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Let the Internet Flourish

Why overregulation of the Internet is wrong for Europe

Johnny Munkhammar

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Editor-in-chief
Johnny Munkhammar

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c/o Kellen Europe
Avenue Jules Bordetlaan 142
1140 Brussels

Tel: +32 (0) 2 761 16 75
E-mail: european-enterprise@kelleneurope.com
Web site: www.european-enterprise.org

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Table of Contents

Executive Summary.....6

A Word from the Publisher.....7

Introduction.....9

How Does the Internet Work?.....11

The Swedish Model.....18

Conclusions.....24

Appendix 1: Net Neutrality and the European Consumer.....26

Appendix 2: Net Neutrality in the Telecoms Package.....53

Executive Summary

1) The European Union is currently determining the future regulatory framework for the Internet.

2) Of all the regulations currently being considered by European policymakers, so-called "net neutrality" would be the most harmful one because it would seriously hamper private investment in infrastructure and sophisticated network management.

3) Net neutrality legislation would likely lead to a significant increase in broadband prices, causing serious harm to European consumers and businesses.

4) It is vital for Europe's future as a knowledge economy that the Internet is left free from overregulation. The case of Sweden shows that deregulation rather than regulation caused investment in Internet services and infrastructure.

A Word from the Publisher

This is the fourth publication in the new series launched by the European Enterprise Institute (EEI) during the autumn of 2008. The series is devoted to the values of free enterprise, free competition and innovation.

The aim is to inspire policymakers in Europe, as well as public opinion, by presenting well-founded facts and arguments. The concepts of free enterprise, free competition and free enhanced innovation are important for all members of society.

This publication focuses on the future of the Internet and its implication for innovation and dynamism. The ICT revolution has transformed the world – its society and its economy. The resulting enhanced prosperity was and is possible due to limited government interference and only a few regulations.

In today's Europe, the EU authorities will determine the future of Internet and its contribution to economic dynamism. Among certain politicians there seems to be an increasing eagerness to regulate. Therefore regulations that would stifle the development of tomorrow's Internet must be stopped.

This publication will show the possible contribution of a widespread Internet application to the European economy.

The EEI is focused on the promotion of reforms that make Europe more competitive and that make us leave the recession stronger than before. Innovation resulting from Information technology has proven increasingly important for economic success.
Therefore, we are pleased to publish a Policy Paper on the important issue of the regulatory framework of tomorrow's Internet.

Brussels, January, 2009

Peter Jungen
President, European Enterprise Institute

Introduction

In these times of financial crisis, the long-term focus for European countries should be structural reforms to reach the goal of the Lisbon Agenda – making Europe the world's most competitive knowledge economy.

The Internet is vital to Europe's prospects of transitioning from an "old economy" to a knowledge-based "new economy." Hence, policy makers should pay particular attention to legislation and regulation affecting the Internet.

In November 2007, the European Commission presented a new telecoms package that will update most of the existing EU rules on telecommunications, including the Internet. The European Parliament and the Council of Ministers debated the telecoms package several times during the course of 2008 and will continue to refine the specific legislative proposals ahead of a potential final decision in the spring of 2009.

As it stands now (January 2008), the telecoms package includes several positive elements, but also one especially harmful proposal. This particular proposal would give regulatory authorities in the EU member states unprecedented power to regulate and micromanage the way that Internet service providers (ISPs) manage traffic on their networks, thus stifling innovation and discouraging investment in new Internet infrastructure.

Europe faces competitive pressures on many fronts, from developed world economies such as the United States and Japan to rising developing nations such as China, India and Brazil. Working in its favor, Europe has a well-educated population, well-functioning institutions, the world's largest single market, and many highly productive industries. In recent years, a number of European countries have also enacted impressive economic reforms.

But many of those advantages could be undermined if Europe fails to develop the technological

infrastructure needed to leverage those assets. In particular, state-of-the art Internet technologies that continually evolve will be essential if Europe is to lead the world as the preeminent knowledge economy.

A University of Groeningen study concluded that the substantial difference in productivity growth between the United States and Europe during the last decade can be explained by more use of information technology (IT) and a more productive services sector in the US.[1] Creating the best conditions for Internet expansion and IT use is thus of fundamental importance in building European competitiveness and thus the prosperity and jobs of tomorrow.

The aim of this publication is to show why promoting freedom and flexibility for Internet service providers to invest and innovate is crucial to Europe's economic future.

[1] Bayoumi, Tamim, Laxton, Douglas & Pesenti, Paolo. Benefits and spillovers from greater competition in Europe: a macroeconomic assessment, Federal Reserve Bank of New York, April 2004

How Does the Internet Work?

To fully understand why Internet service providers need freedom and flexibility, one must first understand how the Internet really works.

The Internet is not a single system. It is a multitude of diverse, mostly private communications networks of varying quality, capacity and speeds.

To understand how this system works, it is helpful to view an online transmission in multiple parts. First, there is the Internet backbone, the network of global servers, databases and sophisticated connections that process terabytes of data every second, routing them according to their coding. The emerging technology underpinning the Internet backbone is astounding. Recently, Cisco Systems introduced a new line of routers that can process 15 terabits per second, or roughly enough data to deliver high-quality video streams to 15 million users.[2]

Before arriving at a user's computer, this information must go through the middle mile, or the connections that receive data from the backbone network and route it to the appropriate local "loop" or central office. The "last mile" involves the stage where data is routed directly to the individual user, ultimately through a single coaxial cable or dedicated copper phone line. As new technologies emerge, it may involve a dedicated fiber optic line.

A simplified way to understand the Internet is by drawing an analogy to Europe's roadway system. Consider the Internet backbone to be the Autobahn, a multi-lane freeway allowing large numbers of cars to travel at high speeds between cities. The middle mile represents the two-lane highway connecting the Autobahn with individual communities. Both capacity and speed are diminished from the Autobahn but are still higher than on a neighborhood street, which would be the last mile.

[2] A DVD-quality H.264 video stream runs at approximately one megabit per second. At that rate, Cisco's Nexus 7000 router could seemingly support 15 million such data streams.

Networks have historically been financed through access fees. Individuals pay monthly fees to their Internet service providers, which fund the last- and middle-mile network as well as backbone deployment. Increasingly, large corporations – especially online companies whose business model is based on delivering content directly to customers – are bypassing their own middle- and last-mile, preferring instead to set up their own networks of servers that push data directly onto the backbone. Google's YouTube is an example of this. A less costly option for content providers involves paying a content delivery company such as Akamai or Limelight, which maintains its own network of servers. The result is that under current Internet standards, companies that can afford to distribute their data closer to the user have existing advantages.

From the earliest days of networking, there have been agreements providing for faster treatment of some data. Businesses have long paid ISPs extra for better quality-of-service (QoS). These arrangements have helped finance vital upgrades to the Internet's architecture, improving the online experience for consumers.

Since the very beginning of the Internet, new online services and applications have continuously challenged the capacity of the existing Internet infrastructure. As Richard Bennett, a network architect who has helped design multiple Internet standards, has observed:

> *The Internet has always been vulnerable to the traffic demands of new applications: researchers encountered "Internet meltdown" in the mid-80s, and new users encountered a "World-Wide Wait" in the mid-90s. The solution to these problems was re-engineering of vital protocols, an increasingly dicey proposition. The Internet's much vaunted "end-to-end architecture" means that upgrades to vital systems roll out at a glacial pace measured in years and even decades....*[3]

This is vitally important for a reason that can be summed up in one word: video. For example, BBC's iPlayer, which shows archived episodes of all BBC programs over the previous week, accounts

[3] Source: "The Circus is Coming," (http://bennett.com/blog/2008/04/first-draft-fcc-piece/), April 20, 2008.

for 3-5% of all internet traffic in the UK.[4] Television, movies and other video are migrating to the Internet, to be streamed and downloaded by rapidly increasing numbers of users. In 2005, YouTube didn't exist. By 2007, the site was responsible for an estimated 10 percent of North American traffic.[5] In May 2008, three out of four German Internet users (approximately 26 million) watched more than 3 billion videos online.[6]

This increasing demand for video, especially high-definition, is putting a strain on the Internet's architecture and revealing the current system's inefficiencies.

The Case for Freedom and Flexibility

There are basically two ways to cope with the problem of outdated Internet infrastructure: Build new infrastructure (the equivalent of building new highways or extra lanes on the Autobahn) or develop new ways to manage traffic more efficiently on the existing networks (the equivalent of "truck-free" days, fast lanes, tolls or other methods of easing the flow of cars on congested roadways). Both solutions require freedom and flexibility for Internet service providers.

Let's first look at traffic management. Given the rapidly increasing amount of Internet traffic, Internet service providers will have to find ways to prioritize traffic in order to optimize the Internet experience for the individual consumer. Due to the rapid development of new Internet products and applications, it is virtually impossible to develop one system of prioritization that is right for all consumers all the time. Different Internet users will have different needs, and the preferences of consumers will change constantly as new online applications become available.

[4] Source: "BBC iPlayer 'risks overloading the internet'," (http://technology.timesonline.co.uk/tol/news/tech_and_web/article3716781.ece), April 10, 2008..

[5] See Surprise: P2P Isn't the Biggest Bandwidth Hog, IP Business, at http://www.ipbusinessmag.com/departments.php?department_id=1&article_id=199

[6] Source: http://www.comscore.com/press/release.asp?press=2332

Without this basic recognition that applications increasingly have wildly differing latency and jitter requirements, the Internet will start to slow to the "lowest common denominator" due to data overload and congestion.

Consider the increasingly varied transmission requirements at which data from online applications must be processed:

Table I: Time-sensitivity and Internet Applications

Data requirement	Application
Minimally time sensitive *Data can be delayed slightly with little impact to the consumer*	Email
Partially time sensitive *Data must be sent within a given timeframe but can be sent in irregular "spurts"*	Many file-sharing programs
Fully time sensitive *Data must be sent at a regular and continuous rate*	Audio and video streams Internet telephone calls

One of the most promising online developments in years is high definition (HD) television over the Internet. HD promises consumers a long-awaited alternative to CATV ("cable") or satellite television. However, from a strictly engineering perspective, data from HD television cannot touch the public Internet and maintain its quality. Data for HD must travel end-to-end over a

dedicated network where it can maintain its prioritization.

Net Neutrality: Straightjacket on Tomorrow's Internet

Net neutrality is a difficult concept to rebut since there is no single definition and since some competing definitions actually conflict with each other.

Generally, most net neutrality proposals would regulate the way ISPs process data across their networks. Data would have to be processed on a "first in, first out" basis, though some proposals would modify that to allow for different treatment of various classes of data. Simplified, the idea is to ensure that all applications and websites load at the same speed even though some sites and applications consume much more bandwidth than others.

Net neutrality would thus prevent ISPs from managing their own networks as they please. The ISPs would not be able to freely determine how to prioritize traffic. As noted earlier, the problems with such micromanagement of the ISPs are overwhelming both ethically, legally and technically.

To mention just one of the many technical problems, the concept of net neutrality implies that any video competitor (or all competitors) should have video service over the public Internet that is comparable to private network speed and quality. With the huge cost to deploy new technology, no ISP could afford to build that kind of a network.

The spiraling demands placed on today's communications networks due to video, file-sharing and emerging high definition and real-time video applications require not only new capacity but also innovative "smart network" technology (traffic management). Smart technology also allows for fee-based "fast lanes" over the network. While this may offend some purists (or companies

that use the Internet's current inequality for their own advantage), this is essentially the same concept as paying a toll to enter the Autobahn. No one will argue that Switzerland's Autobahn, which requires an annual ticket (about 25 Euros), undercuts its traditional road system anymore than an overnight delivery service undercuts usual postal service.

But net neutrality would effectively stop this practice (no fast lanes or toll roads would exist in a "neutral" road system) and add confusion to the modernization efforts vital to so many emerging web-based services. Net neutrality is a regulation meant for yesterday's Internet, when email and web browsing were the mainstays. It does not reflect the needs of tomorrow's web. As such, net neutrality will only lead to inefficient networks and slow the deployment of new improvements.

The result of net neutrality would likely be much higher prices for broadband Internet for European consumers and businesses. A quantitative analysis from Copenhagen Economics shows that prices would increase by 33 % in France and Sweden and 34 % in Germany as a consequence of EU net neutrality legislation (see Appendix A).

Unfortunately, the telecoms package proposed by the European Commission in November 2007 and amended by the European Parliament in September 2008 includes a provision that could easily send Europe down a slippery slope to net neutrality. This provision would allow regulators in Brussels and/or national regulators to set "minimum quality of service standards" that Internet service providers must meet (see Appendix B).

Such language is dangerous because it is ill-defined and can be interpreted in different ways – many of which amount to de facto net neutrality. Minimum quality of service standards would define minimum bandwidth levels that an application should run over a network. Mandating such standards raises several questions. First, given the varying speeds of broadband and network connections, how can the any regulatory body establish a reasonable minimum standard? In areas where high speed broadband is not yet available, would these standards not apply? Second, when multiple applications or content providers are competing for the same broadband connection,

applications slow down. If enough consumers are online that the broadband connection dips below the minimum standard, is the network operator breaking the law?

Say for example a regulatory body declared that all applications should get an equal share of peak bandwidth. There are some applications, like peer-to-peer, which are designed to consume greater levels of bandwidth than other applications. Network operators have the ability to balance bandwidth consumption by allowing these applications access to excess bandwidth during low usage periods without impacting their functionality. However, this prioritization may violate net neutrality minimum quality of service standards.

The Swedish Model

The case against overregulation such as net neutrality becomes even more apparent when one takes a look at the record of one of Europe's leading IT nations: Sweden. Sweden is a world leader in IT today exactly because the country gave Internet service providers greater freedom and flexibility earlier on than most other countries in the world.

Deregulation and reforms before the Internet Revolution

Economic reforms, in the form of deregulation, took place in the 1980s and 1990s. Three deregulatory reforms contributed to Sweden's accomplishments in the new Internet and telecommunications economy: first, the deregulation and privatization of the telecommunication market (liberalization); second, the elimination of laws hindering foreign investments in Sweden; and third, the removal of credit market controls in the late 1980s.[7]

At the same time, and shortly after, Sweden adopted extensive tax reforms creating lower marginal income and corporate taxes.[8] Price stability and healthier public finances were also key aspects in preparing the Sweden for the new economy of technology and foreign investment. Many important sectors such as banking, broadcasting and postal service were subject to liberalizing reforms. These reforms created greater opportunities for entrepreneurs and investors.

Without deregulatory reforms, the Swedish IT economy would not have succeeded, at least not of a similar magnitude. For example, the deregulation of financial markets contributed to the

[7] Jonung, Lars, "Den nya ekonomin i ett historiskt perspektiv", Ekonomisk Debatt 2000, nr 6

[8] Agell, Jonas, Englund, Peter, Södersten, Jan, "Tax Reform of The Century – The Swedish Experiment", National Tax Journal, December 1996, http://ntj.tax.org/wwtax%5Cntjrec.nsf/C7B05CD84D78235E85256863004B1F50/$FILE/v49n4643.pdf

implementation of new software for financial institutions and the stock market.[9]

In 2000, Sweden's venture capital market was the third largest in the world after the United States and Great Britain. The number of venture capital companies in the Swedish Venture Capital Association increased from 24 in 1994 to 130 in 2000. Many of these funds invested heavily in the IT sector.[10] The investments contributed to good financing, know-how and important contacts for new high tech companies. In 1990, restrictions concerning foreign ownership of bank stock were abolished.[11] The liberalizing reforms may not solely explain the economic development in the IT sector, but they certainly made things much easier. Of the world's top four Internet banks in 1999 three were Swedish.[12] Swedes were also early adopters of doing banking services with their ordinary bank over the Internet.

The telecommunications market

The telecommunications sector has become an increasingly important part of the Swedish economy, especially since the 1990s. The contribution of telecommunications sector to Sweden's economic growth increased to nearly half of the contribution of the entire industry sector in 2001.[13] Sweden ranks second only to Finland among OECD countries most dependent on the "telecom product" sector of the IT industry.

One company in particular stands out. In 2001, Ericsson's Swedish research and development (R&D) made up 10 percent of the total R&D in Sweden and the company held a substantial share of patents. Around Ericsson, a vast number of companies supplying components and services

[9] Ahmad, Tabrez, Sweden – Business Opportunities for Indian IT & Telecom industries, http://www.ficci.com/
[10] http://www.mcit.se/svca/article_view.asp?ArticleID=19
[11] http://www.nationsencyclopedia.com/economies/Europe/Sweden.html
[12] http://www.nationsencyclopedia.com/economies/Europe/Sweden.html
[13] Ibid.

emerged. Their emergence has led to increased technical competence in certain areas of the country, which, in turn, has led to further incentives to invest for foreign ICT companies.[14]

Ericsson represented the majority of the telecom manufacturing in the 1970s and 1980s. Among the few other manufacturers was Teli, a Televerket subsidiary.[15] Televerket was a state owned company and at the same time a government authority. The relations between Televerket and Ericsson were mixed because of their competition and collaboration. For example, the companies developed the AXE switching system together. The system later became very important to Ericsson's success.[16]

Deregulation

The deregulation of the telecommunications market started in the 1970s and accelerated in the 1980s and was more or less finished in 1993 with the Telecommunications Act when Telia AB was established. Seven years later, the privatization of the company started.

In the 1980s, telecom distribution was administered through a company with monopoly, rather than state, administration. In 1993, market-entry regulations and licensing conditions were significantly deregulated. Companies entered the market, mainly in the international market and business-to-business. These changes took place in Sweden earlier than most other countries.[17]

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[14] Andersson, Erik, J, Bohlin Erik, Johansson, Mattias, Lindmark, Sven, Innovation system Dynamics in the Swedish telecom sector, Emerald Group Publishing Limited, nr 4 2006

[15] Andersson, Erik, J, Bohlin Erik, Johansson, Mattias, Lindmark, Sven, Telecon Dynamics – History and State of the Telecom Sector and its Innovation System 1970- 2003, Final Report, http://www.vinnova.se/upload/EPiStorePDF/va-04-04ny.pdf

[16] Andersson, Erik, J, Bohling Erik, Johansson, Mattias, Lindmark, Sven, Innovation system Dynamics in the Swedish telecom sector, Emerald Group Publishing Limited, nr 4 2006

[17] Six deregulations - Liberalisation of the markets for electricity, postal services, telecommunications, domestic

In 1996, a major overhaul of the Telecommunications Act introduced a range of important reforms. This overhaul included an improvement in the right to choose service providers. Another part of the liberalization was "carrier pre-selection." Carrier pre-selection allowed telephone customers to choose their operator in advance without dialing a routing prefix.[18]

Separation of infrastructure from services has not taken place in the telecommunications market as it has in other markets (energy, for example). Competitors (for example, to Telia's copper network) have found it worthwhile to build new networks. This investment in infrastructure has reduced the imbalance in the telecom market, leading to increased competition and better products for consumers.[19]

Broadening of Ericsson's operations from fixed to mobile telephony was quite successful. At the same time, Sweden rapidly licensed NMT (Nordic Mobile Telephone) and GSM (Global System for Mobile), giving Sweden one of the world's broadest bases of mobile phone users.

The liberalization of Sweden's telecommunication market preceded liberalization in the United States and the EC countries by several years, leading to a competitive telecommunications market earlier than in other countries.[20]

The principal attacker of the monopoly was the Kinnevik Group. Starting in the 1980s with investments in mobile phones and satellite communication, Kinnevik created Tele2 in the 1990s. As a result of competition, prices were lowered and new services rapidly introduced. EU membership further increased competition in Sweden and improved the investment climate for foreign investors. It was also beneficial for the export industry.

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air traffic, rail and taxi services in Sweden, Statskontoret 2005.

[18] *Ibid*

[19] Ibid

[20] Andersson, Erik, J, Bohling Erik, Johansson, Mattias, Lindmark, Sven, Innovation system Dynamics in the Swedish telecom sector, Emerald Group Publishing Limited, nr 4 2006

Investments and the introduction of the Internet

Deregulation has spurred huge investments in Internet infrastructure in Sweden. Swedish carriers of broadband can offer consumers similar or higher speeds than those available in the US, for example. The World Bank has pointed out that while "While Sweden is widely recognized for its technical innovation and competence, the country has adopted numerous tax laws, polices, and regulations that make it extremely attractive for international companies to open offices." They also point out that it is the simple regulations on business that allows companies in Sweden to be productive. The OECD has also drawn the same conclusions in their survey, stressing that the "time to takeoff" for new products is comparably very low in Sweden, thanks to limited regulations on new businesses.

From the late 1990s to 2001, investment in research and development totaled 3-4 percent of Sweden's annual GDP, the highest of any OECD country. According to a report from Financial Times, the IT revolution would have been impossible without huge investments in research and development by big companies, especially Ericsson.[21] In addition, several of the world's most advanced telecom operators were located in Scandinavia, such as Sweden's Telia. Telecom investments in 2000 amounted to more than 6 percent of GDP. Virtually nothing protected domestic interests from foreign competitors entering Swedish markets.

The Internet was preceded by a range of computer networking and technologies. In the 1980s computers at universities were connected in the SUNET network. In 1988, SUNET switched to the open standard TCP/IP, considered the birth of Internet in Sweden. Comvik Skyport connected the first customers to an IP network in March 1991. Later the same year Televerket opened a competing IP network. Both exclusively served corporate customers. In 1994, several companies offered Internet access through modems.

[21] http://www.isa.se/templates/News____3090.aspx

Today, Sweden has a well-developed market for Internet and broadband, with almost 76,7 % (2007) of the population using the Internet, one of the highest percentages in Europe. In recent years, the market has gone to more and more broadband access – high levels of DSL (Digital Subscriber Line), satellite and fixed wireless adaptation. In 2008, Sweden ranked second in the World Economic Forum in Global Information Technology Report's Networked Readiness Index.

Conclusions

In order to become the world's most dynamic and knowledge-based economy Europe needs a number of structural reforms. The example of Sweden shows that deregulation of the telecommunications sector can spur economic growth.

But it is important – and possibly easier – to avoid putting new obstacles in the way, such as government regulation of Internet providers.

The importance of the Internet in making business competitive and creating new prosperity has been showed in recent decades. The continued emergence of new generations of Internet services must be made simple – that is, by providing a business environment of freedom, flexibility and competition.

Providers can offer services over the Internet that can continue to revolutionize our companies, welfare services, daily lives and societies in general. Powerful new wireless technologies allow us to have more mobile use of these services.

Nobody should want this progress to be halted or delayed. European policymakers should reject current and future proposals to overregulate the Internet through net neutrality and similar harmful legislation.

Appendix 1: Net Neutrality and the European Consumers

Appendix 1 is an analysis showing the effects on broadband prices if net neutrality legislation were to be introduced in Europe. The analysis has been performed by Copenhagen Economics, a leading consultancy in Denmark.

Executive Summary

Net neutrality is an often used common denominator for some technical principles of how to organise traffic on the internet. The way priority is given to data packets in a congested network has vast implications for how capacity is utilised, for the quality of service for different applications and for the price and experience for end-users.

Net neutrality usually means that broadband service providers charge consumers only once for Internet access, do not favour one content provider over another, and do not charge content providers for sending data packages over broadband lines to end users. It is thus a specific form of ex-ante price regulation that fix one set of prices to zero (namely vis-à-vis content providers), and risk locking the other set of prices into one specific pricing model (namely a flat-rate model vis-à-vis end-users).

Net neutrality renders congestion management on the internet impossible. Under net neutrality, data packets must be handled after a strict first in-first out principle. With this principle, broadband service providers are unable to use techniques whereby data packets needing priority can be given priority, and packet needing volume can be given volume. Such techniques for organising the traffic on the internet are known as Network Management and aim at increasing capacity utilisation and maximise consumer experience from various applications.

The key question is therefore: Should broadband service providers be allowed to charge content providers for broadband access in exchange of network management services? The relevance of the question hinges on the presumption that it is feasible to design network management services

that will improve capacity utilisation and increase quality of service. It would furthermore require that such new pricing models can be designed in a non-discriminatory and transparent manner, and that the behaviour of all players in the market is subject to continued scrutiny by the relevant competition authorities, and that current EU legislation prohibiting discriminatory practices including blocking are maintained and enforced.

Broadband supply is a classic "two-sided" market. In two-sided markets, prices do not and prices cannot follow marginal costs in each side of the market. Second, price levels and price structures on both sides of the market must be optimized simultaneously in order to succeed in getting both sides on board.

Price regulation on one side (e.g. content providers) is likely to entail effects on the prices on the other side of the market (e.g. end-users). Regulating prices in one side of the market also has implications for the long-term investment decision of the two-sided firm. This is particularly important when the network is facing congestion.

Under net neutrality in a congested network, some end-users would be willing to pay more than the average price for applications needing high quality of service but are prevented from doing so by regulation. At the same time, applications where the quality of service is irrelevant would - under net neutrality - be supplied at a higher quality than customers would be willing to pay for. Both errors entail welfare losses to consumers.

To increase consumer gains, there would be valid grounds to consider allowing European broadband service providers to charge content providers for broadband access in exchange of network management services. Non-discriminatory and transparent prices determined in a competitive market are the best available rationing mechanism in a congested network, and the ability of prices to deliver both short-term and long-term consumer welfare is second to none – and by far superior to rationing mechanisms based on a myopic technical criterion such as net neutrality.

One of the key aims of this report is to provide empirics that attempt to quantify the implications of choosing different options for addressing the congestion problems facing the future of the Internet. This is a complex issue and there are no simple answers. However, we must present our analysis in a clear and transparent framework, and that requires simplicity. We hope it brings clarity and simplifies the decision making.

The results from our analyses show that net neutrality would imply higher average broadband prices for the consumers. Under the most modest assumptions, average monthly subscription prices in France and in Sweden, would increases from 33 EUR to 44 EUR; in Germany from 29 EUR to 39 EUR.

The higher prices will discourage broadband demand and slowdown broadband deployment. In France, we conservatively estimate this will lead to a decrease of broadband subscriptions of some 600 000 on an annual basis instead of an increase amounting to 4 million subscribers that would have materialised if the trend growth between 2005 and 2007 would have been sustained. The effects of net neutrality in Germany would mean only 1.6 million new subscribers. Without net neutrality the trend growth of the market during the last years implies an increase of 7.5 million new subscribers. Almost 80 percent of them would be wiped out if net neutrality was to be imposed. The relatively lower impact on the German market depends on its higher expected growth of broadband subscriptions. The Swedish market would experience a decrease of some 120 000 subscriptions to be compared with an increase of around 700 000 subscriptions in the absence of net neutrality.

Higher prices and lower broadband demand due to net neutrality implies welfare losses for the consumers. We estimate that around 1.6 billions of EUR would be lost if net neutrality was introduced in France. The corresponding welfare losses in Germany amount to 1.7 billion EUR and to 290 million EUR in Sweden. This welfare loss of 3.6 billion EUR in total in the three countries occur since some consumers are worse off at higher prices with lower quality while others leave the market entirely. There are also welfare losses due to the fact that normal

consumers subsidise heavy users as all consumers pay the same price regardless of how much capacity their usage require.

In the appendix we address the potential price impacts on ordinary EU consumers from introducing new net neutrality regulation. We also quantify the welfare effects for consumers and the effects on demand for broadband and estimate how price changes would affect broadband penetration in the three countries mentioned above. These countries have been chosen because they represent different regulatory regimes and different market situations. However, we do believe that the results can be generalised to most European markets.

We therefore conclude that implementing net neutrality would most likely to do more harm than good to European consumers. Net neutrality makes smart network management impossible, and may thereby imply less quality of service for the end-user, higher prices for the end-user and lead to slower broadband roll-out. At the end of the day, and perhaps most worrying, net neutrality could also reduce incentives to invest in the next generation network.

1. The Economics of Net Neutrality

Internet markets are complex. It is useful, but oversimplified, to think of the Internet in three parts: Content Providers like Google, Skype and BBC; Broadband Service Providers (BSPs) like Vodafone and T-Online; and End-us-ers—that is, consumers and business.

1.1. The Internet is like a dating club (i.e. a two-sided market)

Broadband supply is a classic "two-sided" market. "Two-sided" markets have two different groups of customers that businesses have to get on board to succeed. In this respect, it is like a dating club.

Dating clubs are a way for men and women to meet each other. Their business works only if they attract enough members of the opposite sex to their club to make a match likely. Enough men must participate to attract women, and enough women to attract the men. The club must figure out how much to charge men and women so that the club gets the right number and mix of members.

Back to Broadband. Think of content providers as customers at one side of the market. They are at one end of a network supplying content, e.g. web pages, voice communications, search engines, online auctions, online games, etc. Think of end-users as the other side of the market. These are the receivers at the other end of the network, who value and consume the content from content providers. In the middle there are broadband service providers. These need to get both sides of the market on board to succeed . Broadband supplies must attract enough end-users to attract content providers, and enough content providers to attract end-users. broadband service providers must figure out how to charge end-users and content providers so that they get the maximum number of customers and the right mix, while at the same time making money since most of these broadband service providers are in business to make profit.

Two-sided markets add a few complications to the analysis. First, in two-sided markets, prices do not and prices cannot follow marginal costs in each side of the market. Second, price levels and price structures on both sides of the market must be optimized simultaneously in order to succeed in getting both sides on board .

This is important as background when someone is proposing to introducing price regulation on one side of the market, because such regulation is likely to entail effects on the prices on the other side of the market. Regulating prices in one side of the market also has implications for the long-term investment decision of the two-sided firm.

This is not an argument for regulators to steer clear of such industries, but rather an argument for regulators to be aware of the economic principles that govern pricing and investment decisions

in these industries.

1.2. Definitions of net neutrality

Net neutrality has no widely accepted and precise definition. Net neutrality builds on three technical principles for how to organise the traffic on the internet. This is also known as best-efforts routing:

i) End-to-End
ii) All packets are created equal
iii) First In, First Out

These principles were introduced in the early days of the internet, when capacity was abundant and no one experienced congestion or deterioration of the quality of service to the end-user.

Today, these principles may be too simplistic and unfit to the realities. In the process of updating the principles for organising the traffic on the internet one should be aware of two key facts: First, that capacity is scarce. The Net is facing congestion, and available capacity is a scarce resource. In this situation, the three simple principles of net neutrality lead to a sub-optimal use of this scarce resource. Second, capacity is not just capacity. Some applications require volume, but not priority (i.e. need a thick pipe, but can wait a few milli-seconds). Other applications need priority, but do not need much volume (i.e. need to get by fast, but only need a thin pipe) .

1.3. Benefits of network management

Win-win situations can be achieved, if a smart manager is allowed to handle small, but urgent packets first, and thereby leave capacity for a slightly delayed, but unhindered passage of big packets that are a little less urgent.

Such allocation methods are for example used to allocate electricity generating capacity when electricity systems are "congested" in the sense that demand exceeds supply so security of supply is an issue. In these cases, some large customers that do not depend urgently on the supply of electricity (such as a cold storage) accept to be cut off for a period to allow those with an urgent need (for example a hospital) to get supply. It would not be a good solution to reduce all customers by the same percentage since hospitals cannot sensibly reduce their use of electricity instantly. In return for their flexibility, the large customers that may be cut off pay less for their electricity than do those customers that must receive electricity at all times. Hence the price mechanism is used to manage the congestion and guide the scarce electricity to the customers to whom it has the highest value.

If data packets must be handled according to the three net neutrality principles, these win-win situations are not possible. Under net neutrality, all packets are equal, and they are delivered in the same order as they entered. Therefore, networks managed according to the simple (some would say "dumb") principles of net neutrality will per construction be hostile to interactive and real-time applications that require priority over volume.

In practice, this implies that packets that are part of a download of a webpage are accorded the same treatment as packets comprising a VoIP conversation despite the fact that the resulting delay and "jitter" have vastly different effects on the consumer experiences from these applications. Packets corresponding to some real-time medical procedure between a doctor and a distant hospital are subject to the same delay and jitter as packets carrying instant messages between bored high school students in math class.

In a way, net neutrality treats data packets as equals, but implies unequal treatment of applications, and thereby unequal treatment of end-users. Net neutrality puts packets before people. Perhaps it is time to put people before packets.

Another way of organising the traffic on the internet, given that capacity is scarce and that

capacity is a trade-off between priority and volume, would be a network managed with the aim of increasing capacity utilisation and maximise consumer experience from various applications. Such principles for organising the traffic on the internet are called Network Management or access tiering .

The concerns of broadband service providers with the best efforts routing principles are that they lead to commoditization of broadband transmission with resulting low returns, making it difficult for them to carry out the major investments that are needed to expand capacity (e.g. fibre in local networks). Broadband service providers are also concerned with the privilege that the best efforts routing principles give to certain applications (i.e. P2P applications) and the imbalance in the traffic that result from it.

In the absence of net neutrality, broadband service providers would be able to conclude revenue-generating agreements with content providers in exchange of managing the scarce broadband capacity such that all paying content providers can deliver a guarantied high quality demanded by some end-users (e.g. online high-definition video or remote surgery).

Faced with congestion, capacity must be rationed by some mechanism. Because there is not enough capacity, some traffic must inevitably be delayed or degraded. The question is not if, but how? Changing the assignment of priority - from the current first-in first-out principle - to something else could degrade the current quality of some applications relative to others when facilities are congested. The debate of net neutrality is therefore in essence a question of whether prices should be used as rationing mechanism or not. Net neutrality implies that prices are not to be used as rationing mechanism. Economists generally argue that there is no better mechanism to regulate scarce capacity than market prices.

1.4. What is the problem?

The problem is that using any mechanism to assign priority other than one that reflects cost and

consumers' willingness to pay for priority can impose welfare losses to consumers.

Network pricing that accounts for costs and consumers' willingness-to-pay generally increases economic welfare relative to uniform pricing. It is a standard result in economics known as Ramsey pricing that charging different customers different prices according to their willingness to pay is better than charging all customers the same price. This is particularly important when uniform pricing cannot be expected to cover the fixed costs. In network industries, fixed costs are often quite large making this all the more important.

Under net neutrality in a congested network, some end-users would be willing to pay more than the average price for applications needing high quality of service but are prevented from doing so by regulation. At the same time, applications where the quality of service is irrelevant would - under net neutrality - be supplied at a higher quality than customers would be willing to pay for. Both errors entail welfare losses to consumers.

Network management would bring a solution to this problem. It would imply a break-away from the best-efforts model and introduce differentiation in quality of service (but not discrimination in terms of the utility customers derive from the service), intelligence in the network (as opposed to intelligence only at the edges), and new services. With network management, broadband service providers can avoid the commoditization and turn broadband transmission into a real two-sided platform that will give better incentives for investments in future capacity.

1.5 Lack of competition?

Much of the US debate on net neutrality was rooted in fears that US broadband providers – in the absence of net neutrality – would be in a position enabling them to abuse a dominant position vis-à-vis internet content providers.

One expression of this fear is found in a statement from one of the mastodont content providers,

Google:

"Most American consumers today have few choices for broadband service. Phone and cable operators together control 98 percent of the broadband market, and only about half of consumers actually have a choice between even two providers. Unfortunately, there appears to be little near-term prospect for meaningful competition from alternative platforms. As a result, the incumbent broadband carriers are in position to dictate how consumers and producers can use the on-ramps to the Internet."

- Statement by Vinton Cerf, Chief Internet Evangelist, Google .

Opponents of network management point to lack of competition in the broadband access markets and infer that broadband service providers would have the incentive and ability to exercise market power. Economics do not seem to support this claim.

There is competition. Broadband competition in Europe is working well and getting fiercer every year. This should lead EU regulators to be less concerned over net neutrality.

According to the mid-term review of Europe's single digital market strategy, i2010, market competition remains one of the main drivers of broadband adoption. As the number of broadband lines in the EU has risen eleven times from almost 9 million in July 2002 to 99 million in January 2008, the market share of non-incumbent operators in the retail market has increased from 37 percent to 54 percent . As an example, more than 70 percent of UK homes have a choice of four or more telecoms operators .

In the DSL market, regulation has enabled alternative operators to access the network of the incumbent operator. The increase in competition within this segment has been remarkable: while incumbents in 2002 controlled 87 percent of DSL lines, this share has declined to 56 percent. In addition to the entry of new operators, the nature of competition is also changing with many

countries experiencing a gradual move from service-based competition to infrastructure-based competition using local loop unbundling (LLU).

There is little evidence of any significant market failures and little consumer harm from conduct by broadband providers has been documented. The few examples of anti-competitive conduct in the broadband supply industry have been identified and corrected by the European competition enforcement .

Therefore, there is no reason to fear "dictatorship" or "fundamental undermining" from the broadband service providers. In a competitive and generally well regulated market like the European broadband market, no internet service provider would be in a position to dictate prices or to block content .

Because of the competitive pressure on broadband service providers in Europe, few EU broadband providers have dominance, and hence do not have the ability to conduct any form of abusive behaviour vis-à-vis internet content providers. Therefore, the discussion over net neutrality in Europe is less relevant, and concerns over potential competitive harm to consumers from introducing network management are not supported by the facts. We see no need to worry about a problem that is unlikely to occur, and that can adequately be dealt with if it should occur.

2. Likely Impact on EU Consumers

In this section we summarize the results of our findings, and list the likely impact of net neutrality for European consumers regarding quality of service, end-user prices and broadband penetration. net neutrality will have a negative effect on all three, and consumers will be better off without net neutrality.

2.1. Net Neutrality and Quality of Service (QoS)

The fact is that that a small minority of end-users are using 80 percent of capacity. New development of services like e.g. remote surgery requires that a high quality of service is guaranteed.

Some fear that network management say that it will degrade performance. This is at best partially right. Proponents argue that network management would make end-users vastly better off.

Because the best efforts model has given favourable treatment to P2P applications at the expense of all other applications, the break-away from this model will "degrade" P2P traffic from a "too good quality" to a "good quality". The upside for all other consumers is that they will experience a change from "too poor quality" to "good quality". The majority will go from "too poor quality" to "good quality", and a minority will go from "too good" to "good quality". Everybody except the heaviest P2P users will be better off in terms of service quality.

The implication of net neutrality is that it renders consumer welfare enhancing price differentiation impossible. Net neutrality will imply less QoS and introduce overpricing for small users and underpricing for large users.

Without net neutrality, consumer welfare enhancing price differentiation through intelligent and transparent network management techniques is an option and effective competition will sustain competitive prices in each these service tiers.

2.2. Net Neutrality and End-user prices

Imposing net neutrality will have negative impact on end-user prices. It will pass on the cost of scarcity to all consumers regardless of use. If flat-rate is the only pricing model, the price is likely to go up if scarcity increases.

Without net neutrality, network management can decrease scarcity and thus reduce the price

increase. Furthermore, since broadband suppliers will be charging content providers they can reduce prices towards end-users. These effects are very significant.

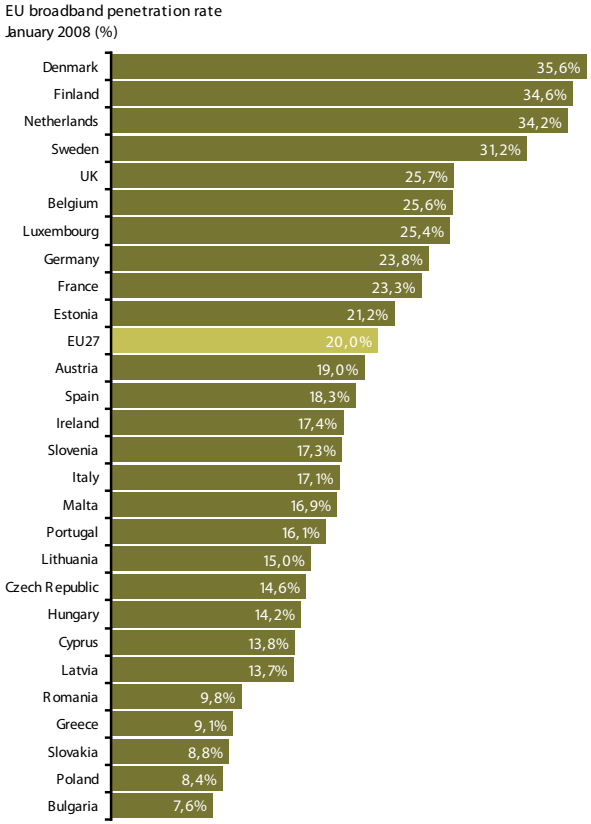
Based on data from the US market, Litan and Singer make a simple estimate of the value to consumers of just one QoS-needy application – an online massive multiplayer gaming application. They estimate a consumer surplus of between $700 million and $1.5 billion per year. This surplus would be lost or reduced if net neutrality regulation were effective in regulating traffic. Add to that figure consumer surpluses from other high-bandwidth, low latency services such as delivery of IP high-definition video and the potential of increasing quality of service through intelligent network management appears enormous.

Other estimates also indicate that such applications (and others) would be priced out of the market in an unmanaged, net-neutral network. According to another US study, the monthly cost to provide capacity for current subscribers in an unmanaged network is about $47 per subscriber. To add sufficient capacity to provide two standard-definition video channels would triple that cost. To add two high-definition video channels would increase the cost by a factor of ten . While such cost estimates are uncertain, they indicate that an unmanaged network would push many high-bandwidth services out of the market, and that this would infer significant losses for consumers.

2.3. Net Neutrality and Broadband roll-out

Net neutrality would also have an impact on broadband penetration. There are large differences in broadband access across EU Member States and between rural and urban regions within member states. Broadband penetration is high in Nordic countries, the Netherlands and the UK, and is generally lower in new member and in southern countries such as Greece and Portugal, cf. figure 1.

Figure 1. Large differences in EU broadband penetration



Note: Data for France, Netherlands, Austria, Estonia and Latvia refer to October 2007.
Source: European Commission

Broadband access is a main driver of productivity growth, and productivity growth is the key instrument in Europe's cohesion policy.

Since net neutrality will imply higher end-user prices (cf. section above), this can risk reducing the speed of roll-out in general and in particular in the lagging regions of Europe who will be harder hit by the increase in prices. The result: The tendency of catching-up and convergence in terms of broadband roll-out may be reverted if net neutrality is imposed in Europe, and this will put additional pressure on objectives of coherence and convergence in growth rates in Europe's lagging regions.

3. Conclusion

In our view, EU policy makers should be cautious to rush for broad, ex ante regulation in a vibrant and dynamic market such as the broadband internet field . Broad and rigorous price regulation may not be warranted in a nascent market where there appears to be effective competition both among broadband service providers and between broadband service providers and competing networks (i.e. mobile networks).

Our main concern is that implementing net neutrality would most likely do more harm than good to consumers. Net neutrality may imply lower quality of service for the end-user, higher prices for the end-user and lead to slower broadband roll-out. At the end of the day, and perhaps most worrying, net neutrality could also reduce incentives to invest in the next generation network, and thereby undermine the infrastructure that helped giving birth to the Internet in the first place.

With effective competition, European broadband suppliers will not be in a position, enabling them to abuse a their position vis-à-vis internet content providers, and strict ex-ante price regulation as implied by the imposition of net neutrality would not be warranted.

Internet service providers and content providers should have a common interest in offering the maximum amount of content to the market at the best possible prices. So prices have to be attractive and the most suitable model would be based on network management with prices as the effective rationing mechanism. Such a system should not include strict ex-ante price regulation, but should be left to commercial transactions between internet service providers and content providers. To allow for (not imposing) differentiated, transparent and non-discriminatory pricing is what is required. Such price models are well-known from many industries where differentiated prices or versioning is used to allocate scarce supply and to let users choose the quality that matches their needs. An example is air fares that are used to allocate seats in aircrafts.

At the same time, regulators should ensure a continuation of tough competition enforcement, while allowing Internet pricing flexibility that promotes a more efficient use of broadband capacity. This would be a much more appropriate response to the current challenges, than importing US-style anti-consumer regulation such as net neutrality.

If net neutrality is introduced to the European debate, it would be "a solution in search of a problem" promoted by those who benefit from its strict pricing principles, rather than a debate about solving the fundamental challenges of scarce capacity and improvement of the quality of service.

Forward looking EU decision makers should look for other solutions than net neutrality to address these challenges. Net neutrality is not very relevant for Europe. The underlying problems are!

About the Methodology

How did we arrive at these numbers? We have compared the required investments for two networks delivering the same quality of services: in one network management is used to level off

Kafka (2006) estimate that without network management, the necessary investments to increase bandwidth under net neutrality implies an average cost of for a typical future customer who uses the Internet for watching HDTV to around $560 per month.

Our cost quantification is based on the most conservative of the estimates available in these studies, and the cost increases under net neutrality are based on current Internet consumption patterns. We have based our cost estimates of expanding the network capacity under net neutrality on a 34 percent increase in the average monthly subscription price.

Another assumption in our analysis is how consumers will react to price changes. Several studies have shown that consumers are very sensitive to price for broadband services . As a result, actions that would increase the cost of these networks could have a significant effect on broadband penetration. The estimate of the cost increase has been used together with a conservative estimate of the demand elasticity for broadband of -1.0 to estimate the effects of net neutrality on the broadband markets in France, Germany and Sweden.

Consumer Effects in France

The French broadband market has undergone dramatic changes since the beginning of the milennium. While less than two percent of the population had access to broadband in 2002, around a fifth of the population was connected to the Internet through broadband in 2007 [OECD (2008)]. This development has been spurred by an active policy to increase competition in among broadband providers.

The increase in broadband connection has been accompanied by falling prices of more than 20 percent at the same time as faster connections for broadband have become available. Simultaneously, content providers have developed more and more advanced services to accomodate the increased demand. The development of broadband capacity has not increased

with the same speed as demand and scarcity of broadband capacity has become an issue.

This situation can be handled by broadband providers if they are allowed to charge content providers for network management. Net neutrality however requires substantial investments in capacity to remedy the congestion problems. These investments will lead to higher costs for consumers. We estimate the welfare effects of higher monthly broadband prices that would result from prohibiting broadband service suppliers to use network management.

If broadband consumption follows the same trend as the last three years, broadband demand in France would increase with 30 percent in 2008. Some of that increase is price-driven. The price increase due to net neutrality would be so forceful that it would reduce broadband demand with almost 600 000 subscriptions.

The lower pace in broadband deployment means that the last years' rapid increase in broadband penetration measured as number of broadband lines per population will be reversed. If the last years' trend in broadband penetration would be allowed to materialise without net neutrality, broadband penetration would increase from 22 percent to 30 percent in France. Introduction of net neutrality instead reduces the broadband penetration to 21 percent.

Clearly, this development affects consumer welfare. The loss in consumer welfare measured as the combined changes of an increased price and reduced demand amount to some 130 million EUR per month or 1.6 billion EUR per year.

Table 1. Consumer effects in France of an introduction of net neutrality

Monthly broadband cost increase in EUR	Net percentage change in broadband demand	Change in consumer welfare (billion EUR)
+ 11 EUR per subscription per month	- 4%	- € 1.6 billion

Source: Own calculations.

the peaks, in the other network the desired quality of services is delivered by investing in capacity. The latter will correspond to the situation under net neutrality and require more investments. The difference between the two is the incremental cost of not using network management. Assuming full pass-through to prices, these additional investment costs will translate into higher consumer prices.

Why is this so? Under net neutrality, the network must have enough capacity to handle peak load. The necessary investment will be determined by the maximum peak, and will require a 'thick' network with a large capacity. Network management is a version of peak-load pricing that is used to help solve a host of resource allocation problem. With peak-load pricing, some of the peaks are cut off and a 'thinner' network with less investment can deliver the same capacity and quality of services as a 'thicker' network under net neutrality. Peak-load pricing is a well know instrument in other industries with similar peak-load problems ranging from dining at restaurants (early-bird specials) to commuting (higher rush-hour subway prices) to generating electricity (lower prices in the middle of the night).

We have identified a handful of studies, mainly from the U.S., that estimate the cost of operating an unmanaged network. These publicly available studies assume that end-users are streaming multiple video entertainment signals at once, either in standard or high-definition formats. With simultaneous usage, the capacity demands on the Internet for video content in this architecture would be substantially larger than the e-mail and browsing content that dominates the Internet today. It is clear that the scope for network management increases with capacity demands. The more advanced demand there is, the more potential for using network management.

Litan & Singer (2007, p. 27) provide an estimate of this additional cost based on the US market. According to their estimates, the additional costs of not using network management under the current usage pattern (mainly e-mails and web browsing) would be a price increase from $35 to $47 per monthly subscription (or a price increase of 34 percent).

According to a review of other studies by Ford et al (2006) the cost increase for a typical user who today mainly uses the Internet for mail and browsing would increase by the same amount as mentioned above, while a future user who uses the Internet for watching High Density TV (HDTV) could end up having to pay several hundreds dollars more per month under net neutrality. Based on a review of publicly available evidence they conclude that if IP video services increase in popularity, the cost of providing a residential subscriber an unmanaged network This s

Consumer Effects in Germany

The German broadband market has developed rapidly the last three years yielding penetration rates now on par with France after having lagged behind a few years. As in France, competition in broadband has been a major driver behind broadband uptake.

Our estimation of consumer effects of introduction of net neutrality on the German broadband market follows the same reasoning as above for the French broadband market. Imposing net neutrality in Germany raises the average monthly cost of a broadband subscription with 10 EUR from 29 EUR to 39 EUR. If subscription costs instead are allowed to follow the price development during the last years, the average monthly subscription price would fall to 26 EUR.

Following the last years development for broadband demand, a German broadband market without net neutrality would yield around 43 percent more broadband subscriptions. Imposing net neutrality on broadband providers substantially dampens this increase. Demand for broadband increases with around 1.6 million subscribers instead of 7.6 subscriptions that would have occurred in the absence of net neutrality. This also means that the upward trend in broadband penetration would be lowered. Instead of achieving an increase of the broadband penetration rate from 21 to 31 percent, net neutrality would dampen this increase to 23 percent.

The German broadband market is larger than the French which means that the effects on consumer welfare are larger in Germany. The loss in consumer welfare in Germany amount to

some 143 million EUR per month or 1.7 billion EUR per year.

Table2 Consumer effects in Germany of an introduction of net neutrality.

Monthly broadband cost increase in EUR	Net percentage change in broadband demand	Change in consumer welfare (billion EUR)
+ 10 EUR per subscription per month	9 %	- € 1.7 billion

Source: Own calculations.

Consumer Effects in Sweden

Broadband take-up among households and enterprises in Sweden has been among the highest in Europe for many years and the market does not show any signs of saturation. Using the developments for the last three previous years, a broadband without imposed net neutrality would result in a price fall with around 2 percent accompanied by an increase of broadband subscriptions with 30 percent. According to our estimates, net neutrality would dampen these positive developments into an increase of the average monthly subscription rate with around 11 EUR to 44 EUR from 33 EUR. In the absence of net neutrality, prices would fall to around 32 EUR.

Projecting the last three years average development of broadband demand would increase broadband with some 30 percent. An introduction of net neutrality would however reverse this development and broadband demand would instead decrease with 5 percent.

Sweden is a relatively large country with a substantially lower population density than most other countries in the EU. Most of the cancelled subscriptions would probably materialise in less densely populated areas where average incomes are lower. The digital gap in broadband penetration between rural and urban areas would therefore most likely increase if net neutrality is imposed on broadband providers. Imposition of net neutrality would mean that broadband

penetration decreases from 28 to 27 percent.

The higher prices and lower consumption implies welfare losses for the Swedish consumers. According to our estimates, these amount to around 24 million EUR per month or 290 million EUR per year.

Table 3 Consumer effects in Sweden of an introduction of net neutrality.

Monthly broadband cost increase in EUR	Net percentage change in broadband demand	Change in consumer welfare (billion EUR)
+ 11 EUR per subscription per month	- 5 %	- € 0. 3 billion

Source: Own calculations.

Background figures

Broadband Average Subscription Prices 2005-2007 in Selected EU Countries

	France	Germany	Sweden
2002	47.13	46.69	37.4
2004	27.54	31.60	37.6
2006	28.2	38.5	33.1
2007	32.7	28.9	33.0

Source OECD. Communcations Outlook 2003, 2005 and 2007. OECD Broadband portal. http://www.oecd.org/document/54/0,3343,en_2649_34225_38690102_1_1_1_1,00.html

Broadband Subscriptions 2005-2007 in Selected EU Countries

	France	Germany	Sweden
2005	8,322,442	8,435,369	1,533,647
2006	11,297,543	12,608,400	2,069,685
2007	14,117,236	17,401,503	2,575,700

Source OECD. Communcations Outlook 2003, 2005 and 2007.

http://www.oecd.org/document/54/0,3343,en_2649_34225_38690102_1_1_1_1,00.html

Broadband Penetration 2005-2007 in Selected EU Countries

	France	Germany	Sweden
2005	12.63	10.24	16.69
2006	17.57	15.11	22.53
2007	22.40	21.21	28.89

Source OECD. Communcations Outlook 2003, 2005 and 2007. http://www.oecd.org/document/54/0,3343,en_2649_34225_38690102_1_1_1_1,00.html

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Contact
Martin H. Thelle
Partner and Director
Brussels, Belgium
+ 32 495 25 72 21
mht@copenhageneconomics.com

Corporate headquarters
Sankt Annæ Plads 13
1250 Copenhagen K
Denmark
Tel: + 45 70 27 07 40
Fax: + 45 70 27 07 41

www.copenhageneconomics.com
E-mail: hq@copenhageneconomics.com

Appendix 2: Net Neutrality in the Telecoms Package

In November 2007, the European Commission presented a new telecoms package, which revises a number of existing EU directives. As part of the package, the Commission proposed a new paragraph 3 to Article 22 of the Universal Service Directive (2002/22/EC). The text on the left below is the Commission's original proposal. The text on the right is the amended text passed by the European Parliament in September 2008. Both texts include the problematic reference to "minimum quality of service standards", which could result in de facto net neutrality legislation. A compromise text is currently being negotiated between the Commission, the Parliament and the Council of Ministers.

Amendment 193 Proposal for a directive – amending act Article 1 – point 13 – point b **Directive 2002/22/EC** **Article 22 – paragraph 3**	
3. In order to prevent degradation of service and slowing of traffic over networks, **the Commission may, having consulted the Authority, adopt technical implementing measures concerning minimum quality of service requirements to be set by the national regulatory authority on undertakings providing public communications networks. These** measures designed to amend non-essential elements of this Directive by supplementing it shall be adopted in accordance with the regulatory procedure with scrutiny referred to in Article 37(2). **On imperative grounds of urgency, the Commission may use the urgency procedure referred to in Article 37(3).**	3. **A national regulatory authority may issue guidelines setting minimum quality of service requirements, and, if appropriate, take other measures,** in order to prevent degradation of service and slowing of traffic over networks, **and to ensure that the ability of users to access or distribute content or to run applications and services of their choice is not unreasonably restricted. Those guidelines or measures shall take due account of any standards issued under Article 17 of Directive 2002/21/EC (Framework Directive).**