# BROADBAND STRATEGIES IN THIN MILIEUX: COMPARING NORDIC EXPERIENCES

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## ABSTRACT

Broadband infrastructures with a high transmission capacity are seen as a key precondition for the development of an information society, and therefore, their supply and availability have become important issues in public policies. The paper analyses the policy strategies applied in Finland and Sweden for promoting territorial rollout of broadband infrastructures. The experiences of these two countries can be seen to be of scientific interest and political relevance especially for the following two reasons: Both countries have been forerunners in the development of information society in general, and telecommunications in particular. Secondly, these two countries are sparsely populated, which is a most relevant conditioning factor in the rollout of broadband infrastructures characterised by nodal features. Despite the above-mentioned similarities of the two countries, they have applied quite different strategies in the rollout of broadband. In Sweden, the public sector has taken a more interventionist role than in Finland. This implies the question whether and how this difference can be seen in the territoriality of broadband supply. The paper attempts to answer this question, and provide conclusions for effective policy strategies. The paper is an outgrowth of the ESPON (European Spatial Planning Observation Network) project 1.2.2 “Telecommunications Services and Networks: Territorial Trends and Basic Supply of Infrastructure for Territorial Cohesion” (see: http://www.espon.lu).

# 1 INTRODUCTION

Broadband connections with a high transmission capacity are commonly seen to form the key infrastructure of Internet connections, and also of an information society. For this reason, public organisations at various levels - from the European Union to individual municipalities - have shown keen interest in their development.

The present paper investigates broadband policies in Finland and Sweden with a special reference to the geographical coverage of this new network infrastructure. The comparative setting is interesting from an academic point of view, and also due to its policy relevance. Both these countries are seen in the spearhead of information societies in general, and they have a considerable technological capacity in the IT sector. Yet they have chosen quite different policy approaches with respect to broadband. In Finland, the role of markets in the supply of broadband is emphasised, whereas the Swedish approach relies more on the public sector. Here, the contrast between Finland and Sweden is especially striking due to the fact that these countries have much in common in their policy and planning traditions, and both are characterised by scattered settlement structures with a low number of potential customers in the rollout of broadband. This implies a comparative - even quasi-experimental - setting, which is analysed in the following: Why have the two countries chosen different policy strategies? How have their strategies been implemented, and which differences are visible in the actual supply of broadband? And finally: are there any lessons to be learnt on how to advance broadband in the most effective way in the conditions of thin demand in sparsely populated areas?

It should be noted that broadband is not a well-established term, and its different interpretations have to be taken into account also in the present comparison. In the Finnish policy context, as usually in literature on the topic, broadband is understood as a wide umbrella concept, covering a spectrum of different transmission technologies with a capacity upwards from 256 kb/s, and based on a fixed monthly fee. In contrast, the Swedish IT Infrastructure Commission, which investigated the accessibility of advanced information and communications technology infrastructure in a regional and social perspective, defined only a transmission capacity of at least 2 Mb/s in both directions as a broadband (SOU 1999:85, 14). This conceptual difference has important implications for the choice of technologies and

policies. For the present purposes, it is worth special attention that existing fixed telephone lines can be utilised in supplying broadband with a lower transmission capacity (ADSL). This links the broadband market closely with market for telecommunications.

Another important qualification concerns the scope of the present investigation. It is clear that the availability of information transmission infrastructures with a sufficiently high capacity is only one of the factors having influence on the development of information society in general, and the use of Internet in particular. In the present paper, however, various lines of action in developing information societies – and overcoming the digital divide - are discussed only as contextual factors: the focus is on the rollout of broadband infrastructures.

Clearly, the public sector can utilise several instruments in broadband policies, including direct investments, regulation and competition policy, public demand for infrastructures, and various training and development initiatives (for a more detailed discussion: see Steineke 2003). Here, the investigation is confined to the setting investments (including investment subsidies) vis-à-vis market regulation by means competition policies, which will be analysed in the market failure framework. This focus is well-grounded due to the fact that as leading information society countries, both Finland and Sweden have actively developed public sector demand for high-capacity data transmission, and also implemented a large number of various training and developments initiatives. Essentially, the difference in their policy strategies boils down to the classical dichotomy: policy-led vs. market-driven development.

This paper is structured as follows: Section 2 discusses market failure in the supply of broadband, with special reference to low demand in sparsely populated areas, in “thin milieux”. In Section 3, the Finnish and Swedish telecommunication policies and broadband strategies are introduced, and the aims and effectiveness of these national strategies are compared. In Section 4, the two main policy options aiming for broader territorial broadband supply on the local level are evaluated. Finally, Section 5 provides conclusions rising from this analysis.

## 2 MARKET FAILURE IN TELECOMMUNICATIONS

The telecommunications markets were historically formed of natural monopolies because of large fixed costs, and universal service obligations were imposed on incumbent operators. The aim was to increase the provision of a service to areas and regions, which were not attractive in market conditions. The operator financed the provision of telecommunications services in non-profitable areas by cross-subsidies.

The economic justification for a universal service obligation is market failure, meaning that the market fails to reach a socially optimal situation because of, for example, imperfect competition, missing markets or externalities. In telecommunications, the main reasons behind regulatory actions are natural monopoly situations, network externalities and universal service (equity) reasons (Faulhaber and Hogendorn, 2000). Figure 1 illustrates the telecommunications market failure.

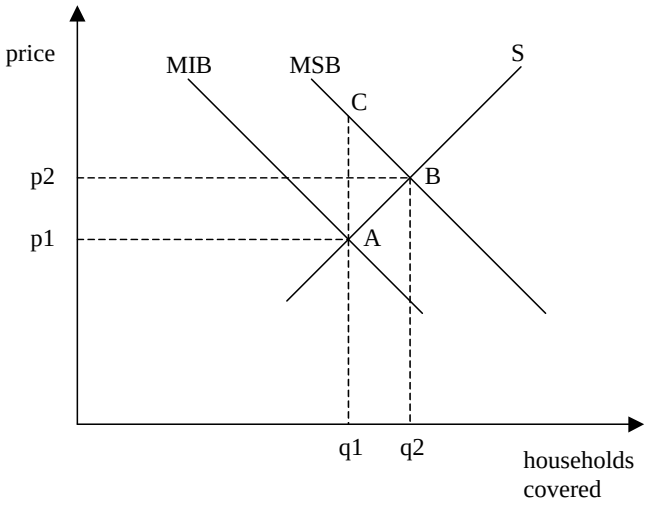


Figure 1. Market failure in telecommunications.

In Figure 1, MIB represents an individual's marginal benefit of subscribing to a telecommunications service, and forms the demand curve of an individual. MSB is the marginal social benefit of the society, and S depicts supply. As it can be seen, in this situation the society's benefit is greater than the individual's benefit. This is due to the above mentioned reasons why the market fails to provide a social optimum: The market settles at point A with only q1 households covered, even though the socially desirable situation would be point B, with a household coverage of q2. As a result, the welfare loss is ABC.

The question is how to reach the social optimum household coverage of q2? This may be done in the following two ways, which are not exclusive. Firstly, the market outcome can be manipulated by increasing an individual's demand, i.e. increasing the benefit of an individual subscriber. Secondly, the supply can be upgraded by lowering the operator's cost by a tax subsidy or cross-subsidy.

The possible measures aiming at shifting curve MIB towards MSB include the improvement of individual's motivation and skills, for instance by providing more useful content and/or a lower price, and education. (Viherä 1999) Also network externalities tend to increase the motivation of an individual subscriber, as (s)he gets more utility when there are more subscribers.

The measures for increasing supply aim at providing better access possibilities for individuals. The costs of an operator, which form its supply curve, might be cut down by subsidies. Traditionally, incumbent operators used cross-subsidies for meeting the universal service obligation, but placing such an obligation on one operator is not applicable in a competitive environment. However, a government still faces the problem of how to extend services beyond the market-based supply, and how to finance this extension (Wellenius, 2000). For instance, it can subsidise an operator's investments, which would shift the supply curve as depicted in Figure 2.

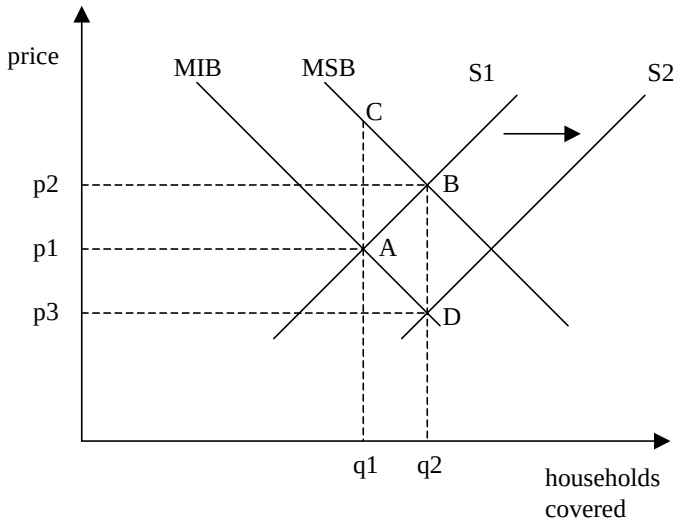


Figure 2. Correcting market failure by supply increasing measures.

Figures 1 and 2 present a static view. In the real world, an operator´s costs usually decline, and demand increases, with time. This has obvious implications for the problem of a market failure: one has to ask whether time will correct it. This dynamic setting is illustrated in Figure 3.

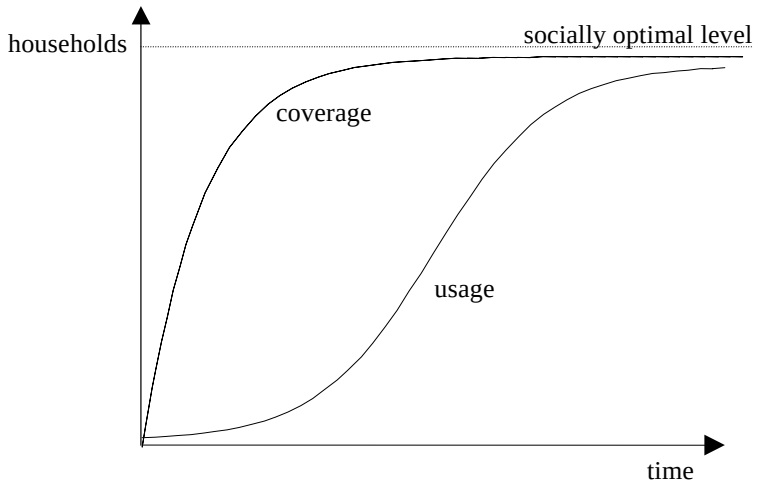


Figure 3. Market failure in telecommunications: a dynamic view.

In Figure 3, the difference between the coverage and the socially optimal level in the end of the diffusion process illustrates market failure in the supply of network infrastructures. Usually, the coverage evolves relatively fast in the beginning, and thereafter slows down, as the network has been built in the most densely populated areas. Another implication from Figure 3 concerns the length of the required time period: the faster the coverage becomes more universal, the smaller the welfare loss from the society´s point of view.

Of course, the coverage of network infrastructures and its demand are two different things. This can be seen in Figure 3 as the difference between a household coverage and household usage (or diffusion) at each point of time. Given typical diffusion curves such as in Figure 3, concerns of a (territorial) digital divide are usually characteristic for early phases of the process: then both components of the digital divide - the gap between the actual v. socially optimal level in the coverage of network infrastructures, and the gap between the usage v. coverage of network infrastructures - tend to be great.

In practice, the supply and demand of network infrastructures are intertwined in a complex way as infrastructure investments have often been observed to lead to a vicious circle: facilitating infrastructure investments also tend to facilitate demand for them (Johansson,

1989). The demand, in turn, is conditioned by the motivation and skills of potential customers (Viherä, 1999). Overall, this leaves a government with several strategic options in overcoming a digital divide. As already noted, the measures which are intended to have an impact on the evolution of (territorial) network coverage are the main focus of this paper.

## 3 TELECOMMUNICATIONS POLICY AND BROADBAND IN FINLAND AND SWEDEN

Historically, the regional provision of telecommunications services in Finland and Sweden has been good, despite the fact that they are the most sparsely populated countries in the European Union. As far as broadband is concerned, the recent figures for Finland indicate a penetration of approximately 25 % of households (February 2004), and the respective rate is even somewhat higher in Sweden. In both countries, the highest growth rates are found in the largest cities, and in the capital city region, which have the best availability of different access technologies. In most Finnish cities, the growth has been mainly based on cable modem, whereas fibre optic access has been the leading technology in Swedish urban areas. Also, the diffusion of ADSL, which is the only access technology available in most parts of the countryside, and in remoter parts of these countries, has been rapid. In Finland, for example, ADSL was not introduced until 1999, but already in 2002 it was available in (at least in some parts of) 98% of the municipalities (MINTC 2002). In Sweden, the availability of ADSL has increased at about the same rate, and currently the coverage of ADSL is close to 80% of the Swedish telephone subscribers (PTS 2003).

The figures above suggest that the achievement of an information society for (practically speaking) all, using the fixed line telephony networks for connecting to the internet, is not a very faraway aim in these countries. For policymakers, however, these developments have not been sufficiently fast, or the infrastructure technologies which are utilised in them are not seen to represent any final route to the information society proper. Thus, both Sweden and Finland have established ICT-policies with a particular focus on increased and universal access to advanced broadband infrastructures. As already noted (see Section 1), these policy strategies are different from each other. In general, this difference concerns the role and activity of a central government and the style of policymaking in general. In more practical

terms, competition policies and their fine-tuning to suit to the specificities of national markets display quite distinctive features. These differences derive from the differences in the history and telecommunications policy traditions of the two countries.

The development of the Finnish telecommunications markets differs to some extent from the usual case. Unlike many other countries, Finland has not had a single true incumbent operator, although there was a state-owned telecom company which had a nationwide network. This company was responsible for interregional services, and local services in the more rural parts of the country (cross-subsidising the latter ones). Other actors in the telecom market were local and regional monopolies. These did not have the same protection by law as incumbents normally have, and they were also exposed benchmark competition and a continuous take-over threat. (MINTC, 2003a)

Due to the distinctive market structure, the liberalisation process has been in Finland somewhat different from the countries such as Sweden, where incumbents have had exclusive rights to networks. Thus, instead of fostering the competition at the national level, the main focus in the Finnish telecom policy has been to increase competition in the local markets. The measures have included, among others, a removal of local entry barriers established by licences, a mandatory lease of access loops, and loop sharing. Yet the results are not impressive: the current prices of both broadband and local calls seem to be lower in Sweden although there is more competition – or at least more operators – in Finland (MINTC, 2003b).

The Swedish government has taken an exceptionally active role in the construction of the information society's physical infrastructure. Its strategy is based on the statement of the state's overall responsibility to ensure that broadband infrastructure is available throughout the whole country. Derived from this, a specific national ICT infrastructure programme was drawn up in the year 2000 so that Sweden was probably the first European country to implement an active broadband policy (MIECS, 2000). In this programme, the Swedish government decided to build a competing fibre optic alternative to the existing monopoly network owned by the state-owned telecom incumbent Telia, i.e. the government itself. In particular, the experiences derived from the Stockholm city municipal fibre network (Stokab) served as an example how public infrastructure investments may contribute to both economic and social success. In explaining the specific features of the Swedish policy strategy, it is also worth noting the important role that shared visions have had in the country's policy-making

culture. In this sense, the chosen approach with massive nationwide infrastructure investments could be seen as a necessary component in achieving a consensus on the priorities of Swedish information society policy. In any case, this decision was and has been the subject to much debate (see, for example, Andersson 2000).

The Swedish government has set the accessibility objective that every household and business, regardless of location, should have access to IT infrastructure with high transmission capacity, making Sweden the first country with “an information society for all”. (MIECS, 2000). In addition to the construction of a new nationwide fibre network, this was seen to presuppose support for the development of IT infrastructure in municipalities (and measures for developing services and upgrading demand, of course).

In contrast, the Finnish broadband strategy proposal, published in December 2003 (MINTC, 2003b) is very much in line with the historical Finnish telecommunications policy, relying on market forces and emphasising technological neutrality. According to its operational aims, by 2005 there should be 1 000 000 households (= approx. 40 % penetration) subscribing to broadband, all citizens should have access to high-speed, easy-to-use and affordable data transfer, and Finland should be among the leading European countries measured by communication network demand and accessibility. These aims of the Finnish strategy are pursued by means of 50 action points, which deal with issues such as fostering competition in communications networks, promoting the provision of services and content in the networks, strengthening the demand of broadband, and developing special actions for low-demand areas. (MINTC 2003b).

Table 1. The Finnish and Swedish broadband policies in a nutshell

| | **Finland: "The national broadband strategy" (2003)** | **Sweden: "An information society for all" (2000)** |
|---|---|---|
| **Policy vision** | "To become a European leader in the availability and use of high-speed telecommunications" | "The first country to succeed in implementing an information society for all" |
| **Broadband concept** | High-speed connections based on "all technologically and economically feasible" access modes | Fibre optic cable with a capacity of at least 2 Mb/s |
| **Market environment** | Multi-operator market structure, partly dominated by the local monopolies | Incumbent's (Telia) monopoly and its close ties with government |
| **Operative targets** | Access for all to high-speed, easy-to-use and affordable data transfer, and one million broadband households (~40% penetration) by the end of 2005. | To connect every municipality to a fibre optic base network. Access for all within the next few years (in 2000). Overall, the goals are not expressed in quantitative terms. |
| **Strategic measures** | <u>Competition stimulating:</u><br>• Legislation and regulation to foster market-based expansion<br><u>Public infrastructure investments</u><br>• No Government funding or co-ordinated approach: given to the hands of local authorities<br><u>Demand stimulating:</u><br>• Emphasis on "soft infrastructure" and "demand pull": network services and content, information security and users' skills | <u>Competition stimulating:</u><br>• Restricting Telia's monopoly position by legislation<br><u>Public infrastructure investments</u><br>• A national infrastructure programme: construction of a fibre optic base network and Government support to its regional/local extensions<br><u>Demand stimulating:</u><br>• Subsidies and tax allowances for fibre connections |
| **Policy co-ordination and implementation** | <u>State / Government:</u><br>• Regulation and loosely defined recommendations by a programme of fifty action points<br><u>Local authorities (municipalities):</u><br>• May draw up broadband plans based on local priorities and regional strategies | <u>State / Government:</u><br>• Funding, regulation, recommendations, and targeted programmes for implementing the national vision<br><u>Local authorities (municipalities):</u><br>• Draw up broadband programmes and channel government support to the market |

The Finland vis-a-vis Sweden setting is summarised in Table 1. As striking as the stated differences may seem, the actual developments may not be that different. Firstly, one has to keep in mind that there are a number of similar features in the strategies of these two countries. Both countries have liberalised telecom markets supported by pro-competition regulation to stimulate private investments in broadband, and they also actively upgrade the demand side. Secondly, despite of the innovative introduction of extending the Swedish fibre-optic network, ADSL is still the only broadband option expected to give (close to) universal coverage within a near future in both of these countries. Thirdly, due to the absence of a direct investments or subsidies by the central government in Finland, local authorities have taken a more active role, subsidising the broadband infrastructure investments along the same lines as their Swedish counterparts. This raises the issue on the impact of the subsidies on the functioning and territorial coverage of the market for fixed line network infrastructures. This issue will be analysed next, and the conclusions will be discussed with respect to pro-competition strategy in broadband policy.

# 4 INVESTMENT SUBSIDIES AND LOCAL MARKET STRUCTURE

As already mentioned, there are two main policy options to widen the availability of broadband in sparsely populated areas: investment subsidies and competition policy. Clearly, they are not mutually exclusive, and actually these both are applied both in Finland and Sweden. In the following, the effectiveness of these strategies is evaluated.

## 4.1 Investment subsidies

Even though the rules of subsidy are different in Finland and Sweden, in both countries the decision concerning broadband infrastructure investment subsidy is made by a local authority. In Finland, the current practice seems to be that municipalities (or regional authorities) subsidize the operator's investment costs by 50%. In Sweden, the municipality adds on the state's subsidy and directs this to the operator. In the end, however, it is the operator who decides whether it is profitable to invest into the construction of broadband infrastructure. This decision is clearly affected by the possible public subsidy to the operator's investment

costs. In general, the sequential decision-making process can be illustrated by the simple game-tree: see Figure 4.

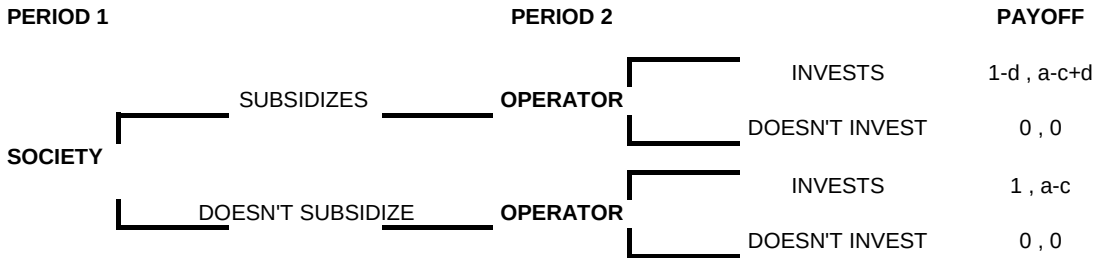


Figure 4. Broadband subsidy game.

In the game depicted in Figure 4, the benefit of investment to the society is 1. The cost of the investment is *c*, resulting to an increase of *a* in the operator's net income. The society must decide whether to subsidize the operator's investments by an amount of *d*.

The best outcome of the game for the society is the investment without the subsidy. If the operator's investment is not profitable, the society loses its benefit. This can be seen as the current case in areas of low population density. Thus, the society may correct the operator's profitability by a subsidy of $d = c\text{-}a$ if $a\text{-}c < 0$ and $1\text{-}d > 0$, i.e. the operator is subsidized only if it does not invest and the society's benefit exceeds the amount of the subsidy.

While these conditions for the efficient subsidy policy are trivial, they impose very large requirements for information. These requirements are hard to be met in practice. Moreover, when taking into account the operator's strategic behaviour and capacity constraint, public subsidies may result both in a delayed market-based roll-out and an excessive compensation for operators.

Unlike most explanations of the claimed delayed roll-out of broadband (Woroch 1998; Faulhaber 2003), the subsidy policy may only cause a temporary delay in investments. The logic for a slower roll-out here relates to the operator's rational strategic behaviour in a sequential setting illustrated in Figure 4. Efficiency requires $d = c\text{-}a$, but both *c* and *a* are only known by the operator. Thus, regardless of whether it is profitable or not, passive investment profile in the first period may serve as a credible signal for the need of subsidies in the second period.

Since it is beneficial for the operator to wait and see the subsidy decision, the faster the society makes its decision, the faster the operator makes its investment decision. If the subsidy decision comes late after the introduction of broadband, such as in the case of Finland, it may slow down the evolution of broadband. Yet, on the other hand, it seems that the early subsidy decision of the Swedish government has not lead to any better territorial coverage.

The question of a proper and "as early as possible" timing is, of course, irrelevant if market-based diffusion has reached its limits. If so, the policy implication for both Sweden and Finland is just to increase the level of subsidies to make the remaining infrastructure investments profitable. This, however, seems not to be the case: rather than motivated by an abrupt sharp decline in private investments, the subsidy policy is aimed at speeding up the rate of market development. This raises the question about what happens if broadband investments are subsidized in the case of the operator's capacity constraint.

To see this, let us assume an operator with $n$ investment plans in broadband infrastructure, and a capacity constraint of only one investment per period. The investments are identical in all other respects, but investment costs are different. This leads to a very simple investment strategy in which the plans are realized according to their profitability. In this setting, the only effect of an optimal subsidy is that the nonprofitable investments are included in a waiting list, to be realized as the more profitable plans have been implemented. The implication is that in the case of operator's capacity constraint, and below the saturation point of market-based deployment, the subsidies having an immediate effect on the investments have to exceed the amount of $c$-$a$. This means overcompensation for the operator, and also results in the crowding out of commercially profitable investments by the subsidized ones.

In general, instead of speeding up, the current investment subsidies in both Finland and Sweden may only contribute to the ordering of investments. And as the decision concerning subsidies is made at the local level – by the authorities that tend to compete with each other – the operators seem to have found it rational to make this order of investments by an auction. Thus, it seems that in sparsely populated areas the local policy – which can be affected by, for example, the availability of EU-funds and needs of the political elite – is taking the place of market forces as a prime driver of broadband roll-out.

## 4.2 Local market structure and territorial availability

In Finland, the historical market structure comprising local operator monopolies continues to have implications for the current evolution of broadband. The local telecommunications operators have been required to split their functions into network and service operations, and the local networks have been made open for competitive service operators[1]. Despite these measures, some local network operators seem to be able to exercise monopoly pricing in leasing out their lines to other service operators. High prices can block out competitive entrants from that territory.

As the local operator exercises its (monopoly) power by setting high leasing prices, it simultaneously forces the entrant to set high consumer prices. If the competitive service operators decide not to enter the local markets because of the high leasing prices, the local operator is able to retain its monopoly pricing. Thus, whatever the competitive situation, the consumer prices are high. As regards to territorial coverage, these higher prices probably result in a narrower territorial accessibility, as demand remains low. This effect is manifold in sparsely populated areas, as the required demand to induce broadband network investments in a specific territory is easily left unfulfilled.

The different market structure is thus probably one factor behind the earlier mentioned fact of consumer prices being higher in Finland than in Sweden. As a policy measure, the Finnish Communications Regulatory Authority is considering the setting of price caps for broadband network leasing prices. This, of course, involves the problematic decision: on which level the price cap should be set. The local network operators may be inclined to exaggerate the costs. As average costs of network operations also greatly vary by area, neither seem nationwide average prices suitable – operating a network in a sparsely populated area tends to be more expensive than in densely populated cities.

This situation is, however, not unique in the sense that also the mobile telephony markets in Finland have been in a similar phase, and actually might have gone trough a fairly similar

[1] This is known as unbundling: incumbents are forced to give other firms access to the copper wires running from the central office of exchange into homes.

process.[2] The companies had to split their operations into network and service functions, and then lease their networks to competitive service operators. However, it took several years before competitive service operators started their businesses, and prices sank. This suggests that while the network is evolving, i.e. it is built by new investments, the investing operator is not willing or even able to lease the network to other service operators. In a way, the network operator seems to cross-subsidize its network investments with the monopoly revenues from the service operator functions. If this is the case, price caps might have the undesired result of reducing new network investments and hindering the territorial evolution of broadband network.

To summarize the above discussion from the point of view of sparsely populated areas, the main aim for the regulators in the long run is to lower prices and thus increase the demand and attractiveness of these areas. In Finland, low prices are pursued through private competitive markets, while it seems that the regulator has accepted - at least in the short run - higher network leasing charges (and consumer prices) in order to promote the upgrading of existing networks and to foster ADSL rollout processes. In Sweden, the publicly-run nationwide network disables the other telecom network operators to ask high leasing prices. This seems to be the case also in Finnish regions where public local (municipal) broadband networks exist. Yet it is unclear whether the investments in those companies are financed through taxes instead of cross-subsidies from the service operator to the network operator[3]. Table 3 summarizes the main points of the comparison.

[2] It has to be kept in mind, however, that the cost structure of mobile telephony market is different from the broadband market.

3 It is also interesting to note that Finnish local authorities, such as municipalities, often own the local telecom network and service operators. Thus, even though they are indirectly publicly owned monopolies, they do seem to behave more like a monopoly than a publicly owned operator.

Table 2. Policy Conclusions

| Policy option | Subsidizing infrastructure investments | Promoting competition in the local network |
|---|---|---|
| **Primary aim** | Regional coverage | Price level |
| **Pros** | + Only option in very sparsely populated territories<br>+ Acts quickly<br>+ Can be based on local needs and priorities | + An encouraging example of mobile telecom markets: permanent incentives to cut costs<br>+ Promotes competition in services between the Internet access suppliers |
| **Cons** | - "Wait and see" before launching the subsidy policy<br>- Imperfect information (timing, amount of subsidy) likely leads to overcompensations for the operator<br>- If capacity constraints exist, leads only to reordering of investments and zero-sum game between the subsidizing authorities<br>- Without unbundling, subsidized capital investments may increase the financial barriers of entry | - Trade-offs between<br>a) Early competition vs. full coverage: the earlier the unbundling, the slower the rollout as the competition concentrates on access services<br>b) Price level vs. investment rate: the smaller the territorial unit of the network leasing, the less the operator can cross-subsidy to its investments<br>c) Equity vs. effectiveness: the more complete the unbundling, the more variation in the price level |

In general, a publicly-run network seems to result in lower consumer prices immediately, as the public sector has no incentive to keep up monopoly prices. In the long run, the mobile telephony example shows that service operator competition seems also to lead to low prices, and to a broad territorial coverage. The decision thus culminates on who should finance the network investments: all the citizens through taxes (the Swedish model), or only the current users of broadband through paying temporary high (monopoly) prices (the Finnish model). This relates to the political decision on whether broadband should be considered as a universal service. If yes, tax-based financing of network investments is justified, otherwise not.

## 5 CONCLUSIONS

As members of the Nordic family, Finland and Sweden share some indisputable similarities also in their policy and planning doctrines and regimes. This does not concern only history, but these two countries still have many similarities: both are unitary states, in which the

public sector has provided a wide range of basic services. The aim has been to treat citizens on an equal basis irrespective of where they live. Yet these two countries have chosen quite different strategies in the construction of the key infrastructure of an information society: even if both emphasise the need to promote information society developments for competitiveness, they seem to advance along quite different routes.

Infrastructure networks - both their construction and utilisation - are typically characterised by scale economies, and broadband infrastructures make no exception. This implies that investments tend to cluster in the regions with a sufficient amount of potential customers. Also the findings on the geographical diffusion of broadband accessibility are in line with this hypothesis: the urban/rural disparity is clearly visible in, for instance, the EU (see CURDS et al 2003). The present comparison derives much of its impetus from this background. Both Finland and Sweden are seen in the spearhead of information societies, but their settlement structures are scattered - this is the fact that emphasises the need for strategic policy intervention in advancing broadband infrastructures.

In general, infrastructure investments can either be seen as demand driven, or they are based on supply decisions; strategic considerations concerning equity, innovativeness, or other wider societal motives. The government may also intervene in this infrastructure market, if it sees that the market supply does not provide enough from the society's point of view. The intervention can, for example, take the form of competition policy or subsidies. The Finnish-Swedish comparison has been outlined in terms of this setting.

As far as market demand is concerned, the factors bearing relevance on it can be assumed to be relatively similar in Finland and Sweden. The average income levels and educational levels of these two countries are close to each other. In addition, both have practised active policies for providing Internet based services and upgrading citizens' skills to utilise information technologies. The spatial circumstances are quite similar in Finland and Sweden, and set constraints to a market driven diffusion of infrastructure networks. Population density, which is the most commonly referred indicator in this context, is very low in a European comparison. However, the key conditioning factor is the share of population living in tightly built settlements; concentrations of demand quite far away from each other can be reached more easily than scattered demand of the same size in a relatively small area.

The supply side, however, is dissimilar in the sense that the institutional structures of the telecommunication sector have followed quite different development paths. In Finland, in contrast to Sweden and most other countries, there has never been a clear national champion, but local operators have provided the bulk of teleservices. This has resulted in that no company has had a nationwide monopoly in telecommunications networks, which has obvious implications for the market supply of any new telecommunication technology.

Overall, it seems that universal and nationwide access of broadband is somewhat lower on the political agenda in Finland than it is in Sweden. According to this orientation, a particular priority in the Finnish broadband strategy is given to the demand and supply side factors of private investments. While special measures for areas which lack the potential for market-based roll-out is one of the four main objectives of the government's broadband programme, a vast majority of the practical measures are targeted to decrease prices, increase demand and other conditions to encourage markets to finance the expansion of broadband. This implementation strategy represents a quite optimistic view of markets and technological change. The existing uneven spatial pattern of network expansion is seen more or less as a temporary phenomenon: differences in terms of access are perhaps pertinent in the ongoing rapid infrastructure development, but they can be expected to decrease even in a very near future.

The Finnish broadband policy takes the view that government funding for infrastructure investments is not necessary. The development of technical infrastructure is not included into the domain of the central government; it is seen mainly as a responsibility of local authorities to support network investments. Yet in comparison to Sweden, much less money is provided by the Finnish municipalities for the IT infrastructure investments. From this perspective, the Finnish broadband policy faces a significant challenge to achieve a widespread geographical coverage by the end of year 2005.

However, it should be kept in mind here that the concept of "broadband" is defined very flexibly in Finland: the set of high-speed connections include all "technically and economically feasible" access modes (MINTC 2003b, p. 4). The properties of such alternatives, in turn, are seen to depend on "the region-specific factors and demand". As there appears to be a lot of variation in these, it seems that in terms of speed, quality and price the

expansion of Finnish broadband infrastructure is expected and accepted to develop in an organic, diversified and decentralised way.

In comparison, the Swedish strategy aims at constructing a nationwide fibre-optic network connecting all municipalities with a very high transfer capacity, and reaching out as close to end-user as possible (PTS, 2003). While the construction of the base network was mainly argued on the grounds of competition policy, the plan for the regional and local networks was clearly designed to meet the needs of territorial equity and universal access. The measures for a nationwide coverage include in addition to the construction of a base network, the state subsidies for municipalities to build connections to high-speed IT infrastructure in the areas, which market forces are assumed to leave outside networks within five years.

It is, of course, difficult to determine to what extent the Swedish approach represents the decentralised features of the country's administrative system, or whether it was inspired, for example, by the fine-grained and localised nature of broadband deployment process. In any case, the practical implications from the decentralised planning procedure are twofold. On the one hand, it increased the number of actors involved, and encouraged municipalities to see ICT infrastructure issues as a pertinent part of community planning and development. According to the evaluation report of ITPS (2003, 72), this is, in fact, one of the most positive outcomes of the Swedish broadband strategy so far.

On the other hand, the decentralised planning evidently reduces the potential for government intervention. As a result, the roll-out of broadband in Sweden is developing more through diverse local initiatives rather than in accordance of a standardised top-down strategy. In practice, it seems that the state subsidy is not always enough to motivate municipalities to build connections. When drawing up infrastructure programmes for their own areas, municipalities can rather freely assess to what extent the public investments in local networks may distort competition, or some other way tend to weaken the potential for commercial broadband deployment. It seems that the local authorities have devoted much attention to these issues, since the municipalities have not been willing and/or able to make as high per capita investments in the fibre optic network as it was originally presumed in the government's national programme.

The main options for broadband policies can be simplified into two options, investment subsidies and altering the local market structure. In any case, both these are implemented at a local level. A subsidy aims at widening a territorial coverage directly, whereas competition policy for manipulating the local market works through prices: lower prices are intended to lead to a higher demand, and thus make sparsely populated territories commercially profitable markets. These options are not, of course, mutually exclusive. The Finnish and Swedish policy practices provide ample evidence on how they work in different combinations in practice.

To sum up the disparities in the broadband policies, it can be concluded that the Finnish model aims at more efficient outcomes in the present markets, while the Swedish approach tries to change the market structures by introducing a new nationwide fibre optic base network. Among the reasons for this disparity in the strategies, major factors include the historical differences in market structures and the distinctive telecommunications policies.

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