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ABSTRACT

This diploma thesis examines new markets in telecommunications industry and how regulatory authorities and public entities should or could act in order to foster broadband deployment. I present the importance of a fast development of new generation networks for an economy and provide and analyse an exemplary model of how regulation authorities could treat a potential new market. For this purpose, I have a look on dynamic efficiency and how the concepts of Schumpeter could help to find an optimal regulation strategy.

Furthermore I present the situation in Austria, whereas I conclude, that the deployment of new generation networks has not yet reached a satisfactory state. Thus, I try to analyse recent regulation policies and bring up some other ideas, which could help fostering broadband deployment. Regulatory holidays, open access policy or concerted public subsidies could help to reach the goal of a comprehensive coverage of modern high-speed broadband networks.

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LIST OF ABBREVIATIONS

OECD	*Organisation for Economic Co-operation and Development*
ICT	*Information and Communication Technology*
GPT	*General purpose technology*
VoIP	*Voice over IP*
IT	*Information Technology*
CT	*Communication Technology*
NRA	*National Regulation Authority*
FTTH	*Fibre to the Home*
FTTC	*Fibre to the Cabinet*
FTTB	*Fibre to the Building*
FTTx	*Fibre to the Home/Building or Cabinet*
ADSL	*Asymmetric Digital Subscriber Line*
VDSL	*Very High Speed Digital Subscriber Line*
PPP	*Private Public Partnership*
SSNIP	*Small but Significant, Non-transitory Increase in Price*
MDF	*Main Distribution Frame*
SAI	*Serving Area Interface*
LTE	*Long Term Evolution*
EC	*European Commission*
EU	*European Union*
TV	*Television*
Art.	*Article*

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Part I. Introduction into the topic

1 Introduction

1.1 Motivation for this work

There were hardly any events which had such a giant influence on economy and society as the revolutions in the telecommunications industry within the last decades. Since the mid 1980ies mobile phones and internet are on a way of completely changing people's communication habits. And the development of new technologies is still in progress.

From an economic point of view, it is interesting, which influences new technologies as the Internet or mobile phones have on growth, employment and education. Furthermore it is even more interesting, how future technologies in the telecommunications sector will influence our lives. Innovation and investment in new, faster broadband networks or faster mobile internet or whatever will appear in the upcoming years, will have a direct influence on a country's competitiveness.

In former times, the telecommunications industry in Europe was usually controlled by firms owned and controlled by governments. Britain was the first European country to liberalise the telecommunications sector. Since the end of the 1990ies the whole European Union follows this way, whereas

some of the markets are left to free competition, while others are regulated by National Regulation Agencies (NRAs). Thus, perfect regulation strategies to establish an investment-friendly, efficient industry were recently in the centre of economic interest.

While the EU-framework for new markets is the same all over Europe, not every country has reached the same state of broadband deployment by now. Concerning so-called new generation networks (NGN), which provide broadband access with speed of 100Mbit/s or higher, especially Austria still has a lot of work to do, if the country did not want to lose its competitiveness. Thus, regulation strategies as well as public policy has to be analysed and adjusted to find a way of how to foster investment into this area.

1.2 Goal of this work

The goal of the first part of this paper is to review the current regulation strategies for new and emerging markets in Europe. Furthermore comprising economic theory about dynamic competition should give us hints to get an idea about how fast-changing markets as in telecommunications industry respond to different regulation policies. Finally, different ways of how to react to quick developments in dynamic markets as the telecommunications industry are discussed.

The second part should analyse the Austrian telecommunications market.

The aim is to find problems, why Austria is far behind when looking at dispersion of new generation networks and, moreover, find and model possible solutions. Therefore recent regulation strategies are analysed and some possible policy implications are provided.

1.3 Overview

After this overview, I will underline the relevance of this paper's issue by presenting some economic impacts of new technologies in the telecommunications sector. I will consider some recent studies, which are made about telecommunications markets and their influence on the economy.

Part I is about the theoretical and legal background of the issue. Therefore, in Chapter 3, I will explain the active regulation policies of the European Union. I will talk about the liberalisation process and the Commission Guidelines from 2002. Chapter 4 treats the definition of markets. I will explain the SSNIP-test and outline its characteristics when defining new and emerging markets. Chapter 5 deals with regulation strategies for new and emerging markets. I will give insights into dynamic theory to understand the essential difference between static and dynamic efficiency, which is important for fast-developing markets as the telecommunications industry. I will then talk about regulatory holidays and possible treatment of pioneer monopolies and its impact on investment and innovation.

In part II I will analyse the Austrian telecommunications market. In Chapter 7 I will present the structure of the Austrian telecommunications market and outline some of the major problems that could be a reason for the slow deployment of NGNs. Furthermore I will provide some recently proposed regulatory measures and analyse their impacts on broadband investment. Finally, in Chapter 8 I will try to provide some strategies of how the country could foster broadband development in the future.

2 Economic impacts of investment into new telecommunications technologies

2.1 Recent developments in telecommunications industry

Over the last decades, telecommunication markets recorded significant technological change. Completely new technologies like the Internet or mobile phones offered a wide range of new services and products, which influenced or even revolutionized the whole economy. In the last years, this development seemed to be even more drastic and it is hard to say, when this revolutionary process will slow down.

Especially the Internet was and still is a source for a wide range of new application areas. Voice over IP (VoIP), TV over IP or online games are just a few examples of services that will gain popularity within the next years. "All these hyper-connectivity services for business and private use are stoking the thirst for bandwidth" formulates Stefan Heng the future development in

his article "Broadband infrastructure" for the Deutsche Bank[1].

In 1998, Jakob Nielsen predicted for the UK raising Internet access speed by averagely 50% every year. As Fig. 1 shows, this prediction seems to be true. From an economic point of view, it is interesting, what kinds of effects the fast development of telecommunications technology has on an economy and if it is possible and useful for an economy to actuate this evolution even further.

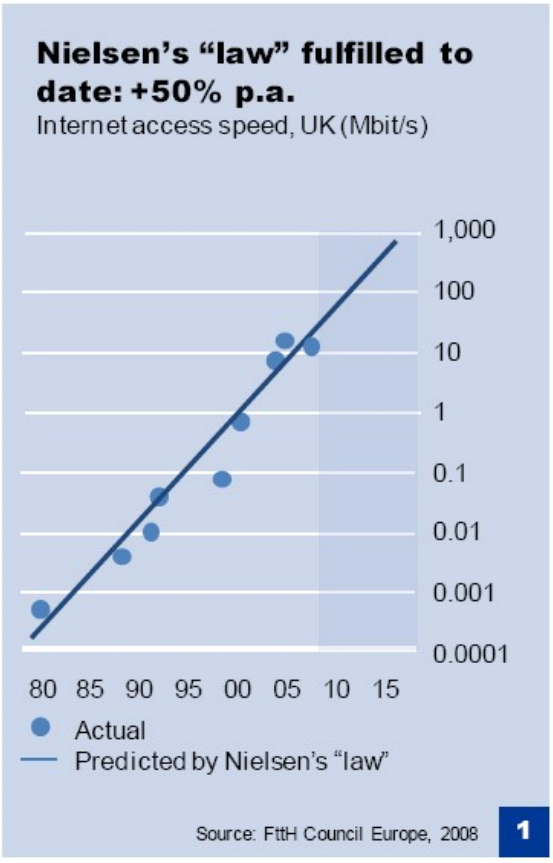

Fig. 1: Nielsen predicted a growth of Internet access speed by 50% p.a.[2] (Source: Broadband infrastructure, Deutsche Bank Research, May 2010)

1 Stefan Heng in "Broadband infrastructure", Deutsche Bank Research, May 2010, p.3
2 Deutsche Bank Research (2010), "Broadband infrastructure" in Economics 77, p. 3.

2.2 Economic returns of investment into broadband deployment

A sufficient coverage of broadband networks means quick access to information for companies, educational or research facilities and simply men in the street. Nowadays it is probably one of the most important drivers for further development in Europe and other developed countries, but also a big chance for developing countries. It not only enables engagement in modern technologies industries (i.e. service providers on the internet like internet providers, hosts, shops, etc.) but also helps companies to make their production processes more efficient. Investment into modern technologies can trigger structural changes in economies, for example "by raising product market competition in many sectors, especially in services"[3].

On the other hand, one has to invest into broadband networks to ensure its availability in a whole country. Katz et al. (2009) calculated the need for investment in the upcoming years in Germany to fulfil the German government's aims for broadband deployment. They found out that it will be necessary to totally invest 20.243 million Euro until 2014[4].

While investing into telecommunications infrastructure was mainly governments' business in most countries in Europe till the end of the 1990ies, due to liberalization it is nowadays business of – more or less private – companies, whose main aim is to maximize their profits. The effects of regulation on these investments are discussed later in this paper.

3 OECD (2007), Broadband and the Economy, p. 5
4 cf. Katz et al. (2009), p. 13

For now, I do not want to examine the question of who invests and why this specific investor does, but of the general importance of investment in the broadband sector and the economic returns for the whole society.

The OECD-study "Broadband and the Economy" points out that "ICTs[5], including computers and the Internet, are generally considered to be a GPT"[6], a general purpose technology. GPTs are main technologies, which have an extraordinary effect on the economy. Other examples for GPTs were electricity or the steam machine. They can not only heighten an economy's GDP as maybe other new technologies might be able to, but start a revolution in the production processes of an economy.

In the case of the Internet, it is especially the fast transmission of information, which forces development. As any other technology, GPTs are being enhanced after their detection. Looking at the Internet, these advancements might be new transmission protocols, programming languages or services. Since most more recent types of Internet-use like video transmission, VoIP and so on need high transfer rates, deployment of broadband is probably the most important enhancement in this sector. The OECD-report compares it to electricity supply. Without a well-developed grid no one could use the fabulous invention of electrical power[7].

Crandall et al. (2007) made one of the first empirical studies concerning this issue. They looked at "The effects of broadband deployment on output and

5 Abbr.: Information and Communication Technologies
6 OECD (2007), Broadband and the Economy, p. 8
7 cf. OECD (2007), Broadband and the Economy, p. 9

employment“ and show, that there is indeed a positive effect of availability of broadband on the growth of employment and GDP. They also state, that “broadband benefits accumulate over time”[8] and that service sectors benefit most[9]. According to OECD estimates, broadband communication will contribute one-third to the productivity growth of highly developed countries by 2011. [10]

We can find two main types of effects how the extension of broadband-networks could affect a country's economy. One type occurs from the instalment process itself, those are the direct effects, the other one from the long-term returns of broadband technology, which we will call indirect effects.

There is a high demand for workers (e.g. telecommunication engineers, building labour) during the construction process, which can reduce unemployment and increase GDP in the short run. The higher households' income induces higher spending and thus higher growth in other economic sectors. Firms that are linked to the construction companies (e.g. accounting companies, etc.) profit indirectly from the investments in broadband – networks.

Katz et al. (2009) tried to measure these effects for the German economy by using Input/Output tables. Their calculations showed, that in the building sector there would be 125.000 more jobs from 2010 till 2014, in the

8 Crandall et al. (2007), p. 9
9 cf. Crandall et al. (2007), p.9ff
10 cf. Stefan Heng in “Broadband infrastructure”, Deutsche Bank Research, May 2010, p.3

telecommunication sector 28.400 and in the manufacturing of electronic devices 4.700, respectively (total: 304.000). 71.000 jobs would be created through effects in other economic sectors and another 75.000 ones through induced job creation. If Germany built an "ultra-broadband-network" till 2020, another 237.000 jobs could be created. So, totally, in Germany 541.000 jobs could be created between 2010 and 2020.[11]

There is also a wide range of indirect effects of extending broadband-networks, from product to process innovations, from new possibilities in R&D to new organisational structures.

While the Internet is being used for almost 20 years now, most services became possible only because of higher bandwidth. In recent years, the Internet especially became a substitute to traditional telecommunication methods. Voice over IP, chat-programs (e.g. ICQ, MSN Messenger) and social networks (e.g. Facebook) are an integral part of people's lives today. They make it easier to share information with large amounts of other individuals and thus replace traditional ways of communication. This process might become even faster in the upcoming years. Precondition for the boundless use is a sufficient state of broadband endowment.

The benefits of this process are hard to measure, but it is clear, that it helps individuals as well as companies in several ways. There is not only the positive effect of easier networking, but also, for example, a higher speed in decision transmission, which lets firms being faster to react on certain

11 cf. Katz et al. (2009), "Die Wirkung des Breitbandausbaus auf Arbeitsplätze und die deutsche Volkswirtschaft", p. 14

events. Furthermore, distances do not matter that much any more. It is easier and much cheaper to hold a conference on the Internet than to bring people from all over the world together in a certain place.

A conclusion of several studies about the use of IT and CT, which are outlined in the OECD-report, can be, that increased adoption of both, Information Technologies as well as Communication Technologies, heightens productivity.[12]

12 cf. OECD (2007), "Broadband and Economy", p. 20ff

Part II. Economic and legal background

3 Recent regulation strategies in the EU

3.1 The liberalisation process

The European Commission first decided to aim at the liberalisation of telecommunications industry in 1987, which was rather late compared to other developed countries[13].

Before the liberalisation process started, the typical structure of telecommunications markets in Europe were national monopolies with hardly any competition between the member states. The plan was to open up markets to private companies by piecewise liberalisation, starting with the terminal equipment sector in 1988[14].

The new Service Directive of 1996 provided the step to full liberalization of telecommunications services, coming into effect on 1st of January, 1998 in most countries within the EU[15]. Compared to that, the US liberalised local markets in 1996.

13 "In the US, the first license to compete for public switched long-distance services was granted in 1969 (operational 1972), and in 1980 the market for long-distance services was effectively liberalized. In Japan, the Telecommunication Business Law of 1985 liberalized most telecommunication markets". Source: Kiessling, Boundeel (1998), p.575.

14 Vgl. Kiessling and Blondeel (1998), p. 575

15 Due to special conditions, the dates for full liberalisation differed for some EU member states: Luxembourg: July 1998; Spain: December 1998; Ireland and Portugal: January 2000; Greece: January 2001. Source: Kiessling and Blondeel (1998), p.575

The main objectives of the liberalisation process in the EU were to ensure "efficient allocation of resources, technical efficiency, innovative efficiency and fair competition"[16], whereas this should be achieved by "implementing cost-oriented and non-excessive prices, minimizing cost of production, the provision of new services that satisfy evolving user needs, and ensuring fair network access and interconnection conditions and the absence of predatory pricing."[17]

It is clear, that there are trade-offs between some of these policy objectives. For example, an obligation for resale to force competition (i.e. service competition) lowers the incentives to competition in the infrastructure sector and so to invest in innovative processes.

3.2 The 2002 commission guidelines

The active rules, which act as the main basis for regulatory authorities are the "Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services" from 2002[18] which base on five directives[19].

16 Kiessling and Blondeel (1998), p. 571
17 Kiessling and Blondeel (1998), p. 572
18 EU, Office Journal 2002/C165/03
19 This new regulatory framework comprises five Directives (Source: "Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services" (2002/C165/03), Article 2):

The new framework provides rules for defining markets, which come into consideration for ex-ante regulation for the national regulation authorities being consistent with European competition law. The NRA are allowed to put commitments on the affected firms, as long as competition is distorted with regard to dominant positions as defined in Article 82 of EC Treaty. This represents a difference to the initial guidelines from 1998, where European competition law was not included. The aim of the new directive is to help the NRA with the definition of markets and the detection of market domination.

The regulation authorities should try to achieve the objectives of "promotion of an open and competitive market for electronic communications networks, services and associated facilities; development of the internal market; promotion of the interests of European citizens"[20].

"Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services, the 'framework Directive';
Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services, the 'authorisation Directive';
Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities, the 'access Directive';
Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services, the 'universal service Directive';
a Directive of the European Parliament and of the Council concerning the processing of personal data and the protection of privacy in the electronic communications sector. However, until this last Directive is formally adopted, Directive 97/66/EC of the European Parliament and the Council concerning the processing of personal data and protection of privacy in the telecommunications sector, the 'data protection Directive', remains the relevant Directive".

20 "Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services" (2002/C165/03), Article 15

Through ex-ante obligations it should be ensured, that firms cannot exhibit possible market power and hence distort competition. The authorities' duty thereby is to investigate whether there is 'effective competition' in each of the markets, which may be subject to ex-ante regulation defined by the commission or not.

The definition of 'effective competition' is therefore a core element of the process. If the authorities detect effective competition, they are not allowed to impose any regulation measures on any firm in the specific market. Following the framework directive, a market is not ruled by effective competition if "there are one or more undertakings with significant market power, and where national and Community competition law remedies are not sufficient to address the problem."[21]

If the NRAs decide, that there is no efficient competition in a market, they can impose special obligations on the dominant firm(s), which may also include obligations for access and interconnection. Because of the wide range of trade-offs between the objectives for the NRAs, they have a wide latitude of judgement, which is limited by Articles 6 and 7 of the framework Directive[22].

21 Directive 2002/21/EC of the European Parliament and of the council of 7 March 2002 on a common regulatory framework for electronic communications networks and services, Official Journal of the European Communities, L108/36

22 cf. Directive 2002/21/EC of the European Parliament and of the council of 7 March 2002 on a common regulatory framework for electronic communications networks and services, Official Journal of the European Communities, Articles 6,7, L108/40-41

4 Definition of new and emerging markets

4.1 The concept of the SSNIP – test for static markets

In order to fight uncompetitive behaviour it is important to know how a market actually is defined. The exact definition of a market gives us the possibility to calculate market shares and provides an overview, which firms are able to limit another firm's uncompetitive behaviour.

The definition of the European Union for a product market goes like this:
"A relevant product market comprises all those products and/or services which are regarded as interchangeable or substitutable by the consumer, by reason of the products' characteristics, their prices and their intended use"[23].

A relevant geographical market is defined as follows:
"The relevant geographic market comprises the area in which the undertakings concerned are involved in the supply and demand of products or services, in which the conditions of competition are sufficiently homogeneous and which can be distinguished from neighbouring areas because the conditions of competition are appreciably different in those area"[24].

The most common method to define a market is the SSNIP-test, which is

23 EU Official Journal C372, 09/12/1997, "Commission Notice on the definition of relevant market for the purposes of Community competition law"

24 EU Official Journal C372, 09/12/1997, „Commission Notice on the definition of relevant market for the purposes of Community competition law"

favoured by many economists as well as by the EU and US antitrust divisions[25].

It is a thought experiment, which should find out, if a small, but significant, non-transitory increase of a product's price[26] – usually 5% or 10% - would increase a hypothetical monopolist's[27] profit (cet. par.) or if consumers would change to a close substitute of the product, so that the loss caused by this substitution effect would be higher than the increase in prices benefits the hypothetical monopolist. If that increase in price is profitable, the market is defined by the product(s) in question. If it is not profitable, one has to add another close substitute and repeat the whole procedure. This is done until the increase in prices is profitable for the hypothetical monopolist.

"In other words, the SSNIP test defines a market as the smallest set of products worth monopolising."[28] The substitution effect, which causes the loss of sales, in this case could be a demand or supply side substitution effect. The first one tells us, if there are any close substitutes for the consumers to the products in question, while the second one tells us, how easy it would be for another firm to change its production to the product in question profitably.[29]

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25 "There is now growing consensus that the hypothetical monopolist test provides the appropriate framework for defining relevant markets"; Baker, Bishop (2001), "Role of market definition" p.1

26 Department of Justice and Federal Trade Commission, "Horizontal Merger Guidelines", April 2, 1992

27 i.e. the product in question is in the thought experiment only produced by one supplier

28 Baker, Bishop (2001), "Role of market definition", p. 7

29 cf. Baker, Bishop (2001), "Role of market definition", p. 7

4.2 General problems of the SSNIP-test

At the first glance, the SSNIP-test seems to be a perfect tool for assessing the "borders" of any market. But in some cases it implies critical problems, which distort the results in a crucial way.

First of all, in all non-merger cases, the "Cellophane Phallacy" is a serious problem. This phenomenon describes the fact, that in situations, where uncompetitive behaviour should be detected, the SSNIP – test asks for an increase in prices, based on probably already uncompetitive, say monopolist, prices. Thus, the hypothetical price increase will in any case be unprofitable, because the monopolist already maximizes her profits by charging the monopoly price. In fact, in this case, the test should ask for a price increase, based on the competitive prices, which only can be measured. If this is not done, the application of the SSNIP – test could lead to a too broad definition of the market. Then, the market shares of the uncompetitive firm are found to be rather low, and the firm is misleadingly not investigated.

The name "Cellophane Phallacy" has its seeds in the "du Pont"-case. Du Pont sold cellophane and argued, that it competed with other packing materials. This result was also found by the SSNIP-test, whereas in fact, cellophane was only in competition with other packing materials at the monopoly prices, du Pont charged. At competitive prices, cellophane formed an own market and thus, du Pont had a dominant position[30].

30 cf. Motta (2004), p. 105; http://en.wikipedia.org/wiki/Small_but_Significant_and_Non-

Another problem of the SSNIP-test is, that it is not so easy to find enough data to apply the test in order to get significant results. If this is the case, competition authorities often use surveys to assess, whether a price increase of a product would lead to high or low reduction in demand.

4.3 Characteristics and problems when defining a new market

Up to this point, we only talked about already existing and stationary markets. Since our focus lies on markets, that change over time, the presented arguments have to be adjusted to new markets and situations, where investment and innovation change the structure of the industry.

4.3.1 What, actually is a "new" market?

At first, it is important to know, what a "new market" actually means in the sense of this paper.

There is the case, that a new market evolves without introduction of a new technology or even product. Changes in preferences could lead to new markets, for example, if people suddenly become eager for a certain brand. In this paper, this kind of new market is not subject of interest. Here, we focus on those, which really base on completely new things. Innovations, that change the whole structure of the industry and are not or hardly

transitory_Increase_in_Price (visited on June 11th, 2010)

substitutable with any existing technology.

Also small technological innovations are mostly not new markets in our sense. A small increase of the bandwidth of DSL is nice for the consumers, but in general it is not enough to form a new market. On the other hand, the jump from 56kBit/s dial-up modems to 1Mbit/s or more highspeed-DSL connections has most likely formed a new market.

Generally speaking, not every new product, that is released, automatically evokes a "new market". For example, a cable connection has the same or almost the same properties for the end-user as a DSL-connection. Assume, that there already was a DSL-network and then another supplier came up with a cable-connection. This is a new product, but certainly not a new market, since the difference for the user between cable and DSL is very small. Both ways to use highspeed-internet most likely belong to the same market. A SSNIP-test or other economic methods may give us the chance to economically test, if other products belong to this market as well (maybe mobile internet via modem, mobile internet on the mobile phone, etc.).

On the other hand, such a new process for supplying a service can very well become a new market on the wholesale level. This is especially the case, if the new process, which provides a final product with similar properties as the old process, is much cheaper or has other characteristics which substantially differ from the old process (for example less labour force needed). But then an asymmetry may arise, as Vogelsang (2006) points out. Because of the cheaper new process the old product with the higher price is

no longer a substitute for the new product for the end-user, while the new product - with the same physical conditions and a lower price as the old product - would always be a substitute to the old one.[31]

4.3.2 The SSNIP-test and new markets

When looking at the definition of new markets, the SSNIP-test implies some severe problems. First of all, the missing data argument becomes even more serious. As argued, it is not easy to find enough data for stationary markets to define them properly. For emerging markets, there are no data available at all in most of the cases, because there could not have been any monitoring for the prices of the young market.

Another problem is, that the technological progress is very fast in the sector of telecommunications and thus, the definition of a market often has only a very short validity.

So, for the definition of the market, it is important to have a forward-looking view on the situation. Nearly the same service can be provided by two different suppliers with different technologies (as an example, take cable modem vs. DSL technology, again). So, if a firm provides a new service and thus has high market shares in the beginning, one has to take into account "a larger range of potential suppliers of the service"[32] in the future. Thus, a firm's high market shares when introducing a new service, could be

31 cf. Vogelsang (2006), pp. 19, 20
32 Gual (2003), p. 39

substituted in the middle or long run by new technologies. For the analysis of market definition it is important that the measurement takes into account a longer time range, so that supply responses by other firms are included.

Gual (2003) criticises that "this forward-looking view of markets is usually missing in the definition of markets in the telecoms industry"[33] and points out the example of the merger between Sprint and MCIWorldCom, where, in the author's view, the large shares of the backbone market of these companies would not have been able to last sustainably.[34] He concludes that "in sum, the regulatory authorities have tended to be fairly conservative when establishing relevant markets in the emerging segments of the telecoms industry"[35]

5 Basic ideas for regulation of new markets

5.1 Overview

When having defined the relevant markets, the question arises, how to handle every single market from a regulatory perspective. Are there advantages of a short time monopoly, which helps innovative processes and if so, how long should these so-called "regulatory holidays" for such a monopoly be accepted?

33 Gual (2003), p.39
34 cf.. Gual (2003), p. 41
35 Gual (2003), p.41

In order to have a closer look onto this question, I will present some main ideas of dynamic competition and will explain, why looking at static concepts as traditional antitrust and regulatory schemes do, is most likely not the appropriate tool for new markets in telecommunications industry.

5.2 Dynamic competition

Dynamic competition is a huge field of study and could be subject of a single paper. In this context, I only want to outline some aspects of dynamic competition which could be interesting for our topic.

To start with and relate dynamic competition to our issue, I will provide a statement from Baake et al. (2007) and investigate its meanings. They say, that, "usually, creation of a new market does not call for active regulation"[36]. The theory behind this statement is as follows.

Take the situation of a state of static efficiency (i.e. a competitive equilibrium), where one undertaking introduces a new product or service. As the other firms see, that the innovator gets rents for her innovation, they will follow and try to imitate her, which will eventually result in another static equilibrium after some time. [37]

Since there is by definition no market-based static efficiency in a regulated market (this is being tried to enforce by active regulation), it is not clear,

36 Baake et al., (2007), p. 124
37 cf. Baake et al., (2007), p. 125

how innovations influence that kind of markets and how the market should be treated from a regulatory perspective. Before we treat this question more detailed, I will have a closer look at the relation and tradeoff between static and dynamic efficiency.

5.2.1 Static vs. dynamic efficiency

In standard neo-classical economic literature, static or allocative efficiency is the most important normative concept. When all individuals maximize their utility and firms maximize their profits, the economy will evolve towards a general equilibrium, where all markets clear and where there is no way to improve one individual's utility or firm's profit without harming another one's. In neoclassical concepts, this competitive equilibrium maximizes welfare. Thus, this state of static efficiency is usually the aim in competition policy to reach. In this static world, any distortion of perfect competition as monopolies or oligopolies reduce total welfare and create a dead-weight loss.

According to Schumpeter, not static equilibria ensure highest possible welfare in a capitalist economy, but innovations, endogenously created and driven by the capitalist's will to be one step ahead and thus make higher profits than her competitors.[38] "The basic impulse, that actuate capitalism, comes from competition for new goods, production and transport processes and organizational models."[39]

38 cf. Schumpeter (1950), p. 134ff.
39 Schumpeter (1950), p. 137 (translation)

"[Schumpeter] argued, that allocation in the static environments was an unimportant phenomenon compared with the enormous innovations that capitalist economies produced."[40] Based on this, as Baake et al. point out[41], Schumpeter formed two hypotheses, which should explain capitalist economies in a better way than the concept of static efficiency does.

In both hypotheses, the static equilibrium is disturbed by a drastic innovation of an entrepreneur, who followingly makes profits through her innovation.

In what is called Schumpeter's "first theory" (1934) in Baake et al., he assumes, that other firms start to adjust or drop out of the market and after some time, in which the innovator earns higher (monopoly) profits, a new competitive equilibrium emerges. Thus, "catching-up competition" ensures, that monopolies are only a temporary phenomenon. Moreover, other entrepreneurs market new innovations and become monopolists by themselves or even crowd the old innovator out of the market, what Schumpeter refers to as "creative destruction"[42].

"The opening up of new markets and the organizational development from the craft shop and factory to such concerns as US Steel illustrate the process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new

40 Dynamic Competition and Public Policy, Ellig (2001), p. 17
41 cf. Baake et al. (2007), p. 380ff.
42 cf. Schumpeter, "Capitalism, Socialism and Democracy" (1975; orig.pub. 1942) pp. 82-85.

one ... [The process] must be seen in its role in the perennial gale of creative destruction; it cannot be understood on the hypothesis that there is a perennial lull."[43]

In his counter theory, Schumpeter assumes, that, by implementing her innovation, the innovator creates a competitive advantage for the next innovation, and thus, it is easier for her to make the next step compared to her competitors. In the end, the process would not result in a competitive equilibrium again, but in a monopolistic economy. Catching-up competition then plays a minor role and the increasingly concentrated markets call for regulatory invention, if welfare should be maximized.

While it is not clear, which of the two theories is empirically "true"[44], Schumpeter's work shows, that innovation is driven by the innovator's incentive to earn monopoly profits and that without the pure possibility of existence of a monopoly, firms would not take the large costs for R&D and for uncertain investments, respectively.

Thus, what the story tells us, is, that with a competition or regulatory policy, which only aims for allocative or static efficiency, where monopoly or market power are undesirable, there are hardly any incentives for innovation and thus technological progress. The same story is true for investment. If a firm has to bear high costs for investment in infrastructure and through regulation, every competitor could utilize the infrastructure as

43 Schumpeter, "Capitalism, Socialism and Democracy" (1975; orig.pub. 1942) p. 82.
44 cf. Discussion in Baake et al. (2007), p. 385

well, the firm might not induce the investment. Furthermore, firms with higher market power have more financial resources to invest into R&D or take the risk for innovations or investment. So, "market power arising from innovation is itself an incentive for innovation"[45].

5.2.2 Innovations from an entrepreneur's perspective

Whenever a company plans to make an investment, the 'simple' question is, if the returns from the investment would be higher than the costs in order to really enforce the investment. Of course, in reality this is not a simple question, because both costs and to a much higher degree the possible returns are uncertain.

Especially when talking about an innovation, for which there might be high development costs, no one can predict how long it would take a company to finish the development of the innovation in order to bring the ready product to the market. And, in the worst case, the innovation totally fails, so it might never become a saleable product and the firm only has to pay the costs for an unsuccessful development.

But even, if the probability, that the innovative product could become ready for the market, is very high, there is still significant uncertainty for the firm when selling the product.

Of course this depends crucially on the type of innovation. If it is, for

45 Ellig (2001), p. 19

example, a drastic innovation, the possible profits are significantly higher than in the case, where it is only a slight improvement of a production process. The probabilities for completion of the product depend also on that, whereas they are most likely much smaller for such a true innovation to be successful.

If the (drastic or not) innovation is successful from the technical point of view and the product is released on the market, there is still a wide range of uncertainties left for the firm.
The first arises from the fact, that not every innovation makes its way to fit people's needs. It depends on the entrepreneur's ability to bring a product to the people, who demand it, which includes marketing and advertisement abilities.

The second, most important (especially for the regulatory policy) uncertainty is, how long the company can hold its monopoly. If the firm acts on a very competitive market, other companies might adjust very quickly and imitate the innovator which might lead to an almost competitive equilibrium very soon, where no firm earns very high profits any more. In this case, the innovator might not be able to cover the costs she spent for the development of the innovation before. On the other hand, if it is hard for other firms to imitate the innovator, she will get the monopoly profits for a long time. In the extreme case, the process will lead to a permanent monopoly without any competition, much higher profits than investment for the innovator and high dead weight losses in the middle and long run.

In telecommunications industry in Europe, where we already have a regulated market with an incumbent (the former monopolist) and a competitive fringe, these ideas become even more complicated.

The main aim for an incumbent is to try to keep her market shares against the entrants. In order to prevent losing market shares despite of the fact that the incumbent is regulated and new entrants come into the market, she has high incentives to being one step ahead in contrast to the competitors. Thus, the incumbent naturally has high incentives to innovate and also has the possibilities to do so. Since she could acquire monopoly profits for a long time, she usually has the capital and technical abilities to innovate. Additionally, if the new market is not regulated in the beginning, the incumbent can exploit the monopoly profits very well (e.g. through economics of scope; advertisement, etc.).

On the other hand, the replacement effect may counteract innovations by the incumbent. "Replacement effect" means, that an innovation by the incumbent would "steal" profits from her old market or a former innovation. Baake et al. (2007) considers this "business stealing effect as rather unproblematic"[46]

The entrants/competitors do not face such a replacement effect. Thus, we expect a wider possible range of innovations for the competitors, which could seek parts of the incumbent's rents. The probability for a revolutionary innovation is probably higher, because there is no already

46 Baake et al. (2007), p. 394

existing infrastructure which could be used by the competitors and so they have a higher incentive to find completely new ways of providing their services or products.[47]

One example, which might go in this direction, is the case of Hutchinson in Austria, which tried to build up a network for mobile internet with the brand "3". The incumbent "Telekom Austria" is very active in the broadband internet sector, where "3" has no influence at all. It might be, that the entrant Hutchinson was a bit faster with implementing the new technology rather than the incumbent's branch "Mobilkom Austria".[48]

Finally, competitors might profit from regulation of areas where the incumbent has a dominant position. Then they can innovate in other, up- or downstream, areas, what might not be possible without regulation.[49]

5.3 Regulation strategies

5.3.1 Traditional Regulation

The discussion hitherto brings us to the point, where we try to find an "optimal" regulation strategy. In a dynamic economy as the

47 cf. Vogelsang (2006), p. 29

48 http://drei.at/portal/de/privat/unternehmen/uberuns/was_ist_3g/Unternehmen_H3G_3G.html (visited on June, 5th, 2010)
http://drei.at/portal/media/960/privat/unternehmen/presse/pressemappe/Facts_Figures.pdf (visited on June, 5th, 2010)

49 cf. Vogelsang (2006), p. 32

telecommunications industry, we have to focus on a regulatory scheme, which allows for investment and innovations. A framework has to be established, in which firms can be sure, that they get returns for their investment, but no permanent monopolies show up.

Traditionally, the main regulatory scheme, which is "based on static efficiency and built on a system of cost-based regulation"[50] brings up severe problems, when we want to achieve the aforesaid aims. Here, a "logic of static efficiency is applied directly to dynamic problems."[51] Of course, this brings up some problems, which have to be solved in order to foster investment and technological progress.

One main problem with traditional regulatory schemes is the "free-rider" option for competitors, who do not have to take any investment, but through regulation, they are still able to use infrastructure built by the incumbent. Thus, the incumbent has to bear high risks when building the network, but probably could not recover her costs, because the earnings diminish, if competitors could use the infrastructure through regulation in the same way as the incumbent did.

Hence, traditional cost-based regulation affects the incumbent's incentives for innovation by price caps with possible profits from the innovation being reduced or, in the worst case, with making the whole innovation unprofitable. [52]

50 Baake et al. (2007), p. 406
51 Baake et al. (2007), p. 406
52 cf. Vogelsang (2006), p. 32

Baake et al. (2007) add, that "cost-based regulation of entry […] also defeats the aim of creating structurally secure (i.e. infrastructure-based) competition".[53] Whether infrastructure-based competition is an aim rather than service-based competition is discussed broadly. Kittl et al., for instance, put it that way: "There are clear signs that infrastructure-based competition is more important to business customers and service-based competition is more important for residential customers. Therefore, if the majority of consumers are also to be able to benefit from competition then both liberalisation strategies will have to be in place – in a balanced approach."[54]

In 2002, the EU brought up guidelines for NRAs how to handle regulation of telecommunications industry, whereas they focused in some abstracts on new and emerging markets. Before I go on, I will have a look on how much the EU could integrate dynamic competition theory in their law so far.

5.3.2 The EU guidelines again

The EU guidelines answer the question of how to treat emerging markets in §32 of the framework in a somewhat fuzzy way: It says, that "emerging markets, where de facto the market leader is likely to have a substantial market share, should not be subject to inappropriate ex-ante regulation". On the other hand, "foreclosure of such emerging markets by the leading undertaking should be prevented" and, generally, "NRAs should ensure

53 Baake et al. (2007), p. 407

54 Kittl et al. (2006), "Infrastructure-based versus service-based: competition in telecommunications".

that they can fully justify any form of early, ex-ante intervention in an emerging market"[55].

An interpretation of this paragraph could be, that, as long as a pioneering role of the new market leader exists, it should be freed from regulation, but once other undertakings have the chance to participate in the new market (i.e. the pioneering role does not exist any longer), the regulatory authorities should focus on competition by implementing regulatory measures.

This fuzzy formulation is quite a source for uncertainty. If an undertaking does not exactly know, how long it can keep a monopoly after making an investment, the uncertainty might be too big to risk an investment into new technology infrastructure.

The monopoly profits of a too short or uncertain time period ex-ante might not be enough to cover the costs for the investment and so the investment simply isn't done. As exemplified in Chapter 2, this may lead to significant dead-weight losses. On the other hand, if such a "pioneer monopoly", as defined in the next chapter, existed too long, competition might be harmed. The result would again be a significant dead-weight loss.

5.3.3 The concept of regulatory holidays

According to standard economic literature, a static monopoly is

55 EU guidelines 2002/C165/03, §32

characterised by a lack of competition, i.e. one firm can choose whatever output it can realize while maximizing its profits with that amount of output. US antitrust law (1997) specifies the definition, as written in "Dynamic competition and public policy": "A Firm is engaged in monopolization, if it employs 'exclusionary' practices, but not, if it dominates its market due to superior skill, foresight and industry or as a consequence of a superior product, business acumen or historical accident".[56]

Thus, the special case of a monopoly in question is one, which arises due to technical progress and investment into the according necessary infrastructure. If a firm manages to create and sell a totally new product, which economically has no substitutes (i.e. the product forms a new relevant market) and fulfils the definition of a monopoly above, we can talk about a "pioneer monopoly" as defined by Vogelsang (2006)[57].

In such situations, according to what we called the first Schumpeterian theory in this paper, other firms usually start to imitate the innovator or come up with even better innovations, which leads to a limited time frame where the monopolist really is a pioneer[58].

When interpreting the EU guidelines like I did in this paper, they propose to not regulate a pioneer monopoly as long as there really is the pioneer status

56 Ellig (2001), p. 1, cf. Department of justice and federal trade commission, 1997, Horizontal merger guidelines.

57 cf. Vogelsang (2006) p. 32

58 Despite of patents or no possibilities to copy (e.g. due to secrecy).

of the innovator, which is referred to as regulatory holidays.

Since this policy helps innovators to exploit their monopoly profits compared to a strict regulatory scheme, it may give incentives to innovations. Furthermore, for both, incumbents or competitors/entrants, there are some special advantages, which facilitate innovations in a pioneer monopoly policy framework.

An incumbent, for example, can easily add the new product to her existing sales mix, which thereby has a significant advantage compared to any competitor's product proposals. In the “worst” case for the competitors, the incumbent can attract the whole old market, which may end up in a dominant position of the incumbent not only in the market for the new product but also in the one for the sales mix or even the old products. Therefore, incumbents might find a way to avoid regulation of their old markets by taking advantage of introducing new products using pioneer monopoly policy.

Competitors are usually not in the sights of regulators, because there is no need to think about regulation of firms which are far away from being dominant. Anyway, a drastic innovation can lead to a dominant position, even if it is provided by a competitor or entrant. So, the non-regulation of pioneer monopolies may help competitors who act as innovators, too. However, the advantages seem not to be as big as for incumbents. The latter have more financial and technical resources to react to new technologies brought up. So it is harder for entrants to utilize the bonus of a new

technology, because the initial incumbent might already have another, even better technology in her drawer. Since an entrant is not subject of any regulatory measure, she can not profit from cancelling regulation due to the new product.

Whether regulatory holidays should be granted for a certain service or product, is not a simple question.

First of all, it is not sure, that due to an innovation or investment there is really a new market created. To assess this, a transformed version of the SSNIP-test as described in Chapter 3 can be used. Of course, this test can not be applied before the investment is done, which leaves some uncertainty to the investor. Since the corresponding data is needed anyway, Baake et al. propose to wait four years before the test is performed[59] to reduce the uncertainty for the investor and give her some time to exploit the monopoly profits.

The somewhat transformed question of the SSNIP-test now would be: "What percentage of customers in the new market would revert to the products of the old market, if the prices of the products available four years ago fell in real terms [...] by 20 percent?"[60] They state, that there is a new market created for sure, if "less than 20 percent of customers would revert to the old products."[61]

59 cf. Baake et al. (2007), p. 409
60 Baake et al. (2007), p. 410
61 Baake et al. (2007), p. 410

On the other hand, four years is a long period, in which the investor already could attract a lot of customers and thus create a long-lasting monopoly. As we will see in the next chapter, there are models, in which it is proposed to grant an even longer period for regulatory holidays due to other reasons.

Regulatory holidays can also be compared to patent monopolies, which also should enable investors to account for their expenditures and their risk. Similarly to the patents, a too rigid competition policy (i.e. a too early interdiction of a monopoly by an NRA after an investment or innovation) can lead to a state, where no investments are done at all, because fixed costs for R&D or the deployment of the infrastructure and the corresponding risk for future revenues are too high.

Another fact which has to be added to the risk for telecommunications markets compared to patents is, that the investor cannot be sure, how his service is treated by the regulatory authority in the future. A patent is granted a fixed time period, in which the innovator can be sure, that she can exploit the monopoly profits. For innovators in the telecommunications sector, changing regulatory strategies through different policies by NRAs or even changes in the national or EU-wide framework on how to treat certain markets could interrupt their plans. Since the decision, if an investment is made, is ruled, before the investment is actually done, the investor has to know *ex-ante* if it is profitable for her to do so. Therefore, one challenge for regulatory authorities is to credibly guarantee, which policy they are going to enforce in order to minimize the investor's uncertainty.

An example for regulatory holidays for broadband networks is South Korea. There, alternative network operators can only get access to already built fibre optic networks, if they are deployed before 2004.[62]

5.3.4 A model for regulating new markets

As presented in the last chapter, regulatory holidays can be a way to foster investment into infrastructure. Baake et al. (2007) have developed a model, which describes a way of how to deal with new markets from a regulatory perspective in detail.

As argued above, it is not clear, if an investor should be granted regulatory holidays for a new product or service after an innovation and moreover, it is not clear, how long this state should prevail, if so.

If the transformed SSNIP-test presented above detects after four years, that the innovation did not create a new market at all, the result is quite easy. The regulatory offices then have to react, as if the seeming new market was a typical market, which underlies regulation.

If, otherwise, the SSNIP-test leads to a result, where a new market is detected, the question is not so easy to answer. On one hand, the investor still has significant market power on his new market and thus, static efficiency is disturbed, which would call for regulation. On the other hand, the aim here is to create dynamic efficiency, which – as Schumpeter argued

62 Jaag et al. (2009), p. 51

– seems to be more important than static efficiency for an economy. Therefore, it is possibly necessary at this point to keep the protection of the innovator to give her the chance to recoup her expenditures. As argued above, and as Baake et al. point out, "it is therefore important for the state to establish a regulatory framework in which an active regulatory authority can be credibly restrained during this phase of the market."

If, after these four years, regulatory holidays are still granted due to the reasons above, the next step must be to ensure, if competition emerges in succession. As Fig 2 shows, Baake et al. propose to check this within several steps.

Firstly, six years after the innovation is implemented, there should be competing infrastructure rising up in order to limit the market power of the investor. For the case of broadband, this could be mobile networks, for instance. If within this period, there are no signs, that alternative infrastructure is built, the model calls for regulation.

In the next step, another two years ahead, the model calls for growing market shares of competitors. Baake et al. propose, that alternative network operators should therefore have shares of over 30 percent.[63]

63 Baake et al. (2007), p. 413

After ten years, a forecast using the SMP-test is proposed in order to estimate the development of the market in question and if regulation could be necessary.

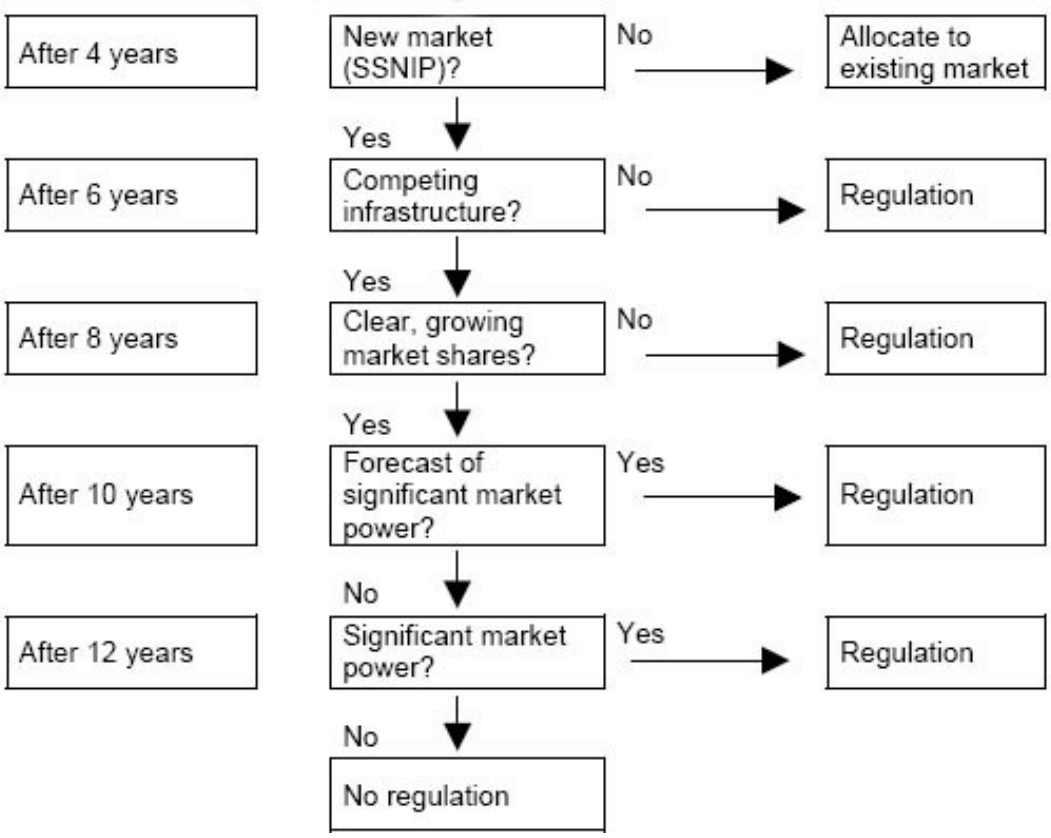

Fig.2 shows the process for regulation of a potential new market for the model of Baake et al. (2007). In this model, it may take twelve years, before any regulation is imposed on a new market.

Finally, after twelve years, the SMP-test is used to assess, if the innovator still has significant market power. In this case, finally regulation would be applied to the market in question.

Baake et al. argue, that their model takes into account "investment

incentives [...and] telecommunication-specific aspects".[64] Especially the fact, that in telecommunications industry, investment into networks could generate new services, which in turn add value to the new network, is here important. The first four years, which pass by before any regulation is thought of, should account for this fact.

Furthermore, Baake et al. see other positive effects when using their model. They argue, that, since both, competitors and incumbents are affected by their regulation framework, it was more likely for infrastructure-based competition to show up.

Another argument for their model is the fact, that undertakings could be quite sure about their expectations. They know *ex-ante*, that the market will be unregulated in any case for the first four years. And even after these four years, it is not crucial, if competition shows up or not, because in the case that competition does not show up, regulation comes into consideration. Thus, the undertakings again can be rather secure about their expectations. They know, that after the first four years of unregulated state, their monopoly will in any case collapse by and by.
Furthermore, the investor does not have incentives to protect her monopoly state any more by preventing successors from market entry, because if they did, they knew, that price and/or access regulation would be imposed on their product or service.[65]

64 Baake et al. (2007), p. 414
65 cf. Baake et al. (2005), pp. 133-134

Most of the arguments provided by Baake et al. to promote their model are quite clear and comprehensible. Anyway, there are still some problems, which would call for different strategies than the proposed one.

First of all, the first four years, in which regulation is not scheduled at all, are a long period. Within this time frame, the innovator could have attracted most of the customers, which would lead to a long-lasting monopoly, even, if regulation is imposed on the innovator after these four years. Especially economies of scale and scope and already established reputation could help the incumbent to keep her large market shares against financially and technically powerless competitors. This phenomenon is seen in conventional telephone networks in many countries. Even though, regulation should have enforced competition in this area during the last decade, in many countries, the former monopolist still has very high market shares. By not regulating a new market for a long time, this could happen again for new markets in the telecommunications sector.

Another problem is, that market power could be transferred to other markets as long as it is not regulated at all. For example, investment into infrastructure to serve a wholesale market is likely to result in a monopoly on the corresponding retail markets. Previously imposed regulation on old wholesale markets become useless in this case and competition is distorted.

Whereas, the authors see a big advantage in competing infrastructure, this can be a severe problem, too. Especially the case, where the same infrastructure is built parallelly, might be inefficient. Solutions, where

infrastructure is built and used commonly might lead to better welfare results than regulatory holidays that last for a too long period.

6 Intermediary conclusion and outlook

In this part of the work, I have presented the economic background for regulating new markets. I have demonstrated of how to use a SSNIP-test to define markets and how it must be transformed in order to test, if a new service or product forms a new market.

After giving insights into the economics of dynamic markets, I have presented the concept of regulatory holidays. Finally, I illustrated and criticised a regulation model, which tries to account for dynamic efficiency compared to traditional regulatory policies.

This discussion showed, how difficult the world of dynamic efficiency can be. While the model gives several incentives for investment and innovation and provides the chance for innovators to exploit monopoly profits for some time in order to recoup their investment and bear the risk, it comes up with new problems as too much and thus inefficient investment into parallel infrastructure or long-lasting monopolies.

To apply the lessons we have learnt in this chapter, in part II of this work, I

will have a closer look on the Austrian broadband market. We will see, that the country did not do so well when it comes to new generation networks. I will focus on the problems and possible solutions for the future.

Part III: Towards a modern broadband infrastructure in Austria

7 Deployment of broadband networks in Austria

So far, I have dealt with the theory behind regulation strategies and proposed some ways of how regulatory offices could react to developments of new markets and how investment can be facilitated. In Austria, the RTR published a concept, in which they impose several remedies on the market leader Telekom Austria for the wholesale market "wholesale network infrastructure access"[66] to help fostering broadband deployment. Anyway, as I will argue, only regulatory measures might not be enough to lead to satisfying results, which could advance Austria to a leading broadband region.

Before I will go into detail with possible solutions for the Austrian telecommunications Market, I will have a look on recent developments and the actual state of broadband deployment in Austria.

66 "Physischer Zugang zu Netzinfrastrukturen (Vorleistungsmarkt)" (Translation), RTR, M3/09-73

7.1 Structure of the broadband market in Austria

As Fig 3 shows, the main driver of the development of the market for broadband access in Austria in recent years was mobile broadband. From end of 2006 to the third quarter 2009, the number of mobile broadband connections increased by almost 500%, while most other types of broadband almost remained static. Only broadband access using DSL, provided through Telekom Austria's pair copper wire network increased as well.

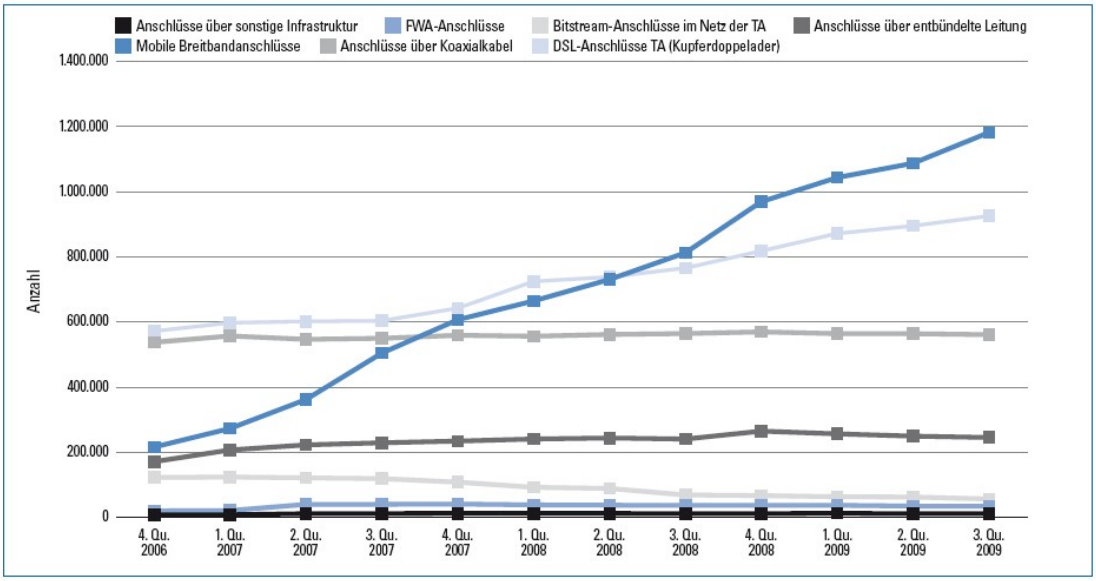

Fig. 3[67] shows the development of high speed - internet access in Austria.

67 The graph shows the number of broadband connections on the retail level, which includes all internet connections which have a bandwidth higher than 144kbit/s. The number of mobile broadband connections represents the number of contracts of mobile internet with included data volume higher than 250MB per month. The total number of broadband connections by pair copper wire in the network of Telekom Austria is split into retail broadband connections by Telekom Austria and connections realised by bitstream. Connections using other infrastructure include leased circuits, FTTH, Powerline (i.e. broadband access using the electricity grid) and broadband connection using satellites. (Source: RTR, "Telekom Monitor" TM1-2010, p. 34)

Compared to this, unbundled connections almost remained the same over the whole time. This probably shows, that, for now, the maximum of households, where it is efficient for competitors to bear the high fixed costs of collocation[68] in order to serve customers profitably, is reached. Furthermore, bit-stream[69] access decreased in the considered period.

As the former monopolist, the Telekom Austria AG (TA) is the only firm which owns a nationwide network of pair copper wires in Austria. Therefore, and as the RTR assesses, TA has got a market share of 100% on the wholesale market for "wholesale network infrastructure access"[70] which includes the circuits from main distribution frames/service area interfaces to single users. Total profit of the wholesale market for Telekom Austria for telephony and internet services was 88,3 million € in the first quarter 2010[71]. The wholesale market for high-speed internet in Austria remained almost constant in the last years, as Fig. 4 shows.

68 In order to use main distribution frames (or in some cases serving area interfaces) in an unbundled network, alternative network operators are granted to have a room at these points, where they can connect their own networks to the unbundled cable of the incumbent. This "collocation room" contains their own technical equipment. If there are only a few users, which can be served with one collocation, it might be unprofitable to do so due to the high fixed costs of rent and technical equipment.

69 "High-speed bit-stream access cannot be considered to be economically or technically equivalent to providing access to the copper pair in the local loop, since a high-speed bit-stream service requires the new entrant to use the high-speed modems and other equipment provided by the incumbent, and that in turn affects the economics of the service and places restrictions on the type of modems that the customer of the new entrant can buy or rent." (Source: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000Y0923%2802%29:EN:HTML (visited on June, 4th, 2010))

70 cf. RTR "Maßnahmenentwurf" M3/09 – 73, p. 12

71 Http://www.telekomaustria.com/dateien/ergebnis-qu1-2010.pdf, p. 4 (visited on June 4th, 2010)

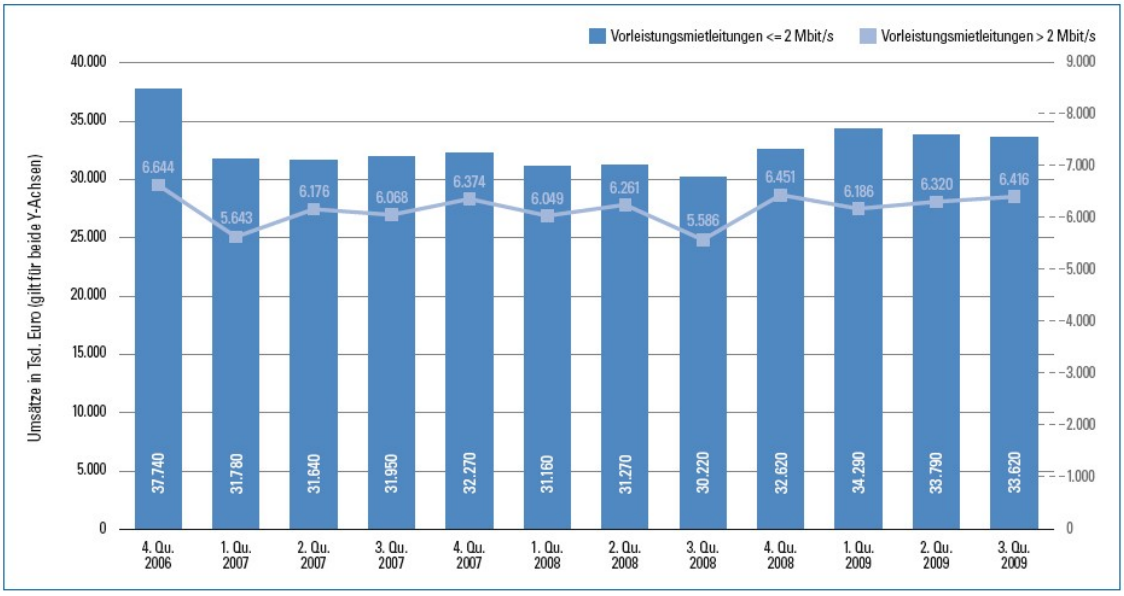

Fig. 4 (top) shows revenues for wholesale broadband markets in Austria. The dark blue coloured bars show the wholesale market for transmission speed below 2Mbit/s, the light blue coloured line shows the revenues for the wholesale market with at least 2 Mbit/s. (Source: RTR Telekom Monitor TM1/2010, p. 17)

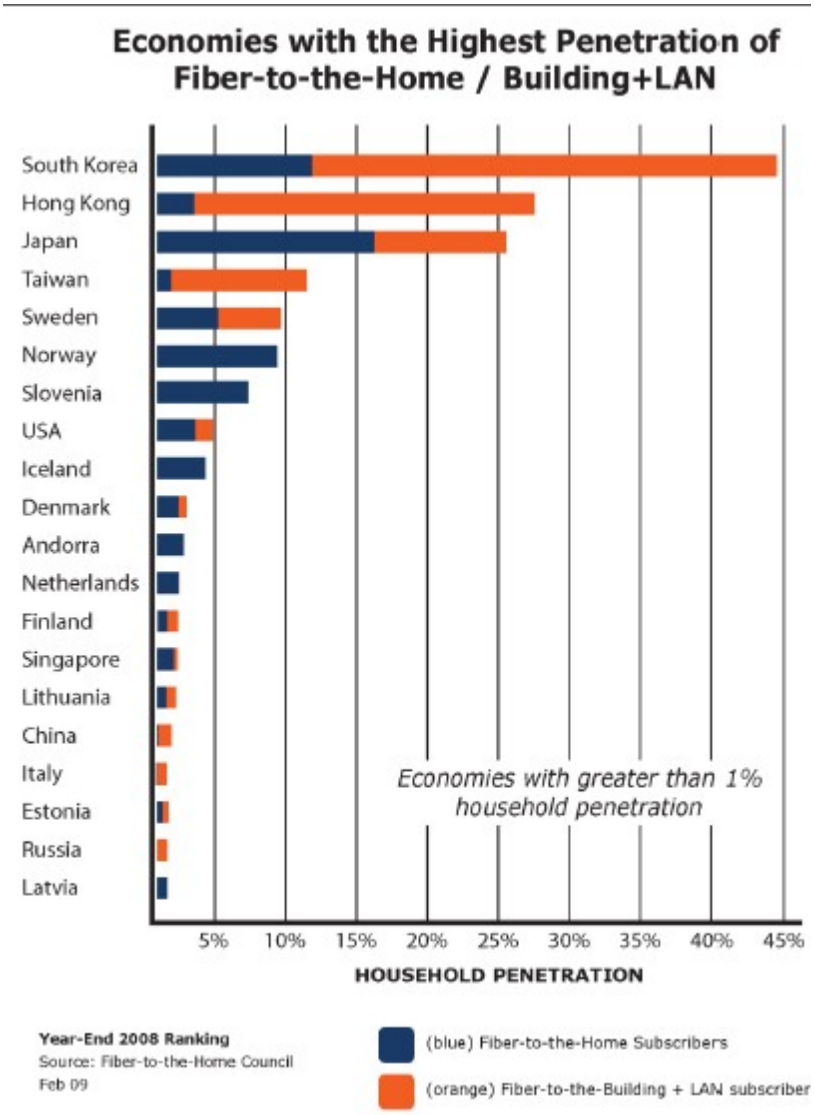

Fig. 5 is a comparison of different countries which already have built FTTH or FTTB connections. South Korea is far ahead. Austria is not in the list. (Source: Hartwig Tauber, FTTH Council Europe)

7.2 Recent development of next generation networks (NGNs)

As in most other developed countries, Next Generation Networks NGNs were a much-discussed issue for the Austrian regulatory agency RTR.
NGNs are defined as high-end networks which guarantee sufficient bandwidths for common or future services.[72] NGA, next generation access describes the connections from main distribution frames or serving area interfaces, respectively, to single households.

From a technical point of view, new generation networks usually need a change in infrastructure technology. Whereas today, in the local loop, mostly twisted pair copper wires are used to transmit data from the access points (i.e. point of presence; usually main distribution frames or serving area interfaces) to single households, in the future, fibre optic transmission will be used to ensure higher bandwidths and thus new services, that can only be utilized within NGNs. (see Fig. 6).

72 cf. RTR (2010), M3/09-73, p. 12

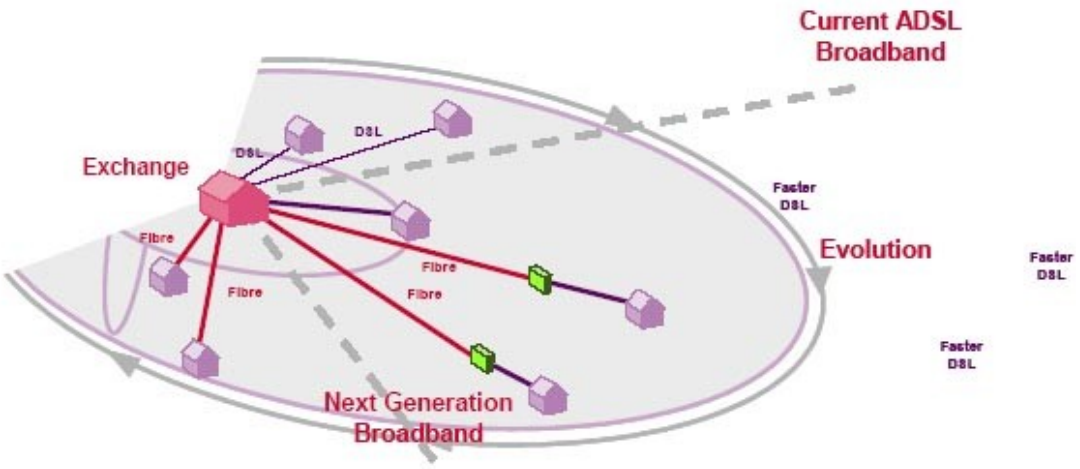

Fig. 6: Today, most broadband connections use pair copper wires (violet coloured). As technology advances, more and more of the distance from the main networks to single households is replaced by fibre glass. In the end, FTTH prevails, connecting every single household via an own fibre glass to the Internet. (Source: A Review of certain markets included in the Commission's Recommendation on Relevant Markets subject to ex ante Regulation, Cave et al. (2006)).

Today, the most common transmission technologies (ADSL, etc.) still use twisted pair copper wires, facing a pay-off between bandwidth and distance and thus resulting in low bandwidths in rural areas. More advanced transmission technologies or a composition of twisted pair copper and fibreglass wires could increase transmission speed, even if fibre optic transmission is not exclusively used. Usually, for FTTC and FTTB, such a composition is used, facilitated by VDSL technology in the serving area interface or the analogous infrastructure at the building for FTTB. FTTH is the ultimate step towards a high-end broadband network with a connection

speed of up to 1 Gbit/s[73]. As mentioned above, investment in FTTH was not very distinct so far in Austria.[74]

Thus, before I will talk about economic and regulatory consequences of investment into new infrastructure in the broadband sector, I will have a look on what plans for constructing new infrastructure Telekom Austria has in the upcoming years.

First of all, they want to realise projects with FTTH and FTTB, FTTC by using VDSL in four areas: Villach, Klagenfurt and two districts of Vienna (15th and 19th). Moreover, they plan to implement VDSL in most of the main distribution frames till 2012, which ensures much higher bandwidth[75], mainly at MDFs where the local loop is not yet unbundled. However, plans for a nationwide or at least region-wide deployment of FTTH do not seem to exist.

7.3 Why Telekom Austria's market power is problematic

"Telekom Austria has – in an economic sense - a high and durable market power on the market in question", assesses the RTR in M 3/09-73[76]. Therefore, already now and without further deployment of NGA, there are

73 As it is the case for example in Japan (Single Star), see http://de.wikipedia.org/wiki/FTTH#Situation_in_Japan (visited on June, 5th, 2010)

74 cf. RTR (2010), M3/09-73, p. 14

75 According to Telekom Austria, the VDSL technology can ensure a data rate of 20-30Mbit/s within a radius of 800 metres and 10-12 Mbit/s within a radius of 1600 metres (Source: RTR (2010), M3/09-73, p. 20)

76 RTR (2010), M3/09-73, p. 20; (transl.)

problems for competition in the wholesale market, which should be solved by regulation.

One problem would be that TA has no interest in voluntarily unbundling their networks, because they would fear alternative network operators and thus more competition and lower profit. Through "excessive pricing", TA could put competitors out of business, in the case that TA was not allowed to not unbundle their services. By charging too high prices, it would be unprofitable for the competitors to offer their products in that case. Furthermore, TA could counteract competition by non-tariff measures, e.g. lower quality.[77]

The implementation of NGNs can evoke further problems for competition. If a line from a main distribution frame to a serving area interface or from a serving area interface to a single household consisting of twisted pair copper wires is already unbundled, a deployment of FTTC, FTTB or FTTH can result in unserviceableness of the connection by competitors, if the technical preconditions are not given any more. And even, if the competitors still can use their infrastructure, they will not be competitive and at some point drop out of the retail market, since they face a longer distance using VDSL from the main distribution frame to the single household than the market leader using VDSL from the serving area interface to the household and thus the alternative operators have to offer a lower bandwidth.

77 cf. RTR (2010), M3/09-73, p. 20/21

Similarly, it might be impossible for the competitors to use the collocation at the main distribution frame to unbundle new local loops, so that it is unusable for the competitors to reach new customers. The collocation then would have to be built at the serving area interface, which brings up another problem for the competitors.

Due to high fixed costs for the collocation, there must be a critical amount of potential customers for the competitor to be profitable to serve a certain attraction area, which is certainly much lower at a serving area interface than at a main distribution frame[78]. Furthermore, a collocation needs some space and other standards (e.g. electricity supply), which might not be available at a serving area interface.

7.4 Deployment of NGNs by TA and competitiors

Concerning the deployment of NGNs, TA and alternative network operators have specific advantages, whereas, clearly, without any regulation they would be much higher for TA as for the market leader.

As the monopolist, TA can access their already existing network and use spare ducts, which saves the high costs for rewiring. Another advantage is the status of TA as the "Austrian" supplier of telecommunications services,

78 cf. RTR (2010), M3/09-73, p. 15: At an SAI there are at maximum 500 who can be served; at an MDF the unbundled attraction area is 6.097 on average; if an access point does not cover 1000 potential users or more, a collocation is usually not profitable.

which helps them in negotiations, especially with public entities. Moreover, with their high number of fixed subscribers, it is much easier for the TA to reach enough customers to implement a technical enhancement profitably.

On the other hand, cable operators, for instance, have the advantage of already existing high bandwidths within their networks (up to 100 Mbit/s), whereas they can only serve certain (typically urban) areas. Mobile network operators, which faced a high growth on the mobile internet sector in recent years in Austria (as shown above), still did not reach the maximum of their bandwidth. New technologies as Long Term Evolution (LTE) guarantee a bandwidth of about 100Mbit/s in the future. Anyway, this development is still some years ahead and might be expensive in the beginning. Also other utilities as electricity grid operators or municipal utilities have already laid tracks for fibre glass networks, which might be used in the future.

Despite these advantages for alternative network operators, the RTR assesses, that the benefits for Telekom Austria are too essential for any other operator to build up a NGN with similar dimensions[79].

7.5 Regulatory remedies

In order to limit the possible negative consequences of Telekom Austria's high market power on competition, the RTR brought up regulatory remedies, which should ensure higher competition in the future, especially

79 cf. RTR (2010) M3/09-73, p. 19

concerning deployment of NGN/NGA. I will focus on those, which affect competition most.

7.5.1 Traditional unbundling

First of all, RTR imposed access to unbundled network components on TA, which should avoid, that the assessed market power on the wholesale level is transferred to other (i.e. retail) markets. Therefore, TA has to provide shared use (of local loops) or unbundling of local loops. Moreover, there must not be spatial constraints of the collocation rooms at the main distribution frames, if the space is needed for deployment of NGN/NGA. Also at the service area interfaces the possibility for alternative network operators to extend their infrastructure up to that point has to be created (i.e. there must be a possibility to have a collocation at serving area interfaces). Of course, this will be only appropriate, if it is profitable for the alternative network operator to serve enough customers from the serving area interface (we assessed before, that this is hardly ever the case due to low numbers of possible customers).[80]

7.5.2 Provision of (unused) infrastructure

In order to ensure the possibility for alternative network operators to build their own infrastructure, the RTR imposed a remedy on TA to offer free cable ducts to their competitors (especially from the main distribution frame

80 cf. RTR (2010) M3 09-73, p. 22/23

to service area interfaces and from competitors' points of presence to main distribution frames/service area interfaces). This is important, because trenching would probably be to expensive for alternative network operators. New infrastructure is important from a competition point of view, because it makes them independent from the monopolist. A problem is that up to now, only ten percent of the cables use a duct.

Moreover, the RTR assesses, that the admission to "dark fibre" (optical fibres, that are currently not in use) has to be provided by TA.[81]

7.5.3 Virtual unbundling

When TA enlarges their fibre optic network closer to the customers (e.g. from main distribution frames to serving area interfaces), as argued, alternative network operators face such a small number of customers for each collocation, that is not profitable any more to serve the customers. Therefore traditional unbundling is not useful any more.

Thus, new measures have to be created in order to maintain competition. So, the RTR developed the concept of "Virtual unbundling" for areas, where TA plans to deploy NGNs.
In order to implement virtual unbundling, TA has to offer a new wholesale product. It can be seen as a compromise between Bit-stream access and traditional unbundling, whereas it is much more flexible that those methods. It is independent of the used technology and should account for

81 cf. RTR (2010) M3 09-73, p. 24

individual and independent service design. Hereafter, virtual unbundling is designed to replace the variety of different wholesale services that exist right now and end up in one wholesale service, which can be flexibly adjusted to the users' needs. One main problem, which should be faced by virtual unbundling is the fact, that by deploying FTTC/FTTB, it becomes unprofitable for competitors to have collocations at the service area interface instead of previously used ones at the main distribution frame. By using virtual unbundling, the collocation could remain at the main distribution frame or even at any higher network layer, even though, the fibre optic wires are deployed further[82].

7.5.4 Non-discrimination

The RTR imposed the remedy on the TA to make a standard offer in order to ensure that the TA itself, associated undertakings or competitors which demand the same services are treated equally with respect to prices and quality of the correspondent services. To ensure this equal treatment, TA must transparently offer the necessary data to competitors.

7.5.5 Tariff-control

Since TA has incentives to use excessive pricing to force competitors out of the market, the RTR assessed, that price caps for their wholesale products are necessary in order to prevent uncompetitive behaviour. The regulated

82 cf. RTR (2010), M3/09-73, p. 2; pp. 25-27

price must be the minimum of cost-oriented price cap and margin squeeze – free price. (p. 31)

Whether a price is free of margin squeeze, can be assessed by looking at the retail prices of the incumbent TA. Therefore the RTR proposed to use APRU (Average Revenue Per User) for all services offered together. Of course, activities that would have to be provided and paid by the competitors (e.g. technical achievements, costs for infrastructure; marketing, accounting, amenities, …) must not be included, since the aim is to assess the benefit of exactly the service, which is sold by the incumbent to the competitor.

Finally, the estimated revenue has to be compared to the costs TA would have to pay if it were an alternative provider (i.e. costs for wholesale services, collocation, back-haul connection etc.). If the result is positive, there is no margin squeeze.
Moreover, for single products or services it has to be checked, if predatory pricing prevails (i.e. if the revenues meet variable costs).

7.5.6 A reaction of TA to the imposed remedies

In a response to the paper of the RTR, TA argued, that through cable and mobile internet, infrastructure-based competition has established[83], which should be a reason for deregulating measures.

In my opinion, this argument is not negligible. Especially in the mobile

83 cf. RTR (2010), M3/09-73, p. 36

internet sector, it can be possible to cover most households in Austria with high-speed internet. Already nowadays, the operator with the – by their own account – largest UMTS-network, "3", could serve 94% of the households in Austria with UMTS[84]. Clearly, with 7,2 Mbit/s[85] (using HSDPA), UMTS is just comparable with ADSL and definitely not with new generation networks, but there is fast development in this sector as well. Using HSDPA+, "3" argues, theoretical bandwidths of 28Mbit/s are possible today[86].

And the future brings even more technically advanced offers. By using the follow-up standard, LTE (Long Term Evolution), downstream speed up to 100 Mbit/s and upstream speed up to 50 Mbit/s[87] are theoretically possible, which is at least comparable to cable and fibreglass networks. Anyway, this development will most likely take several years to be available and affordable for customers.

When looking at the cable network as another rival network, the biggest problem is, that cable network operators can only serve areas of large population density today. It might be the case, that in large cities cable access is an alternative to TA's network, but it is certainly not in rural areas, whereby this can be hardly seen as reason for not regulating TA.

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84 http://derstandard.at/1245820138420/3-Wir-haben-die-groesste-UMTS-Netzabdeckung (visited on June, 5th, 2010)

85 http://en.wikipedia.org/wiki/UMTS, (visited on May, 29th, 2010)

86 http://derstandard.at/1245820138420/3-Wir-haben-die-groesste-UMTS-Netzabdeckung (visited on June, 5th, 2010)

87 http://en.wikipedia.org/wiki/3GPP_Long_Term_Evolution, (visited on May, 29th, 2010)

7.6 A closer look at the RTR policy

Taking the proposed regulatory measures and the economic surroundings, in this chapter I will try to analyse what might be problematic about the imposed remedies.

A criticism of the paper of the RTR certainly is, that they hardly mention, how to treat FTTH-cases, which would certainly be the most powerful future broadband technology. As we have seen in Fig. 5, in other countries as Japan or South Korea, FTTH is already widely spread[88], which gives those countries a clear competitive edge compared to European countries. In Austria, as argued, there is only one case (Villach), where TA already started a test run, whereas we do not know, how much FTTH is used compared to FTTC and FTTB in this and in the coming up test runs in Klagenfurt and Vienna.

Certainly, Telekom Austria has reasons for not investing too fast in new generation networks. For instance, new generation networks enable a wide range of new services, which could compete with TA's own products.

Take VoIP, for example: As NGNs enhance, VoIP will become more important than it is nowadays. Since using VoIP, provided by an ISP for an already existing broadband access is much cheaper than additionally using the conventional telephone network, customers will switch to the new technology. The monopolist, Telekom Austria will not only lose their

88 cf. Jaag (2009), p. 45

customers of their conventional telephone network to their own VoIP-services, but also to alternative network operators, which offer high-speed internet with VoIP rather than they did offer a conventional telephone access. Here the mentioned replacement effect would occur, which gives incentives to TA not to invest into new generation networks.

One solution for this problem would be to make it easier for alternative network operators to invest into own infrastructure. An initiation is made by the obligation imposed by RTR on TA to open up their spare ducts and dark fibre for alternative network operators.

Another remedy is the possibility for alternative network operators to invest into VDSL at the main distribution frame, which would have to be tolerated by TA in any case and without any limit to foster NGN/NGA[89]. A problem hereby is, that the follow-up technologies, FTTC/B/H, are more powerful and thus, investment into VDSL at the main distribution frame could be useless before the alternative service operators could amortise the investment.

Hence, RTR developed a system, in which TA has to bear a part of the investment risk by the alternative network operators. If TA builds up FTTC (FTTB/FTTH) at a certain main distribution frame, where an alternative network operator invested into VDSL within a certain time period, TA has to pay a certain share of the investment cost to the alternative network

89 RTR (2010), M3/09-73, p. 48

operator.[90]

This step might be a good way to foster investment into VDSL, but in my opinion it is not a good way to boost the optic fibre technologies.
First, if TA wants to invest into FTTC at a main distribution frame, where an alternative network operator already runs VDSL, TA has not only to bear the investment of FTTC including the risk, but they have also to pay for the amortisation of the investment into VDSL by alternative network operators. Since in RTR's proposal, the time frame for a total amortisation of an investment into VDSL at a main distribution frame is three years[91], investment into optic fibre networks could be postponed by exactly that time.

At least, to ensure that inefficient investment incentives are as improbable as possible, RTR took into account the general risk of investment into new technologies into their considerations. [92]

Furthermore, the general rule counts, that technologies, that already exist, have a priority before technologies that are to be done, if the two technologies could disturb each others from a technical point of view. That means, that TA has to consider, if an alternative network operators might want to continue their VDSL-services even, if TA invests into optic fibre technology and has to take into account possible technical interferences, which would give VDSL an advantage rather than FTTx.

90 RTR (2010), M3/09-73, pp. 48/49
91 cf. RTR (2010), M3/09-73, p. 49
92 RTR (2010), M3/09-73, p. 49

Second, this rule would also counteract investment incentives into FTTC/B/H for alternative network operators for a similar reason. If they just invested into VDSL at a main distribution frame, alternative network operators will wait to amortise their investment, before they even think of investing into other infrastructure.

To account for these problems, RTR extended their proposed package of measures. TA now has the opportunity to announce, where they definitely do not want to deploy FTTx within a certain time frame. This should facilitate investment decisions by alternative network operators. On the other hand, for areas, which are not part of this announcement, TA is given the chance to change VDSL to FTTx and offer corresponding wholesale products, whereas it must be ensured, that the alternative network operators have the possibility to offer their new services at the same time when TA does. Still, VDSL-investments that were undertaken before the announcement of TA can only be changed into FTTx, if alternative network operators and TA cooperate.

8 Possible strategies for a faster deployment of NGNs

As illustrated, concerning the deployment of fibre optic networks, Austria is one of the most unprogressive countries even in the, compared to other industrialized countries as in Asia, backward European Union. To ensure competitiveness, there must be large investments into that field in the upcoming years. Remember, that the OECD predicted, that one third of productivity growth will come from broadband services in the future.[93] Therefore, policies have to be found, which foster broadband deployment more than it happened within the last years. I will discuss several approaches of how the huge investments into new infrastructure could be taken.

First of all, regulatory incentives as the mentioned regulatory holidays, which could ensure, that telecommunication firms establish NGN/NGA on their own are one way to foster investment into modern infrastructure. Since this will most likely not be enough to serve especially rural areas, other solutions have to be found. These range from public control of the deployment of NGNs to co-operations between firms and public entities, as we will see in this chapter.

93 Heng (2010), in "Broadband infrastructure", Deutsche Bank Research, p.3

8.1 Regulatory holidays

In order to ensure planning reliability for the undertakings – either TA or alternative network operators -, a framework for the deployment of high-speed networks would be necessary, which offers investors special incentives and certainty about their investments. Some of RTR's proposals point in the right direction, but there might be other ways of how to foster deployment of infrastructure by regulation policy.

As argued in Chapter 5, regulatory holidays for a certain time could be a way to ensure planning reliability. Anyway, as mentioned, in RTR's proposal they are not an issue at all. Deployment of FTTx-networks by TA allows for alternative network operators to use it at the same time as TA does. Therefore, at least in regions, where TA already faces harsh competition, there are hardly any incentives for them to bear the investment risk into FTTx. In regions, where TA is still dominant, maybe because investment costs by alternative operators are too high for entry into the market, TA has at least some incentive to invest into modern infrastructure, as they can attract the whole market in the future as well.

Another proposal is, that whatever undertaking is first at connecting a building or household to the fibre glass network, has exclusive rights for a certain time frame to serve the household or building. This policy would ensure, that there are no parallel networks built and from a regulatory point of view, it creates the same preconditions for every market player. However, other factors, like the easiness for the companies to get the necessary capital

to be able to connect the households to their networks are different for each firm. It is certainly easier and cheaper for a state-owned incumbent to get enough capital to make the investments than it is for a small competitor. Furthermore, competition on the service level is disturbed for the time frame, where one firm has the exclusive right to serve a household[94].

8.2 Open Access

Many electric utilities recently built up so-called "passive" infrastructure and focussed on the operation of the networks, but disposed their networks to service providers instead of competing in downstream markets by themselves. This is the concept of Open Access. Therefore, network infrastructure can be used by several undertakings at the same time, which creates a competitive environment. They have access to bottlenecks without being discriminated against, which means, that every service provider faces the same costs and quality and thus competition in the retail market is enforced, which would lead to lower prices, because service providers then have to focus on the efficiency of their own firm.

The most important precondition is, that the owners or operators of the infrastructure, who sell their services to service providers, are not participating in downstream markets. Since, often, vertically integrated telecommunication companies are owners of infrastructure, they could abuse their status and not offer access to their networks to other operators or offer them under worse conditions. This would call for regulation, as we

94 cf. Jaag et al. (2009), p.51; RTR (2009), "Breitbandanschlussnetze in Österreich", p. 104

have seen in the last chapter, where a remedy was imposed on TA to allow competitors to use dark fibre, for instance. Contrary, Open Access means, that even, if an incumbent provides infrastructure, she must not be participating in the retail market.[95]

But also, if the network operator is not vertically integrated and thus not active on the retail market, it might be, that her network forms a monopoly again. Then, regulation for the wholesale market might be necessary as well in order to ensure, that competitive prices are enforced.

In South Korea, the country with the internationally highest penetration rate of NGN/NGA, for instance, open access is the basic principle of telecommunications policies. Every network operator has to grant others access to their networks. This is not only true for monopolists or incumbents, but also for new market participants. The aim of Korea's policy primarily was, to foster competition not only on the service but also on the infrastructure level. In fact, nowadays, customers can not only choose their service provider, but also, which technology they want to use[96]. The only exception are fibre glass networks, which are built after 2004[97].

Politically, open access could be enforced by implementing duct sharing obligations, for instance. At the same time, it has to be ensured, that firms do not engage in wholesale and retail markets at the same time and thus, they might have to be broken apart.

95 cf. RTR (2009), "Breitbandanschlussnetze in Österreich", p. 67
96 cf. Jaag et al. (2009), p.25
97 cf. Jaag et al. (2009), p. 51

8.3 Public control of network deployment

Since in many cases, single firms are not able to manage the deployment of broadband infrastructure efficiently, public authorities could intervene in the process of network deployment actively, and not only by a regulatory framework.

One way of intervention could be, that the state still owns the incumbent and as the holder can force the company to investment into infrastructure to gain the politically decided aims for broadband deployment. One problem hereby is, that the intervention of the state distorts the market significantly, and thus, it has to be ensured, that the incumbent does not have any long-term advantage through this policy compared to the competitors.

To not disturb downstream markets, one possibility is to spin the part of the firm, which is responsible for infrastructure deployment, off the incumbent. Thus, a new firm is created, which still is publicly owned and could reach the policy aims by specializing on laying tracks. The new firm then should provide its facilities to service providers in a non-discriminatory way. This goes hand in hand with open access policy. Similarly, a completely new state-company could be founded to bear the investments into modern broadband infrastructure.
In both cases, the operation of the publicly built networks could be operated by separate (and regulated) firms.

In Austria, TA and other public utilities as Wien Energie[98], for instance, want to start or already started the deployment of FTTH. Since it is not one company which is responsible for the deployment, there might be cooperation problems, which might in the worst case lead to parallel and thus inefficiently built infrastructure.

Thus, another facet is to leave the actual deployment of infrastructure in private hand and only route the investments into a direction favoured by the state. This can be reached by putting an infrastructure project out to tender, for instance. In this case, the distortion of the economy is significantly less than in the cases above, because the bidding process ensures that the company with the lowest costs gets the order to build up the infrastructure. An alternative is to direct the deployment of infrastructure by granting or not granting easement rights.

A way, by which little distortion has to be bewailed as well, is, when companies get subsidies or cheap credits for their infrastructure deployment in a non-discriminatory way. However, the problem may arise, that in this case, too much (e.g. parallel) infrastructure is built, which leads to inefficient results.

To foster investment not only in urban but also rural areas, a grant in urban areas to deploy NGN (where it is highly profitable) can be linked to an obligation for deployment of a certain extent in rural areas as well.

98 cf. http://www.blizznet.at (visited on June 12th, 2010)

8.4 Cooperation and PPP

Since the expenditures that have to be taken when investing into broadband infrastructure, the difficulty to get the necessary amount of money by own or lent capital and the corresponding high risk for getting revenues soon to pay back the credits or satisfy investors with high returns are almost unbearable for single firms, there have to be forms of cooperation, which divide the costs and risks between several participants.

This need not necessarily be the state and private firms. Also incumbent and competitors could cooperate, if an investment is too costly for both single firms. This can include the actual deployment or running and maintaining the infrastructure. Of course, any co-operation between two separate firms can evoke another problem for competition: cartels. Therefore, it must be ensured, that the co-operation is transparent and limited to some extent. Furthermore, there must not be any exclusion of other competitors. According to RTR, the European Commission has a "positive attitude" towards co-operations for deploying broadband networks[99].

Municipals could provide subsidies for broadband investment in order to raise their own competitiveness. Another factor, which is a main matter of expense for FTTH, the wiring within a building, could be minimized by co-operation between a network operator and building societies.

99 RTR (2009) "Breitbandanschlussnetze in Österreich", p. 126

Anyway, a broadly seen "magic bullet"[100] for financing investment into telecommunications infrastructure are public private partnerships (PPP). PPP is a cooperation between public utilities and private firms for "financing, construction, renovation, operation or maintenance" of infrastructure[101].

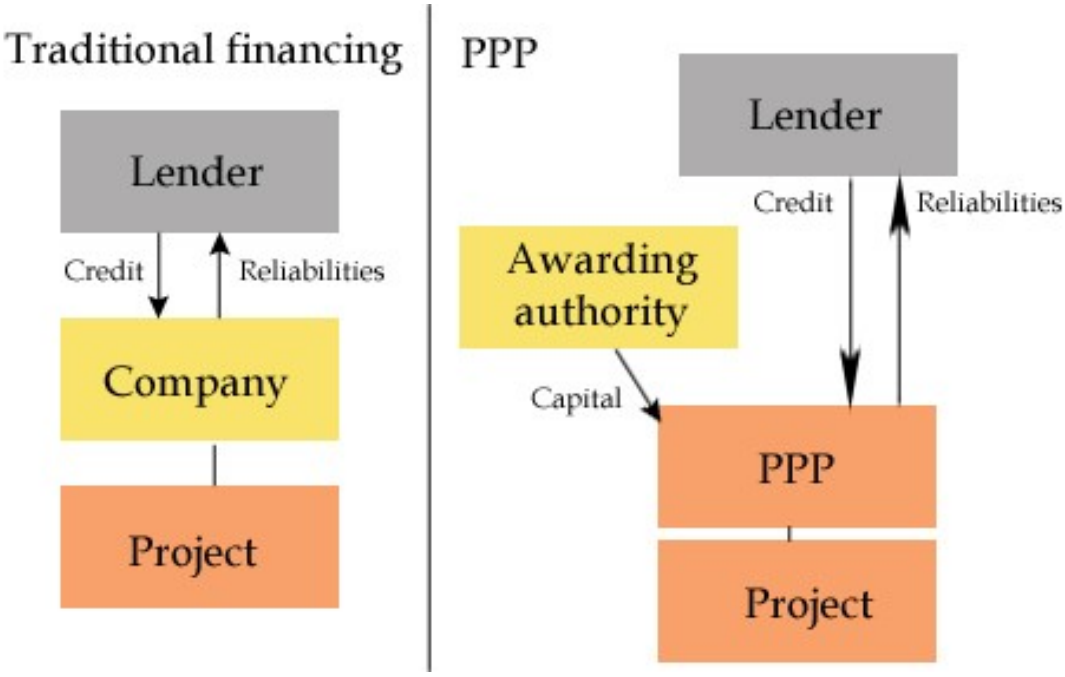

Fig. 7: While in the traditional process of financing a project, the lender is dependent on the financial situation of the company, which enforces the project, PPP ensures, that the lender "only" depends on the profitability of the project, she is involved in. The awarding authority (usually a public entity) orders the project and most likely provides some initial capital.

100 RTR (2009), "Breitbandanschlussnetze in Österreich" , p. 105

101 Seiringer "Chancen und Voraussetzungen von PPP beim Ausbau von Telekommunikationsinfrastrukturen", Presentation, 26. Mai 2009 (translation). (http://www.rtr.at/de/komp/Vortraege26052009/Seiringer.pdf visited on June 17th, 2010)

The concept of project-financing via PPP induces the profitability of the project. As we have learnt, this need not be the case for broadband infrastructure, especially in rural areas. There are a lot of uncertainties, for example resulting of unknown future demand, competing infrastructure (mobile internet) or future regulation policies (could the infrastructure cost be recouped due to a short time monopoly?), which make it seem unlikely to use PPP as the main strategy for fostering broadband deployment[102].

8.5 Public subsidies

After years of liberalizing the telecommunications market there seems to be a change in policies ahead. Most probably it is not possible to build comprehensive new generation networks without any help of public authorities, especially in rural areas.

As argued, PPPs might not be the ideal tool in the case of broadband deployment. Public control of broadband deployment might head the investments into the right direction, but still, more intervention by the state or other public authorities seems to be unavoidable for the public aims of broadband network deployment to be fulfilled.

Now, there are several ways, how the state could reach faster deployment of broadband infrastructure. One way would be to grant a tax relief for certain services or subsidies for services, which use new technologies. The resulting higher demand for such services, which need high-speed internet, generates

102 cf. RTR, (2009), "Breitbandanschlussnetze in Österreich" pp. 105-107; Seiringer (2009)

higher demand for broadband access and thus makes it less risky for a firm to invest into the corresponding infrastructure, because then there are enough customers to serve profitably. Similarly, the development of new services could be subsidized. These method were used in Austria already in some cases. In 2003, for instance, a tax relief for broadband access was enforced and e-government facilities were implemented[103].

Another way is to directly subsidize network operators for deploying broadband infrastructure. In this case, the question arises of how to control, if such a subsidy is really used for network deployment. Another problem is, that it is hard to measure, if these subsidies are granted without any discrimination of competitors. For example, in Austria, most competitors are against public subsidies for broadband infrastructure, because from their point of view, most subsidies were granted to the incumbent Telekom Austria[104].

Of course, state subsidies are generally prohibited by EU law (Art. 87), if they would or could disturb competition or trade between member states in any way. For the special case of broadband deployment, there are rules published by the European Commission to grant subsidies under certain circumstances[105].

103 RTR (2009), "Breitbandanschlussnetze in Österreich", p. 47
104 RTR, (2009), "Breitbandanschlussnetze in Österreich", p. 124
105 cf. Discussion in RTR (2009), "Breitbandanschlussnetze in Österreich", pp. 127-129

9 Conclusion and outlook

In the first part of this work I analysed the current regulation strategies in the European Union and presented a regulation model, which should allow for an investment-friendly environment by granting long regulatory holidays. The authors who proposed this model argued, that it would perfectly fit for telecommunications markets since it accounted for infrastructure-based competition. However, I criticised, that this could lead to parallel and thus inefficient infrastructure deployment. Furthermore, the maximum period of twelve years with the first four years of no control for regulation at all, seem to be a quite long time, in which long-lasting monopolies could be established.

The second part of the work dealt with the case of Austria. Here, next generation networks did not reach a state of very far expansion so far. However, in order to remain the economic attractiveness internationally, it is necessary for the country to kick-.start more investment into modern broadband infrastructure, especially regarding fibre optic technology.
Therefore, I analysed proposed regulatory remedies of the Austrian regulation authority for telecommunications markets, RTR. Moreover, I assessed, that only regulatory measures might not be enough to reach a sufficient state of broadband network deployment, which led me into brining up other policy options to foster investment into broadband infrastructure.

The main policy implications were:

- ensure an investment-friendly regulatory environment, which first of all provides certainty for affected undertakings
- enforce Open Access – policy in order to ensure efficient service-based competition
- direct and financially help investments into broadband infrastructure, especially in areas, where a solely market-solution would not lead to any deployment of NGNs at all

Some of those implications are already in effect. There are initiatives for subsidizing broadband infrastructure. The RTR did a lot of research to find optimal regulation strategies. Anyway, there will still be a lot of work to do to find ways to give enough incentives for firms to invest even more into broadband infrastructure. Regarding the possible welfare effects of a quick broadband deployment, every day, in which no investment is done, is a lost day for Austria's economy.

APPENDIX

GERMAN ABSTRACT

Diese Diplomarbeit beschäftigt sich mit neuen Märkten im Telekommunikationssektor, fokussiert auf Breitbandausbau in Österreich. Zunächst wird analysiert, welche Auswirkungen ein rascher Ausbau von Breitband mit hohen Bandbreiten auf eine Volkswirtschaft haben kann. In weiterer Folge werden theoretische und rechtliche Grundlagen der aktuellen Regulierungspolitik in Europa und Österreich dargestellt. Bevor versucht wird, eine Regulierungspolitik zu finden, die Breitbandausbau bestmöglich fördert, wird auf dynamische Effizienz eingegangen, die in diesem Zusammenhang wichtiger erscheint als das - üblicherweise in der Wettbewerbspolitik - "Maß aller Dinge" - statische Effizienz.

Da festgestellt wird, dass Österreich in Sachen Breitbandausbau ("Next Generation Networks") deutlich hinter den führenden Nationen wie Singapur zurückliegt, soll analysiert werden wo die Gründe für diesen Rückstand liegen und wie sie behoben werden können. Dabei wird festgestellt, dass viele Einzelmaßnahmen zu deutlichen Verbesserungen führen können, wobei manche davon bereits umgesetzt werden. "Open Access", "Regulierungsferien" oder öffentliche Förderungen könnten Wege liefern, um Österreichs Breitbandausbau zu forcieren um in dem Land nicht nachhaltig einen Wettbewerbsnachteil zu verursachen.

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Self-assessment	**Understanding**				**Speaking**				**Writing**	
European level (*)	Listening		Reading		Spoken interaction		Spoken production			
German	C2	Proficient User	C2	Proficient User	C2	Proficient User	C2	Proficient User	C2	Proficient User
English	C1	Proficient User	C2	Proficient User	C1	Proficient User	C1	Proficient User	C1	Proficient User
French	A1	Basic User	A1	Basic User	A2	Basic User	A2	Basic User	B1	Independent User
Italian	B1	Independent User	B1	Independent User	A2	Basic User	A2	Basic User	B1	Independent User
Danish	A2	Basic User	B2	Independent User	A2	Basic User	A2	Basic user	B1	Independent User

(*) Common European Framework of Reference for Languages

Social skills and competences	Member of ESN (Erasmus Student Network) Copenhagen 2009 Member of ESN Vienna Buddy programme from 2009-2010
Computer skills and competences	Microsoft Windows XP/Vista/7; Microsoft Office, Open Office; Adobe Photoshop 6.0 – CS5, Adobe In Design CS+, Fireworks, GIMP, Inkscape; HTML, PHP, MYSQL, JavaScript; E-views, Stata.
Driving licence	B

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