated and some possible subscribers need a subsidy to join the network, it can be argued that with prices set at the level of network costs, an inefficiently low number of consumers may connect to the network. Such a subsidy may, for instance, be funded by setting termination charges above costs, allowing operators to make profits which they can use to support prices that encourage additional subscriptions and therefore achieve the welfare-maximising level of market participation.

We note, however, that this argument is only valid if the market is unsaturated and if some possible subscribers need a subsidy to *join* the network, or in the situation where the costs of *maintaining* a subscription to a network are heavily subsidised and a large proportion of the user base would disconnect without this ongoing subsidy. In the mobile markets of developed countries, including Ireland, the network cost of keeping a user on the network is low (amounting to a SIM plus home location register (HLR), location updating and user registration costs) and the handset terminal cost of keeping a user on a network is also low or zero because there are sufficient old but working mobile handsets available to these marginal end users (due to the

⁵⁴ This could be a network externality.

continued regular subsidy of new handsets by mobile providers). In addition, the argument does not take into account the cost to society of high termination rates. Despite the benefit to subscribers in the form of subsidised services, the cost to callers outweighs this with respect to the welfare of society as a whole.⁵⁵ This means that high termination rates will result in consumers, as a group, paying more.

The argument for network externalities would be potentially valid for both fixed and mobile termination, but it has been used mainly by mobile operators wishing to support their view that network externalities justify termination rates being higher than network costs. The argument depends on a combination of a combination of the following assumptions:

- fixed networks are saturated and USO-type obligations mean low-income fixed subscribers do not receive a subsidy from higher fixed termination charges
- mobile networks are unsaturated and some low-income fixed subscribers need to receive a subsidy coming from higher mobile termination charges
- mobile connectivity generates more externalities than fixed connectivity (for example, because people can be called everywhere).

With regard to the network externalities of fixed networks, the evidence points to these networks being largely saturated, with those countries that have a developed telecoms infrastructure demonstrating high penetration levels and slowing (and in some cases falling) subscription numbers. Furthermore, in many countries the marginal users are protected by universal service obligation (USO) legislation which provides “social offers”,⁵⁶ entailing lower prices for customers on lower incomes. Such marginal users will continue to have access to cheap voice services regardless of any impact that a change in termination rates might have on general telephony service prices.

Squire⁵⁷ states that the introduction of an optimal pricing regime will internalise the externalities⁵⁸ that occur as the number of subscribers changes. Failure to take these interdependencies into account within the pricing regime would be likely to result in a socially sub-optimal network size, with a resulting welfare loss from not internalising the externalities. For instance, if both fixed and mobile network users benefited from an increase in mobile network size as a result of a reduction in mobile retail prices, it would be efficient for fixed subscribers to subsidise the access costs of mobile customers in some way. This subsidy is optimal when a marginal increase in the mobile subsidy results in an external benefit to fixed subscribers equal to the increase in the deadweight loss. Thus, *from the point of view of allocative efficiency in the presence of network externalities*, it could be argued that it is efficient to set fixed-to-mobile MTRs above cost to a certain degree, as

⁵⁵ *The theory of access pricing and interconnection* (Armstrong, 2002).

⁵⁶ DIRECTIVE 2002/22/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive) (EC, 2002).

⁵⁷ *Some aspects of optimal pricing for telecommunications* (Squire, 1973).

⁵⁸ Internalising an externality refers to the incorporation of an externality into the market decision-making process through pricing or regulatory interventions, thereby making the originator of the externality take account of its cost or benefit for others.

this allows internalisation of the benefits that higher network penetration brings to other subscribers. According to Armstrong,⁵⁹ an optimal termination rate ought to be above cost, while remaining below that in an unregulated market in order to increase social welfare by enabling subsidies of less price-elastic services.

However, whilst additional network externality mark-ups have in the past been considered relevant, in most developed countries mobile networks are now highly penetrated and the marginal users who might be subsidised by higher MTRs are no longer as needful of these subsidised prices. This high penetration and the corresponding high number of subscribers make it difficult to support any argument that mobile services are unaffordable. Additional factors that weaken the arguments justifying network externality mark-ups include cheaper SIM-only packages marketed by the operators and the development of a second-hand market for handsets, removing the need for device subsidies for marginal customers.

Call externalities

Both parties involved in a phone call (the caller and the receiver) can derive some utility from the interaction, and if this is not taken into account in any pricing decision then externalities will arise, such that one group of consumers benefits while the other loses. For instance, if the caller pays the entire costs of the phone call (as is the case for most fixed and mobile calls in Ireland, except for international roaming or non-geographic calls), it is only the caller's welfare which determines their willingness to pay for the call, and the welfare of the receiving party is ignored in the decision of whether or not to make the call. In such a scenario, paying the cost of the entire call could dissuade many marginal callers from using the network, and the number of calls would be inefficiently low and social welfare would be lost. Both caller and receiver would lose from such a price structure. According to Ofcom:

“the presence of un-internalised call externalities may justify a further reduction in termination rates which might bring mobile and fixed termination rates even closer together”.

In scenarios where the call externalities are not internalised, welfare will be improved by ensuring that the pricing system takes into account the utility of the phone call to the receiving party. According to Armstrong,⁵⁹ the presence of such call externalities suggests that termination rates ought to be set below costs in order to encourage calls from other network subscribers and maximise welfare. This result applies across both mobile and fixed networks.

Under a 'bill and keep' regime, in which interconnection rates would be set to zero, it is explicitly recognised that the two parties should pay for the costs incurred on their own network, thereby sharing the costs of the call.

A 'receiving party pays' retail tariff (which is consistent with, but not required by, a bill and keep interconnect regime) internalises the call externalities directly.

⁵⁹ *The theory of access pricing and interconnection* (Armstrong, 2002).

4.2.2 Productive efficiency

The level of productive efficiency achieved by a market depends on the ability or desire of firms to fully exploit the economies of scale and scope available to them. In particular, setting prices at cost can assist in achieving productive efficiency, particularly if inefficient costs are not allowed. Conversely, however, asymmetric cost based termination rates may reduce the incentives for productive efficiency of the beneficiary operators i.e. those with higher rates. This point strengthens further the view that cost-orientation is the right approach to help achieve productive efficiency.

The EC supports both of these main points in the setting of regulated wholesale termination charges:⁶⁰ *“Productive efficiency takes place when a good is produced at the lowest cost possible. Rewarding an operator with a price above an efficient or cost-based level can reduce its incentives to innovate and minimise costs”* and *“asymmetric pricing can foster inefficient behaviour and generate productive inefficiencies”*.

Productive efficiency is achieved when output at a particular moment in time is produced at minimum average cost, and can be described as firms minimising their total costs with respect to production technology. This occurs when firms fully exploit their economies of scale and scope and produce with the most cost-efficient set of inputs and technologies available to them. Like allocative efficiency, productive efficiency is considered to be a type of static efficiency. Cost-oriented prices will encourage efficient utilisation of infrastructure (productive efficiency).⁶¹

Competition is important to productive efficiency. There is a large body of evidence to indicate that productivity will improve following regulatory reforms in previously sheltered sectors. Studies in many industries, including water⁶² and rail⁶³ have found that productive efficiency increases as a result of competition, as the rivalry between suppliers reduces marginal costs to the lowest achievable level. This indicates that with imperfect competition comes a significant amount of slack, such as excess use of labour.

However, in this case, there is a retail market and a wholesale market, and the regulated wholesale termination rates form only a small part of the operators’ revenues, assuming they receive net incoming revenues. Also, the network used by the retail market is the same as that used for providing wholesale termination. Accordingly, competition in the retail market (as long as it is sufficiently strong) will exert strong pressure for cost efficiency on the network, which will benefit wholesale termination. In our view, therefore, termination rates will have a positive impact on productive efficiency but this impact will be relatively limited: only in a situation where the retail market was not sufficiently competitive would there be any material additional pressure on efficiency derived from cost-oriented termination rates.

⁶⁰ EC Explanatory Memorandum, Section 4.2, page 20.

⁶¹ *The Theory of Access Pricing and Its Linkage with Investment Incentives* (Valletti, 2003).

⁶² *A study on potential benefits of upstream markets in the water sector in England and Wales* (Ofwat).

⁶³ *The impact of competition on productive efficiency in European railways* (Driessen, Lijesen and Mulder, 2006).

If the retail market is not fully competitive, there is a weak dependency between productive efficiency and the level of the charge set based on LRIC: low wholesale costs are to be preferred, and a termination charge based on the incremental cost of providing termination for an efficient operator would be likely to encourage operators to be efficient. For example, this situation could arise if the prospect of no longer recovering common costs from termination increased the priority given to cost control. If the termination rates are set symmetrically, based on the costs of an efficient provider there is no certainty for any operator that its own higher costs would be compensated: accordingly all operators face incentives to be efficient. Asymmetrical rates (i.e. higher rates for some operators) may reduce the incentives for productive efficiency.

4.2.3 Dynamic efficiency

Dynamic efficiency enables short- and long-term productive efficiency to be improved, through the process of investing in future improvements (new technologies, new services). Competition can foster dynamic efficiency as operators strive to produce at a lower cost compared to their rivals; the broader that competition is (or could be), the stronger the link between competitive activities and dynamic efficiency. Wholesale termination rates paid between operators can partly influence dynamic efficiency in three ways: the competitive balance between operators due to inflows or outflows of termination payments; whether an operator seeks to use higher- or lower-cost technology; and whether an operator undertakes additional investment (in existing or newer technologies and services).

The EC recognises⁶⁴ that the setting of wholesale termination rates should take into account that efficient investment and innovation should be encouraged sustainably across all telecoms markets, e.g. by ensuring FTRs or MTRs do not distort or restrict competition. Removing or reducing restrictions to competition also assists new entrants and alternative operators to enter the market, bringing the diversity and potential dynamic efficiency improvements of new technologies and/or lower costs.

Reductions in MTRs and FTRs give operators an incentive to make cost-reducing investments

Dynamic efficiency is a measure of a firm's productive efficiency over time, and enables the lowering of both short-run average cost (SRAC) and long-run average cost (LRAC) curves. In order to achieve such efficiency, goods and services should not only be produced using the most cost-efficient technology available (ensuring productive efficiency), but the firms should also be developing cost-reducing technologies and innovating new products. A necessary condition for dynamic efficiency is a competitive environment. Rivalries among suppliers are expected to encourage innovation, thereby reducing future costs and improving the quality and variety of products. A 2002 OECD study⁶⁵ found that market barriers have a negative impact on research and

⁶⁴ EC Explanatory Memorandum, Section 4.1, page 16.

⁶⁵ *Labour market institutions, product market regulation and innovation: Cross-country evidence* (Bassanini and Ernst, 2002).

development, while others⁶⁶ have found that it is neither monopoly nor perfectly competitive market structures that maximise innovation.

With regard to dynamic efficiency, it is likely that cost-saving measures aimed at retail services will also increase efficiency in the provision of termination. Were the termination rate to be set in line with the costs of a hypothetical efficient operator, this would create the correct economic environment for dynamic efficiency. It would give the correct incentives for less efficient operators to improve their efficiency, while the more efficient operators would be able to realise profits from investment and innovation. Such improvements in productive efficiency would reduce the price levels of services and increase subscriber welfare.

Overall impact of reductions in MTRs and FTRs on incentives to invest

Mobile and fixed operators have argued that reductions in MTRs and FTRs removed incentives to invest. However recent studies have shown that the effect is not clear-cut. For instance, Friederiszick at al.'s modelling⁶⁷ of investment under regulation⁶⁸ found that regulation has a statistically significant impact on fixed entrant's investment, while there is no statistically significant impact for either fixed incumbents or mobile operators, as shown in Figure 4.6.

Endogenous variable	Results of instrumental variables (IV) estimation ⁶⁹
EntryFix * Incumb	-0.02 (0.21)
EntryFix * Entrant	-0.44*** (0.15)
EntryMob * Mobile	0.87 (0.82)

Figure 4.6: Dynamic model of investment: results from instrumental variables (IV) estimation (dependent variable = Log(Infr)) [Source: Friederiszick, Grajek and Röller, 2008⁶⁷]

Even more importantly, we note that regulatory certainty is key in promoting investment. Indeed, an operator's anticipation of potential regulatory change may bring a change in its investment incentives.⁷⁰ Perceived regulatory instability therefore reduces investment, as a change in policy will change the value of assets specific to that policy and make specific investments appear more risky. This will ultimately reduce the operator's incentive to invest and innovate, thus restricting dynamic efficiency. In order to encourage investment, especially in the development and adoption of new technologies, regulators need to reduce hazards by making a credible commitment to policy stability and predictability. The regulation of MTRs and FTRs in Europe fits that description, as the commitment of the EC and of NRAs to the policy of reducing termination rates over time has

⁶⁶ *Competition and innovation: An Inverted U Relationship* (Aghion at al., 2002).

⁶⁷ *Analysing the Relationship between Regulation and Investment in the Telecom Sector* (Friederiszick, Grajek and Röller, 2008).

⁶⁸ Including price regulation such as regulation of termination rates, quantity regulation and market-entry regulation.

⁶⁹ Robust standard errors are in brackets.

⁷⁰ *The effect of regulatory uncertainty on investment: Evidence from the renewable energy generation* (Fabrizio, 2010).

been very stable. The EC Recommendation itself dates from 2009 and operators have had the time to anticipate its potential application to their own cases.

In addition, the regulation of FTRs and MTRs has the potential to avoid distortion or restriction of competition and promote a competitively neutral framework which would favour investment by both incumbent and new entrants.

4.3 Additional information on competition criteria

Termination rates have implications for retail prices for calls, which differ according to call type:

- mobile-to-mobile on-net calls incur no explicit termination charge
- mobile-to-fixed calls incur FTRs, which are regulated (and often priced according to cost)
- mobile-to-mobile off-net calls incur MTRs
- fixed-to-mobile calls incur MTRs.

This section first discusses some of the competitive issues associated with two-sided markets and how this explains the impact of wholesale termination on the level of competition in fixed and mobile telecoms markets.

The rest of the section considers the specific issues affecting:

- competition between fixed operators
- competition between mobile operators
- competition between fixed and mobile operators.

4.3.1 Competitive issues associated with two-sided markets

The competitive supply of services that cross two telecoms networks takes into account termination rates levied on the calling party network by the receiving party network; both users and networks are involved in the call. However, a competitive bottleneck arises between two networks because at present it is only technically feasible for customers to have calls delivered by their own operator. According to the EC Recommendation: *“There are currently no demand- nor supply-side substitutes for call termination on an individual network. Therefore, each network constitutes a separate relevant market and each network operator has a monopolistic position on the market for terminating calls on its own network.”*⁷¹

⁷¹ EC Explanatory Memorandum, Section 2.1, page 6.

If one operator sets high termination rates and uses the excess profits to subsidise on-net or other usage, then although private benefits may be higher, overall welfare will be lower. These tariff-mediated network externalities can then create large private benefits for networks of subscribers to large networks, and social losses for subscribers of other smaller networks. Setting higher or lower wholesale termination rates thus transfers wealth between terminating and originating operators. This affects operators' abilities to offer more or less competitive services to customers, and the impact on retail prices of setting different termination rates depends on the 'waterbed effect' (the re-balancing of other retail prices) and the extent to which changes in wholesale termination rates are directly 'passed through' to the corresponding retail calling service price.

The EC Recommendation identifies resolution of competition issues as one of the goals of the move to pure LRIC. Indeed, it indicates that "Where termination rates are set above efficient costs, this creates substantial transfers between fixed and mobile markets and consumers. In addition, in markets where operators have asymmetric market shares, this can result in significant payments from smaller to larger competitors [...]".⁷²

In a two-sided market there are two distinct groups of consumers – the calling party and the receiving party – that need each other in some way. Although they are willing to 'trade', if they do this without an intermediary network there will be very high costs to the consumer groups, as for every individual they wish to call they would have to establish a new connection. A 'platform', such as the operator acting as an intermediary, can bring the two sides together in order to increase efficiency and harvest the network externalities (see Section 4.2.1) in a manner the consumers cannot do alone, by lowering transaction costs and duplication costs and thereby reducing retail prices.

The fact that the operators are maximising their profits with respect to interlinked demand from two sides has implications for unregulated service pricing, as explained by Rochet and Tirole:⁷³

"the platform can affect the volume of transactions by charging more to one side of the market and reducing the price paid by an equal amount; in other words, the price structure matters, and platforms must design it so as to bring both sides on board".

In practice, two-sided markets often earn profits on one side and use these to subsidise the other. Evans and Schmalensee⁷⁴ found that the cross-price elasticities between consumer groups can result in a profit-maximising price for one side that is below the marginal cost, or even negative.

⁷² Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC), Recital (3).

⁷³ *Platform Competition in Two-Sided Markets* (Rochet and Tirole, 2003).

⁷⁴ *Markets with two-sided platforms* (Evans and Schmalensee, 2008).

This outcome is not necessarily an issue from a competition point of view if several firms can compete on both sides of the two-sided markets. However, competition issues arise in the case of a ‘competitive bottleneck’, as discussed below.

Competitive issues on the terminating operator side

Armstrong and Wright⁷⁵ define a competitive bottleneck as one in which firms compete to attract one group of consumers (Group A), but there are natural technological or geographical reasons for the individual consumers to either want to, or have to, deal with only one of those firms.⁷⁶ Meanwhile there is a second group of consumers (Group B) who wish to interact with Group A and can be charged high prices for access to the firms’ captive customers. In a highly competitive market, the monopoly profits generated by the high prices for Group B will be passed back to Group A consumers in the form of subsidised services.

This is particularly appropriate to telecoms markets, as when a consumer joins a network that network is the only one that is technically able to deliver calls to the consumer. Even with perfect competition for subscribers, such that overall profits are eliminated (via subsidised services), these excess profits and their corresponding deadweight losses will persist and reduce overall welfare. Additionally, due to the two-sided nature of the telecoms market, the additional revenues generated by high MTRs may be used to fund competitive activity in retail markets, which may distort consumer choices and hence reduce the scope for long-term competition.

This effect is a strong justification for regulatory intervention, as call termination in an unregulated market will be charged such that welfare losses result; the charges will be privately desirable but socially costly. Despite the benefit to subscribers in the form of subsidised services, the cost to callers outweighs this with respect to the welfare of society as a whole.⁷⁷ This means that high termination rates will result in consumers, as a group, paying more.

If the regulator takes action to control the market power of the terminating operators, this can (depending on the impact on retail prices) lead to a transfer of wealth to originating operators and hence have implications for competition.

Competitive issues on the originating operator side

Whenever there is a change in termination rates this results in a cost change for the originating operator, which it can react to in one of three distinct ways. If termination rates fall (or rise), there may be net cost savings (or increases), and an operator can:

- pass the cost savings (increases) directly onto consumers through a reduction (increase) in prices for the services directly affected by the termination charges

⁷⁵ *Mobile call termination* (Armstrong and Wright, 2007).

⁷⁶ The competitive bottleneck of termination (both mobile and fixed) obliges consumers to interact with only one firm.

⁷⁷ *The theory of access pricing and interconnection* (Armstrong, 2002).

- pass the cost savings (increases) onto consumers through price reductions (increases) spread across the operator's entire portfolio of services
- retain the cost savings (increases) as changes in profit without altering prices for its services.

Pass-through is the passing on of such cost changes to subscribers through changes in service prices, rather than retaining them as profits or losses.

Theoretically, in a perfectly competitive market an operator will set its prices based on costs, such that a change in an input cost (for example, MTRs) will lead to a change in price.⁷⁸ The extent of this price change will depend on the price elasticity of demand in the market. High demand elasticity will mean that operators keep their profit margins very low and the reduction in mobile termination rates will be matched by a relatively large reduction in prices. With inelastic demand, profit-maximising operators will charge a high mark-up, although the profit-maximising price of services is still likely to fall.

However, if the originating operator has been "obliged", as a result of regulatory intervention, to price its retail services below the profit-maximising level, the fall in MTRs may be considered an opportunity to move closer to this profit-maximising price and prices might not fall significantly, resulting in limited pass-through.

This issue has been mostly prevalent for fixed-to-mobile (FTM) pass-through due to the significant reduction in MTRs in recent years. The extent of FTM pass-through is contested, with some mobile call providers arguing that fixed-to-mobile calls have not reduced, but become more expensive, as MTRs have fallen.⁷⁹

MNOs have claimed that in scenarios where pass-through of termination rate reductions is incomplete, it may be welfare maximising to set termination rates high.⁷⁸ However, this argument from mobile operators overlooks the possibility that incomplete fixed pass-through might in fact be efficient. This means that the economic rents from calling are channelled back to fixed consumers as lower subscription charges or reduced charges for other types of call, rather than being retained by fixed operators as profits. We note that many mobile tariffs do not offer lower prices for calls to fixed numbers, even where the termination costs are minimal (which ought to allow the operators to offer cheaper calls), which implies that mobile-to-fixed pass-through is not complete either.

4.3.2 Impact of FTR and MTR regulation on mobile competition

Impact of MTR regulation on mobile competition

The nature of mobile competition is oligopolistic, as noted by Genakos and Valletti:⁵² *"Mobile markets worldwide are dominated by a small number of firms. Competition among them is*

⁷⁸ *Pass-through* (Sandbach, 2007).

⁷⁹ *Wholesale mobile voice call termination* (Ofcom, 2011).

expected to be somewhere between the two extreme scenarios of perfect competition and monopoly. Under these more general (oligopolistic) market conditions, the same economic logic applies.”

Indeed, there are significant fixed costs involved in providing mobile service, and so mobile markets will always be oligopolistic. One of the observed profit-maximising approaches used by mobile operators is to set termination charges and retail off-net charges above cost and to discriminate between retail prices for on-net and off-net calls.⁸⁰ Such price discrimination, with low on-net and high off-net charges, generates “tariff-mediated externalities”,⁸¹ resulting in a competitive advantage for the larger network operators⁸² and a potential reduction in the degree of competition that can be brought to bear by smaller network operators.

These tariff-mediated network externalities are created because the discrepancy between on-net and off-net charges causes subscribers to care about which network the people they want to call are on. Tariff-mediated externalities put smaller networks at a disadvantage, while benefiting networks that have a large customer base. The inefficiency arises from the fact that retail off-net calls will tend to be priced far higher than their underlying cost. Operators choose not to offer off-net calls at the same price as their on-net calls, thereby restricting the demand for off-net call minutes. This effect is particularly detrimental for smaller operators as a result of the call externalities (the utility derived from receiving calls), as those on smaller networks will have a smaller pool of individuals who can call them on the cheaper and more attractive on-net price than those on the larger networks. As a result, in order to compete smaller networks may be obliged to offer even lower prices than would otherwise be the case, as shown by Hoernig.⁸³ He found that even in a market with a balanced calling pattern, where each consumer calls every other consumer with the same probability regardless of whether or not they are on the same network, then, in cases where there is either asymmetry of MTRs or there are call externalities, on-net/off-net retail price differentials will arise, which will cause an imbalance in the traffic between the two networks. With such asymmetrical traffic a smaller network will incur a permanent access deficit.

Such behaviour (creation of on-net/off-net differentials) could also act as a barrier to entry, thereby restricting competition and having a negative effect on dynamic efficiency. A new entrant could find itself at a disadvantage in offering retail access and outgoing call services, due to its asymmetric position in the market. This suggests that low and symmetric mobile termination rates are beneficial for mobile competition.

If there is asymmetry, some (typically smaller) MNOs or MVNOs may have MTRs set higher than those for other MNOs, enabling them to compete by using their additional revenue to subsidise some of the services they provide. However, higher MTRs for smaller operators also help larger

⁸⁰ *Mobile network competition, customer ignorance and fixed-to-mobile call prices* (Gans and King, 2000).

⁸¹ Network externalities that come about as a result of differences between prices.

⁸² *Consultation document on a Draft joint ERG/EC approach on appropriate remedies in the new regulatory framework* (BEREC, previously known as European Regulators Group of National Regulatory Authorities (ERG), 2003).

⁸³ *On-Net and Off-Net Pricing on Asymmetric Telecommunications Networks* (Hoernig, 2007).

MNOs to justify high off-net prices, which reinforces tariff-mediated network externalities. It appears that, in the short term, such asymmetry can be beneficial by encouraging dynamic efficiency, but in the long term it can harm competition. An awareness of this is reflected in the EC Recommendation which allows asymmetric termination rates to last for a maximum of four years:⁸⁴ *“Drawing upon the ERG Common Position, it is reasonable to envisage a time frame of four years for phasing out asymmetries based on the estimation that in the mobile market it can be expected to take three to four years after entry to reach a market share of between 15 and 20%, thereby approaching the level of the minimum efficient scale.”*

Impact of FTR regulation on mobile competition

Many mobile operators do not offer lower prices for calls to fixed networks, even when these ought to be substantially cheaper than on-net calls. This behaviour gives us some insight into the market environment. Incomplete mobile-to-fixed pass-through implies that any impact of a change in FTRs must be very low, as in general there is no price difference.

There may arguably be some small effects arising from changes in FTRs for some mobile user groups, but they would be very minor.

This difference between the impact of fixed termination on mobile operators and the impact of mobile termination on fixed operators can be attributed to the relative importance of the termination rates within their costs. For mobile operators, the FTR is small compared to their retail costs, while for fixed operators, the MTR makes up a much larger part of the whole.

4.3.3 Impact of FTR and MTR regulation on fixed competition

Impact of FTR regulation on fixed competition

An incumbent fixed network operator, formerly a monopoly operator with a full network, has profit-maximisation incentives to set its FTR interconnection charges at high levels in the same way as mobile operators. Regulators have therefore found it necessary to intervene in setting the incumbent’s FTRs in order to enable competition in the market. These rates are traditionally cost oriented, and often based on LRAIC.

Setting FTRs at LRIC (with no mark-ups for common cost) in accordance with the EC Recommendation on the costing of wholesale termination services could have a particular effect on incumbents. This is because the incumbents typically also face ex-ante regulation on wholesale origination, again with cost orientation. For these CPS customers (with or without WLR) the incumbent would have no opportunity to recover common costs from retail services.

This situation could allow an alternative operator to purchase wholesale origination and termination from the incumbent without fully contributing to the common costs. In contrast, the

⁸⁴ Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC).

incumbent would have to absorb the full costs of its own end-to-end calls and would therefore be placed at a material competitive disadvantage relative to the new entrants. Competition and investment incentives may be weakened if the regulation of origination prices does not take account of changes in an operator's ability to recover common costs from termination. (See Section 3.4 earlier for detailed discussion of this important issue.)

Regulation of FTRs will promote competition among fixed operators, with lower FTRs reducing the likelihood of tariff-mediated externalities, and also being superior if there are un-internalised call externalities. As noted above, fixed penetration is very high and network externalities are therefore likely to have a limited effect on fixed networks.

Impact of MTR regulation on fixed competition

Although MTRs have no *direct* impact on fixed competition (as all fixed operators pay the same MTR to a given mobile operator or to all operators in the market), there is an indirect impact. This indirect impact arises from the way MTRs constrain what fixed operators can do on the retail side.

For example, if a reduction in MTRs occurs, some operators may be in a better position to retain the extra profit rather than passing it through, which would have competitive consequences. Operators serving the business segment, for instance, may have contractual clauses forcing them to pass on any reduction in MTRs.

A fall in MTRs would enable the use of a 'flat-rate' tariff which would create opportunities for operators, for example in relation to more innovative retail offers. A number of countries, including France, have fixed operators that sell retail bundles which include large quantities of inclusive voice minutes. Until recently it was not possible for such fixed operators to include calls to mobile networks in their inclusive minutes due to the high wholesale costs of such calls. However, following the latest regulatory initiatives to reduce MTRs in line with the EC Recommendation, fixed operators are starting to include calls to mobile in these bundles.⁸⁵

In conclusion, although it is difficult to predict the impact on retail prices, lower MTRs will promote retail competition by fixed operators to some extent.

4.3.4 Impact of FTR and MTR regulation on fixed–mobile competition

Impact of MTR regulation on fixed–mobile competition

Mobile and fixed networks are involved in a degree of competition because their services, mobile and fixed calls respectively, are partially substitutable. In particular, certain households have given up their fixed line and are 'mobile-only', while some other households do not have a mobile phone. This means that effects which distribute resources between fixed and mobile networks and

⁸⁵ For example, a number of French fixed operators (Free, Orange, SFR, Numericable) offer unlimited fixed-to-mobile calls either in the package or as an option for approximately EUR3 per month.

affect retail prices (and competition between fixed and mobile networks) also cause transfer effects between households that make more or fewer mobile or fixed calls.

Wholesale MTRs are higher than FTRs, leading to net transfers of resources from the fixed to the mobile sector. To the extent that termination rates are above cost (e.g. reflecting market power, network externalities or as a result of glide paths), these transfers leave the fixed sector at a competitive disadvantage. In the past, it has been claimed that high MTRs have adversely affected fixed customers and operators and damaged fixed competition.⁸⁶

Impact of FTR regulation on fixed–mobile competition

The history of termination rate regulation for fixed and mobile networks has been radically different, with cost-based pricing for fixed networks being implemented at an earlier date. This historical asymmetry in the regulatory regimes has given mobile operators a competitive advantage over fixed operators, in that they benefited from cost-based FTRs while receiving unregulated MTRs.

It is arguable that the regulation of FTRs removes or lessens the degree to which fixed operators can use their buyer power to negotiate lower interconnection rates with mobile operators (and *vice versa*, albeit that regulation of fixed charges came first in most cases).

4.4 Additional information on equity criteria

In addition to efficiency and competition issues, a third set of economic criteria needs to be taken into account, related to the equity or distributional impact of the proposed approaches. This is because while society as a whole benefits from improvements in efficiency, this can result in negative welfare implications for certain consumer groups.

There are various possible sources of impact on different consumer groups, because termination rates:

- do not affect all types of call equally (e.g. only mobile-to-mobile off-net calls and fixed-to-mobile calls incur MTRs)
- have different impacts on different types of operator
- affect the attractiveness of users who receive more calls than they make
- represent both revenues and costs (in different amounts) for mobile-only, fixed-only and mobile-and-fixed customers.

As a consequence, any set of termination rates will result in some groups of users or operators being (dis)advantaged to a greater or lesser degree.

⁸⁶ *Mobile To Mobile Call Termination* (Rey and Julien, 2004).

While society as a whole benefits from improvements in efficiency, this can result in negative welfare implications for certain consumer groups (the equity–efficiency trade-off). This section assesses possible equity welfare implications of termination rates by looking at:

- the manner in which termination rates affect retail prices and potentially distort consumer choice, and
- the impact of changes in termination rates on different user groups and how they may result in welfare transfers between the groups.

Impact of termination rates on retail prices

Even if any profits earned as a result of above-cost termination rates are competed away, there may still be distortions of retail prices which may harm consumer welfare. They may enable mobile services to be subsidised, which could distort consumer choices with regard to both subscriptions and call minutes. As a result, there could be inefficiently high consumption of certain services (e.g. on-net calls) at the expense of other services (e.g. fixed voice subscriptions, off-net calls). According to Gans and King,⁸⁷ regulation leading to a reduction in MTRs will result in a fall in the cross-subsidisation of mobile subscriptions. This could remove distortions of consumer behaviour and lower the price of fixed-to-mobile calls (depending on pass-through), and while it may reduce mobile subscriptions, the cheaper or in-bundle fixed-to-mobile calls may contribute to a corresponding increase in fixed subscriptions.

It has been argued that lower MTRs will make certain customer groups unattractive to serve (chiefly those who receive many more calls than they make), and that this may cause operators to wish not to serve these customers. If MTRs fall, retail mobile prices may rise slightly over time, as a result of waterbed effects (e.g. arising from the loss of revenues from fixed-to-mobile calls), and this might cause subscription levels (the number of end users with a mobile phone) to decline modestly. It should be noted that the penetration impacts are more complex, as there are many end users with two or more subscriptions, and some of these may exist as a result of tariff-mediated externalities which should decline over time. However, the currently relatively high level of on-net calls (again due to tariff-mediated externalities) means that, at least in the short term, this effect is not as big as might be thought (those users who are net receivers of calls are often called by on-net callers).

In addition, if the termination rate is at or above incremental cost the calls do not actually lose money (albeit the other costs of servicing those customers have to be borne by the few outbound calls they make). The cost to operators of keeping their existing pre-pay users on the network can be calculated as the cost of maintaining customer records on the HLR. This value is relatively low, as discussed in Section 5.4.1, suggesting that keeping existing customers who make few calls is relatively inexpensive (compared to, for example, the costs of signing up a new subscriber).

⁸⁷ *Mobile network competition, customer ignorance and fixed-to-mobile call prices* (Gans and King, 2000).

Impact of changes in termination rates on different user groups

A reduction in termination rates would bring about utility transfers between different groups of consumers, as described below.

► *Mobile vs. fixed user groups*

Via this mechanism, such a fall in MTRs could reduce the utility of both mobile-only and mobile-and-fixed customers as mobile retail prices rise. However, if the retail price increases are targeted at specific products, this utility loss may not be felt by all.

In scenarios of high MTRs, and depending on the extent to which these high rates are used to subsidise mobile subscriptions, consumer behaviour is likely to be influenced. Mobile-only and mobile-and-fixed subscribers are likely to benefit from these low retail prices. However, as it is likely that operators will maximise their profits (which may include targeting specific groups of customers), not all mobile subscribers will reap the rewards. Furthermore, the benefit to mobile users may be offset by the high cost of calling other mobiles (e.g. via higher off-net tariffs).

A fall in MTRs is likely to benefit fixed-only consumers (depending on the extent of pass-through), while mobile-only consumers are likely to lose on average via the waterbed effect as their operators face a reduction in revenues from inbound fixed-to-mobile calls. The extent of the impact on these mobile-only subscribers depends on their sensitivity to retail price changes. In addition, the reduction in tariff-mediated network externalities (by removing the incentives for higher prices for off-net calls) may lead to greater competition in the retail mobile market, therefore benefiting all mobile subscribers. Meanwhile, consumers of both services have the potential to gain from such a move. There may also be incentives for those with multiple subscriptions to reduce their number of subscriptions if on-net and off-net tariffs are equalised.

► *Off net vs. on net user groups*

Excessively high termination charges not only shift welfare between consumers of fixed and mobile services, but also between the users of on-net and off-net calls. This is because on-net mobile-to-mobile calls are not subject to any explicit termination charges, which reduces their marginal cost. This results in utility transfers within the group of mobile consumers.

However, on-net discounts have been justified by some⁸⁸ not as a potentially anti-competitive practice which would harm certain consumer groups, but rather as a rational reaction to call externalities within the operator's own network. This could enable the internalising of these call externalities, since on-net calls provide the call externality to the networks' own subscribers and therefore on-net discounts would be an efficient and potentially welfare-maximising decision. However, in the situation where subscribers of larger operators benefit more from these on-net discounts, the attractiveness of smaller operators to consumers will be reduced and competition from smaller/new entrants may be weaker as a result.

⁸⁸ *Theory and practice of on-net pricing* (Sandbach, 2008).

► *MVNO customers vs. MNO subscribers*

In scenarios where MVNOs have their termination rates set asymmetrically, such that they are given the competitive advantage of higher termination rates, welfare will be shifted towards MVNO customers at the expense of MNO subscribers. This will enable MVNOs to earn excess profits that they could use to reduce retail prices for their customers.

► *Impact on vulnerable groups*

Changes in termination rates could raise equity ('fairness') concerns, particularly with regard to vulnerable consumer groups.

For instance, in relation to the regulation of mobile termination, vulnerable consumers may be equally distributed among both fixed-only and mobile-only subscriber groups (as they were in the UK⁸⁹), who on average are likely to gain and lose utility respectively from a reduction in MTRs. Indeed, certain disadvantaged consumer groups such as the elderly are likely⁹⁰ to use more fixed services and thus gain from the downward regulation of MTRs.

More generally, the EC Universal Service Directive and its provision of "social offers", as mentioned in Section 4.2.1 (page 33 earlier), permits the setting of "special tariff options to deal with the needs of low-income users"⁹¹ that may be used to protect the most vulnerable consumers from any telephony price rises resulting from a change in termination rates. In addition, Regulation 8 of the Universal Service Regulations⁹² provides that ComReg should monitor the evolution and level of retail tariffs, in particular in relation to national consumer prices and income.

ComReg's latest ICT survey in 2011 provided a variety of relevant equity data for Ireland:

- Older residents are more likely to be fixed-line users (99% of respondents aged 65+, compared to 64% of respondents aged under 30). Conversely, only 1% of these old-age households are mobile-only households, while 36% of under-30 households are mobile-only.
- Fixed-line household penetration is uniform at around 74% to 76% across social segments C1, C2 and DEF (which make up around 80% of households); and only slightly higher (at 84%) for social segment AB.
- Fixed-line penetration is relatively high for low-spending mobile customers (79% for those with mobile spending of EUR0 to EUR20 per month), and relatively high for high-spending mobile customers (80%+ for those with mobile spending of EUR70 or more per month). However, it is customers in the mid-range of mobile spending who have the lowest fixed-line

⁸⁹ *Wholesale mobile voice call termination Market Review, Annex 13 (Ofcom, 2010).*

⁹⁰ *E-Communications household survey report (EC, 2010).*

⁹¹ DIRECTIVE 2002/22/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive) (EC, 2002), Recital (10).

⁹² Which transposes the US Directive (European Communities (Electronic Communications) (Authorisation) Regulations 2011 (S.I. No. 337 of 2011) (the Universal Service Regulations).

penetration (and also the highest proportion of mobile-only households), with fixed-line penetration falling to as low as 67% for those with mobile spending of EUR36 to EUR49 per month).

- Mobile-only households are not strongly concentrated in lower income social segments: all of C1, C2 and DEF have between 24% and 26% mobile-only households, compared to 15% for AB households.

These statistics show that:

- There is a strong age trend in (increasing) fixed-line usage and (decreasing) mobile-only households.
- There is a reasonably uniform trend in fixed and mobile-only usage by social segment, with C1, C2 and DEF segments showing similar proportions, and AB segments showing slightly higher usage proportions (e.g. due to household wealth). Furthermore, it is users who are 'mid-range mobile spending users' (approx. EUR21 to EUR69 per month) that are typically mobile-only. Low-spending and high-spending mobile users (less than EUR20 or more than EUR70 per month) tend to have both fixed and mobile connections.

Therefore equity effects on fixed-only users will be emphasised in the older segments of the population, and effects on mobile-only users should not be prominent in low-spending or DEF segments of society.

5 Ireland-specific market factors for assessing the various regulatory approaches

5.1 Current regulatory context

This section describes the current regulatory context in Ireland, covering the fixed wholesale origination and termination markets and the mobile wholesale termination market.

5.1.1 Fixed wholesale origination and termination (Markets 2 and 3 of the 2007 Recommendation)

Decision No D06/07, published on 21 December 2007, set out ComReg’s “Market Analysis – Interconnection Market Review Fixed Wholesale Call Termination Services”. In this document, ComReg identified the SMP obligations that it considered would be appropriate to impose on an SMP operator in the relevant markets, including the obligations of access to specific network elements and associated facilities, transparency, non-discrimination, accounting separation, price control and cost accounting obligations. A subset of these obligations was imposed on the SMP FNOs, with the exception of eircom, on whom the full suite of obligations was imposed. These obligations are comprehensive but standard for Market 3; ComReg had previously established that cost modelling is a necessary means of regulating eircom in this area.

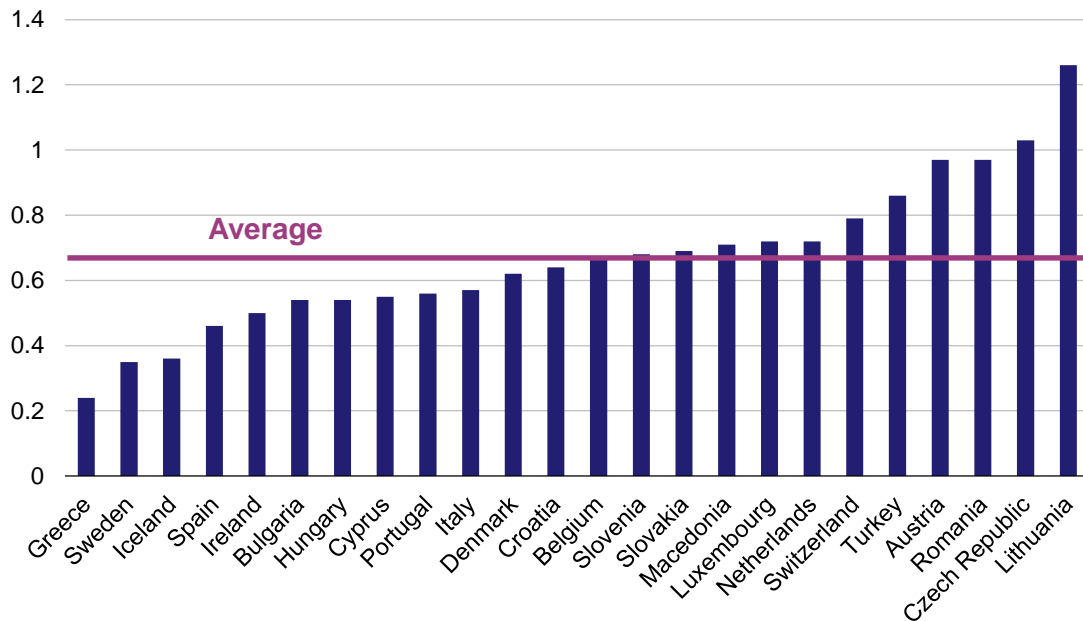
eircom publishes its call termination schedules, prices, product descriptions and inter-operator process manuals in its *RIO document*. The prices charged by eircom are already ‘cost-oriented’ and are required to be calculated using forward-looking long-run incremental costs (FL-LRIC); we understand that the current method relies on some fully distributed historical cost components, obtained from eircom’s cost accounting system.

However, according to BEREC’s⁹³ FTR Benchmark snapshot (as of January 2011)⁹⁴ the FTR reported for Ireland was close to the European average. This highlights that ComReg’s existing application of (commonly applied) top-down cost models to fixed incumbents has kept Ireland in line with European trends.

⁹³ Formerly known as European Regulators Group (ERG).

⁹⁴ Source: http://erg.eu.int/doc/berec/bor/bor11_57_ftsnapshot.pdf.

Figure 5.1: Interconnection charges for terminating calls on the incumbent's fixed network at 1 January 2011 (layer 2, average, in EURc) [Source: BEREC]



In 2007, eircom announced plans to start rolling out a core NGN over the period 2007–15. As such, the incumbent proposed the following four-phase plan:

- Phase 1: Deploy high-bandwidth Internet Protocol (IP)/Ethernet network to all sites with more than 200 working lines (approximately 240 sites)
- Phase 2: Deploy a public switched telephone network (PSTN) emulation server to provide for PSTN growth in Phase 1 sites
- Phase 3: Retire legacy PSTN equipment in Phase 1 sites
- Phase 4: Retire legacy PSTN equipment in remaining sites.

eircom has invested in constructing a core NGN and began to increase the speed of its fixed broadband offerings during 2010. For example, it upgraded the speeds of its entry-level broadband services, without increasing prices, to a headline speed of 8Mbit/s in January 2010, and launched a premium asymmetric digital subscriber line 2+(ADSL2+) service offering up to 24Mbit/s in March 2010. eircom launched NGN Ethernet services in August 2010 through eircom Wholesale, and as of June 2011 it offered speeds of up to 1Gbit/s from over 600 locations across Ireland.

Fibre-to-the-home (FTTH) trials in Sandyford and Wexford town covering 10 000 homes and businesses began in June 2010. In September 2010, eircom Wholesale held a next-generation access (NGA) industry engagement session to which around 40 wholesale customers were invited. During the session, customers were briefed on eircom Wholesale's Phase 1 fibre roll-out plans, which include delivering fibre infrastructure to over 100 000 homes and businesses by summer 2012. To further define the NGA products and processes that are to be developed by eircom

Wholesale, another series of industry workshops are to be held. Upgraded infrastructure will also use fibre-to-the-cabinet (FTTC) technology.

In parallel with the developments in NGN and NGA in Ireland, ComReg took steps to develop a bottom-up cost model for voice termination – this model, developed in 2008 [§<....], presents bottom-up cost estimates of both PSTN and NGN network costs for voice termination and origination on a LRAIC+ basis. It should be possible for this bottom-up model to be adjusted to calculate pure LRIC, but this activity would need further input from eircom and possibly other industry players, during consultation, to establish the scope of NGN costs that are incremental (avoidable) to the LRIC increment applied (e.g. the relatively limited traffic sensitivity of NGN transport, switching and voice platform costs).

[§<....] eircom’s phased NGN plans indicate that PSTN equipment will eventually be removed from major and minor network sites, and so although timing is somewhat uncertain (depending on the rate of eircom’s move away from PSTN) it can be expected that all fixed operators will operate IP interconnection in the medium to long term. Typically, a move to IP interconnection is accompanied by a reduction in the number of interconnection points: secondary interconnection points in Ireland may eventually be closed to interconnection, with only primary interconnection remaining in the largest cities (based on our experience, we estimate that a country the size of Ireland would have approximately three to five IP interconnection points). In this respect, we would expect eircom and other operators to be able to co-ordinate the removal of TDM interconnection at smaller nodes over the next three to five years, even if plain old telephony service (POTS)/PSTN services remain active in the access layer (e.g. served from IP multi-service access nodes (MSANs)).

The EC Recommendation which supports use of an NGN core model is therefore consistent with expected plans in Ireland, and the eventual move to IP interconnection should occur alongside the retirement of PSTN equipment. A cost model may therefore be used to establish one of three cases for fixed interconnection:

- all-IP interconnection (the efficient long-run situation)
- a blended cost based on progressive (“dynamically efficient across all services”) migration from TDM to IP interconnection
- separate costs for TDM and IP interconnection (the implication being that operators remaining on TDM interconnection may face a higher price due to the costs of additional protocol conversion equipment that is needed).

The EC Recommendation states in its Annex that for the purposes of a cost model, “*when defining the single efficient scale for the modelled operator, NRAs should therefore take into account the need to promote efficient entry while also recognising that under certain conditions smaller operators can produce at low unit costs in smaller geographic areas.*” This means that a large (national) operator would have a large (national) market share, and a small (regional) operator would have a small (regional) market share. A cost model of termination and origination based on

full national coverage should therefore have the market share of a full national operator – in Ireland this would be eircom.

5.1.2 Mobile wholesale termination (Market 7)

Irish operators charged the following MTRs as of 1 January 2012:

Figure 5.2: MTRs in Ireland on 1 January 2012 [Source: BEREC six-monthly snapshot report,⁹⁵ 2012]

Operator	Peak (EUR)	Off-peak (EUR)	Average (EUR)	Average weekend (EUR)
Vodafone	0.0522	0.0264	0.0402	0.0264
O2	0.0568	0.0209	0.0402	0.0214
Meteor	0.0738	0.0100	0.0402	0.0100
H3G	0.1388	0.0100	0.0782	0.0200
Tesco Mobile	0.1712	0.1202	0.1380	0.0981

The BEREC report also provides a snapshot of the average MTRs per country: Ireland's average MTR is marginally above the simple average of MTRs in Europe.⁹⁶

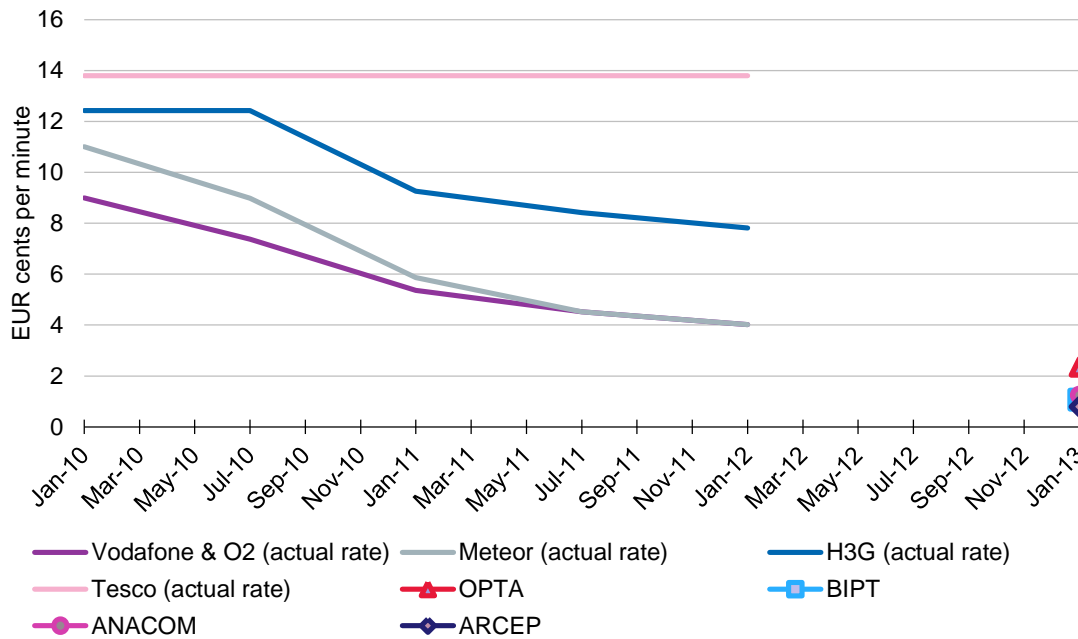
BEREC and the EC have announced that MTRs should be symmetric in a normal competitive market and that asymmetry requires an adequate justification. At present, the three main mobile operators in Ireland are applying symmetric termination rates, and H3G has not yet reached the targeted average rate or symmetry. Tesco Mobile, a full MVNO with its own termination rate, and Lycamobile, another MVNO who recently launched, also do not have a symmetric rate.

Figure 5.3 compares the voluntarily agreed MTRs of Ireland's mobile operators with the recent targets set by some other European regulators.

⁹⁵ Source: http://erg.eu.int/doc/bor_12_56_tr_integrated_snapshot_final.pdf.

⁹⁶ The average MTR in Ireland was EUR0.0464, slightly higher than the European simple average MTR of EUR0.0450.

Figure 5.3: MTR evolution in Ireland since 2010 [Source: Analysys Mason, 2012, based on BEREC MTR snapshot report of the dates shown http://erg.eu.int/documents/berec_docs/index_en.htm#board]



In terms of mobile spectrum, liberalisation of the 900MHz and 1800MHz bands will allow the deployment of 3G and 4G-based mobile broadband at these frequencies, which will also make it possible for operators to roll out extensions to their current mobile broadband networks. ComReg plans to hold a spectrum auction in 2012 for frequencies in the 800MHz, 900MHz and 1800MHz bands.⁹⁷ Current technology usage is shown in Figure 5.4, highlighting that H3G is the only 3G-only operator.

Figure 5.4: Current technology usage [Source: TeleGeography, PolicyTracker Global Spectrum Database, 2011]

Operator	2G	2.5G	3G	3.5G	4G
Vodafone	GSM	GPRS	UMTS/HSPA3.6	HSDPA/HSUPA/HSPA+	–
O2	GSM	GPRS/EDGE	UMTS/HSPA3.6	HSDPA/HSUPA	–
Meteor	GSM	GPRS/EDGE	UMTS	HSDPA/HSUPA/HSPA+	–
H3G Ireland	-	-	UMTS/HSPA7.2	HSDPA/HSUPA	–

By the end of the planned frequency auctions for the existing GSM bands, all the main mobile spectrum bands in use today (900, 1800 and 2100MHz) will have been awarded through market mechanisms.

[✂....]

[✂....]

⁹⁷ Multi-Band Spectrum Release: Release of the 800 MHz, 900 MHz and 1800 MHz radio spectrum bands, 24 August 2011, available at: http://www.comreg.ie/_fileupload/publications/ComReg1160.pdf.

The EC Recommendation⁹⁸ states that the radio access network should be based on a combination of 2G and 3G telephony, “reflecting the anticipated situation”.⁹⁹ The majority of operators in Ireland operate parallel 2G/3G networks (H3G is 3G only, but has a 2G roaming arrangement in place with Vodafone). Therefore the EC Recommendation appears generally consistent with the typical network technology situation in Ireland. 4G could be considered if it is expected that this technology will become commercially available during the period for which MTRs are set or will carry a material volume of voice termination traffic in the timeframe of price control, as the EC Recommendation indicates that “the cost model should be based on efficient technologies available in the time frame considered by the model.”⁹⁸

In terms of building a cost model for an efficient mobile operator, the EC Recommendation states in its Annex that “*the recommended approach is to set that scale at 20% market share [...] In case an NRA can prove that the market conditions in the territory of that Member State would imply a different minimum efficient scale, it could deviate from the recommended approach.*” In the case of Ireland, the three 2G/3G operators have a market share of at least 20%, and H3G has approximately 5% (8% including mobile broadband) but only one network (a 3G-only network). If ComReg adopts a bottom-up cost modelling approach to setting MTRs, it will be necessary for the modelling procedure to establish the efficient operator scale applicable to the Irish mobile network situation.

The EC Recommendation does not explicitly recommend how to approach the termination costs of MVNOs, but we believe that the following points are relevant:

- **EC Recommendation (10):** “*In case it can be demonstrated that a new mobile entrant operating below the minimum efficient scale incurs higher per-unit incremental costs than the modelled operator, [...] the NRAs may allow these higher costs to be recouped during a transitional period via regulated termination rates. Any such period should not exceed four years after market entry*”.
- **Footnote 42 in the Explanatory Note** to the EC Recommendation says: “*the opportunity to lease relevant network inputs from the mobile network operators may reduce the impact of economies of scale implying that low unit costs could potentially be achieved at low levels of output*”.
- **Annex on fixed network:** “*operators have the opportunity to build their networks in particular geographic areas and to focus on high-density routes and/or to rent relevant network inputs from the incumbents*”. We consider that this aspect of the fixed market EC Recommendation may be implicitly applied to the context of MVNOs during a modelling procedure, recognising that an MVNO has stratified its opportunity not by choosing to deploy a network by geography, but by selecting the network elements it chooses to operate

⁹⁸ Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC), Article 4.

⁹⁹ Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC), Recital (12).

(primarily interconnect/mobile switch, HLR and ancillary elements, but not radio access equipment).

5.2 Analysis of traffic and revenue flows between players

This section analyses the wholesale traffic and revenue flows between industry players to inform subsequent impact assessments.

Flows of traffic and revenues between mobile operators, between fixed operators, and between fixed and mobile operators, are summarised in Figure 5.5 and Figure 5.6 (based on data provided by ComReg). They show flows for H1 2011 (with values broadly rounded). For example, mobile operators sent [X....] million minutes of traffic to one another during this six-month period, and as a result paid EUR[X....] to one another for termination. It can be observed that although mobile-to-mobile and fixed-to-fixed traffic volumes are comparable, the termination payment between mobile operators is about ten times higher than the payment between fixed operators. Similarly, mobile-to-fixed traffic is approximately half of the volume of fixed-to-mobile traffic, but the associated mobile-to-fixed payment is just [X....]% of the fixed-to-mobile revenue flow. This clearly indicates that fixed operators pay mobile operators much more for termination than they receive in return, and fixed operators are therefore highly likely to benefit from a reduction in MTRs.

Figure 5.5: Flows of traffic among operators in H1 2011 (millions of minutes) [Source: Analysys Mason, 2012]

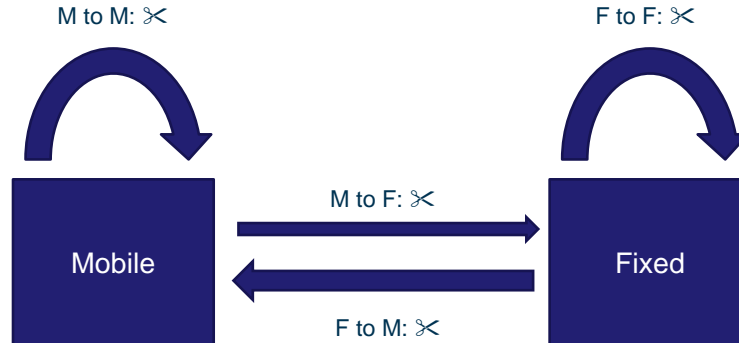
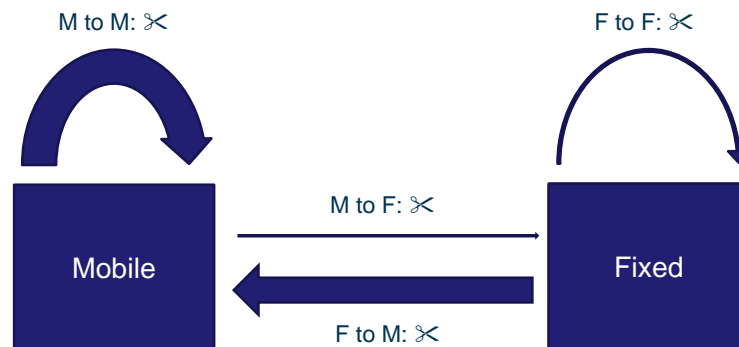


Figure 5.6: Flows of funds among operators in H1 2011 (EUR) [Source: Analysys Mason, 2012]



At the level of individual operators, the flows of traffic and funds to/from each mobile operator from/to all other mobile operators and from/to all fixed operators are shown in Figure 5.7 and Figure 5.8. For clarity, the information is presented as a percentage of total flows of traffic or funds for each mobile operator. For example, mobile operator 1 sent [%....]% of its total traffic with interconnected operators (total traffic with other interconnected operators being the sum of incoming and outgoing traffic, excluding on-net) to the other mobile operators, sent [%....]% to the fixed operators, and received [%....]% of its total interconnected traffic from the other mobile operators and [%....]% from the fixed operators, as shown at the top of Figure 5.7 (thus summing to 100% for each operator). As a results of these flows of traffic, mobile operator 1’s total flows of funds (sum of termination payments and revenues) with other operators comprised [%....]% paid to other mobile operators and [%....]% paid to fixed operators, and [%....]% received from other mobile operators and [%....]% received from fixed operators, as shown at the top of Figure 5.8. These figures show that there are some differences in the net flows of traffic and revenue among the mobile operators (with some making a net gain on mobile-to-mobile interconnection and others making a net loss). This demonstrates that the preferences for higher/lower MTRs when looking only at mobile-to-mobile traffic will vary by operator.

Figure 5.7: Flows of traffic among operators in H1 2011 (as a percentage of total traffic to/from each operator) [Source: Analysys Mason, 2012]

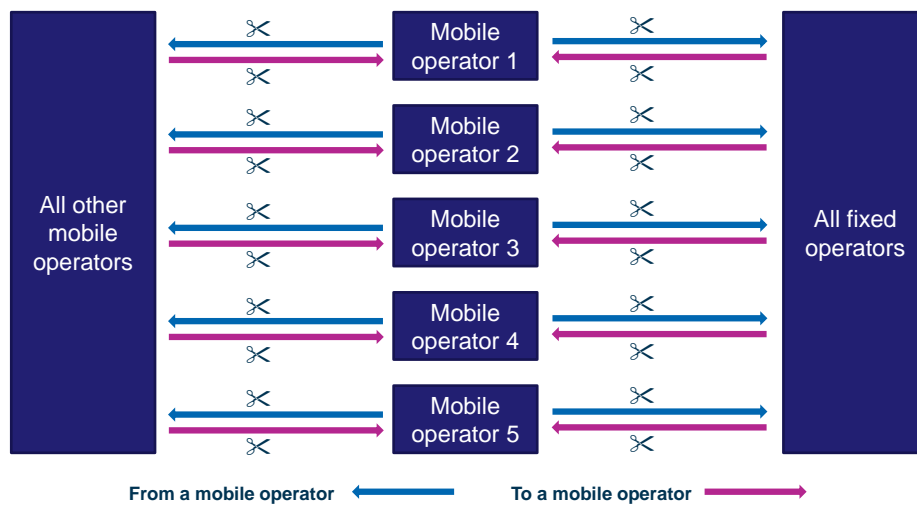
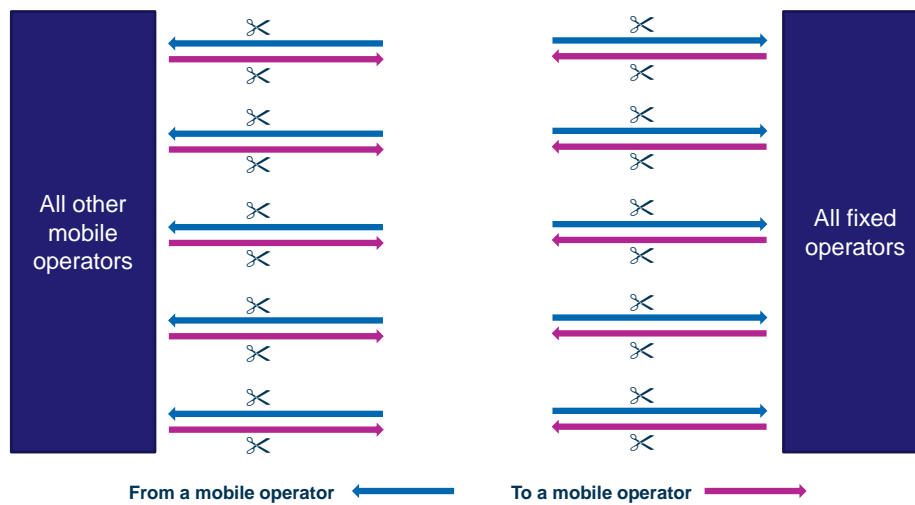


Figure 5.8: Flows of funds among operators in H1 2011 (as a percentage of total flow of funds to/from each operator) [Source: Analysys Mason, 2012]



5.3 Impact of FTR and MTR levels on wholesale and retail markets

This section discusses the impact of FTR and MTR levels on wholesale and retail markets by looking at:

- the impact on retail prices and pricing structures
- the impact on competition
- the impact on investment.

In developing the discussion in this section, we requested information from the Irish fixed and mobile operators, and have used a variety of the information that was made available to us during this project. It should be noted that we did not receive complete information from all operators, and the various quantitative responses were also provided at different levels of detail.

5.3.1 Impact on retail prices and pricing structures

Fixed market

The fixed market is characterised by one main player, eircom, and a number of other residential or business-focused competitors such as BT Ireland, UPC and Vodafone. All fixed operators typically offer line rental packages, including a number of options for inclusive calls, such as:

- no inclusive calls (line rental only)
- inclusive off-peak/weekend calls
- inclusive anytime calls excluding calls to mobile networks
- inclusive anytime calls including calls to mobile networks.

Operator data submitted to us indicates that less than [X....]% of residential fixed-line households subscribe to a package that includes calls to mobile networks; for business customers the percentage is higher, with around [X....]% having a package that includes calls to mobile networks. Furthermore all fixed operators indicated to us that, in the residential market, only a small proportion of customers subscribe to plans which have legacy ‘friends and family’ calling circle discounts. In the business market, because many companies have corporate private automatic branch exchange (PABX)/virtual private network (VPN) functionality, intra-company calling is not managed by the fixed network provider.

A number of operators submitted data to us on the declining retail price of fixed-to-mobile calls. The decline in retail prices can be correlated with the reductions in MTRs to show the level of pass-through of reductions. In the case of one residential-focused operator, there was a minor amount of pass-through [X....]. In contrast, for one business-focused operator more than half of the reduction in MTRs was passed through. We also received information from one operator that [X....] means that there would be 100% pass-through of any future MTR reductions.

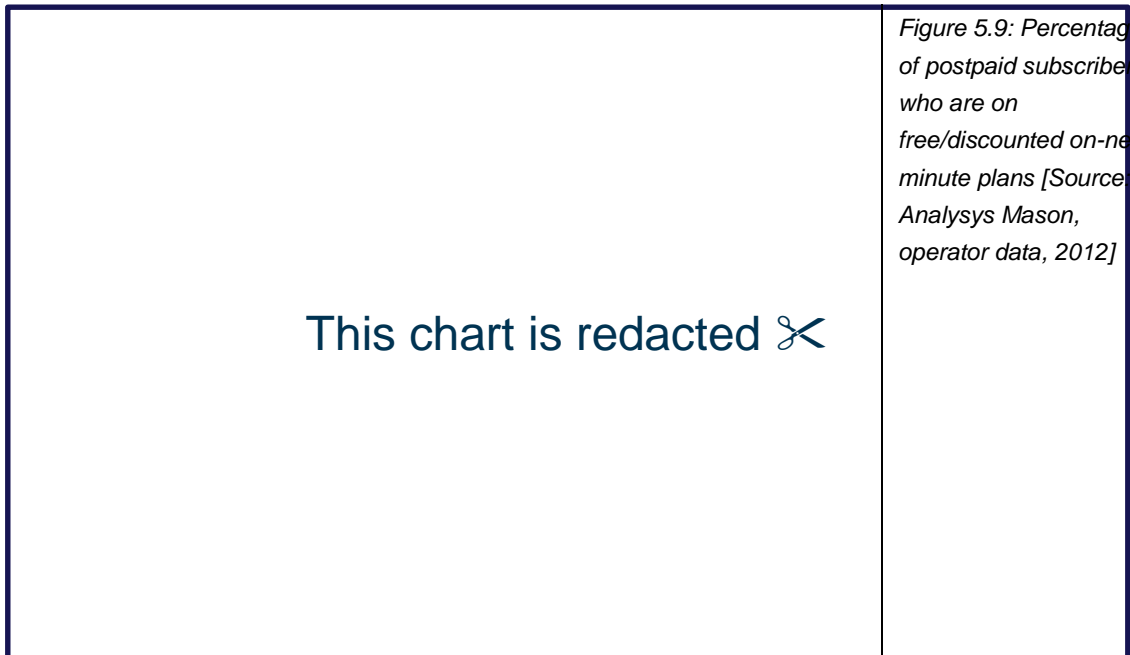
Fixed operators charge the same retail prices for calls to fixed (local or national) numbers, regardless of which operator is the terminating operator. This means that there are no material fixed-network tariff-mediated network externalities generated by groups of customers choosing one fixed network over another. However, eircom charges a lower price to customers for calling Meteor or eMobile numbers, which means that customers who have both fixed and mobile subscriptions may benefit from joining the eircom group.

Mobile market

All mobile operators offer a variety of prepaid and postpaid subscription packages. Most mobile operators also have a business division (offering SME and/or large corporate packages). However, there is no evidence of specific ‘friends and family numbers’ or ‘business group’ tariff discounts being offered by mobile operators to significant enduring segments of the market (with only a small number of legacy tariff plans having these structures). Discounted or free on-net tariffs do not fall in the category of ‘friends and family numbers’ or ‘business group’ tariff discounts as they are applicable to *all* the subscribers of an operator, not just a selected group of any-network users nominated by a subscriber. Instead, retail packages with on-net tariff discounts or free on-net calls are available on all mobile networks. This means that the externality benefits of low prices within frequent calling circles cannot easily be realised using off-net traffic.

Figure 5.9 shows the percentage of postpaid subscribers who are on free/discounted on-net minute plans for two of the mobile operators. This means that in order to benefit from discounted or free calls between specific user groups, consumer circles must take out subscriptions on the same mobile network. The benefit that these friends, families and business groups obtain as a result of this behaviour is a tariff-mediated network externality. Regarding off-net calls, typical mobile price plans that are currently available from all of the mobile operators do not normally differentiate between the price per minute to call off-net mobile numbers and the price for calling off-net fixed numbers. Given that current interconnection charges are significantly lower on fixed

networks than on mobile networks, it can be seen that mobile operators are not passing the lower FTR through to a lower retail tariff to call fixed networks.



The postpaid retail packages offered by mobile operators typically include a bundle of usage (minutes, SMS and/or megabytes of data) per month. The amount of usage included in the bundles for a certain monthly payment has increased in recent years. Prepaid top-ups increasingly include ‘added value’, where the mobile operator rewards regular or large top-ups with additional credit or specific additional usage allowances. Prepaid credits sold by the mobile providers typically remain valid for 12 or more months. Certain ‘minimal’ usage criteria are required to keep a prepaid subscription active (such as making a call, or adding the minimum prepaid credit in a 150-day period). However, there is no ‘standing charge’ levied on prepaid accounts.

Mobile operators do deactivate some of their inactive prepaid accounts – that is, probably those which are not used or topped up according to the operator’s specific activity criteria. In the situation where an operator closes prepaid accounts, it will be able to account for expired credit as a form of ‘revenue’ or accounting gain. The amount of prepaid credit which is expired is an interesting metric within the market, as it can point to a number of effects:

- customers may not place any value on the expired credit that they lose when prepaid subscriptions becomes inactive (whether through losing or abandoning the account)
- mobile operators may be able to accrue the benefit of expired credit to offset other costs.

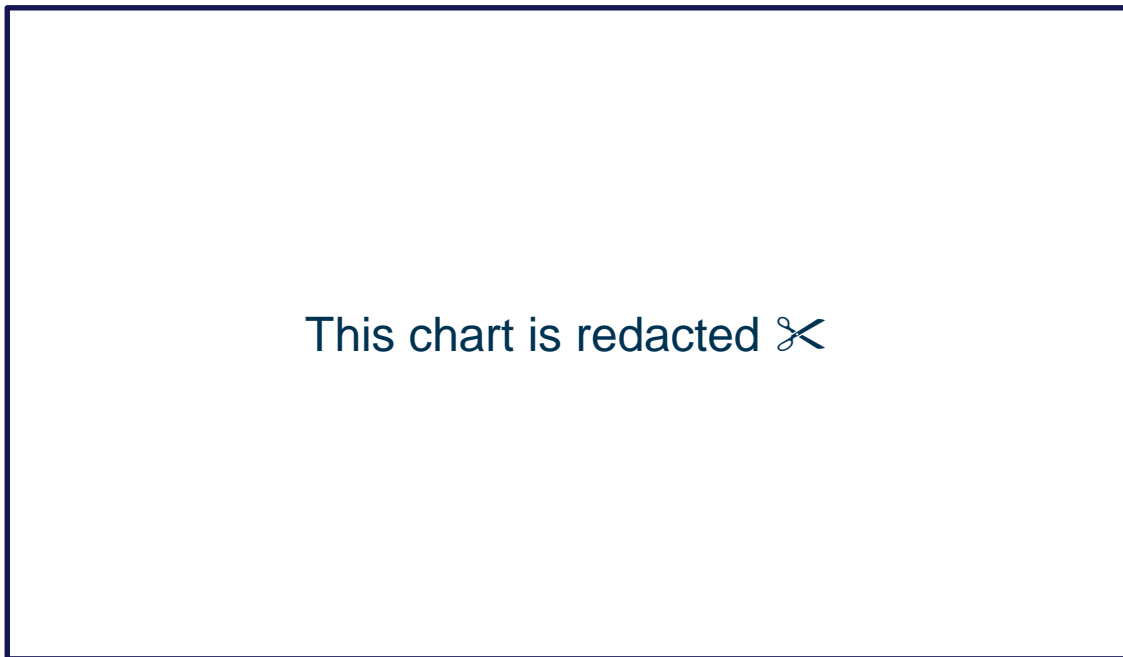
Information submitted by the mobile operators indicates that the amount of expired credit is, on average, very low (approximately EUR[✂....]–EUR[✂....] of expired credit per average prepaid customer per month). However, there is evidence from operator data that some prepaid packages (amounting to more than [✂....] prepaid customers in total) are associated with a much higher level of expired credit on average: these packages appear to have around EUR[✂....] of expired

credit per average prepaid customer per month. This suggests that some subscribers may not fully value the purchased or bonus prepaid credits that they are entitled to use. It is not known whether this level of credit expiry will persist, or whether it was related to specific marketing activities.

We observe that significant amounts of bonus call credit (in monetary value) is also offered by some mobile operators, in a number of ways, and also when customers port their number in from another mobile operator. The barrier to inter-operator competition in Ireland may be inferred from the high value of credit offered by one of the smaller MNOs to entice a customer to ‘port in’ from another operator.

On a decile and user group basis (according to the data provided by the operators), it can be observed that customers in the lowest-usage group pay the highest approximate price per minute¹⁰⁰ for the calls they make, as illustrated in Figure 5.10. Figure 5.10 also shows that the approximate price per minute declines to a lower level for very-high-usage customers (above [X....] minutes per month).

Figure 5.10: Approximate revenue for the operators per outgoing minute (including on-net) averaged across a number of mobile operators in Ireland [Source: Analysys Mason, 2012]



Information submitted by the mobile operators has allowed us to investigate the degree to which mobile operators are subsidising the costs of the handsets offered to customers when they join or remain a subscriber to an Irish mobile network. We have observed the following indicators:

¹⁰⁰ Approximate price per minute = retail ARPU / originated minutes (off-net to fixed, off-net to mobile, and on-net).

- A typical ‘voice’ handset costs around EUR[€...]-[€...]¹¹⁰¹ for the mobile operator to purchase from the manufacturer, package up and sell in the retail market. A typical voice handset today would still be expected to have non-voice features such a mega-pixel camera, colour screen, etc. We believe that basic voice handsets (i.e. without cameras, etc.) cost much less, at around EUR [€...].
- Consumers typically pay around EUR[€...] upfront for a basic voice handset package, meaning that the operator subsidises the handset itself by around EUR[€...]-[€...]. There is evidence that (some) basic voice prepaid packages are also subsidised, although to a lesser extent (between EUR[€...] and EUR[€...]. The subsidy would then be recouped through monthly and per-minute charges over the (expected) lifetime of the customer.
- A smartphone handset might cost the mobile operator between EUR[€...] and EUR[€...], depending on the type of device offered. Consumers typically pay more upfront for a smartphone package, and may also be required to subscribe to higher monthly payment commitments and/or a longer minimum contract term. However, despite the larger upfront retail payment, handset subsidies for smartphones can still be of the order of EUR[€...], EUR[€...] or EUR[€...] depending on the strategy of the operator, type of device, etc.
- No significant upfront subsidies are provided on mobile-broadband only subscriptions – the cost of a USB dongle is quite low (approximately EUR[€...]-[€...]) and it is typically only high-usage plans that include a subsidy against the upfront cost of the modem.
- For SIM-only packages (with no handset), the cost of the SIM is very low (approximately EUR[€...]).

The importance of SIM-only packages in Ireland can also be observed from recent operator data, which indicates that approximately [€...] SIM-only packages have been sold per month. In order for these packages to function there must obviously be a large available base of (unlocked) working mobile telephones, either sold second-hand or freely recycled.

5.3.2 Impact on competition

When operators in Ireland develop their competitive offers in the fixed and/or mobile access and origination markets, they have submitted to us that they may take into account a number of considerations with respect to MTRs and FTRs (depending on the positioning and scope of the operator), including the following:

- [€...]
- [€...]

¹⁰¹ Source: Analysys Mason estimates, supported by data submitted by the Irish mobile operators in response to our questionnaire.

- It may not be possible to purchase a wholesale (resale) package from a mobile network operator which includes free or unlimited types of usage, and so it may not be possible to rely on wholesale services to replicate some retail offers (particularly those mobile offers that include free or unlimited types of usage). This limits the ability of operators without networks to compete against free or unlimited retail packages.
- The relative size of the operator's own customer base compared to the size of the off-net customer base influences the amount of on-net/off-net traffic expected.
- Offering unlimited call bundles that include off-net mobile calls requires off-net MTRs to be factored into the price, taking into account expected (or fair) usage levels, and taking into account the fact that current MTRs are highly asymmetric; in this respect, lower MTRs would make it easier for operators to incorporate off-net mobile calls into larger or unlimited usage bundles on both fixed and mobile networks.
- [✂....]
- The ability for an operator to charge a higher termination rate than its competitors would allow it to accrue greater termination revenues with which to offer (more) attractive connection, subscription and/or usage retail prices to new and/or existing subscribers, as the higher termination rate helps the operator to have a higher in-payment than out-payment for interconnection services.
- A large difference in FTRs and MTRs, without any objective cost justification, does not facilitate the emergence of converged fixed–mobile offers.
- The (expected) profitability of individual customers may be measured by the operator (provided that management, IT and CRM systems have been designed to do this) and the profitability *may* be assessed taking into account both origination and termination revenues.
- Operators have a range of sources from which to recover their costs, including connection revenues, monthly subscriptions, per-call and per-minute charges, SMS and data charges, as well as revenues from prepaid customers obtained by setting minimum top-up amounts or voucher expiry timescales.

It is our view that the reduction of MTRs and FTRs, along with symmetric termination imposed on all players in each market should allow operators to develop new retail packages. These packages could provide larger or even unlimited¹⁰² off-net bundles, and so would greatly reduce tariff-mediated network externalities and promote competition. They could also be converged fixed–mobile offers.

¹⁰² Possibly with fair-usage policies

5.3.3 Impact on investment

The general investment activities of both fixed and mobile operators can be characterised as *next-generation core and access* deployments. In the case of fixed networks, there are core NGN (all-IP) deployments and NGA investments (FTTC, FTTH, and potentially removing PSTN and replacing with only voice over IP (VoIP) in the access network). In the case of mobile networks there are also core NGN deployments (moving to converged all-IP mobile core infrastructure) and advanced 3G and 4G access deployments (supporting mobile broadband and eventually mobile VoIP in the air interface).

These next-generation deployments are designed to support both voice and data traffic in a converged network, and in particular will benefit from significantly greater potential economies of scope from carrying voice and data traffic, using transmission architectures that can be scaled in a more cost-effective way. Investment cycles and asset lifetimes for NGNs are 10, 20 or more years.

Where wholesale termination rates are set above cost and generate a large proportion of overall revenues, the operator may choose to use these revenues to support larger investments in next-generation infrastructure. However, in our opinion investments are unlikely to be more than marginally reduced by lower termination rates. Depending on the intensity, retail competition will prevent operators from not investing in their network if they want to keep up with their competitors. Also, in relation to the investment decisions of operators, we are of the view that regulatory certainty matters as much as, if not more than, the actual level of termination rates. The EC Recommendation was published three years ago, and so operators have known for some time that their termination rates are likely to be reduced further, and should have had the opportunity to plan their investments accordingly.

5.4 Assessment of the impact on operators of a possible implementation of the EC recommended approach

This section assesses the impact on operators of a possible implementation of the EC recommended approach, both:

- at the level of particular groups of subscribers and
- at the level of the overall operator.

The assessment is based on a combination of:

- a move of mobile wholesale termination towards pure LRIC
- a move of fixed wholesale termination towards pure LRIC
- a move of fixed wholesale origination towards NGN-based LRAIC+.

5.4.1 Impact at the level of particular groups of subscribers

Using information provided to us as part of the data questionnaire, we have been able to observe and investigate the traffic patterns and revenues of different user groups – either by segment or by

decile of ARPU. Our investigation has simulated the effect on user revenues of a change to MTRs and FTRs (in this case applying a scenario that assumes EUR1c for mobile termination and EUR0.1c for fixed termination). The net revenue effect on each customer group then depends on the applicable traffic patterns and usage profiles. Our analysis, carried out for each operator which provided sufficient data, shows that for this scenario:

- [§<....].
- [§<....].
- [§<....].

In addition, as was explained in Section 5.3.1 (and shown in Figure 5.10), low-usage groups appear to be charged a (much) higher price per minute for outgoing traffic than other usage groups. The combination of these two effects leads to our conclusion that low-usage groups in particular are not heavily reliant on the termination revenue they accrue to their operator in order to be profitable to serve, and so these groups are not at risk of being forced to cancel their subscription following a reduction in termination rates. Moreover, we expect that network and competition effects would give operators an incentive to retain them on their network with a package designed for low-margin customers (e.g. SIM only, off-peak usage, etc.).

5.4.2 Impact at the level of the overall operator

This section uses the traffic flows described in Section 5.2 and information at the subscriber group level to estimate the impact at the level of the overall operators of:

- a move of mobile wholesale termination towards pure LRIC
- a move of fixed wholesale termination towards pure LRIC
- a move of fixed wholesale origination towards NGN-based LRAIC+.

The impact of the reduction of termination rates for mobile operators as a whole is shown in Figure 5.11 and Figure 5.12.

Figure 5.11: Split of revenues for mobile operators based on Q3/Q4 2011 MTRs and FTRs (as a % of retail revenue) [Source: Analysys Mason, 2012]

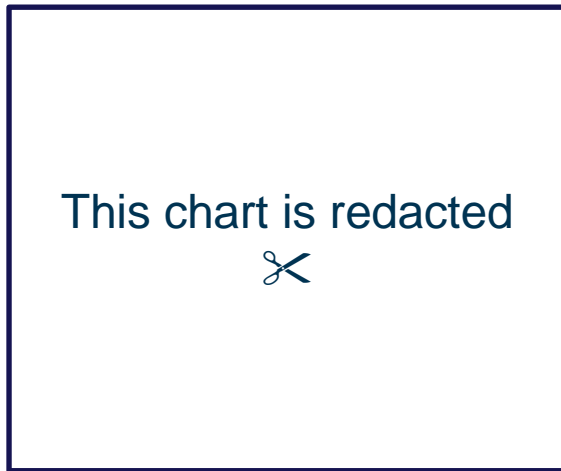
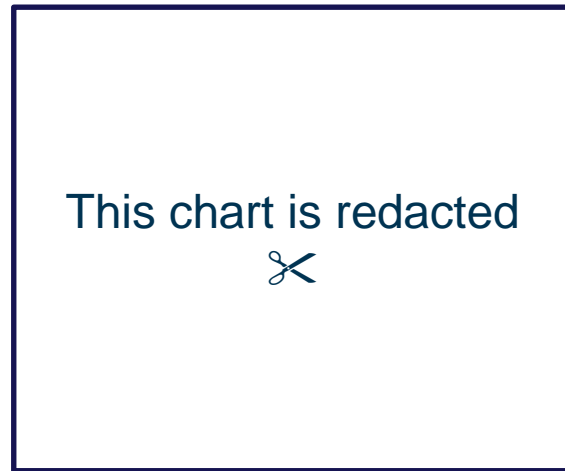


Figure 5.12: Split of revenues for mobile operators with a EURc1 MTR and a EURc0.1 FTR (as a % of retail revenue) [Source: Analysys Mason, 2012]



■ Payment to fixed operators ■ Payment between mobile operators ■ Retained retail revenue ■ Wholesale revenue from fixed

The value of EURc1 for MTR is broadly estimated based on a benchmark of pure LRIC cost results in other countries. With estimated pure LRIC-based rates, mobile operators will see a reduction in the wholesale interconnect revenues from fixed operators (a reduction from [X....]% to [Y....]% as a proportion of their own retail revenue) but they will retain an additional [Z....]% of their own retail revenue internally, by reducing the termination charges they pay to one another and also to fixed operators (the retention from lower payments to fixed operators will be marginal, as FTRs are already relatively low). With a mobile market evolving from [X....]% of retail revenue retained plus [Y....]% received from fixed operators to [Z....]% of retail revenue retained plus [X....]% received from fixed operators, competition will significantly shift away from there being a net subsidy in termination from other players (whether fixed or mobile). In our view, this shift within the fixed and mobile markets should have benefits in both cases:

- Fixed operators will increasingly be able to offer calling bundles, including fixed-to-mobile calls, which may result in more fixed-to-mobile traffic being generated by residential and business fixed subscribers, as well as further facilitating the development of converged fixed-and-mobile subscription packages.
- Mobile operators will be in control of a greater proportion of their retail revenues. This means that there should be greater innovation at a retail tariff level (e.g. in terms of more flat-rate bundles, larger calling bundles or off-peak discounts).
- Mobile operators will pay a smaller proportion of retail revenues to their mobile competitors, tariff-mediated network externalities will be largely removed, and operators may choose to increase the availability of free/discounted mobile call packages, particularly to off-net mobile numbers.

Alternatively, with interconnect rates set at LRAIC+ (for example, approximately EURc2 to EURc3 for MTRs), the impact on the revenue splits for mobile operators is somewhat moderated

compared to the effects shown in Figure 5.12. Using LRAIC+, the [X....]% additional wholesale revenue from fixed operators in the Q3/Q4 2011 situation would decline to around [X....]%, and the payment between mobile operators would decline from [X....]% in the Q3/Q4 2011 situation to around [X....]%. The effect on FTRs would still be small in percentage terms.

With regard to wholesale fixed origination, two effects can be expected from a move towards NGN-based LRAIC+:

- It is likely to result in a significant reduction in the cost of wholesale origination
- Allowing the common costs that are no longer recovered from wholesale termination (as a result of using pure LRIC for termination) to be recovered from wholesale origination (in line with the discussion in Section 3.4) will increase the cost of wholesale origination, but this is likely to be insufficient to fully compensate for the move from TDM-based to NGN-based costing.

[X....]

[X....]

[X....]

6 Assessment of regulatory approaches

This section assesses our view of the merits and drawbacks of the regulatory approaches (principles and methodologies) described in Section 3, based on a standardised set of assessment criteria (defined in Section 4.1) and also taking into consideration the Irish-specific market factors identified in Section 5.

At the end of each section of the assessment we present a table summarising our conclusions. Each table uses ‘Harvey balls’ to denote the suitability of each approach for fulfilling the assessment criteria, as follows:

- = Zero, Unsuitable, Minimum
- ◐ = Low
- ◑ = Medium
- ◒ = High
- = Very high, Very suitable, Maximum

6.1 Need to take utmost account of the EC Recommendation

No price control: an unregulated price of termination is in contradiction with the EC Recommendation. It also conflicts with ComReg’s previous assessments of the fixed and mobile termination markets and associated remedies that it has imposed.

F&R:¹⁰³ this approach is unlikely to satisfy the EC, although it is possible that the resulting MTRs or FTRs meet the EC’s expected rate per minute. If allowing material asymmetry (e.g. for smaller operators), it is also unlikely to satisfy the EC because of the length of time for which later Irish entrants have now been in the market.

B&K:¹⁰⁴ this approach does not allow operators to recover any costs from the party (operator) which originated the call (which, according to the TERA/Hogan Lovells report, is a requirement of the Access Directive). However, this method is specifically discussed as a possibility by the EC Recommendation and it could be argued that cost recovery from the called party (the operator’s own subscribers) is consistent with recovering costs from those that cause them (the calling party causes costs by calling, but the called party also causes costs, by accepting the call).

RPP:¹⁰⁵ this approach faces a double challenge: it may not be possible to impose zero termination rates as a remedy (see B&K above), and ComReg would also have to establish whether it can legally apply this methodology. An RPP regime would involve adjustments to operators’ published retail tariffing schemes (e.g. bundles of incoming minutes, or a directly charged receiving call price (which currently exists in international mobile roaming situations)).

LRAIC+ (implemented via a cost model): a LRAIC+ cost model is incompatible with the EC Recommendation, which recommends pure LRIC. However, this approach could meet other parts of the EC Recommendation such as cost orientation, symmetry and the use of a bottom-up model based on an efficient operator.

LRAIC+ (implemented via a benchmark): The EC Recommendation allows benchmarking based on countries using pure LRIC to be used in the short term: “*an NRA [...] could consider setting interim prices based on an alternative approach until 1 July 2014*” and requests that “*any [...] outcome resulting from alternative methodologies should not exceed the average of the termination rates set by NRAs implementing the recommended cost methodology*”,¹⁰⁶ which is a pure LRIC cost modelling approach. Benchmarking based on LRAIC+ would therefore not be compliant.

¹⁰³ F&R = fair and reasonable.

¹⁰⁴ B&K = bill and keep.

¹⁰⁵ RPP = receiving party pays.

¹⁰⁶ Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC), Recital (12).

- **Pure LRIC (implemented via a cost model):** a pure LRIC cost model of termination is what is put forward in the EC Recommendation. Therefore this method is the most compelling when assessed against the criterion of taking utmost account of the EC Recommendation.
- **Pure LRIC (implemented via a benchmark):** a benchmark referring to pure LRIC costs is likely to be compliant with the EC Recommendation in the short term, as it states that “an NRA [...] could consider setting interim prices based on an alternative approach until 1 July 2014” and requests that “any [...] outcome resulting from alternative methodologies should not exceed the average of the termination rates set by NRAs implementing the recommended cost methodology”. However, in the long term ComReg would need to defend the continued application of a benchmark approach in the absence of an Irish-specific cost model.
- **Cost modelling vs. benchmarking:** benchmarking is acceptable in the short term, subject to compliance with this aspect of the EC Recommendation, and a model is recommended by the EC in the long term.
- **Symmetry:** symmetry is part of the EC Recommendation and has a positive impact on any approach in terms of compliance with the EC Recommendation, as any approach that includes symmetry is more likely to be accepted by the EC.

Figure 6.1: Assessment against compliance with EC Recommendation and EU Directives [Source: Analysys Mason, 2012]

Criterion	No price control	Fair and reasonable	B&K	RPP	Cost orientation	
					LRAIC+	Pure LRIC
Need to take utmost account of the EC Recommendation	○	◐	○	○	◑	●

6.2 Assessment against efficiency criteria

No price control: *allocative efficiency* is poorly benefited by this approach. Operators try to maximise their profits in the monopoly supply of voice termination to their subscribers. There is no consideration of any promotion of welfare. As explained in Section 4.2.2, as termination is only a relatively small share of operators’ revenues, in a competitive retail market, retail activities are the key driver of *productive efficiency*. If the retail market is not fully competitive, the ability for operators to set the price of their voice termination above their efficient cost of production may reduce the incentive to reduce their cost of production.

The ability for operators to set the price of their voice termination would be likely to allow the continuing existence or even expansion of tariff-mediated network externalities (which have prominence among some of the major retail offers in Ireland, e.g. from [X....] and [X....], and this might prevent the development of a more effective retail market. This would be likely to have a knock-on effect on *dynamic efficiency* because it would reduce incentives for all operators to increase efficiency over time in order to be able to compete more strongly.

F&R: operators are no longer able to charge absolutely what they want, as their prices now have to be fair and reasonable. However, uncertainty regarding what is ‘fair and reasonable’ means that *allocative efficiency* cannot be guaranteed – we believe that this is the case in Ireland where Tesco Mobile sets its own (high, asymmetric) termination rate, and there have been complaints in the past about whether this rate is acceptable. As explained in Section 4.2.2 and demonstrated for the Irish market in Figure 5.11, because termination is only a minority share of market revenues, in a competitive retail market, retail activities are the key driver of *productive efficiency*. If the retail market is not fully competitive, there is a weak dependency between productive efficiency and the level of the charge considered ‘fair and reasonable’: low wholesale costs are to be preferred, but any rate at the efficient cost of production would provide correct incentives. *Dynamic efficiency* depends on the level of the charge considered ‘fair and reasonable’. Some small level of asymmetry for a limited period of time may strengthen competition by enabling the growth of an entrant, which could lead to a more effective retail market.

B&K: bill and keep requires operators not to invoice one another for wholesale services. In terms of *allocative efficiency* it could be better or worse than low termination rates, depending on the size of the call externality. If the pure LRIC is very low (in relation to LRAIC+), then bill and keep will not give a very different outcome for efficiency.¹⁰⁷ It may also create negative externalities, such as direct marketing spam. If the retail market is fully competitive, there is no substantial impact in terms of *productive efficiency*. If the retail market is not fully competitive, low wholesale costs are to be preferred, but a rate of zero provides no stronger incentive than a rate set at the efficient cost of production. A more effective retail market may arise from the ability of smaller operators to compete for customers (due to the removal of the incentives for tariff-mediated network externalities), thus improving *dynamic efficiency*. In Ireland this would mean that the on-network benefits accruing to subscribers of larger network operators (e.g. Vodafone and O2) from discounted or free on-net minutes could be extended to other network subscribers, as off-net termination rates would be set at zero. This would improve the ability of smaller operators to compete for individual customers who have a specific calling circle, and improve competition and efficiency over time.

RPP: this approach transfers the cost of the call to the receiving party and therefore internalises the call externality. In addition, each operator recovers its cost from its own subscribers and can therefore recover common costs as it chooses, under the constraints of competition. These can be considered as improving *allocative efficiency*. However, RPP may create negative externalities such as direct marketing spam which will be paid for by the receiving party. All services (including receiving calls) become subject to retail competition, which will provide incentives for *productive efficiency* if the retail market is competitive. A more *dynamically efficient* retail market may arise from the ability of smaller operators to compete for customers (due to removal of the incentives for tariff-mediated network externalities). In addition, if one operator reduces its cost of termination, it can reduce what it charges its retail customers for termination and advertise this change to attract new customers, thereby encouraging other operators to make investments to

¹⁰⁷ [§<....]

similarly reduce their cost of termination, or to innovate and offer better termination deals to customers.

LRAIC+ (implemented via a cost model): LRAIC/LRAIC+ cost modelling determines the termination charge based on the average cost of traffic (including termination), usually also allowing some common costs to be recovered from termination (LRAIC+). The allocation of common costs is typically done using EPMU rather than Ramsey pricing for practical reasons (the lack of information available to the Irish operators on the elasticity applicable to consumers in Ireland means it is not possible to calculate the Ramsey allocation of common costs between retail and wholesale services that would lead to *allocative efficiency*). Network and call externalities could be taken into account to increase/reduce the level of termination if that is judged to increase efficiency. In the market the penetration of telecoms services in Ireland is already measured to be in excess of 100% of the population. Also, the cost of maintaining a subscription to a telecoms network is relatively small now that we believe there are thousands of spare working mobile handsets available in Ireland, and SIM-only offers can be purchased at a very low entry price or obtained free of charge.¹⁰⁸ As a result, we consider that there is not a strong efficiency case for adding a material network externality mark-up to call termination rates. As explained in Section 4.2.2, because termination is only a small share of operators' revenues, in a competitive retail market, retail activities are the key driver of *productive efficiency*. If the retail market is not fully competitive, there is a weak dependency between productive efficiency and the level of the charge set based on LRAIC. Unless used to set symmetric rates, LRAIC+ might lead to smaller operators having a higher rate than larger ones (if economies of scale are a dominant cost-increasing effect for small operators). However, in Ireland the small operator H3G has only a 3G network and it carries significant volumes of mobile data traffic, meaning that it should not have worse economy of scale effects than the larger operators with two networks (2G+3G) [§<....]. When smaller operators charge asymmetric termination rates, it provides the larger operators with a justification for tariff-mediated network externalities which have a detrimental knock-on effect on the development of a more effective retail market and therefore on the incentives for productive efficiency. Highly asymmetric wholesale termination rates are difficult to communicate to consumers, and billing and retail simplicity is obtained when tariffs do not have exceptions depending on whether the person is calling a network operator with an asymmetric termination rate.¹⁰⁹ In addition, termination charges based on cost modelling might include a glide path to reduce the charge over a number of years to reach the efficient cost in the final year of the charge control. To the extent that reaching the new lower values reflects the lower cost of termination with the introduction of new technologies (such as Ethernet, HSPA, etc.), such changes may encourage operators to make similar investments to also reduce their costs, thus improving *dynamic efficiency*.

LRAIC+ (implemented via a benchmark): the efficiency considerations of a benchmark approach would be the same as for a cost model.

¹⁰⁸ For example, Vodafone's free prepaid SIM card for existing customers who keep their current mobile number.

¹⁰⁹ A view which was supported by one of the operators in its response to our questionnaire.

Pure LRIC (implemented via a cost model): in a single-product market, *allocative efficiency* is defined as average revenue being equal to the marginal cost. Pure LRIC, which uses the whole service of termination (rather than only an additional unit) as the increment, is therefore closer to that efficient definition than LRAIC+ (which allows prices to recover common costs). However, the non-recovery of common costs in pure LRIC raises issues of allocation of common costs between retail and wholesale services. Our analysis of the effects of setting pure LRIC-based termination rates on the revenue flows of the mobile operators in Ireland (where sufficient robust data was available from the industry questionnaires) shows that a higher proportion of retail revenues would remain under the control of the retail operator (as a smaller proportion of retail revenues would be paid out in off-net termination charges). Figure 5.12 earlier provided an illustration of this effect aggregated across a number of mobile players. The fact that a higher proportion of retail revenues would be retained by the operators means that operators would have opportunities to recover more of their costs from their own customers, rather than from subscribers of other networks. This exposes a greater proportion of costs to recovery in the competitive retail markets, rather than via regulated charges imposed on other SMP operators in the termination markets.

Operators already distinguish user groups across a variety of categories (prepaid, postpaid, high usage, low usage, data users, smartphone, basic phone, etc.). Through these existing market characteristics, operators have the ability to manage a greater proportion of cost recovery from their own subscribers, taking into account the indicators of affordability and willingness to pay which are already captured in these categories. Operators also already use a wide variety of revenue recovery options for these types of subscriber, in particular the balance between free and paid-for connections, handsets, monthly fees, voice usage charges, non-voice usage charges, bonus credits and promotions, etc.

For fixed operators, setting FTRs at pure LRIC will only have a marginal impact on their own revenue flows because this is very small component of overall fixed revenues (which are dominated by line rental and broadband packages).

As termination is only a small share of most Irish operators' revenues (as shown in Figure 5.11) and operators are both buyers and sellers of termination, in a competitive retail market, retail activities are the key driver of *productive efficiency*. If the retail market is not fully competitive, there is a weak dependency between productive efficiency and the level of the charge set based on LRIC: low wholesale costs are to be preferred, and a termination charge based on the incremental cost of providing termination for an efficient operator would be likely to encourage operators to be efficient. For example, this situation could arise if the prospect of no longer recovering common costs from termination increased the priority given to cost control. A more effective retail market may arise from the ability of smaller operators to compete for customers, thus improving *dynamic efficiency* (due to a reduction in the incentives for tariff-mediated network externalities).

Pure LRIC (implemented via a benchmark): the efficiency considerations of a benchmark approach would be the same as for a cost model.

Cost modelling vs. benchmarking: in general, the methodology used to establish a cost-oriented price would not affect efficiency considerations, unless it produced a different result for costs.

Symmetry: symmetry at low rates increases consumption compared to asymmetry or symmetry at high rates (by removing incentives for higher off-net tariffs) and would therefore have a positive impact on *allocative efficiency*, assuming low rates. Symmetry may have a slightly positive impact on *productive efficiency*, as a less efficient operator would be compensated based on the symmetric implied level of efficiency, not its actual one. However, as discussed above, the impact would not be significant if the retail market was sufficiently competitive. Asymmetry (to a limited extent and for a limited time) may encourage or support entry, and increase competition, which is why it is explicitly included in the EC Recommendation. In the long term, symmetry reduces tariff-mediated network externalities by removing some of the justification for higher off-net tariffs which leads to greater competition (see next section) and ultimately increases the incentives for *dynamic efficiency*.

Figure 6.2: Assessment against efficiency criteria [Source: Analysys Mason, 2012]

Criterion		No price control	Fair and reasonable	B&K	RPP	Cost orientation	
						LRAIC+	Pure LRIC
Efficiency	Allocative	○	◐	◑	◒	◑	●
	Productive	○	◐	◑	◒	◑	◑
	Dynamic	○	◐	●	◒	◑	●

6.3 Assessment against competition criteria

No price control: holding a monopoly to terminate traffic to its subscribers, each operator would act as an unregulated monopoly and set termination to maximise its profits. Large operators could also decide to set a very high price for termination, rather than maximising their profit in the short term (as the volume of incoming calls to their networks would fall), in the expectation that they would fully benefit from the “tariff-mediated network externalities” to increase or protect their market share, and therefore maximise their profits in the long term. This could equally affect *fixed–fixed competition* and *mobile–mobile competition*. Mobile operators may have the opportunity to charge very high termination rates and benefit from cross-subsidies from fixed operators which would have a negative effect on *fixed–mobile competition*. It is unclear to what extent fixed operators would be able to do the same thing, given the differences between FTRs and MTRs today.

F&R: ‘Fair and reasonable’ is likely to be understood as a more or less symmetric rate between fixed operators and separately between mobile operators, with some flexibility for smaller operators to charge more than larger ones (depending on the position of the regulator, this might be based on justifiable higher costs of termination). Low FTRs and low MTRs would limit tariff-

based network externalities and promote *fixed–fixed competition* and *mobile–mobile competition*). The effect on *fixed–mobile competition* would depend on the level of the charges adopted and whether there is a significant difference between FTRs and MTRs.

B&K: bill and keep applied to payments between fixed operators or to payments between mobile operators essentially removes all tariff-mediated network externalities and therefore promotes *fixed–fixed competition* or separately *mobile–mobile competition*. The effect on fixed–mobile competition would depend on whether bill and keep also applies to payments between fixed operators and mobile operators. If that was the case, this would create a level playing field, make it easier for fixed operators to compete and lead to an increase in *fixed–mobile competition*. If that was not the case (i.e. if bill and keep was restricted to payments between fixed operators and payments between mobile operators), then this would have no impact on *fixed–mobile competition*.

RPP: RPP applied to payments would have the same positive effect on *fixed–fixed competition* and *mobile–mobile competition*) as bill and keep, as it would remove all payments between fixed operators and between mobile operators. The effect on *fixed–mobile competition* would be positive as RPP benefits fixed operators, which otherwise currently have to pay higher per-minute rates for traffic to mobile operators than they receive from terminating calls. This makes it easier for fixed operators to compete.

LRAIC+ (implemented via a cost model): LRAIC+ cost orientation allows recovery of termination costs (or at least the costs that would be borne by an efficient operator) but eliminates above-cost transfers. This is valid between fixed operators and between mobile operators and leads to an increase in *fixed–fixed competition* and *mobile–mobile competition*. This is also valid between fixed and mobile operators, where it removes (at least some of the) revenues paid by fixed operators to mobile operators and therefore contributes to an increase in *fixed–mobile competition*.

LRAIC+ (implemented via a benchmark): the competition considerations of a LRAIC+ cost orientation implemented via a benchmark would be the same as for one implemented using a cost model.

Pure LRIC (implemented via a cost model): as pure LRIC only considers incremental costs, it would reduce termination even further than LRAIC+ and allow some of the smaller operators such as H3G and Meteor (which cannot benefit as much as larger ones from tariff-based network externalities) to compete more easily. This would therefore have a positive impact on *mobile–mobile competition* in Ireland. In terms of fixed–fixed competition, the issue of the treatment of common costs that are no longer recovered and the possible impact on other services such as fixed wholesale origination (discussed in Section 3.4 and estimated in Section 5.4.2) means that the impact would be positive for *fixed–fixed competition* but significantly less so than for mobile–mobile competition, because fixed operators in Ireland do not take FTRs into account to a significant degree when setting retail offers.

The effect on *fixed–mobile competition* would be positive, by removing the revenues paid by fixed operators to mobile operators and by allowing more competitive innovations such as the inclusion of calls to mobiles in fixed call bundles. The fixed retail market in Ireland would be likely to benefit from this approach, as at present only around [X....]% of residential customers and [X....]% of business customers have fixed-line call bundles which include calls to mobile numbers. Pure LRIC based MTRs would increase fixed operators' opportunities to offer these packages, according to the information obtained from the Irish operators during this study. We believe that there would also be an increase in the ability of operators to put together converged fixed–mobile packages that include (e.g. a large bundle of) calls to all off-network operators.

Competitive dynamics and pricing in the mobile market may also change as a result of termination rates being set at pure LRIC, because mobile operators would no longer be able to rely on a net inflow of revenues from fixed operators (as demonstrated by our revenue scenario in Figure 5.12). However, for the Irish market our industry questionnaires provide evidence that mobile operators continue to subsidise [X....] handsets, while at the same time consumers are already in possession of a large number of working mobile handsets. This aspect of retail competition and pricing in the handset side of the market (i.e. consumer electronics, cameras, touch screens, mobile data) is not strongly related to competition for basic voice calling services and so in our view could be reduced without detrimental effects on competition for voice calling.

Mobile operators also provide free prepaid credits, typically to subscribers who top up regularly and/or top up with higher values. There is also evidence in Ireland of large amounts of free credit being offered to port in from another operator. We have obtained information from some mobile operators in Ireland about the amount of prepaid credit which expires. While the values are typically low (EUR cents per customer), there is evidence that one operator is expiring a larger amount of credit (around EUR[X....] per customer per month). This suggests that this specific competitive behaviour which includes significant bonus credit may not be fully valued by the end customers. On the other hand, because prepaid credits are already expiring in the market (e.g. when customers lose or cancel their prepaid connections), the magnitude of any standing charges that might be added to prepaid accounts in order to recover operators' costs could be slightly lower. Standing charges would also give consumers an incentive to reduce multiple subscriptions to mobile networks (unless they valued the benefit of dual subscriptions). This would mean that competition could focus on the primary SIM card of each user, usage per SIM would probably therefore be higher, and customer usage loyalty could be increased across all types of calls (with a corresponding impact on cost recovery).

Pure LRIC (implemented via a benchmark): the competition considerations of a pure LRIC cost orientation implemented via a benchmark would be the same as for one implemented using a cost model.

Cost modelling vs. benchmarking: in general, the methodology used to establish a cost-oriented price would not affect competition considerations, unless it produced a different result for costs.

Symmetry: symmetry has a slightly positive impact on *fixed–fixed competition* and *mobile–mobile competition*. This is because symmetry is only one part of the way to promote efficient competition between fixed operators and/or between mobile operators. If symmetry was set at a high level, tariff-mediated network externalities would still play a detrimental role. As it is not expected that symmetry in rates would apply to *all* operators in Ireland (but rather separately to all fixed operators and to all mobile operators), there is no guarantee that the respective rates would promote *fixed–mobile competition*, except in the situation where reducing the highly asymmetric rates charged by Tesco Mobile (and to a lesser extent H3G), prevented operators from including calls to *all* mobile numbers in retail call offers.

Figure 6.3: Assessment against competition criteria [Source: Analysys Mason, 2012]

Criterion		No price control	Fair and reasonable	B&K	RPP	Cost orientation	
						LRAIC+	Pure LRIC
Competition	F–F	🕒	🕒	🟢	🟢	🕒	🕒
	M–M	🕒	🕒	🟢	🟢	🕒	🟢
	F–M	🕒	🕒	Neutral or 🕒		🟢	🕒

6.4 Assessment against equity

No price control: termination would be set in order to maximise profits rather than taking into account equity and the ability of all customers (including fixed-only subscribers and the poorest in society) to benefit from telecoms services. Mobile-only customers may benefit from subsidies if mobile operators can charge relatively high MTRs.

F&R: the net effect on equity is not obvious. Termination charges are likely to be lower than in the ‘no price control’ approach. Depending on how ‘fair and reasonable’ is viewed, termination charges might, however, remain higher than with other approaches. At the same time, mobile-only customers may currently benefit from subsidies to other services if mobile operators can charge relatively high MTRs. However, mobile off-net interconnect charges may remain higher than in other methods, thus limiting cross-network competition and possibly having a negative effect on some groups of mobile-only customers.

B&K: as bill and keep is below the LRIC cost of carrying the inbound calls, low-usage customers with very high inbound calls might be expected to become marginal to serve (and potentially loss-making). However, the analysis presented in Section 5.4.1 shows that ‘low-usage’ mobile subscribers are actually quite high spending on a per-minute basis, even after removing the effect of termination payments. Fixed-to-mobile calls could become as inexpensive as fixed-to-fixed calls, which would have a positive effect on fixed-only subscribers.

RPP: all subscribers who would pay lower prices overall as a result of RPP would benefit, such as fixed-only subscribers.

LRAIC+ (implemented via a cost model): as LRAIC+ cost orientation allows operators to recover network common costs, even prepaid consumers with few originating minutes should remain as profitable as they currently are without the need to increase their retail charges. Compared to a pure LRIC approach, MTRs would stay relatively high which would have a detrimental effect on fixed-only subscribers or those wishing to make high volumes of off-net calls.

LRAIC+ (implemented via a benchmark): same as for LRAIC+ using a cost model.

Pure LRIC (implemented via a cost model): all subscribers who would pay lower prices overall as a result of pure LRIC termination rates would benefit, such as fixed-only subscribers. As detailed in Section 4 some mobile operators argue that regulating mobile termination based on pure LRIC, and thus largely reducing the revenues they receive from termination, may force them to raise the price of outgoing calls, ongoing rental and/or handsets (connections). As a result, they argue that this could force some prepaid customers out of the market, as they would no longer be able to afford to make mobile calls, or would at least strongly reduce the number and/or length of calls they made. Although the link between reduced voice termination charge and increased voice origination charge may seem relevant, the analysis presented in Section 5.4.1 shows that low-usage mobile subscribers in Ireland are on average quite high spending on a per-minute basis, even after removing the effect of termination payments, so there would appear to be no strong reason for mobile operators to increase their retail prices further for this group of customers. In fact, it is typically higher-usage users who pay the lowest price per minute in Ireland. This suggests that mobile operators are not offering low-usage users the benefits of the lowest possible calling prices. If low-usage customers reduced the number of outgoing calls they made (due to affordability issues) but remained on the network, then the network externality benefits of being able to contact those subscribers would persist, and it would be efficient for other customers to subsidise this benefit not through the wholesale termination rates that they pay to other operators, but directly through the (higher) retail prices they pay to their own operator.

As discussed in Section 5.3.1, in the Irish market some mobile handsets, including some prepaid packages, are subsidised at the point of sale. The handset subsidies vary from relatively low values [€<....] to high values (hundreds of Euros for high-end smartphones). At the same time, a significant number of SIM-only packages have been sold in Ireland in recent quarters, and these do not involve any handset subsidy. In the event that mobile operators sought to recover additional revenues from up-front connection costs (following a reduction in termination rates), there is strong evidence that there are sufficient working handsets available in the Irish market to maintain high levels of connection (effectively 100% of adults) to a telecoms network in Ireland, e.g. via SIM-only subscriptions or by customers re-subscribing to a network without taking a new (smart) handset.

Relevant data that supports our equity assessment by age and social group is available from ComReg's latest ICT survey. In particular, the data supports the following conclusions:

- **that the benefits experienced by fixed-line users of pure-LRIC based MTRs should significantly reach the older population**, who are much more likely to be fixed-line users and least likely to live in mobile-only households. The real or perceived concerns that older, or housebound, people face about the cost of calling mobile numbers will be significantly reduced with this price control option.
- **we conclude that there is there is a low risk of disconnecting large numbers of low-spending customers from telecoms service in Ireland if mobile prices are increased to cover reductions in wholesale termination revenues, and many mobile-only users are not low spending or drawn disproportionately from lower social segments.** Low-spending mobile customers are on average not heavily reliant on their mobile phone for connectivity, as this customer group exhibits relatively high levels of fixed-line penetration. Conversely, Irish residents who rely *only* on a mobile phone for connectivity are typically mid-spending customers, and this user group is quite uniformly present in social segments C1 to F.

Pure LRIC (implemented via a benchmark): same as for pure LRIC using a cost model.

Cost modelling vs. benchmarking: generally, the methodology used to establish a cost-oriented price would not affect equity considerations, unless it produced a different result for costs.

Symmetry: the impact of symmetrical rates may have some short-term detrimental effects on equity for some groups (e.g. subscribers of networks with previously high termination rates) but the long-term effects through the promotion of competition are likely to benefit all subscribers.

Figure 6.4: Assessment against equity [Source: Analysys Mason, 2012]

Criterion	No price control	Fair and reasonable	B&K	RPP	Cost orientation LRAIC+	Pure LRIC
Equity						

6.5 Assessment against ease of deciding on and implementing approach

No price control: no resources are needed to implement this method. Knock-on effects are covered by the regulatory certainty criterion.

F&R: this is potentially less time consuming for the regulator than a full market review of the termination market and may be more appropriate for small operators and MVNOs. This approach has been used in some countries as a way of maintaining an existing reciprocity regime with relatively low regulatory requirements in relation to smaller operators (e.g. in the UK). The dispute resolution mechanism that has to be put in place to deal with complaints from operators requires some staff resources, and may require certain existing regulatory tools (such as an existing cost model). But as it is ex-post, it may not actually be used, or only rarely. This can be reinforced by managing the expectations of the operators in relation to the dispute resolution mechanism, though

it may be harder to convince the EC that this approach provides sufficient regulatory certainty of its preferred (harmonised) outcome for termination rates. Some initial disputes are likely (such as those that have occurred in the UK), if only to test the boundaries of what is considered ‘fair and reasonable’.

B&K: this approach only requires a decision to implement it – there are no calculations to run, or disputes to resolve.

RPP: bill and keep with CPP does not require significant resource as it only affects the wholesale market. In contrast, RPP changes the way the retail market works. It would require very significant resources to create new retail offers and educate (reluctant) subscribers about the switch from CPP to RPP. It is probably the most resource-consuming approach, at least until the transition is complete.

LRAIC+ (implementation via a cost model): cost models require a relatively large amount of time and both financial and staff resources. However, these resource requirements are small compared to the size of the financial flows between operators and the impact that cost modelling may have on those. The ease of implementing this approach in Ireland would be increased for fixed termination, as ComReg already has a fixed NGN model.

LRAIC+ (implementation via a benchmark): benchmarks do not require significant resources, compared to cost models, but they are time consuming if they need to be repeated regularly.

Pure LRIC (implementation via a cost model): a pure LRIC model involves additional considerations relating to small incremental costs compared to a LRAIC+ model (which is primarily concerned with total (efficient costs)). However, a number of regulators in Europe have already tackled the modelling requirements of a pure LRIC approach and so ComReg can learn from this experience. This means that a pure LRIC modelling approach does not present significant additional drawbacks that need to be considered.

Pure LRIC (implementation via a benchmark): benchmarks do not require substantial resources, compared to cost models. However, the limited availability of fixed benchmarks using pure LRIC would make benchmarking a more challenging approach – although this depends on ComReg’s ability to identify and obtain relevant benchmark information. In this respect, we observe that there are a number of publicly available pure LRIC results for mobile networks in Europe, but fewer available for fixed networks.

Cost modelling vs. benchmarking: benchmarks do not require significant resources, compared to cost models.

Symmetry: the need for resources relies mostly on the approach chosen, rather than on whether or not symmetry is applied. Symmetry may nonetheless reduce the need for resources, for example by requiring only a generic operator to be modelled (rather than individual operators as well) or only a single benchmark rather than multiple benchmarks based on different operator sizes.

Figure 6.5: Assessment against ease of deciding on and implementing the approach [Source: Analysys Mason, 2012]

Criterion	No price control	Fair and reasonable	B&K	RPP	Cost orientation	
					LRAIC+	Pure LRIC
Ease of deciding on and implementing approach	●	◐	●	○	◐ (for mobile model)	◐ (for model)
					◐ (for fixed model)	◐ (for mobile benchmark)
					◐ (for benchmark)	◐ (for fixed benchmark)

6.6 Assessment against transparency/regulatory certainty

No price control: in this situation, there is no transparency and only limited regulatory certainty (certainty that what you charge is in your control, but no certainty regarding what you will be charged). Each operator sets termination rates to suit its own interests and may decide to change the price at any moment; and dispute resolution may lead to a change in the resulting prices. Long-term certainty cannot be guaranteed as ComReg is not obliged to follow this method in subsequent regulatory periods.

F&R: there is no predetermined rate, only an obligation on operators to charge one another a ‘fair and reasonable’ termination, and so the level of certainty is low. The regulatory certainty may be improved by the regulator’s consistency in resolving disputes (otherwise the assessment of ‘fair and reasonable’ could change with each legal case).

B&K: this approach is very transparent and provides regulatory certainty (as operators know they will not receive any termination revenue). This approach provides a reasonable amount of long-term certainty, as moving to bill and keep would most likely be a permanent change of regulatory regime.

RPP: this approach is very transparent and provides regulatory certainty (as operators know they will not receive any wholesale termination revenue). However, it is less transparent for consumers, who may face new price structures for receiving calls.

LRAIC+ (implementation via a cost model): cost models can provide a good level of transparency, as public versions can be published, particularly where generic efficient operator models are developed (and especially for mobile networks). However, it is typically harder to publish a meaningful fixed network cost model because this might reveal information about the network or costs of eircom. Cost models also provide strong regulatory certainty as to future rates, as they are typically used to set prices for the next three years following a glide path. LRAIC+ methods are often applied in regulated markets where it is necessary to ensure full recovery of

(efficiently incurred) costs – for example in one-sided markets. Some markets have a long history of applying this method of cost orientation. ComReg has an existing LRAIC+ model for fixed termination, which can be used transparently in discussion with eircom.

LRAIC+ (implementation via a benchmark): transparency is likely to be relatively high, as it would be expected that the countries used to define the benchmark have made their price decisions public. A benchmark based on *price* is likely to be revised every year or even more frequently, and each year some of the benchmark countries are likely to revise their price controls, therefore providing limited regulatory certainty. In contrast, a benchmark based on *costs*, allowing the regulator to set its own glide path over (say) a three- to five-year period, offers greater regulatory certainty regarding future rates.

Pure LRIC (implementation via a cost model): the pure LRIC approach has a similar level of transparency and certainty as a LRAIC+ model. A move to pure LRIC for voice termination is a new approach for ComReg, but all of the Irish mobile operators will have been aware of the draft and final EC Recommendation on the costing of termination services for a number of years, and so should not be surprised that it is being considered in Ireland. Most of the Irish operators are part of operator groups which have already been heavily involved in discussions on pure LRIC in other European jurisdictions. The fact that MTR and FTR markets are two sided (operators are both buyers and sellers of voice termination) means that reductions in termination rates affect both costs and revenues of the players, and this reduces the uncertainties faced by network operators from reductions in the rates charged. ComReg has an existing cost model for fixed termination which could be adapted in discussion with eircom to produce a pure LRIC result. Although ComReg would need to develop a new model for the mobile sector, increasing evidence is available from other countries in Europe of the challenges and solutions associated with developing a pure LRIC mobile model, and ComReg would be in a position to learn from this experience.

As can be seen from recent EC and BEREC activities, compliance with the EC Recommendation brings a degree of regulatory certainty.

Pure LRIC (implementation via a benchmark): same as for LRAIC+ via a benchmark.

Cost modelling vs. benchmarking: the methodology used to establish the cost-oriented price would affect transparency and legal certainty. Cost models can be more transparent than benchmarks, as public versions may be published and assumptions may be assessed by all parties (depending on whether the cost model contains confidential or non-confidential business information about the fixed or the mobile parties concerned). Cost models or benchmarks based on costs provide more regulatory certainty than benchmarks based on prices, as they are less dependent on what happens in other EU Member States over time. Regulatory certainty may also be lower if there is a lack of harmonisation in the remedy applied in fixed and mobile situations, or if one market is under appeal and the other has been imposed or accepted.

Symmetry: imposing symmetry in pricing improves the transparency of the process for determining the termination charge, as no confidential model or benchmark is used for price

setting and so the basis for decision is in the public domain. Similarly, symmetry improves regulatory certainty in the sense that all operators know they will be treated in the same way.

Figure 6.6: Assessment against transparency/regulatory certainty [Source: Analysys Mason, 2012]

Criterion	No price control	Fair and reasonable	B&K	RPP	Cost orientation	
					LRAIC+	Pure LRIC
Transparency/regulatory certainty	○	◐	●	●	● (for model)	● (for model)
					◐ (for price benchmark)	◐ (for price benchmark)

7 Conclusions and recommendations

In this section we summarise our assessment of price control options and provide our conclusions on a recommended approach for Ireland.

7.1 Assessment of all approaches

The table below provides an overall summary of our assessment of each approach.

Figure 7.1: Assessment of all approaches [Source: Analysys Mason, 2012]

Criteria		No price control	Fair and reasonable	B&K	RPP	Cost orientation	
						LRAIC+	Pure LRIC
Need to take utmost account of EC Recommendation		○	◐	○	○	◐	●
Efficiency	Allocative	○	◐	◐	◐	◐	●
	Productive	○	◐	◐	◐	◐	◐
	Dynamic	○	◐	●	◐	◐	●
Competition	F-F	◐	◐	●	●	◐	◐
	M-M	◐	◐	●	●	◐	●
	F-M	◐	◐	Neutral or ◐	●	◐	●
Equity		◐	◐	◐	◐	◐	◐
Ease of deciding on and implementing approach		●	◐	●	○	◐ (for mobile model)	◐ (for model)
Transparency/regulatory certainty		○	◐	●	●	● (for mobile model)	● (for model)
						◐ (for fixed model)	◐ (for mobile benchmark)
						◐ (for benchmark)	◐ (for fixed benchmark)
						● (for price benchmark)	● (for price benchmark)

The 'no price control' and the 'fair and reasonable' approaches were included for reference but

discarded because of their poor overall rankings against the criteria used in our assessment. The ‘bill and keep’ and ‘receiving party pays’ methods, although obtaining more favourable assessments against our criteria, were rejected because of their possible non-consistency with the EC Recommendation and Directives.

We conclude that cost-orientation methods have attractive economic and competitive effects. This leads to a recommendation to use LRAIC+ or pure LRIC, based on either a cost model or a benchmark.

Voice termination is a two-sided market: this means that the application of pure LRIC reduces both costs and revenues for buyers and sellers of termination services (albeit to a varying extent, depending on traffic patterns). On the other hand, some other markets regulated by ComReg are one sided, such as local loop unbundling (LLU) or leased lines, and the regulation of these markets is justifiably based on total costs (LRAIC+, FAC), to ensure recovery of the incumbent’s (efficiently incurred) costs.

LRAIC+ and pure LRIC define the ‘normal’ bounds of cost orientation for wholesale termination services if not using Ramsey pricing (the standalone cost is the theoretical ceiling which would only be achieved under the maximum Ramsey pricing situation). Call externalities which would tend to reduce the efficient price are real but unknown. At the same time, we do not think that network externalities (the benefit of greater penetration) is a valid argument for a wholesale termination rate subsidy in Ireland, with more than 100% penetration and low (network) costs for maintaining a subscription to a telecoms network. There will also be fixed–mobile and mobile–mobile competition benefits in Ireland from lower termination rates, which would tend to favour pure LRIC over LRAIC+.

We find that LRAIC+ is easier to implement and avoids creating a knock-on issue for the costing of fixed origination (because LRAIC+ is a total-cost methodology and does not require common costs to be reallocated to other services). However, LRAIC+ would not significantly address current drawbacks of the retail market in Ireland, such as the observed tariff-mediated network externalities.

Pure LRIC is fully compliant with the EC Recommendation and may have better allocative efficiency, depending on the size of call externalities. Pure LRIC would also have a positive impact on mobile–mobile and fixed–mobile competition in Ireland because it would help to remove tariff-mediated network externalities and reduce payments from fixed-to-mobile markets. Pure LRIC-based termination rates also support (higher) usage bundles, including off-net mobile calling. These competition benefits should improve dynamic efficiency. With a pure LRIC-based FTR, some shared voice and common network costs would not be recovered from fixed termination services and may need to be recovered from other services (that may include regulated services such as fixed origination).

Pure LRIC should be implemented according to the increment definition in the EC Recommendation: “*defined as the wholesale voice call termination service provided to third*

parties. This implies that [...] NRAs should establish the difference between the total long-run costs of an operator providing its full range of services and [...] in the absence of the wholesale call termination service being provided to third parties.” In our experience, it is possible to compute this using a bottom-up model run *with* and *without* the relevant input traffic for wholesale termination and to identify the switching, transmission and core assets which are avoided. Typical avoided cost elements in a mobile network could include radio air interface capacity, switching and transmission, and interconnection capacity; in a fixed network (NGN), the avoided cost elements could include some IP transmission, IP or Ethernet switching and routing, certain components of the voice platform and some interconnection capacity.

7.2 Recommended approach

The comparison presented above allows us to reach our recommendations for ComReg, as follows:

Mobile termination

The outcome from the assessment is that for mobile termination:

Cost orientation using pure LRIC for MTRs best fits the assessment criteria and the market in Ireland.

A benchmark of the pure LRIC for mobile termination is possible today because it achieves consistency with the EC Recommendation, the competitive benefits of lower rates, and is relatively easy to implement.

Modelling of the pure LRIC cost is also appropriate for mobile termination. It offers a similar numerical outcome as a benchmark, with some added robustness of Ireland-specific modelling, but it does increase the costs/timescales involved.

Fixed termination

The outcome from the assessment is that for fixed termination:

Cost orientation using pure LRIC for FTRs best fits the assessment criteria and the Irish market.

A benchmark of fixed network pure LRIC cost (while possible for mobile) is not ideal for fixed networks, because there is not as good a consistent picture of fixed costs, and the result is strongly dependent on the NGN situation being adopted in the country (e.g. PSTN+FTTC or VoIP+fibre to the premises).

Therefore *pure LRIC cost modelling* is a practical alternative, because (subject to consultation) ComReg should be able to make use of its existing PSTN and NGN voice cost model.

Fixed origination

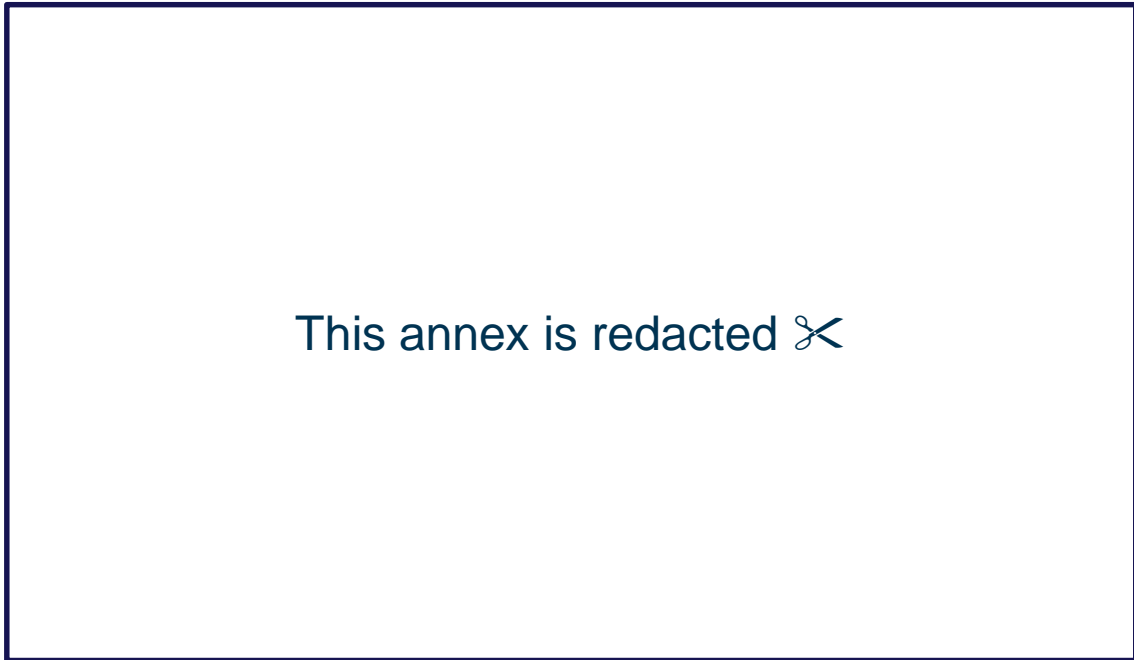
Accompanying our recommendation for pure LRIC-based FTRs, we also recommend that ComReg identifies the level of costs that would remain unrecovered from fixed termination, and that these should be recovered from fixed origination based on NGN costs (in either of the ways described in Section 3.4.3 above, so as to avoid a distortion between on-net retail call and CPS call cost recovery). This is to ensure full recovery of (efficiently incurred) NGN costs for delivering voice services in totality, and to minimise distortions in the market for retail voice calls. We recommend that this cost recovery should consider the totality of unrecovered costs and the totality of originated traffic on the fixed network, because fixed operators do not typically measure all traffic types for all customers.

Symmetry

We recommend symmetry for all current operators offering mobile termination. This is because H3G and Tesco Mobile have both been active in the market for more than four years and are unlikely to have objectively justifiable higher costs for their own network equipment. We also recommend that all fixed operators have symmetric termination rates. In the fixed market, similar considerations apply, plus as already noted by the EC, smaller fixed operators have the option of partial national coverage.

All future MVNOs with SMP should be regulated at the same symmetric MTR as MNOs, unless they can show that their efficiently incurred costs are objectively and exogenously higher than those of their network host.

Annex A Confidential annex on fixed operators' data



[✂....]

Annex B Confidential annex on mobile operators' data



✂....]

Annex C Confidential detailed annex for BT Ireland



✂....]

Annex D Confidential detailed annex for eircom



✂....]

Annex E Confidential detailed annex for Magnet Networks



[✂....]

Annex F Confidential detailed annex for UPC



✂....]

Annex G Confidential detailed annex for Lycamobile



✂....]

Annex H Confidential detailed annex for Meteor



✂....]

Annex I Confidential detailed annex for O2



✂....]

Annex J Confidential detailed annex for Tesco Mobile



✂....]

Annex K Confidential detailed annex for H3GI



✂....]

Annex L Confidential detailed annex for Vodafone



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Annex M Methodological options for bottom-up cost modelling

This section briefly presents the most important methodological choices to be made in the case of a price control based on a bottom-up cost model: choice of the operator, services, technology and implementation, as shown in Figure M.1.

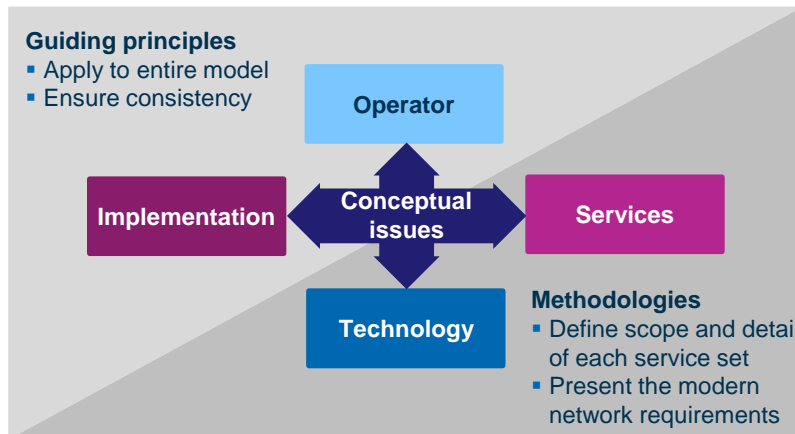


Figure M.1: Overview of bottom-up modelling principles [Source: Analysys Mason, 2012]

The choice of **operator** is governed by its type, footprint and scale. Only one choice of operator is typically used to consistently calculate the cost of all the regulated services.

For regulatory purposes, the type of operator modelled is likely to be different for a fixed or a mobile model. For a fixed model, where the incumbent is likely to be much more widely deployed than any of its competitors, a hypothetical existing efficient (i.e. not less efficient than the incumbent) operator based on the incumbent scale and deployment timescale (i.e. modelled over the same historical timescales) may be a suitable definition. For a mobile model, often in a market where there was competition from launch and with more comparable network scale and coverage, the definition of a generic hypothetical operator is the one that is now usually adopted.

The footprint of the modelled operator defines where its services are available, which is usually over a whole country, with a given number of households connected (for a fixed operator) or a given area coverage of the country (for a mobile operator). The scale of the modelled operator is defined as its market share of access connections (fixed) or subscribers (mobile) and core network traffic. For a fixed model, it often reflects the scale of the incumbent, but for a mobile model, with the use of the generic operator, it is usually $1/n$, with n being the number of operators in the market, or the number of active networks in case of radio access network (RAN) sharing.

Implementation issues govern the construction and cost calculations of the model. As such, they should be applied consistently across the whole calculation model. The structure of the model, the increments and depreciation method used are the most important implementation principles. A bottom-up model should not be developed in isolation, but validated where possible with top-down

information from the operators, and using a number of inputs that have been derived from the operators' top-down information, adjusted for efficiency in a number of particular areas.

It is possible to build a single model that can calculate both the pure incremental cost and the average incremental costs of wholesale voice termination.

The depreciation method may take into account a variety of factors, such as financial, economic or remaining asset lifetimes, past and future input cost trends of the assets in question, terminal values beyond the modelled period, and the WACC for employed capital that is returned to the investors in later years. The depreciation method used is usually the same over time, although more recently hybrid depreciation methods have been developed which change from accounting to economic measures of depreciation.

Services and **technology** are the set of services provided by the operator(s) modelled and the technologies it/they used to provide them. In the case a generic operator is used in the model, it needs to be decided which services and technologies are relevant for this efficient generic operator if they vary among existing operators.