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**Rational Regulatory Policy for the Digital Economy:
Theory and EU Policy Options**

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Summary: Telecommunications is a key element of the ICT sector which has been shaped by strong innovation dynamics since the 1990s. Market dynamics in OECD telecommunications markets are analyzed. We present new ideas about efficient regulation, emphasizing the need to adopt a broader international perspective. Analytical innovations also include the discussion of an adequately-modified Hitch-Sweezy oligopoly model. Moreover, we suggest differentiated two-part tariffs as an ideal welfare-maximizing approach in both wholesale and end-product markets. From a theoretical point-of-view, the need to avoid regulatory uncertainty is also emphasized. Theoretical progress is contrasted with regulations in the EU and the US. The EU offers a broad range of different regulatory approaches where the link between framework regulation and national regulation is rather complex. The internationalization of telecommunications requires a broader cooperation among regulators in the OECD.

Zusammenfassung: Telekommunikation ist ein Schlüsselement des IKT-Sektors der seit den 90er Jahren durch hohe Innovationsdynamik geprägt war. Die Marktdynamik in ausgewählten OECD Telekommunikationsmärkten wird untersucht. Neue Überlegungen zu einer effizienten Regulierung werden präsentiert, wobei die Notwendigkeit zu einer breiteren internationalen Perspektive betont wird. Analytische Innovationen betreffen hierbei auch die Diskussion um ein adäquat modifiziertes Hitch-Sweezy Oligopol-Modell. Darüber hinaus werden differenzierte zweistufige Tarife untersucht, und zwar als idealer Ansatz zur Wohlfahrtsmaximierung sowohl in Großhandels- wie Endkundenmärkten. Der Analysefortschritt wird den geltenden Regulierungsansätzen in der EU und den USA gegenübergestellt. Die EU hat relativ komplexe Regulierungsansätze entwickelt, wobei die Verbindung von Rahmenregulierung und nationaler Regulierung relativ kompliziert ist. Die Internationalisierung der Telekommunikation verlangt insgesamt nach einer verstärkten Kooperation der Regulierungsbehörden in den OECD-Ländern.

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1. Introduction

At the beginning of the 21st century, OECD countries have increasingly been shaped by information and communication technology (ICT). The share of ICT in total value roughly doubled in the 1990s and had achieved about 10% of gross domestic product in the US and Germany at the end of that decade. Telecommunications is one crucial sub-sector of ICT. It is characterized by high technological progress and a rise in the overall market in the context of technological convergence and digitization.

Since the 1990s, information and communication technology (ICT) has been a major driver of economic growth in OECD countries. There is a broad consensus in the literature that ICT production - mainly due to high rates of process innovations - is contributing to growth. Moreover, there is also some evidence that the use of ICT contributes to long-term output growth (WELFENS, 2002; AUDRETSCH/WELFENS, 2002 BARFIELD/HEIDUK/WELFENS, 2003). Digital services have also increasingly become internationally traded. Relatively falling prices in international telecommunications amount to reduced international transaction costs which in turn stimulate trade in general and trade in digital products and services in particular. Due to a high rate of technological progress, one may anticipate a continual fall in relative prices of ICT goods – such equipment is a key element for telecommunications – and hence an ongoing decline in telecommunications services. Since software is becoming increasingly important relative to hardware, one may furthermore assume that there is increasing long term scope for software-based standardization and product differentiation. Standardization facilitates exploiting economies of scale and network effects; flexible product differentiation should help generate higher average revenues of digital services in end-product markets.

Telecommunications is a key element of ICT, and telecommunications regulatory issues have been important in OECD countries for many years. The EU has made progress in telecommunications through the rapid growth of rather unregulated mobile telecommunications (with regulation mainly referring to the licensing process). WELFENS/PONDER (2003) and EITO (2005) have shown that Eastern European countries have considerably caught up in the field of telecommunications. VAN ARK/PIATKOWSKI (2004) have presented evidence that ICT has also contributed to economic catching-up in EU Accession countries.

In OECD countries, digital Services expanded in the late 1990s for three main reasons:

- Digitization blurred traditional market demarcations
- Expansion of broadband networks created huge new markets for digital communication
- Governments in Europe – and partly in Asia – opened up markets for competition, thus following developments in the US and the UK in 1984.

The traditional approach, which considers telecommunications to be a natural monopoly, was given up in both the US and Europe in the 1980s and 1990s, respectively. However, the telecommunications sector has to some extent remained a special sector which seems to justify regulation and has sector-specific competition rules.

Regulation can put a strategic focus alternatively:

- on the service markets; this focus is typically chosen when infrastructure competition seems too difficult to achieve, that is, if there are hardly any domestic or foreign newcomers expected and if the incumbent enjoys very strong market dominance;
- infrastructure competition; emphasizing infrastructure-based competition puts the focus on incentives for adequate investment of competing network operators and for incentives for the resale of capacities

Traditionally, there have been three arguments for government to intervene in telecommunications markets:

- Natural monopoly – which no longer is an argument in general, however, technological arguments still play a particular role;
- Need for interconnection rules which reflects a kind of externality of network operation on the side of each network operator; this is partly related to the topic of network effects which stands for endogenous growth and are mainly linked to certain services (not networks as such)
- Universal services which reflect the desire of society/the political system that all citizens should have access to important services at affordable costs. Due to technological developments, voice telephony and value-added services cannot be separated in a meaningful way and access to the internet has become at least as important in modern societies as voice telephony; a new concept of universal services is needed.

The main aim of regulation is static and dynamic efficiency in telecommunications, in particular in digital services. From a pro-competition policy perspective, it is necessary to achieve:

- sustained competition in telecommunications;
- not to impose a technological bias or distort the innovation process;
- to particularly maintain an open and competitive access, as the access market is a kind of intermediate input for all digital services;
- effective international policy cooperation in order to make sure the competition in international telephony is holding.

As regards effective competition, there are four potential impediments:

- traditional market barriers to entry which typically are related to high sunk costs (R&D and marketing expenditures are the main aspects here);
- bundling strategies of the incumbent operator which typically tries to shift market power from market i to market j;
- barriers for foreign investors which could serve as a powerful element in potential competition;
- impediments for resale which should play a certain role as long as at least two full competing networks still do not exist.

Given the dynamics of telecommunications markets in OECD countries and NICs, it is quite important to achieve sustained competition through a consistent mix of general competition policy and regulatory policy – the latter involving ex-ante remedies (e.g., price caps). Economic opening up of fixed-line telecommunications in the EU and other countries has brought major changes, including falling prices and a wave of innovations which are partly linked with mobile telecommunication dynamics. After 1998, network operators in the EU have cut back on R&D expenditures relative to sales, however, equipment firms have stepped up R&D activities. The implication of this structural shift in R&D activities is that barriers to entry in the telecommunications markets have reduced to some extent. The rather new phenomenon of bundling contributed to higher barriers to entry at the beginning of the 21st century. It is rather difficult to decide whether the incumbent's offering of certain bundles (e.g., call packages and internet flat rate) are a normal bundling phenomenon which should have been expected in a competitive framework or anti-competitive bundling launched by a firm with significant market power.

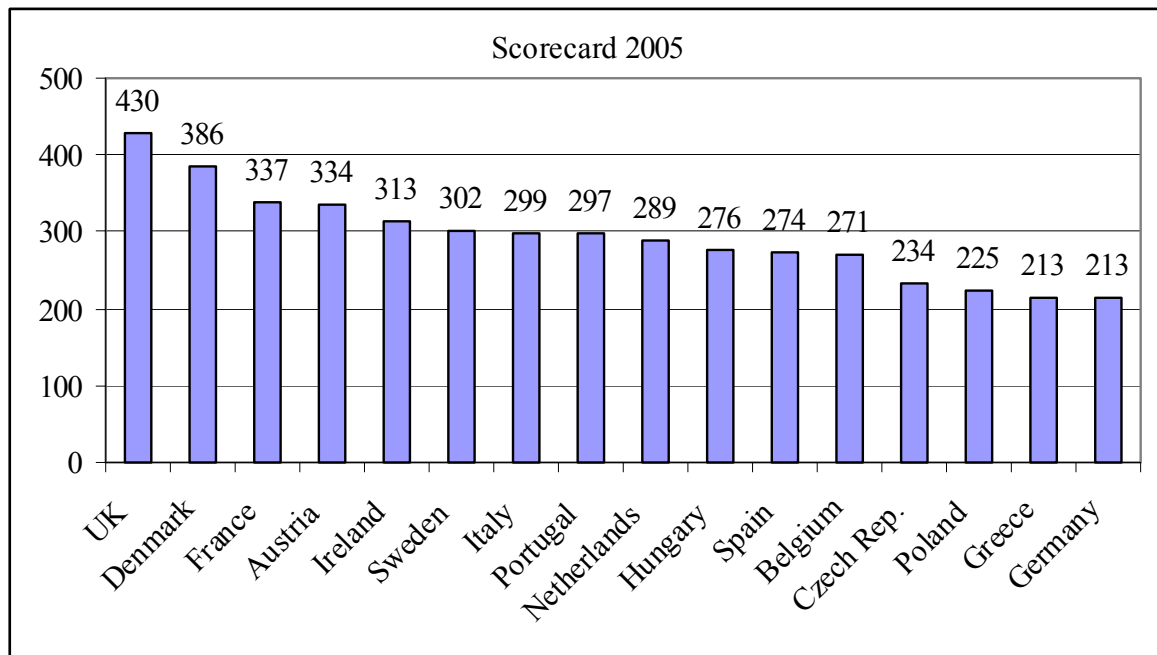
A key challenge for the regulator is vertical integration on the side of the incumbent operator. Newcomers in downstream markets could face discrimination in the intermediate input market so that the competition process grows distorted. In a more general perspective, there is the issue of whether regulation can be confined in a consistent manner to a few bottlenecks so that the burden of regulation is rather small. From the perspective of general competition law, one should ideally limit regulatory intervention in such a way as to allow efficiency goals to be achieved at low costs. Regulating intermediate input markets – including the access market with its high barriers to entry – should normally suffice for creating sustained competition. At the same time, one should be well aware that simply hoping that the dominant operator/a firm with significant market power will offer contracts to competitors who are efficiency-enhancing and contribute to Pareto-optimal solutions would be naïve.

From an economist's perspective interested in sustained competition, one should not impose regulations without clear reasons. The EU which has imposed a broad regulatory framework – and holds a double veto power (with respect to market definition and market analysis as provided in the notification by the national regulatory authorities) – requires a triple cumulative test:

- There must be considerable sustaining barriers to entry;
- there is no inherent tendency in the market to achieve effective competition within a relevant time horizon
- general competition law is not sufficient to provide an adequate remedy for the problems to be anticipated.

There is, however, no common degree of regulation across EU countries. Even if one takes into account that initial conditions differ across countries, it is rather surprising to see that the ECTA Regulatory Scorecard (a study sponsored by OFCOM) shows large differences across EU countries, the leading countries being the UK, Denmark and France. Poland, Greece and Germany are positioned at the bottom of the rankings. ECTA has argued that there is a positive correlation between the scorecard results and the level of investment in the telecommunications sector.

Figure 1: Regulatory Scorecard



Source: ECTA (2005), Regulatory Scoreboard.

To some extent, foreign direct investment should contribute to a narrowing of the scores across countries. There is certainly some regulatory arbitrage across EU countries, at the same time one cannot overlook that large EU countries – representing relatively important markets – still enjoy considerable policy autonomy. Whether a stricter EU regulatory framework would be useful is doubtful since it is unclear whether or not the EU will pursue a rational policy approach which would enhance static and dynamic efficiency. It is quite interesting to notice that there is a clear positive correlation between the scorecard results and investment in the telecommunications sector (ECTA, 2005). As this sector is part of the ICT sector with its high technological dynamics, low investment growth in the telecommunications sector is likely to undermine overall economic growth. From a theoretical and empirical point, there are also other arguments which point to a particular relevance of the telecommunications sector in a digitally-networked economy. For facilities-based competition, this is obviously crucial.

The standard literature on regulations of fixed-line telecommunications has emphasized the high technology dynamics in the digital sector and that asymmetric price regulation and price caps are adequate policy strategies. Moreover the first stage of economic opening up requires a rather strict regulation of the incumbent operator (see e.g. BEESLY/LITTLECHILD, 1989; WELFENS/YARROW, 1996; WELFENS/GRAACK, 1996; VOGELSANG, 1998; BUNTE/WELFENS, 2002; WELFENS/ZOCHE/JUNGMITTAG et al. 2005). After an initial stage of market opening up – in the EU with options for pre-selection in national and international calls as well as opportunities for newcomers to rent lines from the incumbent operator – the situation has changed in the early 21st century. Newcomers have gained market shares, and mutual invasion of markets through foreign investors has taken place; in part of the EU there seems to be oligopolistic interdependence. Mobile telephony has started to play an increasing role in the EU and

also in the US. The expansion of the internet and the increasing availability of broadband raise new issues. Innovation dynamics are strong both in the telecommunications network equipment sector, in the market for telecommunications equipment (particularly in the mobile market) and in the digital services markets.

Among the thorny regulatory policy problems is the relationship between general competition law and regulations. Only a consistent framework at the national level will optimally stimulate static and dynamic efficiency. OFTEL/OFCOM has enjoyed both regulatory powers (ex ante interventions) and a role in the broader field of competition policy which mainly is ex post intervention. In Canada, the Competition Bureau and the Canadian Radio-Television and Telecommunications Commission (CRTC) have concluded an Interface Agreement in 1999 specifying those areas where each authority has jurisdiction and fields of joint responsibility. Similarly, there was an agreement – the Cooperation Protocol – between OPTA, the regulator in the Netherlands and the Dutch competition authority (OECD, 2006). The revised EU Framework Directives, which emphasizes market analysis (basically for 18 markets) before implementing regulations, requires that member states ensure that “this analysis (market analysis) is carried out, where appropriate, in collaboration with the national competition authorities”. As regards the US, authorities avoid potential conflicts associated with overlapping jurisdiction over competition issues. The FCC has concurrent authority with the Department of Justice to enforce section 7 of the Clayton Act with respect to telecommunications common carriers. Moreover, as regards mergers the FCC does not need to rely on the Clayton Act Section 7, rather it can rely on its more general “public interest” authority to review transfers of licenses or authorizations subject to regulations of FCC. In merger cases, consistent decisions require cooperation between the FCC and antitrust agencies which can be difficult in the case that confidential information available to the latter cannot easily be shared with the FCC (a waiver often helps here). There is no formal cooperation agreement between the FCC and the DOJ and the Federal Trade Commission, where informal cooperation seems to work. The FCC also often refers to merger guidelines jointly developed by the Federal Trade Commission and the DOJ for standard principles on issues as market definition and measurement of concentration. However, one may pose the question as to whether in an increasingly internationalized digital market and with rapid growth of VOIP/internet-based telephony, will there be a global telecommunications market in which it might become difficult to distinguish between EU market and US markets. Enforcement in the internet world is difficult.

In the following analysis, we first present a theoretical analysis (section 2) which includes new ideas on optimum two-part tariffs and the role of a Hitch-Sweezy-type model for the telecommunications market. In section 3, we take a closer look at EU regulations (plus some US developments) and contrast the EU regulatory framework with our theoretical reflections. Section 4 offers some basic policy conclusions with particular relevance for OECD countries.

2. Theoretical Analysis of Telecommunications Markets and Regulation

2.1. Background

Telecommunication markets consist of various elements and layers which create in an open economy a complex setting for the regulator; telecommunications markets – narrowly defined – are closely linked with dynamic services markets, in particular the internet market. Both falling prices of international telecommunications and a faster internet (read: broadband access) can help to stimulate international trade. As regards the internet FREUND/WEINHOLD (2002) have shown in their empirical analysis that increasing internet density contributes to growing trade. WELFENS/JUNGMITTAG (2002) have shown, in the case of the EU, that trade in goods and services in the EU is positively influenced by the intensity of international telecommunications.

Besides important links between trade and telecommunications/the use of the internet – with causation possibly running in both directions- an international perspective is warranted in the context of foreign direct investment in telecommunications and the internet service provider business.

In the US there have been only a few entrants from the EU, Canada and Japan. As regards the internationalization of the telecommunications sector the process of market consolidation in the EU is still incomplete. To the extent that former incumbents would like to merge there are often thorny issues of competition policy so that cross-country mergers of that type are a rare exception (TELIA-SONERA as a Swedish-Finnish merger is such a case).

Barriers for international mergers and acquisitions in the fixed-line telecommunications sector can be expected to fall in the long run, namely for two reasons:

- As newcomers gradually gain market shares in many EU countries the effective restrictions on international mergers in Europe will decline;
- The growing market share of mobile telecommunications in the overall telecommunications sector and tendencies for mobile phone services to substitute for fixed line telecommunications (thus the old paradigm, according to which mobile telephony is complementary to fixed line telephony) implies a medium term erosion of the effective market share of incumbent operators in most EU countries. This holds because market share in mobile telephony typically are more equally distributed than in fixed line telephony.

With international telecommunications mergers in the EU expected to increase one may also expect a rising internationalization of digital services. The digital entertainment sector thus could become much more internationalized than at the end of the 20th century.

In the internet business there are three different pillars of revenue for the service provider:

- access to the internet; this market clearly is interwoven with the telecommunications and cable TV market – regulatory policies matter (e.g. role of

bitstream access which is different across EU countries due to different national regulatory policies and different structures of the communications network – see for example the strong competitive role of cable TV in the Netherlands and the UK vs. the weak role of cable TV in Germany and Italy);

- paid services; the market for paid services is almost global, however, there are language barriers and sometimes technical access barriers (the latter mostly in countries with an authoritarian regime) which prevent full internationalization. Internet providers in principle can provide TV services;
- portal revenues generated through advertising. EU firms and US firms in the advertising business – originally coming from the print and TV media - dominate the global advertising markets.

Within the EU, digital services trade and internationalization respectively are seriously hampered through artificially high access costs in some countries. This concerns, in particular, countries which do not have bitstream access (unbundled internet DSL access) and where broadband markets are not fully competitive. Germany is a country which suffers from both deficiencies.

The EU regulatory framework effectively consists of several directives which are supposed to bring about sustained competition and broad access to e-communication as emphasized in the directive on universal services. National regulatory authorities (NRAs) have considerable autonomy in the regulation of telecommunications and the structure of the telecommunications sector is different in the EU countries. Countries with a broadly available cable TV network – offering internet services, telephony etc. – have rather strong competition, including the internet markets. Fixed-mobile convergence also is an important trend: Mobile operators offer special discounts for a home zone so that the mobile phone effectively is becoming a substitute for the fixed line access.

There is a strong overlap of cable TV and fixed-line telecommunications as well as mobile telecommunications (and there is a natural competition between satellite TV and cable TV which is not covered here). In mobile telecommunications there is regulation only in two key areas in EU countries: licensing on the one hand, termination fees on the other hand – the latter does not hold for Germany. From a theoretical perspective the regulation of termination fees is only one option to avoid monopoly pricing problems in mobile telecommunications. An alternative provision would be variable pre-selection which would offer receiving customers a choice through which mobile operators they would like to receive their calls; this model effectively would mean pre-selected mobile termination.

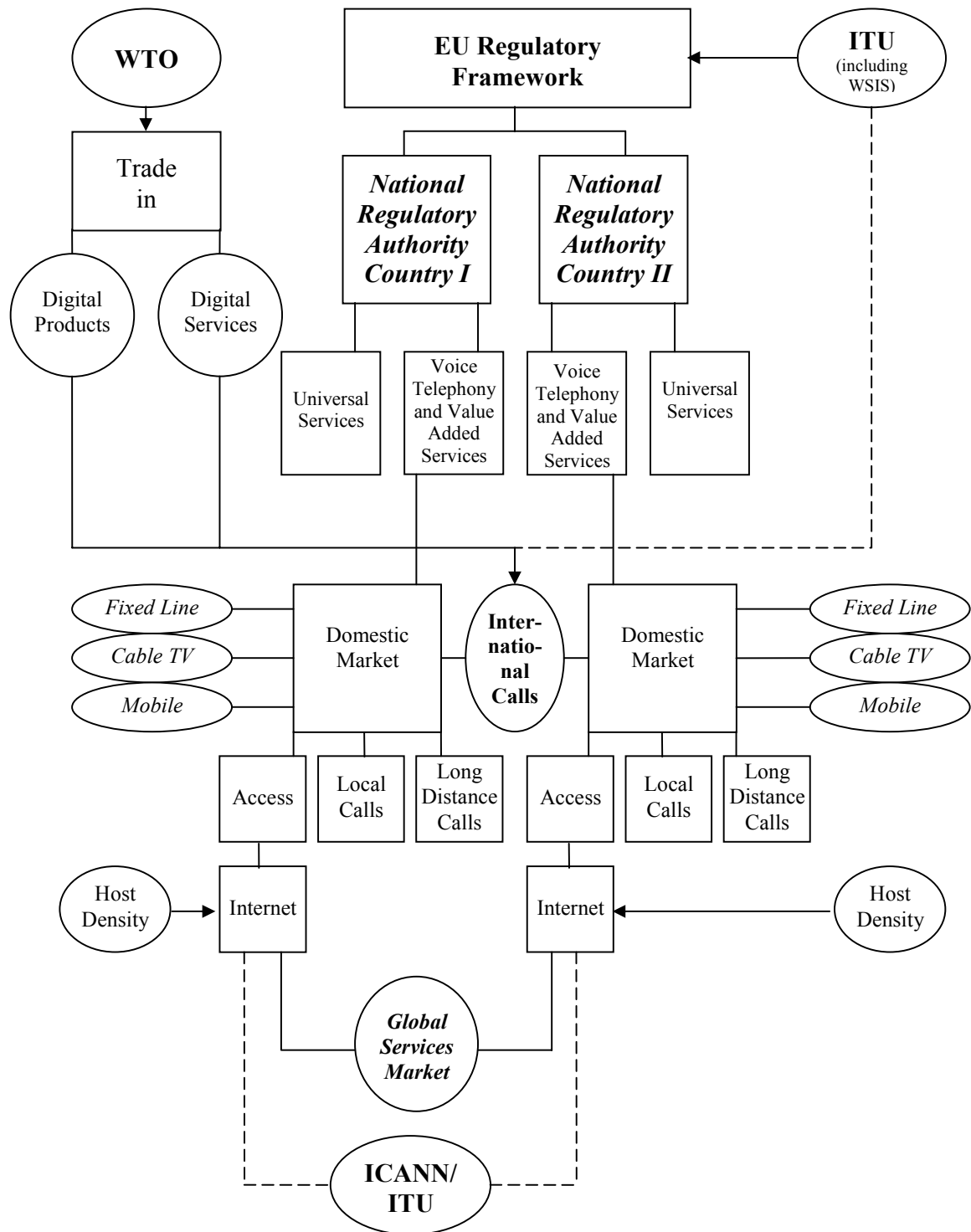
A growing share of digital services provided through broadband is related to internet providers. For internet providers access to high speed networks is crucial. Here vertical integration on the side of the incumbent operator can cause conflicts. If the incumbent has a dominant market position and wants to exclusively provide high speed services to customers this raises the question about undiscriminatory access. Taking a look at US developments and EU developments in 2004/05 it is not clear that one can easily find a consistent regulatory answer for this challenge – considering the transatlantic regulatory dialogue it seems that one might not find a common approach on both sides of the Atlantic. Whether or not the OECD is a policy forum developing guidelines on digital access of

internet providers remains to be seen. As regards internet providers interested in launching innovative services there is a natural interest to obtain bitstream access and to offer a range of various services packages which might include VOIP telephony whose expansion could cause accelerated depreciation on the side of the incumbent fixed-line operator; the stock market price also could come under pressure.

Strong competition in EU markets – after opening up in 1998 and a wave of international investment which often reflected a mutual invasion of neighbor markets through former national monopoly operators – has strongly reduced national and international telecommunications prices. The liberalization of markets worldwide has eroded the role of the International Telecommunications Union which traditionally has set accounting and settlement rates, that is, organized the revenue split between outgoing traffic countries and inbound traffic countries. With asymmetric liberalization in the 1980s and early 1990s it was the US which had the highest sectoral current account deficit in telecommunications services since relatively high prices abroad implied a bias for international calls to originate in the US.

A relative fall of international telecommunications prices will stimulate internationalization of digital services as will strong competition in local access markets, in particular in DSL and other broadband segments; cheaper local access facilitates the expansion of internet service providers. The internet plays a key role in the World Summit on the Information Society (WSIS) which is long run project under the auspices of ITU.

Figure 2: Regulation of Telecommunications and Digital Services



Certainly, in all EU countries there is long term digital growth. Moreover, international outsourcing takes place – partly reflecting digital outsourcing -, rising trade in ICT goods is observed and e-government has become prolific. There are considerable differences

among EU countries/OECD countries, respectively. This is partly related to two basic problems:

- the fact that (following the arguments of ARROW) information markets are systematically imperfect as those who want to sell digital information have to reveal part of the information for free. This implies that national information markets as well as international information markets typically suffer from market imperfections related to the fact that the effective demand – as perceived by the supply side – is below the demand level reflecting the marginal social benefit. This also implies that the national excess demand in any potential import market for information is lower than in a normal market and hence international trade in information is below the optimum level.
- Part of the information and knowledge market suffers from the fact that the respective products are “experience goods” or “confidence goods” where potential users find it quite difficult to indicate the value of the respective goods. Hence there is a market for lemons problem in part of digital markets.

While it is well known that in markets with experience goods or confidence goods building reputation on the side of sellers and certain signaling mechanisms can minimize market failure, the real digital world is not always characterized by efficient strategies of firms. International telecommunications firms and internet service providers also face the problem that they encounter rather different regulatory approaches in the various OECD countries.

Prices in liberalized OECD markets have fallen and there is evidence that the price elasticity of telecommunications services is above unity (OECD, 2005) so that sustained competition in combination with a high growth rate of technological progress should bring considerable volume growth in telecommunications. The EU has liberalized telecommunication markets in 1998 only when most countries in continental Europe relied on state-owned operators in fixed-line telecommunications. If prices in telecommunications are falling quickly after market opening-up this is likely to reflect three different elements: switching from monopoly prices towards a more competitive price pattern; reducing X-inefficiencies at the incumbent operator; technological progress which is strong in digital markets.

2.2. Theoretical Starting Points

The starting point of theoretical analysis in telecommunications is that we face a natural monopoly in the telecommunications market: Marginal costs k' and average costs k are falling. This problem is relevant for fixed line telecommunications, for cable TV and – less than in fixed line telecommunications – in mobile telecommunications. In combination with network effects this implies a serious regulatory challenge as there is a large discrepancy between a hypothetical monopoly outcome and the economic optimum which is characterized by the intersection point of the marginal costs curve and the marginal revenue curve. If government would pay a subsidy covering the gap between marginal

costs and average costs the implication is that there will be a higher tax rate (e.g. income tax) which in turn will distort economic allocation. Even worse, paying – an economically reasonable - subsidy to the telecommunications sector will stimulate calls for subsidizing other sectors which indirectly reinforces the arguments against paying subsidies at all. Instead a regulatory authority could try to impose a pricing regime which amounts to allow firms recovering average costs.

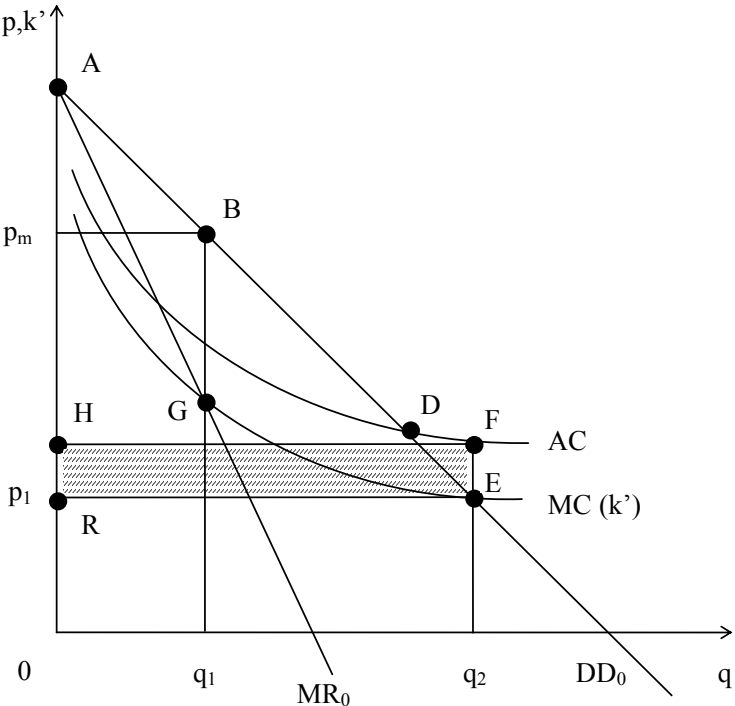
In fixed-line telecommunications most OECD countries, except for Finland (and a few other cases), have a dominant incumbent firm which potentially is associated with various issues. Potential problems associated with the existence of a dominant position concern:

- Refusal to deal: this is related to the essential facilities doctrine: an essential facility is a facility supplied on a monopoly basis which is required by competitors and cannot be reasonably duplicated by competitors for economic or technical reasons. This problem of a monopolistic bottleneck is often crucial;
- Predatory pricing: the (dominant) operator charges prices below a normal cost standard and there is evidence that this is not sporadic or reactive price-cutting. This strategy aims to keep newcomers at bay;
- Cross subsidization: the dominant firm uses revenues from a market in which it is dominant to cross-subsidize the price of a service or product it provides in other markets – thus impairing competitors and keeping out newcomers; in some case the threat of predatory pricing will suffice to keep newcomers out of the market;
- Tied sales/bundling: Service 1 sold only if service 2, 3,...n are also bought – this is anti-competitive if firm has a dominant position in one of these markets. The dominant position is thus effectively transferred to other markets;
- Excessive pricing: the price is above the level under competition so that there is a monopolistic element in pricing.

As many former monopoly operators enjoy a market share above 50 percent in fixed line telecommunications the potential problems associated with dominance have to be studied carefully by the regulator.

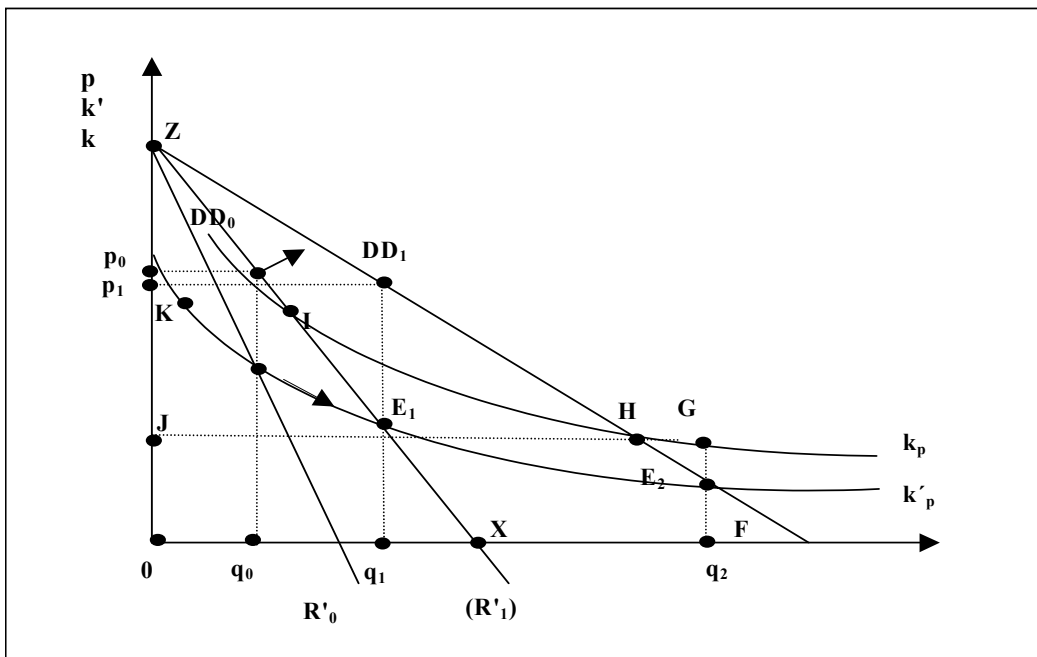
The problem of market dominance in telecommunications is serious to the extent that there is a natural monopoly in fixed-line telecommunications. Indeed, there are economies of scale and economies of density in part of the fixed-line network operation which imply falling average costs (AC) and falling marginal costs k' (or MC). From an economic perspective it would be optimal to realize point E that output where marginal cost is equal to marginal benefit. However, this will require a subsidy since average costs exceed marginal costs by the distance EF. The overall subsidy would be equal to the area FEp_0H . One of the many problems associated with subsidization is that other industries will also call for subsidization. Moreover, every subsidy has welfare costs through the necessary financing and raising of taxes, respectively. Fixing output in accordance with the intersection of the average costs curve and the demand curve would be a second-best optimum which indeed, might come very close to an optimum – subsidization is avoided. If part of telecommunications is a natural monopoly – the access market could indeed stand for such a situation in many countries – it is clear that there will be the problem of a dominant operator or even a monopoly. Regulatory interference is necessary in this case.

Figure 3: Natural Monopoly/Economies of scale



Telecommunications is more complex than other industries not least due to the existence of network effects: The existing early users of a certain service will enjoy higher benefits if other consumers/firms are also linked to the network and also use the respective service. Such network effects imply an endogenous growth of sectoral demand (for an economist this looks similar – but only similar! - to the case of positive external effects on the demand side; in such a case the social benefits exceed private benefits so that the relevant demand curve is farther to the right than individual willingness to pay indicates). It is unclear whether telecommunication firms can fully anticipate network effects; correct anticipation would be crucial for adequate investment planning. Assuming that network effects show up as an outward rotation of the demand curve we can portray an initial demand curve DD_0 (without network effects) and the dynamic demand curve DD_1 which includes network effects.

Figure 4: Network Effects and Natural Monopoly



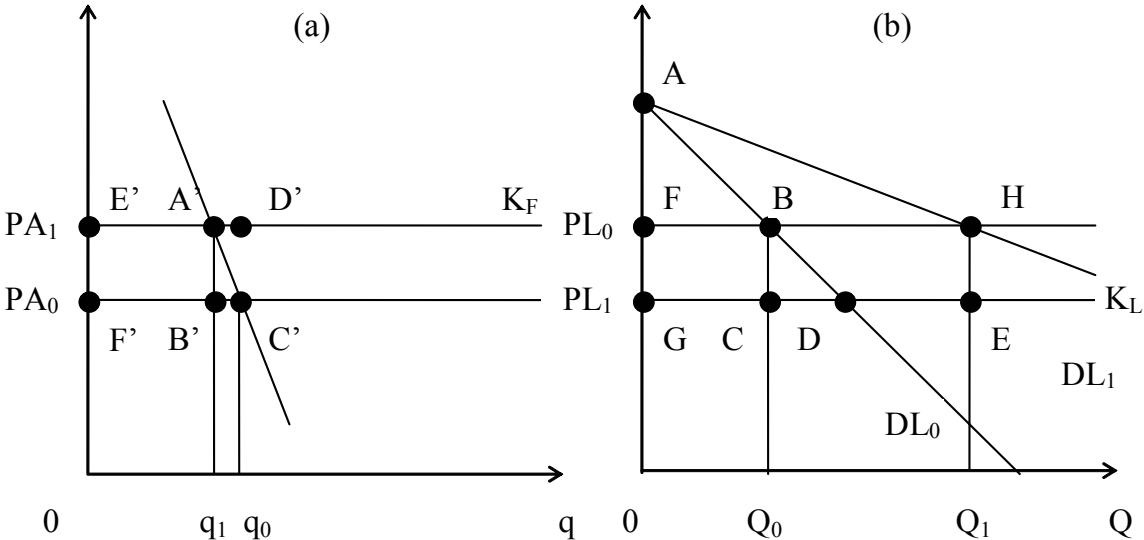
The demand curve DD_1 is drawn in such a way that the initial demand curve DD_0 coincides with the marginal revenue curve (R'_1) for DD_1 . We can immediately see that there is a large discrepancy between monopoly pricing on the basis of DD_0 and the optimum solution in point F or the second-best solution in point H. The existence of network effects implies that it is useful to have several suppliers, ideally in an oligopolistic setting with considerable interdependence among firms. For example, with several firms active in the mobile telecommunications market the spreading of new services has been very fast since each major operator wants to be a leader in product innovations while making sure that novel services can also be transmitted to other mobile operators, or to fixed-line network users.

Network effects are also crucial when it comes to process innovation. Take the simple case of constant marginal costs, process innovations imply a downward shift of the k' curve. With network effects there is an additional increase in consumer welfare. Therefore, it is crucial that the regulatory framework stimulates process innovations.

Another problem related to the telecommunications market and market power, respectively, concerns the interdependence between the access market and services markets – e.g., the long distance market. Typically, the demand curve in the access market is rather steep. The long distance market is relatively price elastic and it is characterized by network effects so that AH is the relevant demand curve; not DL_0 which is the static short term demand curve (without network effects). In the presence of network effects in the services market it pays off for an integrated network operator to subsidize access and hence, to charge only PA_0 while average fixed costs is K_F . Cross subsidization can be realized if firms can charge PL_0 in the long distance market which is higher than average costs in the long distance market (K_L). Without network effects the quantity in equilibrium (in line with the simple original demand curve DL_0) would be Q_0 , but due to network

effects (see DL_1) – partly mobilized through subsidization of access – it will be Q_1 . The combination Q_1 in the long distance market with q_0 in the access market generates (as $E'A'B'F'=FBCG$) a net welfare gain of the triangle $A'B'C'$ plus the area ABH where the latter is the network effect in the long distance market. This analysis then raises the question whether a cost-oriented pricing in the access market – as imposed by the regulator – is really welfare-maximizing.

Figure 5: Access Market and Long-Distance Market: Cross-Subsidization



Many OECD countries have adopted price regulations, typically in the context of an asymmetric regulation strategy. Regulatory pricing rules imply, however, three types of costs:

- Regulatory costs in the sense of bureaucratic costs at the regulatory agency.
- Cross-regulatory costs in non-regulated sectors where firms – normally used to only anticipate market actors’ behavior on the basis of the general competition framework – will have to consider some of the regulatory problems to the extent that the respective firms are using services provided in regulated industries as an input or are offering services which are complementary or a substitute to the services of the regulated sector.
- Regulatory costs on the side of the regulated firms; the regulated firm will not only hire experts for a regulatory policy division – rather it also will face a certain degree of regulatory uncertainty which will translate into higher prices at the final product level provided that the management of the vertically integrated firm is risk-averse. Regulatory uncertainty implies an upward shift of the cost curve. Regulatory uncertainty raises the final product price and increased regulatory uncertainty will translate into a higher final product price. The paradox situation could occur that the regulator will admonish the dominant operator for raising final product prices – allegedly because of exploiting significant market power – while in reality rising regulatory uncertainty is the true problem.

While a certain degree of policy autonomy is needed on the side of the regulatory agency, the degree of autonomy should be limited in order to achieve an efficient and effective regulatory regime; both government and the regulator should be aware of the problem of shadow regulations, these are informal regulations and are difficult to detect;

- Thus government would be wise to limit the autonomy of the regulator in order to avoid the problem of “shadow regulations” which many regulatory authorities in OECD countries observe (shadow regulations mean e.g. threats to introduce new regulations if certain types of behavior on the side of the incumbent continue). If shadow regulations affect the access market they will contribute to a general rise of telecommunications prices – see the model in the appendix;
- The regulator would be wise to pursue a consistent and transparent policy which facilitates anticipation of the regulatory policies and remedies applied.

It would be desirable to minimize regulations and to use a regulatory regime which is consistent and welfare-maximizing. We will argue that there basically two different approaches that could be pursued in order to achieve economic efficiency and welfare-maximization, respectively.

2.3. International Analytical Framework for Monopoly Problems and Competition

The analysis of competition problems in the standard literature basically refers to the analysis of a monopoly in a closed economy. This, however, is not the reality of telecommunications markets in OECD countries. Particularly in the EU we find the case of asymmetrical international competition in the sense that the incumbent in most EU countries enjoys significant market power in the home country while foreign subsidiaries set up after the 1998 opening up of EU15 markets often are relatively small players in the market. One may argue that the subsequent analytical framework proposed is relevant not only for the EU but for other regional integration schemes (NAFTA, ASEAN etc.) as well.

An adequate analytical perspective is a two-country framework with several operators – some of which are foreign investors. With two-way foreign direct investment (and trade in digital services), the problem of significant market power looks different than in the standard national policy approach of EU countries. Typically, each EU country has a focus on its respective national market, and the regulatory authority determines the relevant market and conducts basic market analysis – thus looking at the issue of significant market power – in order to finally decide upon adequate remedies. This approach, however, is not adequate, and it is surprising that the European Commission which is used to taking a broader view of policy topics has also implicitly adopted a kind a nationally-fragmented regulatory approach.

What is the key issue here? Let us take a closer look at a simplified two-country setup. The typical situation considered here is one in which the incumbent firm F_1 in country I

enjoys a significant market power on the basis of a purely national market perspective. We will assume that the firm has a subsidiary f_1 in country II. Economists and policy makers are interested in effective competition on the ground that only in the presence of such competition can one expect static plus dynamic efficiency (static efficiency requires that the firm's offer price is based on long run costs while dynamic efficiency emphasizes the firm's ability to come up with process innovations – translating in falling prices in the medium term – and product innovations which initially are associated with a rising relative price. Product innovations create Schumpeterian rents and allow firms to temporarily fetch prices above long run costs). We can distinguish cases for which there is strong competition in both countries, a monopoly in country I and II (the subsidiary f_1 then is the only supplier abroad) or strong competition in only one of the two countries considered.

Table 1: Basic Alternative Scenarios in a Two Country Model with Foreign Direct Investment

		COUNTRY I	COUNTRY II
<i>Relevant Environment Perspective of Headquartered in I</i>	<i>Market from MNC</i>	Monopoly	Monopoly
<i>Relevant Environment Perspective of Headquartered in I</i>	<i>Market from MNC</i>	Monopoly	Competition
<i>Relevant Environment Perspective of Headquartered in I</i>	<i>Market from MNC</i>	Competition	Monopoly
<i>Relevant Environment Perspective of Headquartered in I</i>	<i>Market from MNC</i>	Competition	Competition

The policy approach in EU countries – and the EU competition framework – basically ignores the phenomenon of foreign direct investment and thus the degree of competition in foreign markets. Assume that there is a monopoly position in country I but competition in country II. Compared to the alternative scenario of a monopoly in both countries, one may expect that the subsidiary f_1 will be exposed to competition dynamics and thus will be subject to a continuous learning and diffusion plus innovation process; the experiences made and insights obtained will feed into the parent company. This could include international diffusion of product innovations and process innovations (including improvements in corporate governance). If government and the regulatory authority in country I are interested in static and dynamic efficiency, they will not ignore the international activities of the incumbent operator, in particular if it occurs in other OECD countries. If FDI were mainly in developing countries, the case would be different as international diffusion would dominantly occur in the form of technology flows from

country I to country II/firm F_1 to f_1 . In the presence of FDI, the regulatory authority will also enjoy opportunities to observe which demands the foreign subsidiaries is making on the dominant operator abroad with respect to interconnection, co-location, etc. If both countries are structurally comparable and regulatory regimes similar, the regulatory authority in country I will be able to draw important conclusions about the consistency of behavior of the multinational telecommunications (integrated) network operator. The parent company in country I should not be surprised if competitors come up with similar demands as f_1 in country II.

If FDI abroad reinforces product innovation dynamics in country I, there will be an intensification of competition, namely towards monopolistic competition. Thus one may argue that the original monopoly power of the incumbent in country I has been weakened. This would be true all the more if the incumbent operator in country II also invests in country I. Finally, there would be a reinforcing of pressure for optimum governance and innovation dynamics in country I if there were a credible potential takeover threat from abroad. To the extent that two incumbent operators in neighboring countries – with each incumbent enjoying significant market power in the national market – clearly will not be allowed to engage in an international merger, there is a negative international externality of having an initial situation with such symmetrical market power problems. Again by implication, we conclude that introducing effective competition in country I or country II or in both countries should affect the analysis of the problem of market power. A pure national policy perspective is inappropriate.

It seems to be most natural to expect that the European Commission would adopt such a broader view on competition. One should also assume that the Commission would not be indifferent to a development where a multinational telecommunications operator loses significant market power (or a monopoly position) in country I while moving from competition towards a monopoly position in country II. The EU is, however, likely to ignore this if such a monopolization process occurs outside the EU unless it would impair international trade so that the WTO becomes involved. Such a broader policy view is also adequate in the presence of international network effects and in the case of static or dynamic scale economies. An isolationist national policy perspective would overlook key aspects relevant to the competition process. Finally, with the expansion of internet telephony (VOIP) the national demarcations in competition policy also will become largely obsolete. The implication is that there are very good reasons for a broad international regulatory dialogue.

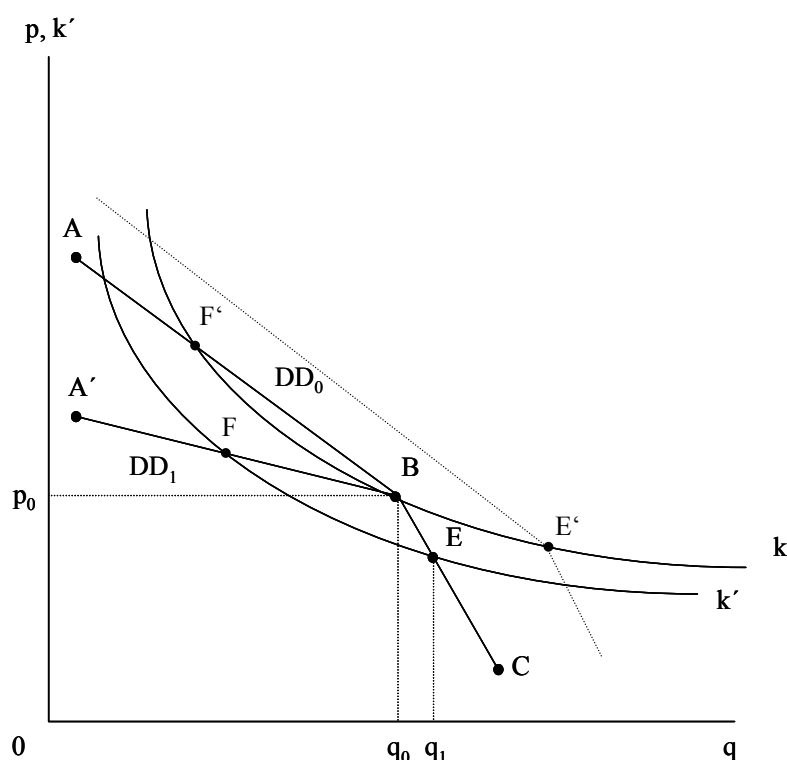
2.4. Efficiency in Oligopolistic Markets

In several OECD countries liberalized telecommunications markets effectively are characterized by an oligopoly or the tendency towards an oligopoly. There are all kinds of models for various types of firms' strategies in oligopolistic markets so that there seems to be broad uncertainty about the implications for regulations. However, the typical oligopoly observed in the first decade(s) after liberalization is one in which the incumbent is the clear

price leader. Assuming asymmetric behavior of newcomers in the sense that newcomers will reduce the price if the incumbent is reducing the price while newcomers do not follow when there is a rise of the incumbent's offer price we have an interesting case of the HITCH-SWEEZY model, in a setup with falling marginal and average costs (WELFENS, 2004).

The assumptions of the HITCH-SWEEZY model – assuming a given number of firms - are rather specific and only empirical analysis can tell whether the reality in fixed-line telephony indeed is represented by the assumed type of asymmetric behavior – a variant of “follow-the-leader” strategy. In the model there is an asymmetrical interdependency under oligopoly as there is one dominant firm and many relatively small competitors: If there is price reduction of the dominant supplier 1 the other firms will follow, which makes part of the effective demand curve less price elastic (steeper than a normal demand curve); the arch below the current equilibrium price is rather inelastic. If firm 1 raises the price other firms will, by assumption, not follow so that the effective demand curve is more elastic above point B: see the segment BA'. If the oligopoly is facing less competition through substitute products – e.g. as a consequence of bundling of products in the market – the demand curve becomes steeper above point B: see segment BA; temporary pricing according to marginal costs implies a reduced quantity in this situation with a more pronounced price leadership (compare point F' and F). If the situation is a stable oligopoly with clear leadership there is not a big difference between the hypothetical optimum defined by equality of marginal costs and the demand curve and pricing based on average costs (point B and equilibrium quantity q_0 versus optimum output q_1 and point E, respectively). The problem of a dominant market position – and hence the situation of a leading leader - is likely to emerge in an oligopoly in which one firm has a clear lead in the market share. The existence of network effects would not really alter the argumentation, only the equilibrium point is moving from E (or B) to E'. The key aspect in a Hitch-Sweezy model with falling marginal and average costs is that the difference between the optimum allocation q_1 and q_0 is rather small; and given the costs of regulations one might then indeed consider only relatively limited regulation at all as long as the asymmetric oligopoly is persistent. The situation is more complex if one considers vertical integration which potentially raises problem of cross-subsidization and discriminatory access on the side of competing service providers. Moreover, a modified dynamic Hitch-Sweezy will have to take into account the problem of market entry and market exit explicitly; market exit would increase the ability of the incumbent to raise the price: This corresponds to an initial demand curve A'BC which then is replaced by ABC (the arch AB is steeper than A'B). Market entry of a firm conversely implies that we move from an initial demand curve ABD to a new curve such as A'BC. To the extent that market entry brings a downward shift of the costs curve we may consider the initial k' curve to be the new k curve so that the initial equilibrium, point B, is replaced by point E (note that the kink in the demand curve then would also move into E).

Figure 6: Modified Hitch-Sweezy Approach to Oligopoly



Limit Pricing

In the case of dynamic limit pricing we have a situation in which one dominant operator acts as an undisputed leader and is fixing the price in a way that it minimizes the incentive for newcomers to enter the market. A simple approach (see the GASKINS-type model in WELFENS, 2005) shows that under certain conditions the price is lowered by $\frac{1}{2}$ of the quantity offered by newcomers. Thus, we can conclude that newcomers help to reduce the price charged by the industry leader to a level below the monopoly price, but at the same time we can see that the equilibrium price is clearly above the price under competition.

2.5. Achieving an Optimum through Differentiated Two-part Tariffs

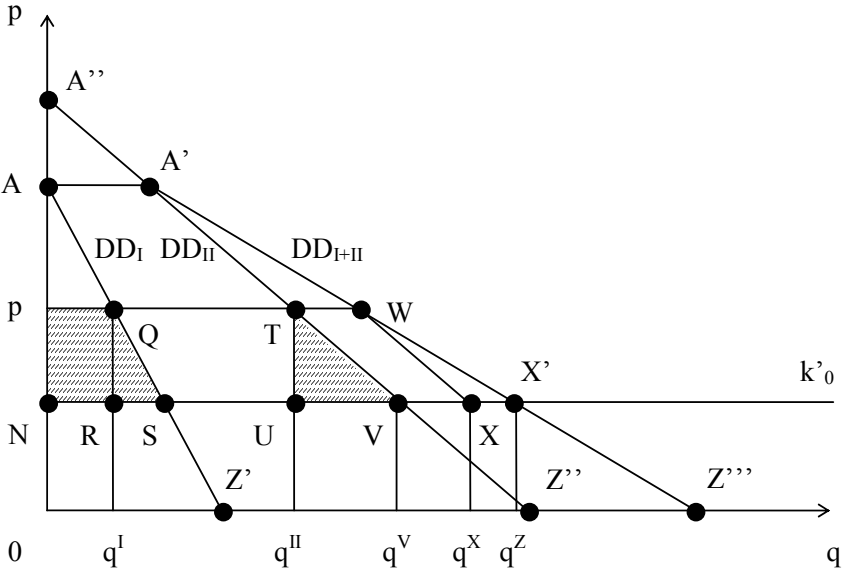
Two-part tariffs are rather common in network industries. However, to date there is no clear theoretical model. The following reflections present a brief argument not just in favor of two-part tariffs but of differentiated two-part tariffs which could be highly relevant for regulators in telecommunications. Indeed, one could argue that uniform regulated prices at the wholesale level or in the access market are not Pareto-efficient, rather differentiated two-part tariffs are required. If the dominant operator is not offering differentiated two-part tariffs the regulator should impose a provision which enforces broadly differentiated two-part tariffs. The following arguments should make clear the logic behind this approach.

Two part tariffs are used in many sectors of the economy, in particular in network industries where high fixed costs are important. The firm can recover costs more easily if it does not offer a uniform price but a two part tariff which is composed of an access fee and the option for the user to buy a certain quantity at marginal costs. If the marginal costs are constant the arrangement almost looks like a uniform price except that it is composed of two elements, of which one is the access fee and the other the uniform price. KNIPEPS (1998) has argued that such a two part tariff is welfare enhancing. We will refine the argument in a broad way and argue that differentiated two part tariffs will bring enormous welfare gains. At first we will take a look at the simple two part tariff, namely for the case of two users with demand DD_I and DD_{II} respectively. This corresponds to the case of KNIPES (1998). Aggregate demand is given by the curve DD_{I+II} . For simplicity, marginal costs k' are assumed to be constant, k'_0 . Moreover, it is assumed that fixed costs are given by the area $PTUN$. The firm basically could adopt alternative price strategies as follows:

- (i) standard monopoly pricing
- (ii) full price differentiation
- (iii) cost-oriented uniform price setting
- (iv) two-part tariff setting
- (v) differentiated two part tariff setting

We will show that the latter case is welfare maximizing. We will ignore here standard monopoly pricing and full price differentiation. First taking a look at cost-oriented uniform price setting, we can see that a uniform price p – with p being equal to OP – implies for users I and II that the quantities q^I and q^{II} are realized. If the firm instead announces that it will offer a two part tariff where paying the access price $PTUN$ (designed to recover fixed costs) allows the user to obtain his/her desired quantity at marginal costs, the user I – with the relatively small demand – will renounce this offer and rather consuming at price $OP=p$ the quantity q_I . Clearly, the access price $PTUN$ exceeds $PQSN$.

Figure 7: Output and Welfare Effect of Introducing a Differentiated Two Part Tariff



The high volume user II will, however, prefer the two-part tariff so that he/she will have a demand equal to q^V , which exceeds q^H , the overall demand thus increasing to q^X . The welfare gain from switching to the two part tariff is given by the triangle TVU.

We now can go beyond the traditional approach. It can be argued that differentiated access cards/access prices are welfare maximizing. The firm offers individual access cards to every user. For the user I the adequate access price is PQRN – demand of user I will be equal to the distance NS. Offering indeed two different access cards thus raises the equilibrium demand by the distance RS. User II gets an access card at the price QTUR. With the differentiated access card, we now have a further rise in the equilibrium quantity which now is equal to q^Z . The welfare gain from switching to a differentiated two part tariff is the triangle QRS plus the area PQRN.

We immediately recognize that the standard procedure by certain regulatory authorities of imposing uniform access charges is not welfare-maximizing. Instead differentiated two-part tariffs are welfare maximizing (also at the wholesale level). They achieve the same goal as Ramsey pricing, but in a different way. In our approach it is not the regulator which has to estimate cross price elasticity's, as in the case of Ramsey pricing. Rather the regulator would stipulate that users are entitled to individual entry cards on the basis of an efficient provision of services. Here this means that the regulated firm should not be allowed to inflate its fixed costs, thereby reducing marginal user prices artificially. The regulator only needs knowledge about the cost structure of the regulated firm; and the welfare gain from switching to a differentiated two-part tariff can be high (see appendix). An important implication is that equal access requirement cannot simply be translated into equal prices for all network users; in the special sense of a differentiated two-part-tariff discounts should be allowed.

As regards welfare analysis in regulatory policy one should emphasize that a comprehensive analysis should consider:

- Welfare analysis in the sense of consumer surplus for households in the telecommunications services sector.
- Welfare analysis in the sense of taking into account the producers surplus both in the domestic economy and in foreign countries – the latter to the extent that the domestic regulatory framework affects the ability of multinational telecommunications firms to be successful foreign investors abroad (from a pure national policymaker's perspective one normally will ignore the producers surplus in the home market which accrues to foreign subsidiaries in the country; in the EU context, however, the European Commission in its regulatory policy should consider overall EU25 welfare analysis).
- Welfare analysis should take into not only the direct impact in the telecommunications services market but also the important direct effects which occur through telecommunications services used as intermediate inputs in all sectors of the economy: E.g. a fall of telecommunications services prices will translate into lower costs of production and hence higher volumes sold of all products using telecommunications services. As the volume of telecommunications services for business customers in OECD is higher than services sold directly to households one should indeed not overlook this aspect. A similar reasoning applies

to product innovations supported by innovative digital services inputs (upward rotation of the demand curve).

Finally, with international network effects in telecommunications the traditional view of national policymakers also becomes less convincing. The stronger foreign direct investment is in telecommunications and the more relevant international network effects are the more is there a need for a broader international policy perspective and for policy cooperation.

3. Regulatory Developments

3.1. Regulatory Developments in the US

US Approach and EU Approach to Regulation

The US regulatory policy has been modified after the 1996 Telecommunications Act. It mainly is based on the following elements (STOCKDALE, 2003): prohibition on the provision of competitive services, structural safeguards (e.g. the incumbent monopolist has to provide competitive services through a structurally separate subsidiary), equal access requirements (e.g. the incumbent LECs has to provide to all long-distance network operators exchange access and related services on an unbundled tariff basis and on non-discriminatory rates terms and conditions) and other safeguards.

The Telecommunications Act is the basis for regulation and consists of several key elements which differ from the EU approach (OPTA, 2005):

- Access regulation is based on access to unbundled network elements (UNEs) while the EU approach puts more emphasis on wholesale services;
- supply obligations are imposed on operators which have a broadly dominant position, while the EU framework of 2003 puts emphasis on significant market dominance in – 18 pre-defined – markets;
- the US approach brings obligations to supply a particular unbundled network element or several such elements only if this is considered to be a pre-requisite for competition.

In the late 1990s the US approach basically emphasized services competition, while infrastructure-based competition was adopted after the collapse of the New Economy bubble in 2000/01:

- the FCC has at first emphasized in many cases that incumbent local exchange carriers (ILECs) should offer local unbundling and offer resale. The FCC has required that ILECs offer UNE-P (consisting of use of both the access network and the facility of the local switch run by the ILEC) so that by early 2005 about 10% of the 180 million exchange lines in the US were organized within UNE-P rules;

- the FCC has favoured line sharing so that competitors (CLECs) could use against a modest rental fee the high frequency part of the local loop for broadband access while the ILEC was continuing provision of voice telephony over the remaining low frequency part of the loop.

The FCC has shifted emphasis in its approach in the Triennial Review Order of 2003 and now focuses more on infrastructure-based competition, as fixed line network operators argued that cable TV operators were the leading suppliers of broadband services in the residential sector and had no UNE-obligations – and indeed the FCC rules state at the beginning of the 21st century:

- no requirements to supply UNE-P arrangements and no requirements for ILECs to supply unbundled elements from its fiber to the home or fiber to the curb facilities;
- when replacing copper loop access network with fiber ILECs have no requirement to maintain existing rented local loops or offer substitute products to competitors;
- as regards ILECs they are obliged to give their competitors access to all except the largest office blocks, but there is no obligation to offer dark fiber or interconnect links.

The basic aim of this new strategy is to stimulate investment in new broadband infrastructure in the US. It obviously is in this context that the FCC has abolished broadband fixed-line regulation in 2005.

In Canada facilities-based entrants into the long distance market were allowed in late 1992 and in 1997 the regulator CRTC opened local telecommunications market to competition - incumbents were required to interconnect with newcomers and to provide essential services for resale. Leasing of unbundled network elements also was introduced, namely at estimated costs +25% mark up. CRANDALL (2005) argues that the relatively slow liberalization in Canada helped to avoid the stock market frenzy which characterized the US in the late 1990s.

3.2. Regulatory Developments in Europe

The regulatory debate in Europe is influenced mainly by several main policy actors: The European Commission clearly is an active player at the supranational level; among the NRAs there are several players which are rather active and influential – obviously with a certain lead by the British OFCOM. The latter has a relatively long experience in regulation dating back to 1984; this implies that competition has developed to a rather broad extent while the general EU opening up of markets only dates back to 1998. EU eastern enlargement brought 10 additional countries in the Community as of May 1, 2005; and all accession countries are dominated by mobile telecommunications which has become a popular substitute to the long-neglected fixed-line network.

In the UK, OFCOM – in the consultation document of November 25, 2004 - has adopted an approach which puts emphasis on infrastructure and less on the regulation of

markets. OFCOM considers, with respect to next generation networks, four principles and emphasizes that BT should give access to bottlenecks:

- promoting competition at the deepest possible level within the infrastructure network;
- emphasizing regulation in a way which brings equality of access to facilities and services which are suffering from insufficient competition (equivalence approach);
- eliminating regulations where competition is working;
- encouraging efficient and timely investment;
- the incumbent operator BT should provide access to competitors where bottlenecks are relevant.

While OFCOM is rather influential in the EU one cannot overlook that the situation across EU countries differ considerably. It is absolutely unclear how one can have a single integrated EU telecommunications market with very different national regulatory approaches; this critical perspective holds particularly for the mobile market. OFCOM also has been rather active in organizing a secondary market for mobile licenses.

In Germany the revised telecommunications act emphasizes reducing regulatory intervention but also gives the Federal Network Agency (FNA) some competences for ex-post regulation which is in contrast to the very idea that regulation normally is restricted to ex ante rulings while competition policy puts the emphasis on ex post analysis of market dynamics – except, of course, in the field of mergers & acquisitions.

The EU framework competition gives a broad guideline, however, individual EU countries have high degrees of freedom in implementing the EU framework. Efficient regulation of telecommunications/e-communications is not only important in the context of competition policy but also in a broader context of EU policy.

The Lisbon Agenda set by the Commission and the European Council has aimed at stimulating growth and employment on the one hand, on the other hand the EU wants to become the most competitive knowledge-based economy by 2010; the mid-term KOK-report has come out with a very sober assessment according to which the Lisbon Agenda is overloaded and most goals are rather uncertain to be achieved in the coming years; researchers also have found that the EU has fallen back behind the US in ICT to some extent (DENIS/McMORROW/RÖGER/VEUGELERS, 2005). Moreover, the EU is facing a serious decline in political legitimacy as the failed referenda on the EU constitution in France and the Netherlands – there with a shocking no-majority of almost 2/3 of the population – have shown in 2005.

The EU has adopted a regulatory framework, composed of 5 directives, which was expected to be translated into national law by 2003. A long term goal is to move to general competition law. There is an International Regulatory Group/European Regulatory Group (IRG; ERG) in which national regulators cooperate. In the EU the NRAs have considerable autonomy but must submit reports to the Commission in which they notify evaluations on 18 pre-defined relevant markets. Moreover, the Commission's guidelines on significant market power also play an important role. The new EU regulatory framework stipulates that new telecommunications markets should not be subject to unnecessary regulatory

burden; the idea is to stimulate the expansion of innovative services. This is likely to be conflict-prone in the field of internet access and broadband services, respectively. Competitors will require continued access to DSL network elements of the incumbent operator. The incumbent is, however, likely to roll out VDSL and argue that the shift to VDSL creates new markets which should be unregulated.

The Aim of the EU directives (Frameworks Directive, Authorization Directive, Access Directive, Universal Service Directive, Directive on Privacy and Electronic Communications) is to establish an EU-wide framework for regulations of telecommunications in a way which encourages static and dynamic efficiency while making sure that a minimum of generally available services at uniform low prices is available in each EU member country. The basic aim is to maximize social welfare (sum of consumer rent and producer rent) under the side-constraint of universal service provision. While universal services in telecommunications have traditionally referred to universal access to voice telephony at uniform rates within a country, the phenomenon of digital convergence and the rapid growth of mobile telephony have changed the universal services perspectives. Moreover, the increasing use and usefulness of the Internet implies that broadband local access will be important for a dynamic digital social market economy.

The Commission Recommendations on relevant markets are complementary to the above directives and suggest 18 markets as candidates for ex-ante regulation – national regulatory authorities (NRAs) have to conduct market analysis within this framework (Article 16 of the Framework Directive). While the rather unregulated mobile telecommunications markets in sales terms have gradually become more important than fixed-line telephony in Western Europe at the beginning of the 21st century and have dominated fixed line markets in most accession countries since the mid-1990s, the fixed line telecommunications market has continued to be regulated in EU countries. EU fixed line telecommunications markets have been increasingly characterized by mutual entrance of incumbent operators so that former national monopoly operators have become multinational companies eager to export and import digital services as well as launching product innovations at home and abroad. Within an approach of asymmetric regulation the incumbent operator has been regulated; national regulatory authorities have adjusted and slightly liberalized the regulatory regime in most EU countries. However, regulatory authorities have hardly recognized the challenge of foreign direct investment which requires a more complex welfare analysis; e.g. there are foreign investors operating in the fixed-line market – effectively this could refer to traditional copper cable or cable TV – this means part of the producer rent in the telecommunications services will accrue to foreign investors. From a national regulatory perspective/economic policy perspective one will ignore the effects of national policy measures and regulatory remedies on producer rent accruing to foreigners. However, from an EU perspective such an approach is inadequate; at least should one distinguish between intra-foreign investment and EU-outsiders. From a Community perspective the perspective on policy measures is naturally this: One should clearly consider not only national welfare but also welfare effects in other EU member states. Moreover, the broader approach to competition policy in OECD countries also lets one expect that a certain consideration also should be applied to welfare effects in EU no-member countries. From this perspective regulatory impact assessment clearly should not be confined to simply taking into account national welfare effects, rather

the ongoing dynamics of foreign direct investment in the EU and the OECD, respectively, require the adoption a broader and more refined approach. A broader approach which includes some international welfare effects is not easily achieved in an n-country Community as long as each member country has specific national policy goals and regulatory approaches. At the same time it also is clear that a variety of policy approaches can be quite useful for an evolutionary learning process in the Community. Moreover, the EU 25 countries are much too different in terms of size of the economy, per capita income, population density etc., that one could simply consider a uniform regulatory approach.

A strength of the framework is that it has established a uniform framework which helps policymakers to adopt approaches which across countries are not too diverse and thus facilitate formation of expectations on the side of investors. Moreover, it has forced regulators to cooperate to some extent in the EU. The weakness of the framework is that it does not allow low income countries which are catching up to have, transitory, an extra degree of freedom in regulation. While it is true that one may blame the insufficient freedom given to transition economies on the lack of desire of accession countries to get permission for transition regimes in the negotiations with the Commission on EU accession, one also could argue that the Commission should consider an extra degree of freedom in accession countries as a natural desire on the side of the overall Community. The aim is to fully exploit the medium term economic benefits from the modernization of the telecommunications sector in relatively poor countries. Given limited EU structural funds it should be quite obvious that transition countries might need some extra room for maneuver in order to stimulate investment in infrastructure which is so clearly behind the level of EU15 countries. Another weakness is that the EU does not specify a clear-cut criterion whose fulfilment allows national regulations in certain fields to be abolished. E.g. if there is nationwide sustained competition in fixed line telecommunications – see the case of the Netherlands where cable TV is a full-fledged alternative to the fixed line network – why should ex ante regulations be maintained at all? Rather, general competition law should then become relevant which not only would mean a shift towards broader use of general rules (as opposed to sector-specific regulations) but also imply a major reduction of policy costs and of costs for the regulated firms. A particular weakness is the failure to generally encourage long term facilities based investment in general and more foreign direct investment in particular; intra-EU foreign direct investment is a natural element of the EU single market.

The framework has achieved its objectives in the sense that all national regulatory authorities are carefully observing the EU framework and have become willing to cooperate with regulatory authorities in other EU countries. The framework has reinforced competition in telecommunications in the EU, it also has helped to encourage NRAs to more carefully look into economic analysis as a useful basis for the pros and cons of alternative regulatory approaches.

In the Netherlands the national regulator OPTA has emphasized not only the distinction between regulation of services vs. regulation of infrastructure. As regards services one additionally may distinguish between established and emerging markets (OPTA, 2005). As regards infrastructure one may additionally (OPTA, 2005, p.5) make a distinction between legacy infrastructure based on past investment - and established technologies – and new infrastructure which requires additional new investment and which is exposed to

considerable demand and/or innovation uncertainties. OPTA obviously does not want to regulate emerging markets and also is reluctant to interfere in fields where considerable new investment is to be expected.

Germany has a relatively independent regulator and has made considerable progress with competition so that many newcomers have entered the market. A disaster has been telecommunications where the incumbent telecommunications operator was allowed for several years to maintain its cable TV network until it sold the majority ownership in cable TV. However, the cable TV network is still hardly used for modern digital services such as internet and telecommunications since the layers of the network are split in a strange way – the end user level is in the hands of thousands of small and medium-sized firms so that the cable TV is not really important for competition in telecommunications; this holds despite its broad coverage (2/3 of households could be reached, about 1/3 is using it). This situation is in sharp contrast to the Netherlands where government forced the incumbent telecommunications operator to sell the cable TV network so that there is full infrastructure-based competition in the Netherlands; and therefore only very limited need to regulated the digital markets. Broadband uptake was strong in Germany in a rather short period, but broadband access is mainly through fixed line telecommunications where about 90% of DSL subscribers were customers of the incumbent (EITO, 2005, p. 116). The growth rate of broadband subscribers in the EU15 was much higher than in Germany in 2003. Lack of local loop unbundling in the DSL market is one of the key problems.

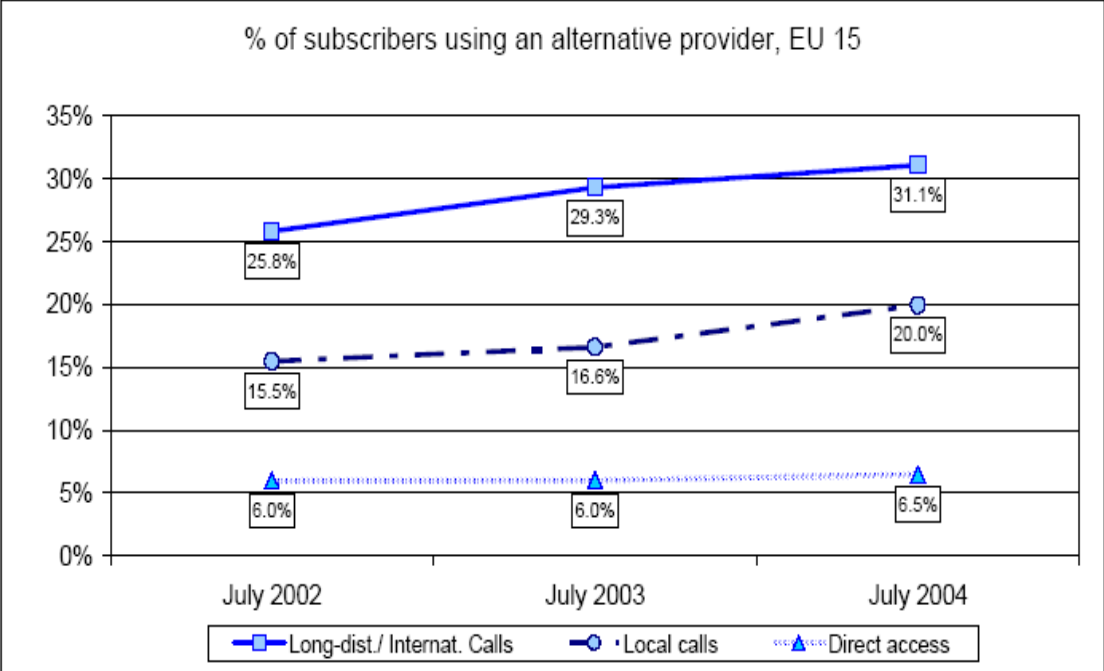
In Germany the Federal Network Agency (FNA: responsible for telecommunications, railways, energy, postal services) has adopted an asymmetric regulatory approach and uses various price caps. A main regulatory issue which came up in late 2005 was the VDSL (very high bit rate digital subscriber line) network. The incumbent operator Deutsche Telekom had announced plans to invest around € 6 bill. over several years in a new VDSL network and had argued that this should be exempt from regulation. While the FNA initially was willing to grant an exemption from regulation, namely on the ground that this could concern a new market, the European Commission opposed this plan. The regulator has been rather reluctant to stimulate VOIP/Internet telephony.

The percentage of subscribers using an alternative provider in the EU15 has increased over time. In mid-2004 it was close to 7% in the field of direct access, while in local calls it was 20% (up for 15.5% in mid-2002). The degree of effective competition in direct access in the EU certainly was higher than indicated by this figure if one would include mobile telecommunications users who have substituted fixed-line access through mobile telecommunications. Moreover, cable TV increasingly is becoming an alternative infrastructure for telecommunications and other services – with the Netherlands standing out in the EU.

The percentage using alternative providers in long distance/international calls was 31%. Obviously the access market still is the real problem in the EU15/EU25. For the growth of innovative broadband internet services this is a serious challenge. Foreign investors from non-EU countries are likely to face problems here. While the incumbent operator has a natural interest to earn Schumpeterian top-ups on investment in innovative infrastructure networks there also is an interest that expansion of innovative digital services not to be impaired by incumbent operators. From a EU25 perspective it is quite crucial to put regulatory policy also in a broader context of innovation and growth policies (the

Lisbon Agenda). High wage economies such as Germany or France will witness relocation of manufacturing industry to eastern Europe and Asia, thus it would be all the more important that ICT services – representing relatively skilled-intensive sectors – will expand at high growth rates. A competitive Schumpeterian telecommunications environment also is a favorable breeding ground for a high innovation rate in the telecommunications equipment sector.

Figure 8: The Role of Alternative Providers in Telecommunications in EU15



Source: Briglauer 2006

As regards international innovation dynamics it is clear that the emergence of fast broadband networks in OECD countries will accelerate the international diffusion of knowledge and new technologies on the one hand, on the other hand it also will facilitate an increase in international networking among researchers. So both the innovation process as such as the diffusion process will be intensified in a networked world economy. Moreover, there is an increasing scope for positive spillover effects from (national) innovations. To the extent that network effects play a role for many product innovations one also should point out that the opportunities for innovators to recover R&D costs are improving if the telecommunications regulatory arrangements in both countries – in the context of a two-country model – are such that sustained effective competition in network operation and in the provision of digital services is encouraged. In an n-country context with heterogeneous countries (in terms of human capital endowment and R&D capital intensities) one certainly would expect asymmetric international spillover effects of innovations whose positive impact on national income could trigger further interdependencies related to secondary-round effects via growth of trade and foreign direct investment flows. However, there is a particular challenge for innovation policy since international external effects of innovations – related to traditional positive spillovers or network effects – could undermine the willingness of government to invest in R&D:

International “innovation leakage effects” indeed imply that part of the benefit from government R&D support will accrue to firms abroad so that considerable growth effects and hence additional tax revenues are generated in foreign countries. This problem could be overcome through international cooperation among policymakers and R&D promotion agencies, respectively.

4. Conclusions

The main conclusions concern the field of e-communication and the suitable strategies in regulation. If one wants to achieve sustained competition in telecommunications/e-communication in the digital economy one should adopt a regulatory approach which emphasizes sustainability of competition. This implies that in the early stage of market opening up there is a relatively strong need for regulation, in particular in the access market. Governments eager to promote competition certainly should encourage investment in the cable TV sector – a problem which has been underestimated in many EU countries (in Germany the competition authorities paradoxically wanted to impose in 2004/05 particular requirements on foreign investors eager to invest in the German cable TV which undermined foreign investment and indeed reinforced the dominant market position of the incumbent in the fixed network). While mobile telecommunications is rapidly expanding in eastern Europe and western Europe one should not assume that mobile telecommunications can be a full substitute for fixed line networks/cable TV networks: Indeed, as regards internet access it will take some time until mobile communications become a substitute for fixed line access – only for firms this could be a new option in the medium term.

Regulation of digital markets is to some extent necessary, but unnecessary regulation should be avoided. We may state several clear conclusions:

- In the case that the telecommunications market effectively is characterized by an asymmetric oligopoly with a behavior as described in the HITCH-SWEEZY approach, one could consider not applying any price regulation at all (the benefit of regulation is most likely to outweigh the costs of regulation). Rules for interconnection would be the only major field of regulation in this case. As we understand market-opening up and regulation as a dynamic process one may emphasize that adequate regulation depends on the stage of market development and the structure of the market, respectively.
- Since it is unlikely that an asymmetric oligopoly is a stable market structure the regulatory authority should be maintained in any case as a critical watchdog of competition. However, in fields where regulation can be phased out it should be phased out. There is no reason for imposing regulation if general competition policy is sufficient to bring about effective competition.
- At the wholesale level and in end-product markets one carefully should consider strong incentives for differentiated two-part tariffs. If all major firms in the

telecommunications sector agree to offer quite differentiated two-part tariffs, the regulatory authorities also have no incentive to intervene, except for the requirement of interconnection (incidentally, the principle of differentiated two-part tariffs can usefully be applied in all infrastructure sectors). The EU framework for regulation and regulatory policy in many EU countries lacks theoretical underpinning and so far has neither adequately considered the oligopoly problems in fixed-line telecommunications nor the option of fostering differentiated two-part tariffs which would allow the minimization of regulations. Indeed, the proposal made here could be applied across OECD countries. As regards the ongoing internationalization, it would be useful to have a broader policy dialogue which should include theoretical background studies and policy benchmarking studies. Efficient regulation of telecommunications/e-communications is one of the most important challenges in the Digital Market Economy. In a pragmatic perspective one may state that the access market can be expected to remain the most difficult market from a regulatory policy perspective. At the same time it is clear that very large differences in regulatory efficiency – as found in the EU - should not be a sustainable phenomenon. The natural mechanism for a market-driven process towards regulatory convergence is foreign direct investment, including international M&As. The more competition there is in the market, the less restrictive cross-border M&As in telecommunications should be handled. In the long run, facility-based competition should be encouraged along with an efficient resale regime which partly could involve subsidiaries of the incumbent operator. Making the best use of existing network capacities and investment is really important when trying to maximize long run services use and to stimulate product and process innovations. A particular issue is the introduction of a newly-defined universal service in the EU. In a modern digital economy, one may indeed consider broadband universal services as a kind of basic digital service to which all citizens of the Community should have access at affordable rates. Universal services could be delivered at minimum costs if competitive bidding processes would be organized by governments so that the firms requiring the lowest subsidy would get the contracts. Positive external effects of the networked use of information and stimulation of innovations - with positive external effects - are a justification to indeed invest taxpayers' money in the provision of broadband universal services.

Among the many problems encountered in telecommunications markets, one should not overlook the special issue of secondary markets for mobile licenses. While the US has reduced the burden for mobile operators to sell an obtained license (unless it is a satellite license), the opportunities for selling licenses in EU countries are rather limited. Indeed, getting an UMTS license in many EU countries is associated with unclear/imperfect property rights of the licensee. This impairs the optimum exploitation of spectrum use. There is, however, the caveat that competition authorities must have the right to intervene in this market if there is a clear risk that selling a license will amount to creating a position with significant market power.

If universal service is to be defined on the basis of broadband services one has to carefully analyze how an efficient universal service can be achieved. In regions with low population density government should allocate subsidies and indeed give a contract to that

firm which requires the lowest subsidy. To impose broadband universal service through regulation per se would distort competition as the largest firm probably would have to bear the highest burden in the sense of making high loss-making investment in regions with low population density. As competition makes cross-subsidization difficult an artificial upgrading of universal services through regulation would indeed encourage anti-competitive behavior of some firms. High revenues from auctioning of licences could partly be used to finance subsidized universal services in low-density regions.

In an increasingly networked digital world economy, one may anticipate considerable benefits from increased competition which should include positive effects from import competition and increasing foreign investment flows. There are considerable challenges in the field of international cooperation among regulators, in particular if telecommunications markets become global markets. Moreover, one should emphasize that there will also be new challenges for cooperation between R&D policymakers as growing digital networks imply more opportunities for international spillovers from both innovation and innovation policy. In countries with effective competition between alternative networks (e.g., fixed-line network vs. cable TV network), the regulation of telecommunications can be much milder than in countries where facilities-based competition is rather weak and where one finds an incumbent with significant market power. It is clear that weak competition in network operation implies a considerable risk that the digital services market will also suffer from weak competition and insufficient Schumpeterian dynamics. As benefits for the consumer are not only related to end-user digital services but also indirectly to digital services, which are an input in the production of other goods and services, policymakers should indeed adopt a broader welfare economic perspective. With respect to the proposed principle of differentiated two-part tariffs, one should emphasize that the approach suggested is not only valid for infrastructure services (ranging from telecommunications to transport and energy) but also for other fields with high fixed costs – a particular field is R&D which always is characterized by high fixed costs.

Appendix 1: Welfare Gains from Introducing Differentiated Two-part Tariffs

If we assume constant marginal costs, k' , we can easily calculate the welfare gain from a switch to a differentiated two part tariff. (One may also assume that average fixed cost $F=k'(1+f')$ where f' is a parameter indicating the relative size of average fixed cost.) Let us consider the case of a demand function $p=a-bq$ and marginal costs $k'=f$. The intersection point of the sum of the marginal costs and the average fixed cost curve with the demand curve is given by $q^\# = (a-(f+F))/b$. It is well known that the consumer rent (Ω) in the case of pricing in line with marginal costs f is given by $\Omega = (a/2)(a-f)^2/b$. The increase in consumer rent associated with a switch from a uniform two part tariff to a differentiated two part tariff can be calculated by subtracting the triangle AQP from the triangle ASN:

$$(1) d\Omega = (a/2)(a-f)^2/b - (a/2)(a-(f+F))^2/b = (a/2b) (2aF - 2fF - F^2) = (2F - 2fF/a - F^2/a) / 2b$$

The steeper the demand curve and the higher 'a' is, the higher the increase in consumer rent. The higher f is the higher the rise in consumer rent. A necessary and sufficient condition for a rise of consumer rent is the condition $F(2 - 2f/a - F/a) > 0$. A rise in F will positively influence the rise in consumer rent, if $F/a < 2(1 - f/a) < 2$.

What is a pragmatic estimation of the increase in welfare from switching to two-part tariffs? A lower-bound estimate is to assume that the consumer welfare of low-volume users will double. In addition, if consumer welfare under full cost average pricing is evenly split between a few high volume users and the many low volume users, the increase in economic welfare is one-quarter the initial consumer welfare. If, alternatively, we assume that the welfare gain per low volume user is 2/3 of the revenue and if the revenue from low volume users is one-half of the market revenue, the increase in welfare gain would be 1/3 of market revenue. As a pragmatic estimation of the potential benefits, one may assume that low volume users represent 1/2 of overall potential traffic.

In many markets with considerable fixed costs of production, one finds an implicit differentiated two part tariff in the form of discounts which depend on staggered minimum sales. Typically, the relative discount is higher, the higher the sales are with the respective high volume customer. In reality, many markets indeed are characterized by bonus schemes for high volume users which to some extent could effectively reflect differentiated two-part tariffs. However, a true differentiated two part tariff has the advantage that both parties agree ex ante on which class of implicit discount will be given. Collecting all the relevant data from all customers will give the producer an almost perfect idea about required production capacities.

Appendix 2: Modeling the Problem of Regulatory Uncertainty

Let us consider a firm which is facing regulatory uncertainty in an intermediate product market where uncertainty is covered by the standard deviation of regulation (R). The firm considered is regulated in an intermediate product market only. The firm maximizes expected utility of profits, so that we have a profit function in which the expectation value (μ) of profit enters with a positive sign while the standard deviation (σ) of profits enters with a negative sign. Managers are risk-averse. Hence we have utility function $U(\mu, \sigma)$ where partial derivatives $U_\mu > 0$ und $U_\sigma < 0$.

The firm is producing in the end user market the amount q and will use intermediate products $f(q)$ which are obtained at a regulated price which effectively consist of average costs c' (as indicated by the firm in intermediate production) times a regulatory factor. This positive factor could be above unity at some point of time but temporarily also could be below unity if the regulator assumes that there is significant market power that has to be corrected or if the incumbent has to contribute to the universal services fund.

The final product effectively is value-added involving labor and the intermediate product; the expectation value of profits is in the case of wage cost W (W is nominal wage is W , labor input is L) given by

$$(I) \mu = pq - WL(q) - E(R)c'f(q)$$

$$(II) \sigma = c'f(q) \sigma_R$$

$$(III) U(\mu, \sigma) = U(pq - WL(q) - E(R)c'f(q), c'f(q) \sigma_R)$$

What is the optimum quantity to be produced which relies on regulated intermediate inputs? Differentiating (III) and setting the first derivative equal to zero, namely $dU/dq=0$ we get as the necessary condition for utility maximization:

$$(IV) U_\mu (p - WL_q - E(R)c'f_q) + U_\sigma c'f_q \sigma_R = 0$$

$$(IV') p = E(R)c'f_q + WL_q - (U_\sigma/U_\mu)c'f_q \sigma_R$$

We can see from equation (IV') that the offer price p in the final product market is he higher the higher the expected level of regulation is (parameter R) and that a rise of the standard deviation in regulation will lead to a rise of the final product price.

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