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TILEC Discussion Paper

Structural Separation and Access in Telecommunications Markets

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Short abstract

This paper presents a basic framework that can be used to assess whether mandatory structural separation is desirable in a given market. This framework is illustrated in the context of the market for fixed telecommunications. It can, in principle, also be applied to other industries, such as electricity, post, railways, and financial services (e.g. clearing and settlement). The key question that underlies the case for structural separation is the following: is local access a persistent bottleneck? Only if the answer is yes, does it make sense to compare the costs and benefits of structural separation.

(Extended abstract on next page)

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Extende abstract

Given the growing importance of broadband connections, the demands on local loop unbundling (LLU) are increasing. At the same time, it seems fair to say that LLU is still in its infancy, given that it can potentially be used to target mass segments of markets for fixed telephony. To make LLU a success, regulatory frameworks have been set up to ensure that entrants can get access to key inputs from incumbents. However, incumbents do not have strong incentives to act in a cooperative manner, as it would result in more intense competition. In the light of these incentive problems, questions have been raised about the effectiveness of regulation aiming at the development of LLU-based entry.

It is widely accepted that behavioral regulation, such as regulating wholesale access prices, has its limitations. Therefore, it has been suggested that it might be better to directly change incumbents' incentives, rather than trying to control their behavior. One way to do this is to structurally separate, on a mandatory basis, the regulated firm into monopoly part and a competitive part ('structural separation'). Accordingly, a central question is whether the effectiveness of LLU can be increased in a more drastic way, compared to fine-tuning of current regulatory interventions.

In this paper, I try to provide a perspective on structural separation that is broader than the viewpoint sometimes presented in policy discussions. In particular, I will not weigh the relative costs and benefits of structural separation compared to behavioral regulation. Instead, this paper presents a basic framework that can be used to assess whether mandatory structural separation is desirable in a given market. This framework is illustrated in the context of the market for fixed telecommunications. It can, in principle, also be applied to other industries, such as electricity, post, railways, and financial services (e.g. clearing and settlement). The key question that underlies the case for structural separation is the following: is local access a persistent bottleneck? Only if the answer is yes, does it make sense to compare the costs and benefits of structural separation.

The framework presented in this paper is used to discuss static and dynamic efficiency in telecommunications markets. Particular attention is paid to firms' incentives to invest and innovate, depending on the regulatory regime.

1. Introduction

Telecommunications markets have known great turmoil during the last decade.¹ The ICT bubble of the late 1990s, to a certain extent caused by unrealistic views about the new economy, resulted in misguided strategies and investments. Internet startups blossomed, but many of them failed to deliver on their promises. High-profile growth strategies, for instance based on takeovers abroad, were pursued in the telecommunications industry, but the claimed gains did not materialize. In several European countries, mobile operators bid huge amounts in spectrum auctions for the third generation (3G) of mobile telephony UMTS. Overly optimistic speculations about growth in data communication led to huge investments in long-distance networks (roughly € 200 billion worldwide). After the burst of the bubble, survival was the name of the game. Telecoms firms started restructuring their financial structure, organization and management. At present, most firms in the telecommunications industry seem to be in relatively good shape, ready to return their focus to strategies based on innovation and investment.

In the market for fixed telecommunications, broadband internet access is picking up speed. Fixed telecoms operators upgrade their copper lines to digital subscriber lines (DSL), allowing for high-speed data transfers. In some areas, WiFi 'hotspots' are connected to create a regional local access network.² The second generation (2G) of mobile telephony is very successful, and several operators' recent marketing efforts have been directed towards service packages that include multimedia data communication based on packet-switched technology.³ An example is NTT DoCoMo's *i-mode*, marketed and sold in the Netherlands by KPN. The number of mobile subscribers in the European Union increased from 69 million in 1998 to 306 million in 2003, while the average penetration rate in the EU increased from 18% in 1998 to 81% in 2003.⁴ For an increasing number of consumers, a mobile telephone is an adequate substitute for a fixed connection. Innovative applications of 2G mobile telephony are being implemented, for instance based on data communication combined with the Global Position System (GPS) in transportation and logistics. Mobile operators are warming up for the introduction of third generation (3G). This technology, known as UMTS in Europe, may lead to applications beyond mobile telephony and mobile broadband access, just as the

¹ See, for instance, "Beyond the bubble: A survey of telecoms", *The Economist*, 11 October 2003.

² An example of an apparently successful experiment is discussed in "Wifi evolueert in Leiden", *Computable*, 2003, p. 26-27.

³ Data is split into small packets that are separately transmitted, as is also the case for the Internet.

⁴ European Commission (2003).

short message service (SMS) was an unexpected hit for 2G mobile telephony. In particular, since UMTS allows for high-speed data communication, it can also be used as an alternative for a fixed Internet connection.⁵

Perhaps the major promise of the 1990s was the rollout of local access networks.⁶ In fact, underlying the liberalization of telecommunications markets was the belief that technological progress would end the natural-monopoly nature of the industry. Given the high expectations, however, local network rollout has been disappointing, and at present, there is still only little competition in the 'local loop'. So far, network rollout has been narrowly targeted. While operators found it worthwhile to connect offices in business districts and metropolitan areas, residential customers have hardly been exposed to entrants with their own networks. Residential callers did, however, benefit from entry by firms without their own networks, purchasing capacity from incumbent operators and reselling it to end-users in order to offer voice telephony services (known as 'Carrier Select' services).

Similar to facilities-based entry (i.e., based on network rollout), entry based on 'local loop unbundling' (LLU) has not demonstrated the growth that was initially expected.^{7 8} At present, it seems most promising as a means for entrants to offer broadband Internet access based on DSL technology. Given the growing importance of broadband connections, the demands on LLU are increasing. At the same time, it seems fair to say that LLU is still in its infancy, given that it can potentially be used to target mass segments of markets for fixed telephony.

To make LLU a success, regulatory frameworks have been set up to ensure that entrants can get access to key inputs from incumbents. However, incumbents do not have strong incentives to act in a cooperative manner, as it would result in more intense competition.

⁵ UMTS modems are expected to be twice as fast as GPRS, approaching the speed of current DSL-based technologies.

⁶ Local access networks, also known as customer access networks, connect end-users' devices to local switches. The transmission medium typically consists of wire (e.g. copper wire or optical fibre) or radio spectrum.

⁷ Unbundling of the incumbent's local access network allows entrants to lease the incumbent's local lines in order to get access to end-users.

⁸ It is important to note that if the success of LLU has been limited, this is largely in comparison to policy makers' initial expectations. In general, there exists no objective benchmark to assess the timeliness and speed of adoption of new technologies. Instead of regulatory ineffectiveness, the slow pick-up of LLU might just as well be due to well-informed business decisions.

In the light of these incentive problems, questions have been raised about the effectiveness of regulation aiming at the development of LLU-based entry.⁹

It is widely accepted that behavioral regulation, such as regulating wholesale access prices, has its limitations.¹⁰ For instance, regulators are not perfectly informed about incumbents' cost levels, information which is needed to select optimal regulated prices. Also, designing regulation is a complex matter, requiring substantial time and effort without guaranteeing that regulatory interventions are optimal. Therefore, it has been suggested that it might be better to directly change incumbents' incentives, rather than trying to control their behavior (see e.g. OECD, 2002, for an overview). One way to do this is to structurally separate, on a mandatory basis, the regulated firm into monopoly part and a competitive part ('structural separation'). Accordingly, given the limitations of behavioral regulation, a central question is whether the effectiveness of LLU can be increased in a more drastic way, compared to fine-tuning of current regulatory interventions.

In this paper, I try to provide a perspective on structural separation that is broader than the viewpoint sometimes presented in policy discussions. In particular, I will not weigh the relative costs and benefits of structural separation compared to behavioral regulation. Instead, I will argue that before deciding on the introduction of structural separation, a crucial question needs to be addressed first: is local access a persistent bottleneck?

A closely related paper is Crandall and Sidak (2002), who discuss several cases of structural separation in the US. They argue that (mandatory) structural separation leads to substantial costs in terms of forgone coordination benefits and economies of scope. In their view, based on empirical observation in the US, the observed failures of entrants flow from defects in their own strategies, rather than from anticompetitive behavior. Furthermore, they argue that structural separation is harmful for consumers and investments. Also related is Cave (2003), discussing structural separation in the context of postal markets and presenting a somewhat different decision tree that assesses the case for structural separation. The literature on access and investment incentives is also closely related to this paper, see, for instance, Cave and Vogelsang (2002) and Valletti (2002).

The structure of this paper is as follows. Section 2 provides the conceptual starting points of the paper. First, it presents a simple definition of structural separation that is useful for

⁹ See, for instance, the publications by OECD in the list of references.

¹⁰ See, for instance, Laffont and Tirole (2000).

the purposes of this paper. Next, it briefly discusses the costs and benefits of structural separation. Third, on a stylized level it presents different modes of entry and competition, and discusses their welfare implications both in the short and the long run. Based on these starting points, Section 3 provides a rudimentary framework to assess whether structural separation is an option (from a welfare point-of-view). Section 4 concludes the paper with a brief summary and a personal outlook on the telecommunications industry.

2. Structural separation: the broader picture

2.1 What is structural separation?

There are many definitions of structural separation, ranging from setting up 'Chinese walls' between monopoly parts and competitive parts (leading to accounting separation), to 'physically' breaking up a company into parts without ties between them (leading to full ownership separation). OECD (2003) contains an extensive overview of different modes of separation.

For the purposes of this paper, a rather rudimentary, generic notion of structural separation will be used. According to this definition, the incumbent is split into:¹¹

- a company owning the local access network, providing wholesale access ('LoopCo');
- the rest of the company, owning the long-distance backbone and providing retail services ('NetCo').

The central idea of this stylized definition is that the incumbent's retail operations are put in a position similar to that of LLU-based entrants. Accordingly, NetCo leases local lines from LoopCo, just like LLU-based entrants. Based on this new constellation, one can discuss the costs and benefits of separation.

Structural separation has several potential or claimed benefits and costs. Crandall and Sidak (2002) and OECD (2003) contain extensive discussions on this topic. In this subsection, I will give a brief overview, which is not meant to be exhaustive or complete.

The main benefit, which was already mentioned in the Introduction, is non-discriminatory access for all operators without local networks. Separation eliminates both the ability and

¹¹ This definition is also discussed in "Beyond the bubble: A survey of telecoms", *The Economist*, 11 October 2003.

the incentives to restrict competition in the downstream market. In particular, it eliminates the incumbent's incentives and possibilities, whether legal, economic or technical, to raise the costs of its rival firms by reducing quality or increasing the cost of access. This increases the intensity of competition, and may ultimately lead to lower prices for end-users. On a more general level, the scope for anticompetitive practices, for instance on the market for broadband Internet access, may be reduced.¹²

Structural separation helps to prevent cross-subsidization and makes reliable cost information about the incumbent's non-competitive activities more readily available. Ultimately, the idea is that regulation becomes much simpler and effective, and less costly. Not only are firms that are not vertically integrated easier to monitor, anticompetitive behavior is much less likely to occur.

There are also many potential and claimed costs and disadvantages to structural separation. In itself it is a very drastic and costly intervention, while there is no guarantee that it will lead to the desired outcome. In particular, it is uncertain if regulation will really become more effective and simple. The incumbent faces a substantial cost to reorganize, a cost that will ultimately be passed on to end-users.

Separating a vertically integrated operator eliminates the coordination benefits, as well as the economies of scale and scope, that accrue from vertical integration. For example, coordinating investments in the network between the new (separated) parties may become problematic, given that innovations in services may require investments in competitive as well as non-competitive activities.

Given that separation is a costly and time-consuming affair, it may raise the cost level of the incumbent operator. As a result, entrants become relatively – but not intrinsically – more competitive. Thus, structural separation on the one hand eliminates the possibilities to raise rivals' costs, but on the other hand introduces new possibilities to do so.

Finally, the decision to split up an incumbent forces policy makers to address many complex questions. Some examples are the following: Exactly which form of separation is optimal? Should LoopCo, the local access monopolist, be a privately or a publicly owned company?

It will be clear that making a cost-benefit analysis in a given situation, will neither be easy nor lead to a simple, unambiguous result. As noted in OECD (2003):

¹² According to Crandall and Sidak (2002), this is a non-existent problem.

“The benefits of structural separation are uncertain while the costs potentially large”. (OECD, 2003, p. 29.)

An important question, however, is under which conditions one should go through such an analysis in the first place.

2.2 The broader picture

Should policy makers simply weigh the costs and benefits of structural separation, and based on the outcome, decide whether to go through with it, or is there more to it? Given the potential costs and uncertainties that were discussed in the previous subsection, one should at least think twice, and first explore the possibilities for improving the current regulatory regime. More importantly, however, is the fact that structural separation will not undo the bottleneck status – if any – of local access. Therefore, before initiating a cost-benefit analysis, one should assess exactly under which conditions structural separation makes sense in the first place.

A central question that underlies privatization, liberalization, and more specific structural policy interventions such as separation, is whether competition, and what type of competition, is possible at all in the market for fixed telephony. Do we just have to wait some more years before we can observe fullfledged competition between operators with their own networks? Or will some parts of the market always remain monopolies despite attempts by regulators to introduce competition? To discuss the possibilities for competition, one must therefore distinguish different modes of entry and competition.

On a stylized level, one can distinguish three entry modes in the market for fixed telecommunications:

- Facilities-based entry: entrants roll out their own networks, including local access networks.
- LLU-based entry: entrants (who may roll out their own long-distance networks) lease local connections from the incumbent.
- Carrier Select-based entry: entrants (who may roll out their own long-distance networks) purchase originating access from the incumbent to allow their customers to originate calls.

Whereas facilities-based entry implies complete network rollout, 'pure' cases of LLU-based entry and Carrier Select-based entry would involve partial or no infrastructure investment with regard to local access networks.¹³ Hence, the latter two entry modes can be grouped together under the label 'access-based' entry, although this common label does not do justice to the possibility that such entrants may actually invest a lot in their networks, for instance at the long-distance level, or rather selectively (targeting particular users) at the local level. One should therefore be aware that the distinction above does not explicitly recognize the wide variety in entry opportunities that can be observed in the real world. Observed entry strategies include, for instance, combinations of network rollout in metropolitan areas aimed at business customers and LLU-based access to residential end-users.

In a recent speech, the European Commissioner for Competition Policy, Mario Monti (2003), warned against phrasing the discussion in terms of facilities-based versus access-based competition:

"The debate, it seems, is between those who advocate a facilities-based model of competition on one side, and those who advocate a model of competition based on access on the other side."

(Written version of Monti, 2003, which may be different from delivered speech; emphasis in the original.)

Furthermore,

"[...] I believe that there is not necessarily a contradiction between access-based and facilities-based competition. Competition would never be able to develop, in the short term, if entrants were not able to gain access to the incumbent operator's network to start offering services."

(Monti, 2003; emphasis by PdB.)

Monti is, of course, correct in pointing out there is not always a black-and-white distinction. In fact, an optimal access regime typically takes into account that in an infant market, entrants lack customer awareness and a reputable track record for providing quality high-quality services (De Bijl and Peitz, 2002). Nevertheless, distinguishing different entry modes can be very useful, and is probably necessary, to structure the discussion in terms of fine-tuning regulation that takes into account entrants' incentives to

¹³ LLU-based entry typically involves more investment than Carrier Select, because of the necessary technical adaptations at the level of local switches.

invest.¹⁴ Indeed, the benefit of distinguishing different types of entry seems to be confirmed in the following remark by Monti:

"However, it must also be that, in the longer term, the regulatory framework should privilege operators which base their competitive advantage on building their own infrastructure, simply because they are those who are likely to best improve the competitive conditions of the market."

(Monti, 2003.)

Accordingly, to design a regulatory framework that over time increases entrants' incentives for network rollout, one should not ignore that entrants may lean stronger towards access-based operations or towards a strategy aiming at building their own infrastructure.¹⁵ In particular, which type of strategy an entrant follows will heavily depend on the regulatory regime in the first place.

As a helpful thought experiment, let me therefore discuss the welfare implications of different entry modes, although the reader should keep in mind that this is an abstraction. First of all, facilities-based entry results, by definition, in 'infrastructure competition' (or 'network competition'), whereas access-based entry leads to 'services competition'.¹⁶ The former type of competition implies that competitors have their own (local) infrastructure. The latter one implies that entrants offer services to end-users but do not have their own networks.

Arguably, infrastructure competition is superior to services competition since it results in a level playing field between incumbent and entrants, allows for more innovation by entrants, and does not erode incumbents' incentives to upgrade and maintain their own networks, as there is no 'free riding'. As a consequence, infrastructure competition leads to a higher welfare level, especially in the longer run: dynamic efficiency is increased. Network rollout takes time, though, so that the benefits for consumers do not materialize immediately. The emergence of successful operators may take, say, five to ten years, while the Schumpeterian process of 'creative destruction' can lead to victims along the way. Thus, patience and determination from politicians, policy makers and regulators are required. Regulators, in addition, must actively make themselves redundant over time, for

¹⁴ See, for instance, De Bijl and Peitz (2002) and Valletti (2002), for analyses and discussions of access and retail regulation in different entry modes..

¹⁵ See Cave and Vogelsang (2002) for the regulatory notion of 'eligibility'.

¹⁶ See also Cave and Vogelsang (2002) for a discussion on infrastructure and services competition. De Bijl, van Damme and Larouche (2003) discuss the welfare implications of network and services competition in postal markets.

example by committing to 'sunset clauses'. From a political economy viewpoint, this may not happen automatically.

Services competition, on the other hand, results relatively quickly in intensified competition and hence lower prices for consumers. This is good for static efficiency in the short run. Drawbacks are, first, that little effort and commitment – both in terms of innovation and investment – are required from entrants, and second, that entrants depend heavily on regulation. Resale or access-based business models may also limit the scope for innovation by entrants, since the incumbent's existing infrastructure is restrictive (in terms of technological possibilities and efficiency levels) compared to a network that is designed from scratch. Crandall and Sidak (2002) argue, based on empirical observations in the US, that entrants that build their own networks are more likely to generate revenues and survive than entrants that rely on access.

"Several of the more successful CLECs [competitive local exchange carriers, i.e., entrants] combined resale and the leasing of unbundled network elements with the construction of their own networks, but none of these firms relies exclusively on UNEs [unbundled network elements] or resale and these firms added more facilities-based elements over time to improve upon the product that the ILECs [incumbent local exchange carriers] offer."

(Crandall and Sidak, 2002, p. 398; additions between square brackets by PdB.)

Services competition may therefore lead to lower dynamic efficiency, compared to network competition. Moreover, withdrawing an open access regime can easily force entrants that focus on reselling and marketing telephony services to leave the market. In other words, services competition not only requires that a heavy apparatus of fine-tuned, asymmetric access regulation remains in place, but also tends to lead to an unsustainable form of competition.

The stylized comparison between network competition and services competition naturally raises the question whether market characteristics are such that network competition is feasible. In general, this is the case if the economies of scale and scope, and also the cost characteristics of network elements, make it possible that two or more firms, each one with its own facilities, can co-exist in a competitive market. Thus, the market may by definition be a natural monopoly, but only to a certain extent, since competition is viable. For example, postal markets are, to some extent, natural monopolies, but without substantial sunk costs that result in bottlenecks. Experience in several countries demonstrates that facilities-based competition is a realistic option in postal markets (De

Bijl, van Damme and Larouche, 2003). This is quite different in the markets for electricity and gas, where economies of scale and sunk costs of the distribution network do not allow for more than one firm being active in distribution. Later I will come back to the question whether network competition is feasible in the market for fixed telecommunications.

To conclude, the bottom line of the discussion above is that in general, infrastructure competition is superior to services competition. The question is whether it is feasible. The key to answer this question is an assesment of the bottleneck-nature of local access. An input to a production process, such as a certain part of a network, is a bottleneck – or equivalently, a monopolistic bottleneck, or an essential facility – if it is essential to provide services to end-users, and it cannot be economically reproduced, typically because of substantial sunk costs (see Knieps, 2002).¹⁷

It is crucial to distinguish bottlenecks from natural entry barriers, such as economies of scale and scope. Many, if not most, markets share natural-monopoly characteristics, but this does not imply that there are bottlenecks. An example is the postal market, in which sorting and distribution involves substantial economies of scale. Nevertheless, there are no significant sunk costs in postal markets, so that there is no bottleneck.¹⁸

3. Persistent bottlenecks

From the reasoning in the previous section, it follows that there is no need for structural separation if the market allows for network competition (i.e. competition resulting from facilities-based entry). Formulated in another way, structural separation makes sense only if local access is a bottleneck. Since technological change may eliminate the bottleneck nature of certain network elements, one should add the condition that bottlenecks will (i.e. are expected to) remain persistent. The latter condition is especially relevant in telecommunications, a market which is characterized by rapid technological change.

The presence of a persistent bottleneck is not sufficient to make a case for structural separation, since a first check should be to assess why current regulatory regime is not effective. Since separation is a costly and risky intervention, improvement of current regulation should always be the first step. A practical problem is that there may not be a

¹⁷ A bottleneck is by definition a monopolistic bottleneck.

¹⁸ See Knieps (2002) and De Bijl, van Damme and Larouche (2003).

good benchmark. How can one assess whether the effectiveness of regulation can be improved? Hopefully, experience in other countries provides help, but still, for the best-in-class country there is no comparison available.

If local access is a persistent bottleneck and there are no ways to improve regulatory regime, then structural separation can be an option. Whether one should pursue in that direction should, of course, depend on a cost-benefit analysis. Figure 3.1 summarizes the policy maker's decision problem.¹⁹

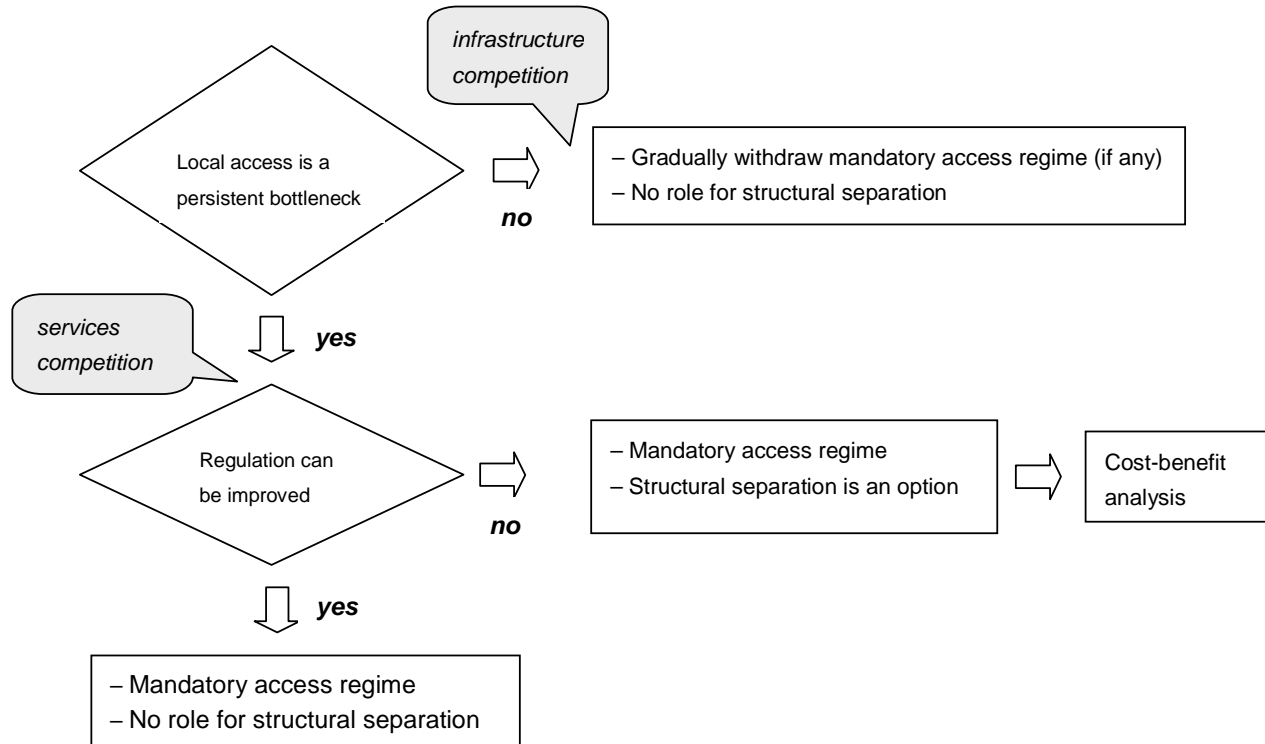


Figure 3.1: Structural separation yes or no?

¹⁹ See Cave (2003) for a somewhat different framework. The Ministry of Economic Affairs in the Netherlands (2000) also published a related decision framework, although with different implications.

Figure 3.1 illustrates that the key issue is the assessment of the bottleneck-nature of local access. Such an assessment may not be easy, unfortunately, as it depends on a range of different parameters. The most important one is perhaps the cost structure of local access. If the investment for network rollout are substantial and involve a large sunk cost, then it is more likely that there is a bottleneck. Cost characteristics do not exist in a vacuum, though. They depend to a large extent on the population density and geographical characteristics. For instance, rolling out a local access network typically involves less costs (per end-user) in a metropolitan area, where consumers are located closely to one another, than in a rural area. Furthermore, the willingness to pay and nature of demand for telecommunications services determines the future revenues from the investment. Since business customers usually require more services and demand higher 'quantities' than residential customers, investing in a network will not be equally attractive for different segments of the market. Furthermore, local access based on existing technologies may happen to be a bottleneck now, but technological change may drastically change the cost characteristics of local access networks. In fact, such technologies already exist, think for instance of wireless networks. In the following section I will come back to this issue.

Besides cost, demand and technological characteristics, also the institutional environment can have an important impact on the feasibility of network competition. In particular, the goals, views and beliefs of policy makers and regulators, and how they translate into current and (expected) future access regimes, are crucial for the investment climate. For instance, Hennis and Zelner (2001) find, in an empirical study, that a low level of infrastructure deployment in a country may not mean that the market potential has remained untapped, but rather indicates a substantial risk of expropriation by the government. Within the context of this paper, the regulatory regime may prevent firms from investing in network rollout. Suppose, for example, that facilities-based entry is, in principle, profitable for entrants. If the regulator enforces a mandatory access regime combined with artificially low access prices, then entrants lose their incentives to roll out networks themselves. Thus, if the regulator believes that network competition is not feasible, and for that reason imposes network access at low access prices, then the belief of the regulator becomes a self-fulfilling prophecy. In addition, a regulator may want to stimulate services competition independent of the existence of bottlenecks, in order to show that regulation is effective in the short run. More generally, whether a regulator wants to promote competition, secure low prices for consumers, or encourage the rapid deployment of infrastructure will indirectly be an important determinant for operators' incentives to invest.

Crandall and Sidak (2002) argue that in the US, investments by entrants in residential areas have occurred at a slower rate than in business areas because of regulatory distortions. In particular, mandatory unbundling at artificially low prices encourage entrants to rely on incumbents' facilities, and to 'wait and see' before investing. These empirical observations confirm that mandatory access may distort firms' investment decisions.

Although it is outside the scope of this paper to present a complete framework for the identification of bottlenecks, the discussion above provides several guidelines for analysis. First, unsegmented structural separation can never be fully effective, as it ignores fundamental differences that may exist across segments. In particular, one should distinguish segments according to population density, geographical characteristics, and different customer types (e.g. corporate and residential customers). It is likely that any assessment of bottlenecks will depend on the characteristics of the segments. The importance of geography suggests that structural separation may be an option in some areas but not in others, resulting in regional LoopCos. The extent to which regionally limited structural separation is technically feasible is another question.

Second, since the bottleneck-nature is intertwined with policy and regulatory choices, one has to neutralize feedback effects by conceptualizing a hypothetical regime without mandatory access. This thought experiment, in which entry based on resale is ruled out by definition, provides a useful starting point for the analysis. It allows one to filter out policy-makers' and regulators' beliefs about the feasibility of network competition, as well as their goals (e.g. to stimulate services competition in the short run).

Finally, the way in which the market is defined will have important implications for the assessment. According to Crandall and Sidak (2002), one should not restrict the boundaries of the market to the delivery of narrowband applications (such as voice telephony). The reason is that technological change and convergence expand the market to a state in which media and Internet companies become competitors.

4. Conclusion

Investing in telecommunications assets is relatively risky. Think, for instance, of the unpredictability of demand (both in quantity and in nature), and about the high speed of technological change in ICT industries. Should policy makers try to reduce the risks faced by firms and investors? It will be obvious that it is socially optimal to reduce regulatory

uncertainty to the minimum by creating a transparent and predictable regulatory environment. Nevertheless, interfering with the intrinsic risks of new technologies is likely to distort firms' incentives to invest and enter new markets. This can be detrimental to social welfare.

Since network rollout takes considerable time and entrants initially lack a track record for quality, open access regimes and asymmetric access regulation are useful in infant industries. However, superimposing a market structure for the longer run may be counterproductive. In particular, prolonged facilitation of resale-based entry may limit the options for entry and hence enforce existing monopolies. The potential damage of such intervention can be quite large in industries with fast technological change where the nature of future winning technologies is unknown.

This paper underscores the key issue that underlies the case for structural separation, which is the question whether there is a persistent bottleneck with respect to local access. Since the answer expectedly depends on cost and demand characteristics of different market segments, a simple and single answer may not exist. Moreover, the answer is interdependent with policy and regulatory views, beliefs and choices. For segments with persistent bottlenecks, structural separation may be an option, so that a cost-benefit analysis will be a natural step to follow, under the condition that the effectiveness of the current regulatory regime cannot be improved.

The basic framework (figure 3.1) that summarizes the main decisions to be made with regard to structural separation, applies, in principle, to any industry. Other network industries, such as electricity, railways and post immediately come to mind. Post, for instance, is not characterized by bottlenecks, so it does not lend itself to access regulation or structural separation. An application that is perhaps less obvious, but nonetheless very relevant at present (see European Commission, 2002), is provided by the market for national and international clearing and settlement of securities transactions. In these markets, the 'book entry' function of securities depositories has characteristics of a natural monopoly. Even though book entry is a relatively straightforward and low-cost operation, it can be seen as a bottleneck.²⁰ Because of these characteristics, it may be socially optimal to separate this bottleneck element from the competitive parts involved in clearing and settlement, and create a central European securities depository that performs the book entry function at a regulated price. The international central securities depositories that currently provide this function as part of a

²⁰ See Milne (2002).

bundle of clearing and settlement services, would then only be active in the markets for competitive services related to securities trade.

To conclude, I will provide a personal (and therefore subjective) outlook on the telecommunications industry. It seems beyond controversy that local access will become more important for economic activity. Think, for instance, of the Internet, e-commerce, and flexible homeworking to combat traffic jams. Thinking ahead five to ten years, I expect that local access will not remain a bottleneck, at least not in most market segments. At present, there already exist various alternative technologies to the traditional copper lines of incumbents. Examples include cable, the third generation of mobile telephony, WiFi (in particular if hotspots are connected to create a local network), and wireless local loop. In many cases, cable and mobile telephony already provide substitutes for end-users in the market for fixed telephony. More generally, while not all of the examples mentioned above have already been introduced or adopted, but there is no reason to expect that none of them will become a serious alternative. Also, if firms do not invest themselves, end-users may take initiative themselves, such as the development of a community-based network of connected WiFi hotspots.

Accordingly, infrastructure competition – which is, from a welfare viewpoint, superior to services competition – seems feasible in telecommunications markets in the foreseeable future. Therefore mandatory access regimes should gradually be withdrawn, so that entrants' incentives to invest in local access networks are restored. Since some segments of the market (e.g. residential customers in remote, rural areas) may always remain devoid of facilities-based competition, universal service obligations will probably remain necessary.

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