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Contents

Abbreviations **v**

1. Motivation and Outline **1**
1.1. Motivation 1
1.2. Outline 3

2. Kondratiev's Cycle Theory **5**
2.1. Historical Perspective 5
2.2. Cycles in the Context of Public Utilities 7

3. Public Utilities in the Scope of Natural Monopolies **9**
3.1. Introduction 9
3.2. Natural Monopoly Theory 10
3.3. The Structural Similarities of Utilities 10
3.4. The Rationale for Utility Regulation 11
3.4.1. Normative Theory 12
3.4.2. Positive Theory 13
3.5. Distortionary Effects of Utility Regulation 14
3.6. Paradigm Shift away form Natural Monopoly Theory 16

4. Globalisation and Public Utility Sector Privatisation **17**
4.1. Public Utility Reform Paradigm 18
4.1.1. Public Ownership and Privatisation 18
4.1.2. Market Liberalisation and Technological Shift in the Telecommunication Sector 21

4.1.3. Unbundling of non-competitive Network Segments versus Operational Separation 24
4.2. The Austrian approach to Public Ownership 27
4.3. The Austrian Telecommunication sector 31
4.3.1. Historical perspective and basic preconditions 31
4.3.2. Technological change 33
4.3.3. Market Liberalisation in the course of EU Membership 35
4.4. Market Analysis of the Austrian Telecommunication Sector 38
4.4.1. Current Market Situation in the Austrian Fixed and Mobile Phone Sectors 39
4.5. Implications of the Liberalisation Process on Telecommunications 44
4.6. Re-Regulation and Future Challenges 46

5. Open Access Theory: The Regulation of Public Utilities 49
5.1. Financial Crisis and the Ideological Reversion of Keynesian Economics . 50
5.2. Next Generation Access Networks 52
5.3. Network Neutrality – Openness is the Key 54
5.4. Open Access Theory 56
5.5. Infrastructure Cooperations 58
5.5.1. Cooperation between Energy Suppliers and Internet Service Providers 58
5.5.2. Housing associations and Public Subsidies 60
5.6. Critiques and the Financing of NGA Networks 60

6. Conclusion 63

Bibliography 69

A. English Summary 75

B. Deutsche Zusammenfassung 77

C. Curriculum Vitae 79

Abbreviations

ARPAnet Advanced Research Project Agency Network

AT&T American Telephone & Telegraph

BAWAG Bank für Arbeit und Wirtschaft

BEREC Body of European Regulators for Electronic Communications

BT British Telecom

CEPT European Conference of Postal and Telecommunications Administrations

CERN European Organisation for Nuclear Research, Geneva

DSL Digital Subscriber Line

EC European Commission

EU European Union

FCC Federal Communications Commission

FTTB Fibre to the Building

FTTC Fibre to the Curb

FTTH Fibre to the Home

GDP Gross Domestic Product

GNP Gross National Product

ICT Information and Communication Technology

IPTV	Internet Protocol television
ISP	Internet Service Provider
ITU	International Telecommunications Union
LLU	local loop unbundling
LTE	Long Term Evolution
NGA	Next Generation Access
NRA	National Regulation Authority
ÖBB	Österreichische Bundesbahnen
OECD	Organisation for Economic Co-operation and Development
OES	Österreichisches Einheitssystem
ÖFEG	Österreichische Fernmeldetechnische Entwicklungs- u. Förderungsgesellschaft GmbH
ÖIAG	Österreichische Industrieverwaltung AG
ÖIG	Österreichische Industrieverwaltungs GmbH
ÖPTV	Österreichische Post- und Telegraphenverwaltung
ÖVP	Österreichische Volkspartei
P2P	peer-to-peer
PSK	Postsparkasse
PST	Public switched telephone
PTA AG	Post and Telekom AG
PTBG	Post und Telekommunikationsbeteiligungsverwaltungsgesellschaft
PTT	Post, Telecommunications and Telegraph

RTR	Rundfunk- und Telekom Regulierungs GmbH
SGI	Services of General Interest
SPÖ	Sozialdemokratische Partei Österreichs
TA AG	Telekom Austria AG
TKK	Telekom-Control-Kommission
UCLA	University of California, Los Angeles
UK	United Kingdom
USA	United States of America
VAT	Verband Alternativer Telekom-Netzbetreiber
VOD	Video on demand
VoIP	Voice over Internet Protocol
WWW	World Wide Web

1. Motivation and Outline

1.1. Motivation

Public Utility Services include a wide variety of industries: among others the supply of water, the generation of power, telecommunications services, supply of natural gas, and the provision of transportation infrastructure: all these share the characteristics of network industries. It is generally acknowledged that an efficient infrastructure improves conditions for businesses and working productivity. Public utilities are not only fast growing but also very significant sectors for economies around the globe. Even though public utility services are today acknowledged as human rights, many countries are still confronted with an under developed supply. One tends to forget that many advantages of our daily life are resulting from high infrastructure investments made by previous generations.

For quite a long time public utilities used to be regarded as natural monopolies either regulated or government-owned. Network externalities and economies of scale in particular justified the natural monopoly theory. In the last decades a trend towards liberalisation and privatisation of these industries released a dynamic global transformation process. The main purpose of the global market liberalisation was primarily to achieve more competitive market environments and in the context of privatisation to avoid conflicts of interest between the state as a service provider and the state as a regulatory authority. Consequently, this reform process provoked by a re-definition of traditional state responsibilities, which historically included the provision and control of critical infrastructure systems as one of their core functions. One of the most crucial examples in this respect is the complex transformation process and the worldwide upheaval in the Information and Communication Technology (ICT) sector in the past three decades. The reform process, however, does not exclusively apply to telecommunications, but also

to other important network industries.

The complexity and interdependence of the economic system further increases our dependence on unconditional availability of public utilities. In this context it is all the more surprising the share in public infrastructure investment in GDP has declined significantly in Europe over the past twenty years (cf. Schulmeister 2010: 119). According to Streißler (2009: 18) instead of "refinancing the (w)ailing banks, which will have hardly any employment effect it would be infinitely better to invest into the environment. But for such projects governments are not likely to find any money, too much of which goes into pensions, unemployment relief and other social services – expenditures without lasting benefits." It is also argued that the backlog of infrastructure investments should be reappraised, especially in the expansion and renovation of the trans-European transport and communications networks. Moreover particular emphasis should be placed on a fundamental renewal of the energy system, from production through distribution to consumption, not only because of the climate change but rather because of the exhaustion of traditional energy resources.

It is believed that public authorities will have to deal with numerous infrastructure challenges in the near future (cf. Brennan 2009: 279). One is the transition from the current copper based telecommunications access network to a future fibre optic based Next Generation Access (NGA) network. Another is the expansion and maintenance of electricity transmission networks in the light of climate change concerns and the transition to renewable energy. As pointed out by Brennan (2009: 279) "it is not only recently that technological change made networks relevant for regulatory policy and business planning in these infrastructure sectors."

Previous technological infrastructure changes, however, were implemented by legally enforced regulated monopolists, which have been integrated from network construction to the supply of services. In the scope of competitive markets the most difficult challenge is how to manage and finance the expansion and maintenance of core infrastructure networks. In this context the question is not only the financing of infrastructure projects but also the future governmental commitment and responsibility for the supply of the population with modern core infrastructure networks.

The purpose of this thesis is therefore to examine public utilities in a historical perspective, to analyse the described discrepancy between market liberalisation and infrastructure investments, and finally to elaborate framework conditions for future infrastructure

investments in a competitive market environment. One main issues of the present thesis will therefore be the application of the open access theory to regulatory policy.

1.2. Outline

The thesis is structured as follows:
Chapter 2 reviews the Kondratiev Cycle theory by Joseph A. Schumpeter in the context of public utilities.
Chapter 3 reviews why public utilities were historically regarded as natural monopolies.
Chapter 4 examines the three main pillars of the utility reform paradigm which can be identified as the privatisation of public ownership, liberalisation of markets and the unbundling of non-competitive network segments. Furthermore the Austrian experience with the utility reform paradigm will be illustrated in a case study with particular emphasis on the telecommunications sector.
Chapter 5 discusses the open access theory as a tool of promoting the necessary technological changes in a liberalised market environment.
Chapter 6 concludes and gives an outlook to future research.

The thesis is completed by a bibliography and three appendices.

2. Kondratiev's Cycle Theory

2.1. Historical Perspective

Nikolai D. Kondratiev (1892-1938) was one of the most profound and internationally known Russian economists at his time. His decisive contribution to economic research was the development of the theory of long cycles in capitalist economic development. Kondratiev's long cycles can be described as long-run oscillations of economic conjuncture with an approximate duration of 45 to 55 years. According to Kondratiev, these economic cycles, revealed in price levels and trade statistics, are caused by periodic renewal of basic capital goods, which appear to provoke social upheavals and technical innovations (cf. Barnett 1995: 413).

Kondratiev became known to western economists and historians primarily through the interpretation and propagation of his work in Joseph A. Schumpeter's *Business Cycles* published in 1939. The Austrian economist started his theoretical, statistical, and historical research analysis of the capitalist process essentially from Kondratiev's long price cycles by trying to link price movements to the grand sequence of technological leading sectors (cf. Rostow 1975: 720). According to Schumpeter an industrial revolution is launched through the accumulation of massive technical innovations, which in turn creates new leading industrial and commercial sectors. Therefore the materialising of investment opportunities is taking place during waves of technical innovations which occur approximately only every fifty years. In honour to Nikolai Kondratiev, pioneer investigator of long capitalist cycles, Schumpeter called them *Kondratiev Cycles*.[1] At the time Schumpeter introduced his theory there had been only three completed Kondratiev

[1]By referring to Escudier (1990) Freeman and Louçã (2001: 70) state that "'long cycles' where uniformly translated into German as 'long waves', whereas Kondratiev preferred to use the concept of waves for the analysis of variables, and to use the concept of long cycles for his interpretation of global movement"

Cycles, whereas until the present day we have witnessed five completed Kondratiev Cycles.

The British Industrial Revolution, which most historians place around the 1790s, was the first boom of industrial innovations, also described as the Age of Cotton, Iron and Water Power. Surprisingly many studies of the first Industrial Revolution do not mention the fact that the first wave of growth was also based on transport infrastructure expenditures, basically on creating, improving and maintaining canals, turnpike roads, and bridges (cf. Freeman and Louçã 2001: 164-5). The second Kondratiev Cycle, around 1855, was the Age of Railways, Steam Power, and Mechanisation. The third Kondratiev Cycle from 1895-1905, was the Age of Steel, Heavy Engineering, and Electrification. The Fourth Kondratiev Cycle, took shape around 1955 and was centred in the USA mainly based on the Age of Oil, Motorisation and the introduction of Mass Production. Finally the fifth, "our" Kondratiev Cycle which appeared in the turn of the millennium was based on the Information and Communication Technology innovations (cf. Streißler 2009: 12).

In the introductory chapter of *Business Cycles*, Joseph A. Schumpeter (1939: 13) states that "general history (social, political, and cultural), economic history, and more particularly industrial history are not only indispensable but really the most important contributors to the understanding of our problems." Even though virtually all economic historians agree that the sustained growth of per capita income and labour productivity, is a relatively recent phenomenon, since it is historically based on the first Industrial Revolution which took place in Britain, many criticise long cycle theories, including those of Kondratiev and Schumpeter. Moreover, scientists also differ in their interpretation of the main features of the different Kontratiev Cycles. Some put the main emphasis on inventions and innovations, some on transportation and communications infrastructure, some on entrepreneurship, and some on the accumulation of capital and the mobility of labour. Almost all, however, agree that "single-factor explanations are inadequate, and almost all mention most or all of these together" (Freeman and Louçã 2001: 153). In his analysis Schumpeter points out that any satisfactory explanation of the development of capitalist economies must always place innovation, their diffusion and last but not least their profitability at the centre of analysis. Furthermore in contrast to many economists who regard technical change as a slow gradual process, Schumpeter was of the opinion that the appearance and diffusion of innovations is an inherently uneven process:

sometimes explosive, sometimes slow and gradual. At this point it is important to emphasise that innovation and diffusion which lead to new technologies and production processes are not isolated events, but are necessarily related to the availability of different factors, such as, human resources, infrastructure, supply, demand, and to a certain degree on the political situation in a country.

There are obvious reasons why this should be so, since a technological system goes in its entire life through several different phases. It is certain that all main features of the different Kontratiev Cycles were used long before their actual breakthrough. In this context, Freeman and Louçã (2001: 143) refer to Stankiewicz (2000), who "has described this as the opening up of new 'design space' for engineers and entrepreneurs ...."

First, large-scale diffusion can only begin after the successful demonstration of technical and commercial feasibility. Secondly, as a consequence the speed with which a new technological style becomes dominant after having demonstrated its potential, depends to a considerable extent on the new infrastructures that are needed for its diffusion. From a macroeconomic perspective the important phenomenon is the transition from small quantities to the huge expansion of an industry.

2.2. Cycles in the Context of Public Utilities

After this brief introduction to the Kondratiev Cycle theory by Joseph A. Schumpeter, it seems granted that we have experienced technological revolutions, which changed our way of life. In addition, if we have a close look into the main properties of the Kondratiev Cycles, patterns can be identified. In every single Kondratiev Cycle typical network industries are present, such as roads, railways, energy and water supply, and more recently communication infrastructure. This pattern reflects the exceptional significance of utilities to economic growth in our society since the first Industrial Revolution taking place in the late 18^{th} century. This concept of utilities basically includes all infrastructure facilities, which are regarded as prerequisites for the smooth functioning of our economic and social life. Historically, the term infrastructure refers to secure supply routes of the military organisation. In this perspective, Schneider (cf. 2001: 43) describes utilities as the "basis resources" which are necessary for the supply of other social resources. It is hallmark of modern societies that all economic, political, and social activities are at a

high level directly dependent on the unconditional provision of infrastructure services such as energy and water supply, transportation, and communication. Because of the increasingly closer interconnection between these systems we have reached a degree of dependence in which, unforeseen failures in any of the mentioned sectors could lead to a catastrophic collapse of economic and social life. In recent years the concept of "critical infrastructure" was coined in the USA in order to designate such central support structures. In more recent U.S. government documents physical as well as virtual sectors such as telecommunication, energy, banking, transportation, water, emergency services and so forth are being mentioned (cf. Schneider 2001: 44). As a consequence investments in infrastructure always require political initiatives and changes in regulatory regimes, and these are normally subject of intense political debates and conflicts.

In the following chapter I will discuss why public utilities were historically regarded as natural monopolies.

3. Public Utilities in the Scope of Natural Monopolies

> "When technical conditions make a monopoly the natural outcome of competitive market forces, there are only three alternatives that seem available: private monopoly, public monopoly, or public regulation. All three are bad so we must choose among evils." *(Friedman 1962: 28)*

3.1. Introduction

As already mentioned in the introductory chapter the term *public utility* includes a wide variety of industries with huge social importance. Utilities supply citizens with electricity, telecommunication services, natural gas, water, road infrastructure, railroads, airports, and other essential services whose unavailability would injuriously affect public health and welfare. Rick Geddes reviews in his survey *Public Utilities* published in 1998 by Edward Elgar and the University of Ghent in *The Encyclopaedia of Law & Economics*, the literature on public utilities, which is vast corresponding to their social importance.

In the present chapter I will review why public utilities were historically regarded as natural monopolies. In addition I will examine utilities by focussing on several salient issues including their structural similarities, rationale for, and distortionary effects of regulation. Last but not least I will give a brief outlook on the paradigm's shift away form natural monopoly theory.

3.2. Natural Monopoly Theory

Adam Smith published his magnum opus, *The Wealth of Nations*, in 1776, which is widely considered the first work of modern economics. According to Smith, the sovereign or commonwealth is committed to serve the society with three main duties. First there is the necessity of public institutions for the defence of the society, and secondly the administration of justice. The third and last duty of the sovereign or commonwealth should be the supply and maintenance of those institutions and works, which even though they might "be in the highest degree advantageous to a great society, are, however, of such a nature, that the profit could never repay the expense of any individual, or small number of individuals" (Smith 1776: 561). The works and institutions of this kind are chiefly facilitating the commerce in general and in particular for the society, such as sustainable roads, bridges, navigable canals, and harbours, and those for promoting education of youth.

Another approach, the theory of "technical monopolies" (Friedman 1962) or "natural monopolies" (Sharkey 1982), locates the main causes of monopolisation in structural constraints. Friedman claims that the market could operate public utilities but technical conditions render it difficult to do it that way. The main role of governments should be to do what the market is not capable of doing itself, "namely, to determine, arbitrate, and enforce the rules of the game" (Friedman 1962: 27). The basic idea is pretty evident: if due to the technical characteristics of a good, or a production process, a single provider or operator is able to satisfy all demands for a service more efficiently than two or more suppliers, then solely because of cost benefits an increasingly competitive environment will end up in a monopoly market structure. Therefore, an industry is naturally monopolistic if and only if a product can be produced at least cost by a single firm. According to Geddes (1998: 4) "traditionally, this was thought to be the case where a firm produces a single good and its long-run average cost curve is declining throughout the entire range of output."

3.3. The Structural Similarities of Utilities

The major idea behind the natural monopoly theory is that utilities are subjected to strong structural similarities. "Utilities typically create a good or service at one location,

and then distribute it over a "network" where it is delivered to numerous customers for end use" (Geddes 1998: 2). In this sense, these industries share a common *network structure*, which connects suppliers and customers via a network of pipes, wires, roads, rails, or air routes. Due to the significant investment in infrastructure needed to start the operation, the associated infrastructure is usually characterised by economies of scale (decreasing long-run average costs as output increases) and substantial sunk costs (costs that have been incurred and cannot be reversed). Services distributed over the existing infrastructure, however, are characterised by very low marginal costs. In order to achieve productive efficiency in such a market environment it is necessary that in a legal assigned territory only one firm operates a corresponding network infrastructure.

This phenomenon specifically applies to public utilities such as telephone services, a typical industry with high sunk costs because of the need for extensive infrastructure. Erecting and maintaining the infrastructures requires high fix costs, while providing a service, for instance a phone call, requires comparatively low variable costs. More precisely, it would be a waste of social capital if each competing company would maintain its own network. In this respect a monopoly structure of the network infrastructure is inevitable, which is, as far as it is privately owned, in need of appropriate rate-of-return regulation. Regulation prevents price gouging by monopolists and at the same time ensures fair rate of return on their investments. Alternatively, state ownership could ensure the achievement of both productive and allocative efficiency. Historically, utilities have been mostly privately owned in the United States of America, while in Europe, utilities have been usually government-owned. In both cases it has been argued that the necessity of an extensive infrastructure implies that public utilities "have been granted legally enforced monopolies over their service territories" (Geddes 1998: 1).

3.4. The Rationale for Utility Regulation

According to Posner (1974: 335) "a major challenge to social theory is to explain the pattern of government intervention in the market" what he defines as the "economic regulation". The term refers to explicit legislative and administrative controls of prices and competition by entry control, as well as all sorts of taxes and subsidies. Joskow (2008: 550) stated that "the primary goal of regulation in the public interest is to stimu-

late the regulated firm to produce output efficiently from cost and quality (including reliability) perspectives ....” The academic literature proposes two main theories, namely the *normative* and the *positive* theory, to explain the pattern of governmental regulatory intervention which are, as already mentioned, especially observed in public utilities.

3.4.1. Normative Theory

According to the *normative*, or as often stated *public interest* theory or *consumer-protection* hypothesis, regulation is imposed by governments in response to market failures. If competition appears to be impossible or inefficient due to natural monopoly characteristics, regulation authorities can enforce obligations to protect consumers. In order to protect consumers from a monopoly rent and therefore from exploitation by the monopolist, a fair rate of return on investment can be determined as a policy tool. In addition, regulators can also use other instruments such as determining minimum standards for service quality and the obligation to contract. In the latter, certain services have to be offered at a given price to all consumers regardless of their location. Thus regulation authorities can ensure that public utilities are available to the entire population. It can be concluded that governments mainly enact regulation in order to correct inefficiency or inequitable market practices in the interest of consumers and to enhance social welfare.

As briefly summarised by Geddes (cf. 1998: 16-9) there are several reasons why economists became very dissatisfied with the public interest theory to utility regulation over time. First, and perhaps most importantly, due to the lack of empirical evidence. Regulation restricted entry in many potential competitive industries, even though the normative approach provided no rationales. Moreover, the regulation failed to lower price levels and to prevent price discrimination. The public interest theory implies that firms oppose regulation, since the theory claims that profits are likely to be reduced if they are regulated in the public interest. Many regulated utilities however actually lobbied for regulation. As pointed out by Jordan (1972: 152), the credibility of this hypothesis is further reduced “by the fact that regulatory commissions frequently act in ways that are inconsistent with its implications.” Even though regulation should be designed to prevent monopoly gouging, empirical evidence suggests that prices increased to the disadvantage of consumers. Another criticism arose as the normative approach

did not provide any satisfactory mechanism to transform market failures into regulation policy.

As already noted above, the traditional natural monopoly theory considered a case where a firm produces a single good. However, if we consider a multi-product firm, as a matter of fact almost all utilities produce more than one product, serious theoretical problems arise. "Baumol investigated the relationship between economies of scale and natural monopoly. He showed that the correct definition is not that long-run average costs decline, but that the cost function is sub-additive" (Geddes 1998: 8). The cost curve is sub-additive if and only if one firm can produce a given output more cheaply than two or more firms. Because of the interdependence of outputs in the multi-product case, Baumol (1977: 819-20) showed that economies of scale are neither necessary nor sufficient for the sub-additivity of costs. By referring to Baumol, Panzar, and Willig (1982) Geddes (1998: 9) states that "an industry is a natural monopoly only if the firm's cost function is subadditive over the entire range of outputs."

3.4.2. Positive Theory

The inadequacy of the normative approach led to a series of papers, which attempted to provide an alternative theory of utility regulation. In contrast to the initial purpose of the normative theory, Demsetz (1968) demonstrated in his article, *Why Regulate Utilites?*, that there is no condition under which government regulation could guarantee to enhance social welfare. Rather Demsetz intimated that the defence of the natural monopoly theory was just a pretext by industries to justify regulation because they benefited most. According to Priest (1993: 300) Demsetz "challenged the defenders of regulation, especially those within the regulated industries themselves, to show that regulation did not exist to serve their economic interests" when he stated: "if the managements of utility companies doubt this belief, I suggest that they reexamine the history of their industry to discover just who it was that provided most of the force behind the regulatory movement" (Demsetz 1968: 65).

Three years later George Stigler (1971), formalised Demsetz speculation in his paper *Theory of Economic Regulation*. Another three years later Posner (1974) contrasted Stigler's economic theory in his paper *Theories of Economic Regulation* with alternative approaches. This accumulation of research papers is considered to be the beginning of

the *economic theory of regulation* debate (cf. Priest 1993: 293).

In contrast to the discussed *normative* theory, the *positive* theory implies just the opposite. In essence, it holds that regulation is supplied in response to the demands of producer interest groups in order to maximise their profits. That's why the positive theory was often stated as the *producer-protection* hypothesis. Posner introduced in his article the terminology of *capture* theory. According to Posner, the regulatory agency, which perhaps was created to pursue the normative theory in the first instance, is later *captured* by the dominant influence of the industry. Even though Posner (cf. 1974: 356) concluded in his article that none of these theories was entirely successful in explaining the incidence of regulation, the economists's version of the capture theory was however the most promising one for future research. In contrast to the lack of empirical evidence in the normative approach, the positive theory did turn out to be consistent with the available evidence regarding the effects of government regulation (cf. Jordan 1972: 153).

3.5. Distortionary Effects of Utility Regulation

Jordan (1972: 161) concludes that existing studies indicate that regulation authorities have not achieved to "significantly decrease the power of natural monopolist to practice extensive price discrimination." On the contrary, the "regulated industries have managed to pervert their regulators until the commissions become the protectors of the "regulated" rather than of consumers" (Jordan 1972: 152). Thus, the producer-protection hypothesis seems to be more applicable than the consumer-protection hypothesis. In order to investigate the distortionary effects of utility regulation the focus must be placed on the fair rate-to-return investment regulation.

Until the mid 1970s there was political consensus that public utilities fulfil the characteristics of natural monopolies. Thus, in most countries governments licensed just a single company to provide public utilities. In the case of public ownership according to public choice theory "state industries are associated with conflicting and poorly articulated operating goals leading to disruptive political intervention in management, capture by rent-seeking groups (notably trade unions) and financial failure" (Parker 1998: 30). Whereas private ownership raised problems as the only profit-maximising company in the market it obviously tried to generate a monopoly rent. As already mentioned, in

order to protect consumers against exploitation by (natural) monopolists, governments established regulation agencies in order to avoid excessive monopoly charges, ensure safe operation, and service on equal terms to all customers. A common tool to ensure that consumers do not pay inflated prices is the cost-plus pricing method. In order to guarantee a fair rate of return on investment the price granted by the regulatory authority is calculated by the cost plus in addition of a reasonable profit. In contrast to the regulated firm, regulatory authorities are, however, more likely to have imperfect (asymmetric) information about the firm they regulate, relevant costs and quality issues, and general market attributes. Accordingly, the regulated firm uses its information advantages to exploit the regulatory process to increase its profits. According to Joskow (2008: 551) "this creates potential moral hazard (for example, too little managerial effort resulting in excessive costs) and adverse selection (for example, prices that are too high relative to production costs) ...." Hence, firms try to declare their costs as too high, in order to increase prices and other charges levied on consumers. A common way is to redistribute a portion of profits as costs. Particularly suitable for this are bonus payments to the management. Another possibility is to record costs of political lobbying as expenses. As a result providers had neither an incentive to reduce their costs, which would increase their profit to *inappropriate* levels, nor to improve their service at the pace of technological advance made in these industries (cf. Frey and Kirchgässner 2002: 109-11). As a consequence monopolistic provisions of utility services often result in inefficiency and poor service quality since monopolists pursue their own rather than welfare maximising objectives.

From these considerations it can be concluded that any attempt to achieve a sound regulation policy is quite difficult. It is obviously not enough to introduce a *reasonable* rate of return. The regulator is forced to establish a network of controls which includes price verification, controls if opportunities to reduce costs by technological and organisational innovation being implemented, and last but not least to control the quality and availability of the service.

In addition, the natural monopoly theory was challenged by another line of research introduced by Demsetz (1968) which highlighted the notion of *potential competition*. In the context of the theory of contestable markets, it was proven that a monopolist market environment is possible for potential competitors to bid for the right to serve the market. This takes effect if and only if competitors have the possibility to enter the market at

very low costs and leave the market again with the entrainment of their profits. Under these conditions the threat of potential competition may discipline markets to produce at lower costs. By referring again to Baumol, Panzar, and Willig (1988) Geddes Geddes (1998: 8) states "a perfectly contestable market is defined as one in which entry and exit are easy and costless, which may or may not be characterized by economies of scale or scope, but which has no entry barriers (...)." Also Friedman (1962: 29) supported this approach since "technical monopoly may on occasion justify a *de facto* public monopoly," however, it cannot make "it illegal for anyone else to compete."

3.6. Paradigm Shift away form Natural Monopoly Theory

The theoretical inconsistency of the natural monopoly theory addressed by academic literature finally challenged the concept in the real world too. In addition to economists, politicians lately began to realise major problems with the status quo and claimed that public utility sectors should be opened to competition. As a consequence, governments began to seek for solutions towards liberalisation and privatisation of public utilities in order to increase competition through a more liberal market entry. The goal was to facilitate services on a commercial basis through more private participation under a regulatory supervision. The intensification of competition was achieved by abolishing monopolies and thus facilitating consumers to choose between different providers. This in return forced companies to produce more efficiently. The achievement of lower prices and better service quality were the main targets of the market liberalisation process. As emphasised by Geddes (1998: 1) "where once regulated or government-owned monopolies dominated because of the belief that most utilities were "natural monopolies", there is now a growing consensus that competition can perform a broader and more effective role." As we will see in the next chapter, in particular the development of new technologies in the ICT industry made regulatory reforms possible.

4. Globalisation and Public Utility Sector Privatisation

There is a general consensus that our society is in a phase of deep political, economical, and technical change. The three key concepts that describe this radical change best are privatisation, globalisation and informatisation. Privatisation refers to a development which changes the social division of work between state and public society in favour of the private sector.[2] Globalisation is a breathtaking development that refers to a variety of economic, political, technical, and cultural processes, which dismantles national boundaries both in a political and economic perspective. Finally, informatisation summarises the various technical trends, which lead to a new information and knowledge society.

These transformations are often associated with the innovations of the fifth Kondratiev Cycle, namely innovations in the Information and Communication Technology (ICT) sector. Infrastructure networks of the telecommunications sector are particularly interesting, since it is one sector in which technological change, even though in the past telecommunications operators were highly regulated at the state level, not only removed the natural monopoly argument but also have transformed our society so deeply that all other social, economical and political areas depend mainly on them. In that sense the ICT innovations can be compared with other fundamental socio-economic upheavals as the innovation of agriculture, introduction of book printing or the steam engine (cf. Schneider 2001: 19).

[2]Due the effect of financial and economic crisis in 2008 the privatisation trend seems to be reversed for the time being. Especially in the United States of America and Europe numerous banks have been nationalised. This is, however, just a temporary phenomena. Already in the medium run the recently nationalised companies will be privatised again.

4.1. Public Utility Reform Paradigm

In the past three decades countries all over the world have increasingly shifted from using public policy instruments, such as private monopoly under strict regulation or nationalised public utility ownership, to a greater reliance on market mechanisms. Irrespectively that time, speed and depth of this reform process have varied across states and industries, three main pillars of the utility reform paradigm can be identified: privatisation of public ownership, liberalisation of markets, and the unbundling of non-competitive network segments. The main purpose of this section is to discuss these important dimensions of the reform paradigm in network industries, with particular emphasis on the telecommunication sector, since the reform process has not only started but has also been particularly intensive in this sector.

4.1.1. Public Ownership and Privatisation

Historically, after the Second World War, public ownership has been a common feature of European economies. Especially in the context of Keynesian post war consensus, a major expansion of state enterprises occurred in most European countries. In particular public utilities were typically supplied by central governments, local municipal or regional bodies given a legal monopoly position due to their key tasks of general interest. In some countries strategic industries, for instance, mining, steel, as well as the banking sector were nationalised too. The significant role of state intervention in economic development was generally justified in terms of market failures, due to which free markets would not obtain maximum economic welfare. (Parker (cf. 1998: 10-1), Obinger (cf. 2006: 154))

The Treaty of Rome (1957) aimed to create a single common European Market, where goods, services, persons and capital could freely circulate. Since the very beginning the treaty included public utilities, "stating that these services should be subject to competition as long as that did not deter their provision of these services" (Clifton and Díaz-Fuentes 2008: 7). In reality national governments, however, subsidised, supported, and legally enforced monopolies either by public or private enterprises. This practice, however, was widely ignored by the European Commission (EC). Despite the Treaty of Rome does not forbid public ownership, it clearly pronounces the explicit prohibition of state aid to companies. This should ensure "that government interventions do not

distort competition and intracommunity trade" (Ceriani et al. 2009: 5). This double-edged approach arose primarily from the original belief that monopolies were necessary in public utility sectors in order to ensure a non-discriminatory universal service, and from the need to accommodate policies within European Union (EU) countries with varying intensity of state ownership (cf. Parker 1998: 20-1).

Although traditionally the official EU policy approach reflected a neutral stance on public ownership of industries, there have been continuously comments that privatisation may be beneficial in order to establish competitive markets. The already discussed inadequacy of the natural monopoly theory in economic literature, was accompanied by the internationalisation of financial markets and production, as well as technological change. All these factors have increasingly contributed towards privatisation efforts. A strong impulse towards privatisation has derived from the progress of European economic integration by removing restraints on trade through market liberalisation, with deep implications for industries, which previously were protected from competition. As a consequence the EC took the decision to replace the ambiguous term *public utility* in official discourse with the more technical term *Services of General Interest (SGI)*. The Commission argued the ambiguity was the general understanding of those two terms: *public ownership* and a *service for the public*. From the traditional approach adopting a neutral stance on utility ownership the "EC argued that SGI was a more accurate term as it expressed the service was for the "general interest" without suggesting who owned it" (Clifton and Díaz-Fuentes 2008: 12).

As briefly summarised by Aiginger (1998: 70) "the term 'privatisation' can refer to three broad types of policy: first, asset transfer from the public to the private sector, generally through sale; second, deregulation or liberalisation of statutory monopolies (with or without the sale of assets), with particular emphasis on the removal of entry restrictions; and finally, franchising or contracting out the provision of marketable goods and services to private sector firms. We could add corporatisation as a fourth method of privatisation; this is transferring the supply of goods and services from the governmental sector to a separate company according to corporate law, while the government remains the owner." Aiginger (1998: 70) concludes that "the motives for privatisation fall in general into one or more of the following categories: financial motives of the seller (gaining revenues or balancing losses), increase of productive efficiency (reducing average costs), and the pursuit of allocative efficiency (increasing consumer surplus)." Of course,

privatisation can also be motivated by by political targets.

The core incentive for the privatisation of public ownership is often discussed as the tension between commercial interest and public interest within the government as provider, owner, and law-maker, which is naturally difficult to reconcile. Therefore, the usual argument for privatisation in economic literature centres on the negative effects of state ownership to achieve both productive and allocative efficiency. As a result, the idea prevailed that privatisation of public monopolies is a priori and necessary condition for the liberalisation of markets. Researchers of the OECD economic department have, however, pointed out, for most network industries privatisation is a necessary but nevertheless not sufficient condition to obtain a competitive market (cf. Ceriani et al. 2009: 5). The experience shows that privatisation needs to be accompanied by reforms which facilitate fair competition and monitors the former incumbent provider in order to prevent re-monopolisation tendencies. These include "i) fencing the non-competitive segments (e.g. through vertical separation) and exposing to competition the competitive segments; ii) equipping the regulator with the powers and the resources needed to stimulate cost efficiency, keeping market power under control and monitoring the quality of the services provided by the privatised firm; iii) ensuring that market regulation is consistent with the objective of making the corporate governance framework as efficient as possible." *(Ceriani et al. 2009: 5)*

At this critical point of discussion it is crucial to recall the following objective: since we are talking about policy advice and implementation it is particular important to distinguish between developed economies and less developed ones. At least in industrialised countries under-provision is not the main issue, as much as insufficient or unequal access. Less developed regions, however, are in general confronted with an imbalance of supply and demand of goods. Services of general economic and especially *social* interest, provide essential services for our daily life and are considered to be essential for economic, social and human development. The EC has recognised this fact, and has pointed out "that the notion of a non-discriminatory universal service, as part of a public service objective for a public utility, may conflict with liberalisation and privatisation process" (Parker 1998: 23). Considering access to public utility services as a human right, the question arose if in a competitive market with private actors access of a defined quality and at affordable prices is going to be supplied to every citizen. Changes in quality and access to public services clearly enter in the calculation of any welfare change for

people, however this is certainly more crucial in less developed countries, where substantial numbers of citizens are not even connected to these networks, not to mention the inadequacy of supply and service quality. In this context I consciously refer to the term *citizen*, in contrast to *consumer*.

4.1.2. Market Liberalisation and Technological Shift in the Telecommunication Sector

Along with the mentioned change in intellectual thinking and arising privatisation tendencies some movement came into the debate when the EC tried to extend the internal market to those public services which were previously not taken seriously into consideration, even though they have been in the Treaty of Rome since its inception. In this period of transformation the previously politically unsolved contradictions on public utilities were increasingly challenged and finally completely reformed. This change was in particularly characterised by a global shift from Keynesian state interventionism towards a more neoconservative economic policy based on faith in market-orientation and private ownership (cf. Clifton and Díaz-Fuentes 2008: 8). This development was accompanied by a combination of problems of perceived underperformance and economic and financial crises that forced governments to support their loss making industries, which in turn lead to budgetary constraints. In addition economists pointed to technological change creating a scope for competition in previously monopolistic markets and therefore undermined natural monopoly characteristics.

There is, however, still huge compliance and most parts of network infrastructure still exhibit non-competitive and therefore monopolistic characteristics such as telephone lines, electricity transmission and distribution over high voltage networks, and railway infrastructure, since it would be economic nonsense and technically almost impossible to duplicate these networks nationwide. Unanimous consensus, however, prevails that this is not the case for providing utility services anymore. These utilities included particularly telecommunication services, electricity, natural gas, and railway services.

The telecommunication sector is, however, not just one among the network industries that experienced a policy paradigm shift over the last thirty years. Rather "it has been its core laboratory world-wide and the one where the reforms started earlier" (Bacchiocchi et al. 2008: 2). In the past, telecom services were highly regulated at state

level. Typically the national Post, Telecommunications and Telegraph (PTT) office was given exclusive rights to supply telecommunication services. This avoided national duplication, assured international technical compatibility, maintained network integrity, exploited economies of scale, often contributed profits to the state budget, and in return guaranteed universal service.[3] Each country had its own national supplier, which meant that the telecommunications industries remained highly state-centric and fragmented along national boundaries. "International co-operation was confined largely to technical matters and international tariffs and accounting rules, agreed in classic intergovernmental fashion through the International Telecommunications Union (ITU) and the European Conference of Postal and Telecommunications Administrations (CEPT)" (Humphreys and Simpson 2008: 413).

This development was initiated from the 1980s onwards by new technologies and the globalisation process. The technological shift was revolutionised mainly by the transition from mechanical to digital switching, the development of the Internet, mobile telephony, and by computerisation. The technological shift not only required vast investments but also launched a global economic dynamic. As pointed out by Humphreys and Simpson (2008: 143) "telecommunications both exemplified a globalising economic sector and an enabler of global economic activity." In addition a modern telecommunications sector became a crucial factor for economic growth and location decisions.

The parallel divestiture of American Telephone & Telegraph (AT&T) in the United States of America (USA) and of British Telecom (BT) in the United Kingdom (UK) in 1984 can be considered as the most convincing turning point inaugurating a new era in the public utility sector. The political forces driving the reform were the Thatcher government in the UK and the Reagan administration in the USA. While the circumstances for divestiture were quite different across the two sides of the Atlantic, in both cases the institutional change targeted to establish competition in the industry. AT&T, a private integrated monopolist under strict regulation, was forced to split into seven regional Bell telecom operators, while BT, an integrated public monopolist, operated after privatisation under regulation along with another privatised operator (cf. Bacchiocchi et al. 2008: 2).

To achieve the initial goal, to introduce competition, governments necessarily needed

[3]The obligation to provide universal services in public utility sectors is particularly important, since otherwise *cream-skimming* in densely populated areas occurs while rural areas are neglected.

to re-build the governance of the telecommunication industry through re-regulation, to the extent that they have become "regulatory states" (cf. Humphreys and Simpson 2008: 850). In fact, it required transition from the *positive* to the *regulatory* state in order to establish the *competition* state. Regulations are instruments needed to ensure fair competition and to prevent the former monopolist from abusing their market dominance. The regulatory package consists therefore of licensing new market entrants, preventing inefficient foreclosure by dominant firms, encouraging innovation and long-term investment, as well as setting conditions for network access and costs for interconnection. Open and fair interconnection for new entrants to the facilities of incumbents was particular necessary in order to introduce competition into the former monopolistic telecommunications industry (cf. Yoon 2006: 363). Thus, telecommunications apart from the *local loop* or *last mile* came to be considered competitive, rather than being a natural monopoly.[4] Accordingly, the early telecommunications liberalisation adapters, namely the USA and the UK, "unleashed a global dynamic of international 'regulatory competition' and 'competitive emulation'" (Humphreys and Simpson 2008: 851).

With the growing knowledge that a modern telecommunications infrastructure is a fundamental pre-condition for the global information society and under the pressure of globalisation and technological development Continental Europe became insightful that liberalisation is unavoidable in order to retain international competitiveness with regard to the competitive challenge from the USA and UK. This applies, however, not only to their national telecommunications sectors but also to their economies as a whole, in particular as a factor for enhancing social and economic welfare. With regard to the telecommunications sector, the EC took its first step toward a liberalisation reform process in 1987 with the publication of the "Green Paper on the development of the common market for telecommunications services and equipment" published in June 1987 (EC COM(87)290). The Green Paper "included full liberalization of the equipment sector and progressive opening of services, and harmonized European measures with respect to network access, interoperability and interconnection" (Bacchiocchi et al. 2008: 5). In detail the EC emphasised the following for the telecommunication sector:

[4]Local loop and last mile refer to the "wire links carrying the main fixed public telephone network from the local telephone central office into the subscriber's home or office. Local loops are usually owned by incumbent operators and are enormously expensive for new entrants to replicate, therefore giving incumbent operators a huge advantage" (EC MEMO/10/211)

> "In general, an open, competitive market for new service providers and terminal manufacturers make a substantial contribution to the rapid spread of the new services, under the current conditions of rapid development of technology and market opportunities." *(EC COM(87)290: 52)*

The Green Paper was subsequently implemented though directives on the following issues: "(1) liberalisation of the supply and provision of terminal and network equipment; (2) liberalisation of services, excluding for the time being public voice telephony and the operation of the basic network; (3) the separation of regulatory and operational functions, in order to create efficient market structures; (4) open access to networks; (5) promotion of Europe-wide standards; and (6) full application of competition rules to the telecommunications industry" (Parker 1998: 29).

Between 1987, when the EC published the Green Paper, and 1998, when markets were fully opened, a series of EU liberalisation and regulatory harmonisation directives progressively introduced competition into the telecommunications sector. The publication of the first telecommunication directive which implemented the liberalisation of terminal equipment was the first step in the realisation of the Green Paper (EC 90/388/EC). Subsequently competition was introduced in further areas, which in the first place were not taken into consideration, such as mobile telephony. Finally in 1996 the Full Competition Directive was introduced which fully liberalised the telecommunications sector and the obligation to install independent national regulators (EC 96/19/EC). Accordingly, Member States established regulatory authorities and implemented liberalisation guidelines from 1998 onwards.[5] Moreover, whilst privatisation was still not an EC competence, most governments also fully or at least partially privatised the sector.

4.1.3. Unbundling of non-competitive Network Segments versus Operational Separation

As described in the last two sections EU Member States simultaneously privatised their public utility sectors and established competition through market liberalisation. This paradigm shift and the following elimination of the natural monopoly character changed

[5] A more detailed presentation on EU directives can be found in various academic literature including Parker (1998), Humphreys and Simpson (2008), and Ceriani et al. (2009).

market composition and the assignment of regulatory authorities dramatically. Accordingly, from then on their main tasks were to price interconnection and to "establish a functional competition, which then should lead to cost reductions, lower prices, and innovation" (cf. Wieser 2000: 10). The regulation of utility sectors is necessary because of competitive reasons (accumulation of market power) and consumer protection (supply of unprofitable areas and services, quality assurance).

As already mentioned several times, the fact that public utility services are sold through a network infrastructure does not imply monopolies on the production side anymore. The production of public utilities rather can by carried out by different companies competing with each other on the same network. It has been acknowledged that privatisation is not a necessary prerequisite to ensure an effective transition to a competitive market. However, liberalisation policies have to be accompanied by local loop unbundling (LLU) of non-competitive network segments and corresponding regulatory reforms. Unbundling the local loop refers to regulatory measures guaranteeing access to the incumbent's last network mile, the non-duplicable part. Many analysts refer to liberalisation as the cornerstone of the reform package, the two other pillars having only limited value (cf. Ceriani et al. 2009: 4). Considering the inherent natural monopoly network features, however, unbundling is a prerequisite for the liberalisation process advocated by the OECD and the EC (cf. Ceriani et al. 2009: 13).

Since it is necessary for new service providers to access the existing network infrastructure for reaching costumers, the former monopolists were forced by regulatory authorities to open their non-competitive network segments to competitors. Hence, the impetus of interconnection policies can be seen as the initial spark to competitive markets. Interconnections are mostly observed in public utilities since, as already mentioned, fixed and sunk costs invested in the infrastructure are significantly higher than the cost of transmitting one unit of output over these types of networks. In this sense interconnection means that a phone call, which is originated in a local loop is carried out over the network of another carrier. Today, interconnection is practiced in a wide variety of service industries including telecommunications, electricity, natural gas, and railroads. While infrastructure, both public as well as privately owned, still exhibits natural monopoly characteristics, most economists agree in their analysis that at the production stage many network industries are nowadays inherently competitive markets (cf. Geddes 1998: 3).

According to Shy (2001: 8) this demonstrates "that the introduction of competition

together with the regulators' demand that the existing infrastructure will be available for use by all competitors for "reasonable" access charges led to even more efficient utilisation of infrastructure by having different companies providing substitute or complementary services. All this leads us to conclude that letting industries be controlled by the so-called "natural monopolies" was inefficient." The fact, however, that the network infrastructure, which is exclusively necessary to distribute products and services remained property of the former monopolist, diminishes the liberalisation success in the long run. As pointed out by Crandall and Ellig (1997: 7) "the real controversies focus on access to, and pricing of, the transmission and distribution infrastructure" since in most utilities the former monopolist is still integrated into all activities.

During the liberalisation and privatisation process – not only in the telecommunications sector – in most countries the former monopolist was not forced to separate non-competitive segments (mainly network infrastructure), which apparently still exist, from those which are competitive (such as maintenance, production, and supply). Hence, the incumbent provider is still responsible for construction and maintaining the network infrastructure, while at the same time competing on the service level. As a consequence former monopolists have a vast advantage over new entrants as their network offers wider coverage and they can take greater advantage of network effects. The greater coverage not only implies that each costumer regardless of her location can be linked to the network at relatively lower cost but, even more important, in most cases a new operator will only be able to provide costumer access by making use of the network belonging to the former monopolist. Therefore the monopolist, who requires transmission charges from the competitors, has competitive advantages by gaining cross-subsidisation. As already noted the regulation authority has to set a maximum interconnection price. Nevertheless this is not an economically adequate solution since authorities often fail to observe true construction and maintaining costs for various reasons.

The aim of separation is primarily to avoid access discrimination, cross-subsidisation and distortion effects on competition. On this understanding the most important policy issue related to the market liberalisation process of network industries is how to prevent infrastructure operators "from granting privileged access conditions to their own production facilities, at the expense of competitors" (Ceriani et al. 2009: 12). Market liberalisation is useless if the former monopolist and unvaried incumbent provider still owns the network infrastructure and behaves anticompetitive towards its rivals. An

option to defuse this conflict would be to refuse the owner of the distribution network to compete on the service level. Whereas this solution does not solve the problem of the network operator trying to gain a monopoly return, it has nevertheless the vast advantage of dramatically simplifying regulation policies.

In order to recapitulate, the main argument for operational separation under the new paradigm for utility reform is a pro-competitive one. The resulting higher competitive pressure should entail higher productivity and a downward pressure on prices, ultimately translating into higher economic growth. In this context it is obvious, the stronger the separation, the lower is the risk of anti-competitive conduct. The position of the OECD and EC in this regard have been clearly in favour of operational separation between the competitive and natural monopoly segments of network industries (Bacchiocchi et al. (cf. 2008: 5), Ceriani et al. (cf. 2009: 13)). This approach has been repeatedly stated in different policy documents. The member states, however, "were free to choose between different alternatives: from the most radical that prescribes proprietary separation of the monopoly activities from the competitive ones, to a milder legal separation, reached through the creation of different companies under a common holding, to the weakest version of accounting separation" (Ceriani et al. 2009: 14).

After the discussion of the three main pillars of the utility reform paradigm I will now give a brief introduction into the Austrian approach to public ownership after World War II and then illustrate the Austrian reform paradigm process by a case study of the telecommunication sector.

4.2. The Austrian approach to Public Ownership

After the end of World War II, Austria was, like many European countries, both politically as well as economically devastated. Under the supervision of the Allied Forces, Austria's political influential powers took the chance for a new beginning and "engineered a strong government in the form of a stable "grand coalition" uniting the conservative and socialist parties" (Aiginger 1998: 71). Parallel to the parties the highly centralised informal *social partners* cooperation was established, which constitutes essentially a gathering of the representatives of the employers' and workers' associations. Their aim is to resolve conflicts of interest by consensus and to reduce open conflicts. As a matter

of fact they have gained considerable power in the Austrian domestic policy. According to Aiginger (1998: 71) "both institutions helped Austria to regain sovereignty in 1955 and counterbalanced economic backwardness for the next several decades."

As already stated earlier, public ownership has been a common feature of post-war Europe. In this respect Austria was no exception, rather Austria even took a leading position in relation to the size of the public enterprise sector in comparison to other western European countries. This dated back to 1946 and 1947 when the grand coalition passed two Nationalisation Acts ("Verstaatlichtengesetze"), which initiated the nationalisation of about 70 companies. The state owned enterprises dominated the coal and metal mining, as well as the oil, energy, chemicals, steel, and aluminium industries. In addition to the heavy industry, large shares of the banking sector, including the two major banks in Austria, were nationalised. Apart from the nationalised industry, typical public utilities, including the transport sector, railways and highways, as well as telecommunication, and postal service were public owned and government operated enterprises. On top of that, there existed several state monopolies, for example salt, tobacco, lotteries, and hard liquors, as well as several other enterprises including the national forests, Austrian Airlines and the Austrian Broadcasting Company. To conclude, it seems to be obvious that the economic activities of the Austrian state were exceptionally diverse and extensive. (Parker (cf. 1998: 17-8), Aiginger (cf. 1998: 70-2), Obinger (cf. 2006: 154-7))

The incentive, however, for this huge nationalisation was primarily a consequence of war-related issues and less of political and ideological reasons. An important motive for the nationalisation was the attempt to protect the property of former German firms from the expropriation by the Allied Powers, during Austria's period of limited sovereignty. In 1945 German ownership existed in Austria, since some Austrian firms were expropriated during the Nazi period, while some other "firms were actually founded by the Nazi regime in order to help supply their war machine" (Aiginger 1998: 72). The reconstruction of the Austrian economy was further complicated by a very underdeveloped capital market and the lack of large private companies. These gaps were filled by the State on the one hand, who acted as an important strategic investor, and the state owned banks on the other hand which had considerable equity stakes in big manufacturing and construction firms.

As already mentioned before, in sectors in which natural monopolies originally existed, there are two alternative policy approaches. While European countries usually

established public ownership, the United States typically chose to regulate private firms. As pointed out by Aiginger (1998: 72) "instead of choosing between these two options, Austria installed the double grip: ownership plus a regulatory process embedded in the bureaucracy of a ministry (also allowing the trade union and employers' organisation to play supporting roles). This tactic led to a predominance of political over economic goals. In the first stage, this governance structure implied a rapid rebuilding and expansion of capacities, which proved extremely important for Austria's recovery process." That was the initial ignition for a period characterised by remarkable recovery in Austria, which lasted up to three to four decades after the end of the war. In this period the nationalised industry played an extraordinarily significant role, which was inter alia noticeable by the high level of public employment. Added to that, up to the end of the 1970s, 25 percent of the Austrian GNP was produced by publicly owned enterprises (cf. Aiginger 1998: 71). Moreover low prices for heating and transportation, as well as free education helped Austrians lower incomes groups to catch up with the middle class.

As the system continued over decades, gradually many of the already mentioned inefficiencies of cost-plus regulation became apparent. The recruitment of the executives was not only based on their abilities, but according to their political orientation and membership to various lobby groups. In addition, the importance of nationalised companies was reflected by the sheer number of employees and therefore by their function as an instrument of employment policies. Initially prices were fixed by parliament with the goal to support low income groups and guarantee a certain quality of living standard. Later on, prices were set particularly with regard to the next election date. As emphasised by Aiginger (1998: 72) the "potential increases in the productive efficiency of large firms, and their Schumpeterian potential for innovation, were more than outweighed by Leibenstein's 'x-inefficiency' and allocative inefficiencies. Rent-seeking managers, firms and political parties decreased the incentive to equate resources with demand (leading to allocative inefficiencies), while cost-plus regulation inhibited the search for low-cost technologies and innovation and promoted an organisational slack."

Initially the ownership rights of nationalised enterprises were directly exercised by the government and its appropriate ministries. In the course of reforms by the first one-party-government after World War II (formed by the Austrian People's Party, ÖVP), the Austrian Industries Management Board, ÖIG, was founded in 1967 as a state owned holding company in order to manage the Republic's shares of nationalised companies. In

1970, ÖIG was transformed into a public limited company: the Austrian Industries Holding Company, ÖIAG. Until the mid-1980s, there were no reforms in the public enterprise sector even though nationalised companies were increasingly generating losses, beginning form the early 1980s.

Following the international steel crisis in the mid-1980s, which was "exacerbated by losses incurred by speculating in the oil market and difficulties in the major state-holding company, ÖIAG, the government announced that it would introduce private funding into some of the state-owned companies" (Parker 1998: 18). Since the ÖIAG was in this capacity far from successful, a new corporation called the Austrian Industries AG, a huge conglomerate of various state owned enterprises, was founded.

The turning point of Austrian industry policies can be found in the year 1986, when the re-issued grand coalition of the Social Democratic Party, SPÖ, and ÖVP, was no longer willing to cross-subside the losses of the nationalised industry from the state budget. After this major shift in the former political consensus, three different privatisation phases can be distinguished to the present day (cf. Obinger 2006: 164). The first privatisation phase (1987-1992) is characterised by the aim to strengthen the Austrian capital market, a number of organisational restructuring measures (founding of the Austrian Industries AG) as well as a massive annihilation of jobs. In order to prepare privatisation large financial injections were needed. In spite of these huge investments, the government still retained a majority stake in public enterprises. This structure, however, turned out to be not viable for various reasons. One was the politically enforced merger of profitable and unprofitable enterprises, which tended to result in loss making of the Austrian Industries in the early 1990s. Another reason was the growing national debt and the impending EU membership, which led again to a change of policy.

The amendment of the ÖIAG act in the year 1993 marks the start of the second phase. The almost defunct ÖIAG was merged with Austrian Industries and the privatisation of the majority of its holdings within a reasonable period was required by law. However, the state share of major enterprises was not yet to be reduced below 25 percent, since in this regard no consensus could be achieved within the grand coalition. In particular, the Social Democrats insisted, mainly because of industrial and employment policy reasons, to maintain the state's role as a core shareholder.

The right-wing conservative government coming into office in 2000 again carried out a fundamental paradigm shift in economic and industrial policy. A cornerstone of its

political programme was to push back the role of the state. Its main task was therefore the further privatisation of public companies. Whereas the social democratic party had been able to defend the blocking minority of 25 percent successfully during the previous decades, the new right-wing conservative government decided to skip this level, provided that Austria's economic position was strengthened. Furthermore the characteristics of the third phase are the enormous pace of privatisation ("speed kills") – directly related to the goal to reduce the debt of ÖIAG within a legislative period (cf. Obinger 2006: 165). The government attempted also to install a new depoliticised supervisory board – in which they completely failed. With respect to privatisation tasks the new government program anticipated the full privatisation of several former state enterprises including the telecommunication sector.

It can be concluded that sixty years after the "Verstaatlichtengesetze" Austria turned from a special case within the OECD world in relation to the size of the public enterprise sector into a normal case (cf. Obinger 2006: 167). After the disastrous losses of nationalised industries in the 1980s, there existed a consensus about the necessity of privatisation among the parties. However, there have been political differences especially with regard to the scope and pace of privatisation and in relation to the strategic role of the state as a core shareholder.

4.3. The Austrian Telecommunication sector

Within the scope of this thesis, only the recent developments in the Austrian telecommunications sector will be outlined. A more detailed and general presentation on the historically developments of the telecommunications sector can be found in the comprehensive study by Volker Schneider.

4.3.1. Historical perspective and basic preconditions

Historically the telecommunications sector was and still is in almost all countries an issue of public policy. Internationally, the control and regulation of telecommunication structures were fixed in constitutions, laws, regulations, and administrative procedures. Telecommunication policy was therefore always subject to a result of political processes. Until the mid 1980s the sector had, however, internationally no particular visible political

role in spite of its major infrastructure function (cf. Schneider 2001: 24). In this context it seems to be obvious that the technological revolution and the increasing economic and political relevance of the communication and information technology are directly correlated and dependant on each other.

These general conditions can be found in Austria too. The Austrian telecommunication sector was until the liberalisation in 1998 under strong political influence. The Austrian telephone company, ÖPTV, was a state-owned monopolist, which was divided until its dissolution in 1996 into three divisions, telecommunication, postal, and bus services. In contrast to the service supply, the telecom equipment market was dominated and shared by four suppliers, which were operating in a policy approved legal cartel setup. Two of them were Austrian family businesses, namely Kapsch and Schrack, while the other two were subsidiaries of multinational companies, Siemens Austria and ITT Austria.[6] Their first letters were used as an abbreviation for their cartel, first KISS and from 1987 on it changed to KASS, as ITT was renamed to Alcatel Austria. In this respect Austrian's telecommunication sector was a sealed-off market. The state-owned ÖPTV assigned contracts to the four equipment suppliers according to fixed quotas which therefore did not experience a competitive market situation (cf. Unger et al. 2001: 65).

In a triangular setting which consisted of ÖPTV, the equipment suppliers' cartel, and the social partners, each participant was pursuing its own goals which were in turn synergetic to each other. The main political and economical priorities were to provide access to a functioning telecom network at a reasonable price, to secure jobs and to control wages, and last but not least to protect the domestic economy by keeping the value added chain in Austria. Considering the number of employees, ÖPTV was, besides the state owned steel company, VOEST, and the national railway company, ÖBB, one of the three major employers in Austria. By the end of the 1970s ÖPTV employed 66.000 people, out of which 19.000 worked in the telecom sector (cf. Unger et al. 2001: 29).

Prices for telephone rates and telecom equipment were among the Austrian fixed consumer prices. Neither ÖPTV nor KISS could determine autonomously their prices, rather they had to be negotiated with the social partners according to socio-political criteria and had to be approved by parliament (cf. Unger et al. 2001: 31). Because of

[6] Siemens was considered as a quasi state owned company due to its specific history as it was among the nationalised firms in 1946.

parliamentarian regulation, prices have not been much higher than the West European average at that time; however the long waiting periods for the installation of new lines and their limited quality were below average standards. Moreover the ÖPTV was not only state owned, but was also used as a "cash cow" (Unger et al. 2001: 31). Not only the telecommunication sector was the only profitable division and had to cross subsidise the postal and bus divisions, profits were also reallocated in order to stabilise the Austrian national budget.

To sum up, the specificity of the Austrian situation was the importance of the telecommunications sector with regard to employee numbers and therefore telecommunications were considered as a sector for the provision of jobs: labour interests were the main policy generating issue.

4.3.2. Technological change

The decision to modernise the network infrastructure was taken by the ÖPTV in 1977. The outdated electro-mechanical signalling system that was dominant in the Austrian telecommunication sector until the late 1980s, had been in operation for more than 30 years (cf. Unger et al. 2001: 33). This system was no longer able to handle the increasing demand.

Nevertheless, ÖPTV was in Europe among the first telecommunication operators who made the decision to modernise the network infrastructure by implementing a digital switching system. The decision was made at a time when no digital system was yet in operation. After the decision was made, it took eight years, until the first switches went into operation in 1985.

In order to organise the digitalisation process and in particular to decide, which of the existing foreign digital system was suitable to Austrian needs, the ÖFEG was founded in 1978. The biggest share holder of the new joint venture was the state holding 50.4 percent, while the four members of the KISS cartel each were holding 12.4 percent. The two Austrian members, Kapsch and Schrack opted for the system DMS 100 by the Canadian company Northern Telecom, while Siemens and ITT both suggested the systems of their mother companies (EWSD and ITT's System 12-30). Österreichische Fernmeldetechnische Entwicklungs- u. Förderungsgesellschaft GmbH (ÖFEG) ended up with a majority vote for the Northern Telecom system DMS 100.

The final system decision was, as always, politically influenced. Even though the digital system of Northern Telecom was technologically superior and more appropriate for the Austrian telecom market, the minister of economics and transport decided to procure and implement two systems in 1981: DMS 100 from Northern Telecom and EWSD from Siemens. Siemens Austria, in terms of turnover and employees, the largest telecom supplier company in Austria, threatened to stop their operations and to cut down personnel in Austria, if their system was not be taken into consideration (cf. Unger et al. 2001: 35). As a consequence, Chancellor Kreisky, who highly favoured Siemens and wanted to keep them in Austria, intervened. As the main interest of the social partners was to protect jobs in Austria and they therefore had an interest that Siemens was keeping their operations in Austria, they accepted the chancellor's decision. The political decision was, however, not a real surprise, since the ÖIAG held 43.6 percent shares of Siemens Austria by that time. The procedure therefore perfectly corresponded to the Austrian manner of compromise and consensus (cf. Unger et al. 2001: 32-3).

As already mentioned, with the first delivered digital switches in 1985, the continuous extension of the technology modernisation of the telecommunication infrastructure was started. By 1992, 42 percent, about 1.5 million of an entire 3.5 million main lines were connected to digital switches. By 1999 the digitalisation process was successfully completed. The outcome of the decision for two systems obviously proofed that political decisions do not necessarily go hand in hand with economic ones. In order to establish the Austrian digital system, OES, the two systems had to be made compatible. A fairly expensive network (about ATS 6 billion), with high development and compatibility costs as well as the long-time burden of high maintenance costs was the consequence. According to Unger et al. (cf. 2001: 36) it was never officially assessed, whether the federal money invested in the two digital systems has in the end paid off. Nevertheless, there has been at least an improvement of the quality of voice telephony and the transmission of data. The main interest of the triangle was not driven by the issue to modernise the technology, but rather by the aim to prevent foreign competition and to safeguard domestic jobs (cf. Unger et al. 2001: 32).

The established protectionist policy system just described, accompanied by the almost exclusive orientation towards the domestic market, could therefore not generate the necessary profits required for investments in research and development. The basic problem of Austrian telecommunication sector was consequently the lack of domestic

know-how in digital switching and the lack of a clear technology policy and public funding to compensate this deficit. The research department of ÖPTV was closed in 1955. As neither of the two Austrian equipment suppliers had substantial know-how in digital technology and both multinational subsidiaries were integrated in their parent companies' research and development fields, Austrian research and development activities were almost inexistent. This meant that both digital systems had to be licensed abroad and were only partially produced in Austria. As a consequence, due to the complexity of the Austrian network the digital fixed network is still mainly supplied by the former cartel suppliers in spite of the liberalisation process which was meant to break up the oligopolistic structure of the suppliers (cf. Unger et al. 2001: 64-7).

Until the start of the Austrian liberalisation process in 1998, "telecommunication policy was either industrial policy (support KASS to keep jobs in Austria and guarantee a functioning telecommunication infrastructure) or budget policy (revenues of the telecommunication unit of ÖPTV were reallocated to cross-subsidise deficits of other state-owned enterprises)" (Unger et al. 2001: 62). Austria had obviously difficulties to get out of a system that had worked quite well for a long time in order to meet the challenges of a changing technological, political and economic environment.

4.3.3. Market Liberalisation in the course of EU Membership

> "In many countries, the new digital technology laid ground for breaking the monopoly of public telecommunications. In Austria, however, it stabilised the old actor configuration. It was not digitalisation, the technological push, but liberalisation, the economic push that initiated major shifts in the network infrastructure and services." *(Unger et al. 2001: 40)*

Austria became a member of the EU in 1995: this had several strong effects on the Austrian economy. First, the rather comprehensive and intricate system of subsidies that had evolved in Austria had to be partly banned and partly modified in order to meet EU directives. Secondly, many of the former state monopolies were liberalised and therefore opened to competition in the European internal market. Finally, the ownership structure changed considerably, since direct investments by EU members became possible.

In Austria the first step in the course of telecommunication liberalisation consisted in restructuring the former state monopoly. In 1996, the Post Restructuring Act ("Post-

strukturgesetz") became applicable that hived-down the ÖPTV from a governmental administration structure into a private limited company, the Post and Telekom AG (PTA AG). The initial incentive was the preparation for (partial) privatisation and moreover the intention to establish a more customer-oriented and cost-efficient company. However, the entire share capital was still held by a holding company, the PTBG, owned by the Republic of Austria. With respect to the impending market liberalisation and in order to legally implement EU directives, Datakom GmbH, a subsidiary of PTA AG was founded. Datakom GmbH offered corporate networks and value added data services to potential competitors (cf. Unger et al. 2001: 36). Thus, Austrian authorities voted for a mild legal separation obtained through the creation of different companies under a common holding, instead of a complete operative separation. Hence, PTA AG was composed of independently operating companies for various telecommunication services, in addition to postal and transportation services. As before liberalisation, the equipment suppliers were still the same four cartel members. However after liberalisation, the US company Motorola entered the Austrian mobile telecommunication market quite rapidly after winning several public tenders with their Austrian partner "Center Nachrichtentechnische Anlagen GmbH" for the setup of mobile networks (cf. Unger et al. 2001: 41-2).

On the eve of the forthcoming liberalisation the Austrian government was forced to establish new regulatory authorities. As a National Regulation Authority (NRA) the Telekom-Control-Kommission (TKK) was established in November 1997 (TKG 97). It is a fully state owned, non-profit limited liability company. Its main task is to establish a framework for workable market regulation, in order to encourage new competitors to enter the market, and to guarantee them fair and effective competition conditions (cf. Winkler 2000: 9). The TKK receives guidance from the Supreme Postal and Telecommunication Authority, which in turn is part of the Austrian Federal Ministry of Transport, Innovation, and Technology. In addition the Ministry established a special department dealing with Telecommunication Policy after Austrian's accession to the European Union. This department was and still is concerned with the development of the regulatory framework of the Austrian information society. As described by Winkler (2000: 11) "the Supreme Postal and Telecommunications Authority also monitors liberalisation developments on international telecommunication markets in order to pass on trends and promote a vivid competition on the Austrian telecommunication market. Furthermore, it formulates strategic tasks for the National Regulation Authority, implements inter-

national agreements, drafts ordinances and laws and decides in case of appeal against decision of the Local Telecommunications Authorities and the Certification Office." The regulatory authorities decide among others on the following core regulatory issues: determination of prices the incumbent operator may charge for LLU; intervene in case of anti-competitive conduct by the dominant operator; and numbering licensing (e.g. number allocation, number portability).

Next to the State institutions, the Association for Alternative Telecommunications Operators, VAT, was established in summer 1997 as a lobby organisation for the new network and service providers. The main task of the association was and still is monitoring and commenting on the development of fair competition conditions. In addition VAT represents its members' interest on major competition topics, like interconnection and numbering, by lobbying at national and international regulatory authorities and especially opposing the incumbent operator and former monopolist, Telekom Austria AG (TA AG) (cf. Winkler 2000: 12-3).

As the European telecommunication market was finally fully liberalised in 1998, a totally new market environment arose. In Austria the telecommunication sector was separated from the postal and transport businesses. The former PTA AG was divided into two companies, TA AG and the Post AG, both still owned by the PTA AG. A few months later in October 1998 a strategic partner, Telecom Italia, the former Italian monopolist, acquired 25 percent plus one share of TA AG (cf. Unger et al. 2001: 43). In July 1999, due to provisions by the EC, the TKK forced the TA AG (which owns as the former monopolist major parts of the Austrian fixed telephone networks) to open the last mile of the telecommunication infrastructure for alternative telecom operators (direct access to consumers). Even though the OECD and the EU encourage national governments to operative separation, TA AG was not forced to separate competitive operations from non-competitive infrastructure segments. Thus, TA AG still operates as an integrated universal provider.

At the very beginning of the legislature of the new right-wing conservative government in 2000 the agenda was focused on the reorganisation of the ÖIAG. The major issue was the merger of the holding company ÖIAG, PTBG and PTA AG retroactively by 31st December 1999. From now on everything went stroke upon stroke. On 21st November 2000 TA AG sold shares on the stock exchange for the first time. While the Post AG remained 100 percent in public ownership until May 2006, their own bank, PSK, was

sold to the BAWAG in 2000 and the Postbus area was sold to the ÖBB in 2002. The government Schüssel II continued the chosen privatisation path with undiminished speed. Based on the new government convention of February 28th 2003 the federal government already assigned a new privatisation commission to ÖIAG from 1st April 2003 on, in which the Austrian Railways and the Verbund AG, Austrians biggest electricity group, were to be integrated. The plans were to dissolve ÖIAG after the successful completion of the privatisation process (cf. Obinger 2006: 162). This reform, however, was never implemented.

Ironically in summer 2004, efforts by Swisscom to take over TA AG were prevented in the last minute by massive political intervention (cf. Obinger 2006: 163). Nevertheless the privatisation was pursued over the last decade through the continuous sale of TA AG shares. However, despite efforts to fully privatise the former state-owned company, there are currently only about 72 percent in free float including the shares hold by the employees. The other 28 percent are being hold by the ÖIAG.

Another shift in telecommunication regulatory policy occurred as the separate radio and telecommunication company, RTR, was established as the independent regulator in January 2008. The fundamental distinction to previous regulators lies in the fact that RTR has arbitration powers in dispute-solving between service providers, interest-group representatives and consumers. Last but not least in July 2010 the two partly state owned and former monopolists Mobilkom Austria AG and Telekom Austria AG again merged into one common enterprise. With this organisational reunification the new company A1 Telekom Austria AG is the biggest telecommunications enterprise in Austria and is the market leader in all of its core activities, which are: fixed telephone network operation, mobile communications, and data communications.

4.4. Market Analysis of the Austrian Telecommunication Sector

Most of what was said in the previous sections explains why the final test of the success of the reform paradigm should be based on an evaluation of market outcomes. By referring to Stiglitz (1994) Ceriani et al. (2009: 19) state “the choice is not between perfect markets and perfect planning . . . but between different types of information and

other constraints to efficiency."

4.4.1. Current Market Situation in the Austrian Fixed and Mobile Phone Sectors

The Austrian electronic communications market is characterised by strong competition in the mobile sector. However, in fixed line services and fixed broadband the market dynamism is highly unsatisfactory as the incumbent operator not only confirmed its position as the market leader but also increasingly tries to use its market power in order to suppress competitors. The following statistical data is based on the RTR Telekom Monitor published in February 2010 and on the 15th Progress Report on the Single European Electronic Communications Market published by the EC in August 2010.

Austria's Fixed Telecommunication Sector

Even though to a lesser extent than in some other EU countries, the incumbent fixed line operator maintained its leading position and is regaining market share in several types of calls. For instance, its market share for national fixed calls grew from 59.9 percent in 2007 to 64.1 percent in 2008, and its market share increased from 49.7 percent to 59.2 percent for calls from fixed to mobile. "As regards fixed broadband lines, the market share of the incumbent operator has been increasing over the past years, and it was 51.1 percent in January 2010 up from 45.4 percent in January 2009 and above the EU average in January 2010 of 45.0 percent. In January 2010, 68.1 percent of broadband lines in Austria were based on DSL technology and the market share of the incumbent fixed network operator in DSL was 75.0 percent, well above the EU average of 55.8 percent" (EC MEMO/10/211: 84). How important local loop unbundling actually is for alternative providers is illustrated by the following figures: "In January 2010 82.8 percent of DSL broadband lines provided by new entrants were based on full LLU" (ibid.). The penetration rate of broadband internet was 22.7 percent in January 2010 up from 21.8 percent in July 2009 and 21.4 in January 2009, but below the EU average of 24.8 percent. Furthermore the decline in the rate of growth of fixed broadband services in Austria continued. Between January 2009 and January 2010 107,733 new lines were created compared to 130,533 new lines create in the same period of the previous year

(cf. ibid.). This declining growth in fixed broadband lines however may be explained by the growth rates of mobile broadband services in Austria. In addition, fixed operators are facing further competition and especially substitution to mobile by innovative and attractive offers from mobile operators. At the end of 2008, 71 percent of total voice traffic was handled though mobile networks. It is alarming that less that 2 percent of Internet connection based on fibre optics are operated by the NGA network.

Why a market setting in which a service provider also owns the network infrastructure can indeed be anti-competitive, is impressively illustrated by a conflict in the telecommunications sector: the cause of the collective agitation in late 2007 was a promotional bundle offer by TA AG combining landline, broadband internet, and mobile phone for €19.9 per month. As the service competitors were charged with anti-competitive network interconnections rates (minimum €17.48) they had under no circumstances an economic basis for a competitive offer.

Georg Serentschy, CEO of RTR, whose responsibility would have been to restore a competitive market situation commented to have "no competence" to proceed against aggressive offers by TA AG (Presse 21.11.2007). In this context, Jana Halesova, product manager of Silver Server, spoke of "secret agreements" between TA AG and the regulator (Presse 22.11.2007). Eventually TKK intervened and forced TA AG to defuse their promotional offer and charge €25.9 for the bundle. The forced corrections by the regulator, however, did not solve the core issues as stated by Roland Turk, president of the Austrian association of Internet Service Provider (ISP): According to him the operative separation of the infrastructure and the service provision is the "only way to secure fair competition in the long run" (Presse 21.11.2007). This step is essential in order to prevent further market abuses by the incumbent provider due to which its leading position is even more expanded. Even though the monthly rental prices for full LLU were further reduced during 2009, bundle offers remain a matter of concern for alternative fixed operators. In this case of promotional bundle offers, the NRA asserted to verify that the offers proposed by the incumbent do not lead to vanishingly small margins for the alternative providers. The alternative providers replied, however, that the current market situation allows only the former monopolist to drive competition and that their margins are not sufficient to offer innovative products in the long run.

Austria's Mobile Phone Sector

In contrast, the mobile market in Austria continues to be highly competitive, with attractive prices and innovative services. "Mobile penetration stood at 133.5 percent in October 2009 with more than 11 million subscribers, above the EU average of 121.9 percent ..." (EC MEMO/10/211: 86). Almost 70 percent of the users have a post-paid service, with 30 percent using prepaid services. The average price per minute of mobile communications in 2008 was €0.10103, which is below the EU average of €0.13. The diversity of offers, including for flat-rate offers, have brought prices down considerably to the third lowest in the EU. In just a year the consumer price for medium mobile phone usage has dropped from €16.36 to as low as €7.31 per month. Mobile broadband services including access to the internet via mobile phone as well as data cards continue to be very popular mainly due to competitive prices. In this respect, mobile broadband penetration in Austria is among the highest in the EU: the penetration in January 2010 was at 15.1 percent, up from 11.4 percent in January 2009 and well above the EU average of 5.2 percent.

"The NRA has reported that mobile broadband connections account for 35 percent of the total retail broadband connections" (ibid.: 84). According to the NRA, residential consumers consider mobile broadband services as a substitute for fixed broadband services. It should be noted, however, that mobile broadband internet is particularly successful in rural regions where, due to lack of competitors in the fixed sector, there are until now few alternatives to the incumbent provider.

Just like in the fixed market, by the end of 2009 Mobilkom Austria holds a dominating position in mobile sector reflected by 42.3 percent market share, followed by the T-Mobile and Orange holding a market share of 30.1 and 19.8 percent respectively. The smallest provider Hutchison 3G has a market share of 7.8 percent. The omnipresent market dominance in both fixed as well as mobile market by the former monopolist seems to be especially questionable in terms of the recent merger between Mobilkom Austria AG and Telekom Austria AG.

Compared with the fixed sector where the regulatory authority did not interfere to prevent anti-competitive offers by the incumbent, the regulator intervened actively in the mobile market in order to establish anti-competitive termination rates helping the

former monopolist.[7] In contrast to the fixed market the mobile sector differs in one fundamental attribute: each mobile provider, except some virtual resellers, operates its own network infrastructure. In order to facilitate the cost intensive market entry, mainly because of network construction, and to help new market entrees to be more competitive, the termination rate was originally organised progressively. Hence, the termination rate was asymmetrically in relation to the individual market share. In 2008, for instance, Mobilkom Austria received €0.073 for each connection, T-Mobile €0.097, Orange €0.103, and Hutchison 3G €0.141. RTR however decided to change the progressive termination rate system into a regressive and symmetric one. By that decision the NRA determined a symmetric mobile termination rate of €0.0572 as from 1 July 2008. In addition NRA decided to reduce the termination rate to €0.0201 by June 2011. Exactly ten years after the liberalisation of the Austria telecommunication market Georg Serentschy celebrated this decision as "the end of the asymmetric regime" (Presse 4.9.2007). With the benefit of hindsight the NRA defended their procedure by claiming the lower level of mobile terminations rates has promoted innovation services including the development of flat rate offers which delivered lower prices to consumers. This is generally true, however, on the other side of the coin the incumbent operators benefits primarily from the new termination rate setting. Taking into consideration the market share of the incumbent operator of 42.3 percent and the combined market share of the three big players of over 92.2 percent, it is apparent that asymmetry was further exacerbated by the new system. More precisely, only the big players, especially Mobilkom Austria, benefit by the regressive system. The smallest provider, being most favourable to competition, claimed several times that fair competition is only possible if the termination rate is completely abolished.

Austria's Landline Termination Rates

Last but not least, interconnection charges have been again a hotly disputed topic in the domestic telecom market during 2009. This time, however, relation to fixed termination rates. In a dispute settlement procedure between the incumbent fixed network operator and Hutchison 3G over the setting of fixed interconnection rates, TKK adopted a decision to increase those rates by about 30 percent. Initially the mobile operator had wanted

[7] The termination rate is the rate that operators charge each other for putting through calls.

to achieve a reduction. The RTR justified and defended the increase by arguing that the cost for the fixed network operator has increased heavily since 2004, caused by the declining volume of call minutes in the fixed network. Already the existing fixed interconnection charges in Austria were among the highest in the EU. In October 2009 the rate for fixed interconnection at local level was €0.0082, compared to an EU average of €0.0054. As a result of the dispute settlement they were further increased to €0.0112. The rates for single and double transit were €0.0128 and €0.0225, significantly higher than the respective EU averages of €0.0079 for single and EU €0.0109 for double transit. Following the dispute settlement decision, these rates were set at €0.0158 and €0.0216 for single and double transit, respectively.

The recently deceased CEO of Hutchison 3G and Verband Alternativer Telekom-Netzbetreiber (VAT) president Berthold Thoma stated "that the recent increase of termination rate into the fixed network of Telekom Austria is in blunt contradiction to all recent arguments of the RTR and to the trend of European regulation. Obviously the NRA wants to safeguard the landline branch of Telekom Austria even by hook or crook" (ORF Futurezone 7.8.2009). According to T-Mobile and Orange the increase will cost at least a figure in the tens of millions of Euros. These costs must be shared by all except by the market leader TA AG. That is why the alternative operators accuse the NRA to favour the partly state owned TA AG. Orange CEO Michael Krammer describes the RTR as a "society for the promotion of Telekom Austria" and T-Mobile CEO Robert Chvatal blames RTR of conscious "cross-subsidisation" of TA AG (ORF Futurezone 7.8.2009). Once again, the newly merged company A1 Telekom Austria AG is the only profiteer of the implemented regulation policy. As pointed out by Wallsten and Hausladen (2009: 91) an infrastructure provider has "an incentive to engage in anti-competitive behavior against a content provider that competes to provide similar services." Twelve years after the beginning of the liberalisation process in Austria it is exactly this phenomenon that can be observed: the former monopolist (with the support of the regulatory authorities) tries to increases its market power, which is especially manifested through infrastructure ownership, and consequently to prevent any economical and social beneficial competition. In the long run this unfavourable market constellation will trigger re-monopolisation tendencies.

4.5. Implications of the Liberalisation Process on Telecommunications

By referring to Alfred E. Kahn, author of *The Economics of Regulation: Principles and Institutions*, Robinson and Weisman (2008: 540) state that "governmental policy should focus on unleashing the power of existing markets and the creation of new ones rather than the control of market power, *per se*." In addition, Kahn's integrity and impartiality in liberalisation concerns are proofed by his policy of non-discrimination and by his codes of conduct, in order to ensure fair play for the competitive battles that would ensue (cf. Robinson and Weisman 2008: 540).

Based on the noble requirements by Kahn, it is clear why regulation policy in Austria turns out to be anti-competitive in the long run and does not encourage infrastructure investments, which could unleash the power of new market opportunities. The regulatory approach neither conducts a policy of non-discrimination nor does it ensure fair play for the occurred competitive battles. The main cause for the failure of the reform paradigm lies in the fact that the operational separation of non-competitive infrastructure segments was not implemented, although recommended by the EC and the OECD. Most EU countries rather decided to establish competition among ISPs by unbundling the incumbent's network infrastructure (cf. Wallsten and Hausladen 2009: 91). This approach primarily arose from the unwillingness to split former state-owned enterprises and thus limit their market power. Despite the Treaty of Rome and the intention to create a single common European Market, many member states were neither in a political nor in an economical perspective courageous enough to dismantle their national boundaries. The effect was that the liberalisation process did not entirely lead to the initially desired prosperous and fair competitive markets. New market entrants can economically operate only in densely populated urban areas (after unbundling the local loop). In typically sparsely populated rural areas with low economical potential the former monopolist remains the sole provider.[8]

Another important question is whether the current regulatory policy to unbundle but not to separate creates incentives for infrastructure investments. Such investments

[8] Only recently the incumbent is confronted with competition by mobile broadband connection. However, particularly for corporate customers mobile services cannot be considered as a substitute for fixed broadband services.

would in particular be necessary on the last mile, the so-called bottleneck of today's network infrastructure. It turned out, however, to be very unattractive to invest, not only because unbundled network segments are being shared among ISPs, but also since interconnection prices are regulated. As a matter of fact, due to their direct access to end-users alternative providers would directly benefit from investments made by the incumbent. As a consequence, the former monopolist was no longer willing to share new network capacities, claiming competitors should invest by themselves. Moreover incumbent providers threatened regulators that, unless the new technological leading infrastructure was excluded from regulation, the expansion of networks would be stopped. As emphasised by Blum et al. (2007: 343) regulatory authorities "faced an issue of first and second degree errors." If regulation is applied, welfare enhancing investments may be prevented. If, however, no regulation measures are applied, competition would be inhibited and market power exploitation would be facilitated. Although Viviane Reding, former EU Commissioner for Information Society and Media, "remains opposed to any type of regulatory holiday" she implicitly recognised the "trade-off between mandating access to lines and investment incentives" (Wallsten and Hausladen 2009: 95). Nevertheless no substantial regulatory solution was provided. Inevitably the uncertainty lead to an inherent investment problem, where nobody was willing to further invest into the network infrastructure. As a consequence important and overdue infrastructure investments were not made, which in the long run can cause deceleration of growth and a deterioration of the location factor, especially with regard to the economic importance of telecommunications networks.

These examples fundamentally demonstrate the main problem of the regulatory reform package. In a competitive market environment, where the former monopolist provider is still operatively integrated, regulators try to anticipate market-power exploitation while they have to consider that the intervention may prevent investments. This also explains, why concepts to improve the pan-European infrastructure which have been developed already more than twenty years ago by the Commission President, Jacques Delors, so far have not been implemented. According to Schulmeister (cf. 2010: 119) this manifests the preference of governments to erroneously strengthen the nation economy against overall cooperative strategies, which would improve the economic situation throughout Europe.

4.6. Re-Regulation and Future Challenges

Three main conclusions can be drawn from this chapter. First the simple change of the ownership structures from public to private is not sufficient for achieving competitive markets, breaking up monopolies, and guaranteeing better conditions for market entry for private investors. By referring to Atzmüller and Hermann (2004), Hofbauer (2006: 4) states that this is because "liberalisation and privatisation of public services cannot simply be understood as the liberation of the market and the rolling back of the state." In fact the new economic market environment requires also a new approach to regulation. Replacing former monopolies by competition can only work, if the emergence of new monopolies, this time private ones, is effectively prevented. Liberalisation, privatisation and, regulation are politically sensitive subjects, which are frequently reasons for conflict. Secondly, in the last century people dealt with market failure in network industries either through public ownership or through regulation of privately owned monopolies but, over the past three decades "they became increasingly convinced of the prevalence of government and regulatory failures" (Ceriani et al. 2009: 4). Thirdly the Austrian telecommunication sector seems to confirm the *positive theory* already discussed in chapter 3.4.2: Posner (1974) argued that regulatory agencies, which were created to pursue the public interest in the first glance, are later captured by the dominant player of the industry.

The EC fought and continues to fight resistance by member states, which are reluctant to transfer national sovereignty over *their* public utilities to Brussels (cf. Parker 1998: 2-3). Confronted with this situation, the EC failed to implement an EU wide well defined reform paradigm, which however is considered to be necessary to establish a single common European Market situation. Instead member states surrendered their competence to NRAs which in turn developed their own market liberalisation policies to promote competition and liberalisation. As a consequence of its decentralised character, the liberalisation and unbundling process soon revealed considerable variations across EU countries. Its implementation is therefore characterised by inconsistency between member states thus complicating market entrance and infrastructure investment in a pan-European perspective.

To counter this problem, a new European wide regulatory authority was established in January 2010. This new Body of European Regulators for Electronic Communications

(BEREC) is composed of a Board of Regulators consisting of the heads of the 27 NRAs. BEREC is set up to provide administrative and professional support to the EC and to the NRAs. In addition BEREC will "assist the European Parliament and Council, on issues related to the application of the EU regulatory framework for electronic communications. BEREC will particularly help to ensure fair competition and consistency of regulation in the internal market for electronic communications by providing expert advice on market definitions, analysis and remedies, definition of trans-national markets, cross-border disputes and numbering issues."[9] Since the operational activities will not start in the third quarter of 2010, nothing substantial can yet be said on this new regulatory authority. The fact that policy recommendations by BEREC will have binding nature is, however, promising.

According to literature dealing with the reform paradigm, the promotion of competition in the network industries raises questions on how to best design regulatory mechanisms. The BEREC office and the EC has to create clear and fair regulatory conditions, which in turn will result in fair competition and the establishment of one single common European Market.

[9] cf. http://www.erg.eu.int

5. Open Access Theory: The Regulation of Public Utilities

> "The shift from monopoly to competition in telecommunications over the past forty years tells a remarkable story – a Schumpeterian story in a way – about the capacity of modern industry to change in ways that defy anticipation." *(Robinson and Weisman 2008: 509)*

As discussed in the last chapter the main purpose of the liberalisation and privatisation process over the last decades was to achieve a more competitive market environment and to reduce state's impact in public utility sectors. The regulatory package, however, did not entirely lead to the desired competitive incentives.

The increasing complexity and interdependence of our economic system further increases the social dependence on the unconditional availability of public utilities in general. This dependence increased particularly in the information and technology sector. Telecommunications infrastructure is an important prerequisite for the development of other economic sectors and is a key criterion for the assessment of regional location factors. The dependence on communication structures is historically not a new phenomenon – only the intensity of dependence is new (cf. Schneider 2001: 44). In this sense, a rapidly increasing demand for faster access networks can be observed in modern knowledge societies. The supply with appropriate networks and services has thus become a core issue of the economic and social debate. The deployment of appropriate access networks with sufficient bandwidth, reliability, and high quality are of utmost importance. It is all the more surprising that despite the increasing importance of infrastructure services not only the state control tends to decrease (cf. Schneider 2001: 19-20) but even more significantly the share of infrastructure investment in GDP has declined in Europe over the past twenty years (cf. Schulmeister 2010: 119).

In times of market liberalisation and public utility privatisation the observed reluctance of companies investing to invest into infrastructure indicates the necessity of appropriate framework conditions. Especially, since this trend will even intensify in the future. More investments can be expected if an appropriate regulatory framework design and technical guidelines are implemented.

The elaboration of possible scenarios for the development and financing of NGA networks, embedded in a competitive market environment will be the main focus of the following chapter.

5.1. Financial Crisis and the Ideological Reversion of Keynesian Economics

Numerous scientific studies have shown a positive effect of telecommunications investments on the rate of economic growth. Goolsbee (2002) stresses the importance of efficient and in particular nationwide network infrastructure coverage. The economic impact associated with the spread of telecommunications sector in developed countries has been accurately measured by Röller and Waverman (2001). Their empirical results show that one third of GDP growth between 1970 and 1990 in 21 OECD countries can be attributed to investments made in telecommunications infrastructure (0.59 percent of the annual growth of 1.96 percent). Lehr et al. (2006) have measured the economic effect of increasing broadband usage. Their econometric analysis confirms a significant effect of the spread of broadband on the economy as a whole. More recently the paper "The Effects of Broadband Deployment on Output and Employment" by Crandall et al. (2007) and the study "Economic Impact of Broadband: An Empirical Study" by LeCG (2009) proofed a correlation between broadband expansion and economic growth.

As a matter of fact, more and more capacity will be needed in order to meet increasing demand and therefore secure further economic growth. This however can only be accomplished by huge investment efforts in basic infrastructure networks. Already in the short-term, capacity shortage (bottlenecks) can threaten economic growth and immensely influence the location factor negatively. Already Adam Smith (1776: 561) recognised this fact by emphasising that "the erection and maintenance of the public work which facilitate the commerce of any county, ... must require very different de-

grees of expense in the different periods of society is evident without proof." In addition he stated that "the expense of making and maintaing the public roads of any county must evidently increase ... with the quantity and weight of the goods which it becomes necessary to fetch and carry upon those roads." I would add that utility infrastructure actually needs not only to keep up with growth to maintain the current level of quality, but on the contrary needs to grow at a pace faster than demand.

In the scope of the economic and financial crisis in 2008 an ideologically reversion of some Keynesian core values occurred. Governments inter alia refocused to public financing of infrastructure projects. Politicians and economists argued and defended the application of an expansionary policy, since it is generally accepted that investments in infrastructure have a positive economic impact. It is also assumed that high volume investments combined with broad regional distribution would accelerate employment. In addition more efficient infrastructure would improve production conditions for business and working productivity. That's why many countries decided to invest in infrastructure projects. An overview of the OECD (cf. 2009: 14) shows that countries like Australia (USD 33.4 billion), Japan (USD 29 billion), United States (USD 7.2 billion), Germany (USD 219 million), Finland (USD 96 million) and the European Union (USD 1.46 billion) invested quite considerable amounts in the expansion of broadband access networks. Schulmeister (2010: 119-20) also believes that the backlog of infrastructure investments should be reappraised, especially in the expansion and renovation of the trans-European transport and communications networks.

In this context the Austrian regulatory authority RTR has initiated in 2009 a national discussion about technical and regulatory issues related to NGA networks, and scenarios for their expansion and financing. Considering public funds, it is of crucial importance how this expansion can take place in compatibility with competition laws to ensure that competition is not undermined. Consequently the already mentioned attempt to establish new NGA network monopolies was banned by the EC most recently in September 2010 (EC MEMO/10/424). This alone, however, does not solve the current stalemate. The key problem is not so much the withdrawal of state monopolies but rather the non-implemented operational separation of the incumbent provider from the network infrastructure. In addition the lack of framework conditions for future investments and the unsatisfied access regulation to those networks can be included too.

Before turning to the elaboration of clear framework conditions for future infrastruc-

ture investment models, I will discuss the technological shift towards Next Generation Access networks.

5.2. Next Generation Access Networks

Similar to the technological change during the 1980s the telecommunication sector is currently again in a technological transformation process, which has the potential to change everything once again. In the 1980s the technological change was primarily based on the transition from the electro-mechanical to the optical-digital signalling system in the backhaul of the network. The current transition is based on the migration from the classic copper-based PST Network towards a fibre optic based NGA as far as to consumers' homes.

According to today's technological knowledge fibre optic networks allow the fastest data transmission possible. No other wired or radio transmission technology has neither the same technical potential nor economic performance. It has become apparent that already in the medium run the copper wire-based access network will no longer be sufficient for tomorrow's bandwidth requirements (cf. Rundfunk- und Telekom Regulierungs GmbH 2009: 19). Fibre optics are therefore considered as the ultimate long term sustainable technological solution. In the near future the 4^{th} generation standard in mobile network technology, LTE Advanced, can meet advanced broadband criteria too. LTE Advanced, however, depends on fibre optic connection in the backhaul in order to transport increasing data streams. Hence, the development and expansion of a fibre optic infrastructure for both fixed and mobile communication is a factor of huge importance in relation to global location factor competition and overall economic welfare.

The use of fibre optic in the access network ranges from Fibre to the Curb (FTTC), to Fibre to the Building (FTTB), and Fibre to the Home (FTTH). While in the case of FTTC and FTTB the remaining connection to the end costumer is implemented over the existing copper infrastructure, FTTH indicates direct fibre optic end-user connection. FTTH access networks require very high infrastructure investments, which under current market conditions cannot be financed by a single company. Particularly in economically difficult to develop rural regions an ambitious broadband concept requires an incorporation of fibre optic and LTE networks in the medium run. This example

demonstrates the necessary interaction between mobile and fixed networks in the near future. This illustrates once more under which circumstances the operational merger of Telekom Austria and Mobilkom Austria has to be considered. Building on top of the existing infrastructure, by preventing duplications, they can save NGA infrastructure deployment costs. In this sense they will together further enhance their market power by strengthening their position as the technological industry leader.

These technologies are, however, just tools that cannot give right answers to difficult policy questions. In addition the replacement of existing copper cable is associated with very high investment costs and concurrent economic opportunities and risks (cf. Rundfunk- und Telekom Regulierungs GmbH 2009: 13). It is of crucial importance for the construction of broadband infrastructure to ensure the financing of these major investments. A typical standardised funding model for investment in broadband access networks has so far not been elaborated. Investments in a new network generation are typically related with very long payback periods. Over a reasonable estimated amortisation period of 20 to 25 years it is difficult to forecast growth and stable conditions in regulatory, economic and financial environments (cf. Rundfunk- und Telekom Regulierungs GmbH 2009: 68).

Hence, regulatory framework conditions are necessary to create economic incentives for accelerated expansion, in order to reach the goal of nationwide coverage. In this respect, it is widely assumed that the development of FTTH access infrastructure will be implemented on the basis of different network concepts and investment strategies. In the debate regarding how to finance the inevitable high investment costs, aspects of cooperation between companies within the telecommunications with companies from other industries are gaining particular importance. Due to the high transmission capacity of optical fibre and LTE Advanced networks these technologies are virtually predestined to be used simultaneously by multiple service providers in the same network (EC IP/09/1238). As pointed out by Yoon (2006: 351), the OECD considers that "services will be separated from the transport network" in NGA network environments. That will imply that the competition moves from the infrastructure level to the service level and consequently follow the design of an open access model. The migration to and the development of NGA networks infrastructure therefore have the technological and economical potential to definitely dissolve the traditionally operational integrated business model of the former monopolist. As, however, emphasised by Genachowski (2009) "achieving

this goal will take an approach that is smart about technology, smart about markets, smart about law and policy, and smart about the lessons of history."

Before I come to the open access theory in infrastructure networks, I briefly want to discuss the origins of the theoretical concept, i.e. the network neutrality concept in the Internet industry.

5.3. Network Neutrality – Openness is the Key

Network neutrality has its origin in the Internet Industry and is best defined as a network design principle: "The idea is that a maximally useful public information network aspires to treat all content, sites, and platforms equally. This allows the network to carry every form of information and support every kind of application. The principle suggests that information networks are often more valuable when they are less specialized" (Wu n.d.).

In acknowledging the existence of challenging competitive, economic, and technological principles for the network neutrality of today's Internet, U.S. President Obama and the Congress have instructed the Federal Communications Commission (FCC) with developing a National Broadband Plan to ensure that every American has access to open and robust broadband. In this context Julius Genachowski, chairman of FCC, gave a speech on "Preserving a Free and Open Internet: A Platform for Innovation, Opportunity, and Prosperity" in September 2009.

The theoretical concept of network neutrality can be traced back to the summer of 1969, when engineers in a University of California, Los Angeles (UCLA) lab managed to connect two computers and transfer data back and forth. This was the first successful test of the Advanced Research Project Agency Network (ARPAnet), a project funded by the U.S. Department of Defence that became later the Internet we know today. ARPAnet was not open to non-military users until the 1970s. The first public users were some universities in the United States of America followed by the general public in 1983. The World Wide Web (WWW) was invented in 1989 by the European Organisation for Nuclear Research, Geneva (CERN) and started publicly in 1991.

Already from the very beginning the desire was to design a future proof network, a network that could support applications that at those days were not even conceivable. The original architects achieved this goal by their key decision to devise a network

based on the principle of non-discrimination. The solution was to establish an open system based on the *end-to-end* design principle, allowing everyone to contribute and to innovate without restriction. Due to the fact "that broadband providers cannot discriminate against any particular Internet content or application", a marketplace of ideas, opportunities and innovations was created (Genachowski 2009). Thus the Internet was not founded on a business model solely reserved for companies who are paying for access permission. The Internet was open to everyone. Neither the network architecture nor anyone else was meant to pick winners and losers, as they might have picked the wrong ones. According to Julius Genachowski (2009) the Internet's open architecture instead "pushes decision-making and intelligence to the edge of the network – to end users, to the cloud, to businesses of every size and in every sector of the economy, to creators and speakers across the country and around the globe."

The communication and information technology as a platform enabled an enormous economic growth, which in further consequence accumulated to the fifth, *our* Kondratiev Cycle. The Internet was an essential input, catapulting economies into their next level of economic competitiveness, working productivity, education as well as healthcare opportunities. The Internet enables much more than just commerce. Nowadays it is also an unprecedented platform for speech and democratic engagement around the globe. It can be concluded, that the core principle of openness has been a hallmark of the Internet since its inception (Genachowski 2009).

In spite of its success the free and open Internet faces today three substantial challenges. First due to re-monopolisation tendencies competition among service providers is limited. Secondly, due to the growing popularity of high-bandwidth content the total Internet traffic roughly doubles every two years. To keep pace with this development an expansion of network capacities will be required. Above all, the Internet's openness is finally challenged by the economic perspectives and incentives of broadband providers and the resulting dissolution of their traditional value chain. Traditionally, network operators rely upon revenue of services in an economically critical dimension, like landline and television subscriptions. By the expansion of available bandwidth and the increasing sophistication of Internet applications, *virtual* content providers started to offer Voice over Internet Protocol (VoIP), Video on demand (VOD), and Internet Protocol television (IPTV) services via the Internet and were thus in direct competition with traditional service providers. Although the differentiation of the traditional value

chain is apparent, providers try to protract this process by deviating from the Internet's historic openness. Incumbents block access to VoIP applications and implement technical measures that degrade the performance of peer-to-peer (P2P) software distributing lawful content (Genachowski 2009).

It seems apparent that the challenges we face in the expansion of telecommunications infrastructure networks and the degradation of the principle of Internet network neutrality share several similarities. In a totally new market environment we are confronted with long-established structures and incumbent providers trying to cling on to their old business models. Consequently, political exertion of influence is necessary to implement the required paradigm shift. The goal should, however, not be limited to secure network neutrality, but rather to go one step further: the basic idea is to transfer the Internet's virtual network neutrality concept to an open access principle in the physical infrastructure itself. The disintegration of public utility networks combined with non-discriminatory access could be the spark for developing innovative new services and unleash infrastructure investments. As emphasised by Hogendorn (cf. 2005: 20) *open access* and *network neutrality* "would allow a user to select any ISP on any conduit, and then use that ISP to access any content."

5.4. Open Access Theory

For some time already, the open access theory to network infrastructure is part of the regulatory debate. The interpretation of open access concepts, however, varies significantly between different market participants.

For incumbent providers open access implies above all that they remain operationally integrated companies, just reselling access rights to the local loop to potential competitors on the wholesale. In the true sense, however, open access implies that the operators of the network infrastructure are not active in the retail segment. Therefore, operationally integrated operators understand the new concept of open access principle as a regulatory threat (cf. Rundfunk- und Telekom Regulierungs GmbH 2009: 57).

The open access principle is fundamentally designed on the theory that the non-competitive parts of public utilities access networks should be accessible to all service providers on a non-discriminatory base. This guarantees that there will be no conflicts of

interest with regard to the provision of retail services and the conduct of the wholesale. In this respect the open access approach, however, requires a horizontal separation of the corresponding layers: construction and expansion of network infrastructure, maintenance and distribution of network, and the development of innovative services (cf. Rundfunk- und Telekom Regulierungs GmbH 2009: 67). Open access is therefore in many ways a new answer to an old question, namely regarding how equal access can be granted to the naturally monopolistic network infrastructure. This approach is the most open form of sharing infrastructure, allowing multiple providers to compete at equal access cost, quality, and conditions in the same network environment. As a result this leads ultimately to separated business segments, which however interact intensively with each other. Thereby innovative services and support quality are becoming increasingly important. This new approach creates market opportunities for new entrants at different and perhaps quite specialised levels and puts the current business model of the traditional supplier under future pressure. Traditionally integrated network operators have little interest in splitting up their value chain. The idea of operational separation is therefore a fundamental paradigm shift and the willingness to cooperate in this regard is kept within foreseeable limits.

In order to recapitulate, it seems to be inefficient from an economic point of view, if in a liberalised market an at least partly privatised former monopolist still owns the infrastructure, which in the first place was financed by public, hence by taxpayers' money.

The fundamental idea is therefore to establish a national infrastructure company which provides infrastructure to all interested service providers on equal terms. It is crucial that the joint development of network infrastructure should not only integrate the new but also the existing grid of the former monopolist. Political leadership is a necessary prerequisite since without, neither the open access principle can be implemented nor can the system operate effectively. At this point it must be emphasised clearly that open access is not about re-nationalisation of public utilities. On the contrary, this is the attempt to establish a framework of fair network access rights.

In a commonly utilised network infrastructure it seems natural that infrastructure cooperations have to be taken into consideration as an alternative to exclusive development. Infrastructure cooperations must be evaluated in terms of welfare enhancement both in business as well as in economical aspects.

5.5. Infrastructure Cooperations

The interesting fact of infrastructure cooperation is the possibility to establish new business models which are based on the *open access* theory. Considering the long return of investment periods for NGA networks from a business perspective, cooperation can ensure lower risk and lower total costs, as well as optimised utilisation of resources. In respect to overall economic performance and attractiveness as a business location, any country would benefit by deploying and expanding NGA networks. It is an important aspect of potential cooperations that the discussion should not be restricted to companies in the telecommunications sector. Cross-industry collaboration as well as public and private sector cooperation should be institutionalised. Partnership between telecommunication providers, energy supplier, cities, municipalities, local authorities, private investors, and housing societies are desirable. In Austria, the knowledge of cooperation opportunities is poorly developed. There are some approaches between energy suppliers, local authorities, telecommunication providers, however, the number of actually realised cooperations is quite low and regionally limited (cf. Rundfunk- und Telekom Regulierungs GmbH 2009: 77)

The following examples demonstrate possible market solutions for reaching the goal of nationwide NGA network coverage.

5.5.1. Cooperation between Energy Suppliers and Internet Service Providers

According to the study by Rundfunk- und Telekom Regulierungs GmbH (2009) on the development of NGA networks, cooperations between energy suppliers and telecommunications companies are sustainable. Particularly in industrial regions and cities energy suppliers have invested and built fibre optic communication networks in addition to their original electricity networks. Primarily they are using the fibre based networks for remote maintenance of substations and for internal communications purposes. In recent years energy companies, however, have recognised the potential associated with supplying businesses and private users with NGA network infrastructure. Energy suppliers, however, have often no experience with the provision and operation of internet services. Thus, an open access collaboration with ISPs seems to be a an ideal solution. Such

a cooperation would imply that ISPs are providing customers with appropriate communications services such as Internet, VoIP, VOD, and IPTV, while the infrastructure operator takes care of the construction and maintenance of the network. This approach guarantees that there will be no conflict of interest with regard to the provision of retail services and the conduct of the wholesale.

For instance, Wien Energie, the energy company of the city of Vienna, has laid fibre optic cables since 1983 and holds now at approximately 2000 kilometres. While they were initially used for internal purposes only, Wien Energie started to use them for providing Internet services in recent years. Christian Herbinger, marketing director of the telecommunication sector, describes the incentives and goals as follows: "We are preparing for services of the future, many of which we do not even know yet" (Standard 28.09.2009). For the operation of their fibre optic network Wien Energie has opted for the open access approach. Hence, Wien Energie focuses exclusively on the establishment and conduction of the NGA network, while the infrastructure is open to all ISPs on equal terms. This model not only guarantees high service quality and product diversity for end-users, but also facilitates the opportunity for startups to offer their services at low entry costs.

Another trend that can be observed in the collaboration between energy suppliers and NGA networks is the *smart grid*. Smart grid overlaps the original electrical grid with an information and network metering system. By delivering electricity using a two-way digital transmission technology not only consumers' meter data can be transmitted electronically to the vendor but also client-side load management can be performed. The interplay between electricity and communication networks enables technologies which promise to reduce cost, increases reliability and transparency, and reduces carbon dioxide emission.

To summarise, the trend seems to go towards utility companies constructing and maintaing fibre optic networks in order to provide their customers not only with smart grid products but also Internet access in collaboration with ISPs. In the long run this will help save energy and create new business opportunities.

5.5.2. Housing associations and Public Subsidies

As already mentioned in the case of FTTC and FTTB the remaining connection to consumers' homes is implemented over the existing copper infrastructure, which impacts the transmission rate negatively. That's why besides public network expansion, house wiring is an important part of NGAs network deployment. Since in-house wiring causes a substantial share of FTTH expansion costs, from an economical point of view it would be reasonable to subsidise the cost of fibre optic cabling in cases of new constructions and renovations. Particularly in new buildings this would be marginal in relation to total cost. Similarly, public authorities also subsidise and encourage heat insulation of houses or the access to community heating. These political measures would imply huge benefits for both house owners, infrastructure operators and the general economy. Fibre optic connected real estates would gain in value, infrastructure operators could supply residents with high bandwidth and smart grids: the more people are connected to NGA networks, the better for the economy. Similar to good public transport connections, the increasing distribution of NGA networks has a positive effect on the location. Hence, municipalities have to be involved in questions regarding infrastructure deployment.

5.6. Critiques and the Financing of NGA Networks

After the analysis of important factors that have significant influence on the deployment of NGA networks, also some critical remarks have to be emphasised. First, it has to be noted that there is no global solution to the problem. According to the prevailing market conditions and the corresponding framework conditions, which in certain circumstances have to be adjusted, a national utility infrastructure strategy has to be defined and implemented. By developing a national infrastructure master plan, medium term objectives can be set, which in turn create a certain momentum both in temporal and financial terms. Therefore, the elaboration of clear goals and focusing on practically achieving them is important. The government and the regulatory authority have an important role by setting a consistent and transparent regulatory, legal and policy framework guideline. In return this creates the necessary investment safety and investment friendly climate. A nationwide coverage with adequate broadband infrastructure for virtually the entire population seems to be impossible without public subsidies. In the organisation of in-

frastructure cooperations the government has an important function either as a partner itself or as a promoter.

Secondly, opponents of the open access and network neutrality principles usually criticise the establishment of a *common* infrastructure in two crucial points. They argue that such directives would reduce incentives to invest in the network and this would lead to an inefficient use of the existing infrastructure (cf. Wallsten and Hausladen 2009: 91). This can be refuted by the fact that cooperation offers the most viable and effective way to raise the high investments by spreading the economic risk adequately on all providers and by avoiding network duality. In addition Wallsten and Hausland show in their empirical study "that the more a country relies on unbundled local loops ... the less incumbents and entrants invest in fiber" (Wallsten and Hausladen 2009: 107). This result is also supported by other economists who demonstrate that unbundling diminishes infrastructure investments incentives for the already elaborated reasons (Pindyck (cf. 2007: 296), Hogendorn (cf. 2005: 22-3)). Furthermore, the concern is raised that a common infrastructure would necessitate sustainable and accompanying regulation (cf. Rundfunk- und Telekom Regulierungs GmbH 2009: 136). In reality, however, a separated network infrastructure is much easier to regulate, not only because all providers have the same rights and obligations, but also because there are no conflicts of interest whatsoever between infrastructure operators and service providers.

Last but not least incumbent providers often express their concern that infrastructure networks are not sustainable, if they are only financed on a wholesale model. This can best be countered with a quote from Adam Smith:

> "When the carriages which pass over a highway or a bridge, and the lighters which sail upon a navigable canal, pay toll in proportion to their weight or their tonnage, they pay for the maintenance of those public works exactly in proportion to the wear and tear which they occasion of them. It seems scare possible to invent a more equitable way of maintaining such works. This tax or toll, too, though it is advanced by the carrier, is finally paid by the consumer, to whom it must always be charged in the price of the goods. As the expense of carriage, however, is very much reduced by means of such public works, the goods, notwithstanding the toll, come cheaper to the consumer than they could otherwise have done, their price not being

> so much raised by the toll, as it is lowered by the cheapness of the carriage. The person who finally pays this tax, therefore, gains by the application more than he loses by the payment of it. His payment is exactly in proportion to his gain. It is, in reality, no more than a part of that gain which he is obliged to give up, in order to get the rest. It seems impossible to imagine a more equitable method of raising a tax." *(Smith 1776: 562)*

This states clearly the obligation of the commonwealth to promote investments in infrastructure: Adam Smith obviously had already more than 200 years ago insights that are lacking to present decision markers: it is the basic message of Adam Smith that investment in network infrastructure can very well be profitable. In addition, his model promotes cost transparency of infrastructure investments, as it offers a solution to include the cost of their utilisation.

6. Conclusion

This thesis examines a practical case of monopoly regulation in Austria. The particular problem under scrutiny is that the monopoly to be regulated is a natural one due to the huge fixed cost of infrastructure investments. This has consequences for the investment strategy of this sector – a problem that is not dealt with in the classical monopoly theory.

The main purpose of this thesis was therefore to analyse whether the application of the open access theory to public utility regulation policy can improve competition and creates incentives for infrastructure investments.

For a number of reasons I have decided to examine this issue from a historical perspective. The distribution of goods and services of public utilities typically rely on a network infrastructure connecting suppliers and customers. In the past, public utilities were legally enforced monopolies because of their network structure implying economies of scale as well as network externalities. The analysis of Schumpeter's Kondratiev Cycle Theory shows the exceptional significance of public utilities for economic growth from the first industrial revolution up to the completion of the fifth Kondratiev Cycle.

We can therefore conclude that the significance of public utilities for economic growth depends considerably on the existence of a network infrastructure for the diffusion of goods and services. Infrastructure investments in transportation, electrification, as well as communication networks played a significant role in promoting economic innovation and growth.

During the last three decades countries all over the world have increasingly shifted from public policy instruments, such as private monopoly under strict regulation or national public utility ownership, to a greater reliance on market mechanisms. This change was characterised by a global shift from Keynesian state interventionism towards a neoconservative economic policy based on the faith in market-orientation and private ownership. This development was further promoted by a combination of perceived underperformance and an economic and financial crisis that forced governments

to support their loss making industries.

In addition to that, major technological innovations in the Information and Communication Technology (ICT) sector, such as the transition from mechanical to digital switching systems in the fixed telephony, or the rise of mobile telephony, have significantly furthered the liberalisation process in telecommunication sector.

The reform process was first initiated by the Thatcher government in the UK and by the Reagan administration in the USA. Later the EC implemented the liberalisation process in all member states. This reform process has varied in time, speed, and depth across countries and industries. Nevertheless, three main pillars can be identified: privatisation of public ownership, liberalisation of markets, and the unbundling of non-competitive network segments.

As I have shown in a case study on the Austrian telecommunications sector, the technological shift in the 1980s initially further stabilised the monopolistic market environment. Since the national telecommunication company was one of the three major employers at that time, the main incentive for the government was preventing foreign competition and safeguarding domestic jobs. It was not until Austria's EU accession in 1995, that the former state monopolies were liberalised and opened to competition. Major changes in Austria's telecommunication sector were therefore initiated more by an exogenous economic push in the course of EU accession rather than by the technological innovations.

The OECD and the EC encouraged national governments to operatively separate non-competitive segments (mainly network infrastructure) from those business segments, which are competitive (such as maintenance, production, and supply). Instead of implementing this policy recommendation, most EU countries, including Austria, established competition among service providers by unbundling the incumbent's network infrastructure. This approach primarily arose from the national unwillingness to split former state-owned enterprises and thus limit their international market power.

After the liberalisation process the former Austrian monopolist continued to construct and maintain the network infrastructure and at the same time competed on the service level with new providers. Due to this market constellation the former monopolist had and still has a huge competitive advantage: in most cases the new operators depend on the network of the incumbent in order to provide services to costumers. Therefore the monopolist who charges transmission fees has a competitive advantage by gaining

through cross-subsidisation. In order to prevent anti-competitive prices the NRA is compelled to set maximum interconnection prices. As before liberalisation, this solution is still not economically adequate, since regulatory authorities have imperfect information on the firm they regulate and therefore often fail to determine rates based on true costs. Thus, the former Austrian monopolist exploits its information advantages for increasing profits and regaining market shares. Twelve years after the start of the reform process in Austria, it can therefore be concluded that liberalisation did not entirely lead to the initially desired fair competitive market. Moreover, the first re-monopolisation tendencies can already be observed.

The Austrian experience leads to the following main conclusions on the liberalisation of public utilities. First, the reform process implies a re-definition of traditional state responsibilities, which historically included the provision and control of critical infrastructure systems as one of their core functions. Secondly, market liberalisation is useless if the former monopolist and unvaried incumbent provider still owns the network infrastructure. Apparently, the simple change of ownership structures, from public to private, is not sufficient to achieve competitive markets. In fact, replacing former monopolies by competition can only work, if the emergence of new monopolies, this time private ones, is effectively prevented. Last but not least, and most importantly, the introduction of competition and simultaneous non-separation of non-competitive infrastructure segments have negative effects on infrastructure investments. Before liberalisation, infrastructure investments were implemented and financed primarily by the state or by legally enforced monopolists. After the liberalisation process, the unbundled network segments are shared among service providers and interconnection prices are regulated: it became therefore very unattractive to invest. Moreover incumbent providers threatened regulators, that unless the new technological leading infrastructure was excluded from regulation, its expansion would be stopped.

This clearly demonstrates the main problem of the liberalisation of public utilities. In a competitive market environment, regulators, while trying to prevent market-power exploitation by the incumbent also risk to prevent infrastructure investments. This situation was further exacerbated during the last years, since it has become apparent that already in the medium run the current copper wire-based access networks will no longer be sufficient for tomorrow's bandwidth requirements. In order to prevent future bottlenecks, a new infrastructure challenge emerged – the transition to an access network

based on fibre optics. This was creating a new dilemma: who is supposed to support the huge cost of this new infrastructure investments?

Several solutions became apparent: in the scope of the economic and financial crisis, governments refocussed to public financing infrastructure projects by investing considerable amounts in the expansion of broadband access networks. Politicians and economists argued and defended the application of an expansionary policy, since it is generally accepted that investments in infrastructure have a positive economic impact. It is also assumed that more efficient infrastructure would improve production conditions for business and working productivity. On the other hand, in times of market liberalisation and public utility privatisation, it is crucially important to determine how public finance is taking place without undermining competition in these economically very important sectors.

Only the implementation of the open access theory can solve this problem: this theory is fundamentally designed on the principle that non-competitive parts of public utility infrastructure network should be accessible to all service providers on a non-discriminatory basis. In this respect the open access approach, however, requires an operative separation of the construction and expansion of network infrastructure from the maintenance, distribution as well as the supply of innovative network services. The open access theory is therefore in many ways a new answer to the old question – how equal access can be granted to a naturally monopolistic network infrastructure.

This leads us to the main argument of this thesis: open access not only establishes fair competition since its guarantees no conflicts of interest with regard to the provision of retail services and the conduct of the wholesale, but also unleashes private infrastructure investments.

Open access also favours infrastructure cooperations: Considering the long return periods for infrastructure investments, cooperations ensures lower risk and lower total costs, as well as optimised utilisation of resources. In the light of rising public debt, governments should be either partners or promoters of infrastructure cooperations by setting consistent and transparent regulatory, legal and policy framework guidelines.

A reliable and future proof network infrastructure based on the open access and network neutrality principles promotes investment and innovation by setting clear conditions. Investments therefore no longer distort market access – on the contrary, they tend to have positive effects on regional location factors and on the employment situation.

Finally, the outcome of my research may also apply to generation of electric power, which has similar infrastructure conditions to those in the telecommunication sector. With climate change on top of the world's agenda and the EC proposing the open access approach also for the electricity sector (Energy Sector Inquiry 2007, (EC SEC(2006) 1724)) it would be interesting to examine the impact of the discussed concept on renewable energy production. Applying the open access theory to the electricity network could be seen as a major step towards a decentralisation of energy production and in further consequence opening a *design space* for engineers and entrepreneurs installing renewable energy power plants. The technical and commercial feasibility of renewable energy power plants has been demonstrated, however, the large-scale diffusion has not started yet. From a macroeconomic perspective the important process is the transition from small quantities to the huge expansion of renewable energy.

The open access approach in the context of energy production means that everybody can become an energy producer leading to a massive diffusion of renewable energy plants. As a further consequence, this could lead to a massive accumulation of technological innovation creating new leading industrial and commercial sectors, which in turn will create the next industrial revolution: the 6^{th} Kondratiev Cycle.

While many see every policy decision as either pro-consumer or pro-business, such an approach is contra productive, as the main argument for operative separation of networks is a pro-competitive one. It was the aim of this thesis to prove that competition under the open access paradigm is essential for increasing investments and innovation in the network infrastructure for the benefit of both consumers and businesses, ultimately leading into higher economic growth.

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A. English Summary

The main purpose of this thesis is the analysis of the application of the open access theory to public utility regulation policy and its capacity to improve competition and the creation of incentives for infrastructure investments.

In the first part (chapter 2 & 3) the historic significance of public utilities in the context of Schumpeter's Kondratiev Cycle theory is analysed. This is followed by a description of the of the theoretical approaches to the functioning of public utilities.

The second part (chapter 4) deals with the global shift from legally enforced monopolies to a greater reliance on market mechanisms. This reform process implied a re-definition of traditional state responsibilities, which included the financing and provision of critical infrastructure systems as one of their core functions.

As shown in the case study on the Austrian telecommunications sector, the non-separation of non-competitive infrastructure segments did not lead to the initially desired fair competition. Moreover, this led to a situation where investments into infrastructure became very unattractive.

In the final part (chapter 5) the open access theorem is introduced, showing that it constitutes a possible solution to the above-mentioned problems. Only the open access approach favours competition by providing access to the infrastructure on a non-discriminatory basis. Open access has also the advantage to favour infrastructure co-operations, which in the light of the long return periods for infrastructure investments ensure lower risk and lower total costs, as well as optimised utilisation of resources. A reliable and future proof network infrastructure based on the open access and network neutrality principles is therefore most likely to promote investment and innovation by setting clear conditions.

This thesis proves that competition under the open access paradigm is essential for increasing investments and innovation in the network infrastructure for the benefit of both consumers and businesses, ultimately leading into higher economic growth.

B. Deutsche Zusammenfassung

In dieser Diplomarbeit wird untersucht, ob die Anwendung der Open Access Theorie in der Regulierungspolitik von öffentlichen Versorgungsunternehmen Wettbewerb fördern und Anreize für Infrastrukturinvestitionen schaffen kann.

Im ersten Teil der Arbeit (Kapitel 2 & 3) wird die historische Bedeutung von Versorgungsunternehmen im Rahmen von Schumpeters Kondratjew-Zyklus Theorie analysiert. Daran schließt sich eine theoretische Beschreibung der Funktionsweise von Versorgungsunternehmen an.

Der zweite Teil (Kapitel 4) beschreibt die globale Veränderung von rechtlich geregelten Monopolen zu marktwirtschaftlichen Organisationen. Dieser Reformprozess implizierte die Neudefinition der traditionellen staatlichen Aufgaben, die die Bereitstellung von Infrastruktursystemen als einer ihrer Kernfunktionen betrachtete.

Wie in der Fallstudie zum österreichischen Telekommunikationssektor gezeigt wird, fand hier keine Trennung zwischen den nicht-wettbewerbsfähigen und den kompetitiven Segmenten statt, was den ursprünglich angestrebten Wettbewerb verhinderte. In dieser Situation wurden Investitionen in die Netzwerkinfrastruktur extrem unattraktiv.

Im letzten Teil (Kapitel 5) wird der Open Access Ansatz als mögliche Lösung des oben genannten Problems diskutiert. Der Open Access Ansatz fördert Wettbewerb, womit der Zugang zur Infrastruktur auf einer nichtdiskriminierenden Grundlage gewährleistet wird. In Anbetracht der langfristigen Rendite von Infrastrukturinvestitionen begünstigt Open Access Infrastrukturkooperationen durch geringeres Risiko, geringere Gesamtkosten und die optimalen Ausnützung von Ressourcen. Nur eine zuverlässige und zukunftssichere Netzwerkinfrastruktur, die auf den Prinzipien des Open Access und der Netzneutralität aufbaut, kann wegen ihrer klaren Bedingungen Investitionen und Innovationen fördern.

Die Essenz dieser Arbeit ist, dass Wettbewerb unter Open Access steigende Investitionen und Innovationen zum Vorteil von Verbrauchern und Unternehmern fördert, was sich letztendlich auch in einem höherem Wirtschaftswachstum widerspiegelt.

C. Curriculum Vitae

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