Regulation and Innovation in the Telecommunications Industry

Forthcoming Telecommunications Policy

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Abstract

This paper aims to introduce issues that relate regulation and innovation in the telecommunications industry. We try to address the following question: which types of regulatory schemes are likely to promote innovation in a fast-growing telecommunications industry? The first section analyses ex ante control by sector specific regulation and ex post control by competition policies. The second section deals with the importance of compatibility hence regulation of standards in the telecommunications industry. The third section discusses the major issues pertaining to the relation between innovation and pricing on the one hand, and innovation and unbundling on the other.

Keywords: telecommunications, regulation, innovation.

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Introduction

Criteria for long-term economic efficiency embody both dynamic and static efficiency. Static efficiency stands for minimized costs of current production both at the firm level and at the industry level. On the other hand, dynamic (innovative) efficiency reflects demand creation and innovation. Innovation not only improves quality and variety, but also leads to price reductions by the invention of cost reducing new technologies. Among other forms of efficiency -allocative[1] and productive efficiency- dynamic efficiency provides the greatest improvement in social welfare, and thus becomes essential to develop analyses that go beyond the limited concern for consumer welfare.

Recent discussions in the antitrust literature have been identifying dynamic efficiency as the primary concern of antitrust analysis due to its role in generating and/or enhancing economic growth and competitiveness. In order to conclude whether any business conduct is anticompetitive, efficiency arguments should be carefully examined. This so-called notion of "efficiency defense" has been acknowledged both by the literature and the antitrust authorities, and has been applied to cases of mergers and predatory pricing[2] among others. Although innovative efficiency, besides other elements of efficiency defense, has been

[1] Allocative efficiency is tantamount to marginal cost pricing.

[2] Some authors consider that a firm may well price below cost in order to promote a new product, to enter a new market, to reduce costs through learning by doing or to increase the value of its product through network externalities. However, an identifying question is whether below cost pricing would be likewise profitable in the absence of actual and potential competitors. See Bolton et al. (1999).

receiving increasing attention in antitrust policy discussions, very little has been said regarding its potential role in regulatory policies. There is certainly a need for introducing efficiency defense rules to sector specific regulation.

The telecommunications industry is the most dynamic industry among those subject to sector specific regulation.[3] Dynamic industries are characterized by a high speed of innovation. Two types of innovation, namely innovation for new services and innovation for alternative network infrastructures, underlie competition in the telecommunications industry. While innovation for new services is provided mainly by telecommunications operators, equipment suppliers provide most of the innovation for new network technologies. A network innovation in the equipment sector is followed by an adoption process in the telecommunications sector. Operators have to decide whether and when to adopt the new technology. Indeed, an immediate adoption may be costly and risky. Therefore, adoption resembles innovation. In the rest of the paper, innovation will refer to both invention (endogenous innovation) and adoption (exogenous innovation).

Generally, regulation can affect these innovative activities via two different channels. First, price regulations (or more specifically, the regulation of interconnection charges and retail prices) alter industry profits, hence the incentives to innovate. Secondly, both price or entry regulations change the terms of entry, and hence innovation decisions regarding new entry.

One of the main objectives of sector-specific regulation is to ensure an evolution to a self-sustaining pro-competitive market structure in which the firms behave in a competitive manner so that benefits from competition, in terms of lower

[3] Other asymmetrically regulated industries include electricity, railway, etc.

prices, better quality and extended variety of product choice, are attained. Another important objective of regulation is to attain the maximal market growth in terms of both volume and value so that markets achieve both lower costs and new products.

Those two objectives are not mutually exclusive, and they coincide in the long run. However, the former objective applies in particular to the markets in which the incumbent possesses a strong first-mover advantage (e.g. the market for long distance services), whereas the latter is emphasized more in the "new markets" (e.g. mobile telephony services or Internet), in which there is a huge potential for innovation, and technological progress is very rapid. In these new markets, the incumbent does not necessarily hold an installed base advantage.

In order to accomplish these objectives in the telecommunications industry, regulatory policies should consider the dynamic aspects of competition. To the extent that technological changes alter the organization of the industry, speed of innovation - particularly in the new markets- should be reflected in any regulatory intervention. If regulatory authorities cannot respond fast enough to follow the rapid change of the market, many regulatory measures then become either inefficient or obsolete. On the other hand, due to the endogenous relationship between technological progress and industry structure, regulatory policies affect the speed of technological change in return. Insofar as technological changes in the telecommunications industry have substantial externalities on overall economic productivity, there are additional costs associated with regulatory errors.[4]

[4] One important source of regulatory errors may be the difficulty in identifying and defining the relevant markets in high technology industries.

This paper aims to introduce the issues that relate regulation and innovation in the telecommunications industry. Using examples related to regulatory issues, we try to address the following question: which types of regulatory schemes are likely to promote innovation in a fast-growing telecommunications industry? The organization of the paper is as follows: The first section discusses two different types of control that prevail in the telecommunications industry, namely asymmetric regulation and competition policy with respect to their relation to innovation. The second section analyzes regulation of standards and compatibility that are directly linked to incentives for innovation. With its two subsections, Pricing and Unbundling, the third section aims to address innovation questions pertaining to regulation of essential facilities.

Asymmetric Regulation Ex ante vs. Competition Policy Ex post

The present market structure of the telecommunications industry urges some type of control, either by means of sector specific regulation or by competition policy. Asymmetric ex ante regulation[5] aims at preventing the incumbent from abusing its dominant position, held by virtue of its control of the essential facility, the (ubiquitous) local access networks. Any operator who wishes to provide telecommunications services needs to obtain access to this bottleneck which cannot be duplicated by reasonable means. Control on local loops and access switches gives

[5] Ex ante regulation applies asymmetrically to the telecommunications industry. The incumbent is regulated where as its competitors, the entrants, are subject to little or no regulation. A mere example for symmetric regulation is on tariffs for terminating calls.

the incumbent a superior ability to provide new services to those of its potential competitors in a fast growing market. Therefore, asymmetric regulation also serves as a commitment device to attract entry which might not take place otherwise.[6]

Contrary to regulatory policies, competition policies provide ex post control. However, employment of ex ante regulatory measures does not rule out the scope for ex post competition policies. Generally, both measures operate jointly in the telecommunications industry.[7]

This section aims to provide a short discussion of the main differences between ex ante and ex post intervention, and to examine incentives to innovate under the two different types of control mechanisms in more detail.

Apart from their timing, these two types of control mechanisms differ mainly in two aspects. First, regulatory authorities and antitrust authorities are distinct as the former holds superior knowledge with regards both to the regulated firm and the regulated industry, to those held by the latter. In practice, this information is at the disposal of the antitrust authorities, whenever it is requested. However, in the absence of regulatory bodies, antitrust authorities may be ineffective for gathering all the relevant information.

Another important difference is with respect to the policy objectives of the two control mechanisms. As Cave and Crowther (1996) state:

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[6] For example, see Kiessling and Blondeel (1999). Note that, in serving as a commitment device to attract entry, asymmetric regulation should not encourage the entry of inefficient entrants.

[7] An exception is New Zealand, where control on the telecommunications industry is retained exclusively through competition laws.

> "The competitive process is relied upon to provide goods and services at acceptable conditions of price and quality, with only a relatively minimal intervention to correct specific market failures. 'Traditional' regulation, on the other hand has been employed to achieve specifically defined social and political objectives, for instance to impose universal service obligations"

Achievement of these social and political objectives requires a more rigid intervention. On the contrary, the objective of competition policy is rather an "unrestricted" one, and can be achieved by more flexible mechanisms. For that reason, control by competition policies provides a certain degree of freedom for the incumbent firm's business decisions. Due to the difference in the degree of control, one might expect a bias towards over-controlling by ex ante control and bias towards under-controlling by ex post control. It may be possible to eliminate these biases by the joint use of the two types of control mechanisms in certain ways.

Efficiency

Due to the restricted information that the antitrust authorities hold, detection of anticompetitive conduct may be rather difficult. However, once detected, a better assessment of the damages caused by the anticompetitive conduct could be provided relative to the ex ante predictions made by the regulators. Degree of risk aversion of the authorities and the size of the possible damages may limit the use of ex post antitrust control, despite the benefits obtained with greater certainty.

Either of the two mechanisms may provide a more efficient control depending on the relevant market structure. For example one might think that the flexible nature of ex post measures stimulates the incentives to innovate, and hence should be used for the new markets in which the ultimate aim is to promote market growth and the

incumbent has no important dominance. On the other hand, a stricter control by ex ante regulation may be more suitable for the old markets in which abuse of the dominant position by the incumbent should not be tolerated even for the sake of higher market growth.

Innovation

The literature on regulation, in particular for an oligopolistic setting, is inadequate in presenting general results of the effect of ex ante regulation on the incentives for innovation.[8] Among the very few authors who address this issue, Riordan (1992) shows that regulation may slow down technology adoption by making preemptive strategies less attractive. In his model, the incumbent monopolist has incentives to adopt a new technology preemptively to discourage the entry of the rival which possesses a new technology that would enable him to enter the market and reduce monopoly rents. Ex ante price and entry regulations reduce the incentives for preemption strategies and thus slow down technological adoption.[9]

Lyon and Huang (1995) find out that ex ante asymmetric regulation tends to create an environment where only the unregulated firm finds it profitable to

[8] It should be noted that the literature of regulation treats innovation as a cost reducing new technology.

[9] In the telecommunications industry, interconnection regulation may reduce the incumbent's incentives to deploy next generation IP/ATM switches. As Farrel (1997) suggests, the regulator may decide that when an incumbent introduces a new network technology, the "new" network elements are not immediately made available on regulated terms.

innovate.[10] However, tighter regulation of one firm may either speed up or slow down the industry-wide rate of innovation. This is because, while reducing the incentives of the regulated firm to innovate and to imitate a rival's successful new technology, it may facilitate innovation for the rival by making its innovation profitable. They conclude that asymmetric regulation may be desirable in some cases in which efficiency is enhanced when a new technology is adopted by only one firm.[11]

As for the policy implications, such regulatory measures may be desirable when the innovation is subject to high uncertainty and/or is expensive to adopt, but is at the same time easy to imitate so that without restrictions on the incumbent firm neither of the firms would like to innovate. However, to decide whether ex ante asymmetric regulation is socially desirable or not, the regulatory body must possess enough information about the costs and benefits of innovation; the question is then: is this information at its service?

De Fraja (1997) studies the effect of potential entry by unregulated firms to the market on optimal regulatory policy. He argues that entry puts competitive pressure on the incumbent so that prices go down and incentives for cost reduction assume greater significance.[12]

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[10] Lyon and Huang study the following framework. At the beginning, the incumbent and the entrant decide whether to innovate. After that, a firm that has not adopted initially may imitate the leader. Later on, a share of the incumbent's profits may be retained by the regulator.

[11] This is likely to happen when innovation brings up a dramatically cost reducing technology.

[12] However, his study is on the effect of entry to a regulated industry, not on the effect of regulation under oligopolistic competition.

Regulation may induce the incumbent to pursue a more aggressive strategy regarding innovation, as this might be the only strategic choice left for the firm. However, it may well reduce the incentives of the incumbent firm to innovate by reducing the opportunities to extract benefits from its innovation. For the entrants' incentives to innovate a similar indeterminacy prevails, yet for different reasons. Whether it would expand or contract its incentives to innovate would depend on the very type of regulation and the possibilities of imitation.

However, delays created by ex ante regulatory intervention have a relatively straight forward effect on incentives for innovation. These delays are due to the assessment of new products and services that are to be introduced by the incumbent. In most countries, the incumbent should, under given conditions, present new retail tariffs to the regulatory authorities before they are introduced to the market.

In France, the incumbent operator, France Télécom must present new retail tariffs if they belong to the Universal Service Obligation category[13] or whenever there is no competition in the relevant market. The French regulatory authority, ART, assesses the new offer in terms of predatory practices and gives its advice to the Ministry of Telecommunications. The latter takes the final decision. It is rare that the decision of the Ministry opposes that of the ART. ART may approve the offer conditionally with some constraints which would leave room for ex post intervention. In France, the average delay for introduction is about two months.

In the UK, only the services for which the tariff is lower than the relevant fully allocated cost are to be approved by the regulatory authority, Oftel. Contrary to the

[13] This category includes connection fees, monthly rates, tariffs for traffic, tariffs for payphones, tariffs for enquiry services, etc.

French case, Oftel makes the final decision. Nevertheless, the Monopolies and Mergers Commission may intervene in the decision process. In the UK the maximum delay for approval is 90 days and that applies to cases where there is no competition for the service that British Telecom (BT) wants to introduce. The delay is reduced to 28 days when there is competition for the subject service. New Zealand and Australia are the only countries that retain this control exclusively by competition policies.[14]

The regulatory delays, together with the asymmetric nature of ex ante control, provide the entrants with a competitive advantage, even though they may be inefficient. These transitory competitive advantages may have substantial impact on the long run evolution of the market whenever there is a strong first-mover advantage due to the presence of switching costs or strong network externalities. For example, services like access to the Internet or mobile telephony may involve strong network externalities and switching costs. Thus, once the customers are locked-in, it may be costly to move from a less efficient network to a better one. Reluctance to switch to a superior technology may impede incentives for further innovation. Cost of delays and disincentives for innovation may be further increased in fast growing new markets in which there is a large population of unattached customers.

Alternatively, competition policy tries to improve economic welfare via enhanced competition. To achieve competition, it aims to discourage predatory business conduct that results in market dominance. However, it is important to condition the antitrust policies in terms of whether market dominance is achieved by desirable or undesirable means. Penalizing dominance that is a result of innovative

[14] In New Zealand, Part IV of the Commerce Act empowers the Minister of Commerce to control the prices of Telecom New Zealand. However, this power has not been employed recently.

efforts rather than anticompetitive practices can be inefficient, especially in the long run. The inefficiency stems not only from the unrealized innovation in the current period due to fear of ex post intervention, but also from reduced capacity for further development and application of innovation. The scope of this effect is amplified in a dynamic telecommunications industry in which cumulative innovation is vital, and externalities apply to the entire economy.

Nevertheless, under ex post control of the antitrust authorities the incumbent has more flexibility for its business decisions. Higher flexibility gives the incumbent superior incentives with respect to its R&D decisions, in comparison to those induced by ex ante control. Moreover, business conduct that aims at preemption can be punished and hence discouraged by efficient enforcement mechanisms. Any damages that incur to the entrant by the dominant firm's anticompetitive conduct may at least partially be compensated through penalty mechanisms.[15] However the same argument of network externalities and switching costs apply and full compensation might not be feasible.

To conclude, ex post control mechanisms are expected to provide better incentives for innovations, at least to the incumbent firm. Indeed, the delays that ex ante regulation creates hinder incentives for the incumbent to introduce innovative services by facilitating imitation by rival firms. As for new entrants, their incentives to innovate may be stronger under asymmetric innovation. Therefore, there may be a social trade off between innovation by incumbents and innovation by new entrants.

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[15] At this point, it is also important to assure that the antitrust mechanisms effectively prevent strategic litigation abuse by the firms.

Regulating Standards in the Telecommunications Industry

In the telecommunications industry in which significant network externalities prevail, standardization and compatibility issues raise important questions both for regulation and for competition policies. In the presence of network effects, the scope of networks[16] is an important dimension of industry structure, and the degree of compatibility shapes the nature of innovation and price competition.

Obtaining and maintaining compatibility is essential for operators, equipment suppliers, for maintenance of competition, and ultimately for consumers. Incompatible systems reduce the size of the positive benefits that are present due to the network externalities from the market to the product level. A perfectly compatible system of networks prevents static welfare losses which might otherwise arise due to lessened competition and dynamic welfare losses which stem from reduced innovative incentives. Regulation of standards ensures a better competitive environment with a greater variety of products.

In the absence of regulation, firms battle for standard setting unless they voluntarily agree to compete under a given standard. The winner of a battle is not necessarily the most efficient firm as it is the *expectations* which determine the winner.

The firm which has a de facto standard has an incentive to maintain a closed system in order to eliminate competition and keep its dominant position. That is because compatibility eliminates the installed base advantage of the dominant firm.

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[16] Farrell and Katz (1998) define the scope of networks as the set of compatible components in a communications network or the set of substitute components that can share same complements.

Closing up a system is basically manipulating standards or specifications without announcing them, in order to make other parties' systems incompatible, unnecessary, or inferior. The dominant firm may exclude, limit, or delay a rival's access to its standards, either by contractual or technological means.[17]

Innovation

One important way to disrupt compatibility is predatory product innovation. Church and Ware (1998) define predatory product innovation as changing the design attributes or interfaces in the system to make third-party complementary components incompatible. It may occur either by introducing a closed system and keeping it closed, or by introducing an open system which allows second-sourcing third-party provision of complementary products, but then closing out producers of complementary products.

A large installed base serves as an entry barrier to other incompatible systems, and hence creates a tendency for sustained market dominance. Both incentives and ability to deter other incompatible systems are positively correlated with the size of the installed base.

For reasons of predation explained above, *the incumbent may have inefficiently large incentives to innovate*. It should be noted that it is not only the quantity of innovation that matters but the *quality* as well. The quality of innovation may significantly improve when the dominant firm makes its decisions on the basis of economic efficiency, and not in an attempt to maintain its market power.

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[17] For example, dominant firm may introduce frequent changes in design attributes or interfaces in the system, without announcing them.

On the other hand, reduced competition due to incompatibility eliminates incentives for entrants to innovate and produce differentiated but compatible products, as producing a better product may not suffice to attract consumers. Furthermore, the technological pace would slow down due to inhibition of possibilities for subsequent innovation.

However, it is important to note that regulating interoperability is essential for maintaining effective competition *whenever there exists market power or a tendency for market dominance*. For the markets in which there are no distortions due to market dominance or interface control,[18] it might not be necessary to impose interoperability. Moreover, such control in these markets might have some important drawbacks in terms of innovation, as the operator who wishes to keep exclusive provision of its innovative services might be under an incentive to develop innovative and differentiated services. Oftel takes the measure of market power as a key to its approach for defining the new services that should be available for interconnection.[19] Indeed, this measure is generally used to define the degree of regulation (or deregulation).

[18] Interface control is a first mover advantage , and is the ability to influence other operators' decisions on the timing of deployment and the technical specifications of interfaces.

[19] See OFTEL (1998).

Regulating Essential Facilities

Pricing interconnection

Cost based regulatory methods are claimed to fail in promoting both static and dynamic efficiency. They do not provide incentives for firms to invest in process innovations that would lead to lower production costs in the future.

Several authors, namely, Magat (1976), Cabral and Riordan (1989), and Clemenz (1991), show the superiority of price cap regulation[20] over rate of return regulation[21] and other forms of regulation in inducing a higher speed of technical progress. The basic intuition behind these results is as follows: rate of return regulation enables the firm to enjoy some extra profits from its cost reducing activities until the regulatory review. On the other hand, under price cap regulation, the firm enjoys profits if its costs are below the cap, and it can charge the monopoly price and enjoy further profits if it can make a drastic cost reduction. However, in practice, price cap regulation resembles rate of return regulation in some respects. First, even though review periods may be longer under price cap regulation than under rate of return regulation, it is not necessarily always the case. Secondly, the rate of return of the firm under price cap regulation is constrained both upside (through the regulatory review) and downside (because the firm is often assured of a reasonable rate of return).

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[20] Price cap regulation is referred to setting a price ceiling, effective in some future date, below which the firm is flexible to set its price.

[21] Rate of return regulation, corresponds to prices being reviewed at regular intervals and set equal to marginal cost at the time of the review.

Price cap regulation also offers more pricing flexibility to the regulated firm than rate of return regulation. This flexibility enables the regulated firm to introduce innovative retail pricing schemes.

Some authors question the superiority of price cap regulation over rate of return regulation for inducing innovative efforts. For example, Kahn et al. (1999) argue that rate of return regulation offers some incentives for risky investment, because the regulated firm is assured to recover its R&D costs plus a reasonable return. However, it should be noted that R&D expenditures are a measure of input to the innovative process, rather than a measure of innovative output: R&D expenditures may be high and yet lead to few innovations. Moreover, as Cohen and Levin (1989) suggest, R&D expenditures do not properly represent the current flow of resources devoted to innovation.

Price cap achieves higher social welfare and a larger consumer surplus particularly in the long run when innovation is seen as an ongoing process. However, a potential disadvantage of price cap regulation should be noted: it requires more information on technological opportunities than does rate of return regulation. Moreover, price cap regulation gives the regulator substantial discretion over the firm's profitability. This may increase the risk of both regulatory capture and regulatory taking.[22] The regulatory capture (taking) occurs if the regulator overestimates (underestimates) the incumbent's costs.

[22] For the discussion on regulatory capture and regulatory taking, see Laffont and Tirole (2000).

Practice

In 1996, France adopted a price cap regime on a basket of Universal Service Obligation services for two periods: January 1, 1997 to December 31, 1998 (RPI-9% per year) and January 1, 1999 to December 31, 2000 (RPI-4,5% per year). In the UK, the first price cap was introduced in 1984. The period of validity of the current price cap lasts from August 1, 1997 to July 31, 2001 (RPI-4,5% per year). This price cap covers a basket of voice telephony services including monthly line rental and local, national and international calls. It is currently under review by Oftel.[23]

In the US, the FCC replaced rate-of-return regulation of AT&T by price cap regulation in July, 1989. In January, 1991, the FCC introduced price cap regulation schemes for the largest incumbent local exchange carriers.[24] Price cap regulation was

> "designed to mirror the efficiency incentives found in competitive markets [...] by encouraging LECs to move prices for interstate access services to economically efficient levels, to reduce costs, to invest efficiently in new plant and facilities, and to develop and deploy innovative service offerings"[25]

Today, most of the Incumbent Local Exchange Carriers are regulated under a price cap regime.[26] In 1997, the FCC required Local Exchange Carriers (LEC) to reduce

[23] See Oftel (1999a).

[24] See FCC (1990a) and FCC (1990b).

[25] See FCC (1995).

[26] Only some small rural ILECs are still regulated under a rate-of-return regime.

prices for interstate access services by a factor of RPI-6,5% per year from July 1, 1997 to June 30, 2000.[27] Access charges are included in the price cap basket.

While a consensus has been reached upon predominance of price cap regims in the retail markets -both in theory and in practice-, pricing regimes for interconnection still exhibit a divergence. In Europe, only the UK applies a price cap regime. Under BT's Network Charge Control (set by Oftel),[28] BT's network charges are price capped, whereas their provision is not fully competitive.[29] The current network charge control lasts from October 1, 1997 to September 30, 2001. One of the important motives for the countries that continue to implement rate of return schemes is probably the informational requirement of regulatory bodies.

Unlike Europe and the United States, New Zealand has no regulatory authority to control and monitor competition. The setting of interconnection rates is thus left to negotiations between market participants. The Commerce Commission prevents any anticompetitive conduct through the application of the 1986 Commerce Act. In Australia, the Australian Competition and Consumer Commission (ACCC) regulates both the telecommunications access regime and anticompetitive conducts, while the Australian Communications Authority regulates consumer and technical issues. As in New Zealand, the setting of interconnection rates is left to negotiations between operators, with possible resort to the ACCC.

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[27] The X-factor for this period and the next period are currently under review. See FCC (1999a).

[28] See OFTEL (1995), OFTEL (1996) and OFTEL (1997).

[29] BT is required to reduce inflation adjusted network charges by an X-factor of 8 percent annually.

Innovation

Interconnection charges constitute roughly 50% of the total operating expenses for providing telecommunication services. Rate of return regulation prompts uncertainty for potential and actual entrants. Short review periods disadvantage them in engaging in long run business decisions. Consequently, it creates a type of barrier to innovation by increasing uncertainty in the development process. Frequency of regulatory reviews should provide predictability, if not certainty. Furthermore, the entrant firms' downward pressure for the interconnection rates during the regulatory reviews[30] may not harm only the incumbent, but also the investment incentives of other operators who supply interconnection services.

Similarly, if interconnection rates are thought of as an entry-inducing device, new entrants may have little incentive to build market share, since they anticipate that the reductions in the interconnection rates would end up once they reach a given market share. This perverse effect is suspected to have operated in the UK during the duopoly period (1982-1991),[31] and was also recognized by Oftel.[32]

On the other hand, price cap regulation provides entrants with a longer horizon regarding their business plans. For example, in the UK, review of competition and prices for BT's retail and interconnection services are made every four or five years by Oftel. These periods are also judged to be appropriate in providing incentives for cost reducing activities, as discussed formerly.

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[30] This pressure may be carried out by aggressively reduced retail price offers.

[31] See Laffont and Tirole (2000).

[32] See OFTEL (1994).

Price cap regulation provides the incumbent with a greater flexibility on business (pricing) decisions. There is a general expectation that a price cap regime would finally lead to *deregulation*. It might be seen as a stepping stone (or a transitional regime) towards the final stage of deregulated competition. Among other regulatory bodies, Oftel declares its long term policy aim as that of achieving complete deregulation. In particular,

> "Oftel recognizes that regulation may impose costs. It may distort incentives to invest and innovate and therefore work against consumers' interests by denying them choice of supplier and availability of state of the art services. So it is important that regulation should be the minimum necessary to achieve its aim especially in rapidly changing markets as found in the Telecom sector. Controlling prices by regulation in these cases can undermine the incentives to invest in alternatives and reduce choice for customers. In general Oftel only seeks to regulate where the market, left to itself, will not deliver the best outcome for the consumer in both the short and long term"[33]

Farrell (1997) also states the possible long run benefits of deregulation, which are expected to balance its unfavorable short run effects like temporary price rises. The major benefits of deregulated competition are the ones that are related to innovation. Deregulation that is implemented gradually, successfully, and with good timing is claimed to perform better than regulation as it encourages both invention (or adoption) of cost reducing new technologies and new products and services. Deregulation leads to a faster pace of technological progress as it enables firms to

[33] Oftel Stakeholder Discussion Document - Developing a long term strategy to achieve the best deal for telecom customers.

reap the benefits of their innovative activities. Even the price cap regime, which is claimed to provide the best incentives for innovation among other regulatory schemes, may create problems of quality or non-price discrimination.

It is unclear under which conditions deregulation can lead to a self-sustaining competitive market structure. It has also yet to be determined what market structures can be labelled as competitive. In the telecommunications industry, many markets will probably remain as oligopolies.

Many authors agree with the fact that price cap regulation provides incentives for innovation greater than those provided by cost oriented schemes. It can also be argued that a price cap regime may also stimulate the incentives for the entrants who wish to provide interconnection services to build up alternative networks.

Unbundling

Unbundling aims at providing the entrants with access to the local loop. There are typically two different unbundling schemes. First, the incumbent may be mandated to give access to its local copper lines. This option is usually called “raw copper unbundling” or “copper line rental”. New entrants need to upgrade the incumbent's copper lines that they lease in order to deliver high bandwidth services. In the second option, the incumbent upgrades its loop for DSL services itself, or is mandated to do so by the regulator. The incumbent is then required to provide a wholesale interconnection service to other operators. This option is called “bitstream access”.

Technology driven demand (e.g. high speed Internet access) requires advanced access infrastructures. In order to achieve such well-developed infrastructures, the incentives for the development of alternative access networks should not be undermined.

Without unbundling, competitors have limited access to the essential facility which is reached through interconnection. Technical conditions and pricing of interconnection require regulation. However, in many developed countries, the long run target set for the telecommunications industry has been defined as a deregulated competitive industry. Facilities-based competitors can discipline the market power of the incumbent and serve as a stepping stone in achieving this long run target. Therefore, facility based competition in the telecommunications industry is perceived as a necessary condition for long term efficiency. Using possibilities for innovation, entrants are expected to introduce new and better services.

Facility based competition, which leads to efficient investment and adoption of better technologies, can be provided either by the same network infrastructure, or by alternative network structures. Although both contribute to long run efficiency, building up alternative networks is considered to be more effective for competition and innovation purposes. That is so because in any local loop rental scheme, most consumers are attached to a single operator and the range of services is limited with customers not being able to compose their preferred portfolio of services.

On the contrary, if alternative access networks are available, customers may subscribe to different access providers. For the full functioning of competition, it is necessary that each operator control its supply chain to the largest possible extent. The benefits from flexibility and innovation obtainable under this state of affairs exceed by far those achievable under facility sharing settlements.

Unbundling facilitates entry as the firms are enabled to join the market without having incurred huge fixed and sunk costs. Under certain supply conditions, expansion of entry may result in better incentives to invest in alternative network structures in the long run. Among the increased number of actors active in the

telecommunications industry, those with a long term commitment would have an incentive to invest in alternative network structures. Moreover, unbundling enables facility based competitors to get a full coverage and provide services on a nationwide basis. On the other hand, since unbundling facilitates entry and enhances competition in the local loop, it may also undermine the incentives for building alternative networks.

Alternative Network Structures

For the time being, alternative technologies to copper local loops are:

- *Cable networks* - They are used mainly by competitors to deliver narrowband and broadband services to residential customers. Cable networks represent, to date, the best alternative to DSL copper line networks, in particular when the penetration rate is high. In the US, AT&T has spent more than $100 billion to acquire TCI and other cable franchises throughout the country. In Europe, France Télécom has invested a total of $5.5 billion in NTL, now the largest cable telephony and TV company in the UK (with more than 2.8 million customers).
- *Broadband fixed wireless local loop* - Due to an alleged cost advantage, the fixed wireless local loop might represent an ideal solution in competing with the incumbent's local loops. In the US, telecommunications company Winstar has been building a broadband wireless network for business since 1995, which uses the 38 GHz, 28 GHz and other portions of the radio spectrum.[34] In France, two

[34] Winstar announced in January that it had access rights totaling more than 8,000 commercial office buildings.

national wireless local loop licences and two regional licences per region will be awarded by October 2000.

- *Broadband mobile wireless local loop* - The third generation mobile technology (labeled Universal Mobile Telecommunications Services - UMTS - in Europe) will enable operators to offer a new range of mobile services. In France, four UMTS licences will be awarded in 2001. Applicants will go through an administrative process. In the UK, five licences have been awarded in 2000 through an auction.
- *Upgraded cellular mobile networks* - Upgrading of the cellular network (e.g. GPRS upgrade on GSM networks) enables mobile operators to introduce new 'high' bandwidth services (e.g. WAP services).
- *Other alternative technologies* - These include satellite links, fiber networks, and powerline technologies (though possibly with poor future prospects).

Among the new alternative technologies, cable networks, mobile links and satellite links contain the largest fixed and sunk costs, and have relatively larger economies of scale. Cable networks in particular display large economies of scale and also contain large economies of density.[35]

The Practice

In the US, the 1996 Telecommunications Act requires unbundling of network access elements (which include loops, switching, transports and signaling elements) at any technically feasible point in a nondiscriminatory fashion. Kiessling and Blondeel

[35] For a more detailed comparison see Cas (1999).

(1999) discuss the fact that the availability of unbundled network elements that were not essential has harmed competition between alternative network structures. Hausman and Sidak (1999) also claim that with the Local Competition First Report and Order on the Telecommunications Act 1996, the FCC had no serious limiting principle for implementing unbundling rules. In the aftermath of this unlimited unbundling process, the FCC implicitly limited unbundling with the essential facilities by mid 1998. In September 1999, the FCC[36] declined to require incumbent LECs to unbundle DSL access multiplexers.[37]

In the UK, Oftel requires that BT make its local loops available to other operators by July 2001.[38] BT is expected to launch its DSL services by March, 2000. In France, the Ministry in charge of Telecommunications has asked for the unbundling of the local loop to enhance competition for the provision of ADSL services. At the beginning of year 2000, the French Regulator, ART, initiated a working group with industry participants. The objective is to make unbundling available by the end of 2000.

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[36] See FCC (1999b).

[37] The FCC noted: "Given the nascent nature of this market and the desire of the Commission to do nothing to discourage the rapid deployment of advanced services, the Commission declined to impose an obligation on incumbents to provide access to packet switching of DSLAMs at this time. The Commission further noted that competing carriers are aggressively deploying such equipment in order to service this emerging market sector". See FCC (1999c).

[38] See OFTEL (1999b).

Costs and benefits

As DSL services are subject to economies of scale, one important cost of unbundling would be increased average costs. There are also costs associated with co-location and order handling.

The expected benefits are in line with those of a competitive market. First, a competitive environment in which the firms compete for market share is expected to stimulate both the incentives to create more efficient ways of production, and the incentives to innovate differentiated services. Secondly, the increased number of firms would limit the profit margins of the firms with the benefits accruing to consumers in the form of lower prices.

It should be noted that the costs of unbundling are likely to exceed its benefits in low demand areas. Therefore, geographical limitations may provide more efficient outcomes in the unbundling process.

Desirable outcomes of unbundling do not only entail price levels and quality, but also investment[39] incentives as well, which is a key determinant of long-run efficiency. Supply conditions thus assume predominance in the efforts to achieve the desirable outcomes.

Supply Conditions

The optimal price for the local loops would reflect the trade off between the short run benefits from service based competition and long run benefits of improved facility-based competition. A price too low may deter investment in alternative networks, and

[39] Investment stands for a new technology adoption, and is not necessarily the invention of the respective technology.

a price too high would discourage entrants from joining service based competition. The UK and the US employ the LRIC *plus* (Long Run Incremental Cost + *markup to cover common costs*) scheme.

As stated previously, limiting unbundling to certain geographic areas in which duplication of local loops is not feasible might provide more efficient outcomes. Furthermore, as the costs of unbundling tend to exceed its benefits in low demand areas, the focus should be given to high demand areas.

Timing of introducing local loops for leasing is also an important supply condition. "Sunset clauses"[40] and the timing of their introduction may have effects on innovative efforts. Different timetables (and possibly different regulatory regimes) should be introduced for geographical areas with different market structures in order to provide efficient incentives to innovate. In a 1997 decision on local competition, the Canadian Federal Commission (CRTC) determined that unbundling would be mandatory only for essential facilities. According to CRTC, a facility is essential if:

a) it is monopoly controlled,

b) a competitive LEC needs access to the facility to provide services,

c) the facility cannot be duplicated economically or technically.

The Commission stated that local loops in small urban and rural areas were essential facilities, while local loops situated in urban areas were not. Hence, the Commission introduced a "sunset clause" for the latter: after a period of five years, unbundling in

[40] A "sunset clause" specifies ex ante a period of time after which the facilities are no longer unbundled or regulated.

urban areas would no longer be regulated. A sunset clause has also been introduced by Opta, the Dutch regulator.

Innovation

The ultimate aim of the regulator is both to encourage the innovative use of DSL technology to provide different services, and to promote the development of alternative access routes. However, facility based competition seems to be favored over service based competition[41] as innovation leading to alternative network technologies are essential for full competition which would in turn introduce innovation for new services. Entry, which is induced by facilities-based competition, brings forth the adoption of advanced technologies and efficient capital investment. A survey made by Woroch (1998) concludes that facilities-based entry stimulates investment by both incumbents and entrants.

With copper line unbundling, the entrant has access to the same network as the incumbent, and at cost similar to that incurred by the incumbent. The entrant will become capable of introducing services that he was not able to provide previously. This symmetry will induce both parties to invest in innovative, differentiated services. Service based competition will be improved, and the incumbent will have a greater incentive to provide a variety of new services. Social benefits come from improved services, adoption of new and better technologies, and lower prices along with lower costs.

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[41] An example of a service-based competition is reselling the incumbent's service. However, as Riordan points out, resellers act more like distributors than competitors, and they have no independent ability to lower the cost of services or to introduce new services.

Unbundling facilitates entry. The entry barriers due to the large sunk investment costs are no longer more a deterrent factor. Expanded entry may stimulate investment in alternative network access structures in the long run. However, as unbundling makes local loops available to the competitors, the incentives for entrants to build up their own networks may be affected adversely. The prevailing supply conditions will provide a sign of the net effect on investment efforts.

It has been discussed above that in order to achieve effective investment in alternative access networks, it is necessary to limit unbundling to the infrastructure elements that cannot be duplicated in reasonable ways. Unlimited provision of unbundled elements may be inefficient and may destroy the incentives of entrants to develop their own access networks.

When examining the impact of unbundling on the incentives for building alternative access networks, the real option value of local loop rental must be carefully analyzed.[42] Local loop rental of the incumbent's lines can be started and stopped at any time. This is in contrast with direct investment in an alternative infrastructure. Once committed, this investment is mostly irreversible and investment costs are inevitably sunk costs. Facing an uncertain demand, especially when advanced services are at stake, the entrant will prefer to invest in its own network only when market prospects look very promising, or when the real option value of local loop rental is taken into account in the pricing scheme.

[42] For a general account on real options, see Dixit and Pyndick (1994).

The relation between unbundling and the incentives of entrants to innovate is relatively clear. However, incentives for the incumbent will be determined by the pre-entry and post-entry regulation.[43]

Conclusion

In general, ex post control mechanisms provide a greater flexibility for the incumbent's business decisions. The incumbent is expected to engage in more substantial innovative activities compared to those he would exploit in the case of a tighter ex ante control. Ex ante control, and its asymmetric nature may provide inefficient entrants a competitive advantage. This transitory competitive advantage, accompanied by network externalities and switching costs, may have substantial impact on the long run evolution of the market.

Regulating standards in the markets in which there is no (tendency for) market dominance provides the entrants with superior incentives for innovation when compared to a non regulated market of incompatible systems. Compatible systems avoid both static and dynamic losses which come about due to lessened competition and eliminated incentives for innovation, respectively. Under interoperability rules, even though the incumbent might not provide quantitatively improved innovations, the quality is expected to improve significantly. That is because the incumbent that has a quality advantage with a larger installed base in a market with incompatible systems would be no longer willing to engage in preemptive innovation strategies to

[43] With no regulatory framework, the incumbent responds to entry by reducing its capital stock whenever it decides to accommodate entry.

keep its quality advantage. This quality advantage is naturally eliminated when the market operates with compatible systems, and thus rules away the anticompetitive conducts of the incumbent with respect to quality. It is important to note that rules for interoperability might create inefficient outcomes when there is no market dominance. In such markets, regulatory rules may have drawbacks in terms of innovative incentives as firms would like to keep an exclusive provision over their new products and services.

Regulation of pricing of both interconnection and retail services also has important impacts on innovation. Price cap regulation has been argued to provide the best incentives for innovation among all other schemes (e.g. rate of return regulation). Although it is extensively applied to the pricing of retail services, it is not widely used for interconnection pricing, despite its favorable effects on innovative efforts.

Unbundling copper local loops is a relatively new issue. Giving the entrant's access to the local loop it would provoke service based competition by providing equal opportunities to other operators to supply differentiated services. However, it may hinder or encourage incentives to invest in new alternative network structures and the net outcome would depend very much on the conditions of supply.

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