Encouraging infrastructure competition via the ladder of investment

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Abstract

Recent discussion of regulatory interventions in telecommunications markets have considered an approach in which competitors are encouraged progressively to make investments in network assets which are less and less easily replicable—thus climbing ‘the ladder of investment.’ The paper proposes and illustrates methods for assessing the replicability of different assets and sets out the steps which regulators can follow in implementing the approach.

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0. Introduction

Almost everyone believes that ‘competition is the best regulator’. It promotes consumer welfare by offering choice, variety, keen prices and innovation. Conversely regulation is often associated (but is not necessarily the sole cause of) lack of choice, uniformity, high costs and disincentives to innovate.

A corollary of the belief in the advantages of competition is that it should extend across the whole of, or as much as possible of, the value chain. So-called service or supply competition, in which competitors do little more than resell the incumbent’s services, fails to provide two of the above-noted benefits of competition, service variety and innovation. It offers choice of a sort, and where it offers keen prices it is often through regulator-promoted arbitrage which allows resellers to buy cheap at wholesale prices and attack the incumbent’s margin.

The telecommunications market place is still heavily influenced by the inheritance of state monopoly, which in many European countries only came to an end in 1998. In the opinion of some commentators such as Alfred Kahn (1998), this provides a theoretical justification for transitory entry assistance to overcome the advantages of the historic monopolist.¹ The medium and long-run desirable outcome is, however, competition on level terms among operators of the kind which is already found in mobile markets.

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This is unlikely to happen overnight, but the regulatory regime should enable it. The key is the encouragement of investment both by the historic monopolist and by entrants. The latter may have to acquire capital assets progressively, as they acquire customers and revenues. This approach has been likened to climbing a ‘ladder of investment’, which should culminate in a high level of competition across the value chain (Cave, 2004).2 Achieving extensive competition of this kind has the inestimable advantage of making the next generation of technology contestable—in effect creating a race among the competitors to implement it. This reduces the need for future regulation.

To set the right incentives, regulators must credibly signal that access conditions will change over time. They must also ensure that the ascent of the ladder is demanding, but feasible, in terms of the distance between the rungs (the incremental investment to be undertaken) and the speed of the ladder’s climb.

This paper sets out a possible way for implementing an approach to the regulation of one-way access (in which competitors have access to the incumbent’s facilities but not vice versa), consistent with the maintenance of investment incentives for both the incumbent and its competitors.3 Section 1 describes the ‘ladder of investment’ approach in the context of access pricing theory and the prospects for its application in the new European regulatory regime for electronic communications services. Section 2 discusses the notion of ease of replicability of assets and how it might be established. Section 3 sets out a possible regime of dynamic access regulation. Section 4 describes a recent analysis by the European Regulators Group (ERG) of broadband competition from the standpoint of the ‘ladder of investment’. Section 5 contains conclusions and recommendations.

1. The theory of access pricing, the European regulatory regime and the ‘ladder of investment’

The basic principles of one-way access pricing are comprehensively summarised in Armstrong (2002) and Vogelsang (2003), which focus primarily on the different static contexts in which it is appropriate to apply cost-based access pricing, Ramsey pricing, and the efficient component pricing rule (ECPR). Relatively little of the literature surveyed steps outside a static context to consider dynamic problems of investment incentives for asymmetrically placed incumbents and entrants (see Armstrong, 2002, pp. 331–333). An exception is de Bijl and Peitz (2002), who develop a model of network competition in three modes (full network duplication, local loop unbundling and carrier selection). Using simulations based on Dutch data, they show the impact of alternative access pricing policies following the arrival of new market entrants. The dynamic element is, however, limited by the assumption that firms maximise only their current profits. Valletti (2003) points this out and develops some models of investment ‘races’.

Chang, Kosler, and Majumdar (2003) have carried out an empirical analysis of access pricing and investment in the USA and Europe. They find that lower access prices spur the development of new technology by local incumbents in the USA. Zarakas et al. (2005) also find that higher US access prices would have spurred investment. Chang et al. also tentatively conclude (based on limited data) that in Europe above average access prices are associated with more investment overall.

The absence of a fully developed theoretical framework for dynamic access and clear empirical conclusions from cross-country studies has not delayed the application in practice by European (and other) regulators of access pricing policies based upon a desire to stimulate entrants to build their own infrastructure. This has become explicit under the new European regulatory regime, set out in the 2002 Directives,4 the key elements of which, for our purposes, are:

- the need to define markets, using anti-trust principles and taking account of demand and supply side substitution;
- a finding of dominance (single firm, collective or leveraged), taking account of potential competition, as a pre-condition for the imposition of remedies;
- the availability of a range of more or less draconian remedies, including the mandating of access using different principles for pricing it.

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2 In the US, the ‘horizontal’ metaphor of (normally flat) stepping stones is preferred to the ‘vertical’ one of a ladder.
3 The paper will not address the issue of newly emerging markets.
4 For details, see Buigues and Rey (2004).
The use of dynamic access regulation for the purposes of stimulating competing investments is one such remedy, and one which was discussed in a paper on remedies adopted by the European Regulators Group in April 2004 (ERG, 2004).

The paper notes that one of the objectives of the regulatory regime set out in the Framework Directive is to ‘promote competition in the provision of electronic communications services and associated facilities and service facilities.’ When considering remedies, NRAs are responsible for, inter alia ‘ensuring that there is no distortion or restriction of competition in the electronic communications sector.’ Thus in the context of remedies for one-way access, the Framework Directive emphasises the objective of promoting innovation and encouraging efficient investment.

The paper then goes on to draw a distinction between cases where consumers have to be protected because the assets providing the services cannot be replicated and hence they are exposed to excessive pricing, and cases where it is feasible to support infrastructure investment by competitors. In the latter case, one of the themes in the Access Directive states that

…the imposition by national regulatory authorities of mandated access that increases competition in the short-term should not reduce incentives for competitors to invest in alternative facilities that will secure more competition in the long term.

The ERG paper suggests in relation to one-way access that:

…new entrants can decide on their investment in a step-by-step way and can establish a customer base (critical mass) before they go to the next step of deploying their own infrastructure. In those areas where infrastructure based competition is feasible, such interventions have as their long-term objective the emergence of self-sustaining effective competition and the ultimate withdrawal of regulatory obligations.

The paper does not, however, go into the details and sometimes uses these ideas as a means of justifying access regulation without explaining how such regulation will generate, in appropriate cases, sustainable competition.

It is possible to make the approach more concrete by considering an illustration of the investment ladder mentioned by the ERG. As summarised in Cave and Vogelsang (2003), entry in The Netherlands occurred in voice and internet markets as a result of firms, starting from whatever was the relevant base, progressively accumulating assets, beginning from the most easily replicable or least visible, for example

Consider the case of Tele2, an operator whose strategy consists of targeting a mass market, involving considerable marketing and advertising expenditure, on the basis of—initially at least—minimal investment in infrastructure. As time passes, Tele2 makes further investments in switching and conveyance at the national level, but its sunk costs are limited (possibly confined to marketing costs).

Conversely

A cable TV operator like UPC will have already replicated some aspects of the local loop, although further investments are required both for telephony and the development of internet services. In this respect, local access pricing makes little difference. The cable operator has to buy call termination from the incumbent, probably in respect of the majority of calls. Finally, the cable operator needs access to long-distance conveyance, which is replicable, either by the cable operator or by other entrants and should, with time, be competitively priced.

Finally

The case of non-cable entry into the high bandwidth market is considered. This is a new market, in which the incumbent has no historic market share, although clearly it has the advantage of providing the related service of basic telecommunications to the vast preponderance of domestic and business customers.

5. A detailed account of the developments described below can be found in Rood and te Velde (2003).

6. Subsequently, Tele2 explained its proposals to acquire the assets in The Netherlands and Belgium of Versatel, an infrastructure operator, by stating: ‘Tele2 is pursuing its strategy of backward integration into infrastructure where it has a critical mass of customers.’ Press Release, July 17, 2005.
Incumbents and entrants are under the same necessity to make the appropriate investments in service. In this instance, the key non-replicable resort for entrants is the local loop, or access to part of the bandwidth provided by the loop. Setting aside wireless access technology, which is essentially untried, unbundling of the loop is a necessity.

These observations (based on 2000 data) led to a recommendation for access prices which rise over time, in a way to be elaborated more fully later.

Moving ahead to 2005, the (wholesale) market for DSL in the EU has become dominated by the historic monopolists, with the Commission and regulators turning their attention to a situation in which those operators have already installed capacity to offer broadband services end-to-end, making the significant investments necessary to do so. Competitors generally (but not invariably—see below) have fewer assets, such as DSLAMs, nearer the customer and rely on the incumbent for wholesale products.

In these circumstances, the ERG discusses the need for bitstream (an intermediate wholesale product comprising DSL access and varying degrees of backhaul) as a step on the ladder of investment (ERG, 2004, p. 92).

As the access to the unbundled local loop, to which it is complementary, [bitstream access] is a means to promote infrastructure, the competitor climbs up the value chain or the ‘ladder of investment’, as he can use more and more of his own infrastructure, he is able to add gradually more value to the product offered to the end user. At the same time he reduces the reliance on the wholesale products of the dominant operator.

In order to enable a step by step increase of investment, NRAs must regulate prices of the various access products consistently if a price control measure (according to Article 13 of the Access Directive, i.e. cost-oriented pricing), is also in place.

As will be suggested below, a more balanced approach to the role of bitstream in the promotion of infrastructure competition is warranted. This reflects the general proposition that a detailed analysis of particular circumstances is necessary if the ‘ladder of investment’ approach is to be applied rigorously and effectively. The purpose of this paper is to fill in some of the gaps, beginning with a discussion of the definition and measurement of replicability.

2. The notion of replication and its measurement

Underlying most of regulatory economics is the existence of problems associated with lack of competitive entry. It is this which makes markets fail or succeed. If prices rise above competitive levels, entry occurs and the increased supply forces prices down. A process of exit restores equilibrium if there is too much supply.

Unsurprisingly, the Commission’s 2003 Recommendation on relevant markets locates barriers to entry and to the development of competition as the first (of three, cumulative) criteria for subjecting a market to ex ante competition: ‘for instance, high structural barriers may be found to exist when the market is characterised by substantial economies of scale, scope and density and high sunk costs’. These factors will erode prospects for duplication, or—more generally—replication, of the assets needed to provide the service. If such replications can occur, the competitive outcome described above should be achievable. As the Recommendation makes clear, the EU regulatory framework defaults to the use of competition law alone in the absence of high and non-transitory barriers to entry.

The question then becomes: which markets produce services using assets which are replicable, and which do not? It is clear that replicability is not a simple binary variable. The chance of successful replication depends upon a range of changing factors. Accordingly it is helpful to distinguish between easily replicable assets, non-replicable assets (of which the local loop is at present the most cited example) and an intermediate category which is the concern of the present paper. Replication opportunities also change over time as demand and cost.

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7EC (2003). The Recommendation is currently subject to review.

8In answering this question it is necessary to be clear that economies of scale, scope and density do not lead to barriers to entry in the absence of sunk costs, as such markets are contestable and hence should not be subjected to ex ante regulation. It is, however, reasonably safe in most telecommunications markets to assume that some costs are sunk. But such markets may nevertheless be capable of sustaining competition.
expectations vary, as does the nature of expected competitive interventions. I return below to the implications of this classification.

Determining replicability can be addressed in two stages. First an NRA should adopt an empirical approach and look at the degree to which operators have built out competing networks. This approach, recommended by the ERG, is not necessarily conclusive in the short term, since the regulators’ concern should be with sustainable competition. It must however be a strong indicator of replicability. The process will be illustrated by three examples: local competition in the US, the development of competitive broadband suppliers in the Netherlands, and the development of local carriers in Germany.

2.1. Replication in fact

2.1.1. Local competition in US

The first example is of a failure of replication which might be attributed to regulatory intervention. The 1996 Telecommunications Act in the US required the local operating companies in the US to unbundle their networks into a set of elements and lease them at cost to any firm whose attempted entry would otherwise be impaired. These requirements included unbundling and (later) sharing of local loops—i.e. the leasing of upper frequencies only in the local loop.

As competitive conditions in the US became more difficult as a result of the telecommunications collapse, the FCC choose to expand the unbundling to include the leasing by competitors of the incumbent’s entire local service, at a substantial discount (about 50–60%) to retail prices. This product was known as UNE-Platform (UNE-P).

The use of UNE-P began in 1999, as AT&T and MCI/WorldCom, two highly influential companies, attempted to enter the local market. By 2002, WorldCom had failed and AT&T was in steep decline. The FCC, despite legal rebuffs, continued to mandate UNE-P until it was finally declared to be inconsistent with the 1996 Act in 2004.

The passage of the Act originally elicited significant local entry, but when UNE-P was mandated from 1999, infrastructure-based competition stagnated while the proportion of lines based on UNE-P came to account for nearly half the total, with half of those supplied by WorldCom and AT&T.

This conclusion is supported by Zarakas et al. (2005), who develop a dynamic simulation model of competition in local exchange markets which shows that higher UNE prices would have stimulated higher total investment, but have led to higher retail prices.

One way of interpreting these data is that FCC was operating a ladder policy in reverse by opening up over time increasingly favourable opportunities based on the lowest requirement for infrastructure construction. This continued until the court overturned the policy. This episode illustrates the fact that one cause of the lack of replication can be regulation itself: if comprehensive access products are too cheap, competitive investment will not materialise. The lack of such investment may then be taken to justify the access policy, completing the circular argument.

2.1.2. The Dutch broadband market

The extract on bitstream quoted above from the ERG Remedies paper suggested that competing ADSL operators needed an intermediate wholesale product to enable them to bridge the gap between simply reselling the incumbent’s service and providing their own IP network, backhaul and DSLAMs, while renting (or sharing) a loop with the incumbent. DSL competitors in other countries have endorsed this view. But is it disproved by what has happened in The Netherlands, where the historical operator (KPN) has not been forced to supply a bitstream product?

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9'If the level of uncertainty as to replicability is low (i.e. replication that appears efficient has happened elsewhere) than there must be a case for believing replication is feasible in the particular context under consideration’ (ERG, 2004, p. 68).

10This is based on analysis by R.W. Crandall in Cave et al. (2006).

11Hazlett (2005) argues that this analysis shows the inadequacies of the ‘stepping stones’ (or ladder) approach, but it can also be taken as evidence of the failure of its incorrect application. Hazlett’s analysis also emphasises, in a way consistent with what is argued here, that when local access is already provided by a fixed telecommunication operator, a cable TV company and several mobile operators, the need for regulatory intervention disappears.
In the first place, The Netherlands already has the majority of homes (more than 90%) passed by cable as well as by the telecommunications operator, and at the end of 2003, more than four-fifths of those had access to broadband cable. At that time, cable accounted for slightly more than half of broadband subscribers (see Table 1).

However, while KPN’s DSL network supplied four-fifths of ADSL customers, it is noteworthy that coverage of ADSL platforms, including DSLAMs, was very extensive.

In other words, assuming ADSL and cable-providers focussed broadly on the same larger exchanges, many subscribers had access to three independent infrastructures up to the exchange (ignoring LLU). Moreover, although KPN did not offer wholesale bitstream services, BBNed, the supplier with the second largest coverage, focussed entirely on wholesale (both DSL ATM and IP products). Tiscali also offered an extensive wholesale portfolio, including IP transit (Table 2).

The competitive DSL providers only supplied 9% of the market at the end of 2003. But their presence in the market coincided with a major decline in retail prices. Tiscali’s strategy is of particular interest because it involves accumulating a large number of subscribers at any exchange by reselling the KPN broadband product and then, when a critical mass is available, transferring them to its own ADSL services using rented loops.

In July 2005, the Dutch regulator determined that the market for broadband wholesale access of standard quality was effectively competitive and did not require regulatory intervention (OPTA, 2005).

2.1.3. Local carriers in Germany

Germany differs from The Netherlands in the extent of its broadband cable coverage. Nonetheless 70% of homes are passed by cable, and the prospects for cable replication of broadband access are good. Indeed, cable providers such as Kabel BW, Ish and Kabel-Deutschland in 2004 launched high speed internet access services in Germany in areas where networks had been upgraded.

Germany also has actual and potential DSL competition provided by city carriers. (This name is misleading, as they also provide service in rural areas.) Such operators typically rely on unbundled local loops, of which 2

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12This assumption is borne out by a survey of DSL competition at the local exchange level carried out by TU Delft.
million were rented at the end of 2004, accounting for 60% of all unbundled loops in Europe. Local loop competition is so far concentrated in the North and West of Germany but city carriers are expanding their business in the South and East.\footnote{For example, Versatel acquired Berlin city carrier Berlikomm, and Hansenet (owned by Telecom Italia), initially based mainly in Hamburg, started operations in 2003 under its European brand “Alice” in Berlin, Frankfurt, Lubeck, Munich and Stuttgart.}

About half of the unbundled lines are used to support DSL access. As a result DT’s competitors’ share of such access in Germany as a whole grew from 6% at the end of 2002, to 9% at the end of 2003 and 33% at the end of 2004, with shares of 50% or more realised in particular areas.

If competitive DSL providers have replicated DSLAMs and backhaul in some urban and rural exchanges, why cannot they or others do so elsewhere? One possible reason is that earlier investments have not paid off, but current investment activity tends to belie that possibility. The data thus suggest that bitstream is replicable in Germany, immediately or in the near future. If this is the case, regulatory policy should ensure that existing and developing ULL-based competition is not distorted or discouraged. In its recent draft market review, however, the German regulator found Deutsche Telekom to be dominant in two bitstream markets, on the basis of a national geographical market definition \cite{RegTP05}.

\subsection*{2.1.4. Overview}

What are we to make of these three experiences? At one level they show that DSLAMs and backhaul have been replicated in The Netherlands and in both rural and urban areas of Germany even when the regulator has not mandated an equivalent access product. Such episodes are therefore an important and persuasive piece of evidence on replicability. They are always subject to the criticism of any case study that the results are explicable by a differentia specifica of the case. But this consideration is weakened by the similarities in the regulatory environment and general economic and commercial conditions across large parts of the EU. For this reason, replication in fact is persuasive evidence of replicability. In some cases, however, it may be desirable to supplement it by an alternative approach.

\subsection*{2.2. Replication in models}

Where the empirical approach fails or produces ambiguous results, it may be appropriate to analyse replicability by studying the underlying cost structures of the activities of interest. This approach has two disadvantages. Firstly, cost modelling based on engineering calculations tends to assume perfect productive efficiency and to ignore management and other problems associated with large enterprises. This creates a bias against replicability. Secondly, the market outcome depends not only on cost data but also the likely competitive interactions in the market place—and these are hard to predict.

The general proposition is that, where economies of scale or of density are large, replicability is proportionately limited. The extreme of this is captured by the notion of a single-product natural monopoly—a single product market which can most cheaply be supplied by a single-product firm. See Fig. 1 where average total cost—ATC—is still declining as the whole market is supplied by that firm.\footnote{Output can either be specified nationally or in a particular geographic area, as may be appropriate where economies of density are important.}

An insight into economies of scope is supplied by Fig. 2, which replaces the ATC of a single product firm by the average incremental cost of supplying an additional service, such as broadband, to customers of an existing service, such as voice telephony. A declining \text{AIC} (such as \text{AIC}_y) especially one which is lower than the ATC of an alternative platform, such as \text{ATC}_x, capable of delivering the same service, may represent a barrier to entry.

Thus one way to evaluate prospects for replication is simply to rely on engineering estimates of the cost curves for the services in question.\footnote{This type of modelling is quite different in its nature and purpose from the cost modelling utilised, for example, to set interconnection prices. The type of modelling contemplated here is at a much higher level, and intended to identify the broad cost characteristics of a technology over a large range of current and prospective demand.} As noted above, these estimates are subject to error and incomplete. However it should be remembered that this approach is designed to complement the empirical approach set out above and that the aim of the exercise is not only to establish \textit{absolute} levels of replicability (for which
purpose empirical observation may be most relevant) but *relative* measures, which can guide NRAs as to their strategies in promoting infrastructure competition.

As an example, it is helpful to consider the chain of supply in current generation broadband, which for these purposes will be taken to comprise\(^{16}\):

- access to the customer via a copper loop or shared loop;
- DSLAMs located at the local exchange;
- ATM backhaul;
- access to an IP network;
- access to the world wide web via transit or peering services;
- retailing functions (marketing, billing, helplines, etc.).

\(^{16}\)There is always a slightly arbitrary element in making any such identification of elements, but this one is sanctioned by custom (see e.g. ERG, 2004).
On the basis of past cost modelling or other analysis, it is reasonable to assume the following ascending order of replicability:

- **The copper loop** is least replicable by an identical access network. However, a cable network’s hybrid facilities (if suitably upgraded) can provide identical or similar access services and wireless access (fixed, nomadic or mobile) is increasingly available. Despite this, in non-cabled countries the loop is not widely replicated at the moment.

- **DSLAMs**: Competitive broadband suppliers renting loops have to install DSLAMs, normally co-located in the incumbent’s exchanges. The feasibility of this process has been controversial, with numerous accusations of obstruction, overcharging and sabotage by incumbents seeking to foreclose competition. However, from a ‘pure’ cost-modelling point of view, the issue of replication revolves around the fixed costs of co-location and the economies of scale in the supply of DSLAMs associated with (a) the ability of suppliers with a larger number of customers to provide the same quality of service (contention rate) with a smaller safety margin and (b) different equipment procurement costs for customers of different scales. Cost modelling suggests a minimum efficient scale high in relation to the current number of broadband subscribers on any exchange, but dependent on the mix of business and residential customers. The latter point suggests that the scope for replication will vary within a country, suggesting that different policies will be appropriate in different parts. If this distinction is not made competitive investment opportunities may be lost.

- **Backhaul, using ATM or other networks**: Replication prospects here seem heavily dependent on geography. The minimum efficient scale might be the whole of the market on ‘thin’ routes, while replication is feasible on routes with more traffic or a more central location. Again this implies different regulatory approaches for different routes.

- **The ‘core’ IP network**: Modelling suggests a high degree of replicability here, especially as network operators are able to attract more voice traffic to their IP networks, which already carry data for business customers.

- **Access to the web**: This is an effectively competitive activity, which most broadband suppliers buy from a large provider.

- **Retailing or reselling**: This is not susceptible to cost modelling in the same way as the supply of network services. The emergence and survival of resellers may be the result of arbitraging regulator-set wholesale and retail prices, as described above in the USA. Clearly a regulator might choose to establish a large retail margin to persuade entrants to embark on the ‘ladder’, but if the purpose of the exercise is to encourage infrastructure competition, this step, by itself, is of little or no value.

This short account suggests the relative ranking of replicability of assets which can be ‘bought or made’ shown in Fig. 3.

### 2.3. Reaching a conclusion on replication

However, this is only a relative ranking. An NRA has to decide whether/when to intervene—in other words where on the ladder intervention may be desirable. The analysis should also affect market definition and the assessment of competition, where the NRA considers constraints on a firm’s ability to behave independently of customers and competitors including constraints arising from potential entry. If a competitor is just below another on the ‘ladder’ or it is on the same rung in an adjoining market, its entry potential should be taken into account—otherwise a harsh remedy might effectively freeze out the potential competitor.

In this section, it was suggested that the replicability of assets is a concept which can be made operational and subjected to evidence, in a two-stage process which considers successively:

- evidence of replication in similar circumstances;
- evidence from cost modelling.

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17See also Hazlett and Havenner (2003).
Each has its own strengths and weaknesses. In relation to the former, if there are limited examples of replication, they may be the result of special circumstances and/or be unsustainable, although in evaluating the former point, evidence from the same country, under nearly identical conditions, will be most convincing. Conversely, the absence of replication may itself be a consequence of regulation. Cost modelling has the bias noted above towards a finding of non-replicability which can lead to a ‘false positive’ for regulation, although it may give clearer insights into the relative difficulty of replication. Although NRAs will have different data at their disposal in different cases, in my opinion it is safer to rely on the presence or absence of replication in practice than on cost modelling.

How is the NRA to process this evidence, when considering mandating ‘bridging’ access or adopting a dynamic approach to access regulation? Clearly a cost-benefit approach is needed which compares the expected outcome with the intervention against one or more counter-factual. This must take account of the risks of promoting inefficient entry and of stifling innovation, and the benefits of promoting sustainable competition. The next section examines a procedure for implementing the approach.

3. Implementing the ladder approach

The process is set out in a series of steps, including for completeness some which have been discussed above. 

Preparatory step:

Decide which of the value chain products are clearly non-replicable, recognising the danger that the regulator may be making a self-fulfilling prophecy in this regard. If it is decided, for example, that the local loop is a natural monopoly, then any regulatory approach that creates infrastructure-building incentives in this element is not appropriate. This first stage is critical to the calculations, and mistakes about the feasibility and desirability of competition will have lasting consequences when implementing the ladder approach.

It was noted above that assets fell into the categories of easily replicable and non-replicable (neither of which is relevant here) and an intermediate category where replication has just became possible or will become so in the near future (as, for example, demand expands).

If an asset is found already to be replicable, a brief transition period may still be required in which a form of remedy may be appropriate to deal with existing access purchasers. Nevertheless, it should remain short. Where conditions for replication are favourable in the future, the NRA may feel it helpful to signal its

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18Thus it would be safer to draw conclusions for the rest of Germany from the success in some areas there of ‘city carriers’ than to read the experience across, for example, to Italy.
intentions to modify its intervention, in one of the ways described below. While the existing set of remedies gives the NRA the opportunity to react to the different degrees of market failure by selecting measures ranging from transparency to mandatory access at reasonable prices and access at cost-based prices, the discussion below shows that if replication is possible, NRAs should move away from conventional cost-based access prices towards access by commercial agreement or a definition of ‘reasonable prices’ on the lines set out below.

Step 1: Rank replicable components of the value chain for relevant products by their ease of replicability—as illustrated above. This involves evaluating empirical evidence or modelling of cost structures as shown above.

Step 2: Identify where on the ladder all firms (incumbents and entrants) are now located.

This is necessary to avoid a fundamental danger—namely that the ladder approach will slow down rather than speed up competitive investment. Ideally, entrants are encouraged to climb the ladder driven both by the attractiveness of the rungs above (relative to staying where they are) and by fear that the rung on which they are currently standing will be less comfortable.

The problem is that different entrants will be at different stages of development of infrastructure competition. Some will have made substantial investments, but may not be strong in terms of market share and expectations of profitability. Others may be just starting. It might be practically feasible (though difficult) for the NRA to fabricate a different set of incentives for each entrant, based upon its current position. However, this would be (a) probably illegal, as it would breach restrictions on non-discrimination which apply both to the regulator and to firms in the market place and (b) counterproductive, as the existence of privileged arrangements for late comers will have the opposite effect to that intended, by slowing down the process of competitive investment.

This imposes on the regulator the task of choosing the point on the ladder at which the intervention should still be applied. This decision will be based on an analysis of the scale and prospects of the operators at various points, with a bias in favour of what might be described as ‘leading competitors’, defined as those more advanced in their infrastructure building and satisfying a minimum market share criterion.

This approach may appear harsh to later entrants, whose arrival on the scene may be associated with less favourable access conditions—the relevant assets being deemed, by that stage, to be replicable. However, such later entrants will have the opportunity to seek access either from the initially dominant firm or from earlier entrants, which may have excess capacity which they are eager to sell. Indeed competition may even have become ‘effective’ in the relevant market, precluding any sort of regulatory intervention.

Step 3: Having identified the rung in the ladder at which intervention should be focussed, it is then necessary to determine the likely investment potential of actual and potential entrants at that point—in other words their scope for progression over the period of the intervention (say 2–3 years). In order to make this determination, the NRA will have to quantify the scale of the investment required by competitors to develop their infrastructure. This will require careful judgement.

Step 4: Choose the mode of intervention, which can be by price or quantity instruments—in other words, either based upon rising access prices (relative to costs), subject to a short transition period where necessary, or upon the projected withdrawal of mandatory access.

There is an extensive economic literature on when price and quantity instruments should be applied, focussing upon the damage which might arise from a mistaken intervention.\(^{19}\) Clearly, withdrawal of a mandated service, if undertaken before competitors’ assets were in place, would have very adverse effects. As experience of the proposed withdrawal of local loop unbundling in Canada suggests,\(^ {20}\) in the case of an asset requiring such substantial investment in its replication as the local loop, uncertainty as regards replicability is relatively high. In this instance, withdrawal of the service may be impossible, making a good argument for a graduated price-based approach. Where replicability is relatively certain however, withdrawal of mandated access may be a better approach.

\(^{19}\)Beginning with Weitzman (1974).

\(^{20}\)In Canada, the CRTC decided in 1997 to divide the country into two regions—large urban, and small urban and rural. In the latter, unbundled loops would be available for an indefinite period as an ‘essential facility’. In the former, they would be available for 5 years only, giving entrants a window of opportunity to build their own loops. This plan to withdraw mandatory access to loops in more populated areas was, however, abandoned in 2001, as roll-out of competing loops was slower than expected.
Step 5: Calibrate the intervention. If mandatory access ceases, that is equivalent to making a significant and sudden change in the price of access to a level which would be commercially negotiated between the access provider and access seeker. This would be infinite if access is not made available. The variable within regulatory control is thus the date on which mandatory access ceases.

If a price-based approach is chosen, this can rely upon the well-understood theory of option pricing, which is an extension of basic investment theory. According to that basic theory, investment will occur when its expected return is at least as great as the project’s cost of capital, where that cost of capital includes in appropriate cases an adjustment for risk. This principle will normally govern initial investment in assets by the first-mover or incumbent.

It may seem that an access charging regime based on long run incremental cost (LRIC) plus common cost, using the appropriate asset-specific cost of capital, would then send the correct ‘make or buy’ signals to other operators. If they could self-supply at a lower cost, they would ‘make’; if not, they would ‘buy’.

However, this ignores the fact that competitors whose access is mandated always have the option of continuing to buy—unlike the first-mover. Undertaking an investment in conditions of uncertainty and sunk cost carries a risk which makes the option of continuing to buy more attractive. To persuade a competitor to invest, the access price must cover the competitor’s cost of supply and the value of the option. If the option is not priced into the access charge the competitor’s incentives will be distorted against investment.

Precise estimates of the option value of delaying investment until uncertainties have been resolved can be made, using a variant of the model for valuing financial options developed initially by Black and Scholes (1973) and applied to ‘real options’ initially by Dixit and Pindyck (1994). The key factors for applying the approach to telecommunications include the degree of demand uncertainty and the expected change in input and output prices. It is possible, making assumptions about these factors (and others), to calculate the option value of access. The product of the calculation is the ‘mark-up’ on LRIC associated with pricing the option. Dixit and Pindyck estimated it as 100%, but a recent paper by Dobbs (2004), taking account of other factors influencing output prices, suggests that a mark-up of 5–50% is more likely. Moreover, this mark-up only applied to the sunk cost component of an access product.

This estimate can then be built into a dynamic access pricing regime consistent with incentives to invest. In Fig. 4, the line shows prices rising over a period of $T$ years from the LRIC value to the ‘option’ value.22

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21It may be appropriate to deal with some risks by other means than an adjustment to the cost of capital.

22Note that the option component in the access price should be ignored in margin squeeze calculations—in other words, the incumbent would be allowed to set a retail price based on the LRIC component of the access price along (before the option price mark-up). If this were not allowed, the main effect of increasing the access price as shown in Fig. 4 would be to increase retail prices, making it as profitable as before for competitors to refrain from investment.
The timing of the price change is key, and two cases can be distinguished. In the first, replication is already feasible, and prices should after a brief transition period for existing obligations (say, 6–12 months) go up to the option price level shown in the figure (or access should cease to be mandatory). In the second, replicability is foreseeable in the near future and prices (or other access conditions) should start to adapt to it over what may be a slightly longer period (say 2–3 years).

In terms of the European regulatory framework for electronic communications services (see Buigues and Rey, 2004), there are alternative remedies under the Access Directive—one involving cost-based access, the second mandatory access under ‘reasonable’ terms and conditions. Access pricing involving an ‘option’ component is clearly permissible under the second variant. Alternatively, costs can be defined as including those of buying out the option.23

Step 6: Make a credible commitment to the policy. This is required as entrants must believe that mandated access will be temporary or that its price will rise if they are to factor this into their investment decisions. Otherwise ‘moral hazard’ problem will arise, with entrants knowing that, if they do not invest, the regulator will not remove their benefits. Commitments to change the relative prices of more replicable products can be made credibly, provided they rely upon consistent definitions and are not made too far in advance. If this approach is followed, then access to a product might continue to be mandated, at progressively higher prices, until replication had taken place on a scale which meant that no firm had significant market power (SMP) in the relevant market—in which case intervention would be prohibited by the European Directives.

4. Broadband in the EU: the analysis of the European Regulators Group

The European Regulators Group has recently carried out an empirical study of the spread of broadband in 13 EU member states, from which they conclude that the ‘[ladder of investment] explains recent developments in European broadband markets quite well and can serve as a good regulatory model’ (ERG, 2005, p. 1). As a broader context, the study notes that DSL had outstripped cable modem in all the countries covered, that countries with more competitive markets had higher penetration rates and higher growth rates of penetration. In relation to the ‘ladder’, the study notes that while at the beginning new entrants relied on resale, bitstream access had taken over from resale as the preferred form of access.

There are obvious problems (as the study recognises) in drawing conclusions relating to a hypothesis which is not specified very exactly, using a relatively small data set, and it would perhaps be unwise to regard the results as strong evidence for the ladder proposition (or propositions). However there are at least three observations made in the paper which deserve further discussion.

Firstly, emphasis is placed on the need to ensure ease of migration from one rung in the ladder to another. Incumbents seeking to maintain an infrastructure monopoly will resist such migration, by manipulating price differentials and, where possible, imposing one-off migration fees.

Second, the paper claims that ‘the more complete the chain of available access products is, the higher the competitive dynamic (e.g. France, UK, Spain)’ (ERG, 2005, p. 1). The evidence for this from the country studies is patchy at best, and it can plausibly be argued that a more demanding incremental target for investment (in the form of greater distance between the rungs in the ladder) will, if supported by appropriate incentives, promote investment more effectively. The evidence on this is at least inconclusive.

Thirdly, the implementation process outlined above involves both ‘pull and ‘push’ stimuli to infrastructure investment. Both are likely to be required. The ERG paper notes that ‘the regulator should not only discourage access, but may actively support the upward move by signalling either through dynamic pricing or sunset clauses that regulation will be removed’ otherwise entrants will not move. But the paper goes on to say that ‘most NRAs are still in the process of erecting the ladder, it is too early to anticipate when and how these elements can be introduced by NRAs in practice, without risking disruption.’ A footnote refers to the possibility of new entrants ‘falling down the ladder’ (ERG, 2005, p. 24).24

23For a discussion of the role of option pricing in setting the cost of capital, see Ofcom (2005a).

24Unless the regulator has made a mistake, this should not happen as the entrant will either be able to invest itself or have access to an alternative supplier already.
Clearly a balance has to be struck between entrants' opportunities and the risks they face. But the case studies above suggest that considerable opportunities for replication already exist. Ofcom, for example, pursues a less passive policy. In its June 2005 statement on broadband regulation, it announced a commitment by BT to cut unbundled loop prices, to maintain the existing margin between the price of unbundled loops and the most popular current bitstream product until 1,500,000 loops had been unbundled, and to bring forward its next review of the bitstream market, probably to the end of 2005.

5. Conclusions

It has been argued in this paper that the objective of one-way access regulation should be to generate sustainable infrastructure-based competition where feasible, and that the twin objectives of promoting competition and promoting investment and innovation can be achieved by providing access opportunities for competitors which are appropriately calibrated over time. These are designed to encourage competitors to 'climb the ladder' of infrastructure investment, by installing progressively less replicable assets.

The paper has emphasised, however, that this is not an argument for providing access at low prices on a carte blanche basis. Instead the proper approach seeks to restrict mandatory access to a limited period—after which it ceases to be available, or becomes subject to commercial agreement (Ofcom, 2005b) its regulated price rises.

In order to apply the ladder approach rigorously it is necessary first to establish which assets are replicable, which are non-replicable and which are in an intermediate position. This is best done by critically examining national and international experience, and can be supplemented by cost modelling. It should be remembered, however, that non-replication may arise as a result of too generous access arrangements. In other words the risk of a ‘false negative’ must be considered, as the US case study suggests.

The case study from The Netherlands has shown that DSLAMs and backhaul have been replicated in circumstances where the regulator has not provided an equivalent access product. In Germany, in some cities and rural areas DSL competition on the basis of unbundled local loop appears to be sustainable and is spreading to other areas. The development of competition in bitstream access in these cases raises the question of whether and when it can be replicated elsewhere.

Where an NRA finds an asset which is already or imminently replicable, it can withdraw or plan to withdraw from regulation. This can be achieved by ceasing to make access mandatory or by allowing access prices to rise, possibly to a level consistent with real options—i.e. incorporating the benefits which accrue to a competitor from having access to an asset rather than taking the risk of making sunk investments. This may lead to a small but significant change in the balance between making and buying.

This more rigorous and strategic approach is necessary to prevent implementation of the ‘ladder’ approach relapsing into a policy of ‘easy access’, thereby denying consumers the benefits of infrastructure competition.

References


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