OPTA

05

REGULATING EMERGING MARKETS?

ECONOMIC POLICY NOTE

Onafhankelijke Post en Telecommunicatie Autoriteit

REGULATING EMERGING MARKETS?

Prepared for OPTA by Ovum, David Lewin and Indepen, Brian Williamson

Explanatory note

The Dutch Independent Post and Telecommunications Authority (OPTA) regulates the postal and telecommunication markets in The Netherlands. OPTA is an independent executive body that commenced its activities on 1 August 1997. OPTA's mission is to stimulate sustained competition in the telecommunications and post markets. In the event of insufficient choice OPTA protects end-users. OPTA regulates compliance with the legislation and regulations on these markets.

In terms of market conditions, market structure and regulatory framework, telecommunications and postal markets present a continuously changing landscape. In this environment, OPTA has committed itself to improving the economic reasoning on which strategic choices are made in such a way that market parties can contribute to and have a clear understanding of the development of OPTA-policies, now and in the future. In 2003 the OPTA bureau was complemented with the Economic Analysis Team (EAT) headed by the Chief Economist. EAT is responsible for developing economic reasoning and stimulating discussion on key issues within the telecommunications and postal markets. To achieve this, EAT produces two kinds of policy notes - short discussion papers. Economic Policy Notes focus on economic issues and principles. Regulatory Policy Notes focus on strategic economic issues in specific regulatory fields. To stimulate discussion EAT organises roundtables. With its products and activities the Economic Analysis Team expects to add value to the economic debate in Dutch telecoms and post.

Often, lessons can be drawn from past cases. Policy Notes will try to benefit from analysing such cases. These Notes, however, are aimed at contributing to the development of future OPTA policies and are focused on providing sound economic reasoning to that effect. For the purpose of these Notes it is not necessary to take into account other considerations, either of a factual or of a policy nature that may have played a role in these past cases. These Notes, e.g., do not set out to identify or evaluate short term benefits service providers may offer to end consumers but primarily aim to look into long term benefits of competition between service providers. As a consequence, discussion of these cases should not be considered or construed as an attempt to revise or evaluate these cases. Furthermore, Policy Notes are not aimed at reviewing past policies or expressing future policies. They are solely intended to stimulate discussion and critical comment within as well as outside of OPTA, thus laying a basis for the development of future policies.

The analyses and conclusions expressed in Economic and Regulatory Policy Notes of the Economic Analysis Team (EAT) do not necessarily reflect the opinions of the Commission of OPTA. As such, the opinions of EAT, in whatever shape or form, do not have a legal status. Quotes from and references to these Notes can be made freely, provided that such quotes and references sufficiently express the preliminary character and purpose of the Notes.

Content

Explanatory note II

Content III

Abstract V

1 Introduction 1

1.1 Background 1
1.2 The structure of the report 1
1.3 The basis for the findings 1

2 What is an emerging market? 2

2.1 The emerging market concept 2
2.2 Definition of an emerging market 3
2.3 Today's emerging markets 3
2.4 The characteristics of emerging markets 4
2.5 The dimensions of regulation 5

3 Regulating emerging markets – approaches so far 8

3.1 Introduction 8
3.2 The US approach 8
3.3 The approach in Hong Kong 9
3.4 Developments in Australia 10
3.5 The approach in the UK 11
3.6 Lessons from other jurisdictions 13
3.7 The competition law case against Microsoft 13

4 Options for regulating emerging markets 16

4.1 Introduction 16
4.2 Regulating existing services running on new infrastructure 16
4.3 A possible synthesis of viewpoints 17
4.4 The regulation of non replicable assets 18
4.5 The ladder of investment 19
4.6 Long term development of regulation 20
4.7 Maximising economic welfare 22

5 Regulating non replicable assets 26

5.1 Introduction 26
5.2 What is a non replicable asset? 26
5.3 Uncertainty over asset categorisation 27
5.4 Regulation of non replicable assets 28
5.5 Setting a cost base price 28
5.5.1 Problem 1: bias in cost estimation 28
5.5.2 Problem 2: asymmetric loss from incorrect pricing 29
5.5.3 Options for dealing with these problems 29

5.6 Regulatory Holidays 30
5.7 Obligations to supply 31
5.8 Regulatory certainty and commitment 32
5.9 Equality of access 34
5.10 Geographical averaging of prices 34

6 Conclusions and proposals 35

6.1 The characteristics of an emerging market 35
6.2 Proposals for regulating emerging markets 35
6.3 Regulating non replicable assets 36
6.4 Other issues 37

Annex A: Regulating NGNs in the UK 38

Annex B: Bias in cost modelling 42

B1 Assumed asset lives and values 42
B2 Assumed network configuration 43
B3 Capacity utilisation 44
B4 Risk 44
B5 Value of flexibility 45

References 46

Abstract

The new regulatory framework of the EU provides a set of principles for determining what ex ante regulation to apply to deal with competition problems in established telecommunications markets. It warns against imposing ex ante regulation in emerging markets, but it does not define these markets. Nor does it offer guidance on where ex ante regulation might be appropriate.

This Economic Policy Note considers these problems. It concludes that the central problem in emerging markets is not one of whether and how to regulate emerging services ex ante, but how best to get investment in new multi service platforms on which both emerging and established services will run without remonopolisation of established services. It proposes that ex ante regulation of services running on such platforms should be confined to non replicable assets used to provide the services and looks at options for identifying and regulating these assets.

1 Introduction

1.1 Background

The regulatory framework which came into force across the EU in July 2003 requires National Regulatory Authorities (NRAs) to identify markets susceptible to ex ante regulation, to determine whether any operators in these markets exert significant market power (SMP), and then to impose proportionate ex ante obligations on such operators so as to deal with the competition problems which arise.

In developing this regulatory framework the European Commission recognised that such an approach can lead to problems when applied to new and emerging markets. So it cautions against the imposition of ex ante regulation in such markets. But it does not provide a definition of what constitutes an emerging market. Nor does it give clear guidance on the circumstances in which ex ante regulation might be appropriate.

1.2 The structure of the report

In this Economic Policy Note we consider the problems associated with regulating these emerging markets in more detail:

- Chapter 2 introduces the concept of emerging markets, provides a working definition, and then looks at the characteristics of current emerging markets
- Chapter 3 provides a review of how leading regulatory authorities are dealing with regulation of such markets
- Chapter 4 sets out our analysis of different approaches to the regulation of emerging markets and concludes that an approach based on forbearance, with ex ante regulation restricted to non replicable assets, offers the best approach to maximising overall welfare gains
- Chapter 5 then goes on to discuss the range of approaches which an NRA might take towards the regulation of non replicable assets
- finally in Chapter 6 we summarise our findings and recommendations.

1.3 The basis for the findings

The analysis presented in this report is based on three main inputs:

- a review of academic literature which is relevant to regulation of emerging telecommunications markets. As well as analysis of telecommunications markets, we have also looked at literature on patents and aspects of the competition law case against Microsoft
- a review of approaches to the regulation of emerging telecommunications markets in the USA, Hong Kong, Australia and the UK. These appear to be the countries where regulatory analysis of emerging markets is most developed

discussion with interested parties. These include discussions with both regulatory bodies[1] and telecommunications operators in the Netherlands[2]

As part of our analysis we consider how regulation of emerging markets fits within the European Union's new regulatory framework (NRF). But we do not confine ourselves to consider only options which fit within this framework.

[1] Representatives of the ERG, European Commission, Ofcom and OPTA.

[2] bbned, KPN, Tiscali and UPC.

2 What is an emerging market?

2.1 The emerging market concept

The European Commission introduced the emerging markets concept when it developed the new regulatory framework. This framework now forms the basis for all sector specific regulation of the telecommunications industry in the EU. If a market is to be subject to ex ante regulation then:

- that market must be properly defined in accordance with the principles of competition law as set out in the Commission's Notice on Market Definitions[3]
- that market must be considered susceptible to ex ante regulation. It must pass the following three tests on a cumulative basis: there are substantial and non-transitory barriers to entry into the market ***and*** the market is not tending to a state of effective competition within "a relevant time horizon" ***and*** competition law alone is inadequate to deal will the competition problems which arise within the market.

The European Commission has published in its Recommendation a list of 18 markets which it considers currently susceptible to ex ante regulation[4]. An NRA can add a market to this list, and subject suppliers in that market to ex ante regulation, only if it can persuade the European Commission's Article 7 Task Force that the market passes the three tests listed above. A similar mechanism applies if an NRA wants to remove a market from the list.
This new regulatory framework is designed with established markets in mind. Considerable information[5] is required in order to carry out rigorous analysis to determine:

- whether a market is distinct from other markets or whether, as a result of supply side and/or demand side substitution effects, it should be considered part of an existing market
- whether that market passes the three tests established by the Commission so that it is judged susceptible to ex ante regulation.

The European Commission is concerned that, in an emerging market, where the market leader is likely to have a substantial market share advantage, that players should not be subject to "*inappropriate ex ante regulation*"[6]. Ex ante regulation in emerging markets "*may unduly influence the competitive conditions taking shape within new and emerging markets*". So the Commission advises in Paragraph 15 of its Recommendation that "*new and emerging markets, in which market player power may be found to exist because of "first mover" advantage, should not in principle be subject to ex ante regulation*".

At the same time, the Commission is concerned to prevent foreclosure of competition in emerging markets. So it does not ban ex ante regulation completely. Instead it advises NRAs to ensure that they can fully justify early ex ante regulation in an emerging market, given that they retain the ability to intervene at a later stage[7].

The European Commission also considers the problem of leverage of market power from an

[3] Commission Guidelines on Market Analysis, 2002/C165/03, July 2002.
[4] Commission Recommendation on Relevant Markets…susceptible to ex ante Regulation, C(2003)497, February 2003.
[5] For example on market structure, prices, price elasticity and market entry behaviour.
[6] Market Analysis guidelines Para 32.
[7] Market Analysis guidelines Para 32.

established market into an emerging market[8]. It concludes that:

- any abusive conduct in the emerging market should be dealt with through competition law rather than ex ante regulation and that
- any horizontal or vertical leverage of market power from an established market should be dealt with through regulation of that market.

Finally the European Commission notes[9] that entry barriers in innovation driven markets may be less relevant than in established/mature markets. In innovation driven markets (which are likely to be emerging markets) competitive constraints arise from "*innovative threats from potential competitors that are not currently in the markets*". So such markets are less likely to be susceptible to ex ante regulation.

2.2 Definition of an emerging market

The analysis of the previous section provides us with a working definition of what constitutes an emerging market:

> *An emerging market is any relatively new market in which there is insufficient information (for example in terms of demand, pricing, price elasticity and entry behaviour) to carry out the necessary market definition procedures and/or tests as to whether the market is susceptible to ex ante regulation.*

It is possible to take a narrower definition in which the market is sufficiently mature to allow basic market analysis to define the market but not sufficiently mature to test whether it is a candidate for ex ante regulation. Indeed the ERG, on Page 21 of its remedies paper[10], appears to use this narrower definition. But we have taken the wider definition since it allows us to consider the major investment incentive problems associated with emerging markets.

2.3 Today's emerging markets

The definition of Section 2.2 does not help us to decide to what extent and in which way an NRA might regulate emerging markets. To provide a starting point for this analysis it is useful to compile a list of current emerging markets. We have based this list on:

1. discussion with the interested parties listed in Section 1.3
2. a recent Indepen/Ovum study[11] which provides a scenario of key developments in ICT markets over the next five years.

This process provides us with four main categories of service which we might consider as emerging markets.

Category 1: VoIP services. This category breaks down to three main types of services:

- PC client based VoIP services such as those provided by suppliers like Skype
- voice over broadband services, usually provided in conjunction with fast Internet access. This

[8] Guidelines on Market Analysis, Paras 83 to 85 and especially Footnote 92.
[9] Recommendation, Para 13.
[10] Common Position on the Approach to Appropriate Remedies in the New Regulatory Framework, ERG(03) 30 Rev1, April 2004. http://erg.eu.int/doc/whatsnew/erg_0330rev1_remedies_common_position.pdf.
[11] Achieving the Lisbon Agenda: the Contribution of ICT, A study for the Brussels Round Table Group, Indepen and Ovum, January 2005.

bundle of services is sometimes referred to as “double play”

- VoIP services provided to customers connected to a next generation IP network. This might be a public network (e.g. BT’s 21st century network) or a private network e.g. an IP VPN

The second and the third types of VoIP service are also contained within the much broader set of Category 2 services below.

Category 2 services based on next generation fixed access and core networks. At the access level such networks might use ADSL2+ technology, VDSL technology or fibre to the home or building. These networks are capable of offering a wide range of high speed services including the triple play bundle of TV, fast Internet access and voice telephony in the consumer market.

Category 3 services based on next generation mobile networks. In the EU this involves the rollout of third generation W-CDMA cellular mobile networks on which mobile operators plan to offer a wide range of multi media services.

Category 4: fixed mobile integration services which use next generation core IP networks, a range of wireline and wireless access networks, and devices with multiple radio interfaces which include Wi-Fi, Bluetooth, GSM and W-CDMA.

2.4 The characteristics of emerging markets

What characteristics do these major categories of emerging markets have in common and what implications do these characteristics have for regulatory policy? We have identified five main features.

First emerging markets are new and uncertain. There is very little information available about how they will function, what demand that will generate, how they will be priced, or even who will succeed in the market place. This characteristic applies particularly to services in Categories 2 to 4. But it also applies to the VoIP services of Category 1[12]. Such a lack of information means that it is not possible for NRAs to apply the standard procedures of market definition and test for susceptibility to ex ante regulation as set out in the new regulatory framework. Indeed such a conclusion is inherent in the working definition of emerging markets as set out in Section 2.2.

Secondly the focus of the list is on investment in new multi service infrastructure[13] which the main operators are now making or planning, rather than on the services and markets which will run on them. In many cases those making these new investments do not yet know what services will succeed on these platforms. So, while an NRA might know with reasonable certainty about future investment in new technology platforms, it does not, and cannot know for some time, about the nature of the markets these platforms will generate.

Thirdly it is possible that these investments will, in many cases, generate new markets consisting of a bundle of established services which are today in separate markets. We know that the provision of a triple play bundle of TV, voice telephony and fixed Internet access over a next generation network will

[12] Regulatory authorities have conducted market analysis here. But they have reached varying conclusions. For example the French NRA, the ART, recently announced the results of its public consultation on relevant markets. It decided that voice over broadband was not part of the fixed line telephony market but was, along with fast Internet access, part of the retail broadband market. This decision was later overturned by the NCA in France.

[13] This infrastructure consists of tangible assets such as fibre and servers, software and the data used to configure the software.

generate very substantial economies of scope on a next generation platform. So it is plausible that platform operators will be able to supply the bundle at a price which is significantly below the combined price of the separate products today. This price difference, together with the opportunity for the platform operator to bundle in other, quite new, services, could create a market which is economically distinct from the three established service markets which form the core of the bundle. We come back to this issue of how to treat bundles of established services running on new technology platforms in Chapter 4.

Fourthly emerging markets are characterised by strong technology innovation which have the potential for major public welfare gains in terms of higher functionality services delivered at lower costs and prices. It is clearly important that an NRA regulates in a way which does not reduce, delay or prevent such gains. In this context delay to market development could be almost as significant as no market development. Telecommunications is characterised by strong network externalities in which welfare gains may increase with the square rather than in proportion to the number of users (Metcalfe's Law). So reduced or delayed demand could lead to major economic welfare losses.

Finally emerging markets are also characterised by high risk for investors. All four of the categories listed in Section 2.3 involve substantial technology and demand risks for the investors. So the problem of failure is not trivial. Given the potential major welfare gains from these investments in innovation, it is important that an NRA imposes access regulation in a manner which minimises any further loss of investment incentives.

An emerging market is any relatively new market in which there is insufficient information to carry out the necessary market definition procedures and/or tests as to whether the market is susceptible to ex ante regulation. At present emerging markets in electronic communications are characterised by technological innovations requiring high and risky investments in multi-service platforms which offer both established and emerging services.

2.5 The dimensions of regulation

It is clear from this analysis that there are two main ways of categorising telecommunications markets for regulatory purposes:

- on a ***services/markets*** dimension in which we categorise markets, and the services of which they are composed, into ***established*** and ***emerging*** markets. This is the approach taken in the new regulatory framework. We can use the definition of Section 2.2 to define the boundary between these two categories
- on an ***infrastructure/assets*** dimension in which we distinguish between ***legacy*** infrastructure based on well established technologies and past investment and ***new*** infrastructure which requires new investment and which is subject to substantial demand and/or technology uncertainties. It is possible to distinguish here between new technologies and new infrastructure by adding a third dimension to the matrix of Figure 2.1. But this third dimension would complicate analysis substantially and, given the strong correlation between major new investment and new technologies, add little to its accuracy.

This categorisation of regulatory problems along market and infrastructure dimensions gives us the two by two matrix of Figure 2.1. This is also the approach followed by de Streel in a paper to the

International Telecommunications Society[14].

Figure 2.1 Categorisation of regulatory problems

Item	*Established market/services*	*Emerging market/services*
Legacy infrastructure	***Cell 1*** Use NRF	***Cell 2*** No ex ante regulation
New infrastructure	***Cell 4*** Major debate	***Cell 3*** No ex ante regulation

We can then ask how an NRA should apply the EU regulatory framework to regulate competition problems which lie in each cell. Our analysis is as follows.

Cell 1: *established services running on legacy infrastructure* such as circuit switched voice services. As far as we can see there is no debate here. An NRA should use the NRF as it is currently doing through its programme of market analysis.

Cell 2*: emerging services on legacy infrastructure*[15]*.* Again we can see relatively few problems here. An NRA can again apply ex ante regulation in established markets to prevent SMP operators from leveraging power from those markets into emerging markets. At the same time we can see no reason why an NRA should apply ex ante regulation in the emerging market itself. Instead it can rely on competition law to constrain the behaviour of players there. This is clearly what the European Commission intends as set out in Section 2.1. There is competition case law for an NRA to draw on here. For example the recent cases in the US and the EU provide judgements on how Microsoft has leveraged its power in the PC operating systems markets into the web browser markets (US case) and into the markets for media players and work station servers (EU case).

Cell 3*: emerging services running on new infrastructure*[16]*.* Once more this is a straightforward situation. Everyone has agreed that, whilst they remain emerging markets, such services and the infrastructure used specifically to support them should not be subject to ex ante regulation. At some point emerging services will become sufficiently mature to be reclassified as belonging to established markets. At this point an NRA will need to move to the approach chosen for Cell 4.

Cell 4: *established services running on new infrastructure*[17]*.* Here there is a strong divergence of views on how ex ante regulation should be applied. Most AltNets argue that such services should be treated in the same way as established services running on legacy infrastructure. Most fixed incumbents argue that these services should be free from regulation so as to create the right investment incentives. We consider these opposing views in Chapter 4. But before we do so we consider how authorities in countries which have considered the emerging markets problem are

[14] A new regulatory paradigm for European electronic communications, A de Streel ITS European Regional Conference, September 2004.
[15] Several years ago the ***last call received*** function would have been in this category.
[16] For example many content based services running on next generation networks.
[17] For example voice telephony on a next generation network.

tackling it. This is set out in Chapter 3.

Figure 2.2 shows the relationship between the four cells of Figure 2.1 and the four categories of services classified as emerging in Section 2.3. It is interesting to note that services currently perceived as emerging include combinations of services which are classified in Cell 4 of Figure 2.1 as established services running on new infrastructure. For example the triple play bundle of television, voice telephony and fast Internet access, all services from established markets, is often seen as an emerging market.

Figure 2.2 Positioning of emerging services categories

Category of Section 2.3	*Cell location in Figure 2.1*
1. VoIP	Border of Cell 1 and Cell 4
2. Services running on next generation fixed networks	Cells 3 and 4
3. Services running on next generation mobile networks	Cells 3 and 4
4. Fixed mobile integration services	Primarily Cell 3

3 Regulating emerging markets – approaches so far

3.1 Introduction

Before we provide an analysis on regulation of emerging telecommunications markets, we review the approaches taken in the other jurisdictions and industries. In particular we consider the approach taken to regulation of emerging telecommunications markets in the USA, Hong Kong, Australia and the UK. We also consider some implications of the Microsoft anti-trust case in the EU and the US.

3.2 The US approach

The US approach to regulation of telecommunications markets, based on the 1996 Telecommunications Act[18], is conceptually different from the EU approach. For example:

- access regulation is based on access to unbundled network elements (UNEs) rather than access to wholesale services
- obligations to supply are imposed on operators which are considered generally dominant rather than on operators which are dominant in specific markets
- obligations to supply a particular UNE or combination of UNEs are imposed only where lack of such supply is judged to impair competition.

During the late 1990s the 1996 Act was interpreted in a manner which was supportive of service based competition. For example:

- in its early analysis the FCC stresses the need for "stepping stones" to competition to the incumbent local exchange carriers (ILECs) through use of local loop unbundling and resale provisions
- the FCC required ILECs to supply UNE-P[19]. This is essentially wholesale supply of end to end local telephone service at a 50 to 60% discount on the retail price. By the end of 2004 17 million of the 180 million exchange lines in the US were supplied under UNE-P arrangements[20]
- the FCC introduced the idea of the CLECs and the ILECs sharing use of local loops with the CLEC renting the high frequency part of the loop for broadband access and the ILEC continuing to provide voice telephony over the low frequency part of the loop. The rental price paid by the CLEC for shared access was significantly lower than the rental price of a dedicated local loop.

With the collapse of investor confidence in telecommunications in 2000, came a change of policy and a move towards pure infrastructure based competition. The ILECs argued successfully that:

- there were no obligations on the CATV operators, who were, and remain, the leading suppliers of broadband services in the residential sector, to supply UNE from their networks
- ILECs should be treated in a similar fashion.

As a result of two recent decisions, the Triennial Review Order of 2003[21] and the review of Section

[18] Telecommunications Act of 1996, US Government.

[19] Unbundled network elements-platform or UNE-P consists of use of both the access network and the facilities of the local switch run by the ILEC.

[20] Data on local telephone companies, FCC, 22/12/04.

[21] Review of Section 251 Unbundling Obligations, NPRM, FCC Rcd 16978, 2003.

251 unbundling obligations of December 2004[22], together with the findings from a court case on the Triennial Review Order, the FCC now rules that:

- there is no requirement for an ILEC to supply unbundled elements from its fibre to the home or fibre to the kerb facilities[23]
- ILECs are no longer obliged to supply UNE-P offerings
- ILECs are not required to preserve existing rented local loops or offer rivals substitute products when they replace their copper loop access network with fibre
- there is a requirement for ILECs to supply rivals with access to all except the largest office blocks using DS1 or DS3 circuits. However there is no requirement to offer dark fibre or interconnect links.

These rulings are subject to 12 to 18 months transition periods to give CLECs time to negotiate commercial terms or make alternative arrangements for future supply. During this period an ILEC is not obliged to supply new UNEs.

These rulings give ILECs a strong incentive to invest in fibre and several of them have started major new investment programmes e.g. SBC's Lightspeed project. This was the intention. As FCC chair Michael Powell stated:

> *"By limiting the unbundling obligations of incumbents when they roll out deep fibre networks to residential customers, we restore the market place incentives for carriers to invest in new networks"*

So there are virtually no access requirements on the ILECs for new investment in the residential markets and access requirements in the business market are strictly limited.

The 1996 Telecommunications Act also includes explicit provision (Section 401) for carriers to request forbearance, and requires the Federal Communications Commission (FCC) to respond within a year giving reasons for their decision. Forbearance can be applied for a number of reasons, including consistency with the public interest.

3.3 The approach in Hong Kong

Hong Kong, along with many developing countries, imposes requirements on dominant operators to supply unbundled local loops to rivals at cost oriented prices. This is known as Type II interconnect in Hong Kong. In July 2004 OFTA published a statement[24] announcing the phasing out of local loop unbundling. The conditions set out in the statement are as follows:

- Type II interconnect will not apply to any fibre based connection to buildings in Hong Kong. This ruling is consistent with Government policy to encourage investment in the rollout of competing fibre based telecommunications infrastructures
- all Type II interconnect obligations will be withdrawn by 30th June 2008. Type II interconnect from then on will be based on negotiated terms
- in the run up to this date Type II interconnect will be withdrawn, building-by-building, from those premises which are connected to two or more self built access networks

[22] Review of Section 251 Unbundling Obligations, Order on Remand, FCC, 04-290. December 2004.
[23] Except in the latter case to provide a voice path to an end user if requested. This obligation has no practical relevance since it is not commercially viable for a CLEC to supply end users with voice telephony-only using such a path.
[24] Review of Type II Interconnect Policy, OFTA, July 2004.

- withdrawal of obligations at such a building will be subject to a two year transition period
- obligations to supply Type II interconnect will only continue beyond June 2008 for buildings where such interconnect is viewed as an "essential facility".

So Hong Kong has gone further than the US and requires the withdrawal of all local loop unbundling obligations, and not just obligations on those loops which are fibre based. But it is important to keep in mind the unusual characteristics of the Hong Kong market. All of Hong Kong's population live and work in less than 100,000 buildings. This concentration of population in relatively few big office and apartment blocks means that the unit cost of dual supply of access networks is significantly lower than it would be in most EU member states.

3.4 Developments in Australia

The Australian Productivity Commission has initiated an extensive debate in Australia on how to set the right investment incentives for new infrastructure investment in a number of regulated industries - with a focus on the gas and telecommunications industry. Debate there has focused on the idea of prior commitment on how new investment will be regulated. The Commission set out the following options for regulation of access prices so as to deal with this problem in telecommunications[25]:

> *"If firms consider that regulators are fallible and may have difficulty separating rewards for risk from monopoly returns, then this has adverse consequences for investment. Access pricing that fully recognises regulatory uncertainty and the scope for regulatory error may be a remedy – but this may be hard to implement and may lack ex ante credibility. Access holidays, regulatory compacts and other ex ante options may provide greater certainty for carriers prior to making their investments, but they too have some practical implementation problems."*

The Commission also considered an intermediate option referred to as "*open access regulatory compacts*" which allow a vertically integrated incumbent to set the level of the bottleneck infrastructure access price as desired, contingent on offering competitors the same terms as its downstream arm.

In response to the Productivity Commission proposals the Government implemented an alternative to open access regulatory compacts, namely access undertakings which enable potential investors to set out the terms and conditions that will govern access prior to investment, and obtain approval from the ACCC for the terms proposed.[26] Under Part XIC of the *Trade Practices Act 1974*, the ACCC cannot approve an access undertaking unless it is satisfied that the terms and conditions specified are reasonable. Section 152AH specifies that, in determining whether particular terms and conditions are reasonable, regard must be had to the following (among other considerations):

> *"whether the terms and conditions promote the long-term interests of end-users of carriage services or of services supplied by means of carriage services"*

In a separate and more recent development, the Productivity Commission's Review of the Gas Access Regime reconsidered the National Third Party Access Regime for Natural Gas Pipelines with the primary aim of examining the extent to which the regime balances the interests of relevant parties, provides a framework that enables efficient investment in pipelines and network infrastructure and facilitates the development of competition in the natural gas market.

[25] Productivity Commission. 20 September 2001. "Telecommunications Competition Regulation Inquiry Report". Page 294-295.
[26] Trade Practices Act 1974 (Commonwealth), section 152CBA.

As part of the Review, the Commission concluded that there was potential for regulatory error that may reduce expected returns for riskier projects below those required for efficient investment and that regulatory risk can be high due to uncertainty about the potential for regulatory intervention or change at some point in the future. Recommendations made by the Productivity Commission included that the Gas Access Regime should be amended:

- to provide for a light-handed form of regulation, in the form of a monitoring regime, as an alternative to regulation involving an access arrangement with reference tariffs.
- so that the relevant Minister, after receiving a recommendation from the National Competition Council, can provide a 15-year binding no-coverage ruling for a proposed pipeline if it does not meet the coverage criteria.

The Australian Government has not yet responded to the Inquiry Report.

We note that a decision to forbear must be robust to possible appeal in order to incentivise investment. An example of an exemption to access requirements, overturned on appeal, is provided by the case of Foxtel and Telstra who were granted an exemption by the ACCC from standard access obligations in relation to digital pay TV and associated carriage services. The Australian Competition Tribunal subsequently upheld the appeal from Seven Network Limited and C7 Pty Limited on grounds that the ACCC did not have the power to grant exemptions. This decision does not inform the debate about the merits of exemptions, since the decision to grant an exemption was based on a finding that the ACCC had exceeded its powers.

3.5 The approach in the UK

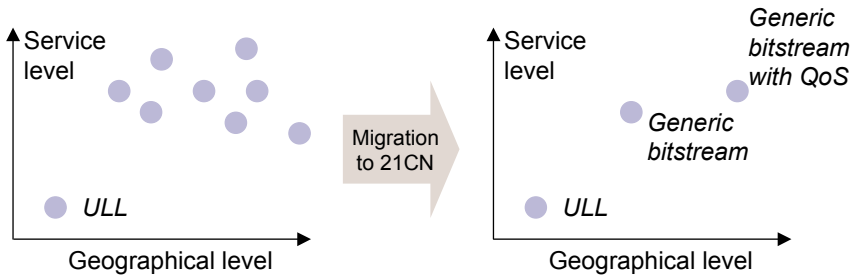
On the 25th November 2004, Ofcom published a consultation document[27] which considered what constraints it should impose on BT as it designs and rolls out its next generation IP network, which BT refers to as its 21st century network or 21CN for short. These proposals are highly relevant in that they provide one way of dealing with the problem of regulating the emerging markets which next generation networks will generate. Annex A provides a summary Ofcom's proposals. We can further summarise them as follows:

- Ofcom considers regulation of ***infrastructure*** rather than regulation of ***markets*** in its analysis
- Ofcom's proposals for regulating next generation networks are based on four main principles:
    - to promote competition at the deepest possible level within the infrastructure
    - to focus regulation to delivery equality of access to facilities and services (also called equivalence) which are non-competitive
    - to withdraw from regulation as soon as competition allows at other levels
    - to provide incentives for efficient and timely investment
- the focus of Ofcom's efforts is on identification of "enduring bottlenecks" within 21CN and then requiring BT to offer rivals access to these bottlenecks. Ofcom is also proposing to require BT to offer equality of access to these enduring bottlenecks. This means that BT's rivals would get access to assets using the same operational support systems in terms of ordering and fault management, as well as the same product at the same price
- Ofcom considers it important to identify the conditions under which rivals will get access to BT's 21CN in advance. Once these conditions are established BT and its rivals can then invest with confidence
- Ofcom sees the development of NGNs as a major opportunity to simplify regulation. It wants

[27] Next Generation Networks – Future arrangements for access and interconnection, Ofcom, November 2004.

to use BT's migration to its 21CN as an opportunity to remove complex layers of service specific regulation. The basic idea is shown in Figure 3.1. Ofcom aims to keep the number of obligations on BT's 21CN to a minimum set of generic products which BT's rivals can then use as inputs to building their own retail services with which to compete with those offered by BT. Then, as the UK market migrates to next generation IP networks, the demand for legacy wholesale circuit switched products will die.

Figure 3.1 Withdrawing from regulation BT migrates to its 21CN



In its strategic review of telecommunications[28] Ofcom introduced the idea of equality of access. In the second consultation document of this review it defined equality of access as providing BT's wholesale customers with:

- the same or a similar set of regulated wholesale product as BT's own retail activities;
- at the same price as BT's own retail activities; and
- using the same or similar transactional processes as BT's own retail activities.

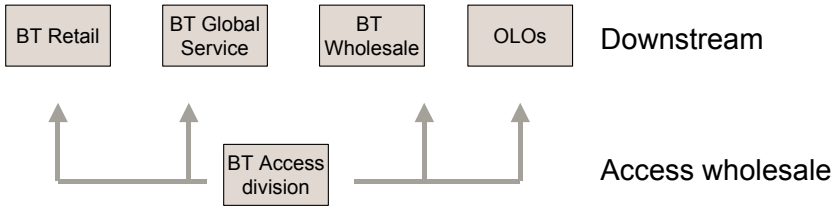
It argues that this is a stronger requirement than that of non-discrimination which is required by Article 10 of the Access Directive[29]. In its consultation document on next generation networks[30] Ofcom then goes on to specify a requirement on BT to build equality of access into its next generation network platform from the start. It recognises that full equality of access is not possible for legacy wholesale products offered by BT because this raises BT's costs unnecessarily. But it argues that such equality of treatment of BT Downstream and BT's rivals must be built into BT's major new platforms from their design phase so as to ensure effective competition.

BT has now responded to this challenge from Ofcom[31]. It has proposed and created a new business unit as shown in Figure 3.2. This new unit, which will operate all of BT's access network facilities, will be separated from other BT businesses in a number of ways:

- the unit will own separate tangible assets, both buildings and plant
- the unit will produce separated accounts and employ separate staff
- the unit will be run by a separate board of directors, which could include representatives from rivals and from Ofcom
- the unit will provide a single interface for network management and ordering for all customers.

[28] Strategic Review of Telecommunications, Phase 2 Consultation Document, Ofcom, November 2004.
[29] Access and Interconnect Directive, European Commission, 2002/19/EC, March 2002.
[30] NGN –Ofcom (2004).
[31] BT's response to Ofcom's Strategic Review of Telecommunications, Phase 2, March 2005.

Figure 3.2 BT's organisational structure to provide equality of access



3.6 Lessons from other jurisdictions

There are three common themes which link approaches to regulation of emerging markets in Australia, Hong Kong, the UK and the USA. When considering how to regulate emerging markets the authorities in these four countries:

- consider the problem from the perspective of access to assets and infrastructure rather than access to services i.e. they focus on the regulation of Cells 3 and 4 combined (of Figure 2.1) rather than on the distinction between emerging markets (Cells 2 and 3) and established markets (Cells 1 and 4).
- acknowledge the need to preserve incentives to invest in new infrastructure by dominant players.
- appear concerned to take decisions which will maximise the level of infrastructure based competition through investment in, and use of, new and innovative infrastructure.

3.7 The competition law case against Microsoft

The competition law cases against Microsoft in the US and the EU also offers some useful lessons on how to regulate the telecommunications industry. This industry, like the software industry in which Microsoft operates, is characterised by a rapid pace of innovation and technological change.
The ***US Microsoft case*** focuses on the market for web browsers. In 1995 Microsoft held a modest share of this market while Netscape held an 80% share. By 1999 the positions were reversed. The US court has found that, in achieving this transformation of its market share, Microsoft was guilty of anti competitive conduct.

We review two substantial documents which analyse and comment on the case - one by Evans and Schmalensee[32] which makes an interpretation which is favourable to Microsoft and another by Bresnahan[33] which is critical of Microsoft's actions. This review leads us to two important conclusions which are relevant to the regulation of emerging telecommunications markets.

- Microsoft had a 94% share of the world wide PC operating systems market in 2000. But this market share did not prompt regulatory action on either an ex ante or an ex post basis. This reflects an acknowledgement by regulatory authorities that
    - Microsoft and its rivals compete ***for the market*** rather than ***in the market*** when they supply PC operating systems
    - there are powerful network externality effects which lead to tipping effects in this and similar markets. Once Microsoft had achieved a certain market share in the PC

[32] Some Economic Aspects of Anti trust Analysis in Dynamic Competitive Industries, Evans and Schmalensee, WP8268, NBER, May 2001.
[33] The Economics of the Microsoft Case, T Bresnahan, Stanford Institute, 2001.

operating systems market, it attracted more and more applications development, which in turn made it increasingly attractive to end users
    - this kind of development benefits end users and should not be regulated. Incentives for the dominant supplier to innovate remain. The pace of technology change means that the threat of entry from a superior product remains.
- Microsoft was not found to have acted in an anti competitive way when it bundled its own web browser, Internet Explorer, with its operating system. But Microsoft did act in an anti competitive fashion when it put pressure on its main distributors, the PC manufacturers, to restrict distribution of the rival web browser from Netscape and when it changed its own operating system so as to make it a "jolting experience" for any end user who wanted to use Netscape rather than Internet Explorer.

The more recent ***EU case*** against Microsoft, brought by the European Commission, focuses on competition in the markets for work group server operating systems and media players. In its judgement[34] the European Commission found that Microsoft had weakened competition by:

- refusing to supply interface information to rivals so as to risk "*eliminating competition in the world wide market for work group server operating systems*"
- tied the supply of Windows Media Player (WMP) with its Windows operating system so as to risk "*impeding the effectiveness of competition in the world wide market for media players*" (Para 992 of the ruling).

As remedies the European Commission ordered Microsoft to:

- disclose to rival suppliers of work group operating systems specifications of the protocols used by Windows work group servers in providing key services to its PC clients. This disclosure covers all currently supported versions of Windows and all future versions. The requirement does not involve Microsoft disclosing its Windows source code
- make these specifications available on a reasonable and non-discriminatory basis within 120 days
- offer a version of Windows which does not include WMP, both for sales made direct to end users and for sales made through PC distributors. Microsoft retains the option of offering a bundle of Windows and WMP, as long as it is not offered at a discount to the Windows only version
- refrain from any conduct which would have the effect of tying WMP to Windows. In particular Microsoft must avoid:
    - hindering the performance of the media players of rivals working on Windows
    - giving WMP preferential treatment eg by providing Internet download updates to WMP but not to rival products
    - giving discounts on a package of Windows and WMP
    - punishing or threatening distributors or end users who obtain Windows without WMP
    - supplying WMP tied with other Microsoft products which have a similar ubiquity to Windows eg Microsoft Office
- implement these changes within 90 days.

There are clear parallels between the US and EU rulings on tying. In both cases there is no prohibition

[34] Commission Decision of 24/3/04 Case COMP/C-3/37.792 Microsoft.

on bundling by Microsoft. But restrictions are imposed to prevent Microsoft from tying the emerging market product (Internet Explorer and Windows Media Player) to the established market product (Windows) so as to hinder rivals in the emerging market from competing effectively.

Analysis of the two cases shows that there are strong parallels between the package software industry and the telecommunications industry. But there are also some important differences.

In terms of parallels:

- both industries are strongly driven by technology innovation and by the impact of Moore's law[35] on the price/performance of the technologies which they use
- in both cases there are major economy of scale effects
- both industries make major sunk investments. The packaged software industry invests in R&D while telecommunications operators make sunk investments in the development and marketing of new products and in new assets and network upgrades[36].

In terms of differences:

- the network externality and "tipping effects" which characterise the package software industry are not as strong in the telecommunications industry. In telecommunications the regulatory requirement for operators to interconnect reduces network externality effects and ensures that the number of basic calling opportunities is the same for all operators
- historically the telecommunications industry has been closer to "old economy" industries which rely on investments in tangible assets for their market power rather than superiority in innovation. Telecommunications incumbents for example have made substantial investment in their access network which has, in the past, conferred substantial market power on them.

But the differences are narrowing over time. In particular telecommunications operators are now investing a growing proportion of their capital expenditure in value added and content based services rather than in hardware. Such investment is more like the R&D investment of the software industry than the traditional hardware and civil engineering investment of the telecommunications industry. It is important for NRAs to recognise this trend when they consider regulation of emerging market services.

Jurisdictions where approaches regarding emerging markets already exist take an infrastructure oriented approach rather than a market oriented approach to regulation of emerging market problems.

Hands-off policies with respect to new infrastructures give operators appropriate investment incentives.

[35] Which states that the power of a computer chip doubles every two to three years.

[36] Telecommunications operators make much less R&D investment than packaged software suppliers. In telecommunications R&D is mainly carried out upstream in the value chain by the operators' suppliers. For evidence see "Some Economic Aspects of Anti trust Analysis in Dynamic Competitive Industries", Evans and Schmalensee, WP8268, NBER, May 2001.

4 Options for regulating emerging markets

4.1 Introduction

The analysis of Chapter 2 identified that there is a divergence of views on how best to regulate established services running on new infrastructure. In this chapter we analyse this issue in more detail.

4.2 Regulating existing services running on new infrastructure

There are two opposing views on how to regulate existing services running on new infrastructure.

Viewpoint 1: most alternative network operators argue that an NRA should regulate existing services running on new infrastructure platforms using the NRF. This is what is required under the technology neutrality principles set out in the Framework Directive[37]. As Paragraph 18 of this directive says: *"…member state to ensure that...it neither imposes nor discriminates in favour of the use of a particular type of technology".*
In terms of the matrix of Figure 2.1, this viewpoint proposes not to distinguish between infrastructure and to focus on the services only. This implies for Cell 4 to merge with Cell 1. Proponents of this viewpoint would have voice services which were offered over a next generation network regulated in the same way as voice services offered over a traditional circuit switched network. This would mean retail price controls on such voice services, together with requirements to offer carrier selection services to rivals as required by Articles 17 and 19 of the Universal Service Directive[38].

Viewpoint 2: many fixed network incumbent operators argue that NRAs should forbear from regulation of all services running on new technology platforms such as next generation networks. They argue that:

- they are about to make major investments in new infrastructure which will generate substantial welfare gains
- they already face market demand and technology risks in making that investment
- imposing ex ante regulation on the services which run on these platforms will significantly increase investment risks and reduce or delay that investment
- regulation will limit investment incentives in two main ways:
  - it will constrain the platform operator's freedom to experiment with pricing (and especially service packaging) and so limit the operator's ability to grow the market for new platform services
  - it will limit the returns which the operator enjoys on its investment to levels at which investment is reduced.

In terms of the matrix of Figure 2.1, this viewpoint proposes not to distinguish between services and to focus on the new platforms only. This implies for Cell 4 to merge with Cell 3.

This position has been argued with considerable success in the USA and Hong Kong. For example US academics Crandall, Hahn and Tardiff[39] conclude that:

> "*There is little economic justification for regulating any broadband services, including those provided by the incumbent local exchange carriers. There is no basis for assuming that*

[37] Framework Directive, European Commission, 2002/21/EC, March 2002.
[38] Universal Services Directive, European Commission, 2002/22/EC, March 2002.
[39] The Benefits of Broadband and the Effect of Regulation, Crandall, Hahn and Tardiff, 2003.

monopoly power will develop in the delivery of these services, but there is every reason to believe that regulation will reduce the incentives of carriers to invest in infrastructure and broadband content. Symmetrical regulation of the incumbent carriers and the cable operators is likely to be much worse than no regulation at all".

4.3 A possible synthesis of viewpoints

We find neither of the viewpoints set out in Section 4.2 convincing. Viewpoint 1 does not deal with the issue of investment incentives raised by the proponents of Viewpoint 2. There is now considerable evidence that the EU will need to make substantial investment in telecommunications infrastructure over the next few years if it is to continue to prosper. For example, in its mid term review of progress towards the goals of the Lisbon summit in late 2004, the European Commission identified as one of its three priorities further investment in telecommunications network infrastructure. This point is also central to the argument put forward by the Indepen/Ovum study[40] in its work on the contribution of ICT to achieving the Lisbon agenda. Viewpoint 1 also does not deal with the prospect that double play[41] and triple play bundles[42] of existing services might become major new markets in their own right for the reasons set out in Section 2.4. Indeed Viewpoint 1 leads to a "Catch 22" situation:

- if such service bundles are regulated under the NRF as services in separate markets then the investment in the platform which can provide them more cheaply may be postponed or cancelled
- without such investment we will not know whether these service bundles really are in separate markets.

On the other hand Viewpoint 2 does not deal with the problem of foreclosure of competition. If there were no regulation of new non replicable infrastructure then an NRA would have to rely on pure infrastructure based competition in the long term. Fixed incumbents would roll out their unregulated next generation networks which would gradually replace their regulated legacy infrastructure. Viewpoint 2 has been adopted by regulators in the US and Hong Kong. And it is one which an NRA in the EU will need to consider. If this option is chosen then there is little more to say on the regulation of emerging markets. But we also need to consider what an NRA should do if it rejects this option. So we go on to consider a third option for regulating new technology platforms. This is set out in Section 4.4. VDSL roll out illustrates the difficulties of balancing investment in new infrastructure by the incumbent against the problems of foreclosure which it can create (see box)

[40] Indepen and Ovum (2005).

[41] Voice telephony plus fast Internet access.

[42] Voice telephony plus fixed Internet access plus TV.

Welfare gains from new infrastructure vs foreclosure

Several incumbents in the EU propose to replace their copper loop network from the MDF to the cabinet with fibre and then to use VDSL technology to provide broadband services. This investment could generate substantial welfare gains by providing these incumbents with the capacity to offer a wide range of broadband services such as triple play.

But these proposals would also undermine the businesses of AltNets which base their business model on renting the incumbent's copper local loops. Fibre to the kerb would increase by an order of magnitude the number of points of interconnect to incumbent's copper network. There is general agreement that the cost of interconnecting at, and building backhaul from, this greatly increased number of points of interconnect would make local loop unbundling non-viable in almost all areas.

In these circumstances there four main options which an NRA could follow:

- it might prevent the incumbent from introducing fibre to the kerb so as to preserve local loop unbundling. There are strong legal and economic objections here. Such a ban might be considered as an ex appropriation of assets. At the same time it might prevent significant economic welfare gains
- it might require the incumbent to preserve the copper loops which are rented to its rivals when it builds its fibre to the kerb network. This option is unattractive on at least two counts. First it raises the incumbent's access network costs considerably. And secondly it offers no opportunity for local loop unbundlers to expand their customer base further
- it might impose no obligations on the incumbent and leave the local loop unbundlers to make their own arrangements. This is the option which the FCC has followed
- it might require the incumbent to offer a suitable substitute product on the grounds that the access network investment is non replicable.

4.4 The regulation of non replicable assets

Under this synthesis of viewpoints an NRA would:

- identify assets used by new infrastructure which are ***non replicable***. That is it does not make commercial sense for an entrant to replicate them once they are in use by the first mover
- focus all ex ante regulation of new technology investment on these assets and use competition law to constrain the behaviour of players in providing services, both emerging and established, over them.

This option contrasts with much current market analysis where:

- the NRA starts by looking at competitive conditions in retail markets
- if retail competition is not effective, it then justifies obligations to supply wholesale products.

Here the approach is to look at the assets which are required to build commercially viable service platforms and ask which assets are non replicable. Requiring their supply on reasonable terms then makes the markets contestable, if not competitive. The two approaches are not that different however. As we will discuss in Section 5.2 the non replicable assets approach *still requires the NRA to consider relevant downstream retail markets*[43] before it can determine whether an asset is replicable or not. We discuss how a regime of regulation focussed on non replicable assets might work in Chapter 5. But we

[43] This means that the analysis of whether an asset is non-replicable still looks at the (then) known services the asset is used for. However, the focus is on whether the supply of services is constricted because of non-replicability of the asset and not on regulating the service itself. In this way, it is not necessary to have "pre-defined" markets as implemented in the NRF.

set out below some of the main arguments as to why we believe an NRA should seriously consider such a regime.

First the non replicable assets approach focuses on dealing directly with the problem of investment incentives by focussing on regulation of new infrastructure assets rather than regulation of markets. There are some significant problems to be tackled in regulating non replicable assets which we discuss in Chapter 5. But this approach, unlike a markets based approach, deals directly with the problem of ensuring that investment incentives are preserved.

Secondly the non replicable assets approach deals with the remonopolisation problem outlined in Section 4.3. Entrants have access to non replicable assets on appropriate, regulated, supply terms. They can then use these assets, in combination with replicable assets which they built themselves[44], to compete in the supply of new technology services at the retail level.

Thirdly this approach allows NRAs to regulate emerging markets with greater confidence. They do not need to try to predict completely what new services will run on new technology platforms[45]. Instead they can consider the investment plans of the main operators, decide where, if at all, they involve use of non replicable assets, and apply ex ante regulation accordingly.

Fourthly the non replicable assets option is consistent with the approach which has been taken to regulation of emerging markets in Australia, Hong Kong, the UK and the USA. In all of these jurisdictions the focus is on which non replicable assets to regulate rather than which emerging markets to regulate.

Finally the non replicable assets approach is consistent with the idea that it is more important to maximise dynamic efficiency gains from technology innovation in the telecommunications industry than to maximise these gains from static efficiency. We expand on this point in Section 4.6 below.

An NRA should seriously consider a non replicable assets approach to regulation. It provides the right incentives to invest in new technology platforms while preventing re-monopolisation.

4.5 The ladder of investment

How would a move to regulation of non replicable assets impact on the investment incentives of entrants? Entrants argue that regulators should create a ladder of investment for them to climb. Under this theory:

- the NRA imposes a series of obligations on the incumbent operator which enable entrants to compete at different points on a spectrum between pure service based and pure infrastructure based competition
- the entrant builds its customer base and revenues using one of the measures designed to enable service based competition. This involves relatively modest investment and low investment risks
- once it has established a customer base, the entrant then starts to climb up the ladder of investment. It might for example move from offering its customers a simple indirect access

[44] Or buy on a competitive market.

[45] e.g. whether a triple play bundle is or is not in a separate market from its components parts offered over legacy infrastructure.

service to bitstream access. From there it might start to use local loop unbundling for access and eventually build its own fibre or radio access network

- this ladder of investment leads to greater investment by entrants long term. Rather than having to make a major sunk investment in its own access infrastructure before it generates any revenues, the entrant is always investing in the knowledge that it has a substantial customer base which can migrate to its new facilities. So the risks are lower and the probability of investment correspondingly greater.

There are a number of objections to this idea. In particular:

- there are major problems in setting supply conditions along the ladder so that there are sufficient incentives for entrants to climb from one rung to the next. So there is a danger that, as a result of regulatory error, the industry becomes stuck in a state of service based competition
- there is limited empirical evidence to show that this ladder of investment process works. In the USA, where it was first implemented, most CLECs have ended up using simple resale and few have migrated to local loop unbundling[46] [47]. In the Netherlands, there is some evidence that certain types of dynamic access regulation have provided incentives for further infrastructure roll-out. But this was based on a simple two rung ladder.

The proposal to regulate non replicable assets simplifies rather than removes this ladder:

- the proposal to regulate non replicable assets does not affect regulation of existing services running on legacy infrastructure. So entry using carrier selection on call origination services provided by the incumbent is unaffected
- in a simplest form the proposals offer a two rung ladder. Entrants gain access to non replicable assets on a regulated basis (Rung 1) or otherwise source network components without regulatory assistance (Rung 2)
- use of triggers, as described in Section 5.2, would enable an NRA to add a third rung to the ladder in some circumstances[48].

At the same time the use of a non replicable assets approach helps deal with the main theoretical objection to the ladder of investment concept. The NRA no longer needs to position a series of related regulatory measures and the danger of regulatory error is much reduced.

A move to regulate non replicable assets simplifies rather than eliminates the ladder of investment concept and does not materially affect investment incentives for entrants.

4.6 Long term development of regulation

In the proposals set out in Section 4.4 we assume that an NRA is required to apply the current EU regulatory framework wherever possible and to apply the non replicable assets approach only to services running on new infrastructure. But, when this framework is reviewed, there is an opportunity to apply the non replicable assets approach more generally to all infrastructure. At this point the two by

[46] Data on local telephone companies, FCC, 22/12/04.

[47] See also Rivalrous Telecommunications Networks with and without Mandatory Sharing, Thomas Hazlett, Working Paper 05-07, AEI Brooking s Institute, March 2005.

[48] For example pure infrastructure based competition plus local loop unbundling plus (subject to market triggers) bitstream access.

two matrix of Figure 2.1 collapses to the two by one matrix of Figure 4.1.

Figure 4.1 A possible long term development of ex ante regulation

	Existing services	*Emerging services*
Services and markets	Services subject to competition law constraints	
Assets	Non replicable assets subject to ex ante regulation	

Under this scheme:

- sector specific ex ante regulation would be imposed only on non replicable assets
- competition law would constrain behaviour in markets.

With this shift of focus of ex ante regulation, from markets to assets, sector specific regulation would complement rather than replace competition law in the regulation of telecommunications markets. As the box below illustrates this is not the case at the moment. Under the current regulatory framework ex ante regulation tends to crowd out competition law.

Ex ante vs ex post regulation in the NRF

The European Framework Convention and guidance governing communications markets appears to facilitate the comparative evaluation of *ex ante* remedies alongside general competition law:[49]

"Only markets where national and Community competition law is not considered sufficient by itself to redress market failures and to ensure effective and sustainable competition over a foreseeable time horizon should be identified for potential ex ante regulation."

In practice, it is presumed that *ex ante* remedies are appropriate wherever Significant Market Power (SMP) is found, without a second stage test as to whether there are net benefits from imposing *ex ante* remedies as opposed to reliance on competition law. For example, the European Regulators Group notes that:[50]

"there is a presumption that ex ante regulation is appropriate on the 18 markets in the Recommendation if a position of SMP is found."

A similar concern has been identified in the US and, while the European Framework might be viewed as more rational by design, due process and the courts in the US might lead to better outcomes for converged markets over time:[51]

"Antitrust and regulation have starkly contrasting traditions on mandated access. As the internet, computer software, and telecommunications ("New Economy") industries converge, affected firms will increasingly seek clear and consistent legal rules. Moreover, courts reviewing the FCC's decisions in this area are increasingly pressuring the Commission to devise a regulatory regime more compatible with economic theory and antitrust policy."

A clear focus for *ex ante* regulation on equivalent access to non replicable assets would leave scope for competition law to regulate conduct in other areas of the communications market.

[49] Commission recommendation on Relevant Product and Service Markets within the electronic communications sector in accordance with Directive 2002/21/EC of 11/02/2003. Page 9.

[50] ERG (2004). Page 9.

[51] Joseph Farrell & Philip J. Weiser. Fall 2003. "Modularity, vertical integration, and open access policies: towards a convergence of antitrust and regulation in the internet age." *Harvard Journal of Law & Technology*, Volume 17 (1). Page 86. http://jolt.law.harvard.edu/articles/pdf/v17/17HarvJLTech085.pdf.

4.7 Maximising economic welfare

In determining the best regulatory policy towards emerging markets we need to consider how the high levels of innovation which characterise these markets are translated into welfare gains through the competitive process. We draw here on a recent paper from Paul de Bijl[52] combined with some of our own analysis.

It is important to distinguish between two different types of welfare gain:

- gains in ***static efficiency*** which result from making the best possible use of existing resources and technologies. In a competitive telecommunications industry static efficiency is maximised when competition is intense and there is strong pressure to price low and produce at low costs using existing technologies
- gains in ***dynamic efficiency*** which result from the introduction of new technology innovations. Welfare gains arise here from process innovations, leading to lower cost of production and product innovations, leading to new services which consumers value more than existing ones. Dynamic efficiency is maximised in a competitive telecommunications industry where investment in new technology is high.

There are a number of studies which show that innovation and competition through innovation produces much more substantial welfare gains (dynamic efficiency) than those which result from driving prices to existing cost level (static efficiency). For example:

- a study by Jerry Hausman[53] in the USA estimated that mobile services there generated a consumer surplus of between $53 billion per annum and $111 billion per annum in 1999
- Hausman also demonstrated[54] that the introduction of new products (in this case mobile services) leads to the public welfare gains which far outweigh the subsequent gains from improvements in cost efficiency and reduced prices over the lifetime of the product[55].

Figure 4.2 illustrates the differences between the static and dynamic efficiency gains which competition can generate:

- the first diagram shows the static efficiency welfare gains which are generated by driving prices towards costs and eliminating economic profit
- the second graph shows one kind of dynamic efficiency gain which is achieved by increasing demand through offering higher functionality services based on new technology
- the third graph illustrates another kind of dynamic efficiency gain which is achieved by reducing unit costs of production through use of new technology.

It is clear, at a qualitative level, that the scope for increase in total surplus is substantially greater through dynamic as opposed to static mechanisms. The incentives for investing in innovative technologies so as to realise dynamic gains are a function of the level of competition in the industry. This is shown in Figure 4.3[56]. Without competition the incentives for investment and innovation are

[52] Competition, Innovation and Future Public Policy, Paul de Bijl. Tilburg Law and Economics Centre, May 2004.

[53] Handbook of Telecommunications Economics, Volume 1, Chapter 13, Elsevier Science, 2002.

[54] Hausman J (1997), *Valuing the effect of regulation on new service in telecommunications*, Brookings Papers: Microeconomics 1997, p. 24.

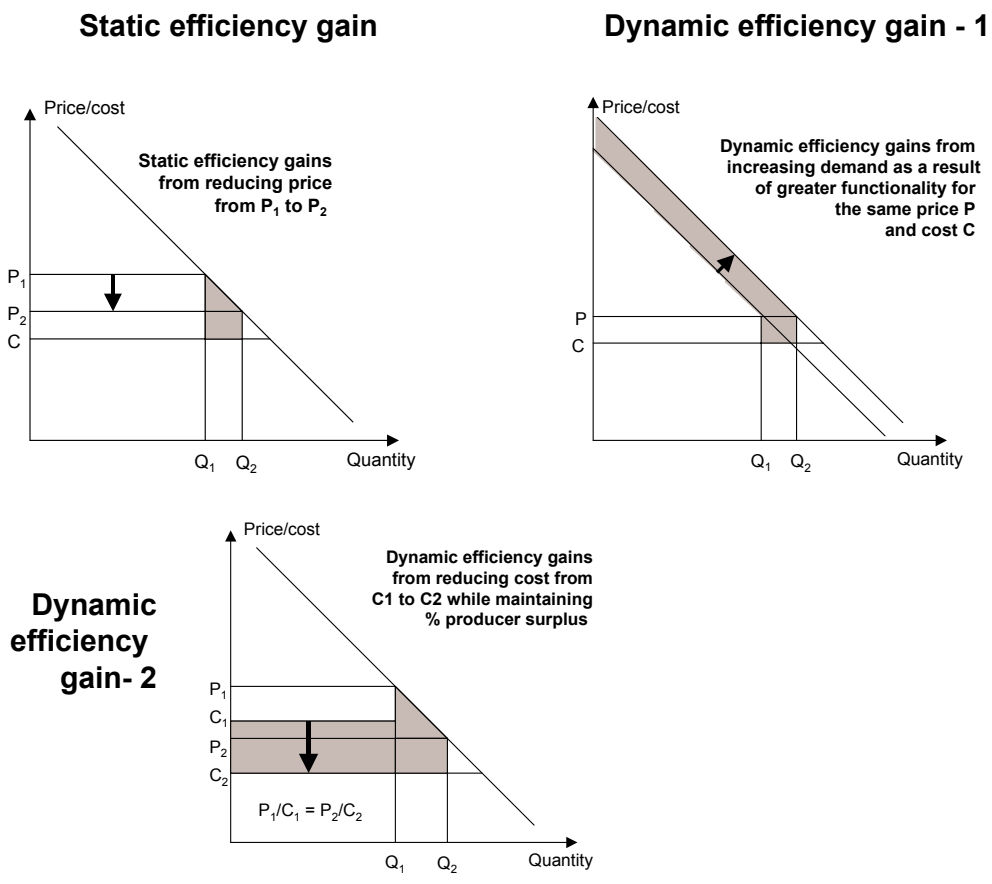
[55] These gains have been realised in an already competitive mobile market and in the absence of the socalled Calling-Party-Pays Principle (in the USA, the Receiving-Party-Pays Principle was commonplace). The CPP Principle is a possible market distortion.

[56] Competition and Innovation; an inverted U relationship, Aghion, Bloom, Blundell, Griffith and Howith, 2002.

modest. If competition increases investment incentives grow as firms seek competitive advantage through innovation. But at some point investment incentives start to decline as competition intensifies to the point where monopoly rents from successful innovation are reduced. This idea goes back to Schumpeter[57].

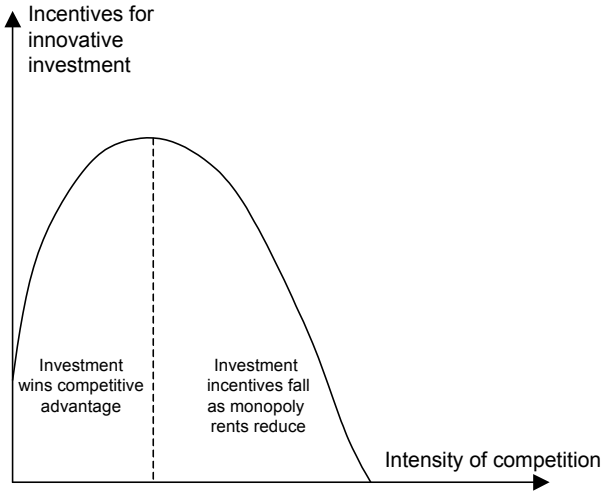
It is unclear to what extent this theory applies to the telecommunications industry. But it is clear that there is a tension between regulation designed to increase service based competition and the level of infrastructure based competition. In the period since full liberalisation in 1998 EU NRAs have introduced market opening measures[58] designed to promote service based competition and to create static efficiency gains. Many observers[59] argue that such measures reduce investment incentives, infrastructure based competition and dynamic welfare gains. The ERG, in its remedies paper[60], recognises this tension. For example the paper (page 59) notes that "*where… replication of the incumbent's infrastructure is viewed as feasible the available remedies should assist in the transition to a sustainable competitive market"* and in markets where replication is uncertain "*no action should be taken that might delay or otherwise stop investment in competing infrastructure where this is efficient*".

Figure 4.2 Dynamic vs static welfare gains



[57] Capitalism, Socialism and Democracy, J Schumpeter, Harper, 1950.
[58] Such as requirements for incumbent operators to provide call origination and carrier selection services.
[59] See for example "The barriers to competition in the ECNS markets of the EU", Ovum, December 2003.
[60] ERG (2004).

Figure 4.3 The impact of competition on investment incentives



Another way to look at this problem is to consider the simple market state model proposed by de Bijl[61]. This model considers the telecommunications market as being in one of the four states of Figure 4.4.

De Bijl argues that regulators should aim for policies which move the industry, and the markets which it serves, into the top right hand quadrant of this figure. But, assuming that we start from the bottom left hand quadrant we need to ask whether we should try to reach our goal via the top left or bottom right quadrants. De Bijl argues that it is better to move in the clockwise direction via the [high dynamic, low static efficiency] state.

> "If one starts with increasing static efficiency, for instance by stimulating competition, one runs the risk that profit levels are reduced which may be detrimental for investment incentives. If the market ends up in the [high static, low dynamic] state, it could be locked into that state for a long time. That could be very unfortunate for consumers, especially if the market in principle allows for rapid technology change. On the other hand encouraging investment and innovation (stimulating dynamic efficiency) first, is likely to lead to more competition, although in the longer run".

Figure 4.4 The different states of efficiency possible within the telecoms industry

Dynamic efficiency	*Static efficiency*	
	Low	***High***
High	Low value for money for consumers Wide range of high functionality products	High value for money for consumers Wide range of high functionality products
Low	Low value for money for consumers Limited range of high functionality products	High value for money for consumers Limited range of high functionality products

[61] De Bijl (May 2004).

To sum up this analysis:

- *dynamic gains through innovation produce much more substantial welfare gains than the static efficiency gains which result from driving prices to existing cost levels*
- *competition is important to maximise innovation, but intense competition which maximises static efficiency gains through service based competition can reduce incentives to invest in innovation and, with it, the dynamic efficiency gains which come from infrastructure based competition*
- *when considering new technology platforms it is better to set regulatory policy in a way which favours investment in innovation over competition which is designed to maximise static efficiency gains*
- *this can be done better by focussing regulatory policy on assets rather than on market developments.*

5 Regulating non replicable assets

5.1 Introduction

In this chapter we look at some of the practical problems which arise in regulating non replicable assets associated with new technology investment and at options for dealing with these problems. We consider:

- what constitutes a non replicable asset
- how access to it might be regulated
- how an NRA might increase regulatory certainty over future investments
- the issue of equality of access to non replicable assets
- the impact of regulating non replicable assets on geographic averaging of prices.

5.2 What is a non replicable asset?

There are two main tests to apply to identify a non replicable asset used for telecommunications infrastructure:

- *has the asset already been replicated on a commercial basis in similar circumstances?* If so then it is unlikely to be classified as a non replicable asset. The phrase "similar circumstances" is important. It may make good commercial sense to replicate an asset in a city centre but not in a rural setting. So the geographic dimension is important here. In the UK for example Ofcom takes the view[62] that, while it is perfectly feasible for rivals to BT to replicate backhaul from the MDF of BT's network to a core IP network, such backhaul is likely to be non replicable in a rural area . The phrase "commercial basis" is also important. It is, for example, questionable whether the CATV networks in the Netherlands, built to provide local TV services with Government funds, would have been constructed by a profit maximising private firm.
- *is there a functionally equivalent asset which is commercially viable and which can deliver comparable services to end users?* There are two problems with this test. First it requires the NRA to make judgements about what end user services the asset will enable. Secondly the NRA needs to make judgements on the commercial viability of alternative technologies. On this second point we suggest that an NRA should look for evidence of actual use of functionally equivalent assets and not rely entirely on arguments about the potential of new technologies to offer functionally equivalent replacements for non replicable assets. There is a long history of new technologies[63] failing to provide a viable alternative to the fixed incumbent's copper loop network.

An important issue to keep in mind in applying these two tests is that pre-existing regulation can itself prevent replication. Measures designed to promote service based competition can remove incentives for investment in infrastructure based competition. One useful way of dealing with this problem is to adopt a ***de-regulatory triggers*** approach. Under this approach an NRA would decide to regulate but commit in advance to a clear regulatory trigger for the withdrawal of mandated access wherever and whenever replication is demonstrated by the investment behaviour of entrants. This approach[64] draws on market information, and sends a signal to both facilities and service based competitors, on how regulation will respond to market conduct, thereby establishing consistency between regulatory and

[62] NGN – Ofcom (2004).

[63] Such as power line communications and fixed wireless access.

[64] Commitment and Adaptability in telecommunications regulation, Brian Williamson, Indepen, October 2004.

business strategy. Potential investors would assess the business case for investment on the assumption that *ex ante* regulation would be withdrawn and that *ex post* competition law only would apply; while service-based competitors would assess their business plans on the basis of expected voluntary access terms by the incumbent or facilities based competitor, or entry into facilities-based competition themselves.

The test of replicability will undoubtedly focus on the local loop networks of incumbent operators in all member states. Such tests might also be required for backhaul from the MDF to the core network. These tests will raise a number of difficult issues:

- what constitutes legacy infrastructure and what constitutes new infrastructure? We might reasonably classify copper loops as legacy infrastructure[65] and fibre loops to the curb or to the premises as new infrastructure
- are fibre local loops replicable or not? The FCC has decided that they are, given convergence in the technological abilities of CATV and traditional telecommunications access networks to deliver a similar range of services to consumers. But in a country or region without CATV networks the decision might be different. Or an NRA might decide that, whilst convergence increases the possibilities of two mass market broadband access networks being commercially viable in the future, the case is as yet unproven
- are all fibre local loop networks replicable or is replicability confined to urban and suburban areas? It is difficult to conceive of replication applying in rural areas, even in countries which are reasonably densely populated
- does the existence of duct networks change the decision on whether a fibre access network is replicable or not? The existence of such ducts lowers the cost of fibre provisioning for their owner and increases the cost premium and investment risks for any prospective greenfield investor without access to such ducts.

Another important question to ask is who is the owner of the non replicable asset? The answer to this question should not change an NRA's judgement on whether an asset is non replicable. But it would certainly affect the way access to the non replicable asset is regulated. An asset owner who does not compete on downstream markets which use the asset has radically different incentives from one who does.

There are two main tests of whether an asset is replicable. First has the asset already been replicated on a commercial basis in similar circumstances? And secondly is there a functionally equivalent asset which is commercially viable and which can deliver comparable services to end users?

5.3 Uncertainty over asset categorisation

As a result of applying these tests an NRA might reach one of three conclusions.

First the NRA might decide that an asset is quite clearly replicable. So it would not oblige the owner to provide access on any except negotiated terms.

Secondly the NRA might rule that the asset is clearly non replicable. It would then consider ex ante regulation from amongst the options set out in Section 5.4. In taking this decision the NRA will need to

[65] Which is dealt with under the existing regulatory framework for the time being.

consider whether an asset is non-replicable for all time or whether new technology might eventually enable replication. If it believes that assets are potentially replicable in future then it might want to use the de-regulatory triggers approach described in Section 5.2.

Thirdly the NRA might be unable to decide whether or not the asset is replicable. It is possible, for example, that potential entrants are waiting to see whether the first mover in an emerging market will succeed before making the necessary investment. Here an NRA has a choice of options which preserve investment incentives to a reasonable degree:

- the NRA could forbear from regulation, arguing that this maximises investment incentives, and that the dynamic welfare gains which flow from this decision more than offset any short term reductions in the level of competition which come from not providing regulated access to rivals
- the NRA could adopt the de-regulatory triggers approach as described in Section 5.2 above. This approach provides greater regulatory certainty to market players while allowing the NRA flexibility in dealing with market uncertainty.

5.4 Regulation of non replicable assets

Having identified a non replicable asset an NRA must then decide in what way to regulate it. We have identified three main options here:

- to set a cost based price for use of the asset. This approach raises a number of difficult issues which we discuss in Section 5.5 below. Given these problems an NRA might decide instead on one of two other options below;
- to forebear from regulation for a period of time and provide a regulatory holiday to the investor;
- to require the owner to provide the asset on non-discriminatory terms but not to set a price.

We consider each of these options in Sections 5.5 to 5.7 below.

5.5 Setting a cost base price

Setting a cost base price for a non replicable asset which requires substantial new investment is fraught with difficulties. There are two main problems here.

5.5.1 Problem 1: bias in cost estimation

There are five possible sources of bias which arise from using cost models to set a cost based price in markets which are dynamic in nature and where levels of uncertainty about the future demand and speed of technology obsolescence are high. These are discussed in detail in Annex B. In summary they are as follows:

- forward looking LRIC models tend to produce under estimates of costs in situations where assets lives are reducing over time
- cost models based on theoretically optimal network topologies may under estimate the costs of a real world efficient operator
- capacity utilisation is often set too high, so producing under estimates of efficient unit costs
- CAPM based cost models, in which the return on capital employed is set equal to the investor's weighted average cost of capital, do not capture the ex-ante risk that the investment will fail or produce a lower than expected return
- investors incur a cost of foregone flexibility when they invest. Access seekers do not incur this cost if they pay a price based on expected unit costs. So they enjoy an options value which is not available to the investor.

5.5.2 Problem 2: asymmetric loss from incorrect pricing

There is also the problem of asymmetric loss from incorrect pricing of a non replicable asset. This is likely to be especially severe in the case of investment in innovative technologies where dynamic efficiency gains are likely to be considerable. This is illustrated in Figure 4.2 and again in the box below.

The scale of economic benefits from the introduction of broadband

Crandall and Jackson (2001) made estimates of the direct benefits of widespread diffusion of broadband in the US.[66] With broadband penetration of 8 per cent (in 2001) and an average price of $40 per month, broadband revenue was about $4 billion per year. Assuming that demand for such service is linear with an elasticity of -1.0, consumer surplus is $2 billion per year in addition to the $4 billion they pay. Crandall and Jackson then considered how expenditure and benefits would grow with demand growth given the shift in the demand curve and allowing for networking effects. They calculated that if broadband service were ubiquitous, similar to ordinary telephone service, annual expenditure would rise to $58.7 billion per year and, assuming an outward shift of the demand curve (with constant slope), consumer surplus would increase to $427 billion per year.

In these circumstances setting an access price for a non replicable asset ***too low*** leads to reduced investment incentives and reduced or delayed dynamic welfare gains. These are likely to far outweigh any static welfare gains from increased levels of competition. Indeed, if the access price is set so low that there is no new investment, then neither the access seeker nor the access provider has an asset to use. The net result is substantial loss of welfare gains. Setting an access price for a non replicable asset ***too high*** has less serious consequences. The level of competition may be reduced for a period as the incumbent established a dominant position in the relevant retail markets, thereby raising prices and perhaps reducing innovation. But a substantial part of the consumer surplus which the innovation generates will be still be realised.

The argument set out above on asymmetric losses from incorrect pricing has an impact when we consider static efficiency gains as well as dynamic gains. The analysis indicates that, where the loss function from regulatory errors in setting the prices is asymmetric, then the NRA should bias regulated prices away from costs - even where the NRA's estimate of underlying costs are unbiased.

5.5.3 Options for dealing with these problems

Gans and King[67], in their study on the use of regulatory holidays to deal with these problems, reached the conclusion that the optimal approach is to allocate any economic profit[68], which new investment in the telecommunications industry brings, to the investor. This conclusion, which is based on mathematical modelling, is intuitively attractive. The investor takes the risk, so it should enjoy the benefit of any supernormal profits which result. Whether such an approach can be turned into practical regulatory measures is open to question. But it does provide a good theoretical basis to guide regulatory price setting for non replicable assets.

At a more practical level an NRA may decide to:

[66] Crandall and Jackson. July 2001. "The $500 billion opportunity: the potential economic benefit of widespread diffusion of broadband internet access." Criterion Economics, L.L.C.

[67] Access Holidays and the Timing of Infrastructure Investment, J Gans and S King, University of Melbourne, 2003.

[68] i.e. profit in excess of the weighted average cost of capital of the industry.

- use cost modelling approaches to minimise the first three sources of cost bias listed above
- set a return on capital employed for the investor which takes account of the option value to access seekers and the risk of project failure to the investor. For example Ofcom is considering such an approach in setting the price of next generation access network components
- add a price premium to take account of the asymmetry of outcomes from regulatory error.

The problem with this approach is that it requires subjective judgement on the size of the price premium to take account of the asymmetry of outcomes and on the premium over the WACC to use in setting a ROCE. These parameters may be difficult to justify, if challenged by access seekers through some appeal mechanism. So the economically correct approach may be difficult to defend.

5.6 Regulatory Holidays

Given the difficulties in setting cost based prices which are both defendable and welfare maximising, some regulatory authorities have considered regulatory holidays on assets. This gives a period of time in which the investor can be confident that it will be fully rewarded for a successful investment, whilst the NRA can monitor the situation to see if there is any foreclosure of competition.

If this approach is used how long should the NRA make the regulatory holiday? There is relatively little guidance here:

- it is possible to draw parallels with patents, which protect R&D investors. Leading software, semiconductor, and telecommunications equipment vendors spend 10 to 20% of their revenues on R&D[69] whilst the main operators in the EU spend around 15% of their revenues[70] on network and capital expenditure. Patents, which typically last 15 to 20 years in the EU, ensure that, on payment of an annual fee, patent holders can license their patent inventions to others and so ensure a proper return on their R&D investment. This in turn provides the necessary incentives for further R&D investment. Cornelli and Shankerman[71] have modelled the optimal patent life and found that, at between 15 and 19 years, it is very close to that provided by patent protection in most countries
- Gans and King[72] look at the length of regulatory holidays required to deal with the problem of truncation of upside returns as outlined in Section 5.5. The paper concludes that optimal holidays need to be judged on a case-by-case basis, though clear simple rules need to be established relating to the type of projects that are eligible for access holidays. Regarding the duration of regulatory holidays, Gans and King note that: *"In our opinion, for relatively high risk projects involving infrastructure with a thirty to fifty year life span, a ten to twenty year holiday would seem appropriate." (Page 29).* This finding suggests that regulatory holidays lasting for ***one third of the life of the asset*** in question might be reasonable
- the authorities in Hong Kong and the USA have declared regulatory holidays for investors on fibre to the home and fibre to the curb, but have not specified any end to these holidays.

There is also an issue in determining the starting date for any regulatory holiday especially when

[69] Some Economic Aspects of Anti trust Analysis in Dynamic Competitive Industries, Evans and Schmalensee, WP8268, NBER, May 2001.
[70] See for example analysis from Ovum's Euroview service.
[71] Patent Renewals and R&D incentives, Cornelli and Shankerman, RAND journal of economics, Summer 1999.
[72] Gans and King (2003).

considering a lengthy programme of network upgrades, such as rolling out fibre into a copper access network or moving from a circuit switched call network to a next generation IP network. Regulatory holidays may have the same effect as setting a cost based price which takes account of cost biases and asymmetry of regulatory error. Where, as normally happens, these two problems occur together to increase the cost based price, this price may reach a level which is higher than the profit maximising price charged by a monopolist. In these circumstances an NRA might find it easier and simpler to justify a regulatory holiday. At the end of the holiday the NRA might review market conditions to see whether a cost based price is required to deal with any competition problems which still exist. By this point in time the market and technology uncertainties, which make it difficult to set a defendable, welfare maximising, regulated price, should be substantially reduced.

5.7 Obligations to supply

A third approach, intermediate between the first two, is to require the investor to provide access to its non replicable assets on a non-discriminatory basis but not to specify a price. The ACCC adopted a form of this approach in Australia when it invited Foxtel and Telstra to set out the terms on which they would provide access to their digital pay TV network to third parties. It then granted them an exemption to further regulation on these assets. However this decision was overturned in the courts on the grounds that the ACCC had exceeded its powers. Some NRAs have adopted this approach to the supply of bitstream DSL products. They require the fixed incumbent to supply the product but leave the incumbent to set the price, knowing that the incumbent could face a margin squeeze case under competition law if it sets the wholesale bitstream service price too high.

The main problem with this option is that it does nothing to prevent margin squeeze on an ex-ante basis. At the same time there are strong objections to an explicit ex ante “retail minus” approach to setting the price of non replicable assets:

- investors in new technology platforms want retail pricing freedom so they can experiment with various pricing options to grow the market. Imposing an explicit retail minus regime on these services so as to discover an appropriate price for the non replicable assets used within these services would put significant constraints on that retail pricing freedom
- the relationship between the retail price of a set of retail services which use a non replicable asset and the economically efficient price of that asset is a complex one. So the process of estimating the “minus” of any retail minus formula is, arguably, more difficult to establish than setting the welfare maximising, cost based, price for the non replicable asset itself.

If the NRA opts for some form of negotiate: arbitrate procedure for establishing supply then it is important to specify the form of arbitration in advance. If the access seeker knows that the arbitration process will lead to some form of cost based price then it is unlikely to negotiate in good faith. At the same time such a procedure will reduce investment incentives for the owner of the facilities under dispute. Some form of final offer arbitration, in which the NRA commits in advance to choose only between the final offers of the parties to the dispute, provides one way to avoid this difficulty.

In determining how best to regulate non replicable assets an NRA has three main options. ***First*** *it can set a cost based price. To set a price in a way which preserves investment incentives, the NRA needs to take account of bias in cost estimates created by project failure and option values. It also needs to set the price in a manner which takes account of asymmetry of regulatory error. In the case of new technology assets this means erring on the high side so as to ensure that the dynamic gains from investment are realised, even if the static gains which come from stronger competition are reduced.* ***Secondly*** *an NRA can forbear from regulation for a period of time i.e. a regulatory holiday. And* ***finally*** *it can require the owner of the asset to provide access but not to specify a regulated price.*

The NRA might also consider a combination of these remedies. For example it might establish a regulatory holiday, during which the owner is required to supply the asset at a fair and non discriminatory price, followed by an obligation to supply at a cost based price.

5.8 Regulatory certainty and commitment

Investment in new telecommunications assets involves substantial market and technology risk for entrant and incumbent alike. These investors are keen not to increase the risks they face through high levels of regulatory uncertainty. If they are to maximise their investment they want a predictable regulatory environment in which they can develop their business plans with confidence. But there is a problem here, especially in the regulation of emerging markets.

> *"There are things we know that we know. There are known unknowns - that is to say, there are things that we now know we don't know but there are also unknown unknowns". Donald Rumsfeld, February 2002.*

Somehow regulation has to deal with these unknowns. This means regulation must be flexible and respond to events as they unfold. New information will, almost certainly, give NRAs good reason to change regulation and so increase regulatory uncertainty. So how can an NRA provide investors with the regulatory certainty they seek while responding flexibly to events as they unfold?

In developing its regulatory policy on emerging markets, there are a number of measures which an NRA might wish to consider so as to try to square this circle.

Measure 1: *develop principles on which all regulation is based.* Ofcom has attempted to develop such principles through its strategic review of telecommunications. These are listed in the box below. Such principles provide a way for an NRA to specify how it will rule on specific regulatory problems as it attempts to balance the often conflicting objectives set out in the EU Framework Directive. They also give potential investors guidance on how the NRA will behave without imposing unnecessary constraints on the regulator's ability to respond to new market and technology information as it is discovered.

Ofcom's seven regulatory principles

1. Promote competition at the deepest level
2. Focus on equality of access below this level
3. Withdraw from regulation at other levels as soon as market conditions allow
4. Provide a favourable investment climate
5. Accommodate different regulatory solutions for different products and geographies
6. Create scope for market entry that could over time remove economic bottlenecks
7. Elsewhere use light touch regulation based on competition law and promotion of interoperability

Measure 2: *ensure that the NRA follows a transparent and consultative process in arriving at specific regulatory decisions.* Such a process is a way of ensuring that the NRA does not diverge from its principles (Measure 1) for reasons of short term expediency.

Measure 3: *enter into implicit contracts with the industry which constrain the NRA in its behaviour.* The FCC and OFTA appear to have entered into unconditional contracts never to require access to an investor's fibre access networks. Whether these are credible commitments is an open question. Many observers believe that such contracts will be broken if events prove that they carry significant economic costs. So they do not see them as credible and investment uncertainty remains.

There are more credible contractual commitments which an NRA might make. For example it might:

- establish a ***sunset clause*** on regulatory constraints. The European Commission established constraints on Vodafone's ability to exploit its pan European mobile footprint when it approved take over of Mannesmann. But this constraint lasted for three years only
- establish a ***sunrise clause***. The regulatory holidays on new technology investment discussed in Section 5.6 are good examples here
- establish ***contingent contracts*** in which the NRA lifts regulatory obligations in certain markets once certain market conditions are realised. The market triggers idea of Section 5.2 provides an example.

Measure 4: *make dispute resolution mechanisms explicit in advance.* This measure, like Measure 2, helps ensure that due process is followed in dealing with unexpected events and so increases investor confidence. Such dispute resolution mechanisms include rights of appeal and adjudication mechanisms such as Ofcom's recent adjudication scheme to deal with disputes on local loop unbundling processes[73].

Measure 5: *continue to regulate using the non replicable assets method[74] in the long term, rather than switching to the new regulatory framework*. Switching regulatory approach to comply with EU law as markets move from emerging to established status creates uncertainty for investors. Maintaining the non replicable assets method of regulation removes this uncertainty, even if it also means that the new

[73] Ofcom. 28 June 2004. "Telecoms adjudication scheme for local loop unbundling".
[74] As described in Section 5.2 and 5.3.

regulatory framework is eventually redundant. However, the legal implications might be severe, unless the new regulatory framework is revised in the meantime.

An NRA can provide investors with regulatory certainty regarding the regulation of emerging markets while maintaining flexibility by developing regulatory principles; ensuring transparency; entering into implicit contracts with the sector; making dispute resolution mechanisms explicit in advance and keeping the non replicable assets approach in the long run.

5.9 Equality of access

In developing regulatory policy for emerging markets and for the new multi service platforms which will create these markets, NRAs will need to consider whether they wish to move from a standard of non-discrimination in the supply of non replicable assets to one of equality of access. Under the latter standard access seekers gain access to assets using the same provisioning and network management processes as the owners downstream businesses, as well as access at the same price for the same quality of asset. The concept is described in more detail in Section 3.5.

5.10 Geographical averaging of prices

It is likely that application of the non replicable assets regime will lead to increased pressure for incumbent operators to geographically de-average their prices at both wholesale and retail levels. It is clear that assets which are replicable in urban areas may not be replicable in rural areas. In these circumstances their owners would be obliged to supply, and the price which it charged would be set to reflect the cost of rural provision and not the average cost of provision of the asset. In urban areas the owner of the asset would face competition and would again supply at a cost based price so as to compete. But in this case the price would reflect the cost of urban provision. These differences in the cost and price of wholesale assets would then reflect themselves in the prices charged for services in competitive retail markets.

This analysis suggests that, while there are likely to be substantial welfare gains from applying a non replicable assets regime to new infrastructure investments this approach will lead to strong pressure for geographical de-averaging of prices. So, if Governments want to preserve the social objectives which geographic averaging of prices by the fixed incumbent now provides, they will need explicit subsidy mechanisms to do so. Given its demographic characteristics this problem is likely to be less severe in the Netherlands than in some other EU member states.

6 Conclusions and proposals

6.1 The characteristics of an emerging market

Within the context of the current EU regulatory framework emerging markets can be defined only in a negative sense. That is they are new markets in which there is insufficient information, for example in terms of demand, pricing, price elasticity and entry behaviour, to carry out the necessary market definition procedures and/or tests as to whether the market is susceptible to ex ante regulation. So the current processes developed to implement the new regulatory framework cannot be used to regulate such markets.

When we look at current emerging markets we find that:

- they consist largely of services which run on new multi service access networks and platforms
- these platforms run both established and emerging market services
- the incentives for investing in these new platforms are dependent upon how the emerging services which will run on them are to be regulated
- there are potential major welfare gains for EU member states from investment in such platforms
- there is a risk that, if we regulate established services running on new infrastructure in the same way as established services running on legacy infrastructure, the investment required to achieve these welfare gains will not be made in a timely and efficient manner

So there is an urgent need to develop an approach to regulation of services, both established and emerging, over new infrastructure which:

- provides potential investors in new technology platforms with the right incentives to invest, whilst ensuring that
- re-monopolisation of markets does not occur as services running on this new infrastructure replace services running on legacy infrastructure.

6.2 Proposals for regulating emerging markets

Figure 2.1 Categorisation of regulatory problems

Item	*Established market/services*	*Emerging market/services*
Legacy infrastructure	***Cell 1*** Use NRF	***Cell 2*** No ex ante regulation
New infrastructure	***Cell 4*** Major debate	***Cell 3*** No ex ante regulation

Whilst the current EU regulatory framework remains operational we propose that:

- established services running on legacy infrastructure use the standard market analysis process to decide on when and how to impose ex ante remedies
- emerging services running on legacy infrastructure are subject to competition law constraints but not to ex ante regulation. It is important to prevent leverage of market power from an

established market into an emerging market. But this is best prevented by regulating the established market
- neither emerging services nor established services running on new infrastructure are subject to ex ante regulation[75].

This proposal creates the investment friendly climate required for rolling out new next generation network platforms. But it does not deal with the danger of re-monopolisation of retail markets as next generation networks replace legacy infrastructure. So we further propose that NRAs should:

- identify assets used by new technology platforms which are ***non replicable***. That is it does not make commercial sense for an entrant to replicate them
- focus all ex ante regulation of new technology investment on these assets and use competition law to constrain the behaviour of players in providing services, both emerging and established, over these assets.

In the long term such an approach to regulation might, if the current regulatory framework is replaced, apply to all services and not just services running on new infrastructure. At this point:

- sector specific ex ante regulation would be imposed only on non replicable assets
- competition law would constrain behaviour in markets.

With this shift in the focus of ex ante regulation, from markets to assets, sector specific regulation would complement rather than replace competition law in the regulation of telecommunications markets.

6.3 Regulating non replicable assets

To identify these non replicable assets an NRA will need to consider two questions:

- has the asset already been replicated on a commercial basis in similar circumstance?
- is there a functionally equivalent asset which is commercially viable and which can deliver comparable services to end users?

In cases where there is uncertainty as to whether an asset is or is not non replicable an NRA might wish to consider the use of market trigger mechanisms – in which the NRA commits in advance to withdrawal of mandated access as soon as replicability of assets is demonstrated.

In determining how best to regulate non replicable assets an NRA has three main options:

- to set a cost based price. To set a price in a way which preserves investment incentives, the NRA needs to take account of bias in cost estimates created by project failure and option values. It also needs to set the price in a manner which takes account of asymmetry of regulatory error. In the case of new technology assets this means erring on the high side so as to ensure that the dynamic gains from investment are realised, even if the static gains which come from stronger competition are reduced
- to forbear from regulation for a period of time i.e. a regulatory holiday
- to require the owner of the asset to supply but not to specify a price.

[75] The access regulation referred to here relates to one way access such as caller origination and local loop unbundling. It does not refer to two way access (e.g. voice call termination) or to regulation designed for consumer protection or empowerment.

The NRA might also consider a combination of these remedies. For example it might establish a regulatory holiday, during which the owner is required to supply the asset at a reasonable price, followed by an obligation to supply at a cost based price.

6.4 Other issues

Investors in new technology platforms want high levels of regulatory certainty so that they can invest with confidence. At the same time NRAs need the flexibility to respond to market developments as they unfold. To reconcile these conflicting objectives NRAs might:

- develop principles on which all regulation is based
- ensure that they follow a transparent and consultative process in arriving at specific regulatory decisions
- enter into implicit contracts with the industry which constrain their behaviour
- make dispute resolution mechanisms explicit in advance
- continue to regulate using the non replicable assets method[76] in the long term, rather than switching to the current regulatory framework for established markets.

In developing regulatory policy for emerging markets and for the new multi service platforms which will create these markets, NRAs will need to consider whether they wish to move from a standard of non-discrimination in the supply of non replicable assets to one of equality of access. Under the latter standard access seekers gain access to assets using the same provisioning and network management processes as the owners own downstream businesses, as well access at the same price for the same quality of asset.

[76] As described in Section 5.2 and 5.3.

Annex A: Regulating NGNs in the UK

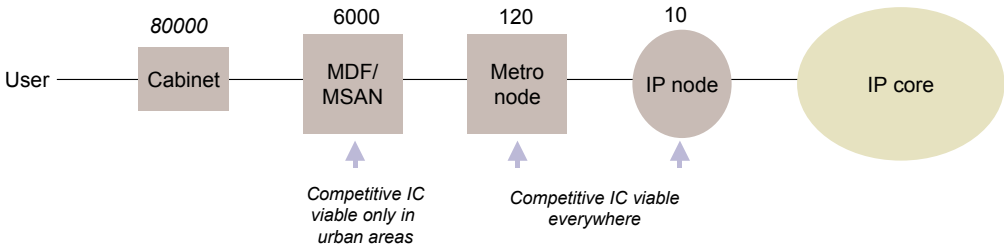
On 25th November 2004, Ofcom published a consultation document which analyses what constraints it should put on BT as it designs and roll out its next generation IP network[77]. In the course of its analysis Ofcom considers a wide range of emerging markets both at the retail and wholesale level. So it is useful to consider the main characteristics of the Ofcom approach. These are as follows.

Ofcom applies four principles[78] to guide its proposals for regulating BT's 21CN:

- to promote competition at the deepest possible level within the infrastructure
- to focus regulation to delivery equality of access to facilities and services which are non-competitive
- to withdraw from regulation as soon as competition allows at other levels
- to provide incentives for efficient and timely investment.

In analysing access arrangements Ofcom provides a simplified diagram of BT's 21CN architecture. This is shown in Figure A1.

Figure A1 The architecture of 21CN



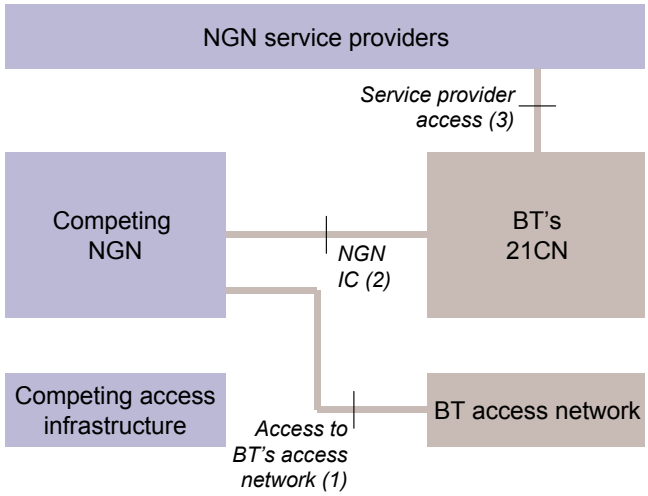
In deciding on what constraints it might impose on BT, Ofcom is conscious of the need not to become involved in the detailed design of 21CN. But it is concern that BT is not allowed to design its 21CN in a way which puts up unnecessary barriers to competition.

Ofcom focuses its analysis on trying to identify enduring bottlenecks. This means that the main focus of its enquiry is on determining where, within BT's 21CN, it should be required to offer access and interconnect to others. It identifies three main interfaces to BT's 21CN as shown in Figure A2. But it concentrates discussion on what obligations it should impose on BT so as to enable rivals to gain access to its access network facilities. In other words it focuses on looking at facilities which are non replicable rather than on trying to identify emerging markets. Indeed there is no mention of the emerging markets concept in the document!

[77] Which BT refers to as its 21st Century Network or 21CN for short.

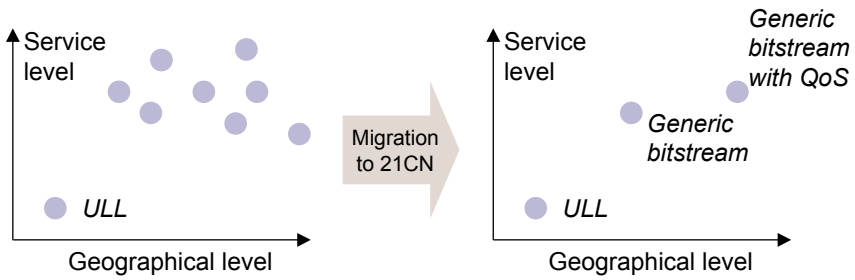
[78] Four out of the seven developed through its strategic review of telecommunications.

Figure A2 Access required to 21CN



Ofcom wants to use BT's migration to its 21CN as an opportunity to remove complex layers of service specific regulation. The basic idea is shown in Figure A3. Ofcom is aiming to keep the number of obligations on BT's 21CN to a minimum set of generic products which BT's rivals can then use as inputs to building their own retail services with which to compete with those offered by BT.

Figure A3 Withdrawing from regulation as BT migrates to its 21CN



Ofcom has identified a number of areas of uncertainty as to where the boundary between replicable and non replicable assets lies. It believes that:

- local loops are, in general, not replicable, at least with today's technology. So local loop unbundling obligations are required on BT
- backhaul from the MDF/MSAN of the 21CN to the metro-node is replicable in urban areas but not in rural areas
- the best way to determine which assets are non replicable might be to rely on market mechanisms. So Ofcom might require BT to offer both bitstream products and unbundled local loops to serve every MSAN. Then, if and when unbundled local loops are rented at an MSAN, regulation requiring BT to supply bitstream metro-node service might be lifted or lightened[79].

In identifying bottlenecks Ofcom considers two dimensions:

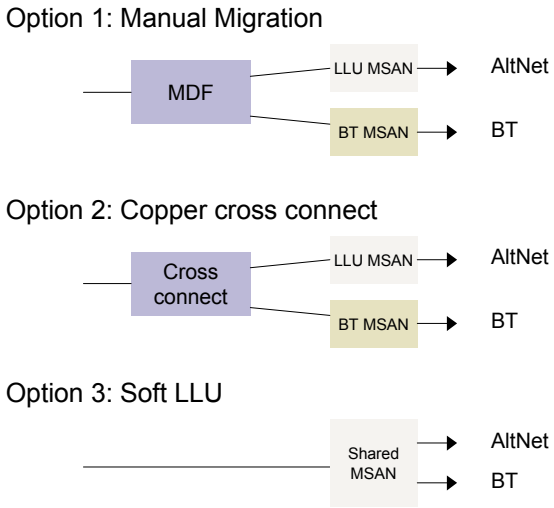
[79] e.g. an obligation for non-discriminatory supply.

- the geographic level within the network ie user premises vs pole vs cabinet vs MDF/MSAN vs metro-node vs IP node
- the service level offered at the interconnect interface ie physical connection vs Layer 2 bitstream[80] vs Layer 3 bitstream[81].

Ofcom is proposing to require equality of access by BT Retail and its rivals to non replicable assets of the 21CN. Ideally Ofcom would like to see equality of ***inputs*** i.e. BT's rivals and BT Retail get access to assets using the same OSS in terms of ordering and fault management as well as the same product at the same price. The alternative is equality of ***outcome*** in which BT's rivals are supplied with comparable products but in which ordering and fault management use different systems from BT Retail.

Ofcom sees the identification of bottlenecks in BT's 21CN as an important pre requisite for creating the right incentives for new infrastructure investment by BT and its rivals. Once they know where Ofcom considers the bottlenecks to be, operators can invest with confidence as to where Ofcom will or will not impose obligations on BT. Ofcom has identify a number of difficult trade off-s in regulating 21CN. In particular it is concerned about the future of local loop unbundling. Setting aside problems of fibre in the access network[82], there is a balance to be struck between minimising overall 21CN costs and maximising the opportunity for competition. BT's 21CN will offer end users broadband dial tone[83]. In contrast with this automated process, local loop unbundling is currently manual. This makes it slow and expensive. So rivals to BT which rely on current LLU will find it difficult to compete with BT. Ofcom could require BT to use cross connect between customer and its MSAN so as to provide equality of access as shown in Figure A4. But such a configuration would substantially increase BT's costs. So Ofcom's preferred solution is for BT to allow rivals to gain access to ULLs from the network side of its MSAN for "soft LLU[84]". Again Figure A4 illustrates.

Figure A4 Future options for LLU



[80] eg ATM, Ethernet.
[81] IP with routing information.
[82] eg to enable VDSL services.
[83] i.e. customers will be able to plug broadband devices into the network which will automatically recognise the need for broadband service and initiate subscription.
[84] ie unbundling which is automated.

Ofcom has identified a wide range of transitional issues which arise when BT rolls out its 21CN. In particular there is a need to consider the speed at which BT is allowed to withdraw legacy products. Fast migration will reduce BT's costs but could raise the costs of BT's rivals. Ofcom proposes that BT should be allowed to migrate at a speed which minimises the overall costs to both parties together.

Annex B: Bias in cost modelling

B1 Assumed asset lives and values

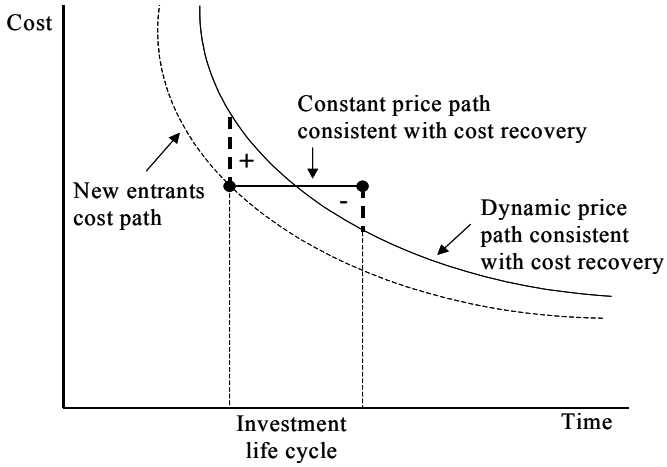
When assets are periodically re-valued, only one unique depreciation profile yields an NPV of exactly zero. William Baumol (1971) proved this result, noting:

> *"we show that… is the only depreciation rule that (a) permits payments to decrease in proportion with the rate of fall of the replacement cost of the asset, and (b) permits the original cost of the asset to be recouped by depreciation payments over its n-year life."*[85]

Forward looking costing methodologies (Long Run Incremental Cost or LRIC models) therefore introduces a possible source of bias in cost estimates and the NPV of returns if assumed asset lives differ from actual asset lives.

Where asset revaluation is more frequent than the life of assets, and replacement asset prices are expected to decline over time, the efficient competitive price path will be consistently above that which a static assessment based on either historic or replacement costs would suggest. Figure B1 from Marks and Williamson illustrates this.[86]

Figure B1 Dynamic price path with declining asset prices



The upper curve, the dynamic price path, is always above the new entrants' cost since declining prices and negative returns, are anticipated over the latter half of the recovery period. The horizontal line spans the asset life for a new asset and illustrates the cost on an averaged basis. Relative to an historic cost based estimate of what returns ought to be, a competitive equilibrium would initially involve returns above the estimate (the +ve region) and later below the estimate (the –ve region).

Mandy and Sharkey (2003)[87] show formally that static LRIC models can substantially under (over)

[85] William J. Baumol. 1971. "Optimal depreciation policy: pricing the products of durable assets." The Bell Journal of Economics and Management Science Vol 2(2). Page 651.

[86] P Marks and B Williamson. June 2004. "Profitability tests in competition law and ex ante regulation." Utilities Policy, Volume 12(2).

[87] Mandy, D and Sharkey, W, 2003. 'Dynamic pricing and investment from static proxy models', Federal Communications Commission OSP Working Paper Series #40.

estimate dynamic competitive prices when asset prices are falling (or rising), and set out how these biases might be corrected (on average).

On the face of it errors in assumed asset lives and depreciation need only involve a random error in the NPV of returns. However, unanticipated technical progress is likely to lead to bias on average, even where anticipated technical progress is taken into account on a best endeavours basis. The reason for this is that when a new technology arises that fundamentally changes the cost structure of an industry, the use of the new technology in LRIC modelling will strand the old assets unless they are fully depreciated before the switch-over occurs.

Failure to take proper account of technological discontinuities could discourage the implementation of new and more efficient ways of providing network services. Ofcom have begun to grapple with this question in relation to the transition to Next Generation Networks (NGNs), setting out the following thoughts in their Phase 2 consultation:[88]

> *"We believe that all parties should be able to plan some time ahead, in the certain knowledge of the future prices of interconnection services. This is a good argument for using a four-year period for the next NCC regime, mitigating many of the risks associated with PSTN-to-NGN migration uncertainty by use of the technology-neutral approach and by limiting the services covered by the control to existing PSTN services (regardless of the mode of delivery)."*

In a competitive market prices will reflect the anticipated likelihood of stranding. It is difficult to mimic this under LRIC. An alternative would be to allow regulated firms only normal returns, but also to provide for recovery of assets that are commercially stranded via some mechanism e.g. levies on inelastic service charges as in energy markets in the US.

B2 Assumed network configuration

Real networks are not continuously rebuilt, but evolve over time in responses to changes in technology and demand. Feasible network configurations will therefore appear less efficient than a hypothetical alternative optimised at a point in time. The FCC expressed the concern as follows:[89]

> *"One of the central internal tensions in the application of the TELRIC methodology is that it purports to replicate the conditions of a competitive market by assuming that the latest technology is deployed throughout the hypothetical network, while at the same time assuming that this hypothetical network benefits from the economies of scale associated with serving all of the lines in a study area. In the real world, however, even in extremely competitive markets, firms do not instantaneously replace all of their facilities with every improvement in technology. Thus, even the most efficient carrier's network will reflect a mix of new and older technology at any given time." (Paragraph 50)*

The bias this consideration introduces is conceptually similar to that introduced by technical progress in relation to individual assets, but would be harder to correct. The only practical alternative is to use a cost model that reflects the actual network under consideration. The FCC tentatively made the following conclusion in their review of pricing rules:[90]

> *"We tentatively conclude that our TELRIC rules should more closely account for the real-world attributes of the routing and topography of an incumbent's network in the development of*

[88] Ofcom. 18 November 2004. "Strategic Review of Telecommunications - Phase 2 consultation document." Paragraph 7.14.
[89] FCC. 15 September 2003. "Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers". WC Docket 03-173.
[90] FCC. 15 September 2003. ibid.

forward-looking costs." (Paragraph 52)

B3 Capacity utilisation

The optimal level of capacity utilisation over time is never 100% due to both anticipated and unanticipated demand changes. Anticipated demand growth and lumpy investment imply low capacity utilisation at the beginning of an assets life and a steady rise in utilisation until replacement or enhancement is required. Unanticipated changes in demand imply that a prudent margin of spare capacity is required since the social costs of denying service are typically very large.

Baumol and Sidak set the problem out as follows: [91]

> *"A utility's investment in seemingly "excess" capacity provides an immediate option to consumers, an option having substantial economic value if demand unexpectedly surges, supply unexpectedly collapses, or both occur simultaneously. That option is analogous to insurance. It is especially true for an outlier event like the California electricity crisis that insurance confers its greatest advantage upon the insured that are the very consumers whom public utility regulation exists to protect."*

While apparently "excess" capacity is clearly likely to be socially optimal, it is difficult to second guess the optimal level of capacity for modelling purposes. The cost of providing capacity and the value of the option to use such capacity will be imperfectly known.

In competitive areas of the market rivalry between alternative suppliers offering competing price-service bundles can be expected to lead to good outcomes (provided consumers are reasonably informed). In price regulated parts of the market a pragmatic approach may be to ensure that the utility has well founded objectives (and incentives) in relation to quality of service, and to assume that the capacity choices that flow from these constraints are optimal. In other words actual capacity utilisation should be used for modelling purposes.

B4 Risk

Non-diversifiable market risk is in principle captured by measuring or finding a proxy for the "beta" factor in the Capital Asset Pricing Model (CAPM). The beta measure captures the non-diversifiable element of returns flowing from an asset (or more usually in practice a company as a whole). This measure does not capture *ex ante* investment risk – the risk that an investment fails and produces no return or a return that is less than expected.[92]

The appropriate margin on returns to reflect the *ex ante* risk of failure for investment is difficult to capture since it is subjective. In competitive markets rewards for *ex ante* risk show up not in the market cost of capital, but in high *ex post* returns (for example, for a successful pharmaceutical product). In the absence of a method for objectively quantifying *ex ante* risk the alternative is to allow normal returns on all prudent investment, where prudence is not judged with hindsight, but based on the information available at the time the decision to invest was taken. Again this points in the direction of using actual rather than hypothetical network configurations, assets and capacity utilisation in cost

[91] William Baumol and Gregory Sidak. 2002. "The pig in the python: is lumpy capacity investment used and useful." Energy Law Journal, Volume 23.

[92] Lawrence Kolbe and William B. Tye. May 15, 1995. "It ain't in there: the cost of capital does not compensate for stranded-cost risk." Public Utilities Fortnightly.

modelling.

B5 Value of flexibility

In a competitive market the period of commitment to purchasing the services of an asset could be expected to be reflected in the price of access, with the lowest price providing a normal return to the supplier only in the case where the term of the contract matches the life of the asset. In a competitive market shorter term leases would be expected to incur higher charges.

In a regulated context access providers incur the costs of foregone flexibility when they invest, but consumers of access services do not necessarily pay a flexibility premium when they take up the offer of short term regulated terms of access.

Formally, whenever an investment is at least partially irreversible, there is uncertainty and a choice over the timing of investment where there is positive value attached to the option of waiting (known as a "real option"). Since real options can only be positive, failure to take them into account in price setting will bias allowed prices downwards wherever the underlying conditions of irreversibility, uncertainty and choice apply.[93]

In a working paper published in February 2004, Pindyck discusses the implications of irreversible investment in telecoms networks with unbundling and LRIC pricing.[94] Pindyck argues that:

> *"Of central importance to this arrangement [use of incumbents' network elements on regulated terms] is that network owners must share their capital with rivals at the option of the rivals, who are free to utilise facilities when they desire to do so, for services of their choosing. They are under no obligation to financially support network investments. This operational flexibility is of great value to entrants, and is very costly to supply by incumbents. However, the pricing formula used by regulators to set lease rates for capital (i.e., wholesale prices for access to network infrastructure) does not compensate incumbents for these rights."*

There are several options for dealing with this bias. First, adjust access prices upwards to account for real options (the required calculations are complex, though market proxies based on term of lease and price information might provide a rule of thumb). Second, require a long term commitment to access. Third, eliminate or reduce the impact of market uncertainty by assuring investors of a normal return irrespective of the level of demand (perhaps by allowing cost recovery in market segments where the elasticity of demand is low, such as last mile access).

[93] Note that real options arise for both monopoly investment decisions and under competitive conditions, in other words competition does not eliminate the value of waiting (Dixit and Pindyck. 2004. "Investment under uncertainty." Princeton University Press).

[94] Robert Pindyck. February 2004. "Mandatory unbundling and irreversible investment in telecom networks." NBER Working Paper 10287. Page 1.

References

- Aghion, Bloom, Blundell, Griffith and Howith, Competition and Innovation; an inverted U relationship, 2002
- Bresnahan T., The Economics of the Microsoft Case, Stanford Institute, 2001
- Cornelli and Shankerman, Patent Renewals and R&D incentives, RAND journal of economics, Summer 1999
- Crandall and Jackson, The $500 billion opportunity: the potential economic benefit of widespread diffusion of broadband internet access, Criterion Economics, L.L.C., July 2001
- Crandall, Hahn and Tardiff, The Benefits of Broadband and the Effect of Regulation, 2003
- De Bijl P. Competition, Innovation and Future Public Policy, Tilburg Law and Economics Centre, May 2004
- De Streel A., A new regulatory paradigm for European electronic communications, ITS European Regional Conference, September 2004
- European Commission, Access and Interconnect Directive, 2002/19/EC, March 2002
- European Commission, Decision of 24/3/04 Case COMP/C-3/37.792 Microsoft
- European Commission, Framework Directive, 2002/21/EC, March 2002
- European Commission, Guidelines on Market Analysis, 2002/C165/03, July 2002
- European Commission, Recommendation on Relevant Markets…susceptible to ex ante Regulation, C(2003)497, February 2003
- European Commission, Recommendation on Relevant Product and Service Markets within the electronic communications sector in accordance with Directive 2002/21/EC of 11/02/2003
- European Commission, Universal Services Directive, 2002/22/EC, March 2002
- European Regulators Group, Common Position on the Approach to Appropriate Remedies in the New Regulatory Framework, ERG (03) 30 Rev1, April 2004.
- Evans and Schmalensee, Some Economic Aspects of Anti trust Analysis in Dynamic Competitive Industries, WP8268, NBER, May 2001
- Farrell J. & Weiser P.J. , Modularity, vertical integration, and open access policies: towards a convergence of antitrust and regulation in the internet age, Harvard Journal of Law & Technology, Volume 17 (1). Fall 2003.
- Federal Communications Committee, Review of Section 251 Unbundling Obligations, NPRM, FCC Rcd 16978, 2003
- Federal Communications Committee, Review of Section 251 Unbundling Obligations, Order on Remand, FCC, 04-290. December 2004
- Gans J. and King S., Access Holidays and the Timing of Infrastructure Investment, University of Melbourne, 2003
- Handbook of Telecommunications Economics, Volume 1, Chapter 13, Elsevier Science, 2002
- Hausman J., Valuing the effect of regulation on new service in telecommunications, Brookings Papers: Microeconomics,1997
- Heaney and Williamson, Reaping the Telecoms Dividend, January 2004
- Indepen and Ovum, Achieving the Lisbon Agenda: the Contribution of ICT, A study for the Brussels Round Table Group, January 2005
- Ofcom, Next Generation Networks – Future arrangements for access and interconnection, November 2004

- Ofcom, Strategic Review of Telecommunications, Phase 2 Consultation Document, November 2004
- OFTA, Review of Type II Interconnect Policy, July 2004
- Ovum, The barriers to competition in the ECNS markets of the EU, December 2003
- Productivity Commission, Telecommunications Competition Regulation Inquiry Report, 20 September 2001
- Schumpeter J., Capitalism, Socialism and Democracy, Harper, 1950
- Williamson B., Commitment and Adaptability in telecommunications regulation, Indepen, October 2004

ECONOMIC ANALYSIS TEAM

The Dutch Independent Post and Telecommunications Authority (OPTA) regulates the postal and telecommunications markets in The Netherlands. OPTA is an independent executive body that commenced its activities on 1 August 1997. OPTA's mission is to stimulate sustained competition in the telecommunications and postal markets. In the event of insufficient choice OPTA protects end-users. OPTA regulates compliance with the legislation and regulations on these markets.

OPTA has committed itself to improving the economic reasoning on which strategic choices are made so that market parties have a clear understanding of what to expect from OPTA now and in the future. In 2003 the OPTA bureau was complemented with the Economic Analysis Team (EAT) headed by the Chief Economist. EAT is responsible for developing economic reasoning and stimulating discussion on key issues within the telecommunications and postal markets. To achieve this, EAT produces two kinds of policy notes - short discussion papers. Economic Policy Notes focus on economic issues and principles. Regulatory Policy notes focus on strategic economic issues in specific regulatory fields.

With its products and activities the Economic Analysis Team expects to add value to the economic debate in Dutch telecoms and post. For further information visit www.opta.nl from where you can download EAT publications.

OPTA

Contact: EAT@opta.nl