A Review of certain markets included in the Commission's Recommendation on Relevant Markets subject to *ex ante* Regulation

An independent report
by

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The opinions expressed in this report are those of the authors
and do not necessarily reflect the views of the European Commission

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Summary

This report offers advice to the European Commission on the review of the Recommendation on Relevant Markets that may be subject to *ex ante* regulation. It covers activities corresponding to all the markets identified in the current Recommendation, with the exception of wholesale international roaming and broadcasting transmission.

Having broadly adopted the criteria for inclusion of markets found in the current Recommendation, the authors have examined whether substantial competition problems would arise in the production of key retail products in an end-to-end value chain in the absence of regulation. Where such problems are found, a sequential examination is made of the likely presence or absence of market power at the level of significant market power (SMP) in the underlying wholesale markets. If the likely remedies on a wholesale market eliminate the competition problem, the analysis is concluded. If it does not, other wholesale markets and, in the limit the retailing activity itself, are examined, until the process is complete. This approach limits regulation as far as possible to wholesale markets, and in any case to the smallest set of markets possible.

In the course of the report the authors consider a range of issues relating to market definition, including the hypothetical monopolist test, two-sided markets, self-supply, geographical markets and technological neutrality.

The report recommends the inclusion of the following ten markets in the revised Recommendation:

A. Retail fixed access which enables no more than two calls at the same time (low-capacity access)

B. Retail fixed access which enables three or more calls at the same time (high-capacity access)

C. Wholesale fixed call origination

D. Wholesale call termination on individual fixed networks

E. Wholesale local-tandem transit

F. Unbundled local loops

G. Wholesale local-tandem broadband access

H. Terminating segments of leased lines excluding those of high capacity

I. Trunk segments of leased lines excluding those of high capacity

J. The termination of incoming calls on individual mobile networks.

Section 1. Introduction

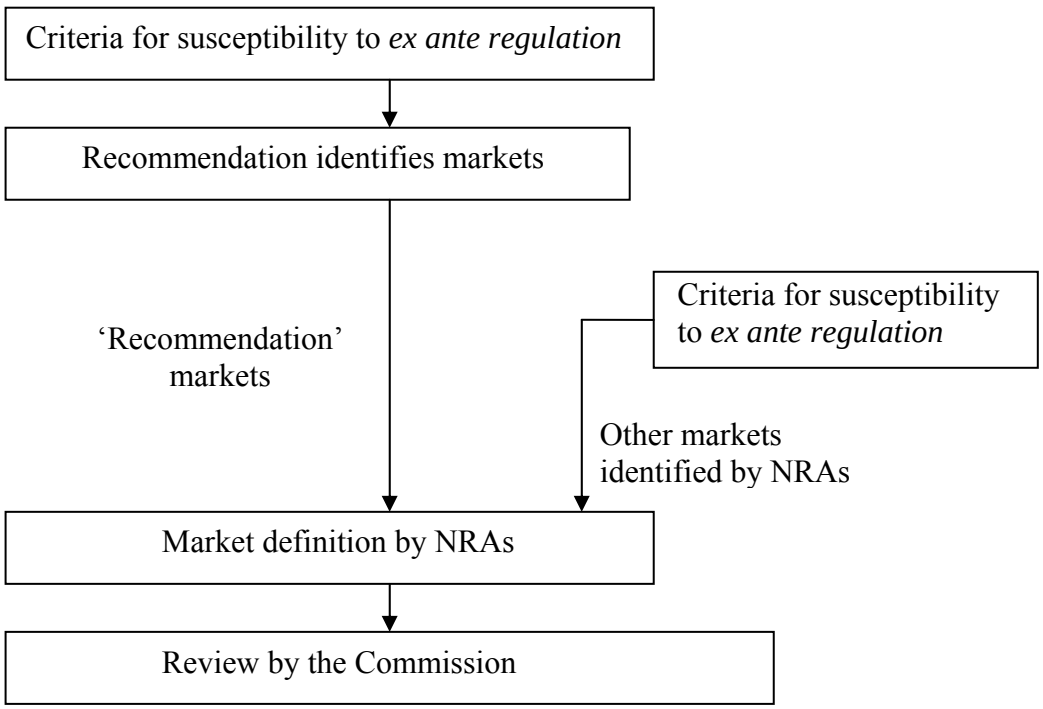
This paper contains the views of the three above-noted economists engaged by the European Commission to offer advice on the review of the Recommendation on Relevant Markets that may be subject to *ex ante* regulation. The report covers activities corresponding to all the markets identified in the current Recommendation, with the exception of markets 17 and 18 - wholesale international roaming and broadcasting transmission. Nor are possible pan-European markets examined. Sections 1-3, on general matters, are joint work by the three authors. Sections 4-6 have as primary authors, respectively, Stumpf, Cave and Valletti.

The role of the Recommendation, as set out in the Framework Directive, can be summarised in the flow diagram shown as figure 1.

The current report is intended to assist the Commission in identifying markets for inclusion in the Recommendation. As noted below, this requires a different approach, based on the idea of a 'representative Member State', than would be utilised by an NRA applying the criteria for susceptibility to *ex ante* regulation to a particular market not included in the Recommendation. Although the report reviews the three criteria for inclusion currently employed, it does not propose radical changes. We have, however, developed an approach which seeks to take account of the restrictions imposed by economic theory concerning dominance at different points in the value chain and of the Framework's explicit preference for minimising regulatory interventions in that chain.

The authors are grateful for the assistance they have received from Commission officials and from meetings held with bodies representing differing shades of opinion among fixed and mobile operators, and with representatives of the European Regulators' Group (ERG). However, the contents of the report are the responsibility of the authors alone.

Figure 1: The role of the Recommendation



Section 2. The Overall Approach

2.1 Retail and wholesale markets

The analysis set out below reflects the policy objectives of the Framework, which are to promote the interests of end users by a variety of means including the development of competition and the encouragement of investment and innovation. The objectives of this sector-specific legislation almost by definition go beyond the goals of competition law. The issue is how to guide the transition from monopoly to effective competition, and the ultimate goal is that of achieving sustainable effective competition across as much as possible of the value chain, including the retail margin.

It is thus appropriate that the methodology adopted in this report for the purpose of identifying relevant markets starts with an identification of problems likely to arise in retail markets for electronic communications services (ECS) in a representative Member State in the absence of regulation. It will then be possible to locate the origin of these problems more precisely in the value chain of the end-user market in question, and apply the three criteria for the application of *ex ante* regulation where high levels of market power are found in any market. This approach relies upon a linkage between defects in competition in wholesale and end user markets of the following kind: if competition problems of any severity emerge in an end-to-end market for the supply of a service to end-users, it must be possible to locate them at some point or points in the value chain; equally, if competition problems of any severity arise at any point in the value chain, they would be reflected equivalently in an end-to-end regime for the supply of a service.

It is important to recognise that this *modus operandi* would not necessarily have to be followed by an NRA conducting market reviews in the context of the current, or a revised, Recommendation. The NRA would be in a position to observe the details of behaviour in any wholesale and retail market, by examining the relevant indicators of the proposed market in the Member State in question. It would also have available the Commission's guidance embodied in the revised Recommendation.[1]

Compared with the NRA's task, the analysis in this report is necessarily more generalised. It has to rely on data taken from a variety of sources to derive a recommendation for a 'representative Member State'. These data include the results of cost studies for ECS activities and single or multi-country reports, such as the Implementation Reports of the European Commission, as well as published notifications of NRAs to the Commission – and Commission responses.

The provisions of the ECS regulatory framework address market failures arising from a firm's control of a network. Market power is also controlled by the abuse of dominance provisions under generic competition law and through merger control procedures.

[1] Given the differences between Member States, national circumstances might differ substantially from the ones of the "representative" Member State that is the basis of the Recommendation. An NRA examining a market not included in the Recommendation may wish to adopt the approach described here.

Generally, the mere existence of a position of dominance does not immediately lead to regulation. It is only if a firm in a dominant position acts in certain ways that it falls foul of the provision of Article 82 of the Treaty. However, a firm with dominance or significant market power (SMP) in an ECS market satisfying the relevant criteria automatically faces remedies. Why does one sector justify the imposition of *ex ante* regulation while another does not? Clearly sectors that are subject to *ex ante* regulation are likely to be key to the functioning of a modern economy. This is also one of the reasons why these industries were state monopolies in the past. It is now recognised that through *ex* ante regulation an ever increasing amount of the value chain can be made more innovative, dynamic and responsive to consumer needs by the competitive process. But it is also recognised that the scope of such special intervention should be narrowly drawn.

Thus, for the purposes of identifying any market the characteristics of which may be such as to justify *ex ante* regulation, this report has started from the proposition that it should be demonstrable using a modified green field approach[2] that the related end-to-end retail market would, absent regulation, be characterised by a substantial degree of market power, causing harm to consumers. This involves looking at competition on the retail market in the absence of upstream or wholesale regulation. The purpose of this is to ensure that regulation is only applied in those circumstances where there is a significant benefit to final consumers that cannot be achieved under competition law.

If a competition problem is found, then a set of wholesale markets within the value chain is identified, and each is examined to see if it is likely to exhibit a situation which satisfies the SMP-test as described in the section 4-6 below. If it does, the analysis of the end-to-end market is repeated, now subject to appropriate regulation where SMP has been found. If regulation solves the problem in the end-to-end market, the process ceases. If not, the process continues based on the analysis of other inputs.

If all wholesale inputs are regulated or found not to have SMP, and dominance or SMP persists at the end-to-end level, then intervention in the retail market under Article 17 of the Universal Services Directive is necessary.

The sequence in which wholesale inputs are analysed is clearly important. Two principles have been adopted. Where alternative wholesale inputs can be ranked in terms of increasing functional coverage, the least inclusive input is examined first.[3]

The second principle adopted is to start the analysis with the least replicable inputs. In the case of fixed voice calls, for example, this would imply the sequence: termination, origination, transit, retail. This is designed to ensure that, in identifying regulatory approaches the most serious issues are examined first. There may, however, be difficulties in some cases in ranking replicability.

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[2] A modified Greenfield approach takes account of non-SMP regulation and of SMP-related regulation originating in markets which are not a component of the value chain under review.

[3] For example, in the supply of broadband, unbundled local loops are in functional terms a less comprehensive product than bitstream, as they provide service over a smaller part of the value chain, which is included in the bitstream product. Unbundled loops would thus be analysed first.

2.2 The three criteria

It is important to be clear about the purpose of having criteria in order to identify markets the characteristics of which may justify the imposition of *ex ante* regulation. It would be feasible to identify innumerable communications markets using the demand and supply substitution test. The purpose of having additional criteria is to narrow this set down to those key markets which may warrant the imposition of *ex ante* regulation.

One of the key purposes of the Framework is to tackle bottlenecks that block the emergence or jeopardize the sustainability of effective competition. The current Recommendation draws from this first criterion that the market be characterised by high and non-transitory entry barriers. This is a necessary but not sufficient condition for a market to be included in the original Recommendation as such a market may yet tend towards effective competition in spite of this. The second criterion looks behind the entry barrier and tries to assess whether a market has characteristics such that it will tend over time towards effective competition. This criterion is a dynamic one, which requires the regulator to make conjectures about the more distant future. The third criterion considers the adequacy of competition law (absent *ex ante* regulation) to deal with problems of the development of competition, taking account of the particular characteristics of the electronic communications sector, and the desirability of limiting *ex ante* regulation to cases where it is strictly necessary.

Criterion 1: High and non-transitory barriers to entry

With respect to the first criterion, two types of barriers to entry and to the development of competition in the electronic communications sector are identified in the current Recommendation: structural barriers and legal or regulatory barriers.

A structural barrier to entry exists when, given the level of demand, the state of the technology and the resulting cost structure are such that they create asymmetric conditions between incumbents and new entrants and impede or prevent market entry of the latter. For instance, high structural barriers may be found to exist when the market is characterised by substantial economies of scale, scope and density and by high sunk costs. Such barriers can still be identified with respect to the widespread deployment and/or provision of local access networks in fixed locations. It is critical that this is considered in a world absent regulation, to avoid the potential for circular reasoning (for instance, a cable operator may not enter the market because the regulator is regulating the alternative network heavily and regulation may make entry barriers appear higher than they are). Similarly, it is incorrect to say that barriers to entry are low because regulation has elicited entry.

Many commentators have made suggestions to the effect that the Commission should clarify the conditions which cause an entry barrier to be considered high. At one level it is easy to enumerate the factors make entry into a market particularly difficult. It is much more difficult to develop hard and fast quantitative thresholds that will enable regulators to make determinations based on actual data. Firstly, because we are looking at multi-dimensional characteristics, it will not be easy (or uncontroversial) to decide how to weight the various factors. For instance, can we envisage a firm that might enter the market on the basis of combining many services together and exploit economies of scope or should we consider entry on the market concerned solely?

Secondly, once such a rule were published it would be instantly subject to gaming from both sides of the debate, which would reduce the usefulness of the threshold in the first instance.

Nonetheless, it is important to be clear about the methodology which we recommend. If it can be shown that a firm as efficient as the incumbent can enter one or several markets with an acceptable level of risk on the basis of just entering this market alone, then entry barriers cannot be considered high enough. This still leaves room for false positives – in the sense that entry barriers might be seen as high when they can be overcome by economies of scope and this possibility should also be considered. Lack of evidence of entry (both in the EU and elsewhere) may give support to the fact that entry barriers are high, provided account is taken both of the possibility of exclusionary behaviour by the incumbent, such as predation, and of the entry-deterring effects of regulation.

A specific and different type of barrier to the development of effective competition can also occur in the electronic communications sector where interconnection is required to enable a calling party to make a call to a specific subscriber number. In relation to termination, the terminating network operator can affect competition adversely by raising a rival's costs or by passing on inefficiencies to competitors. This barrier by itself need not lead to an absence of competition. For example, where the receiver rather than the calling party is responsible for paying any charge associated with incoming calls or traffic, the ability to raise termination charges above costs is muted by competition. Technological solutions might also provide a way round the barrier.

Legal or regulatory barriers are not based on economic conditions, but result from legislative, administrative or other state measures that have a direct effect on the conditions of entry and/or the positioning of operators on the relevant market.

It is often assumed that these barriers are set at the lowest level possible consistent with the public good. However, this is an ambitious assumption. Experience has shown that regulatory barriers are sometimes not set at levels consistent with best regulatory practice.

The best example of this is in relation to the mobile industry. There are examples of spectrum regulators (which may not be the NRA for electronic communications services) issuing an unnecessarily low number of licences; of regulators choosing award processes that have led to long appeals; of regulators awarding spectrum exclusively to incumbent operators; and of allegations of irregularities in licence awards. Some of these may be remediable by the NRA.

This induces a situation of circular causation. A regulator makes poor policy choices and this has an effect on the market. The same regulator can then blame any adverse outcomes on the market and take the power to intervene further. This creates the misleading impression that it is the market that is not functioning properly, when the root cause has been a regulatory failure.

For this reason, it should be made clear in the revised Recommendation that the Commission will take into account the endogenous nature of the regulatory barrier to entry. In essence, the Commission should expect that NRAs to demonstrate that they

have used their current powers to set the regulatory barriers to entry at the lowest level possible for that particular market. Consumers should not, however, be penalised for irretrievable regulatory failures. Thus, regulation may still be necessary in these circumstances, but the regulatory failure should be acknowledged.

Criterion 2: Dynamic towards effective competition

The application of the second criterion involves examining the state of competition behind the barrier to entry, taking account of the fact that even when a market is characterised by high and non-transitory barriers to entry, other structural factors or market characteristics may mean that the market tends towards effective competition.

To be distinct from the first criterion, which should involve a prospective analysis, the second criterion must take into account a longer-run dynamic. In particular, the criterion should be a warning against allowing regulation to act as a deterrent to competitive investment – for example, excessive regulation of DSL discouraging upgrading of cable systems.

Thus, the second criterion should take account of the fact that prospective developments can affect behaviour in advance of their implementation. For example in the mobile sector prices tend to fall in anticipation of entry. The potential for disruptive technology also helps to contain market power. Firms may lower prices in advance to make the market less attractive for such entry. At the same time, current end-users should not be left unprotected over a lengthy interim period.

A further important element that should not be ignored is the role of the market for corporate control. Even in the face of regulatory barriers, there is always the possibility of firm ownership (and hence strategy) changing during the period of a review. Managements are not all as good as one another. In this manner, a form of entry is feasible, that does not change the number of competitors but may still fundamentally change the nature of competition. This is of great importance in the mobile sector as under-performing firms are normally subject to speculation in terms of take-over bids.

Criterion 3: Sufficiency of competition law

Competition law applies generally, and in particular is not disapplied when there is *ex ante* regulation. Nonetheless, there are circumstances where *ex* ante regulation has indispensable advantages- for example situations where the compliance requirements of an intervention to redress a market failure are extensive (e.g. the need for detailed accounting for regulatory purposes, assessment of costs, monitoring of terms and conditions including technical parameters etc), or where frequent or timely or anticipatory intervention is indispensable, or where creating regulatory certainty (for example, by means of a multi-period price cap) is of paramount concern. In this sense, regulation and competition law are complementary instruments.

These considerations justify, yet set limits to, the role of regulation. In the case of any Member State, the efficacy of the two modes of intervention will depend upon the legal framework and the capacity and competence of the respective NRA and NCA; considerations which cannot be taken into account drawing up the Recommendation.

Two particular illustrations of the implications of the third criterion deserve consideration. It has been suggested that the justification for regulating retail prices of fixed services has now changed from consumer protection to the prevention of exclusionary practices in the form of price squeezes etc, and that retail markets should be included in the Recommendation on the ground that SMP, leveraged from an adjoining wholesale market, can be exhibited there, and requires remedies such as the *ex ante* disclosure of retail price data.

The present report has not adopted this approach. There are means within the framework for regulation to require such disclosures, other than finding SMP in retail markets. Retail price squeezes are susceptible to interventions under competition law, and may fail the third criterion. It is also important not to isolate firms from legitimate pressure to reduce margins.

Secondly, it has been suggested that SMP involving collective dominance is better dealt with under competition law than under the framework, and that such cases therefore fail the third criterion. The reasoning is that collective dominance cases under the framework already require analysis of current patterns of behaviour as well as projections of such behaviour into future. Because the latter are more conjectural than projections of the behaviour of singly dominant firms, it is argued that they can and should be avoided by applying competition law, which examines behaviour *ex post*. We have not taken a position on this reasoning, but note that the demonstration of joint dominance under the regulatory framework in practice requires evidence of current as well as of prospective behaviour. The standard of proof for SMP is accordingly high.

In summary, the present report has worked broadly within the framework of the existing criteria, interpreted as indicated above.

2.3 The current round of notifications

As noted above, the authors of this report have had available to this the notifications by NRAs, and the Commission's responses under the current recommendation. The results of the market reviews with regard to SMP are summarised in Table 1.

It is inappropriate, however, to treat a high proportion of SMP findings as creating a presumption of the need to continue to include the market in question in the Recommendation. Technical development may, and deregulatory strategies pursued by NRAs should, reduce the number over time. On the other hand, a widespread finding of effective competition must cast doubt on the need to resort to *ex ante* regulation.

Table 1: Result of the current round of notifications (as of 22.06.06)*

		Number of NRAs that have found SMP	Number of NRAs that have not found SMP
1	Retail fixed access, residential customers	18	0
2	Retail fixed access, non-residential customers	18	0
3	Retail fixed domestic calls, residential customers	14	2
4	Retail fixed international calls, residential customers	9	6
5	Retail fixed domestic calls, non-residential customers	12	3
6	Retail fixed international calls, non-residential customers	9	6
7	Retail leased lines (minimum set of leased lines)	13	0
8	Wholesale fixed call origination	20	0
9	Wholesale fixed call termination on individual networks	19	0
10	Wholesale transit	12	3
11	Wholesale ULL	18	0
12	Wholesale broadband access	17	0
13	Wholesale terminating segments of leased lines	13	0
14	Wholesale trunk segments of leased lines	5	6
15	Wholesale mobile access and call origination	4	9
16	Wholesale mobile call termination on individual networks	23	0

* The table does not include wholesale international roaming and wholesale transmission of broadcasting signals.

Section 3. General issues of market definition

This section reviews five issues common to the market definition exercises described in this report:

- the hypothetical monopolist test
- self-supply
- two-sided markets
- geographical market definition
- next generation networks

3.1 The hypothetical monopolist test

Market definition is simply an instrumental stage in a process designed to evaluate the existence and effects of the level of market power of a given undertaking or undertakings. Put most generally, the goal is to evaluate the degree of competitive constraint placed by customers (demand substitution) and other firms (supply-side substitution) on the ability of the undertaking(s) in question to behave independently.

Under EC competition law, this process of evaluation is undertaken in the two stages of market definition and market analysis including the issue of whether there is an abuse of dominance. The first stage establishes the relevant product/services market which 'comprises all those products or services that are sufficiently interchangeable or substitutable, not only in terms of their objective characteristics, by virtue of which they are particularly suitable to satisfying eh constant needs of consumers, their prices or their intended use, but also in terms of conditions of competition and/or the structure of supply and demand on the market in question'[4] (Guidelines para 44, fn omitted). Once markets have been defined, market analysis can proceed.

In the regulatory framework, markets are defined in accordance with the principles of competition law, as set out in the *Commission Notice on Market Definition*[5] (1997), and in the documents associated with the ECS Directives, including the *Guidelines on Market Analysis*.

The Guidelines identify the hypothetical monopolist test as one means of assessing the degree of demand and supply side substitution, and hence the extent of any market. This test has a lineage going back to the US Department of Justice Merger Guidelines of 1982. It is endorsed in the 1997 Commission Notice and by the NCAs of many Member States. It involves taking a set of services (a 'candidate market') and conjecturing the effect on the profits of an unregulated hypothetical monopolist of that set of services of a non-transitory increase in price of 5-10%. If the effect is negative, because of 'too much' substitution, the set of services is not a market and the process should be repeated with a larger set, until a positive effect on profit is found. If the

[4] *Guidelines on Market Analysis and the Evaluation of Significant Market Power*, 2004.
[5] *Note on the Definition of the Relevant Market for the Purposes of Community Competition Law*, 1997

price increase raises profit, then the set of services is a market – unless a smaller set has the same characteristic.

This test is well suited for the current context, as it permits market analysis to take place on the basis of existing market structures, which in many cases involve historic monopolists, with high market shares. Analysis of the likely outcome of behaviour not regulated with respect to SMP can also provide a 'zero base' for the development of remedies if SMP is found.

It is known that the test has to be applied starting from a 'competitive price' of the chosen services in the candidate market. The prices of other services (not in the candidate market) should be taken to be at their existing levels, unless they themselves are potentially subject to regulation in the same value chain.

Unfortunately, the data to perform such a test literally are rarely available, because existing regulation is often precisely designed to prevent the occurrence of the assumed price increase.[6] Examination of notifications to date by NRAs suggests that the test has been adopted as a conceptual framework, to form conjectures of, for example, the likely impact on fixed-mobile substitution of a 5-10% increase in fixed call charges.

A further complexity arising in ECS market is that services are arranged in a vertical hierarchy, with some – ignoring price – preferred to others by (almost) all consumers – eg. mobile to fixed voice, or broadband to narrowband internet access. In these cases, the superior product can constrain the price of the inferior, but not vice versa; in other words, the market definitions that emerge are not symmetrical.

Those difficulties may seem to evacuate the test of any direct practical utility, beyond a conceptual approach. However, a useful corollary of it can be helpful in certain circumstances. This corollary, known as the Critical Loss Test, asks the following question: if set of services X is <u>not</u> to be a market, how much switching of consumers in response to the 5-10% price increase must be present to make the increase unprofitable?

Critical loss analysis (CLA) is thus an algebraic relationship used to identify anti-trust markets. Its application emerged in US anti-trust merger analysis in the early 1990s. It has since been applied widely by anti-trust agencies around the world.

In summary CLA may be described as involving the following steps:

1. Estimate the 'incremental margin' (i.e. the margin between price and costs assessed by using observations about price and variable costs) and calculate the 'critical loss' (CL) (i.e. the volume of sales that would make a given percentage price increase unprofitable for a hypothetical monopolist).

2. Estimate what the 'actual loss' (AL) in sales would be (using available demand data, including elasticity estimates for the 'candidate market') for the price increase.

[6] To the extent that regulation mimics competition, however, it may help to indicate the level of competitive prices.

3. If AL exceeds CL, the market needs to be broadened.

The data required to perform CLA are as follows.

1. To calculate the CL, information is needed about incremental costs of service provision and the price charged for the service. Price data are readily obtainable. Cost data can be obtained from reports by NRAs or from information supplied by the parties.

2. To calculate AL would require information about demand side elasticities – calculated at the correct price. These are unlikely to be available. We can, however, use stylized illustrations to indicate a range of values, or form a judgement as to whether the actual elasticity is likely to match the critical loss elasticity (CLE)

It is useful to outline the algebra of CLA:

The critical loss for a positive price change $\Delta\ p$ can be shown using simple algebra as follows, where $\Delta\ q$ is the reduction in output sold:

(1) $$\begin{pmatrix} Benefit\ of \\ price\ increase \end{pmatrix} = \Delta\ p\left[q + \Delta\ q\right],$$

(2) $$\begin{pmatrix} Cost\ of \\ price\ increase \end{pmatrix} = -\left(p - c\right)\Delta\ q.$$

Dividing both (1) and (2) above by pq and setting them equal to each other yields:

(3) $$\frac{\Delta\ p}{p}\left(1 + \frac{\Delta\ q}{q}\right) = \left(\frac{-\left(p - c\right)}{p}\right)\frac{\Delta\ q}{q}.$$

The critical loss is identified as the percentage change in quantity $\Delta\ q/q$ that ensures equation (3) is satisfied. Solving (3) for $\Delta\ q/q$ gives:

(4) $$CL = \frac{\Delta\ q}{q} = \frac{\Delta\ p/p}{\left(\Delta\ p/p\right) + m}$$

where $m = (p - c)/p$ is the price-cost margin. Another way to express (4) is in terms of the critical loss elasticity (CLE). This is found by dividing both sides of (4) by $\Delta p/p$:

(5) $$CLE = \frac{\Delta q/q}{\Delta p/p} = \frac{1}{(\Delta p/p) + m}.$$

When assessing market definition, the critical loss analysis should be made at the competitive price-cost margin.[7] At this price, which will be closer to the cost (usually taken as variable cost), the CLE value for a given percentage price increase $\Delta p/p$ will be relatively high when compared against a price greatly in excess of cost. In particular, if the CL and CLE values are estimated at prevailing (and allegedly abusive) prices, there is a risk that the relevant market is defined too widely ("cellophane fallacy"). Conversely, a value of CL > AL at prevailing prices indicates that the market will certainly not be broader than with an estimation at competitive prices.

The value of the 'critical loss' then depends on two factors, the % price increase and the price-cost margin calculated at the competitive price. Table 2 below shows the numbers, based on formulae (4) and (5) above.

Critical loss ratio (CL) and critical loss elasticities (CLE) for different price increases and cost structures are shown in Table 2. For example, if the price cost margin is 0.6, so that marginal cost is 40% of the price, then the service in question is a 'market' if the change in quantity in response to a 10% increase in price is 14% or less. If it exceeded 14%, the price change would be unprofitable, because the additional profit made by the price increase would be more than outweighed by the loss of margin or output which is no longer bought. As noted below, the price elasticity data needed to apply the hypothetical monopolist (or critical loss) test are not usually available. Nonetheless, the threshold values which flow from the latter can be used as a check on more qualitative reasoning.

[7] By contrast in merger analysis the current price is usually used.

Table 2: Critical loss test values

	Price Change			
	5%		10%	
Price-cost margin (m)	CL	CLE	CL	CLE
0.10	0.33	6.6	0.50	5.0
0.20	0.20	4.0	0.33	3.3
0.40	0.11	2.2	0.20	2.0
0.60	0.08	1.5	0.14	1.4
0.80	0.06	1.2	0.11	1.1
0.90	0.05	1.1	0.10	1.0

3.2 Relevance of self supply for definition of wholesale markets

One of the following situations frequently occurs at the wholesale level:

- The incumbent operators do not provide a particular type of wholesale service, usually because this service was not subject to ex ante regulation in the past.

- The incumbent operators provide a particular type of wholesale service, often because this service is already subject to ex ante regulation. The incumbents' wholesale services are the only ones on the market and there are no wholesale demand substitutes provided by other operators.

In both cases it appears that there is no competitive constraint which could force the incumbent operator to offer network access and/or prevent it from raising wholesale prices above a competitive level. This, however, could represent a misleading picture of the competitive dynamics given that new entrants have invested in network build-out, and self supply has made new entrants less dependent on incumbent operator's wholesale inputs. Hence, a full analysis will have to assess possible competitive constraints that result from self supply.

Three issues are addressed in this section:

1. Relevance of self supply where wholesale services do not (yet) exist.

2. Relevance of self supply, where the incumbent is the only provider of a wholesale service, but where self supply may allow other operators to offer inputs to third parties (wholesale supply side substitution), thereby imposing a direct competitive constraint on the incumbent's wholesale service.

3. Relevance of self supply, where the incumbent is the only provider of a wholesale service, but where self supply allows other operators to compete at the retail (retail demand substitution), thereby indirectly imposing a competitive constraint on the incumbent's wholesale service.

3.2.1 Relevance of self supply where wholesale markets do not (yet) exist

A commercial wholesale product may not be made available in the absence of ex ante regulation, because the dominant firm(s) may have no interest in providing a new entrant with an input needed to compete. For example, it is questionable whether incumbents would provide wholesale access to ULLs or wholesale fixed call origination absent ex ante regulation. In a number of Member States, incumbents would not have provided wholesale broadband access without regulatory intervention. Similarly, jointly dominant firms may tacitly collude by not providing wholesale services. For example, it has been argued that the leading mobile operators in some countries may tacitly collude in not providing wholesale access and call origination on their networks. This raises the question whether a notional wholesale market can be constructed in countries, where wholesale services have not been mandated in the past and commercial wholesale transactions do not exist (namely wholesale broadband access and wholesale mobile access and call origination).

The market definition exercise has to be based on a Greenfield approach, i.e., carried out under the assumption of competitive products and prices and absence of ex ante regulation through the SMP mechanism for the wholesale service in question. It is therefore necessary to establish whether in such circumstances commercial wholesale offerings would have developed. Under competitive conditions, the upstream (network) and downstream (retail) divisions of vertically integrated firms would earn a normal return. If a new entrant (non-integrated) downstream operator were more cost efficient than the downstream arm of the integrated operator(s), or if it could market retail services to a wider range of customers (for example, through better targeted tariff options or by bundling the downstream retail service with other services), it would request a wholesale product from the vertically integrated operator(s). Given that the new entrant would be able to offer terms that would increase the vertically integrated operator's return, it may be able to reach a commercial agreement for the wholesale service. It can therefore be argued that under competitive conditions a vertically integrated operator would have an incentive to offer a wholesale product to third parties. Note that this result holds only if the new entrant has some sort of advantage over the incumbent's downstream arm and that the incumbent's economies from a vertically integrated value chain do not outweigh this advantage.

If commercial wholesale offerings were likely to develop under competitive market conditions, it would be justified to construct a *notional* relevant wholesale market and

include the self provided inputs of the existing operators. For example, where commercial wholesale broadband access services do not exist, the (notional) wholesale broadband access market may include the self-provided bitstream of the incumbent and of rival cable operators. Or, in the absence of commercial wholesale mobile access and call origination services, the relevant wholesale market may include the self originated calls of licensed mobile operators. Since there are no market transactions on notional wholesale markets, the calculation of market shares cannot be based on revenues, but will have to use volumes (e.g., number of minutes or number of access lines).

3.2.2 Relevance of self supply where wholesale supply substitution may be possible

For many wholesale services, the incumbent is the only provider. There are no wholesale demand substitutes to the incumbent supplier's mandated offering, or – if they exist - there are few commercial wholesale transactions of rival wholesale suppliers. For example, cable operators usually do not provide a substitute to the incumbent's wholesale bitstream access service. Often alternative fixed operators and mobile operators do not provide wholesale transit services to third parties, or the extent of the wholesale transit services supplied is very limited. Often these firms compete with the incumbent operator on retail markets, self supplying the relevant inputs. Where alternative operators self supply inputs, they may also be able to market those inputs as wholesale services to third parties. For example, cable networks are usually closed networks, and cable operators self supply an input that may be similar to wholesale bitstream access. The question is whether cable operators could provide a wholesale broadband offering to third parties. Another example: CS/CSP operators self provide call conveyance on their own trunk networks. The question here is whether they are likely to provide a wholesale transit service to third parties. If strong enough, supply side substitution could provide a direct pricing constraint on the incumbent's wholesale service offering.

When assessing the strength of direct pricing constraints from wholesale supply substitution, the following questions have to be addressed:

- Rival operators will need spare capacity to handle the additional traffic of wholesale customers on their networks. However, firms often have dimensioned network capacity according to their own needs and will not have the necessary capacity available for providing services to third parties. They will then have to make investments in additional capacity in order to accommodate the traffic of third parties. In addition, operators wanting to supply wholesale services will have to invest in wholesale billing and account management systems.

- The roll-out and geographical coverage ("ubiquity") of the competitors' networks may not match the one of the incumbent operator. In these circumstances downstream wholesale customers would not regard an alternative wholesale offering as comparable with the one of the incumbent. Potential providers of wholesale services would have to make substantial investments in further network roll-out and coverage, before they could start providing services similar to the incumbent.

- In order to switch to alternative wholesale suppliers, downstream operators would need to incur costs in order to (physically) connect to the alternative wholesale suppliers' networks. The switching costs of a downstream wholesale customer could be substantial if network access points of the alternative supplier differ substantially from the ones of the incumbent operator and a widespread reconfiguration of the network would become necessary.

Only in the case where a rival firm has reached a network roll-out and geographical coverage comparable with the existing operator(s), where the necessary spare capacity is available, wholesale billing and account management systems exist, and where switching costs are low, supply substitution appears to impose a strong enough pricing constraint on the existing wholesale products. In this case the rival firm's self provided inputs could be included in the same relevant wholesale market together with incumbent's wholesale offerings. Since there are no revenues for self provided inputs, volumes will have to be used to calculate market shares.

We note that, while the ability of rival operators to potentially offer wholesale services may not be strong enough in the short run to be reflected in the market definition, it may be strong enough in the longer run to be taken into account in the market analysis. It would then be regarded as evidence of low barriers to entry limiting the market power of incumbent operators.

3.2.3 Relevance of self supply where retail demand substitution matters

Where the incumbent is the only provider of wholesale services, and where neither wholesale demand nor wholesale supply substitution is putting a competitive constraint on the pricing behaviour, there may still be an indirect pricing constraint from the retail level. The SSNIP test would be carried out under the assumption of competitive products and prices in the value chain. Retail prices can be regarded as being comprised of a number of input costs. If the price of a wholesale input is raised, the prices of the retail products that are based on the wholesale input increase as well. Retail customers may switch to other retail products based on self supplied inputs. For example, consumers may substitute broadband Internet access provided by the incumbent or a cable operator for a product of a ULL (or WBA) based competitor, whose price rises as a result of an increase in the price of ULL (or WBA). Another example: Consumers may substitute a call provided by the incumbent or a ULL based operator for a CS/CPS call if the price of the latter rises as a result of in an increase in the price of wholesale call origination. If retail customers substitute the retail product based on the self supplied input for the retail product based on the wholesale input, there is a corresponding effect on the upstream input level: The self supplied input replaces the wholesale input.

The question is whether retail demand substitution is strong enough to prevent a hypothetical monoplist provider of the wholesale service in question from profitably and sustainably raising the wholesale price by a small but significant amount. A comparison of *critical* and *acutal loss* at the wholesale level, as set out in Section 2.2, can help to determine the strenght of the indirect pricing constraing.

Critical loss

The wholesale volume loss that would make a small increase of the wholesale price unprofitable (the "critical loss") will depend on the wholesale price-cost margin. Where the wholesale price-cost margin is large, as in the case of local access related wholesale products, a relatively small percentage loss of wholesale volume would already suffice to make the price increase unprofitable.

Actual loss

This critical loss can be compared to the actual loss that would emerge from the increase of the price of the wholesale input. The impact of the wholesale price increase on wholesale demand is diluted, because - in the absence of wholesale demand or supply substitution - it is determined by what happens at the retail level. The actual loss depends on two factors:

- *The price elasticity of demand for the wholesale based retail product:* The price elasticity depends on the substitutability between the wholesale based retail product and the retail products based on self supplied inputs. Other things equal, the higher the degree of substitution at the retail level, the higher the price elasticity of demand for the wholesale based retail product, the higher the reduction of the demand for the wholesale based retail product, and the higher the actual loss at the wholesale level.

- *The cost share of the wholesale input in the overall price of the wholesale based retail product:* Retail prices can be regarded as being comprised of a number of input costs and one of these input costs is the cost of the wholesale service in question. Other things equal, the higher the cost share, the higher the increase of the retail price, the higher the reduction of demand for the wholesale based retail product, and the higher the actual loss at the wholesale level.

The demand for a wholesale input is derived from the demand for the wholesale based retail product. The price elasticity of demand for the wholesale input is related to that for the wholesale based retail product. Under the assumption that there are no direct wholesale demand and supply substitutes as well as a number of other assumptions the price elasticity of *wholesale* demand is equal to the cost share *multiplied by* the price elasticity of demand for the wholesale based *retail* product.[8]

There is often a high substitutability between a wholesale based retail product and the retail product based on the self supplied input, and hence there is a high retail elasticity for the former. It is then the cost share of the wholesale input which determines the strength of the indirect pricing constraint. For example, for wholesale transit, where the share of the wholesale cost in the retail price of a call minute is

[8] This is a simplification of the Hicks Marshall rule of Derived demand. See also Kennan (1998), *The Hicks-Marshall Rules of Derived Demand an expository note*, University of Wisconsin-Madison. The assumptions are: (i) The production function has two inputs and exhibit a constant elasticity of substitution between both inputs. (ii) The demand function is of the constant elasticity type. (iii) The supply function for other inputs is of the constant elasticity type. (iv) The elasticity of supply of the other input is infinite. (v) The elasticity of substitution between the wholesale input in question and the other input is zero.

lower than 10 %, the impact of a wholesale price increase on wholesale demand for transit would be largely diluted. The elasticity of demand for wholesale transit would be less than 10 % of the elasticity of demand for CS/CPS calls. Hence, the actual loss at the wholesale level is likely to be much lower than the critical loss. A hypothetical monopolist provider of transit is unlikely to be constrained by retail demand substitution. Only where the share of the wholesale input in the retail price is over 50 %, the indirect pricing constraint appears to become large enough. This may be the case, for example, for ULL and WBA.

If the indirect pricing constraint from retail demand substitution is found to be strong enough, self supply of competitors *and* the incumbent should be included in the relevant wholesale market. If the competitors' self supply were included in the market, and at the same time self supply of the incumbent excluded, the resultant market share of the incumbent would underestimate its market power. The actual market power of the incumbent is only properly revealed once wholesale *and* self supplied inputs of the incumbent are aggregated.

We note that, if the indirect pricing constraint from short-run retail demand substitution is not strong enough to be reflected in the market definition, it may still have to be taken account of in the market analysis as a factor limiting the market power of incumbent operator.

3.3 Market definition and two-sided markets

In identifying markets, the standard test adopted by most anti-trust and regulatory authorities is the so-called SSNIP test (sometimes also called the "hypothetical monopolist test") which is discussed in Section 3.1. This is designed to explore the consequences of a (hypothetical) Small but Significant Non-transitory Increase in Price on the profitability of the (hypothetical) firm that initiates it. At the heart of this test is the question of what might make such a price rise unsustainable. When the hypothetical monopolist raises its price, it will lose some sales as at least some consumers will choose not to purchase the product and drop out of the market. However, it will also lose sales for two other reasons: some consumers will switch to substitute products ("demand-side substitutability") and some firms operating "near" to the (narrowly defined) candidate market will alter their production programmes and supply similar products to other consumers in the market at lower prices ("supply-side substitutability"). If there are close demand- or supply-side substitutes, then the price increase initiated by the hypothetical monopolist will lead to a large reduction in its sales, and its profits will, as a consequence, fall.

A number of difficulties arise in identifying market boundaries, which requires fairly finely tuned judgements to conduct the exercise of market definition properly. Four particular areas of difficulty are: deciding how to treat firms that operate in many related markets, dealing with intermediate goods markets, applying the test to markets that are already monopolised (known as the "cellophane fallacy"), and determining what is small but significant. We will deal with first two points only, as the other two points are well known.

These difficulties occur when applying these general principles to telephony in general. Customers buy phones for many reasons. Customer profiles are very

heterogeneous in terms of calling patterns, needs, mobility, etc., which is reflected in part in the vast number of tariffs on offer in these markets. The needs of a certain customer are themselves not immutable, and will depend on factors such as circumstances and locations. In principle, therefore, if one defined an antitrust market in a very narrow way and purely on the basis of substitutability at a given point in time, this exercise would result in a proliferation of very narrowly defined markets. At the same time, however, a telephone network operator is a provider of different products and services that satisfy these various needs. In other words, a telephony operator can be seen as a multi-product firm. The fact that a firm manufactures or sells more than one product may suggest, but by no means implies, that there should be a much bigger market for the that firm's total output. According to this view, the relevant market should include a "cluster" of products, where non-substitutes should be included in the same market.

Cluster markets exist when products are offered for sale as a bundle, even though they are not "tied" to each other, that is, there is no requirement that all of the products must be bought from one single supplier. Despite this lack of tying, regulators and courts still might regard the cluster as constituting one relevant product market. To understand when this should happen, it is necessary to examine the reasons for the firm selling more than one product. Often this has a supply-side motivation, because of the cost function facing that firm. For example, the firm may have merged to obtain economies of scope. Economies of scope arise where the firm achieves savings as it increases the variety of activities it performs – producing given quantities of products at a lower total cost than the total cost of producing these quantities separately. With an increasing trend to decomposition in certain markets, barriers to entry are broken by breaking the cluster (if one exists). Clusters of products may also arise (and persist even in the absence of supply-side motivations) because of demand-side considerations if buying them from a single firm significantly reduces consumers' transaction costs (in this case, goods are sometimes referred to as "transactional complements"[9]). Transactional complementarity effectively ties consumer purchases of multiple products to individual firms and thereby makes the cluster the relevant product market.

The concept of cluster markets applies to most telephony services. For instance, in mobile markets, customers typically want one handset and one SIM card to handle almost all their calls. This observation seems particularly pertinent to mobile telephony as it involves a consumer on the move, in different locations, therefore with a reduced ability to use alternative providers, hardware, etc. (convenience). Still, the exercise must be conducted with caution. There is a danger, in focusing on cluster markets, that regulators and anti-trust authorities will be both under-inclusive and over-inclusive in their concept of the relevant market. Under-inclusive, by excluding firms that may offer particular products also offered by the multi-product firm; and over-inclusive, by failing to note the market power existing in particular product lines. Markets are defined for the purposes of identifying particular detriments and public benefits. The real emphasis in competition analysis should be on these factors and not on the formal definition of markets.

Even if one accepts the broader concept of a cluster market, an extra layer of complications arises in the context of telephony because benefits and costs associated

[9] See I. Ayers (1985), "Rationalizing Antitrust Cluster Markets", *Yale Law Journal*.

with calls generally do not accrue to the same party. When a conversation happens, there must be both "senders" and "receivers" involved, which are, by definition, different individuals. Clearly, no one would ever want to place a call if that call is known not to be received or ever retrieved. Even more obviously, one cannot receive a call if this call has not been made! As obvious as this may sound, it is a healthy reminder of the type of economic considerations that must be taken into account when defining markets, without risking the derivation of fictional market definitions.

As an example, it is a common and useful practice to think of a retail market for call origination, although it is clear that this market cannot exist in isolation without termination. When the SSNIP test is applied to the market for call origination, the analysis should try to assess how the call originator would respond to an increase in price, looking for possible substitute services, and so forth. This analysis presupposes that the same change in demand of calls originated by the sender will also occur on the receiving side, i.e., every call is accepted by the receiver. This is indeed a very likely situation since in most case receivers will not pay for the call. According to this line of analysis, the retail market for call origination is de facto extended to include termination as a necessary input for an originated call to be completed. Termination is an input that is not directly bought by the call originator, but is needed to satisfy the call originator's needs. There is a derived demand for termination services. According to this view, there is a retail market for call origination but not a retail market for termination. Instead, call origination and call termination are in a vertical relationship where the provider of call origination takes as given the input price for termination, and then charges a mark up depending on price elasticity of outgoing calls. A market analysis could therefore find that the retail market for call origination is competitive, but the input market for termination is monopolised (or the other way around). The distinction between call origination at the retail level and call termination at the wholesale is, to a large extent, fictitious and reflects only common billing practices rather than an underlying economic vertical relationship in the production of a (completed) telephone call – see Box 1.

The previous example is coherent but incomplete. In fact, we argued that a market for call origination can exist only if there is also a market for termination. Implicitly in the previous line of arguments, we assumed that termination was needed only by the sender. However, if a call is accepted by a receiver, then this is saying that there is *also* a demand for termination of calls on the side of the receiver! If one then applies the SSNIP test to this market, the exercise looks less straightforward. Which price should one increase? And who pays for it? The response of a customer to an increase in the price of termination, and therefore the profitability of the (hypothetical) firm that initiates it, will differ if the party that bears its cost is the receiver or the sender.

A less formal market definition would at this stage consider the whole economic environment, starting from the fact that customers do not demand calls *per se*, rather they want to communicate, e.g., exchange information. Calls sent and received are just inputs in this exchange of information. According to this view, a telephone network operator is a provider of a "platform" that allows the exchange of communications between these two different sides, the senders and the receivers. In this sense, a telephony firm should be analysed in the context of the "two-sided markets" framework, which has recently received much recent attention both in the

literature and in court cases. Section 3.3.1 reviews the main insights from this economic literature.

Box 1 – Termination: retail or wholesale market?

Imagine customer A calls customer B and pays p_{AB} to A's provider. A's provider then pays a termination charge t_B to B's provider. The competitive environment that leads to the setting of p_{AB} (at the retail level) may have nothing to do with the competitive environment that leads to the setting of t_B (at the wholesale level). Alternatively, imagine a "notional" situation where there is no inter-carrier compensation, and customer A pays *directly* p_A to provider A for call origination and p_B to provider B for call termination. In the eyes of customer A, the two situations are formally equivalent if, for instance, $p_A = p_{AB} - t_B$ and $p_B = t_B$. Once again, the competitive conditions that lead to the setting of p_A and p_B (*both* at the retail level under this alternative pricing arrangement) could be very different.

The general point that we are making about market definition is the following. Practitioners and policy makers should not forget that the role of market definition is to provide a basis on which regulators or anti-trust authorities calculate important indicators such as market shares, etc., in making their *prima facie* case. However, the task of defining markets should not be confused with the assessment of competitive effects and efficiencies. In practice, this means that many subtle interactions can be taken into account when assessing market power and eventually imposing remedies.

To sum up, market definition is a very delicate exercise. One should avoid too narrow definitions and, in this sense, cluster markets seem helpful and a natural starting point in mobile telecommunications. However, not all these products can be seen as cluster markets since interdependencies among users are crucial in telecommunications markets. An important case in point is the discussion on the existence (or absence) of retail markets for call origination and call termination. These are useful categories to frame a problem, but clearly there is no market for call origination without call termination, and vice versa. This is because of the perfect complementarity between origination and termination. Without termination, there would be no demand for origination. Conversely, if there is demand for call origination there must also be demand for termination. What matters for consumers is the ability to exchange information, and this exchange necessitates two inputs: origination and termination, which are priced in some particular ways to particular parties. This same debate applies also to wholesale markets. Instead of viewing the originating carrier as a customer purchasing terminating services, one could just as well think of the terminating carrier as purchasing origination services. Once again, it is better to think of each carrier as providing a service that is complementary to the other.

3.3.1 Two-sided platforms

The term "two-sided platforms" (2SPs) refers to products and services which must be used by two (or more) groups of customers to be of value to them. The "platform" enables interactions between the different "sides", trying to get the two sides "on board", and charging each side.

2SPs are the subject of a recent academic literature in economics that usually refers to them as "two-sided markets".[10] Since the term "market" is used in a different way for the purposes of antitrust policy, we will use instead the more neutral 2SP terminology.[11] There is no unequivocal definition of 2SPs in the literature. Some economists would argue that "you know a two-sided market when you see it", which is a bit too loose. Rochet and Tirole (2003) have proposed the following definition: "A market is two-sided if the platform can affect the volume of transactions by charging more to one side of the market and reducing the price by the other side by an equal amount; in other words, the price structure matters".

The previous definition draws an important distinction between price *structure* and price *level*. This makes 2SPs different from markets encountered in textbook economics where the price structure is typically neutral. For instance, in competitive markets it is irrelevant who is charged VAT, whether the producer or the consumer, since only the price level matters for the level of transactions between the two sides (buyers and sellers). In 2SPs, instead, the price structure charged to the two sides has an impact on the allocation. If the two sides cannot internalise externalities between them, then the Coase theorem does not apply and market failures can arise. The role of the platform can therefore be the one of an intermediary, finding the right pricing structure between the two sides and allowing trade to take place.

As an alternative definition that immediately follows from the previous discussion, a 2SP arises in a situation where: (a) there are two (or more) sides, with (uninternalised) inter-group *network externalities*, and (b) platforms have the ability to *price discriminate* between the two sides.

Leaving definitions aside, it is helpful to give a few examples of 2SPs. Evans (2003) introduces a useful taxonomy of 2SPs:

- *Exchanges* such as security exchanges, auction houses, brokers, and various matchmaking activities (e.g., employment agencies, real estate). Exchanges help buyers and sellers search for feasible contracts. The externality here arises from the fact that having large number of participants on both sides increases the probability that participants will find a match.

- *Advertising-supported media* such as newspapers, directories, television, and web portals. Media provide content that attract audiences. Audiences in turn are used to attract advertisers. There are two kinds of externalities between the two sides. Audiences exert a positive externality on advertisers, as advertisers value platforms that have more viewers. On the contrary, advertisers exert a negative effect on viewers, at least to the extent that commercials interrupt a programme, or make it more difficult to consume content.

[10] See J.C. Rochet and J. Tirole (2003), "Platform Competition in Two-sided Markets", *Journal of the European Economic Association*; D. Evans (2003), "The Antitrust Economics of Multi-Sided Platform Markets", *Yale Journal on Regulation*; J. Wright (2004), "One-sided Logic in Two-sided Markets", *Review of Network Economics*; M. Armstrong (2006), "Competition in Two-sided markets", *RAND Journal of Economics*.

[11] See D. Evans and M. Noel (2005), "Defining Antitrust Markets when Firms Operate Two-sided Platforms", *Columbia Business Law Review*.

- *Transaction systems* such as credit cards. These are similar to some degree to exchanges, as cardholders and merchants are more likely to adopt a particular credit card the greater the number of adopters of the same card on the other side. They also have some peculiar features, namely card associations are cooperative 2SPs: for a transaction to be completed there must be an agreement on the division of profits and on the allocation of various risks between the entity that services the cardholder and the entity that services the merchant.

- *Software platforms* such as PCs, video games, music players. The two sides here are represented by users who want to run software applications and developers who write applications and sell them to users.

Are 2SPs relevant for telephony? Clearly, any network operator is a multi-product firm. However, the mere fact that multiple product or "cluster" markets are involved does *not* imply that a 2SP is involved. If the various products are bought and consumed by the same customer, there is no 2SP involved since there are no inter-group network externalities. Therefore, services such as access and call origination can be analysed, to a large degree, with standard antitrust tools that do not need to be extended to the analysis of 2SPs.

There are situations where 2SPs can be applied to telephony as well. An important case in point is call termination. A network operator, in this case, falls in the category of "exchanges" introduced above, as it allows "senders" and "receivers" to complete their match, i.e., communicate. There is an externality involved as senders can communicate more the more receivers they can contact, and receivers are likely to benefit from receiving many calls the more senders there are.[12] More in general, termination revenues form an integral part of the way an operator sets prices for both termination and outgoing services. These can be distinct services but have close inter-relationships since the demand and price for one service affects the other. Although we do not intend to analyse termination markets in this Section, we notice that the exercise of market power when setting termination rates is likely to differ when calls are sent and received "on-net" (i.e., senders and receivers both subscribe to the same network operator) and when they are "off-net" (i.e., senders and receivers belong to different network). In the former case, the "platform" is likely to internalise externalities between the two sides, and the presence of competition constraints the ability of the network operator to raise termination prices. In the latter case, the network operator will not internalise the effects on senders when setting the termination rate, and a market failure is likely to arise. A specific example of this market failure has been found in the case of fixed-to-mobile (F2M) calls.[13]

[12] Notice that it could be argued that all users belong to the same group. One should therefore speak of "intra-group externalities", rather than "inter-group" externalities typical of 2SPs. However, notice that my description of the problem relies on having "senders" and "receivers", which represent the two groups that need a platform to conduct an exchange of communications. In this sense, it can be argued that the definition of a 2SP applies in a literal way to mobile telephony.

[13] The theory of two-sided markets received some prominence in the recent case on mobile termination rates in New Zealand, see NZ Commerce Commission (2005).

3.3.2 2SPs: market definition and market power

The role of market definition is to provide a basis on which regulators or anti-trust authorities calculate important indicators such as market shares, etc., in making their prima facie case. Market definition assists in understanding constraints on business behaviour and assessing the form of competition that is relevant for evaluating a practice. Market definition, however, is not a substitute for a full analysis of the competitive effects of a certain practice.

When applying market definitions to 2SPs one has to be particularly careful to avoid mechanical applications of usual concepts because of the possible intricate relationship between the various sides. When dealing with a 2SP, one has to evaluate if network effects (i.e., links between the two sides) are: (a) present, and (b) limit the extent to which a price increase on either side is profitable. This exercise is tricky as it mixes several things: which price should one increase? Who pays for this increase? What is the starting level for the price increase? Would the firm re-adjust its entire structure of prices when only one price changes?

Take, as an example, the case of F2M calls and mobile access. Are they complements or substitutes? The answer to this type of question is of some use in "normal" markets, as substitute goods are typically presumed to belong to the same relevant market. Imagine first to increase the price of mobile access. Demand for mobile access will go down as a direct consequence of the price increase. As there are fewer mobile customers to call, the demand for F2M calls will also go down. As seen in this perspective, F2M calls and mobile access seem to be complements. Imagine now to increase the price of mobile termination, starting from the termination cost. The demand for F2M calls will go down because fixed users will have to pay more to call mobile phones. However, the increase of the price for mobile termination has also introduced some termination revenues that did not exist when termination was set at its cost. If there is some competition for mobile users, these termination profits will, at least to some extent, be passed on to mobile users. A likely case is that the mobile network operator will push down the price of mobile access. Therefore demand for mobile access will go up. According to this view, an increase in the price of F2M termination has increased the demand for mobile access: F2M calls and mobile access now seem to be substitutes!

It is beyond our scope to conduct a full analysis of the termination problem here. The previous example was also conditional upon having competitive retail markets. The main point that we are making is that questions, such as whether F2M calls and mobile access are complements or substitutes, do not make much sense when they mechanically apply standard notions of substitutability and complementarity to peculiar market realities, such as 2SPs. As we have already seen, a mobile operator is a "platform" that provides access among other things (and the corresponding price is paid by mobile consumers) but also enables the termination of calls initiated by fixed users. Under CPP, the price for termination is indirectly paid by fixed users and not by mobile users. These are the main features that have to be taken into account when conducting an economic analysis of the termination problem.

Another important caveat, when defining markets in the presence of 2SPs, applies to the use of the SSNIP test. Firstly, when a price is increased, the corresponding demand will decrease, as in standard markets, but there may also be additional effects arising from the other side that may or may not decrease the profitability of the price increase, according to the type of inter-group network externalities involved. For instance, in an exchange such as a matchmaker where one side benefits from the presence of high numbers from the other side, imagine the platform increases the price it charges to one particular side. This will reduce the number of buyers from this side, which makes it less appealing for the other side to join the platform, which further reduces the demand from the original side. In this case there is a "multiplier" effect, as a price increase reduces demand more than in standard one-sided markets. On the contrary, in the case of advertising-supported media, imagine the platform increases the price it charges to one side (advertisers). This will decrease the number of commercials bought by advertisers, which makes it more appealing for the other side (viewers) to join the platform.[14] Secondly, it is not clear where the hypothetical price increase should start from. The cost of a product is typically not an efficient benchmark in the presence of 2SPs. Perhaps more disappointingly, even the price level set in a "competitive market" is not efficient. This should not come as a surprise since it is well known in economics that competitive markets "work", i.e., they are efficient and any intervention could just make things worse, only without externalities. This fundamental result can be rephrased by saying that, in the presence of uninternalised externalities, even competitive markets do not work and some appropriate intervention can increase the welfare of society.

It therefore seems that trying to define sharp boundaries can be a risky exercise with 2SPs. Since from a legal standpoint, in practice, market definition requires that a product is found to be either in the market or outside it, a possible reasonable compromise would be to look at standard (possibly narrow) market definition to start with. Then, the impact on competition in "affected" markets (therefore, extending the analysis beyond the original market definition) would be considered at a later stage when conducting a full economic analysis, eventually leading to the imposition of appropriate remedies. Alternatively, one could start with the whole products under consideration, avoiding the exercise of market definition and directly delving into the economic problem at stake. For an economist, this second approach is bound to give the same answer (and therefore the same set of possible remedies) as under the first approach. However, it is not clear if, from a legal standpoint, these two approaches are also identical. For instance, SMP may be found over the narrowly defined market, which would imply the introduction of some remedies, "adjusted" for the two-sidedness feature of the market investigated. However, SMP may not be found if one started from the whole set of interlinked products, where SMP is linked to the presence of some extra rent that the firm can sustain overall. Therefore an investigation may not start although "welfare enhancing" regulation would be available *also* in this case.

While there is no much disagreement on economic analysis, there may be some divergence between the legal and economic approach over the main questions addressed. This is a fundamental and controversial point that goes back to the

[14] We are assuming that other variables such as programme quality or content are not affected. The only point we are making is that it is easy to construct situations where the "multiplier" effect can go either way.

meaning of SMP and the ultimate objective of regulatory and antitrust intervention. Competition law can maintain competition, but typically cannot create it or cure defects or market failures, although some exceptions can be found, such as imposing access obligations in cases of refusal to supply. Competition policy also cannot impose very precise obligations. On the contrary, regulation usually have aims that are wider than those of competition law, and has methods which go beyond those of competition law, because regulators can impose additional or new duties necessary to promote the objectives specified. In the specific context of 2SPs, it therefore follows that competition law might not be able to deal with inefficient pricing structures arising from competition in two-sided markets since in 2SPs a firm cannot unilaterally lower a particular price that is deemed to be "wrong" (e.g., too high) if the other competitors do not - that would result in losses relative to the rivals. The threat of fines thus might not work in this context, because no individual firm can comply. The consequence of this reasoning is that any intervention has to ensure collective compliance - either by all firms having the same unilateral incentives at the same time (e.g., by setting up a position in which the authority in effect requires them to "collude"!) or by their conduct being subject to some exogenous constraint (which is another word for regulation).

Leaving this possible difference aside, the economics of 2SPs provides some important insights over the analysis of market power. While the antitrust problems are similar as in other markets, sometimes the tools and indicators to assess market power are not standard. For instance, we have already said that the link between customers on the two sides can limit the extent to which a price increase on either side is profitable, depending on the type of externalities between the two sides. Overall profitability of a 2SP can be limited by competition on both sides, although the lack of excess profits is no indicator that consumer and social welfare are maximised. Some particular practices may not be anticompetitive with a 2SP. For instance, a price below the variable cost is not necessarily a sign of predatory pricing, since it may be used to solve coordination problems between two sides, attracting particular customers "on board", thus also attracting the other side. Similarly, tying or exclusive dealing can be an efficient way to internalise externalities between the various sides.

3.3.3 Conclusions on 2SPs

2SPs involve inter-group network externalities and are relevant in many industries, including telecommunications. Because of these externalities, socially-optimal prices in 2SPs typically depend in some intricate way on price elasticities of demand, inter-group network effects, and costs. This is a complex exercise that can be conducted by taking into account market realities and avoiding mechanical applications of standard definitions and tools.

Also because of externalities, socially-optimal prices in 2SPs, generally, are not purely cost-based. By understanding the nature of problem, it is therefore easy to avoid possible fallacies. For instance, incremental cost pricing is typically not efficient with 2SPs. High individual mark-ups may also not indicate standard market power. A more balanced pricing structure (interpreted as prices being more in line with costs) does not necessarily arise as competition becomes more intense. Also, the removal of alleged cross-subsidies, e.g., decreasing one price (A) and increasing

another price (B), does not necessarily benefit the side (A) that pays a price above cost. This is because, by increasing the other price (B), some B users may drop off, thus making the product less valuable to A users as well.

Firms with the features of a 2SP are correct to stress the fact that these are special markets, and therefore policy-markers should be very careful with them. We agree with this point and always advocate a full and appropriate economic analysis of these markets. However, we conclude by recalling that, even if a two-sided market is *assumed* to be perfectly competitive, then the market does *not* work, that is, the market does not produce efficient outcomes. This is in stark contrast with standard one-sided markets: when these markets are competitive, they are also efficient and no regulator should interfere with their working. In two-sided markets, instead, privately chosen prices, even when ideally set by competing firms, will differ from socially-optimal prices. An appropriate intervention can increase consumer and social welfare. Therefore there is an argument to say that 2SPs are to be subject to more rather than less regulatory oversight. By the same token, in case intervention is needed, regulation has to be appropriate and informed by the theory and analysis of 2SPs. The application of one-sided analysis to 2SPs might produce serious regulatory failures.

3.4 Geographical market definition

NRAs have responsibility for geographical market definition. The *Guidelines on market analysis and the evaluation of significant market power* (paras 56, 69, footnotes omitted) assert that:

> 'According to established case-law, the relevant geographic market comprises an area in which the undertakings concerned are involved in the supply and demand of the relevant products or services in which area the conditions of competition are similar or sufficiently homogenous and which can be distinguished from neighbouring areas in which the prevailing conditions of competition are appreciably different. The definition of the geographic market does not require the conditions of competition between traders or providers of services to be perfectly homogeneous. It is sufficient that they are similar or sufficiently homogeneous and accordingly only those areas in which the conditions of competition are 'heterogeneous' may not be considered to constitute a uniform market.
>
> 'In the electronic communications sector, the geographical scope of the relevant market has traditionally been determined by reference to two main criteria:
>
> (a) the area covered by a network and
>
> (b) the existence of legal and other regulatory instruments.'

As in other markets, the HMT is of little use here, as it tends to produce very narrow (even single customer) markets. In most cases there is no geographical clustering. In practice, NRAs in the current round of notifications have almost invariably identified national markets. This does not imply, of course, that all ECS markets are national. For example, several markets not included in the Recommendation (and hence not notified by NRAs) might be supra-national – for example markets to provide services

to international corporate customers. The more interesting absence, however, is of sub-national markets, given that the development of competition in most fixed communications markets has been geographically uneven in many Member States.

The interpretation of homogeneity of conditions of competition is by not straightforward. There are several possible criteria. Product quality and technical standards are likely to be similar. On the demand side, the number and concentration of buyers might differ from region to region, although consumer preferences may be fairly homogeneous (absent substantial income differentials). On the supply side, having all areas in a country served by the same number of operators, or – more conclusively – by the same operators, provides *prima facie* evidence of the same or similar competitive conditions. But network build-out often fails to produce this outcome. Often customers in heavily populated areas have a choice of more fixed networks than in sparsely populated ones. This is less common with mobile networks, where roll-out obligations, commercial imperatives or roaming agreements have generally produced operators able to supply broadly equivalent geographic areas. Finally, there is the question of price observations, which are often bedevilled by non-SMP regulation. These multiple criteria create the problem of how to proceed when they diverge.

The approach taken in this report is to seek market definitions which ignore SMP regulation but take account of other types of intervention. The latter include universal service obligations which impose uniform pricing over a geographical area for certain services, mainly of digital fixed line and voice calls. This is often taken to impose homogeneous conditions of competition at the retail level, in the sense that the uniform charge becomes a 'linking condition' across regions with different competitive endowments.

This argument is incomplete and misleading for two main reasons. Firstly, uniform *retail* prices tend to discourage competition in *wholesale* services in high cost areas and encourage it in low cost areas. As a result they distort geographical market entry incentives and introduce regulation-driven heterogeneity in conditions of competition in wholesale markets.

Secondly, absent SMP regulation, a firm with market power subject to a uniform pricing constraint chooses a profit-maximising price based on its demand curve in the universal service area as a whole rather than the distinct demand curves where it faces different levels of competition. As a result, constraints on its behaviour in competitive areas are not extended to less competitive ones, but constraints across all areas are averaged or pooled. If the resulting price contains excess profits, because of a large weight of non-competitive customers, rivals in competitive areas will either force possibly localised price cuts by the incumbent – if they are allowed – or will enjoy considerable competitive advantage. In either case conditions of competition will differ.

These two arguments suggest that regulated price uniformity can, at best, maintain homogeneous conditions of competition in retail markets, but tends to cause them to diverge in wholesale markets.

When price uniformity is the result of business policy, rather than regulation - for example, the advantage of being able to market a single service nationwide -the case

for the linking condition may be more reliable, but it is still subject to two caveats. First, the obligation of a dominant supplier of, say, broadband to provide it as a uniform price may be implicit rather than explicit. Second, the apparently uniform 'headline' price may in fact be significantly amended on a regional basis by persistent special offers, which respond to local competitive conditions.

For these reasons, the conventional arguments that licensing is generally national and that mandated or *de facto* uniform pricing causes regional markets to converge provide insufficient support for a general conclusion that markets are national in scope. What is required instead is a proper analysis which focuses upon supply-side substitution, addressing the question of whether an increase in price in more sparsely populated areas will attract further investments from firms operating in more densely populated areas or other firms, possibly using different technologies such as wireless.

At the same time attention must be paid to the question of whether there is a sharp enough break in conditions of competition across geographical areas to justify separate markets, or (in the alternative) whether there is a continuous variation which makes identification of separate markets difficult. Boundaries may also shift over time.

NRAs must also balance practical considerations in deciding what decisions they should adopt in relation to geographical markets, taking account of the alternative possibility of identifying a national market, but applying geographically distinct remedies.[15]

In many cases this may suffice. But where differential network build-out creates clear and persistent divisions in a Member State, so that one area is likely to exhibit SMP in a market, while another does not, there is a good case for reflecting this difference by defining separate geographic markets.

3.5 Next Generation Networks (NGNs)

'Next generation networks' (NGN) is a term of art applied to networks which seamlessly blend public switched telephone networks and public switched data networks into a single multi-purpose, IP-based network.

NGNs are likely to be installed progressively over the lifetime of the revised Recommendations, but their uptake will be limited. Accordingly, most of the analysis which follows is based on current generation narrowband and broadband technologies. Nonetheless our analysis has to be capable of incorporating NGNs, and here the concept of technological neutrality provides a useful approach.

Technological neutrality in one of the policy objectives and regulatory principles of the ECS regime. It is also a principle of market definition for anti-trust purposes, since that is based upon the identification of close demand substitutes, which do not have to rely on the same or similar technologies.

[15] On the latter see *Revised draft ERG Common Position on the Approach to Appropriate Remedies in the ECNS Regulatory Framework*, Nov. 2005, sec 5.6.1.

This principle is reflected in our proposed *modus operandi* for market definition, described in Sec. 2.1. above, which starts with end-user demands, and treats network or wholesale inputs as a derived demand. It follows from this approach, for example, that if two services relying on different platforms are in the same market, then in normal circumstances wholesale inputs into those services fall in the same market (which may however be broader).

This general principle suggests how questions of next generation networks (NGN) should be addressed. Such networks involve the implementation of new technologies capable of sustaining existing or new services either more cheaply or at a more advanced level. Two variants are distinguished: NG core networks, which typically involve the replacement and amalgamation of certain conveyance networks by a network (or networks) based on internet protocol (IP); and NG access networks, which typically take fibre closer to the premises of the end user than previous technologies. (See Section 5 below.) It is important to note that previous conventional divisions between core and access may be moved as a result of the new technologies; in other words, network architecture may change.

The question of NGNs acquires particular salience because in the EU as in other jurisdictions, such as Australia and the US, non-regulated status has been sought for such investments. In both these countries, commitments to forbearance have been made or sought. The European framework is, however, designed to apply the same general rules and principles to all types of electronic communications services and sets out a uniform test for the absence of regulation – the presence of the effective competition. This section considers how this might be done in the particular case of NGNs.

Suppose first that a particular NGN investment is deployed to provide end user services in the same markets as those provided by other technologies. In relation to NGN core networks, this is likely to be the case, as the NGN will provide conveyance of data which previously had been provided by a variety of networks. In other words, the innovation associated with the NGN is more of a 'process' than a 'product' innovation, and its capacity is a substitute for wholesale services provided by other vintages of technology, while they survive.

In relation to NG access networks, another possibility is available. It could be the case that a fibre-based network permits data access speeds to end users which provide services not possible using earlier technologies, and that there is separate retail demand for such services. This creates the possibility of a separate wholesale market based on demand derived from the retail service. This would include all wholesale services capable of supporting the retail service. Such a wholesale market supporting a new retail market could be described as 'emerging', and hence not subject to regulation. The wholesale service will, however also supply inputs for a range of retail services also available on other access technologies. The question then becomes: are the new services of sufficient weight in the total to generate a separate market? The HMT can help to answer this question. It might also be possible to tailor remedies to the particular circumstances, for example by requiring the operator of a next generation access network to provide access to competition, but only at speeds up to a specified level.

There are thus two possible outcomes, ie. inclusion of NG access networks in existing markets, or emergence of a new market the outcome dependent on the empirical issue of the nature of the market for retail services. This conclusion is endorsed in a Commission letter of 23 December 2005 to BNetzA, the German regulator, which includes the following observations:

> 'The Commission notes that the emergence of new retail services may give rise to the emergence of a new derived wholesale market to the extent that such new retail services cannot be provided over the existing wholesale products. The new retail services may in such a case generate a wholesale demand for broadband access services. Such new wholesale products should not be subjected to inappropriate obligations.'

Section 5 below contains further discussion of this issue.

Section 4. Fixed narrowband markets

4.1 Introduction

The Initial Recommendation adopted in February 2003 identified the following fixed narrowband markets as susceptible to ex ante regulation:

- two retail markets for fixed narrowband access, based on a distinction between residential and non-residential customers;
- two retail markets for domestic calls, based on a distinction between residential and non-residential customers;
- two retail markets for international calls, based on a distinction between residential and non-residential customers;
- two wholesale markets on the originating side, one for access to the unbundled local loop ("ULL") and one for wholesale call origination;
- multiple wholesale markets on the terminating side (single-network markets for call termination to end-users);
- a single wholesale market for transit.

In the first round of market reviews NRAs did not question the susceptibility of the recommended markets to ex ante regulation.[16] NRAs in some cases modified the Recommendation's market definitions, but these modifications, with one exception, did not have a material effect on the outcome of the analysis.[17] The first round of market reviews led only to a limited extent of deregulation.[18]

- *Retail markets:* In retail access markets, NRAs have always found incumbents to have SMP. In retail calls markets, both for domestic and international calls, a majority of NRAs have found incumbents to remain dominant. However, there are also NRAs which did not find SMP provided a number of remedies would be put in place, which include carrier selection ("CS"), carrier preselection ("CPS"), wholesale line rental ("WLR"), wholesale call origination, wholesale call termination, and wholesale transit. Several NRAs noted the emergence of voice-over-IP ("VOIP") as a force stimulating competition in the calls markets.

[16] A possible exception is the Swedish NRA, which found that retail calls markets in Sweden may be no longer susceptible to ex ante regulation. The NRA nevertheless carried out a market analysis, where it did not find SMP.

[17] The Commission vetoed the transit market notification of the Austrian NRA, where the inclusion of self supply was a decisive factor for the outcome of the market analysis.

[18] See table 1 in section 2.1. See also the Commission Communication, which surveys notifications until end of September 2005. Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions on *Market Reviews under the EU Regulatory Framework: Consolidating the internal market for electronic communications,* Brussels, 6.2.2006, COM(2006) 28 final.

- *Wholesale markets:* For ULL and wholesale call origination, NRAs have generally found incumbents to have SMP. For wholesale call termination on individual networks, NRAs have generally designated both incumbents and alternative operators as SMP operators. For wholesale transit, NRAs mostly found the incumbents to remain dominant, but in some countries they also identified a lack of SMP.

The focus of the NRAs' market reviews is the examination of dominance. With few exceptions, NRAs did not address the "three criteria" for susceptibility to ex ante regulation. The NRAs' market reviews are therefore not conclusive with regard to whether the reviewed markets should continue to be susceptible to ex ante regulation in the future. A market, even if characterised by dominance, should be removed from the list of markets susceptible to ex ante regulation if it no longer satisfies the 3-criteria test.

It should also be noted that the NRAs carried out their market analysis with a two-year time horizon in mind, while the revised Recommendation will be in force as long as 2008/09.

There are a number of trends, whose impact on competition has to be taken account of, once a medium-term view is taken. These trends include the following:

- *Network roll-out:* Many alternative operators have rolled out national trunk networks, and some of them have also built out networks to the level of ULLs. More network build-out and local loop unbundling may occur, in particular in those Member States, where full liberalization occurred at a later point in time.

- *Next Generation Networks*: Fixed operators start deploying next generation networks ("NGN"). These are IP-based multi-service networks, which permit to provide a variety of different services, including voice, over a common transport network. The resulting economies of scope lead to a reduction of costs.

- *Fibre in the loop:* In addition, in Member States with higher broadband penetration, incumbents, in particular, are planning large-scale investments in fibre in the local loop to increase bandwidth.

- *Uptake of voice-over-IP ("VOIP"):* Broadband penetration, although in some Member States still at a low level, is steadily increasing. The prime driver to get a DSL connection or a cable modem is high-speed Internet access, but customers that have subscribed to a broadband connection can also get attractive voice-over-broadband ("VoB") subscriptions from their access providers. In addition, an increasing number of non-access providers offer "unmanaged" voice-over-Internet ("VoI") services, some of which can be used with a conventional telephone and a terminal adapter.

- *Fixed-mobile substitution:* Mobile penetration has reached high levels throughout the EU, and mobile voice markets appear to become saturated. To cope with stagnating voice demand, a number of mobile operators have introduced tariff and service innovations including flat rates and home-zone

products, which target fixed subscribers and which provide incentives to use the mobile phone rather than the fixed line for making calls at home/in office.

- *Fixed-mobile integration:*[19] While past attempts to integrate fixed narrowband and mobile platforms were unsuccessful, a number of operators are now planning to integrate fixed broadband and mobile platforms to provide voice services with integrated dual mode terminals. The vision is that customers use one phone with one number, address book and voicemail, using broadband access at home/in office and mobile access while on the move. The vision also includes "seamless" handover of calls between fixed and mobile access. The development work focuses initially on 3G handsets with Bluetooth capability which allow users at home/in office to link over Bluetooth base stations to their fixed broadband connections, and to roam onto a mobile network when outside the Bluetooth coverage. Later on 3G phones with Wi-Fi capability are planned to take over, which would also allow connecting to public hotspots.

- *Bundling and multi-play broadband services:* Broadband networks allow customers to access multiple services over a single connection and terminal device, e.g., triple-play offerings bundle VOIP, Internet access and audiovisual services. European cable operators increasingly offer triple-play services, and incumbents and DSL operators are following. Even though in most Member States the demand for multi-play services is still nascent, it is expected that it will gain momentum in the medium term throughout the EU. As a further step, cable and DSL operators are now also aiming to offer mobile services, together with voice, Internet and TV (quadruple play).

As laid out in section 2.1, ex ante regulation should only be considered if a retail market can be identified, in which - in the absence of ex ante regulation - there is consumer harm caused by a substantial market power problem. Of course, the principle of proportionality should ensure that the benefit to final consumers on the retail market of any consequent regulatory intervention must be considerably higher than any costs associated with regulation. If such a retail market is found, the source of the consumer harm should be located in the value chain and remedied through ex ante regulation.

In order to identify competition problems in fixed narrowband markets and locate their source in the value chain(s), an analysis is carried out using a modified Greenfield approach based on the following assumptions:

[19] The term “fixed-mobile convergence” is sometimes used for both fixed-mobile substitution and fixed-mobile integration.

1. All regulations which are unrelated to SMP are assumed to be maintained. Such regulations include

   - general obligations to offer interconnection, number portability, which apply to all operators connecting end-users;

   - co-location and facility-sharing obligations;

   - specific obligations, which are imposed on the universal service provider(s), such as a uniform tariff requirement;

2. All SMP related regulations which are unrelated to the fixed narrowband value chain are assumed to be in place. Such regulations include

   - the SMP related obligations in the fixed broadband value chain, in particular those related to the high frequency part of the ULL (shared access) and wholesale broadband access, as well as terminating and trunk segments of leased lines, as set out in section 5;

   - the SMP related obligations in the mobile value chain, i.e., those that are related to mobile termination, as set out in section 6.

3. As a corollary, where there are no SMP related obligations in the fixed broadband and mobile value chains imposed, it is assumed that effective competition prevails.

The analysis is based on an environment which is likely to exist in a majority of Member States in the period of 2007 - 09. Given many discrepancies between Member States, the conclusions of the analysis may not apply generally throughout the EU. E.g., Member States differ in fixed narrowband, mobile and fixed broadband penetration rates, in the uptake of VOIP, in customers' preferences for multi-play services or in the availability of mobile "home-zone" services. Hence, there may be Member States where more SMP regulation is required than concluded in the analysis, and the opposite could hold as well.

The structure of Section 4 is as follows:

- Section 4.2 sets out the competition problems that would occur in retail markets absent SMP regulation across the entire fixed narrowband value chain.

- Section 4.3 locates the source and nature of the competition problems in the fixed narrowband value chain, examines whether the 3-criteria test is fulfilled for the markets identified, and analyses whether SMP regulation in upstream markets would be sufficient to create competition in the downstream retail markets.

- Section 4.4 summarises the markets that should be made susceptible to SMP regulation.

4.2 Competition problems in retail markets absent SMP regulation across the entire value chain

4.2.1 Relevant markets

Fixed operators offer two types of access: low capacity connections, over which no more than two calls at the same time can be made (PSTN/analogue or ISDN 2 connections) and high capacity connections, over which three or more calls at the same time can be made (mainly ISDN 30 connections).

A connection provides access to the following services:

- *Outgoing calls to other end-users:*[20] Outgoing calls include local/national, fixed-to-mobile and international calls.Besides a standard tariff for outgoing calls, operators offer a variety of tariff and discount options, where customers can "buy" a reduction of the per-minute charge *vis-à-vis* the standard tariff for an additional fixed monthly charge. In a number of Member States, flat rate offerings for local and national calls have also become common. For customers with large telephony bills, discount schemes are offered.[21]

- *Incoming calls from other end-users:* [22] Incoming calls encompass local/national, mobile-to-fixed and international calls. Under Calling Part Pays ("CPP") incoming calls are not charged to the receiving end-user.

- *Outgoing calls to a variety of service providers ("SP")* identified by non-geographic numbers:[23] The call to the service platform is to be distinguished from the actual service provided by the SP. The latter could be an electronic communications service. E.g., an Internet Service Provider ("ISP") provides Internet connectivity; a Calling Card Operator provides national or international telephone calls. Alternatively, the service provided could be information and content; e.g., a directory enquiry service, a support hotline for technical trouble or breakdown, a line for telephone banking, home shopping, televoting, etc.[24] Calls to service platforms are predominantly domestic.[25] Pricing varies substantially between number ranges and Member States depending on whether the end-user makes a payment to the SP, to the originating network operator, or to both; Freephone calls are free of charge.

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[20] Including fax messages.

[21] In addition, fixed operators provide high-end voice systems solutions to very large business customers (basically integrated and bundled services). The competitive conditions for the supply of such services are different. Large customers have countervailing buyer power as they purchase such contracts often through bidding procedures.

[22] Including fax messages.

[23] Since the network has to translate the non-geographic number dialled into a geographic number to be able to deliver the call to a SP, these services are also termed Number Translation Services ("NTS").

[24] The regulatory framework only covers the electronic communications link, but not the content or the information exchanged.

[25] A study by Cullen/WIK shows that there is increasing scope for pan-European services. See Cullen/WIK (2005), *Study on Pan-European Market for Premium Rate Services*, Study for European Commission, Namur.

Services can possibly be grouped together in a market if they are supplied and demanded as bundles ("cluster market"). Clearly, fixed narrowband access and calls are provided to end-users as a bundle given the economies of scope involved in producing and retailing the services together. Moreover, transaction cost savings on the demand side and the pricing structure (e.g., optional tariffs or volume discounts) provide an economic incentive to end-users to buy access and calls from a single provider rather than getting connected to two providers of fixed narrowband access (if available) and splitting up the demand for calls among them.

The relevant market could be broader than the fixed narrowband service bundle. In a number of Member States, mobile operators and broadband (cable and DSL) operators also target fixed narrowband subscribers. We will however argue below (section 4.2.1.1) that, for a majority of Member States, mobile and fixed broadband access (or service bundles) are not substitutes for, and do not sufficiently constrain, fixed narrowband access (or service bundles).

We further argue that there is not a cluster market which comprises the whole set of fixed narrowband services (sections 4.2.1.2 – 4.2.1.3). Conditions of competition are sufficiently heterogeneous across the various components of the bundle to require the definition of a number of separate relevant markets. First, incoming off-net calls should be analysed separately from access/outgoing calls/incoming on-net calls. Second, access should be treated separately from outgoing calls/incoming on-net calls.[26] Third, incoming off-net calls originated on fixed narrowband networks may have to be analysed separately from incoming off-net calls originated on mobile and broadband networks.

We finally argue that in most Member States a distinction between services for residential and non-residential customers is not appropriate (section 4.2.1.3). Rather one could distinguish, in relation to access, between connections, over which no more than two calls at the same time can be made (low-capacity connections, basically PSTN/analogue or ISDN 2 connections) and connections, over which three or more calls at the same time can be made (high-capacity connections, mainly ISDN 30 connections).

4.2.1.1 Distinction between fixed narrowband access and other access

When the initial Recommendation was published, there were no good substitutes for a fixed narrowband connection and the services provided over it. The notifications of NRAs have echoed this finding. In the following, we examine to what extent mobile and fixed broadband access may become substitutes for fixed narrowband access in the future. Note that we focus here on access substitution; call substitution is examined at a later stage.

[26] A further distinction of outgoing domestic calls from outgoing international calls is required once CS/CPS is mandated. This is not yet the case at this stage in the analysis given that we assume in Section 4.2 absence of SMP regulation across the entire fixed narrowband value chain.

Mobile access

Traditionally, the focus of mobile services is to provide the opportunity to make and receive calls while on the move, and most end-users regard a mobile phone as a complement to the fixed telephone rather than as a substitute at home/in office.[27] So far, access substitution at home or in office was also limited for the following reasons:

- Many residential customers and most non-residential customers do not want to give up their fixed narrowband line, because they use it for dial-up Internet access or need it to purchase DSL access (which is bundled with the telephone line). These customers do not regard a mobile connection as a substitute for a fixed narrowband connection with regard to Internet services.[28]

- Multi-person households usually prefer to have a generally available fixed connection at home for all family members. A mobile handset is a personalised device, which is less susceptible to common usage by all household members. Likewise firms prefer to a have a fixed connection with an appropriate number of channels rather than to share mobile phones.

- Moreover, multi-person households and firms also take into account the cost imposed on family members or employees calling home or the office. Mobile termination rates are higher than fixed termination rates, and the price of making a call to a mobile phone is usually higher than the price of making a call to a fixed phone. Where the cost of calling home/the office is internalised, a mobile connection is less likely to be considered as a substitute for a fixed connection.

- In some Member States there are particular light user tariffs as part of universal service obligations imposed on the incumbent, which provide low cost fixed access.

- Finally, when it comes to price, for customers with higher usage intensity, a mobile service bundle is usually more expensive than the fixed service bundle. The underlying reason is different cost structures: The LRIC of providing a mobile call minute is higher that the LRIC of providing a fixed narrowband call minute. This is mainly due to limits to available spectrum and the cost of cell splitting needed to accommodate increasing traffic volumes.[29] On the other hand, the LRIC of providing access to a mobile network is small compared to the LRIC of providing fixed narrowband access. While it is basically the air interface and the SIM card that provides the access to a mobile network, access to a fixed network requires laying copper into the

[27] In Member States with a more limited roll-out of fixed networks, many end-users may have no other choice but to rely on a mobile phone.

[28] It should be noted that access substitution will not necessarily require subscribers to *fully* substitute mobile for fixed access. Sometimes subscribers have two analogue lines. In this case, they may substitute a mobile subscription for one of the two lines, while preserving the other. Or alternatively, if they have an ISDN connection, they may switch to a single analogue line, substituting the mobile subscription for one of the ISDN channels.

[29] In the longer run, liberalisation of spectrum usage and spectrum trading may make available more spectrum for mobile applications.

ground.[30] The LRIC of adding a new subscriber is low, because the access radio network is shared between subscribers, whereas a fixed line connecting a subscriber offers less possibility for sharing access costs, especially if the subscriber is located in a rural area.

For these reasons, the potential for access substitution is limited. Nevertheless there is a sub-set of predominantly residential fixed subscribers, which are susceptible to access substitution, and which mobile operators have started to target with new services and tariff options. These customers can be distinguished by the following features:

- They use the fixed connection for the purpose of making and receiving voice calls and do not require Internet services at home.

- They are part of single-person households and do not need to share the phone at home with other family members. They may also not take into account the higher mobile termination rates imposed on the parties they receive calls from.

It should also be noted that the distinguishing factors between fixed narrowband and mobile become weaker:

- Mobile data transfer rates will improve in the period under consideration as result of UMTS and HSDPA, so that customers could more readily use the mobile connection also for Internet services.

- Some mobile operators offer cheap multiple handsets for multi-person households.

- The example of home-zone products in Germany shows that mobile operators can address the issue off high mobile termination rates by offering customers a geographical telephone number for calls made and received in the home-zone and by charging fixed termination rates if the customer is called on its geographical number.

We argue further below that there is a retail market for connections, over which no more than two calls at the same time can be made (low-capacity connections), which is distinct from the market for connections, over which three or more calls at the same time can be made (high-capacity connections). It is only the former which is potentially affected by *demand* substitution. Currently and for the time period under consideration, customers that may regard a mobile phone as substitutable for a telephone line are predominantly residential customers that do not require Internet services at home, live in single person-households and have low or medium usage intensity. Given the overall number of subscribers to fixed low-capacity connections, a SSNIP test is unlikely to show that a high enough share would abandon the telephone line as a result of a hypothetical price increase to justify inclusion of mobile access in the market for fixed narrowband access.[31]

[30] Wireless access technologies will however reduce the cost of access compared to copper networks.

[31] This does not preclude that, under particular national circumstances, applying the SSNIP test could show that fixed low-capacity access is constrained by mobile access. It should be noted that

Supply substitution is also not possible given that the wholesale inputs necessary to provide a fixed service bundle are unlikely to be available absent ex ante regulation (as is assumed in this section), and the time, cost and risk required to invest into a fixed local access network would be prohibitive. Mobile operators can, however, mimic a fixed narrowband connection by employing home-zone technologies and attributing a geographical telephone number for making and receiving calls in the home-zone. Outgoing calls made in the home-zone can be priced similar to fixed calls. Also, termination of calls into the home-zone can be priced like fixed call termination. In addition, mobile access can be made "fixed" if handover into/out of the home-zone is blocked.

Fixed broadband (naked DSL and cable)

Broadband operators provide service bundles that besides high-speed Internet services may also include voice (VOIP). Since we are interested in access substitution, we focus here on broadband-only connections. DSL-only connections are known as "unbundled" or "naked" DSL; they refer to a situation where DSL service is provided to an end-user without a requirement from the incumbent that the end-user has (and retains) a PSTN/ISDN subscription over the same loop.

There are a number of reasons why, for fixed narrowband customers, a broadband-only connection is unlikely to be a *demand* substitute to which they would switch in sufficient numbers in case of a 5 – 10 % price increase of their telephone line:

- Some customers, when switching to a broadband connection, prefer to keep their telephone line for having access to emergency calls or to be independent from power cuts. They are using the broadband connection in a complementary way to the telephone line, using it for high-speed Internet access, and keeping the normal telephone line for voice calls. Alternatively, they may use the broadband connection also for outgoing VOIP calls, while keeping the normal telephone line for incoming voice calls, emergency calls and a last resort in case of power cuts.

- Customers switch from narrowband to broadband connections primarily to get access to higher speed Internet services. Superior features of VOIP may also be a secondary motive. These customers appear to migrate from a narrowband to a broadband connection independent of a small price difference, and fixed broadband connections do not appear to constrain the pricing of fixed narrowband connections.

- Price alone usually does not provide an incentive to switch from a fixed narrowband to a broadband connection for the purpose of voice calls. The reason for this is the underlying cost structures. The LRIC of a providing a VoB call minute is lower than the LRIC of a fixed narrowband call minute. In the case of an on-net call to another VOIP user, it will be almost zero. The

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the percentage loss of subscribers that would make a hypothetical price increase for the fixed telephone line (or the fixed service bundle) unprofitable, is relatively small. The reason is the cost structure of fixed narrowband services which exhibits relatively high fixed costs and relatively low marginal costs. While the loss of fixed subscribers would lead to the loss of retail revenues from access and outgoing calls as well as wholesale revenues from incoming calls, the associated cost reduction from loosing fixed subscribers would be small.

lower cost of voice services over broadband networks is due to the use of IP technology and the economics of scope of using a single network for both voice and data services. In turn, the LRIC of providing broadband access to a customer is higher than the LRIC of providing narrowband access. Choosing a broadband-only connection for the sole purpose of making and receiving VOIP calls is for most customer profiles too costly to be considered as a substitute for fixed narrowband access. Customers pay a lower (average) per-minute price for a VOIP call over a broadband connection, but pay a higher monthly charge for broadband-only access.

Supply substitution does not appear to be relevant. A SSNIP test is unlikely to show that a broadband-only operator would migrate to a fixed narrowband infrastructure in case of a non-transitory 5-10 % price increase for fixed narrowband access. Given the stranded investment into DSL or cable infrastructure, and a business model based on multi-play broadband offerings, supply substitution is highly unlikely.

We conclude that mobile and broadband-only connections (cable, naked DSL) are not in the same retail market as fixed narrowband connections. As a corollary we can say that the bundle of mobile services or broadband services is not a substitute for the fixed narrowband services bundle.

4.2.1.2 Distinction between access/outgoing calls/incoming on-net calls and incoming off-net calls

In this section, we show that the bundle of fixed narrowband services does not constitute a cluster market. Incoming off-net calls should not be analysed together with access/ outgoing calls/incoming on-net calls. When analysing them separately, we must however not overlook the two-sided nature of communications.[32]

Fixed operators provide a platform which enables communication by bringing together two distinct sides - senders and receivers. Each side values the service more if the other side also buys the service, in other words, senders need receivers and receivers need senders. A platform is two-sided if it can affect the volume of transactions by charging more to one side of the market and reducing the price paid by the other side by an equal amount.[33] For two-sided platforms ("2SPs") the price structure matters and operators should design it so as to bring both sides "on board".

In the EU, where most people have access to a fixed and/or mobile phone, so-called membership (or network) externalities are of lesser importance, and we will neglect them here. When most people have joined a platform, the interesting issue is to make end-users and service providers intensively use it. It is usage externalities (call externalities), which are the prime concern. If a fixed subscriber calls another person, he/she creates a positive usage externality on that person, and the other person's willingness to receive the call creates a positive usage externality on the caller. Usage decisions depend on how much the platform charges to senders and receivers for

[32] See also Section 3.3.

[33] See section 3.3 of this report or, for a recent survey on the theory of 2SPs, Jean-Charles Rochet and Jean Tirole (2005), *Two-Sided Markets: A Progress Report*.

outgoing and incoming calls.[34] In other words, the volume of calls also depends on the structure and not only on the overall level of call prices.

When applying the SNIPP test, the two-sided nature of electronic communications platforms has to be taken into account. It is not always possible to examine price effects on one side of a market without considering the effect on the other side. Depending on the billing arrangement, i.e., whether the calling party or the receiving party pays for a call, competitive constraints on the originating or terminating provider of the call can differ.

Outgoing calls

Consider first a SSNIP test on the price of outgoing calls to end-users. For outgoing calls to end-users, it is generally the calling party, which pays the full charge of the call. Because of CPP, the receiver typically accepts all calls. The receiver will only be negatively affected if the sender makes less and shorter calls as a result of the increase in the price of outgoing calls, but this is an effect which may be difficult to discern by receivers. The behaviour of receivers is therefore unlikely to impose constraints on the pricing of outgoing calls, when running the SSNIP test. Hence, outgoing calls to end-users can be analysed independently from the receiving side.

Consider now a SSNIP test on the price of outgoing calls to SPs. Note again that calls to SPs are bundled offerings consisting of the call (the electronic communications link from the end-user to the service platform) and the service (e.g., the Internet connectivity, the information provided by a hotline). We are addressing here only the electronic communications link from the end-user to the service platform, which is provided by a fixed operator, and will not be concerned about the service accessed through it. For calls to SPs, a variety of billing principles is applied:

- In case of dial-up Internet calls, the end-user makes the payment for the call *and* the Internet Connectivity to the ISP. The ISP buys the call from the terminating operator (which, in case of an on-net call, will also be the originating operator) on a wholesale basis. Alternatively, the end-user could make two payments: He/she pays the originating operator for providing the call to the ISP platform and makes another payment to the ISP for providing the Internet connectivity.

- Other calls to SPs, with the exception of Freephone calls, are billed by the originating operator to the calling end-user. The end-user, however, may have the "contractual" relationship either with the originating operator or the terminating operator (which is the provider of the service platform). In the first case, the originating operator plays the leading part in the value chain: He is selling the service to the end user. In the second case, the terminating operator plays the leading part in the value chain and sells the service to the end user.

Can we run a SSNIP test on the price of outgoing calls to a SP by simply looking at the behaviour of callers? Leaving aside Freephone calls, it is the end-user which pays

[34] The platforms' structure of charges is relevant only if the two sides cannot internalise the externalities through negotiation. The factor making a telecoms platform two-sided are transaction costs among end-users or more generally absence of, or limits on, the bilateral setting of prices between sender and receiver. See Rochet and Tirole (2005).

the charge of the call (and, in addition, of the service) independent of the billing arrangement. The SP will not only accept all calls, but also has an economic interest that his customers get access to low cost calls. After all, the SP business model depends on receiving calls. In the end, however, it is the end-user who selects the operator, which originates the calls to the SP. Hence, outgoing calls to SPs, similarly to outgoing calls to end-users, can be analysed largely independent from the receiving side.

The incentive of the calling customer to react to an increase in the price of origination may differ between calls to end-users, calls to ISPs and other calls to SPs. Should we therefore make a further distinction between these call types?

Calls to end-users or Internet dial-up calls account for a non-negligible share of an end-user's telephone bill. Customers are likely to react to an increase in the price of such calls by switching to an alternative fixed operator or, if this not feasible, reducing the number and length of calls.

In case of other calls to SPs, the cost of calling the SP is usually a small portion of the telephone bill, and end-users may not react to an increase in the price of call origination.[35] Customers may not even take note of a price increase. There are also cases, where there may be no alternative to making the call (e.g., customers may have no feasible alternative to using telephone banking). The originating operator may have market power in origination of such calls as end-users do not switch their access provider in case of an increase in the origination price.

Hence, there may be differences between calls to end-users and Internet dial-up calls on the one hand and some types of calls to SPs on the other hand, depending on national circumstances. We propose to use a rebuttable presumption that outgoing calls to end-users and calls to SPs are in the same market, but leave it to the analysis of NRAs to justify further distinctions with regard to outgoing calls.

Incoming calls

Under a regime of CPP fixed call termination is purchased on a wholesale basis by the originating operator (alternative operator, broadband operator, mobile operator) from the terminating operator. The wholesale termination price is incorporated into the retail price charged by the originating operator to the calling customer. One can also say, that under CPP the terminating operator charges the price for the incoming call (although indirectly) to the caller.

Under CPP *off-net calls* are characterised by an important aspect. If an operator A increases the price of an incoming off-net call, this will not directly affect its own subscribers. Customers of the alternative operator B will bear the price increase, when making calls to A. There may still be a negative effect on A's subscribers if they receive less and shorter calls from B. A SSNIP test however is unlikely to show that A's subscribers would switch to operator B in sufficient numbers if they received less calls as a result of an increase in the termination price of A. Customers do not appear to be well informed about the price of an incoming off-net call and be able to relate a

[35] Note that we are dealing with the price of the call to the service platform, not the price of content, which in some cases may be immense.

decrease in the number of calls received to an increase in the price of an incoming call. Hence, the market power of an operator over termination on its network is unlikely to be constrained by its subscribers switching networks.

Sometimes customers however care more about the price of incoming calls imposed on senders. So-called "closed user groups", whose members frequently make calls to each other, such as branches of the same firm located at different sites, internalise the price of an incoming call. It is however unlikely that such groups will generally constrain the pricing of incoming off-net calls. Rather, operators may use targeted discounts to prevent these customers from switching to another operator.

Clearly, competitive conditions differ between incoming off-net calls on the one hand and access/outgoing calls on the other hand. CPP leads to an externality and monopolisation problem for incoming off-net calls that must be analysed separately from access and outgoing calls. Therefore, incoming calls and access/outgoing calls should not be made part of a single cluster market.

The case of *on-net calls* is fundamentally different from off-net calls. Here an operator charges the price of incoming calls to its own subscribers. If the price for incoming on-net calls goes up, demand for on-net calls goes down. Also willingness-to-pay and demand for access and outgoing off-net calls may go down. In case of on-net calls the platform is internalising externalities between the sending and receiving side. The presence of alternative networks can constrain the ability of an operator to raise the price of incoming on-net calls and create competitive conditions that are different from incoming off-net calls. This is why incoming on-net calls should be analysed separately from incoming off-net calls, but can be treated together with access/outgoing calls. [36]

CPP creates a monopolisation effect for all types of *off-net calls*. This is independent of the type of the network, where the call is originated (other fixed narrowband, fixed broadband or mobile network). In addition to that, there is another effect, which may justify a further differentiation of markets for incoming off-net calls. Consider first the termination of incoming off-net calls generated on fixed narrowband access networks. An incumbent might be tempted to increase its price of terminating incoming off-net calls in order to distort competition and possibly foreclose the fixed retail markets. Smaller fixed operators will reciprocally increase their price of terminating incoming calls to keep interconnection revenues and costs in balance. As a result, customers will be affected in two ways: they have to pay higher prices for outgoing off-net calls and receive less incoming off-net calls. Since subscribers to a small network make and receive a larger proportion of off-net calls than subscribers to a large network, they may get an incentive to join the bigger incumbent network. Smaller networks can counteract this to some extent by cross-subsidising subscription charges and on-net

[36] CS/CPS, not yet introduced in the analysis at this stage, gives rise to calls which are originated and, in most cases, terminated on the incumbent network. Incoming CS/CPS calls are in one respect similar to on-net calls: If the incumbent raised the price of terminating an incoming CS/CPS call, it would also hurt its own subscribers, since the retail price of making CS/CPS calls would become more expensive. However, given the lack of alternative operators offering CS/CPS, the incumbent would not be constrained when increasing the price of terminating an incoming CS/CPS call. Incoming CS/CPS calls should therefore be grouped together with incoming off-net calls rather than incoming on-net calls.

prices. However, the necessary adjustments for smaller networks may be such that they will no longer be able to break even, and retail markets may "tip".

Consider now VoB and mobile operators. Broadband operators directly compete with fixed narrowband operators in calls (as argued below), but not in access (as argued above). Hence a distortion of competition may arise in the calls markets. However, VoB calls are provided incrementally to high-speed Internet services. In addition, the price of on-net calls on broadband networks is close to zero, allowing VoB operators to offer zero on-net prices almost without any cross-subsidisation. Distortions of competition or even foreclosure are therefore less likely.

Being not in the same relevant retail markets, mobile operators directly compete with fixed narrowband operators neither in calls (as argued below) nor in access (as argued above).

Given the differences in competitive conditions, incoming off-net calls originated on alternative fixed networks may therefore have to be analysed separately from incoming off-net calls originated on broadband networks (VoB calls) and mobile networks (mobile-to-fixed calls).

4.2.1.3 Distinction between access and outgoing calls/incoming on-net calls

So far we have treated access together with outgoing calls and incoming on-net calls. There is however an important difference in the conditions of competition which suggests that access should not be put into the same market as outgoing calls/incoming on-net calls: While substitution of mobile and fixed broadband access for fixed narrowband access is limited (as shown in Section 4.2.1.1), substitutability is more pronounced at the outgoing calls level (as is shown in this section). This is a result of the prospective uptake of VoB calls, which should be put into the same market as PSTN/ISDN calls. Mobile calls, however, should be kept separate for the reasons outlined below.

Mobile calls

Traditionally, mobile phones were only used, while on the move. Substitution of mobile for fixed calls at home or in office was negligable. More recently, mobile operators have introduced a number of mobile tariff and service innovations that make it economically attractive for customers to split up demand for calls at home/in office between the fixed telephone line and the mobile phone:

- Customers can benefit from discounted mobile on-net tariffs by making mobile-to-mobile calls instead of the often more expensive fixed-to-mobile calls.[37]

- Mobile packages incorporate "free" or "inclusive" minutes, which may not be fully used up by calls when away from home/office. The (average) per-minute

[37] In some Member States, large business customers also use GSM gateways in addition to fixed connections. The GSM gateway (incorporating a transmitter) provides a fixed wireless connection between the customer's premises and a GSM base station. GSM gateways are predominantly used to transform fixed-to-mobile calls into lower priced mobile-to-mobile on-net calls.

price of such packages becomes very low for high-user customers. For some of the calls at home/in office, it is cheaper to use the mobile phone rather than the fixed line.

Consumer surveys increasingly show that mobile calls are made at home/in office even though there is a fixed line within reach. Nevertheless, applying a SSNIP test to fixed narrowband calls is unlikely to reveal for a majority of Member States a large enough traffic loss to make a hypothetical 5 - 10 % increase of the price of a fixed call minute unprofitable.

It should also be noted that mobile international calls and mobile calls to SPs are usually not included in "free" or "inclusive" minutes and do not represent a substitute for their fixed counterparts given the significantly higher prices when using a mobile phone.

VoB calls

There are two types of VOIP services provided over broadband connections.

- Non-managed VOIP services, sometimes termed Voice over Internet ("VoI") services: They are provided by companies with no access to, or control over, the local access infrastructure.

- Managed VOIP services, also termed Voice over Broadband ("VoB") services: They are provided by the retail customer's broadband access provider, i.e., the incumbent DSL operator, a DSL operator using wholesale inputs (ULL or wholesale broadband access) or a cable operator.

Customers usually will not regard non-managed VoI services as substitutes for fixed narrowband telephony services. Peer-to-peer services only allow for calls within a closed network of members and do not interconnect with the PSTN. VoI services which, besides peer-to-peer, also allow outgoing and incoming telephone calls to/from the PSTN are closer to fixed telephony services, but still not fully comparable for the following reasons. First, VoI may not allow making calls to SPs. Second, while the voice quality is often similar to PSTN/ISDN if the service is provided over a broadband connection, a particular quality cannot be guaranteed. Third, VoI requires additional intermediary hardware devices or software. Most unmanaged VOIP services are therefore unlikely to be substitutes to traditional telephony services. The exception could be VoI services which allow using the ordinary telephone with the help of nothing more than a terminal adaptor.

In turn, VoB services can be regarded as good substitutes. VoB allows contacting other end-users with a guaranteed voice quality that is similar to fixed narrowband calls. Making calls requires nothing more than a terminal adapter in addition to a conventional telephone.

Given the level of broadband penetration rates likely to be achieved in the coming years, a sufficient share of fixed narrowband customers will potentially be able to switch to VoB to constrain the pricing of fixed narrowband calls. Incumbents – as universal service providers – are often under a nation-wide uniform tariff constraint. They therefore cannot selectively respond to VoB competition, e.g., by discriminating

between households with and without a broadband connection, and fixed narrowband calls as a whole are constrained by VoB calls. In this case VoB calls should prospectively be included in the same retail market(s) as fixed narrowband calls.

We also conclude that, because competition in outgoing calls/incoming on-net calls is higher than in access, access and outgoing calls/incoming on-net calls should not be included in a single cluster market, but rather be analysed separately in different relevant markets.

CS/CPS

We now make a side step to CS/CPS, keeping in mind that, in the absence of SMP regulation, it would not be provided. CS/CPS "unbundles" outgoing calls and from access by enabling operators to provide calls without a direct connection to end-users. While CS/CPS does not directly affect the competitive conditions for access, it creates more competition for outgoing calls. This is why, in the presence of CS/CPS, access and outgoing calls are not part of a single cluster market and must be analysed separately.

But there is an additional effect created by CS/CPS: CS/CPS affects competitive conditions for international calls even more so than it does for domestic calls. For international calls, part of the value chain (conveyance and termination) is located in other countries. Alternative operators often are affiliated to incumbents of other countries or large international carriers, which have their own international backbone networks as well as international transit and far-end termination arrangements that are as least as good as the ones of the domestic incumbent given their often superior international traffic volumes. This ensures lower costs on some routes and allows them to offer better retail tariffs than the incumbent. The impact of CS/CPS is therefore particularly pronounced for outgoing international calls. Once CS/CPS is mandated, outgoing domestic calls and outgoing international calls should be analysed separately and attributed to different retail markets.

CS/CPS also "unbundles" incoming on-net calls from access. An increase in the price of incoming on-net calls will directly affect the incumbent's own customers. The overall price of an on-net call will increase, and as a result the incumbent's subscribers may switch to a CS/CPS operator for making the calls. CS/CPS therefore provides a competitive constraint on the price of incoming on-net calls similar to outgoing calls.

4.2.1.4 Distinction between customer types

Customers can choose between a variety of access and calls options. At the *access* level, the basic distinction is between connections, over which no more than two calls at the same time can be made (low-capacity connections, i.e., PSTN/analogue or ISDN 2 connections) and connections, over which three or more calls at the same time can be made (high-capacity connections, e.g., ISDN 30 connections).[38] At the *calls* level, the basic distinction is between a standard tariff option and tariff options for higher usage. The latter offer lower per-minute prices for an additional monthly fixed

[38] In some Member States, ISDN connections my not be universally available.

charge, a flat rate for an overall fixed monthly charge or turnover discounts for higher calls expenditures.

In some Member States, operators identify residential and non-residential subscribers. Customers need to specify on the contract whether they are residential or business users and, in the latter case, document it appropriately, e.g., by a social security/corporate identity number or a tax number. It appears that residential customers cannot switch to service offerings for business customers (and vice versa) even though there may be cases where this could be beneficial to do so.

In other Member States, operators offer different contractual terms and tariffs for residential and business customer profiles. Customers self select themselves into these categories, but services in principle appear to be accessible to all customer groups. Sometimes operators use monthly spent thresholds as a proxy for distinguishing between residential and business customers.

Unless based on social security/corporate identity numbers and the like, a clear distinction between residential and non-residential customers is difficult to draw. For some access products and tariff options the demand of both customer groups overlaps. While only non-residential customers demand high-capacity connections, both residential and non-residential customers demand low-capacity connections. Similarly, while only non-residential customers demand call volumes high enough to benefit from higher turnover discounts, both residential and non-residential customers benefit from lower discounts or high-user tariff options. Therefore residential and non-residential customers cannot be clearly distinguished by type of access and, at the calls level, by type of tariff option.

It would be more appropriate to identify whether there are gaps in the chain of substitution between access products or between tariff options. In fact, there appears to be demand substitution between analogue and, where available, ISDN 2 connections, but not between low-capacity and high-capacity connections. While two analogue connections are a substitute for an ISDN 2 connection, it appears that a multiple of analogue or ISDN 2 connections are usually not a substitute for an ISDN 30 connection given the difference in overall price and functionalities. As such, a market for low-capacity access can be distinguished from a market for high-capacity access.

There may also be a case to distinguish calls markets for customers with low-capacity connections from calls markets for customers with high-capacity connections. This would be appropriate if high-capacity customers have access to discounts which are better than those that are accessible to those who use multiple low-capacity connections. Other distinctions do not seem to be justified. In many Member States, there appears to exist a chain of substitution across the various tariff options from low users to high users, with no barriers to switch between the options. Customers can self select themselves into the pricing plan they consider most appropriate. Increasing competition in the calls markets will usually go along with an increase in the number of available tariff options to customers and close gaps in the chain of demand substitution. An increase in the number of tariff options may however reduce tariff transparency and make it more difficult to self select into the right option. A pragmatic approach for the revised Recommendation would be to use a rebuttable

presumption that there is a chain of substitution across tariff options from low users to high users and leave it to NRAs to demonstrate if there is a gap.

To conclude, we propose not to distinguish between residential and non-residential customers. Rather at the *access* level, one could distinguish between low-capacity and high capacity access. At the *calls* level, there could be a rebuttable presumption that there is a chain of substitution across the various tariff options and discount levels. Where NRAs find a gap in the chain, they may accordingly distinguish separate relevant calls markets for low and high-volume users.

4.2.2 Competition problems

The analysis from the previous sections suggested the following relevant markets at the retail level absent SMP regulation in the value chain:

- two retail markets for fixed narrowband access, one for low-capacity access and one for high-capacity access;
- a single retail market for all outgoing calls as well as incoming on-net calls (a further distinction between domestic and international calls would be warranted if carrier selection/carrier preselection were implemented);
- multiple network-specific retail markets for incoming off-net calls; for each fixed operator, there are two markets: one for incoming off-net calls originated on other fixed narrowband networks, and a second one for incoming off-net calls originated on mobile and broadband networks.

All fixed narrowband retail markets are likely to be characterised by competition problems in the absence of any SMP regulation in the value chain.

Fixed narrowband access

In the absence of SMP regulation, incumbents are likely to have dominance or substantial market power in both retail access markets. Alternative operators will have to seek wholesale access to ULL through commercial negotiation. Arguably, incumbents would have few incentives to provide, or maintain, access to ULL, since the negative effect on the incumbent's profits through cannibalisation is likely to be more important than the positive effect through expanding market demand. Denial of access and foreclosure could be a major competition problem. In the absence of mandated access to ULL, only operators with wholly owned local access infrastructure would be able to provide fixed narrowband connections. Duplicating the incumbent's legacy local access network to replace ULLs with self provided loops would not be economically feasible given the economies of scale, scope and density as well as sunk costs involved. Absent SMP regulation, the incumbent would capture most of the current ULL based market share in the retail market for fixed narrowband access.

Competitors to the incumbent would be limited to those using wholly owned access infrastructure, such as cable and possibly, in the future, BWA. Broadband and mobile connections do not sufficiently constrain the incumbents' short-run market power as

they are not in the same relevant market as fixed narrowband connections. However, over a longer time period, a majority of subscribers may abandon fixed narrowband connections and migrate to broadband-only and mobile connections, or integrated solutions, which provide more bandwidth and/or mobility.

Fixed outgoing calls and incoming on-net calls

We have further defined a relevant market for fixed outgoing calls including local/national calls, fixed-to-mobile calls, international calls, dial-up Internet calls and other calls to SPs. This market also potentially includes calls originated on broadband networks, such as VoB calls supplied by access providers and possibly VoI calls supplied by non-access providers (provided they do not require more than a terminal adapter).[39] This market finally includes incoming on-net calls, which can be analysed together with outgoing calls.

In the absence of SMP regulation in the fixed narrowband value chain, competition would come from operators providing VoB calls on the basis of own local access infrastructure (cable and BWA) or using wholesale broadband elements (line sharing and wholesale broadband access). Note that the analysis uses a modified Greenfield approach which assumes that SMP regulation in the fixed broadband value chain, as set out in section 5, is in place. Finally, constraints on the incumbent's market power may come from VoI services provided by non-access providers, and from mobile operators.

This may not be sufficient to constrain the incumbents' market power over the period under consideration absent SMP regulation in the fixed narrowband value chain. Competitors would have to seek wholesale call origination through commercial negotiation. The incumbent would have few incentives to provide, or maintain, this service. Denial of access could be a major competition problem. CS/CPS operators may not, or no longer, be able to provide calls. Duplicating the incumbent's legacy access infrastructure would not be economically feasible.

In the absence of SMP regulation in the fixed narrowband value chain, the incumbent would have dominance or substantial market power in the calls market. Over a longer time period than taken for this examinination, however, competing VoB and VoI providers alone may render the retail calls market competitive, so that CS/CPS would no longer be required.

Incoming off-net calls to end-users

For incoming retail calls to end-users, we have distinguished the following *network-specific* markets: incoming off-net calls originated on other fixed narrowband networks,[40] and incoming off-net calls originated on mobile and broadband networks.

[39] Note that *only* the imposition of CS/CPS in the later stage of the analysis will give rise to separate relevant calls markets for domestic calls and international calls.

[40] The market for incoming off-net calls on the incumbent network does also includes CS/CPS calls once these calls are included in the analysis.

Note that these markets are *notional* retail markets. Since end-users are not directly billed for incoming calls, there is no retail price.[41]

Each operator, whether incumbent or alternative operator, has a monopoly with regard to incoming off-net calls. The market power problem is similar for both types of incoming off-net calls, independent of the network they are originated. As noted before, there is an additional competition problem which may exist for incoming off-net calls originated on fixed narrowband networks. Incumbents might be tempted to increase the price for terminating incoming fixed-to-fixed calls in order to distort competition in the retail fixed narrowband markets (see section 4.2.1.2).

4.3 Competition problems in the fixed narrowband vertical value chain

This section locates the source of the competition problems in the value chain. We start with the deepest level of wholesale access (the least replicable element in the value chain). We examine whether the wholesale market in question is characterised by dominance and whether it passes the 3-criteria test. In the affirmative, we assume that SMP regulation in this wholesale market is implemented and then examine whether this is sufficient to make retail markets competitive.

If ex ante regulation at a given level of access is not sufficient to ensure competition in the retail markets, we move up to a higher level in the value chain (a more replicable element). When moving up to a higher level, we assume that effective ex ante regulatory remedies are imposed on the lower level(s) already dealt with.

If SMP regulation at wholesale levels does not remove dominance in a retail market, the 3-criteria test is applied to the retail market in question and, if the three criteria are fulfilled, SMP regulation is also imposed on this retail market.

We carry out the analysis for a value chain that is based on PSTN/ISDN network topology and related wholesale markets. With the emergence of NGNs, the value chain as well as wholesale market definitions will change. Traditional market definitions (e.g., call origination, inter-tandem or local-tandem transit) refer to network elements which will no longer exist on an NGN. Since implementation of NGNs is only starting and related wholesale products and interfaces are not yet fully specified, our recommendation of wholesale markets susceptible to ex ante regulation will still be largely PSTN/ISDN based. It is however clear that the lifetime of the revised Recommendation is likely to be limited given the uptake of NGNs over the next years.[42]

4.3.1 Value chain

The network elements used to provide a call are the following:

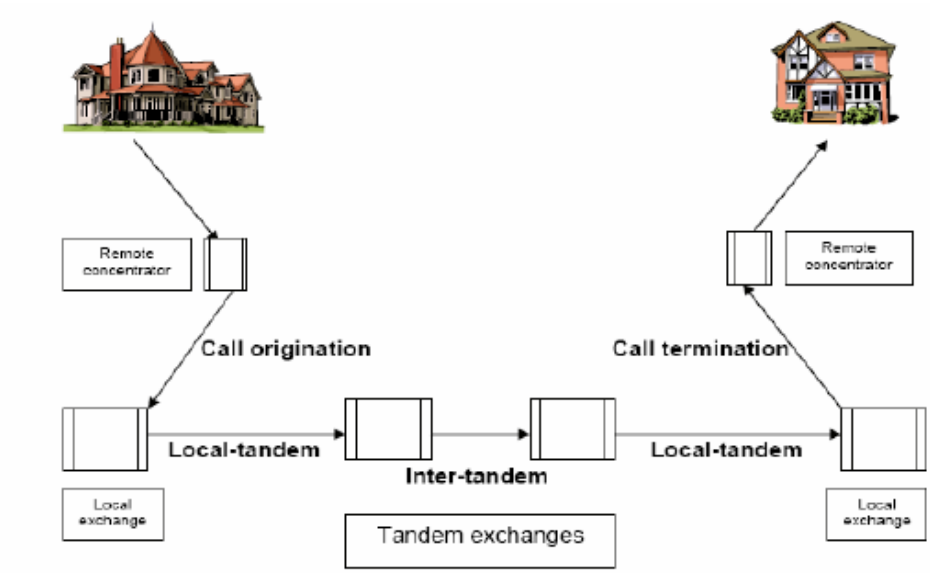
[41] There is also a market for incoming calls to SPs. Strictly speaking, SPs are not end-users. We therefore do not categorise this market as a notional retail market, but will briefly examine it further below when we deal with wholesale markets.

[42] BT, e.g., expects its NGN to be fully implemented by 2010.

- local loop (the link between the end-user and the remote concentrator);[43]
- call origination (the conveyance of calls originated on a customer's loop from the remote concentrator to the nearest local switch), including switching;
- local-tandem conveyance (the conveyance of calls between a local switch and a tandem switch), including switching;
- inter-tandem conveyance (the conveyance of calls between tandem switches), including switching; this also includes the conveyance of calls between a tandem exchange and an International Switching Centre, a specific type of tandem switch for international calls;
- call termination (the conveyance of calls terminating on an end-user's loop from the local switch nearest to the called subscriber to the remote concentrator, or, in case of a call to a SP, from the local switch to the service platform).[44]

The following Figure provides an illustration for a call to an end-user.

Figure 2: Network elements used in providing a call to an end-user



Source: Ofcom

In case of an on-net call, all network elements are provided by a single operator and the call is originated and terminated on the same network. In case of an off-net call, network elements are provided by at least two different operators. E.g., a call may be originated on a mobile network and terminated on a fixed network (mobile-to-fixed call). Or a call may be originated on the incumbent fixed network, conveyed on a

[43] Note that the local loop is also part of the fixed broadband value chain (section 5).
[44] In case of calls to SPs, the terminating operator, besides call termination in the narrow sense, also provides the service platform, including its technical operation.

CS/CPS operator's network, and terminated on a fixed network (CS/CPS call). A necessary condition for off-net calls is that networks are interconnected. In case of off-net calls operators have buyer-purchaser and wholesale billing relationships as set out below:[45]

- For off-net calls to end-users, it is generally the calling party which pays the full charge of the call, the receiving party is not charged (CPP). If the direct access provider sells the call, he self provides call origination and purchases wholesale termination. If a CS/CPS provider sells the call, the CS/CPS operator buys wholesale call origination from the direct access operator and purchases call termination from the terminating operator.

- For calls to SPs, except Freephone calls, it is the calling party that pays for the call and the service. There is a large variety of billing arrangements depending on whether the customer makes the payment to the SP, to the originating operator or both. Moreover, the SP, the originating operator or the terminating operator may have the prime contractual relationship with the customers. This determines whether the terminating operator purchases wholesale call origination or whether the originating operator purchases wholesale call termination.

The degree of replicability in the value chain is illustrated in the following table. Call termination to a particular end-user is not replicable *per definition*, since a call must be terminated on the network the called customer has subscribed to. If the network elements involved are ranked by replicability, local loop comes next, followed by call origination, local-tandem conveyance, and inter-tandem conveyance as well as conveyance to third networks.

[45] For the sake of simplicity, we neglect transit.

Table 3: Replicability in the fixed narrowband value chain

	Replicability	**Evidence (examples)**
Call termination	Call termination to a particular end-user not replicable *by definition*	-
Local loops	Local loops replicable if based on alternative technologies, such as cable and BWA	Cable networks in Austria, Belgium, Netherlands
Call origination	Call origination replicable if based on alternative technologies, such as cable and BWA, or based on incumbent's ULL	ULL based operators in Germany, Netherlands, Sweden
Local-tandem conveyance	Local-tandem conveyance replicable	Some alternative operators interconnect with incumbent at level of local switches
Inter-tandem conveyance, conveyance to third networks	Inter-tandem conveyance and conveyance to third networks replicable	Many alternative operators interconnect with incumbent at level of tandem switches, some direct interconnection between alternative operators and mobile operators

4.3.2 Wholesale termination of calls to end-users

Termination services are usually provided in terms of minutes, not capacity. Similarly to call origination, call termination may be bundled with transit.

The market definition for wholesale termination of calls to end-users mirrors the one for incoming off-net calls at the retail level and includes the following two network-specific markets:

- wholesale termination of off-net calls originated on other fixed narrowband networks, including wholesale termination of CS/CPS calls;
- wholesale termination of off-net calls originated on mobile and broadband networks (mobile-to-fixed calls and VoB calls).

In both cases, there are no demand or supply side substitutes. A call can only be terminated by the fixed operator to which the called customer has subscribed to. *By definition*, each network operator has a monopoly on wholesale termination on its network, not threatened by potential competition, since no other operator can terminate the call. The monopolisation problem is the same for all types of off-net calls. If an operator raised the price of terminating off-net calls, it would not directly affect its own customers. As a result of CPP, it is the originating operator and indirectly its customers, who have to pay the increased termination charge.

The monopolisation problem has already been discussed in relation to incoming "retail" calls, where it was assumed that the receiving operator charges the price for the incoming call directly to the sender. This is a useful description of *one-way* access situations, where the termination price is set unilaterally. One-way access occurs if an incumbent or an alternative operator supplies call termination to a CS/CPS operator. However, in *two-way* access situations, the termination price is negotiated between two networks, e.g., between incumbent and alternative operator, between incumbent (or alternative operator) and mobile operator, or between incumbent (or alternative operator) and broadband operator. In a situation of two-way access, countervailing buyer power may become important.

Countervailing buyer power may take the following forms: refusal to interconnect, refusal to buy termination services (while continuing to supply call termination) or a reciprocal increase in the termination rate. In the following, we examine whether such threats would constrain the termination price charged by a fixed network operator to a level consistent with a competitive outcome.

Wholesale call termination on the incumbent's fixed network

It is unlikely that an incumbent's market power in providing call termination is constrained by countervailing buyer power of small alternative operators, mobile or broadband operators. Neither cutting off interconnection, nor stopping delivering calls to the incumbent or reciprocally increasing termination rates is a threat susceptible to constrain the incumbent's market power in call termination.

- *Cut off interconnection*: It is unlikely that an alternative operator, or a mobile or broadband operator, would cut off interconnection with the incumbent. All operators which control access to end-users, independent of their market power, have a general obligation to interconnect in order to ensure end-to-end connectivity and interoperability of service.[46]

- *Stop buying call termination:* Alternative operators, mobile or broadband operators, also do not have an economic incentive to stop buying fixed termination services from the incumbent. If a small alternative operator, or a mobile or broadband operator, decided to stop delivering calls to the incumbent, this would damage their own subscribers, which would no longer be ensured end-to-end connectivity with the large number of customers, which are on the incumbent's network. In this situation, a small alternative operator's customers most likely would switch back to the incumbent. A mobile or broadband operator's subscribers may switch to a rival operator which continues to ensure end-to-end connectivity.

- *Increase termination rate:* The threat of an alternative operator to increase its own termination rate is also unlikely to constrain the incumbent's termination price to a competitive level. Both interconnect partners may be better off by

[46] Art. 8.3 (b) Framework Directive requires NRAs to contribute to the development of the internal market by "encouraging the establishment and development of trans-European networks and the interoperability of pan-European services, and end-to-end connectivity". Art. 5.1 (a) Access Directive requires NRAs to impose "to the extent that is necessary to ensure end-to-end connectivity, obligations on undertakings that control access to end-users, including in justified cases the obligation to interconnect their networks where this is not already the case".

setting a higher termination rate. In addition, it should also be noted that an operator requiring fixed call termination looses any power to counteract with an increase in its own termination rate if it is subject to SMP regulation and its call termination rate is set by the regulator on an ex ante basis. When applying the modified Greenfield approach to fixed termination, we assume that mobile operators are subject to SMP regulation and their termination rate is set by the regulator (see section 6).

Wholesale termination of calls on an alternative operator's fixed network

It is also unlikely that a small alternative operator's market power in call termination is constrained by countervailing buyer power of the incumbent. We neglect here mobile or broadband operators which often have only indirect interconnection with smaller alternative operators and transit their traffic through the incumbent.

- *Cut off interconnection*: The incumbent, as any other operator which controls access to end-users, independent of its market power, has a general obligation to interconnect in order to ensure end-to-end connectivity and interoperability of service. This rules out cutting off interconnection as a reaction to an increase in the termination rate of an alternative operator. The interconnection obligation is an obligation to commercially negotiate interconnection agreements, which must be taken into account when assessing market power under the "modified Greenfield approach". Universal service obligations also seem to rule out that the incumbent cuts off interconnection with an alternative operator, and deprives its customers of making and receiving calls to/from customers of these operators. Cutting off existing interconnection by the incumbent is therefore unlikely. Incumbents may however delay interconnection negotiations with operators, which intend to enter the market, and there are examples of this in the past.

- *Stop buying call termination:* The incumbent also has no economic incentive to stop buying fixed termination services of alternative operators. If an incumbent decided to stop buying call termination on an alternative fixed network, its own subscribers would no longer be able to make calls to the alternative operator's subscribers. This would create customer dissatisfaction, which the incumbent would not want to incur. The incumbent's customers may also switch to a CS/CPS operator for making calls - provided the CS/CPS operator is directly or indirectly interconnected with the alternative or mobile operator. Alternatively they may use an existing mobile or broadband connection to reach such customers.

- *Increase of own call termination rate:* The threat of the incumbent reciprocally increasing its termination rate is also unlikely to constrain the alternative operator. As noted above, both interconnect partners may be better off setting a higher termination rate.

Commercial negotiations may still fail. Where this is the case, NRAs have the duty to intervene in a dispute at the request of a party involved and issue a binding decision on call termination rates.[47] The outcome of dispute resolution processes may differ

[47] Art. 20 Framework Directive.

according to interconnection relationship and Member States, and generalised conclusions are difficult to draw. However, it is unlikely that dispute resolution will fully remove an incumbent's or alternative operator's market power with regard to call termination.

The 3-criteria are also clearly fulfilled for wholesale call termination on fixed networks. Given the bottleneck nature of termination, replication is not possible and the need for frequent and timely intervention as well as the compliance requirements suggest that ex post application of competition law is not sufficient to cope with the market failure.

4.3.3 Wholesale termination of calls to service providers

Wholesale termination of calls to SPs is analysed separately from wholesale termination of calls to end-users, because it differs substantially with regard to competitive conditions.

Depending on the billing arrangement, it may be the originating operator or the SP/ISP that purchases wholesale call termination:[48]

- *Dial-up Internet calls:* If the end-user pays the dial-up call to the originating operator, it is the originating operator, which buys call termination. If the end-user makes the payment for the call to the ISP, it is the ISP, which purchases call termination.

- *Other calls to SPs, excluding Freephone calls:* The call may be sold to the customer either by the originating or the terminating operator (platform provider). If the originating operator sells the call to the end-user, it is the originating operator which purchases wholesale termination. If the terminating operator sells the call to the end-user, the terminating operator simply self provides termination.

- *Freephone calls:* The SP buys the call from the terminating operator on a wholesale basis.

[48] If customers use a CS/CPS operator, instead of the originating operator, for making a call to a SP, it could be the CS/CPS operator which purchases call termination.

If the terminating operator increased its call termination rate, and hence made the retail call more expensive, SPs could switch to a competing network for hosting the service platform. For Internet dial-up calls there is a strong economic incentive to do so. ISPs compete for customers and the price of a dial-up call is an important factor, when customers select their ISP. Similarly, SPs which use Freephone calls have an incentive to take into account the cost of call termination when selecting the platform operator. Networks therefore constrain each other. Hence, wholesale termination of calls to SPs, unlike call termination to end-users, is a multiple-network market.

There may however be exceptions for some call types. As noted, end-users sometimes will not have a substitute for making the call (e.g., in case of home banking), or the caller's cost of the call may be negligible. The calling party may therefore not react to an increase in the price of the call. SPs may then not have an incentive to switch to an alternative operator in case of a price increase of call termination. Hence, terminating networks may not constrain each other. On the other hand, there may be common pricing constraints as well as billing constraints that could prevent fixed operators from charging higher call termination prices for particular types of calls to SPs.

Overall, the market for termination of calls to SPs does not appear to be susceptible to ex ante regulation. The first criterion in the 3-criteria test, clearly, is not fulfilled. Structural barriers to entry are low. For hosting service platforms, operators do not need to build out networks to a large number of users, and may only interconnect with the incumbent. While some investment in various hardware and software items is required, the costs involved in providing service platforms are unlikely to be prohibitive. We therefore do not recommend making wholesale termination of calls to SPs a market susceptible to ex ante regulation. NRAs may however examine whether there are particular national circumstances which create competition problems that may require intervention.

4.3.4 Wholesale access and call origination

It is clear that ex ante regulation of wholesale call termination alone would not be sufficient to make retail markets more competitive and make them pass the 3-criteria test. Further wholesale remedies are required. In terms of replicability, (i) wholesale access to the ULL and (ii) wholesale call origination are the network elements to be examined next.

While ULLs allow alternative operators to offer direct access to end-users, wholesale call origination enables indirect access based on dialling a prefix. Wholesale call origination also allows ISPs to provide Internet connectivity to end-users and enables other SPs to provide a variety of services.[49] ULLs are usually provided as naked twisted metallic pairs,[50] whereas call origination is provided in terms of minutes or capacity.[51]

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[49] Note that, in the other cases, the originating operator sells the call to the SP directly to the end-user and there is no wholesale buyer-seller relationship for call origination involved.

[50] Hybrid access technologies consisting of fibre and copper, or wireless access solutions, do not allow direct access to the naked line and only offer a predefined electrical interface or a data-stream with a guaranteed bandwidth at the access node.

[51] E.g., flat-rate Internet access call origination ("FRIACO").

The initial Recommendation is based on two findings, which remain valid. First, ULL and wholesale call origination are not demand substitutes for each other. The fact that some ANOs have rolled out networks and replaced wholesale call origination by ULL is not evidence of demand substitution. There are substantial economies of scale, scope and density as well as sunk costs involved in accessing customers through ULLs. The main driver to incur the additional investment to connect with the incumbent's network at the level of ULLs is a sufficient number and density of subscribers. A SSNIP test is unlikely to show that the sole increase in the price of wholesale call origination would induce alternative operators within a timeframe of a year to seek unbundling and reduce demand for wholesale call origination to an extent large enough to make the price increase unprofitable. Substitution of wholesale call origination for ULL is even less likely. Once networks are rolled out, and given the stranded investment, alternative operators are unlikely to switch back from ULL to wholesale call origination in case of a price increase for ULL.

Second, leased lines and Partial Private Circuits ("PPC") are neither a demand substitute for ULL nor for wholesale call origination. Leased lines and PPCs are a viable alternative for connecting non-residential end-users with high traffic volumes, but not for the majority of end-users. The wholesale cost of a leased line or a PPC is significantly higher than the wholesale cost of an unbundled loop or of originating calls for a preselected customer. A SSNIP test for ULL, or for wholesale call origination, is unlikely to show that a sufficient number of customers could be migrated from ULLs, or preselection, to leased lines and PPCs in case of an increase in the price of ULL or wholesale call origination.

There are two other aspects of relevance to market definition that merit a consideration for the revised Recommendation:

- use of wholesale inputs to provide VOIP; and
- indirect pricing constraints.

As argued above, VoB calls should be regarded as a retail demand substitute for fixed narrowband calls. Alternative operators which provide fixed narrowband calls on the basis of ULL or wholesale call origination may switch to providing VoB. Most of the ULL based operators, in fact, have already upgraded their local access networks to provide broadband connections, and some of them, besides high-speed Internet access, already provide VoB. Similarly, CS/CPS operators may switch to offer VoB. However, even if the necessary wholesale inputs – in particular, wholesale broadband access - were available, they would not represent short-term wholesale demand substitutes given the cost and time involved in rolling out broadband networks and adjusting the business model.

Indirect pricing constraints from the retail level are another aspect of potential relevance for market definition. If indirect pricing constraints from retail demand substitutes are strong enough, they may justify the inclusion of self supply in the relevant wholesale markets. Consider first indirect pricing constraints on ULLs, which come from self supplied loops. If the wholesale price of ULLs were raised, the monthly rental of ULL based telephone lines would increase. As a result, some end-users would switch to telephone lines provided over self supplied loops. Retail demand substitution would be mirrored at the input level: Self-supplied loops would

replace unbundled loops. Since the cost share of ULL in the retail price of a PSTN/ISDN connection is high, and telephone lines based on self supplied and unbundled loops are close retail demand substitutes, the indirect pricing constraint should be strong enough to render a small but significant increase in the price of ULL unprofitable. Hence, the self supplied local loops could be included in the relevant wholesale market. This, however, does not affect the outcome of the analysis, since incumbents also provide almost all of the self supplied loops.

Similarly, an indirect pricing constraint on wholesale call origination could come from self originated calls. An increase in the wholesale price of call origination would lead to an increase in the retail price of CS/CPS calls. Calls provided by direct access providers are close retail demand substitutes for CS/CPS calls. Given that the cost share of wholesale call origination in the retail price of a CS/CPS call is less than 30%, the indirect pricing constraint is diluted. A SSNIP test for wholesale call origination is unlikely to show that retail demand substitution is strong enough to render a hypothetical increase of the wholesale price unprofitable. Hence, self provided calls should not be included in the relevant wholesale market.[52]

The result is that incumbents have and are likely to preserve over a medium-term time horizon dominance in local loops and wholesale call origination. Barriers to entry into both markets are substantial given the economies of scale, scope and density as well as sunk costs involved in networks rolled out to the customers' premises (to self supply loops) or to the level of unbundled loops (to self originate calls). Finally, access to the ULL or wholesale call origination is one-way access, where there is no countervailing buyer power on the side of access seekers.

The 3-criteria test is also fulfilled for wholesale access to ULLs and wholesale call origination. Both markets are characterised by high and non-transitory structural barriers to entry (first criterion). It is clear that over a longer term horizon, many customers may migrate to broadband networks (DSL, cable and BWA), and so (narrowband) access to the ULL and wholesale call origination will loose importance. It is however unlikely that the dynamics are such that they will already move the markets towards effective competition in the period under consideration (second criterion). Finally, the compliance requirements of intervention to redress the market failures are extensive rendering ex ante regulation clearly superior to ex post application of competition law (third criterion).

4.3.5 Wholesale transit

Wholesale call termination, ULL and wholesale call origination alone are unlikely to remedy the competition problems in retail markets and make those markets pass the 3-criteria test. Wholesale transit as a further remedy is therefore examined next.

Transit services are provided in terms of minutes, not capacity. They are not demanded per se; they are always supplied as a service bundled with origination or termination:

[52] Note that a further indirect pricing constraint may come from VoB calls, which are retail demand substitutes for ULL based calls or CS/CPS calls.

- Transit bundled with call origination can only occur on the incumbent network. In this case, a CS/CPS call is conveyed from the local switch to a point of interconnection with the CS/CPS operator.

- Transit bundled with call termination can occur on any network with directly connected subscribers. In this case, a call is conveyed from a point-of-interconnection to the local switch that is nearest to the called subscriber.

- Transit is also used to convey calls from a point-of-interconnection with the originating network to a point-of-interconnection with another transit network or the terminating network. The term "unbundled transit" is usually used for such transit. This term is however misleading, because the transit operator assures onward carriage and far-end delivery on the basis of its interconnection agreements, so that the service provided is actually a bundle of transit and onward transit/far-end termination on a third network.

Depending on the network level where transit takes place, we can distinguish between

- wholesale inter-tandem transit (transit between two tandem switches or a tandem switch and an international switch) and

- wholesale local-tandem transit (transit between a local switch and a tandem switch).

Wholesale inter-tandem and local-tandem services are complementary services.

There are no good *demand* substitutes for inter-tandem and local-tandem transit. An alternative operator could use leased lines to link its switches to the incumbent's switches. Use of leased lines is widespread and they are important for alternative operators, when building out networks. They are however not a good substitute for transit for two reasons:

- While transit services provide switching, routing and carriage for switched calls, leased lines only provide capacity on point-to-point links.

- While transit services are priced on a per-minute pay-as-you-go basis, leased lines are priced on a capacity basis and must be purchased for a minimum period.

Substituting leased lines for transit services would only be economically justified if there were sufficient traffic on the particular route in question. Applying a SSNIP test to inter-tandem or local-tandem services is unlikely to show that alternative operators would switch to leased lines in response to a sole price increase for the transit service.

Many alternative operators have built out networks, sometimes using leased lines, and replaced wholesale inter-tandem transit by self-conveyance, thus interconnecting with the incumbent at the level of single-tandem switches. A more rolled-out backbone network also allows alternative operators to directly interconnect with third networks, such as mobile operators, and replace indirect interconnection (transit interconnection). Some alternative operators have further rolled out their networks to interconnect with the incumbent at the level of local switches and replaced local-

tandem transit by self-supplied conveyance. Network roll-out *per se* is unlikely to be evidence of short-term wholesale demand substitution. The prime driver for network build-out is growth of traffic volume which allows exploiting the economies of scale and scope in self providing conveyance. A SSNIP test is unlikely to show that the sole increase in the price of a wholesale inter-tandem or local-tandem transit would lead alternative operators to self-supply the input.

Once alternative operators have rolled out their networks, the question arises whether they may also open up their networks to provide wholesale transit to third parties. A related question is whether mobile operators may provide wholesale transit services. In general terms, the feasibility of supplying wholesale transit services to third parties depends on the time, cost and risk of the additional capacity and the costs of developing systems for dealing with wholesale customers (including billing and account management). It appears that alternative operators and mobile operators have rolled out trunk networks primarily for the purpose of self supplying transit and have provided transit services to third parties only to a limited extent. Alternative operators and mobile operators usually do not have spare capacity and would therefore need to incur additional costs, including network costs (for mobile operators the cost of configuring the switches to carry fixed traffic) and costs of systems for dealing with wholesale customers (billing and account management). For this reason, there is unlikely to be supply substitution within the relevant time frame of a year in response to a small but significant price increase for wholesale inter-tandem services.

Finally, there is no indirect pricing constraint from the retail level. The reason is the very small transit cost share in the overall retail price of a call which would dilute any price increase for wholesale transit services.

Incumbents have high market shares in wholesale inter-tandem and local-tandem transit. While local-tandem transit is still likely to be characterised by dominance throughout the EU, inter-tandem transit in a number of Member States may also be competitive given the lower barriers to entry and the possibility to replicate core networks.

In addition, while the 3-criteria test is still fulfilled for local-to-tandem transit, this no longer appears to be the case for inter-tandem transit. With sufficiently high traffic volumes, build-out of trunk networks is feasible. Many alternative operators have rolled out their networks to the level of tandem switches of the incumbent and self provide inter-tandem transit. There is also a number of operators that have directly interconnected their networks with mobile and other operators and no longer need the incumbent for wholesale transit to third networks. It should also be noted that replicability is supported by the continued availability of leased lines (in the fixed broadband section, it is suggested that both terminating and trunk segments of leased lines, excluding those of high capacity, should continue to be susceptible to ex ante regulation).

4.3.6 Retail access markets

We have argued in the preceding sections that wholesale access to the ULL should be made subject to ex ante regulation in order to improve competition in the retail access markets. Besides ULL, and leaving aside wholesale line rental, there are no other

wholesale markets, which could be made subject to SMP regulation in order to further competition at the retail access level. Hence, retail access markets will continue to be marked by dominance.

The 3-criteria test is also fulfilled for retail access markets. Structural barriers to entry continue to exist and reflect the barriers discussed in relation to ULL (first criterion). As pointed out above, over a longer term horizon, customers will increasingly migrate to broadband networks (DSL, cable and BWA), so that narrowband access will loose importance. It is however unlikely that over the period under consideration this trend will already sufficiently constrain the incumbents in the provision of fixed narrowband access (second criterion). Ex post application of competition law alone would not be sufficient to address the competition problems. Retail access markets should continue to be susceptible to ex ante regulation to enable NRAs to impose remedies such as the obligation to provide CS/CPS, the obligation to provide WLR, and - where WLR and CS/CPS are not sufficient to make retail access markets competitive - retail price control (third criterion).

4.3.7 Retail calls markets.

In relation to retail calls markets, we have argued in the preceding sections that wholesale call termination, wholesale access to the ULL and WLR, wholesale call origination and wholesale local-to-tandem transit, as well as carrier selection and carrier preselection should be made subject to ex ante regulation in order to improve competition in the retail calls markets. With these remedies in place, and given the prospective competition from VoB, there should no longer be dominance in retail calls markets, or dominance could be dealt with by ex post application of competition law.

Given the above-mentioned remedies implemented, the three criteria test is also no longer fulfilled. Barriers to entry are low as core networks can be replicated (first criterion). The uptake of VoB in many Member States is such that calls markets will move towards more competition (second criterion). Finally, any remaining problems could be dealt with by competition law (third criterion).

Concerns have been voiced with regard to whether competition law would be sufficient to deal with possible margin squeezes between wholesale interconnect charges and retail call tariffs. In fact, we do not think that margin squeezes will remain a major issue for the following reasons. If wholesale interconnect charges are regulated at cost-based levels, a margin squeeze is unlikely unless the incumbent is able to cross-subsidise losses of its retail calls division. Such cross-subsidisation is unlikely to occur for the following reasons:

- First, cross-subsidisation could come from retail access; this however should not be possible if SMP regulation sets the price of retail access and/or wholesale line rental at a cost-based level.
- Second, cross-subsidisation could be inter-temporal and fuelled by future profits once the margin squeeze had driven CS/CPS competitors out of the market. Entry barriers for re-entering the calls market however are low given the availability and continued SMP regulation of most wholesale inputs for

CS/CSP operators. Even more important, given the uptake of VoB and VoI, the scope for raising retail prices for fixed narrowband calls in the future is unlikely to be a realistic perspective.

For these reasons, margin squeezes do not appear to be a rational strategy and therefore are unlikely to be a major competition problem in retail calls markets.

4.4 Conclusions

To summarise, it is recommended that the following markets be susceptible to *ex ante* regulation:

1. Retail fixed access which enables no more than two calls at the same time (low-capacity access);

2. Retail fixed access which enables three or more calls at the same time (high-capacity access);

3. Wholesale fixed call origination;

4. Wholesale call termination on individual fixed networks;

5. Wholesale local-tandem transit;

6. Wholesale access to the ULL.[53]

A finer distinction could be made for the wholesale termination of calls on individual fixed networks, which could be split into:

4a. Wholesale termination of off-net calls originated on fixed narrowband networks, including termination of CS/CPS calls;

4b. Wholesale termination of off-net calls originated on mobile and broadband networks.

For reasons of practicality, the two wholesale call termination markets may be merged. Regulators should however bear in mind that remedies for both types of calls may have to be differentiated.

[53] Note that wholesale access to ULL is also recommended as a market susceptible to ex ante regulation in the fixed broadband value chain (see section 5).

Section 5. Fixed broadband markets

As elsewhere, a discussion of market definitions for wholesale broadband access products (broadly defined to include LLU) is preceded by a review of the retail broadband definitions from which the wholesale definitions are derived. Leased line markets are then examined.

5.1 Retail market definitions

This section discusses retail broadband market definitions, taking a forward-looking perspective, especially to access technologies, up to 2010. The three key dimensions of broadband services to be considered are contention, speed and mobility[54]. As always, lip service will be paid to the HMT test, but in this case uncertainties about supply and demand-side developments are very acute and make implementation of the test speculative.

Some demand data.

An ideal data set would show the range of retail broadband products available in the 25 Member States, and the trends in the take up of each product, defined on the basis of the three dimensions noted above. In fact, the data available are much more limited. Some examples are cited:

- Figure 3 shows how broadband prices in the UK have moved.
- Figure 4 shows, for the UK, how broadband has overtaken narrowband internet access in the UK, where the early development of FRIACO made narrowband internet access widespread.
- Table 4 shows the distribution of demand by speed for DSL broadband in several EU countries in 2004 and 2005, and Table 5 shows the same breakdown for cable.

[54] These are special to broadband. More generally other characteristics of the services, such as price, nature of services (functionality), the identity and nature of buyers and sellers and contract terms are also relevant.

Table 4: DSL Broadband customers by speed in 2004 and 2005 (%)

	Germany		France		Italy		Spain		Netherlands		Denmark	
Download Speed	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
128-255	0	0	0	0	0	0	3	0	0	0	76	68
256-511	3	2	49	12	75	50	92	89	11	3		
512-1023	93	4	40		17	40	1	7	0	32	9	8
1024-2047	4	76	11	88	6	8	4	1	54	44	14	20
2048-5999	0	18			2	2	0	2	35	18	2	5
6000 and up	0	0			0	1	0	0	0	3	0	0

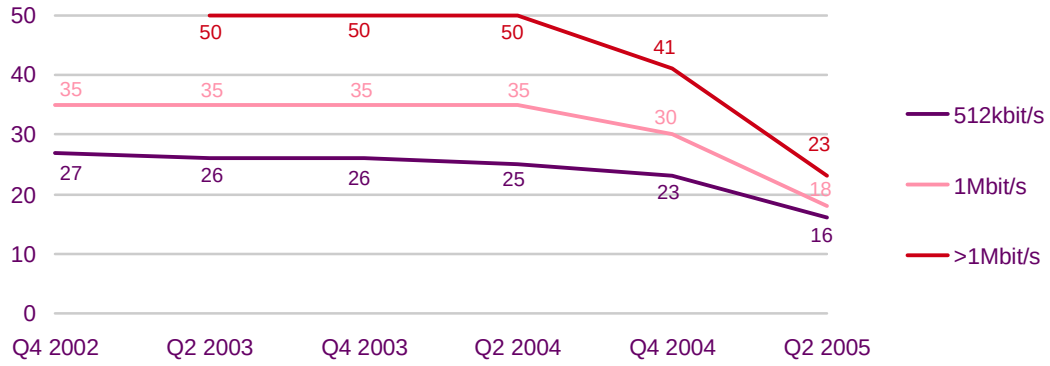
Source: H. Schedl *Ifo Schnelldienst* 19/2005 pp 37-39

Table 5: Breakdown of cable broadband customer by speed in 2004 and 2005

	Spain		France		Netherlands		Denmark	
Download Speed	2004	2005	2004	2005	2004	2005	2004	2005
128-255	72	20			13	0	14	19
256-511	22	40			0	0	30	33
512-1023	4	40	12		45	30	31	4
1024-2047	1	0	88	10	14	25	25	43
2048-5999	0	0	0	60	27	44	0	0
6000 and up	0	0	0	29				

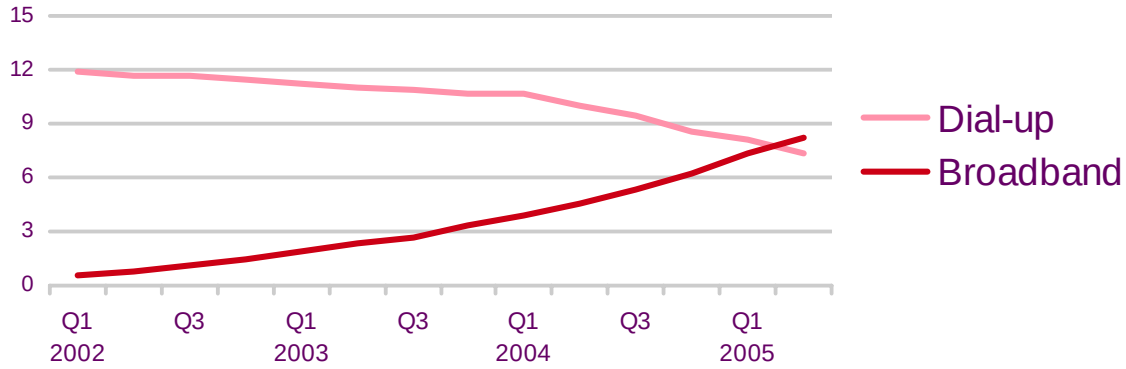
Source: *ibid*

Figure 3: UK Broadband prices over time (£ per month)



Source: Ofcom

Figure 4: UK Internet connections (millions)



These and other data appear to support the following rather obvious conclusions[55]:

- demand is increasing very quickly in most Member States - accelerating up the rising part of the S curve;
- rankings of broadband penetration among Member States are very volatile, suggesting major disparities in market conditions;
- price per unit of bandwidth is falling very quickly, largely because the numerator is constant and the denominator rising;
- operators offer a range of services, presumably in the hope of encouraging upgrading[56];
- apart from 3G (with relatively low capacity) mobile broadband has not started.

These observations lead first to the question: where will the increases in speed go, and how is the answer to this question dependent on the availability of new technologies?

Technological developments

The focus here is on access networks, since the capacity of core and backhaul networks is generally scalable. Table 6 shows the forms of access to broadband retail market currently available on a commercial basis or likely to be available in many Member States.

[55] See also European Electronic Communications Regulation and Markets, 2005 (11th Implementation Report) [COM (2006) 68].

[56] Note the decline in average speeds in the Netherlands between 2004 and 2005, presumably the result of the popularity of entry level offers.

Table 6: Capacities of access technologies (illustrative only)

Technology								
Speed (MB/s) (log scale)	Service requirements	Narrow-band	ADSL	ADSL2+	Cable	Fibre to the cabinet	3G HSPDA*	Wi-Max
0.1	FRIACO							
	Broadband							
1								
	Video							
10								?
	HDTV							
100								

* high speed downlink packet access

Figure 5: High Speed Broadband Access – ADSL Evolution

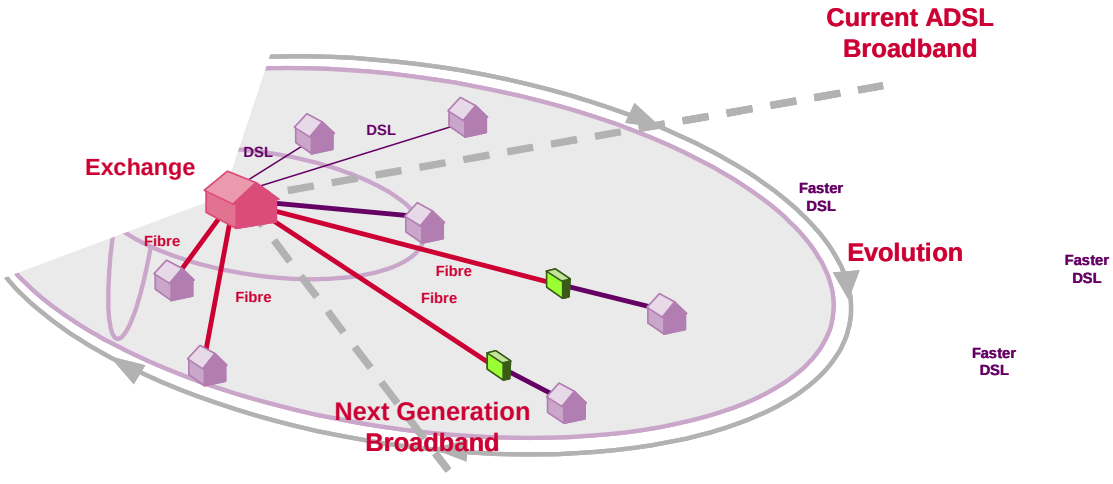


Figure 6: High Speed Broadband Access – Cable Evolution

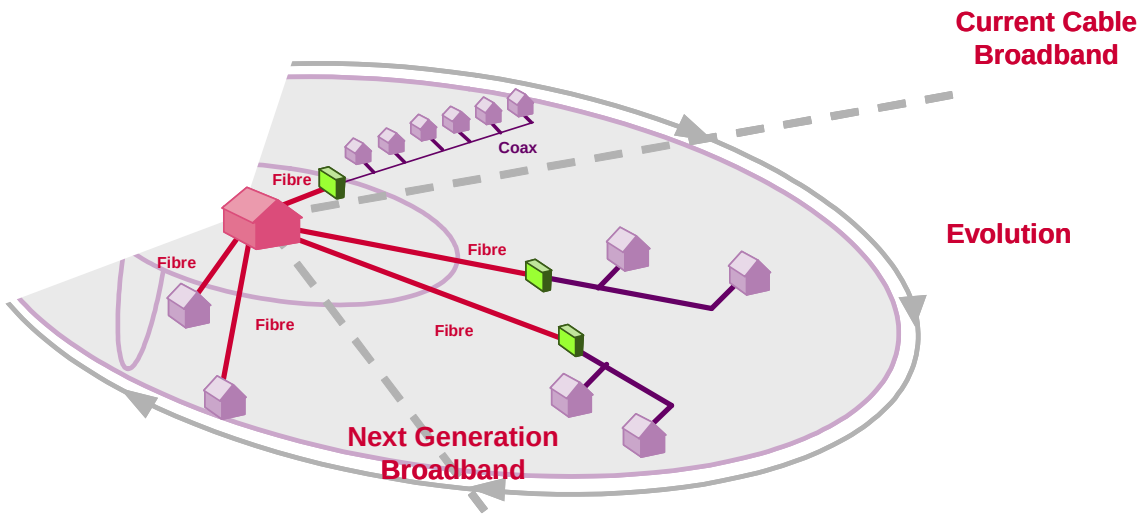
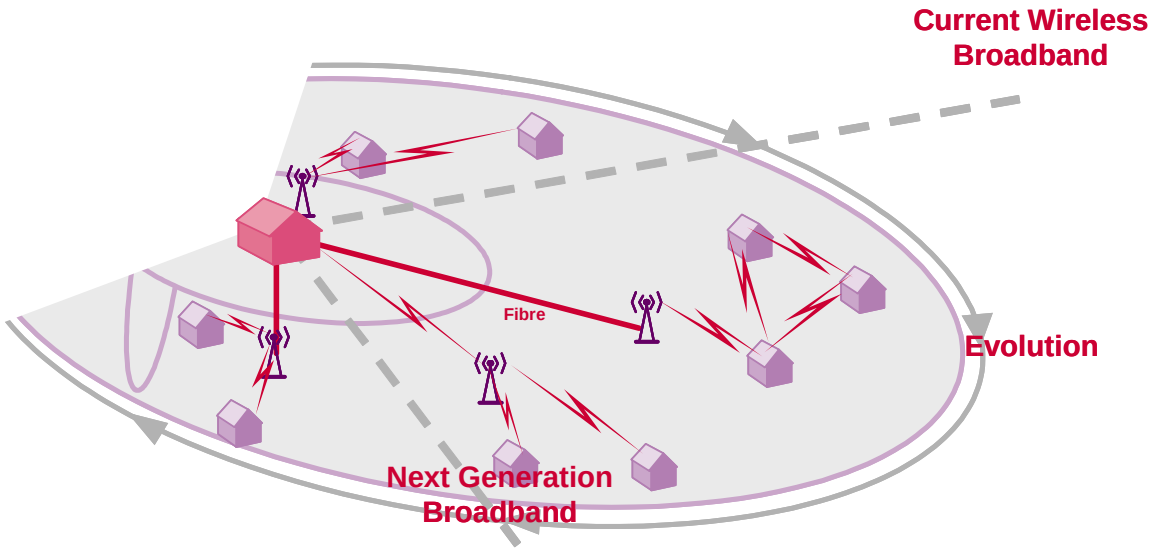


Figure 7: High Speed Broadband Access – Wireless Evolution



As part of the Telecommunications Strategy Review, Ofcom looked ahead at developments in access networks. Figures 5-7 show the regulator's expectations in respect of copper, cable and wireless networks respectively.[57] The figures suggest considerable change in prospect in the technologies and in their capabilities.

[57] *Telecommunications Strategy Review 2*, Ofcom 2005. See also the discussion in Section 6 of this paper.

The key issue for the revised Recommendation is the timing of deployment. Taking up to 2010 as the relevant period, it is likely that Wi-Max will be available (already being trialled or commercially deployed in several Member States and elsewhere). Fibre to the concentrator or cabinet is also planned (see below). Developments in cable access networks are also significant, some networks having upgraded to achieve high speeds, with trials showing even greater potential.

Market definition relating to contention and speed

First we summarise certain notifications to the Commission relating to broadband, as these include a discussion of retail broadband markets.

A. The Netherlands

OPTA's notification of market 12, accepted by the Commission, distinguished between low and high quality wholesale broadband access, the distinction being whether the 'overbooking ratio' lies above or below 20:1. The essential distinction is between the QoS equivalent to a virtual private network and the lower one normally acceptable to individual customers.

B. Italy.

AGCOM concluded that DSL, fibre optic and satellite based retail access services are substitutes for the end user across the full range of bandwidths. This is based on an analysis of the technical characteristics and functionalities of these three technologies, and also of price data. AGCOM notes that Fastweb charges the same prices for fibre optic connections as for ADSL connections for speeds up to 4 Mbits/s in reception and 0.5 Mbits/s in transmission.

Accordingly, the wholesale broadband access market comprises these three technologies. This latter conclusion is disputed by the Commission in respect of satellite, but not for reasons associated with retail market definition.

In its ULL notification, AGCOM finds that access to fibre and to unbundled copper loops are not functionally equivalent as fibre optic access lines have a bandwidth significantly greater than copper. In addition end-users' demand is not homogeneous, with access via copper generally being required by residential users and small businesses, while residential users with particular capacity transmission requirements and large businesses may require fibre optic access.

C. Germany

In its initial Market 12 notification, BNetzA concluded that there were two distinction retail markets- a premium access market and a mass-DSL market. BNetzA did, however, exclude from the wholesale bitstream access market access to VDSL connections offered over so-called 'hybrid local loops', consisting of fibre optic from the MDF to the remote concentrator or strict cabinet, will a copper connector thence to the premises. BNetzA argued that there is no current retail product relying on this input for which demand for a wholesale VDSL input can be derived. It also believed that if such a retail service existed, its price would be substantially higher than for other retail products.

In a 'serious doubts' letter the Commission asserted that, according to the principle of technological neutrality this exclusion is inappropriate, in the light of the incumbent's plan to provide such retail services in the near future. The Commission also noted that there is no indication that retail products offered over VDSL would differ from those offered over ADSL – in particular it was not known which retail products required a bandwidth not available over ADSL 2+. But the Commission did observe that new retail services might give rise to a new derived wholesale market which should not be inappropriately regulated. In the event, BNetzA amended its proposal to include VDSL in the wholesale broadband access market.

Regulators have thus carried cases for separate retail markets based on quality of service, measured by contention. Distinctions based on speed are vulnerable to the argument that there is a continuous chain of substitution, with the standard problem in such reasoning that the extreme (in this case, the fastest) products are least constrained. The problem in establishing gaps in the chain is that the offerings, and consumer take-up of them (see Tables 1 and 2 above), are changing rapidly over time. On this footing, it is difficult to be confident of finding a persistent gap over a review period.

This implies a need for NRAs to undertake an empirical examination of particular conditions in their (national or regional) markets, applying the conceptual apparatus of the HMT to three issues in particular:

- does examination of the range of retail services available suggest 'gaps' in speeds and associated prices – ie blank spaces in availability which suggest a break in the continuous chain of substitution?

- does narrowband access lie in the same market as broadband, where relatively low/low speed 'entry level' products abound? Differences in the nature of access provided by narrowband and broadband (including the 'always or' feature on the latter) strongly suggest distinct markets;

- are there the services for which there is significant prospective demand, requiring speeds which can only be provided by a particular technology or technologies (the VDSL issue)?

Location at which the service is provided, including mobility

Fixed/mobile substitution in voice calls has been a subject of perennial debate. It has received less attention in the field of broadband, where different transmission technologies deliver different degrees of mobility. As with voice calls, there are gradations, from a fully tethered service, via nomadism, portability and limited mobility, to full mobility.

Mobile broadband services are underdeveloped and standard 3G applications increasingly fail to match the speed of fixed technologies, although HSPDA may rectify this. Prices also vary considerably. Table 7 shows the lowest prices offered in a number of Member States for UMTS access in late 2005. Some 3G data services are no more expensive than fixed broadband subscriptions. The majority are much more expensive. Thus, price data do not rescue us fully from the problem of distinguishing between the hypotheses that fixed and mobile services are substitutes and that they are

complements. [58] Nevertheless they do suggest a presumption in favour of distinguishing a distinct mobile internet market.[59]

There is also evidence that mobile data access will be expensive to provide. Wireless operations, including those providing mobile services such as mobile realisations of WiMax, face heavy costs of acquiring spectrum, sites and of subsidising customer premises equipment. They may be assisted in the competition with ADSL by the effective service area of the latter (as given by distance from the local exchange) shrinking as high capacity variants, such as ADSL2+, come into play. But cheaper, fixed wireless technologies are more likely to benefit from this effect.

It is possible that services soon to be offered on a commercial in Japan and Korea (such as Wi-Bro) will disconfirm this view. But in the absence of longer term pricing data from these countries it seems more reasonable to maintain the distinction.

[58] This issue is addressed in a preliminary way by Gao, Hyytinen and Toivanen in *Demand for mobile internet*: *evidence from a real-world experiment*, HEC EK, Finland, December 2004.

[59] See also Section 6.

Table 7: UMTS Data Prices in selected countries (late 2005)

Country/Operator	Name of tariff	Rental	Included MB	Rate per MB inside the bundle	Rate per additional MB outside the bundle
Austria/Mobilkom	Data Flex Plus	7.2	7	1.03	0.4
Austria/T-Mobile	Data 10	5.6	10	0.56	0.8
Belgium/Proximus	Mobile Internet 10	26.66	10	2.67	0.41
France/SFR	Bundle 5	15	5	3	1
Germany/O2	Data Pack Volume 10	8.28	10	0.83	1.46
Germany/E-Plus	Online Volume 10	8.36	10	0.84	1.67
Ireland/Vodafone	Occasional	25	20	1.25	1.45
Netherlands/KPN	Bundle 5	12.5	5	2.5	2.5
Netherlands/T-Mobile	Internet Volume 10	12.16	10	1.26	1.26
Spain/Vodafone	LPD	15	15	1	1
Sweden/Vodafone	Bundle 5	5.07	5	1.01	1.08
Switzerland/Orange	Data Flat	29.15	2000	0.01	0.3
UK/T-Mobile	Starter	15.56	7	2.22	3.62
UK/O2	O2 Data 5	11.67	5	2.33	1.46

Notes: 1. All prices are in € and exclude VAT
2. The lowest priced UMTS has been selected

In relation to lesser degrees of mobility, such as portability, it seems appropriate to assimilate them to services provided at a fixed location.

This suggests that the question of how to define broadband markets in relation to the mobility dimension remains to some degree open. It will be up to NRAs to examine prospective market conditions in their own territories. But there seems to be an accumulation of evidence in favour of separate fixed and mobile broadband markets.

5.2 SMP Issues in End-to-end Retail Broadband

On a greenfield (no wholesale regulation) basis, the market-place for non-mobile broadband in the EU falls into three categories – 0.X, 1.X and the 2.X models[60]. In certain regions of certain Member States, where fixed networks have not been built,

[60] This is a small adaptation of a classification noted by Eli Noam.

the only platforms available are wireless. The availability and viability of these platforms are open to doubt – hence, collectively, they score 0.X. Other Member States have in addition universal coverage of a fixed telecommunications network which can be enabled for ADSL for almost all exchanges/subscribers, as well as the wireless platforms. These score 1.X. Finally, other Member States, in part or all of their territories, have in addition a cable network capable of providing broadband; hence 2.X. Cable, ADSL and wireless networks are all capable of further development, in the manner noted in figures 5-7 above.

Unregulated, the 0.X and, particularly, the 1.X market structure could easily exhibit single dominance on an end-to-end basis. Joint dominance by ADSL and wireless is also possible, but the different cost structures of wired and wireless platforms make tacit collusion less likely.

On the basis of national market definitions, relatively few Member States (Belgium, the Netherlands) have near universal cable/ADSL competition, in addition to whatever competition will be available from wireless. In the absence of strong competition provided by wireless technologies, the possibility of joint cable/ADSL dominance cannot be ruled out. There are thus grounds for anticipating market failure problems (i.e. SMP) in non-mobile retail broadband markets.

Annex II of the Framework Directive contains a list of criteria to be used by NRAs in marking an assessment of joint dominance, and further observations are contained in the *Guidelines on market analysis and the assessment of significant market power*.[61] The criteria produce conflicting results in this case – some appear to encourage, others to discourage an expectation of joint dominance. NRAs will have to make up their own minds about such cases.

Where firms can offer both DSL – based on bitstream and ULL – and cable broadband, they can offer a national service in both cabled and non-cabled area. This will enhance the symmetry between operators and may promote tacit collusion.

Overall, then, there are good grounds for anticipating market failure problems (up to and including dominance) in non-mobile retail broadband markets, in the absence of regulation.

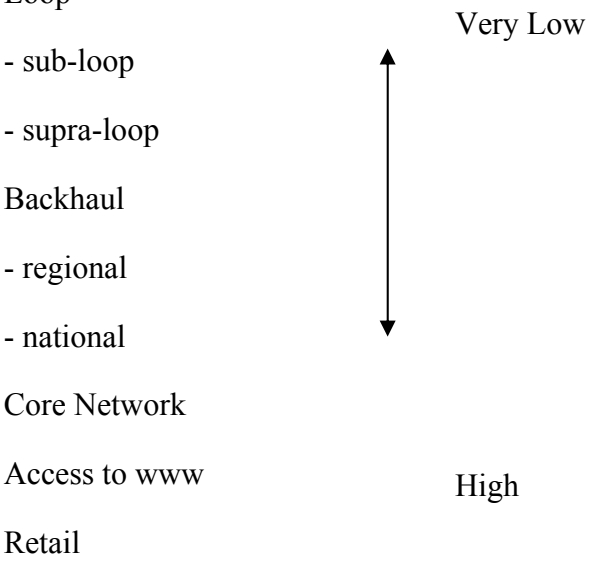
5.3 Wholesale Broadband Markets

The methodology employed in this study, where an 'unregulated' dominance problem has been identified on an end-to-end basis, is to identify the least replicable element of the value chain- the one which a competitor will find it hardest to construct, and establish a corresponding market definition. Where that market satisfies the three criteria, it is provisionally cited for inclusion in the Recommendation. The process is repeated for the next least replicable component of the chain, in addition to the least replicable element already included. That market definition, once established, is tested for SMP on the hypothesis that the previous market is subject to remedies. And so on, until the last component of the value chain, typically the retail margin is investigated, unless the process comes to a halt earlier.

[61] See fn. 4.

Figure 8 below shows a generic representation of the value chain capable of embracing varieties of ADSL, VDSL, Cable 3G and Wi-Max. The value chain is arranged in what is assumed to be increasing ease of replicability (from the bottom).

Figure 8: Broadband Value Chain



The discussion below will focus on ADSL and cable technologies, on the footing that 3G and other mobile services (as noted above) fall in a separate retail market (although they use similar network elements at higher levels in the hierarchy) while fixed wireless broadband is regarded as a technology in the same market, for which (however) market share and other projections are highly doubtful.

A generic problem with market definition arises from the need to establish a criterion for vertical separation of services. This has surfaced in debates about whether ULL is in the same market as (different varieties of) wholesale broadband access, which includes as inputs ULL, DSLAMs and backhaul.

This is clearly a question of supply-side not demand-side substitution – how long does a firm currently purchasing ULL (or any other firm) take to enter that market? Alternatively, how long does it take a firm currently purchasing wholesale broadband access to provide its own backhaul and collocate its DSLAMs with its competitors? The test set out in the Guidelines on market analysis and the calculation of significant market power is whether suppliers would switch in the immediate to short term.[62]

[62] *Guidelines on market analysis and the calculation of significant market power.* COM 2002/C/165, Recital 39.

We will adopt the rebuttable presumption on the basis of the criteria above that local loops form one separate market and wholesale broadband access (available nationally or regionally) another.[63]

Where no cable network is available or likely to be built, there can be little doubt that ULL offers an indispensable route which competitors need to gain access to retail customers. It satisfies the three criteria for inclusion in the Recommendation; on the assumption that wireless technologies will not emerge in sufficient strength over the period in question to replicate the copper loop. As noted above, where a new access technology replicates or replaces, but does not extend the scope of existing loops, it should be included in the definition.

Where a cable system operates, it may be technically feasible, but it will not normally be practicable to supply the equivalent of an unbundled loop. Any constraint it can apply on the price if a loop will be indirect, via the retail market.

In these circumstances, one approach is to apply the hypothetical monopolist test (HMT) test to the copper unbundled loop candidate market and ask the question: would an increase in the price of a loop by 5-10% at least, generate sufficient substitution from DSL to cable broadband to render it unprofitable? As cable networks are generally closed, it seems appropriate to address this issue on the basis of the strength of indirect retail competition (see Sec. 3.2 above). Given the relatively low cost share of unbundled loops in broadband supply, the exclusion of cable ULL seems appropriate.

Take-up rates of ULL are not generally high, so the next issue concerns the inclusion of wholesale broadband access in the list of relevant markets on the footing that ULL is included, and hence subject to *ex ante* regulation if SMP is found. The issue thus becomes, for non-cabled areas: how feasible is it over the period in question for competitors with access to local loops to replicate DSLAMs and backhaul? For cabled areas, the additional impact of direct competition from equivalent cable services should, be taken into account and indirect constraints operating via the retail market, might be. The case for inclusion of cable WBA might rely on the much higher cost share (about 60%) of WBA in retail prices – see Sec. 3.2 above.

In October 2005, entrants' DSL lines in the EU based on unbundled or shared loops exceeded those based on bitstream in the proportion 3:2.[64] At least one Member State, the Netherlands, had found effective competition in wholesale broadband access. Nevertheless, entrants' access by ULL amounted to only 16% of total DSL lines so it would be dangerous to regard that a successful means of entry. Moreover, the ERG analysis of broadband regulation emphasises the importance of intermediate wholesale products as a stepping stone or rung in the ladder towards local loop unbundling[65]. For representative Member States, wholesale broadband access thus appears to satisfy the three criteria.

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[63] The recent French experience in switching access seekers from national to regional bitstream supports this approach.

[64] *11th Implementation Report*, Staff Working Paper Vol 2 p55.

[65] *Broadband Competition Market Report*, ERG (05) 23, 2005.

5.4 SMP Issues relating to the Broadband Retail Margin

A look at the retail market shares of DSL shows considerable variation[66]. In some Member States, the historic monopolist has market shares in the 60-80% range (and in one case of 100%). In others, notably the UK, three-quarters of DSL-based broadband is retailed by third parties. The average is 50%. Considerations relevant to SMP in the narrow retailing activity include:

- price discrimination - particularly whether the DSL supplier practices a margin squeeze (or squeezes) in its pricing of retail broadband and the variety of wholesale broadband products available (such allegations have been made in the UK in the so-called 'Freeserve' cases, and by the Commission in its appealed 'Wanadoo' decision.)

- non-price discrimination in the provision of wholesale products.

Even if dominance is found (or even abuses of dominance) in relation to the retail margin, it is questionable whether the third condition for inclusion as a relevant market (indispensability) of *ex ante* regulation) is satisfied. But more significantly, it is very doubtful whether with LLU and WBA in place, either the second or the first criterion is fulfilled. For all of these reasons, there seems no basis for including retail broadband in the Recommendation.

5.4.1 Leased lines

The present Recommendation includes three leased line markets: the 'minimum set' of retail leased lines up to 2Mb/sec, and wholesale trunk and terminating segments of leased lines. Inclusion of the first is a legal requirement, but raises the question of whether such intervention is necessary, if adequate wholesale regulation is in place. Experience suggests that entrants are quite capable of reselling lines to retail customers so the need for control of the retail margin is questionable, with none of the three criteria apparently satisfied; no persistent barrier to entry and no basis for doubting the capacity of competition l aw to deal with the issue.

This conclusion relating to the minimum set anticipates discussion of whether a break or breaks can be found in the retail market in relation to capacity. Although notifications to date of the 'minimum set' find different breaks, there is a general finding of such a break, sustained by pricing structures which make it infeasible to compete in price with high capacity lines by offering multiple lines of lower capacity.

This break is linked to a difference in the competitive provision of low and high capacity leased lines. The latter are usually installed separately from the PSTN while the former tend to mimic its structure – thus giving the historic monopolist a competitive advantage and hence, absent regulation, the opportunity to exercise dominance or a high level of market power which is not generally present the case of high capacity lines. The break will vary from Member State to Member State, but will be at around 10 Mbits/sec. As a result, the discussion below excludes high capacity leased lines.

[66] *11th Implementation Report,* Staff Working Paper Vol.2 p 61.

On that footing, the debate becomes focussed on low capacity leased licences, for which terminating and trunk segments are required as wholesale inputs. As with the analysis of call origination and transit, so in leased lines, terminating segments, typically between the local exchange and the customers' premises, are likely to be the less replicable of the two.[67] Indeed all accepted notifications of market 14 to date have found that the market exhibits SMP.

This leaves open the question of whether trunk segments should be included. Here the notifications are more mixed, with half finding SMP, the remainder not finding it.

Two points must be borne in mind, however. Notifications of trunk segments have taken place in an environment where the market for the 'minimum set' of retail lines is included in the Recommendations, and subject to regulation. This affords purchasers protection from the exercise of SMP in trunk as well as in terminating wholesale segments.

Secondly, trunk segments are themselves an input into the market for transit services. The discussion of this market in Section 4 of this report concluded – based on the absence of unregulated dominance in leased lines (an input into transit) that intertandem transit should not be included in the revised Recommendation. Regulation of trunk segments and of transit are to some degree substitutes and it is preferable to focus regulation on the more 'upstream' product –in this case trunk segments.

As a result of this analysis, trunk segments as well as terminating segments are included in the list. It is likely, however, that several Member States will continue to find an absence of SMP in the market for trunk segments.

5.5 Conclusions

In summary, four broadband markets are proposed for *ex ante* regulation:

- unbundled local loops
- wholesale broadband access
- terminating segments of leased lines, excluding those of high capacity.
- trunk segments of leased lines, excluding those of high capacity.

[67] Other variants of the definitions of trunk and terminating segments have been utilised, but the one described above is prevalent.

Section 6. Mobile Markets

People buy mobile phones to have access, that is, they buy the ability to make and receive different kind of calls (both voice calls and SMS) while travelling in different places. Access typically involves the purchase of a handset and a SIM card. After having secured access, customers then use their phones, that is, they do make and receive different kinds of calls while travelling in different places. Access, outgoing calls, and incoming calls are the three general groups of services that represent the starting point of the analysis of market definition in mobile telephony. Therefore, one needs to understand how a customer would react when a hypothetical monopolist increases the price of one of these three services.

This apparently simple exercise has to be done while taking into account relevant features of the economic environment under consideration. A crucial aspect in the mobile telephony industry is that, in the absence of any intervention, the party making and paying for the call is typically the sender and not the receiver of the call. This arrangement, known as CPP ("Calling Party Pays") is adopted in all countries in the EU. Under CPP, the service is initiated by, and paid for by, the caller to the mobile phone, not the mobile phone owner. A SSNIP test conducted on the price of access or outgoing calls is therefore a very different exercise compared to a hypothetical increase in the price of incoming calls, since, under the current pricing arrangements, in the former case it is the phone owner that pays directly for the price increase, while in the latter there is no direct payment involved, although the receiver may indirectly suffer from receiving less calls. The convention of CPP ensures that the retail market is split between access and outgoing calls on one hand and the retail market for incoming calls on the other. Because of this fundamental difference, the analysis of access and outgoing calls is going to be kept separate from the analysis of incoming calls.

6.1 Access and outgoing calls

Clearly, access and outgoing calls are not demand-side substitutes. In fact they are complements since, if the price of access increases, demand for outgoing calls will decrease. Similarly, if the price of outgoing calls increases, the willingness-to-pay for access will decrease. Still, these two services can be possibly grouped together as a cluster market because of the reasons exposed in Section 3. If a firm alters the price of one element of the bundle, customers might choose another provider unless some other prices of the bundle are changed as well. To be sure, some elements of this cluster are subject to various degree of competition. For instance, if it is anticipated that a specific type of call (e.g., an international call) has to be made over a certain time period, and this call turns out to be more expensive on a mobile phone, a customer that also owns a fixed line may wait until a fixed line becomes available. This possible substitution pattern exists, of course, but it does not seem to represent a typical scenario for most mobile calls, which are, instead, often short convenience calls that cannot be made from fixed lines.

The question then arises if there is a significant break in the chain of substitution between fixed and mobile calls. While there is a lot of anecdotal stories about this type of substitutability, and some aggregate figures are also available to characterise

market trends (but not to infer causal relationships), very few studies exists using micro-econometric evidence.

Rodini, Ward and Woroch (2003) use a large US household survey and find that the cross-price elasticity of fixed access price on mobile access demand is between 0.13 and 0.18 in the period they consider.[68] They also find that second fixed lines are more price elastic than first fixed lines (the cross-price elasticity of mobile prices on second fixed lines is estimated to be around 0.25). Therefore these authors find some evidence of moderate substitution in the overall market for access to fixed and mobile phones. They conclude: "While mobile has displaced fixed service for a select subset of the population, the two services appear to have achieved coexistence in the market place as well as in household budgeting, each providing consumers with particular advantages".

Ward and Woroch (2005), using the same data set, extend the analysis to the substitutability between fixed and mobile usage.[69] They estimate the cross-price elasticity of mobile prices on fixed line usage from 0.13 to 0.33. As expected, these results suggest more extensive competition between mobile and fixed platforms on the usage dimension, especially for long-distance calls in the US. Mobile usage has replaced fixed usage to some extent: since mobile prices halved over the sample considered by the authors, the estimated elasticities imply that fixed usage would have been higher between 13-33% if mobile had a zero cross-price elasticity otherwise.

These figures are important and need to be constantly updated and scrutinised very closely. In terms of market definition, since the "cluster" dimension of these services prevails, it is probably the cross-price elasticity of access that matters most. For the purpose of voice telephony, mobile phones may still be largely viewed by customers as an addition to fixed phones, as the latter cannot offer mobility. These figures indicate that there is still a large gap before reaching full substitutability between mobile and fixed phones. While on several occasions customers will take advantage of having access to both platforms, in the most relevant scenario they are still prepared to pay a premium for the convenience of mobile phones.

Notice that the cluster market analysis suggests that different type of calls supplied by a mobile operator fall in the same market because these different calls are subject to a common price constraint. This is a case where both transactional complementarities exist for the customer, and supply-side economies of scope in retailing are also relevant. The analysis applies to voice services that ensure mobility, e.g., applies both to 2G and 3G networks that offer voice services since these are considered to be demand substitutes. Also notice that the analysis applies to SMS as well, as a customer typically subscribes to a mobile firm in order to make and receive both voice calls and text messages.

On the supply side, there are few opportunities for substitution between fixed and mobile services. An absolute barrier to entry into mobile markets exists in the form of scarce spectrum. This barrier is likely to be lowered in the near future with the release

[68] M. Rodini, M. Ward and G. Woroch (2003), "Going Mobile: Substitutability between Fixed and Mobile Access", *Telecommunications Policy*.

[69] M. Ward and G. Woroch (2005), "Usage Substitution between Mobile Telephone and Fixed Line in the US", University of California at Berkeley.

of additional spectrum, and with the introduction and development of spectrum trading. It is also costly to develop a mobile network with wide coverage, which makes supply-side substitutability from non-mobile firms very difficult.

A particular kind of substitutability to new generations of mobile services may arise from disruptive technologies, such as Wi-Fi. 3G telephony and Wi-Fi are both similar and different. They are similar because they are both wireless and thus facilitate mobility, they are both access technologies, and they both offer voice and broadband data. At the same time they differ in the underlying business models. 3G services are vertically integrated, and rely on a service provider approach after having secured exclusive access to particular spectrum bands. On the contrary, Wi-Fi is more decentralised, end-user centric, and typically relies on spectrum that is not licensed.[70]

Current forecasts on the number of users on the move are quite homogenous in prediction of increasing trends. The mobile or nomadic connection will depend on the devices that guarantee access. The laptop, for the time being, is the one that, despite its weight, guarantees access and a complete elaboration of the data. Therefore, the growth of laptop adoption could be an important driver in the development of the Wi-Fi technology.[71]

The following Table 8 summarises technical similarities and differences between the two technologies.

[70] See W. Lehr and L. McKnight (2003), "Wireless Internet access: 3G vs. WiFi?", *Telecommunication Policy*.

[71] Similar considerations apply to WiMax. WiMax will support even higher bandwidth and wider coverage compared to Wi-Fi. A viable coverage area could be around 2 Km to 20-30 Km with a capacity of around 30Mbit/s. The same density of spots of WiFi is not needed, as the coverage area is wider. This could result in an easier implementation since fewer residents need to install it and still support a wireless broadband continuous coverage. Wi-Fi and Wimax may also be used in the same area. WiMax may therefore be a very good candidate technology to cover Wi-Fi holes in less densely populated areas.

Table 8: Differences between the two technologies

Characteristics	**3G**	**Wi-Fi (IEEE 802.11b)**
Data transfer velocity	≤ 2Mbps	≤ 11 Mbps
Handover	Guaranteed	Not guaranteed
Roaming	Guaranteed	Only Intra-network
Security level-User authentication	High	In development
Interferences	Low	High
Frequencies	Licenses	No license
Suitable devices	Mobile, PDA	PDA, laptop
Geographical coverage	Wide geographic areas	Hot Spot
On the move	High velocity guaranteed	Not guaranteed
Services	Voice, data	Data

From the demand side, in the business market, which involves a large use of laptops, the Wi-Fi connection seems to be quite convenient, which indicates potential substitutability with mobile services. In the previous analysis, when we concluded that fixed and mobile services belong to different antitrust markets, the single main reason for reaching this result relied on the fact that only the latter ensures full mobility. The willingness to pay a premium for (full) mobility seems demonstrated in practice, at least for voice. In this respect, Wi-Fi is a potential much closer substitute, since the use of mobile phones is often made in a pseudo-fixed environment (travel nodes, hotels, meetings, etc.). However, this substitutability for voice still seems limited and does not apply at the moment to the mass market. The penetration of mobile handsets is of orders of magnitude higher than the penetration of laptops. Despite the fact that the two technologies tend to provide overlapping services, especially as far as it concerns data services (e.g., file downloading), the threat of business stealing between the two technologies is not great at present. It is more likely that Wi-Fi represents an increase of total demand of wireless broadband. However, this scenario may rapidly change.

Given the weight of handsets and the coverage of the network, 3G voice is more convenient than Wi-Fi voice while on the move. This consideration does not necessarily apply to data though. When considering mobile data services and their market definition, two points worth mentioning. Firstly, it is not clear if mobile voice and mobile data, despite being offered by the same mobile platform, should be subject to the same cluster (common pricing constraint). Mobile data are still in an early stage of development and it is unclear how the market should be precisely defined. Secondly, the willingness to pay premiums for mobile data is less clear than for voice. This observation applies to Wi-Fi as well. However, a mobile premium might be

sustained for a different reason, namely that 3G ensures security and a dedicated channel.

Therefore, it seems appropriate to keep mobile voice separate from mobile data. The highly speculative future development of mobile data also suggests not recommending a separate market for mobile data at the present stage. It is also not recommended the inclusion of mobile data in the market for fixed data since it is too early to assess if a premium for mobility can be sustained. Nomadic/portable connections such as Wi-Fi are instead suitable to belong to a rather widely-defined broadband data market. (See also Section 5.)

From the supply side, it is quite likely that the future will involve a mix of heterogeneous wireless access technologies, where 3G providers might integrate Wi-Fi technology into their networks. From this perspective, 3G and Wi-Fi represent complementary technologies. In this respect, it is also quite likely that mobile operators have an advantage compared to Wi-Fi providers given their experience in managing services for nomadic customers such as authentication, security, roaming agreements, billing, integrated service (mobile/hotspot), trusted/recognised brand in mobility.

6.1.1 The retail market

The analysis from the previous section suggests that the relevant retail market is the market for mobile access and call origination (this includes both voice and SMS because of their "cluster" dimension).

Notice that the distinction between "senders" and "receivers" made in Section 3.3 does not affect this conclusion. Because of CPP, the receiver typically accepts all calls, and thus is not likely to impose any constraints on the price of access or call origination, when running the SSNIP test.

Given this definition, we now examine what problems might arise in this market in the absence of SMP regulation. Clearly, both single dominance and joint dominance can occur. Their possible relevance is likely to differ in different European markets as conditions are not homogeneous across Europe.

The assessment whether SMP exists, either in the form of single dominance or collective dominance, follows established guidelines and practice that look at competitive conditions at the retail level and are not repeated here. We will concentrate the analysis only on a few substantive issues that are peculiar to mobile telephony and might affect competition at the retail level.

Firstly, the spectrum constraint in mobile telephony has been relaxed over the past decade, but not yet eliminated, thus entry into the industry is still restricted by regulation (licensing) and market structure is oligopolistic.[72] Secondly, because of

[72] Survey of the economics of mobile telephony can be found in J. Hausman (2002) "Mobile Telephone", *Handbook of Telecommunications Economics* (M. Cave, S. Majumdar and I. Vogelsang, eds.), and H. Gruber and T. Valletti (2003), "Mobile Telecommunications and Regulatory Frameworks", *International Handbook of Telecommunications Economics* (G. Madden, ed.).

different waves of licensing of 2G and 3G mobile telephony, there are both incumbents and new entrants. Therefore, two cases of possible SMP behaviour have to be assessed quite carefully:

a) first-mover advantages and exclusionary behaviour, and

b) collusion.

With respect to a), this aspect is particularly relevant during the transition phase from 2G to 3G services as those network operators with a 3G licence but no 2G infrastructure may be at a disadvantage against incumbent operators while they roll out their networks. The potential problem that arises here is that, in the absence of appropriate intervention, the entrants may become too weak, or even exit the market, and competition could not fully develop.

One specific way an incumbent with a secured customer base could try to put an entrant in a weaker position, is to introduce particular retail pricing structures that distinguish between calls made to own customers (on-net calls) and calls made to rival customers (off-net calls). By making on-net calls cheaper than off-net calls, a potential new customer would be more inclined to join, *ceteris paribus*, a bigger incumbent than a smaller entrant since she would make relatively more on-net calls. The entrant would have difficulties in attracting customers. Should this be true, this type of price discrimination would be harmful to competition and might require intervention. However, price discrimination between on-net and off-net calls, may also happen for very different reasons. One reason is demand-based, that is the elasticity of off-net calls could be lower than the elasticity for on-net calls. This may be possible, but not very likely. Another reason is that the underlying cost for on-net calls may differ from the cost for off-net calls. Clearly, the cost of these two types of calls differs if the (wholesale) cost of termination for off-net calls differs from on-net termination. Finally, if there is no exclusionary intent (that is, firms are more or less equally placed in the market and it is very unlikely that any firm will exit the market), on-net discounts may actually make mobile firms *more* rather than less aggressive overall. Precisely because customers would like to belong to the relatively bigger firm, firms are therefore rather aggressive when making their on-net pricing offers in the attempt to build market shares. All in all, there is neither a *prima facie* case against nor in favour of termination-based price discrimination. Competition policy may actually tackle many of these issues *ex post*. The only obvious danger when relying on competition policy has to do with timing. Given entry dynamics and the fact that some entrants are still small players at early stages of their development, the impact of competition policy may happen too late, and imposing *ex ante* regulation may work better. *Ex ante* intervention at the retail level does look very intrusive, however, and we will reassess this problem at the wholesale level in section 6.3.

With respect to point b), as mobile firms operate in rather tight oligopolies, competing repeatedly against a small number of rivals, they may recognise that their repeated interaction can be used to sustain high prices in a "tacit" way, i.e., without any explicit co-ordination. Whether or not tacit collusion is easy to enforce depends on a fundamental trade-off: the "gain" from deviation against the "punishment". To understand this, imagine one firm that is tacitly colluding: this firm sets high (possibly monopoly) prices and shares the corresponding profits with the other firms in the market in every period. If this firm deviates from the agreement to sustain high prices,

it can get a good share of the market before the rivals can react (this is the "gain" from deviation: in the limit it could get almost the full monopoly profits alone for a while). However, when the deviation is detected, the rivals will be able to retaliate and punish the deviant firm by setting competitive prices: hence in the future the deviant firm will have to renounce to its share of collusive profits it could have obtained had it not deviated in the first place. Whether firms can in fact sustain this type of tacit collusion depends on a series of factors including:

- Entry barriers and number of players: these facilitate tacit collusion as new firms cannot enter in the presence of super normal profits and collusion is easier to sustain with a limited number of firms. Given the spectrum constraint, these facilitating factors are indeed present in mobile telephony;

- Frequency of interactions and transparency: these help sustain collusion as they make the gains from deviation short-lived. In mobile telephony, interactions are very frequent and prices can be adjusted quite rapidly. On the other hand, it is not clear how transparent these tariffs are: they are easy to observe, but is much less clear how customers react to new packages, hence a deviant firm may use this fact in order to postpone as much as possible the rivals' retaliation.

- Multi-market contacts and structural links facilitate collusion as punishment can be made harsher (it can be imposed in many markets). This aspect is becoming increasingly relevant in mobile telephony as a few big groups operate across many European countries.

- Symmetry makes it easier to collude. It is easier to understand this by noting that asymmetries will make one of the players more likely to deviate (typically, the most efficient firm). The relevance of this facilitating factor in mobile telephony can only be assessed on a case by case basis.

As with single dominance, competition policy has the right tools to deal with abuses of joint dominance, therefore ex ante intervention at the retail level does not seem to be required.

6.2 Incoming calls

Mobile customers want to receive calls. Under the CPP system, these calls are initiated and paid by other customers. Given this peculiar feature, the exercise of market definition should be conducted looking at the behaviour of both the sender and the receiver.

Let us start with the sender first. The sender has a demand for calls to a particular person owning a mobile phone. Following arguments very close to those presented in the previous section 6.1, calls to mobile phones do not have strong demand substitutes, as senders typically are willing to pay a premium if they need to contact a person without knowing her exact location. If the price of a call to a mobile network goes up, a caller would probably reduce the number and/or length of calls, according to her demand elasticity, but it is very unlikely that the caller can find good alternative substitutes. For instance, in place of a calling the mobile phone, the caller could send a text message instead. However, this would not be necessarily feasible if the calling

party is calling from a standard fixed line. In addition, a text message is short and there cannot be simultaneity in the conversation. While this practice is viable in some circumstances, it is clear that this type of substitution cannot be generalised. A call is typically placed to a mobile user when the caller wants to be sure to contact and interact in real time with the called party, for which there is no effective substitute. The sender has very limited ability to find substitutes if the price of calls to mobile goes up because of a price increase initiated by the mobile operator that terminates the call.[73]

The behaviour of senders therefore does not impose a constraint to the ability of the mobile firm to increase the price of incoming calls. However, this analysis is incomplete since constraints on increases in the price of incoming calls could also arise if receivers themselves react to an increase in the price of a call to a mobile. For instance, if the receiver cares about the satisfaction of the sender, then the price of calls to mobile will be internalised. The latter case is sometimes referred to as "closed user groups" and can correspond to families that behave under a single budget constraint, or some business users who provide different sort of telephony services to their employees. These can constitute a large part of the customer base of a mobile operator; however mobile operators have the ability to price discriminate among different groups, for instance by offering discounts to large business users, hence their presence does not seem to constraint overall price levels to other customers.

Under CPP, the receiver does not pay for receiving calls. For this reason, from the receiver's perspective, when she chooses the mobile provider, the price of calls to mobile that other customers pay will not be a big driver in her choice of mobile provider. In a sense, when a customer chooses a provider she confers monopoly power to her provider on other customers willing to get access to her. Still, the receiver may limit her provider's ability to charge high prices to other people. In fact, if the price of incoming calls increases, the number of calls received will decrease, which has a negative effect on the satisfaction of the receiver, since receiving calls is clearly one of the motivations to make a mobile subscription in the first instance. However, this is not necessarily a consumer harm that the receiver can easily see or react to. It is documented by several NRAs (e.g., Ofcom) that receivers' awareness of the price of calls to mobile phones is low and that the price of incoming calls is not considered by subscribers to be an important factor in their choice of mobile operator and other factors are more influential. The mobile owner cares most about the prices she has to pay to subscribe to and place calls with a mobile operator, but in most cases she will not take into account the prices paid by other callers to contact her. In

[73] Continuing with the example presented in Box 1 in Section 3, where customer A is the caller and customer B is the receiver, this price increase could be paid directly by the sender if the price p_B for termination is paid directly by customer A to B's provider at the retail level. If, instead, A's provider bills customer A and then pays a termination charge to B's provider, the price increase would be initiated at the wholesale level (t_B) and have a repercussion at the retail level (p_{AB}). In this latter case (the most common situation in practice), the demand for B's provider is a derived (input) demand to be analysed at the wholesale level. In both cases, however, customer A has limited ability to find a substitute good to contact customer B.

general, the ability of a mobile operator to set (directly or indirectly) the price of incoming calls is not constrained by the behaviour of the receiver.[74]

Calls using Voice over Internet Protocol (VoIP) could also be a substitute for calls to mobile. These calls are treated as Internet data. The sender only pays to be on-line. However, for this to happen, the receiver needs an advanced handset (e.g. GPRS-enabled). More importantly, a VoIP call can be terminated only if both the sender and the receiver are on-line simultaneously, which is unlikely since the receiver is also charged for the time she is on-line. Finally, if the receiver has the option to receive a call using either VoIP or with the more common technology, she would probably opt for the latter since she would then not be for charged it.

In summary, in the market for incoming calls, there are no effective retail demand-side substitutes that could constraint incoming prices to the competitive level. There are neither direct constraints from senders who pay for the call, nor indirect constraints from receivers that receive calls and are charged a zero price.

Supply-side substitutability also cannot impose a constraint on the level of price of incoming calls. For this to happen, there would need to be an operator not currently supplying incoming calls to mobile that could switch into such provision, without relying on the mobile operator to which the receiver currently subscribes.

6.2.1 The retail market

The analysis from the previous section suggests that the relevant retail market is the market for incoming calls to mobile users (this includes both voice and SMS because of their "cluster" dimension).

We reiterate that the fact that, formally, there is not a retail price for incoming calls (termination) is simply due to billing arrangements. It is easy to create a "notional" retail market for incoming calls. Under CPP, the system is equivalent to another situation where the caller pays part of the price to the (own) originating provider and part of the price directly to the terminating mobile operator. It is this latter price we are discussing here. If one takes the standard billing arrangements in place instead, then this termination price is an input (wholesale) price. Therefore, what we are saying here on a possible retail price for termination, can be said as well in Section 6.3.2 on wholesale termination, and will not be repeated there. In Section 6.3.2 we will mainly analyse what could be different at the wholesale level compared to the retail level.

When assessing what type of dominant behaviour might arise in this market, it is useful to distinguish between the following three types of mobile incoming calls:

- calls to mobile (on-net);
- calls to mobile (off-net);

[74] It is possible that the mobile phone owner might have a higher level of overall satisfaction, if an increase of the price of incoming calls, despite reducing the number of incoming calls, induces the mobile operator to decrease *other* prices directly paid by the subscriber.

- calls to mobile (from other non-mobile networks, mostly fixed networks in practice).

In principle, given that a mobile firm is by definition the only firm that can terminate calls destined to its own customers, SMP in the form of single dominance should arise, no matter what type of call is under consideration. However, we should not simply run a mechanical exercise. As repeatedly said earlier, in this market there are both a sender and a receiver involved, and their identity cannot be neglected.

In the case of on-net calls to mobile, if the mobile firm tried to increase the price of the termination end of the call, the sender that would suffer the price increase would be one of its own customers. The increase of the price of termination would make the overall package offered by the firm to its subscribers less appealing, and, therefore, the firm would lose customers. Competitive forces do act as a constraint on the firm's behaviour, provided that the retail market is effectively competitive. In terms of the analogy with two-sided markets, in this case the mobile firm is a platform that perfectly "internalises" transactions that affect only its customers.[75]

Contrary to on-net calls, single dominance is likely to exist for the other two kinds of incoming calls, mobile off-net calls and calls to mobile from other networks. In these two instances, the sending party that pays the call is not one of the firm's customers, and the firm's receiving customers would not react to a price increase, which gives the mobile firm the ability to set the price at monopoly levels. From the point of view of single dominance, these two types of calls are therefore quite similar. The associated costs of termination are also quite similar. In terms of demand, the elasticity of demand of off-net mobile calls could differ from the elasticity of demand of call to mobile from a fixed network, although there is no a priori reason to believe that one is smaller or bigger than the other one.

There is nonetheless one possible important difference between these two types of incoming calls to mobile from other customers. The difference lies in the strategic environment. Off-net calls are charged to customers belonging to a rival mobile network, while there is no strategic interaction between a mobile firm and a fixed firm. As customers buy mobile phones with the purpose of receiving calls from other customers, a firm might be tempted to increase its off-net termination price in order to distort competition in the market. This incentive exists, on top of the termination monopolisation effect, only for mobile off-net calls. For instance, a mobile firm could set a high off-net termination charge, so that the overall off-net price paid by rival customers is high. Similarly to the problem described in Section 6.1.1, customers would be willing to join a bigger network, but in this case the reason is slightly different. The motivation would be related to the termination market: on-net calls, to

[75] Of course, there could be situations where there is not effective competition for mobile customers. This could arise, for instance, if a single large MNO has a sizeable share of total subscribers and is not constrained by fairly small rival MNOs. In this situation, the large MNO would have SMP both for outgoing and incoming calls, and, without intervention, will set prices for on-net call origination and on-net call termination that maximise profits, without competitive constraints. This is another case where the distinction between retail and wholesale prices is only notional, as it is immaterial if the caller pays "high" on-net prices because the originating bit is expensive or because the terminating bit is expensive. In both cases the prices are charged by the same operator to the same customer.

the extent that they are cheaper than off-net calls, imply that customers would be *receiving* relatively more incoming calls.

The nature of strategic interaction among mobile firms implies that off-net incoming calls are also subject to possible joint dominance problems, where mobile firms attempt to coordinate tacitly their prices. Given that the convention is to bill the sender only, an effective way to achieve this price coordination could be via deciding on an appropriate level of wholesale termination, which allows reaching a particular focal point in retail prices. This is discussed in later in Section 6.3.3.

6.3 Wholesale markets

The SSNIP test can be applied to a wholesale market to determine whether or not the wholesale market is distinct from the corresponding retail market. The analysis tries to figure out whether purchasers of the wholesale service have any viable alternatives to switch to, in response to an increase in the price.

6.3.1 Wholesale access and outgoing calls

Wholesale services are the packages of calls and access provided to service providers. When conducting the SSNIP test, the relevant question on the demand side is whether purchasers of the wholesale service have any viable alternatives to switch to, in response to a small but significant non-transitory price increase. As argued in Section 6.1, due to the distinct nature of mobile telephony (premium for mobility), there are no substitutes on the demand side. Due to the absolute entry barriers, there are no substitutes on the supply side. Some wholesalers can enter the retail market, although it may take time to build up brand image etc, but supply side substitution is not likely to be effective, because all MNOs already supply services identified as demand side substitutes. As such their entry has already been taken into account so supply-side substitution cannot provide an additional competitive constraint on a hypothetical monopolist retail of mobile services. Therefore, separate retail and wholesale markets for access and outgoing calls can be defined.

6.3.2 The wholesale market

Access and outgoing calls are part of the same market. All outgoing calls (call origination) and SMS also form a single market due to cluster markets.

The problems that could arise in the wholesale level are closely related to those presented in Section 6.1.1 and will not be repeated here. We focus instead on a point specific to the wholesale market, namely the role of Mobile Virtual Network Operators (MVNOs) and their relationship with joint dominance among MNOs.[76]

A MVNO is a firm that offers mobile telephony services without holding a licence to use the electromagnetic spectrum, and therefore without an access network, but that

[76] Full MVNOs are rare in practice, but the arguments presented here also apply to Service Providers.

issues its own branded SIM-cards, has its own unique mobile network code, and operates a physical network infrastructure, typically comprising at least a Mobile Switching Centre, a Home Location Register, and an Authentication Centre. In order to operate, a MVNO needs to obtain access to the radio access network of an MNO. In principle both parties can negotiate freely a mutually beneficial agreement, whereby the MNO concedes access to its network to the MVNO. However, one is left to wonder whether MNOs will voluntarily negotiate agreements with MVNOs, since the services the latter provide compete with the MNOs' own retail services.

The question of MVNOs in an interesting one, both in practice and in theory. In practice, there seem to be a correlation between the presence of MVNOs and the degree of competitiveness of mobile markets. More competitive markets typically have MVNOs. However, this observation does not establish any link of causation. It could be that MVNOs drive the degree of competitiveness, or the other way around, more competitive markets rely on MVNOs to find alternative ways to reach customers. The latter interpretation is probably more appealing, that is, MVNOs are a symptom of competition, especially given that they are normally voluntary choices; however this conclusion is highly speculative given the lack of systematic analysis. In theory, there is not much literature on incumbents, without exclusive control over an essential input, that supply potential competitors.[77]

As it is well known, the monopolist owner of a bottleneck production factor, which is also present in the downstream retail market, may have the incentive and the ability to restrict access to the bottleneck production factor, in order to restrict competition in the downstream retail market. An example of this could be a monopolist owner of a public switched telephone network, which may want to restrict access to its local loop, in order to restrict competition on the markets of fixed telephony or broadband access to the Internet.

In mobile telephony, there are at least three reasons to suspect that MNOs have different incentives than fixed telephony incumbents, with respect to giving access to their networks. First, typically MNOs are not monopolist providers of a network. Therefore, even if a MNO denies access to its network to an entrant, there is no guarantee that the entrant will be blocked as it may obtain access elsewhere. Second, also because MNOs are not monopolists, an MNO that give access to a MVNO will share with other MNOs the revenue loss caused by additional entry. This mitigates the negative impact that entry may have on the revenues of the host MNO. Third, if entry cannot be blocked, then it is probably better for each MNO to be the one that gives access to the entrant. This allows the host MNO to earn additional wholesale revenues, that at least partially compensate the loss in retail revenues caused by the entrant. Altogether, this suggests that incumbent MNOs may face a prisoners' dilemma. They would be jointly better off if entry did not occur. However, individually they have incentives to rush to be the one who gives access to the entrant.

In general, whether an entrant will be supplied in practice, has a lot to do with whether the incumbents' inputs are homogeneous or differentiated, whether

[77] There are two important recent exceptions, D. Brito and P. Pereira (2005), "Mobile Virtual Network Operators: a virtual prisoners' dilemma?", mimeo, Portuguese Competition Authority; and J. Ordover and G. Shaffer (2005), "Wholesale access in multi-firm markets: when is it profitable to supply a competitor?", mimeo, New York University.

cannibalisation from the entrant's product impact incumbents proportionally or differentially. Equilibrium outcomes also depend on what each incumbent believes about its rival's strategy. For instance, other things equal, it would seem that a big firm should be more reluctant to grant access since it has more to lose from cannibalisation. However, the bigger firm also knows that under some conditions the entrant will be supplied regardless, therefore the bigger firm may prefer winning to losing, and thus outbidding the smaller rival in order to supply the entrant. One can also envisage situations where a MVNO will never be supplied for unilateral reasons. This would happen in case the entrant's product takes most characteristics of the supplying firm only, therefore cannibalisation is the only effect and access will never be provided.

Let us concentrate on the prisoner's dilemma described before, which has interesting implications. We argued that there are situations where it is likely that, without any coordination among incumbents, access does happen as an equilibrium feature, despite the fact that, collectively, incumbents lose from entry of an additional competitor. In other words, if incumbents acted collusively by denying access to MVNOs, they would be better off. This situation, which is indeed possible, brings a more fundamental question. Imagine the analysis reveals no SMP in the downstream retail market. Also imagine firms are vertically integrated. Can there still be an allegation of joint dominance at the wholesale level? The answer to this question has to be negative if the absence of SMP at the retail level means that competition at the retail level is effective and no excessive profits are made. With and without entry, operators would obtain a normal return on their investment and therefore not granting access to a new entrant cannot have an anticompetitive intent.

A potentially more intricate case arises in the "grey" area of tight oligopolies, indeed quite an appropriate economic benchmark given that only a handful of MNOs typically compete against each other. In this case it is possible that incumbents compete against each other "imperfectly", i.e., they do not collude but extra rents are made because of the lack of entry at the retail level (due to licence scarcity). In this case incumbents would lose from granting access to a MVNO and therefore creating an extra competitor. This situation seems to support the idea that there may not be SMP in the retail markets, but incumbents have an incentive to collude (joint dominance) in the intermediate market and deny access to MVNOs. However, a problem may arise here. Why, if incumbents collude in the wholesale market, should they not try to collude already in the retail market? There are more gains to be made by coordinating at the retail level, avoiding oligopolistic competition, although the focal point to achieve coordination might be more complex in the retail market. It is true that, if there is collusion in the retail market, then a possible remedy in the corresponding wholesale market could be found to solve for the market failure. If there is no joint dominance in the retail market, instead, it might be more difficult to make a claim that joint dominance exist at the wholesale market. A remedy imposed in the wholesale market could improve on the outcomes of oligopolistic competition, but then it seems like a wrong instrument and analysis are being used to tackle problems arising from tight oligopolies.

6.3.3 Wholesale incoming calls

The wholesale price for incoming calls ("termination" in the normal jargon) is paid, under the typical pricing arrangement, by the network of the customer that initiates the call. This price directly feeds into the price that customer that initiates the call. Therefore the analysis at the wholesale level follows very closely the analysis conducted at the retail level in Section 6.2. The same arguments exposed there apply here and will not be repeated in detail. The behaviour of callers in response to a rise in termination charges and, as a consequence, in the price of calls to mobile calls is not likely to make this increase unprofitable. The limited availability of effective substitutes and the use of mobile operators of special tariffs to target the most price sensitive customers imply that most callers are not likely to respond to a price increase. The behaviour of the called party is also not likely to make the price increase unprofitable. As shown in Section 6.2, there are no effective demand-side substitutes that could constraint termination rates.

Since wholesale call termination on a certain mobile network cannot be substituted with wholesale call termination on a different network (in which case the call will not be terminated), this type of wholesale demand-side substitutability also does not exist.

Substitutability does not exist from the supply side either. There cannot be providers at the retail level that could provide a termination service that did not rely on the provision of termination from the MNO to which the called party subscribes. At the wholesale level, supply-side substitution would be effective is there were other firms who could switch into the provision of wholesale termination to a specific subscriber with relative ease in response to an increase in termination charges. The lack of access to SIM details makes this type of substitutability impossible at present.

On this basis, the appropriate market definition is the market for wholesale incoming calls. Given the common pricing constraint, which makes it very difficult for an MNO to price discriminate between different calls sent to its subscribers, the relevant market includes all incoming calls on a particular mobile network.

6.3.4 The wholesale market

The previous analysis suggests that the relevant wholesale market is the wholesale market for incoming calls (voice and SMS) to mobile customers.

The problems that can arise at the wholesale level are also those that have already been presented in Section 6.2.1. In particular, there is the possibility of single dominance on all incoming calls. This does not cause concerns for "on net" calls, while it produces a possible market failures for incoming calls from other networks (F2M calls and "off net" M2M calls). This appears to be the most severe problem in this market. Because of strategic interaction in the market for mobile customers, "off net" M2M incoming calls may also involve additional effects. In particular, the wholesale incoming price may be used to restrict competition over the price of outgoing retail calls (joint dominance), or to exacerbate single dominance problems (a high incoming off net price may reduce the ability of customers subscribed to rival networks to make off net calls). These problems are a possibility, but overall they seem to represent less of a concern from the perspective of ex ante regulation.

There is, however, a possible main difference with the "retail" market analysis of incoming calls. If the sending party was billed directly by the receiving operator, it seems natural that the termination price is set directly by the receiving network, thus the sending customer has no bargaining power. Instead, at the wholesale level, the termination price is more likely to be negotiated between the sending network and the receiving network. Countervailing buyer power (bargaining, negotiations) should therefore be taken into account when analysing the wholesale market for incoming calls in order to determine the presence of SMP.

In particular, a bargaining model seems quite appropriate to analysis the market for "off net" M2M calls, as this is a bilateral problem of "two-way" interconnection, where two wholesale prices have to be negotiated, one in each direction. One network, when negotiating the wholesale price for sending calls to the rival network, can always use its own wholesale price for receiving calls from the rival as an effective threat in the bargaining game. An originating MNO faced with a high price for termination provided by another MNO may threaten to charge a similarly high price for termination on its network to that MNO. However, whether or not this is a credible threat depends on the impact this would have on profitability of both MNOs. In this context, there are different sets of results from the literature:[78]

- Bilateral wholesale negotiations can get rid of inefficiencies, given the reciprocal nature of bargaining. This is true particularly for negotiations among symmetrically-placed networks.

- As already anticipated, bilateral negotiations may be used to affect the intensity of competition at the retail level. The nature of collusion may be different:

    1. Collusion may happen in a "static" framework by setting high termination rates because of a "raise-each-other's-cost" effect.[79] This result holds true only under particular circumstances, namely retail prices should be linear (which may be applicable to pre-paid cards), while it does not apply under more sophisticated retail

[78] See J.-J. Laffont and J. Tirole (1998), *Competition in Telecommunications*, MIT Press, Cambridge (MA); M. Armstrong (2002), "The Theory of Access Pricing and Interconnection", in M. Cave, S. Majumdar and I. Vogelsang (eds.), *Handbook of Telecommunications Economics*, North Holland, Amsterdam; I. Vogelsang (2003), "Price Regulation of Access to Telecommunications Networks", *Journal of Economic Literature*; C. Cambini and T. Valletti (2005), "Information Exchange and Competition in Communications Networks", CEPR, London.

[79] To see this, imagine what happens when operators charge collusive (monopoly) retail prices to customers. If mobile customers call each other with the same probability, the traffic is balanced and an operator pays the rival for termination services the same amount it receives from the rival for similar services, independently of the value taken by the termination charge. This can be an equilibrium only if no one has a unilateral incentive to deviate. If one firm deviates from the monopoly retail charges by undercutting the rival, it induces its subscribers to call more. Since part of the calls made are destined to the rival's network, the effect of a price cut is to send out more calls than it receives on–net from the rival. The resulting net outflow of calls has an associated deficit that is particularly burdensome if the unit termination charge is high. This will discourage under-pricing in the first place. To get this result some conditions are needed, for instance products need to be not too homogeneous, otherwise the incentive to undercut would have the additional benefit to get market share.

pricing structures (two-part tariffs, e.g., monthly rental plus price per minute of usage).

2. Collusion may also happen in a more standard "dynamic" framework, where networks repeatedly interact with each other. The role of wholesale termination charges may be one of giving a "focal" reference point to set collusive retail prices. Notice that, in this case, joint dominance should be established at the retail level, while the wholesale level may facilitate reaching the collusive agreement.

The applicability of a bargaining model to the determination of the wholesale price for termination of F2M calls is more controversial.[80] There is a difference between a situation where the originating operator is a fixed network operator (FNO) compared to a situation where the originating operator is a MNO. This is because a mobile originating operator is potentially able to use the price it charges for mobile termination as part of its negotiation with a terminating mobile operator. In the case of FNOs, the price they charge for termination on their networks to mobile operators is regulated, and therefore cannot be used to influence the negotiations on the charges for mobile termination. FNO-MNO negotiations on termination are not reciprocal, in contrast to those between MNOs, since any charge the MNO receives for termination of calls on its network will not impact the charge the FNO may be able to levy on the MNO for termination on the fixed network.

In a bargaining model, two parties have to find a way to divide the surplus created by finding a deal. This division is influenced by the outside options that the parties have, i.e., what they could get if they threaten not to strike a deal. The "threat" points are not as natural as in the bilateral negotiation of termination of M2M calls. In the case of F2M calls, the negotiated price is only "one way", as the other way (M2F) is typically regulated. This asymmetric treatment of M2F and F2M calls is a possible source of distortion that must be noted, but, given the "modified Greenfield" approach, cannot be eliminated.

In considering whether a MNO has SMP over termination of F2M calls, it is important to understand if the originating FNO has countervailing buyer power (CBP). Notice that it is not sufficient for the FNO to have CBP but, rather, it is necessary that the FNO can exert sufficient CBP such that the termination prices charged by the MNO are constrained to a level consistent with a competitive outcome, i.e., that the MNO is unable to act independently of competitors and consumers.

The incumbent FNO is the most important FNO to consider for several reasons. First, it typically has the largest market share in the fixed telephony market and originates most F2M calls. Secondly, the incumbent FNO has an "obligation to interconnect" or to offer "end-to-end connectivity". Whilst the originating FNO may be a well-informed purchaser of termination and can be expected to be price sensitive to charges for termination, it cannot exert CBP by threatening to purchase from another party, or to self supply, as this threat is not credible. The problem of bargaining over

[80] See K. Binmore and D. Harbord (2005), "Bargaining over fixed-to-mobile termination rates: countervailing buyer power as a constraint on monopoly power", *Journal of Competition Law & Economics*; UK Competition Appeal Tribunal (2005).

termination rates for F2M calls is made murky by the existence of other regulations. In particular, incumbent fixed-line network typically have an "obligation to interconnect", which seems to mean physical completion of calls, without specifying a price. This concept is a bit obscure since a high enough price will always make interconnection impossible de facto.

This obligation must be taken into account when assessing SMP in the wholesale market for incoming calls under the "modified Greenfield approach". One therefore has to anticipate what the regulator might do in case negotiations fail. If the regulator is toothless, then the "interconnection requirement" plays no role. But then what does this obligation mean? If instead we believe that the "interconnection requirement" – whatever it means – puts the MNO in a better bargaining position against the fixed-line operator than in its absence, then its role must be to push the termination price closer to the MNO's ideal, which also implies that SMP is more likely. This is because the fixed-line operator cannot really impose a credible threat on the MNO by denying interconnection.

If this requirement is interpreted as the regulator's ability to jump in and resolve negotiations, then things can go either way. If the regulator has a bias in favour of the fixed-line operator, then the agreed rate is closer to a take-it-or-leave-it offer made by the fixed-line operator. If the regulator has a bias in favour of the MNO, then the agreed rate is closer a take-it-or-leave-it offer made by the MNO. This is almost tautological, but not completely satisfactory, as, under the "modified Greenfield approach", other existing regulations should be taken into account but should not drive the result of finding of SMP (or its absence). In this case, the possibility of dispute resolution is part of the picture and affects the very same price under investigation, which could introduce a circular reasoning.

The extent to which the FNO is able credibly to threaten to refuse to purchase termination depends upon the expectations of the two parties as to whether the NRA would intervene and, in the event that it would, the outcome of such intervention. NRAs typically have many options to resolve a dispute, which cannot be anticipated *ex ante*. The outcome of the dispute resolution may or may not determine a price lower than the price proposed by the terminating MNO. Given that cost proxy models are not a typical tool used to resolve a dispute, it is possible to argue that it is unlikely that the result would be a cost-based termination charge. This observation then seems to suggest that dispute resolution does not constrains prices to a level consistent with a competitive outcome and therefore does not constrain the MNO's ability to set F2M termination prices such that it does not enjoy a position of SMP.

This problem of "bargaining in the shadow of regulation" still has to be clarified in full. However, some related aspects have received some partial answers. For instance, an argument put forward has been that, to have a viable business, a *small* MNO *must have* an interconnection agreement with the incumbent fixed-network operator. This argument mixes up incoming calls and all other services. In fact, as a first cut, the bargaining problem does not seem to be affected by the size of a MNO. The size of the MNO affects the total surplus to be bargained over, not its division. This is because, once MNOs have some subscribers, bargaining might occur over calls destined to those customers, therefore without substitution possibilities. As a result, we can conclude that the existence of countervailing buyer power over the setting of termination prices does not seem more likely for small MNOs. In fact, there are

theoretical arguments (and some empirical evidence) for supporting the opposite result: smaller networks charge *more* for F2M termination than bigger networks. This is because fixed-line users may have little knowledge of the mobile network they were calling and of the specific call price. This is true in environments where it is difficult for a caller to identify the network he/she is calling. This can arise for various reasons, e.g., consumer ignorance, mobile number portability, or no discrimination requirements for F2M calls.[81]

Rather than size as such, what is more relevant to the problem of CBP is the *sequence* of the possible bargaining between the incumbent FNO and various MNOs. Imagine there are only one FNO and two MNOs, denoted as 1 and 2. For simplicity, also imagine 1 and 2 are symmetric. If a deal has already been reached, say, between the FNO and MNO 1, then the FNO may use, ceteris paribus, the same terms and conditions when negotiating with MNO 2. This is particularly true if: a) it is expected that the regulator, in case it intervenes to resolve the dispute, will also use these terms and conditions to arbitrate, and b) in case of disagreement, traffic between the FNO and MNO 2 is not lost form the point of view of the FNO as a decrease in MNO 2's customers is compensate by an equal increase in MNO 1's customers (where a deal already exists). When these conditions are met, then the ability of MNO 2 to impose unilaterally its pricing conditions would be constrained by the pre-existence of other interconnection terms. Notice that it is the sequentiality that matters to reach this conclusion, not necessarily the size of MNO 2.

6.4 Conclusions on candidate markets for ex ante regulation

Based on the analysis conducted in Section 6, the following wholesale markets are candidates for being susceptible for ex ante regulation:

1. wholesale access and outgoing calls (voice and SMS);

2. wholesale incoming calls (voice and SMS).

A finer distinction could also be made for the market for wholesale incoming calls, which could be further split into:

[81] If fixed-line users base their calling decisions only on an estimated price based on mobile market shares, then the link between a specific termination charge set by a network and the number of calls terminated on that network is broken. If a mobile network raises its termination charge, it gets the full benefit and shares with other mobile networks the reduction in the number of calls received. As a consequence, networks will have an incentive to set very high termination rates, even above the monopoly level. In fact, as termination charges are increased above the monopoly level, two additional effects follow. On the one hand, termination profits per subscriber will decrease, which has a negative impact on the mobile operator's profit. On the other hand, the increase in termination charges will increase the F2M price of all the calls, which will also decrease the termination profits per subscriber which rivals can capture. This causes rivals to compete less aggressively for mobile subscribers. When both operators set termination charges at the monopoly level, the first effect is zero, while the second effect remains, implying that each operator will want to set termination charges above the monopoly level. This effect is stronger the *smaller* the size of the MNO. See Gans and King (2000), "Mobile competition, customer ignorance, and fixed-to/mobile call prices", *Information Economics & Policy*; and J. Wright (2002), "Access Pricing under Competition: an Application to Cellular Networks", *Journal of Industrial Economics*.

2a. wholesale incoming calls (off-net calls);

2b. wholesale incoming calls (calls from non-mobile networks).

The distinction between 2a and 2b above stems from the fact that the economic problems at stake are different. In the case of off-net calls, there is a true possibility that reciprocal deals, bargaining, etc., may achieve solutions that are in the interest of consumers.[82] On the contrary, in case of incoming calls from non-mobile networks (mostly fixed network), unregulated negotiations are not likely to achieve desired outcomes. The distinction between 2a and 2b reflects therefore different economic contexts and may call for differences in the type of regulations eventually imposed (with the expectation that regulation of 2a could lighter than 2b). Notice that according to the distinction above there should be no need to conduct an ex ante analysis for wholesale incoming on-net calls, as in this case any attempt of an operator to increase the price of incoming calls on the receiving end would immediately be felt by customers of the same operator on the originating end. Therefore, for on-net calls only, competition in the retail market for end-users would discipline the price of incoming calls.

In deciding whether national circumstances warrant the consideration of *ex ante* regulation in the segment of that market which an NRA proposes to regulate, we recall that there are three Criteria that the Commission sets out in its Recommendation that NRAs are required to meet, as described in Section 2.2.

The three criteria are met in the case of incoming calls. The "termination bottleneck" problem is endemic to the entire telecommunications sector under the current pricing arrangements (CPP). The case is particularly strong for calls from non-mobile networks. As said above, in the case of off-net calls, the outcome of bargaining among mobile operators could be efficient reciprocal rates possibly approaching costs. Alternatively, bargaining could be used as a co-ordination mechanism with prices well above costs. The results should be easily observable, and therefore some degree of scrutiny should be kept in this market.[83]

A feature which is peculiar to mobile telephony is related to entry barriers (Criteria 1 and 2). This has to be discussed in order to see if Candidate market 1 (wholesale access and outgoing calls) meets the test for this criterion. To a large extent, barriers to entry in mobile telephony are regulatory in nature as they depend on spectrum policies, and may be modified as licences come back up for renewal. Moreover, it appears that the most competitive European markets have let MVNOs and service providers emerge as natural market outcomes. Hence, the dynamic behind the entry barrier is normally satisfactory.

One must draw a clear distinction in treatment between high entry barriers due to structural reasons and regulatory barriers (the height of which is set by the regulator). Structural barriers are those that eventually remain (e.g., because of technology) after

[82] We recall that this is particularly true when consumer tariffs are multi-part, e.g., a monthly fee and a price per minute. If instead tariffs were linear, as in the case of pre-paid cards, then problems may arise.

[83] Efficient bargaining over off-net M2M termination would imply that the second criterion is not satisfied. Given the asymmetric treatment of F2M and M2F termination, it is not anticipated that this could happen for the termination of F2M calls.

policy makers have done what is in their powers to remove all other non-transitory barriers. Structural barriers are those that cannot be undermined via a policy decision. There should be less scope for ex ante regulation in the future if regulatory barriers are set at clearly too high a level, otherwise regulation becomes a self fulfilling prophecy.

On balance, the mobile industry tends towards effective competition, if non-structural barriers are removed. In a scenario with an open spectrum allocation, effective number portability, etc., competition policy should be sufficient to deal with anti-competitive behaviour that might be present in this market. It is therefore concluded that the market for wholesale access for access and outgoing calls does not met the three criteria and should not be recommended for ex ante regulation.

This market could be reintroduced in the list of recommended markets by some NRAs if the local conditions differ from the average scenario described above. In this case, it would be crucial to assess both structural barriers to entry and regulatory barriers to entry. The former would meet the test, the latter should not. Candidate market 1 should be subject to ex ante regulation only if:

- Regulators adopt or commit to remove regulatory non-transitory entry barriers (by adopting more open spectrum policies in particular, which may include MVNO requirements in the licence conditions), *and* structural barriers to entry are still high (notwithstanding open spectrum policies).

To summarise, it is recommended that the following market be subject to *ex ante* regulation:

- Wholesale incoming calls on individual mobile networks. The analysis should take into account a finer refinement between incoming off-net calls and incoming calls from non-mobile networks.

Section 7. Summary of recommended markets

A. Retail fixed access which enables no more than two calls at the same time (low-capacity access)

B. Retail fixed access which enables three or more calls at the same time (high-capacity access)

C. Wholesale fixed call origination

D. Wholesale call termination on individual fixed networks

E. Wholesale local-tandem transit

F. Unbundled local loops

G. Wholesale local-tandem broadband access

H. Terminating segments of leased lines excluding those of high capacity

I. Trunk segments of leased lines excluding those of high capacity

J. The termination of incoming calls on individual mobile networks