

I OWN THE PIPES, YOU CALL THE TUNE

THE NET NEUTRALITY DEBATE AND ITS (IR)RELEVANCE FOR EUROPE

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ABSTRACT

The debate of the so-called “net neutrality” has been under the spotlight in the US for many years, whereas many believed it would not become an issue in Europe. However, over the past few months the need to revise the current regulatory framework to encourage investment in all-IP networks has led to greater attention for net neutrality and its consequences for investment and competition. After the Commission adopted a “light-touch” approach to the issue at the end of 2007, the European Parliament has started to reconsider the issue, and it is reportedly considering a move towards more pro-neutrality rules. This paper summarises the main issues at hand in the net neutrality debate and the views expressed by advocates and opponents of the neutrality principle. The problem is described from a multi-sided market perspective, stressing the role of network operators as intermediaries in the “layered” architecture of all-IP networks. Finally, the paper discusses whether the European regulatory framework and its interaction with ex post competition policy are likely to solve many of the concerns of net neutrality advocates without any need for ad hoc regulation; and whether currently proposed solutions are likely to prove welfare-enhancing and conducive to a better regulatory environment for future e-communications.

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Introduction: “Power to the people”?

The net neutrality debate has been constantly under the spotlight in the US, where the quarrel between “openists” and “deregulationists” has become hectic and, often, reached peaks of unprecedented rhetoric¹. Over the past few years, the term “net neutrality” has been given so many meanings and interpretations that, today, it is even hard to define precisely what is at stake in the debate, and why is net neutrality so important for the future of telecommunications policy².

Until recently, the main concern was that Internet Service Providers (ISPs), especially when vertically integrated into the provision of services and applications such as VoIP, could manage to “close the door” to competing providers of applications and content in order to secure higher revenues. The technical term for “closing the door” is “blocking a port”, and this is what reportedly happened in 2004 in North Carolina, where a small DSL provider named Madison River decided to block the port to competing VoIP provider Vonage. After a consent decree with the FCC, Madison River had to pay a fine of \$15,000³. However small and isolated this case was – no similar case has been decided since then – it proved sufficient to mount a huge fight over the imminent “end of the end-to-end” principle, on which the whole Internet Protocol is based⁴.

The *Madison River* case paved the way for the emergence of a coalition of “openists”, according to which ISPs could have a strong incentive to transform the Internet – which they define as a network of “dumb pipes” with intelligence placed only at the edges, and no possibility to block or prioritize information packets flowing on it – into a more intelligent network, where not all bits are created equal⁵. Openists claim that ISPs could engage in other types of

¹ Check, for example, www.savetheinternet.com and www.handsoff.com, two Internet websites that represent opposing views on net neutrality.

² According to US Senator Jim DeMint, net neutrality “has become a nebulous catchall for a number of competing public policy issues”. See Jim DeMint, *Perspective: Why Net Neutrality Means More Federal Regulation*, CNET NEWS.COM, Jun. 27, 2006, http://www.news.com/Why-Net-neutrality-meansmore-federal-regulation/2010-1028_3-6088253.html

³ See *Madison River Communications, LLC*, 20 F.C.C.R. 4295 (2005). Decision available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-543A2.pdf.

⁴ See Lemley and Lessig (2001).

⁵ By ISPs I refer to both network owners and operators that provide access to the Internet by relying on other operators’ networks.

undesirable behaviour: words such as “tiering”, traffic shaping, packet sniffing, charging for predefined quality of service (QoS), intentionally QoS degradation, and “walled gardens”⁶ have become widespread in the jargon of net neutrality spokesmen. The openists’ claim, in terms of policy, is quite clear and resounding: net neutrality should be made mandatory by an explicit regulatory requirement⁷, and this would at once save the Internet and give back “power to the people”.

On the other hand, network operators and ISPs contend that, let alone isolated cases of application-blocking, for which remedies are already available in the regulatory framework in place, some degree of traffic shaping is needed and desirable in order to secure that high-speed broadband networks perform their functions properly. In an era of convergence, applications of different sorts are all converging over the same backbone, and their co-existence without any form of discrimination hardly serves the needs of end users. In particular, an increasing number of Internet applications – including VoIP, but also video conferencing (including telemedicine) and online gaming, etc. – are time-sensitive, *i.e.*, the packets sent have to get to destination in a timely manner to allow end users to enjoy a sufficiently attractive experience; some applications also require high bandwidth (*e.g.* IPTV)⁸. If sufficient QoS is not guaranteed to these packets on the Internet, the user experience would be disappointing and the growing demand for these applications would remain unsatisfied. So to say, allowing for reasonable discrimination (rather than mandating neutrality) would mean giving “power to the people”.

The debate has unfolded in at least four different dimensions:

- (i) *A technical dimension*, related to the features and needs of traffic shaping, which stems mostly from the problem of network congestion⁹;
- (ii) *A competitive dimension*, which links neutrality to competition at the various layers of broadband platforms, and examines the incentives of different players as dependant on the degree of competitive pressure they face¹⁰;
- (iii) *A consumerist dimension*, focused on the impact of net neutrality on consumer access to content on the Internet¹¹; and
- (iv) *A dynamic efficiency dimension*, which links net neutrality to incentives to invest in Next Generation Networks (NGNs)¹².

⁶ This latter contention opened up an additional front of the debate, involving wireless operators. See, *e.g.*, Wu (2007).

⁷ *E.g.* Laurence Lessig (2006), Timothy Wu (2006), Robert Frieden (2006), Susan Crawford (2007), and Tim Berners-Lee (2007).

⁸ IPTV also requires very low delay, since it cannot use buffering as users must be allowed to flip channels instantly.

⁹ See, *e.g.*, Yoo (2006).

¹⁰ See Van Schewick (2007) and Wu (2003, 2004).

¹¹ Marsden (2007), Frieden (2007), Marsden and Cave (2007).

¹² See, *e.g.* Ofcom (2006).

It is from this latter perspective that, after years of silence, the debate finally arrived to the EU. This is not surprising: operators in the EU are now facing the challenge of upgrading their networks to NGNs – an investment that was estimated at €300 billion by the European Commission for the years to come. Given the delay in broadband penetration in many EU member states, the ambitious plans formulated at EU level to realise the “information society for all” by 2010 crucially depend on this investment¹³. A number of industry players and at least one national regulator (Ofcom) have argued that, if net neutrality is made mandatory, and ISPs have no possibility of charging for different levels of QoS, incentives to invest in NGN would be inevitably jeopardised¹⁴. Others have observed that European competition policy is sufficient to tackle instances of anticompetitive behaviour by ISPs, and that accordingly mandatory net neutrality would represent, at best, a “cure worse than the disease”.

Against this background, while the European Commission has taken a rather “light-touch” approach to the issue in the recently proposed review of the 2002 regulatory framework, the European Parliament is reportedly discussing a number of pro-neutrality amendments, some of which already surfaced in the “Trautmann Report” approved in July 2008.

Commissioner Reding has recently added pathos to the debate when she declared, at the 2008 OECD meeting in Seoul, that

“[t]he discussion on network neutrality is not a technical question to be answered by regulatory authorities but firstly a political question to be answered by the people: the internet is theirs!”¹⁵

Although this seems a rather meaningful way of approaching the problem, the question remains unanswered: what is the best way to give “power to the people”?

This paper addresses this question by describing net neutrality not only as a standalone debate, but also as a piece of a larger puzzle of regulatory provisions, whose aim is to enhance social welfare from a dynamic viewpoint. Section 1 illustrates the economics of broadband platforms, the emerging business models and the growing user demand for new services and applications, and also describes the incentives of ISPs to engage in certain conducts that net neutrality advocates consider as detrimental for the future of the Internet. Section 2 explains whether and how the existing European regulatory framework and antitrust rules could tackle these behaviours when appropriate and needed. Section 4 concludes, by illustrating a “holistic” approach to net neutrality, which takes due account of market conditions and regulatory solutions adopted at all levels of the complex value chain of all-IP networks.

¹³ See the i2010 strategy documents on the Commission’s DG INFSO website at http://ec.europa.eu/information_society/eeurope/i2010/index_en.htm.

¹⁴ Ofcom (2006).

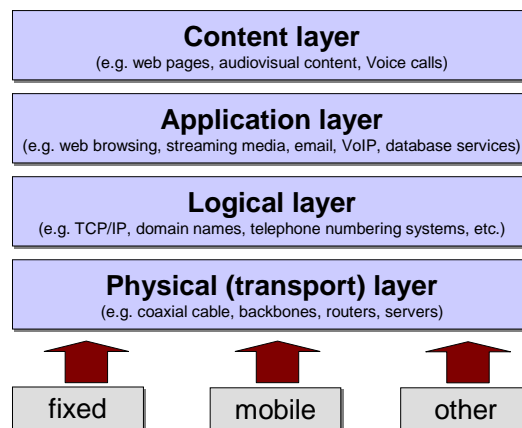
¹⁵ See Viviane Reding’s speech in Seoul, SPEECH/08/336, available online at <http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/08/336&format=DOC&aged=0&language=EN&guiLanguage=en>.

1 Net neutrality: fiction v. facts

The main players in net neutrality are almost invariably the same: on the one hand, a network operator or an ISP relying on a third-party network; on the other hand, providers of applications (IAPs) or content (ICPs) that need to pass through the ISP to convey their products/services to end users. One of the key variants in this story is whether the ISP is vertically integrated into the provision of a downstream service, such as VoIP or IPTV. Finally, a sometimes ignored player in the game is the end user, who chooses *whether* to purchase broadband connection, and also *which* broadband connection to purchase.

As shown in figure 1 below for an NGN environment, IAPs and ICPs have no choice but to pass through an ISP to supply their products to end users. This apparently puts ISPs in a privileged position – that of a “toll gate” on the way to end users¹⁶. As is straightforward, the better the infrastructure provided by ISPs to IAPs and ICPs, the more attractive will the application/content be for an end user. This is in the interest of all players in this game: as users value more the applications and content they can access on the Internet, the ISP will see the value of its platform grow, and IAPs and ICPs will face greater demand and user satisfaction.

Figure 1 – Layered architecture of an all-IP network



In a nutshell, the net neutrality debate is about the means ISPs should be allowed to employ to reach this win-win situation: according to openists, ISPs should only provide the best possible service (“best-effort”) to all IAPs and ICPs that want to convey services to end users; according to deregulationists, ISPs

¹⁶ Users can/will access the NGN through many different channels, be that fixed networks (GPON, VDSL, etc.), wireless (HSDPA, LTE, WiMAX) or any other available means (power lines, satellite, etc.). But once on the network, users will find themselves on a common, high-speed “information superhighway”: the ISP, as provider of access to the superhighway, sets the toll for end users (subscription fee), and delivers them on a best-effort basis (through the TCP/IP protocol) all available applications, services and content.

should be allowed to use an array of tactics, such as traffic shaping and network management, to efficiently organise traffic in a way that maximises satisfaction for subscribers.

Looks at figure 1, the main concern expressed by net neutrality advocates is that players operating at the physical layer (ISPs), using the logical layer (*e.g.* by altering the TCP/IP protocol), could discriminate between players operating at the application and content layers (IAPs, ICPs)¹⁷. This is more likely: (i) if ISPs are vertically integrated into the application and/or content layers; and (ii) if ISPs face limited competition at the infrastructure layer, so that they can act as monopolists by shaping traffic in a way that departs from users' interest¹⁸.

The types of behaviour that are most often evoked by net neutrality advocates are the following:

- *Blocking Applications*: an ISP may decide to block some applications or content, as happened in *Madison River* for VoIP and as reportedly happens in cable networks for P2P traffic¹⁹. In the former case, the ISP had blocked a competing service; in the latter, port blocking is meant to avoid bandwidth intensive and often illegal usage of the Internet.
- *Access-tiering*. This occurs when an ISP reserves specific bandwidth (at a price independent from internet access fees) to IAPs/ICPs that are willing to pay for enhanced or guaranteed QoS. In doing this, ISPs have to engage either in packet inspection (with technologies such as protocol-header inspection or DPI) or at least in some identification of volumes of usage. In both cases, they have to deviate from the “dumb” version of the TCP/IP protocol and treat packets differently according to their type, nature of volume of bandwidth occupied²⁰.
- *Intentional quality degradation*. ISPs may intentionally degrade the quality of non-prioritised traffic, so that downgraded IAPs/ICPs have a stronger incentive to pay for higher QoS. This is a “softer” way of foreclosing some applications or providers, compared to port-blocking; such conduct is more likely to create concerns if the downgraded IAPs/ICPs are competitors to the ISP.
- *Preferential arrangements with content providers*. Net neutrality advocates are concerned that ISPs could conclude preferential agreements with specific ICPs to prioritise their traffic; this would allegedly thwart competition between content providers, as some content would enjoy superior QoS than others. Of course, ISPs may even decide to favour their own content, if they are vertically integrated into content provision.

¹⁷ See, *i.a.*, Jordan (2007).

¹⁸ In addition, advocates of net neutrality also claim that the ISP would have an incentive to engage in anticompetitive behaviour even if it has no market power at the infrastructure layer, and even if it is not vertically integrated. See Van Schewick (2007).

¹⁹ See, *i.a.* Hass (2007) and *infra*, Section 1.1.

²⁰ Many useful applications of DPI exist, including the inspection of email content by spam filters. All email providers use DPI to achieve this result.

- *Consumer-tiering.* ISPs may have an incentive to capture their end users' willingness to pay for internet access by differentiating their offer according to access speed offered. This is a typical case of price discrimination according to quality of service, as the one between economy class and business class on airplanes; as such, it is very mildly contested by net neutrality advocates.

Section 1.1 below illustrates whether these conducts are already adopted by ISPs – in a word, whether and to what extent the net is “neutral” today. Section 1.2 assesses the role and incentives of ISPs as platform operators in a multi-sided market context. Section 1.3 highlights the emerging demand for enhanced-QoS services, and the potential to reach higher social welfare by striking efficient transactions between IAPs/ICPs wishing to pay for higher QoS, and end users wishing to pay to receive higher QoS. Section 1.4 concludes.

1.1 The net is not neutral!

One of the often neglected aspects of the current debate on net neutrality is that, although the Internet was initially conceived mostly as relying on “dumb pipes” and placing intelligence at the edges, a lot of intelligence has been built and is operated also at the core of the network, and is used to shape traffic more efficiently. In a nutshell, the Internet, as it currently stands, is very far from being neutral, as traffic shaping and also application blocking already occur in many areas and layers of the network, mostly due to packet-sniffing technologies such as Deep Packet Inspection (DPI) at the logical layer, and traffic acceleration (*e.g.* caching services) at the application layer²¹. Many fixed-line (both cable and Fibre/DSL) operators ban some forms of traffic – mostly BitTorrent and other P2P traffic; and wireless operators in Europe reportedly ban nomadic VoIP providers such as Skype, or VoIP functionality altogether²².

Even more interestingly, many champions of net neutrality are not behaving themselves “neutrally”: for example, the most quoted victim of net diversity, Vonage, uses equipment that is able to prioritize its voice traffic over other data traffic, including data from competing VoIP providers²³; Google has paid a fortune to become YouTube's and Firefox's preferential search engine, and currently contributes, together with Comcast and other players, to the Clearwire 4G project, where all searches will be filtered primarily by Google itself as preferential search partner²⁴.

²¹ A packet sniffer (also known as “network analyzer” or “protocol analyzer”) is software or hardware that can “intercept and log traffic passing over a digital network or part of a network”. The sniffer can capture each packet and eventually decode and analyze its content. See, *i.a.*, Frieden (2007).

²² This occurred, for example, in the UK with the removal of VoIP functionality from Nokia N95. See *Mobile operators lock VoIP features*, by David Meyer, 20 April 2007, at <http://news.cnet.co.uk/mobiles/0,39029678,49289855,00.htm>.

²³ Hass (2008).

²⁴ See, *i.a.*, Hazlett, T., *On a Clearwire, you can see everything*, Financial Times, 23 July 2008, at <http://www.ft.com/cms/s/0/dac15122-58cc-11dd-a093-000077b07658,s01=1.html>.

The non-neutrality of the Internet is confirmed and, to some extent, praised also by authoritative spokesmen of the IT world. For example, David Clark (2008), one of the authors of the end-to-end principle (often misunderstood as the “dumb Internet” principle), recently acknowledged that “[t]he internet is not neutral and has not been for a long time”: access-tiering and smart traffic prioritization have always been features of the TCP/IP protocol²⁵. Accordingly, “[t]here is not a state of grace to get back to” in the net neutrality debate²⁶. On the other hand, Tim Berners-Lee recently clarified that net neutrality is far from revolving around non-discrimination and prohibition of tiering (at least, of user-tiering). As he observed, “Net Neutrality is NOT saying that one shouldn’t pay more money for high quality of service. We always have, and we always will.”²⁷

The fact that the Internet is not neutral entails that there is no *status quo* currently under attack by greedy ISPs wishing to shape the world according to their (by the way, legitimate) business interest²⁸. To the contrary, net neutrality advocates look for entirely new regulation mandating a wholly new set of rules, realizing a wholly new equilibrium between the different layers of the Internet. Regulators are increasingly aware of this problem: for example, Peter Ingram (2007) from UK regulator Ofcom recently observed that traffic shaping already exists at the core of the network, and that the majority would suffer if shaping were prohibited²⁹. And the European Commission has recently stated that product differentiation through traffic prioritisation and network management is, in general, desirable, as it opens up new opportunities for ICPs and increases consumer choice³⁰.

In conclusion, the net neutrality debate must be approached by having in mind that we live in a non-neutral world: this also means that openists are the ones proposing a “change” in the current Internet architecture, not the ones resisting to change proposed by others; and that such change must be appraised just like

²⁵ Haas (2008) observes that “a free, deregulated internet and a dumb internet backbone network did not exist even in 1984 when Saltzer, Reed, and Clark weighed the concepts”.

²⁶ See <http://blog.wired.com/27bstroke6/2008/05/net-neutrality.html>

²⁷ See the blog post by Tim Berners Lee, available at <http://dig.csail.mit.edu/breadcrumbs/node/144>. See also George Ou’s blog post, *A rational debate on Net neutrality*, explaining the existing agreements aimed at reserving band portions to business customers.

²⁸ See also Faulhaber (2007), rejecting the “a bit is a bit is a bit” idea and, quoting Blumenthal and Clark (2003), observing that “this particular vision of the Internet as pure end-to-end was probably never true in practice and if it were it would certainly be a bad idea”.

²⁹ See presentation by Peter Ingram, Ofcom’s Chief Technology Officer, *Should Regulators be Concerned about Net Neutrality?*, available online at http://www.ofcom.org.uk/media/speeches/2006/12/net_neutrality_111206.pdf

³⁰ See the Commission’s Impact Assessment on the proposed review of the e-communications framework, stating that “product differentiation is generally considered to be beneficial for the market (particularly in industries with large fixed and sunk costs) so long as users have choice to access the transmission capabilities and the services they want. Allowing broadband operators to differentiate their products may make market entry of content providers more likely, thereby leading to a less concentrated industry structure and more consumer choice”. SEC(2007)1472, at 91, note 208 and accompanying text.

any other policy – *i.e.* comparing its costs and benefits with the costs and benefits of alternative policy options, including the “zero” or “do nothing” option. Perhaps the most balanced way of approaching the issue is the following: with the migration to NGNs, some authors and industry players express concern that already existing practices such as traffic shaping may be more intensively used by ISPs, negatively affecting the openness and pluralism normally attached to the “network of networks”. Where does the line fall between “good” and “bad” network management, is the real unresolved issue.

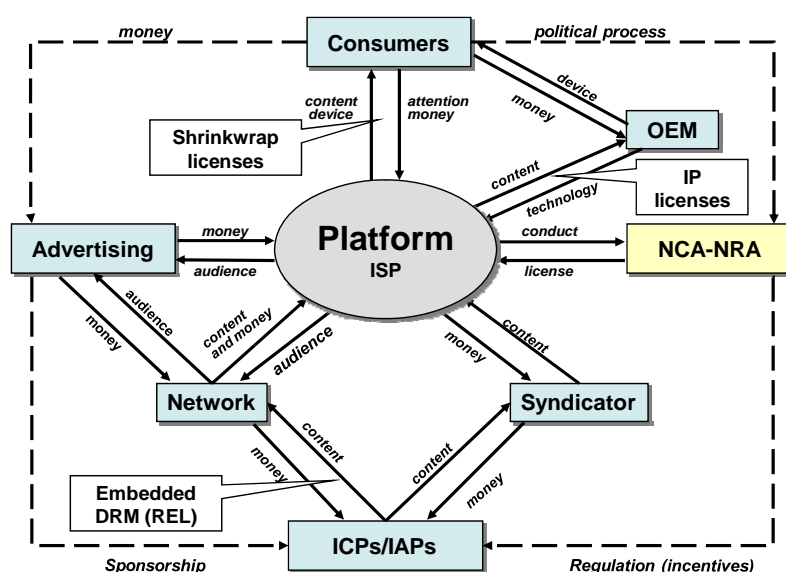
1.2 The supply side: ISPs as platform operators in multi-sided markets

The role of ISPs in a layered NGN architecture is of course essential, but also tricky. Understanding the incentives and choices ISPs face when deciding whether to set up a broadband platform is essential for a thorough understanding of the muddy economics of net neutrality.

In all-IP networks, ISPs act as intermediaries between end users and IAPs/ICPs, just as yellow pages match consumers and advertisers, broadcasters allow content distributors and advertisers to reach the eyes of consumers; and developers of computer operating systems allow end user access to middleware and applications. In a word, NGNs are multi-sided markets, where supply (IAPs, ICPs) and demand (end users) meet on a platform provided by the ISP³¹.

The multi-sided nature of NGNs entails that ISPs will be able to build a successful platform only if they manage to strike the right balance between the interests and preferences of end users and those of IAPs/ICPs, plus all the interests of other platform users such as device producers, DRM developers and advertisers. The take-up of a given platform, moreover, crucially depends on the platform operator’s ability to attract complementary products and services from all layers of the NGN architecture – including access to a broadband network, access to premium content and key applications, connectivity with supporting hardware devices, and a sufficiently large customer installed base to attract advertising investment. Figure 2 shows the interdependency between all players on the value chain and the central role of platform operators. The typical setting in the net neutrality debate is one where the platform operator is also a network operator and is vertically integrated as an IAP and/or ICP.

³¹ See Evans (2003), Rochet-Tirole (2004), etc.

Figure 2 - Multi-sided digital platform

Source: Elaboration on Poel, Renda and Ballon (2007).

From the viewpoint of ISPs, creating a successful platform means thus “getting all sides on board”, and securing that the platform can offer high-quality content, killer applications, attractive services and appealing devices before the platform operator can successfully plan to attract consumer demand and consequently revenues from consumer, advertisers, or both.³² This strategy requires a careful exploitation of indirect and direct network effects, but can prove extremely complex, as players face a “chicken or egg” problem³³. Such a dilemma can be solved only by carefully using two strategic variables, pricing and quality of service.

The economic literature on multi-sided markets explains that ISPs should price higher on those categories of users that have a stronger willingness to pay, as they attach a high value to the platform. A peculiarity of multi-sided platforms is that the optimal price structure is completely unrelated to the underlying cost of the service provided to each side – to the contrary, it is a function of indirect network effects.

In broadband platforms, indirect network externalities will materialise on the two sides of the platform: (i) the platform is more valuable to end users, the higher the number of applications and the wider the choice of content that can be reached through the ISP’s network; (ii) at the same time, the platform is

³² Platforms, in this respect, share the same features as system goods, and all players on the value chain can be defined as complementors of the same complex product. See, for an early contribution, Shapiro and Varian, *Information Rules*, 1998, Harvard BS Press.

³³ Evans (2003), Rochet-Tirole (2004). A similar statement is found in the policy conclusions of Marsden and Cave (2007).

more attractive for an IAP/ICP, the greater the number of its subscribers, as applications and contents can reach more users and “eyeballs”. In more qualitative terms, (iii) the platform is more attractive for end users, the higher the quality of the services and applications they have access to, especially for QoS-sensitive applications³⁴; and (iv) given that the end users are more willing to pay for high-QoS services, especially in QoS-sensitive applications (VoIP, IPTV, online gaming, etc.), also IAPs will be more willing to pay the ISP to secure a high QoS on the ISP network.

The optimal pricing structure for an ISP wishing to develop a broadband platform is hard to predict, as economists agree that the right balance between all parties would have to be seen on a case-by-case basis, and often requires trial and error³⁵. However, the peculiar features of all sides of the market suggest that charging only end users for access would hardly be an optimal strategy. To the contrary, many similar multi-sided platforms decide to charge a very low price to end users, in order to build a sufficient customer installed base, and then ask application and content providers to pay for reaching these users with sufficient QoS. However, under mandatory net neutrality an ISP would be forced to charge only consumers, at most versioning offers in terms of access speed (consumer-tiering). This, in turn, means that the price of Internet access to end users will be very high, as subscribers will bear the full cost faced by the ISP in setting up and running the platform³⁶.

On the contrary, allowing ISPs to subsidise access through QoS fees and a certain degree of application-tiering would rebalance the pricing structure of the platform, allowing for greater demand and participation of all users to the platform. Along a similar line of argument, Darby (2007) calculated that if carriers could recover as low as 10% of the common costs of building an NGN from content providers, the consumer welfare gains over a 10-year period would reach \$8 billion. Likewise, Sidak (2008) extends this rationale to all broadband users, not just to NGNs, and estimates that such a subsidy would allow broadband access providers to reduce their access prices to end-users by \$5 to \$10 per month, with savings ranging from \$3 billion to \$6 billion per year. This reduction in cost would also have very desirable consequences in terms of number of subscriptions to broadband networks. Sidak (2007) finds that as a consequence to a \$5 price reduction in the monthly access price, an additional 14.3 million homes would subscribe to broadband access, given current estimates on elasticity of demand for broadband.

³⁴ For example, the availability of VoIP does not in and of itself add much value to the platform, if the VoIP service exhibits very bad quality, delays and feedback, so that it will never be considered as a reliable substitute to PSTN telephony.

³⁵ See, *i.a.*, Faulhaber (2007).

³⁶ For example, an end user values the platform more if the number of applications available on that platform, or also the quantity and quality of content, increases. Likewise, a platform x has a greater value to an IAP the greater the number of subscribers to x . ICPs would be more willing to pay for posting their content on x if x has a large user installed base. See, *i.a.*, Evans (2003), Rochet and Tirole (2004).

Moreover, approaching net neutrality from a multi-sided market perspective is also useful as it implies that no real difference exists between consumer-tiering and application-tiering: they are both forms of user-tiering, but users belong to different sides. From an economic viewpoint, there is no difference between price discrimination applied to one side of the market (users) and discrimination on another side (IAP, ICP).

Even more importantly, the economics of two-sided markets explains very clearly that the only player able to devise an optimal way of balancing interests on all sides of the platform is the ISP. Only platform operators would know whether pricing tools to segment the heterogeneity of demand, such as peak load pricing or volume pricing, are fit for their own platform and subscriber base. A rigid regulatory environment hampering any mixed pricing structure and quality management would simply kill any attempt to set up successful platforms, and consequently also service innovation, infrastructure deployment, broadband uptake, and ultimately consumer welfare.

1.3 The demand side: enhanced-QoS applications

The problem raised by net neutrality advocates is, at first blush, easy to solve. In virtually all markets, demand for higher quality is normally matched by suppliers through the supply of higher quality. Examples are virtually endless. Users wishing to ship envelopes with guarantee of delivery within a given time-span pay a higher price to express couriers (*e.g.* DHL, UPS, FedEx, etc.). Travellers wishing more comfort and more flexible travel conditions pay higher prices for enhanced QoS on airplanes by purchasing business class tickets or more flexible fares³⁷. Producers of food and beverages wishing to attract consumers to their products in supermarkets pay for display space and best shelves. Advertisers wishing to appear on the top right area of Google's search engine – the best area on the desktop devoted to commercial ads – place their bids in Google's auctions and eventually pay more money to secure this privileged position and a better “click-thru” rate³⁸. Spectators wishing to enjoy a privileged view of the scene and an enhanced experience in theatres pay front row tickets at a higher price.

Broadband platforms make no difference. ISPs, in trying to get all sides on board, have the possibility of reserving bandwidth for some specific uses that require a minimum or guaranteed QoS. If they are unable to provide such services to end users, the value of their platform to them would be significantly reduced. More in detail, ISPs know that, if a sufficient portion of end users demand applications that require a high QoS, inability to match this demand would mean losing profits twice: first, because customers would attach a lower value to the platform (reduced demand from the side of end users); secondly,

³⁷ For a similar example, see Marcus (2007).

³⁸ See Varian (2007), *Position Auctions*, International Journal of Industrial Organization 25, 1163–1178.

because customers would be less attractive for IAPs wishing to serve them (weaker indirect network effects)³⁹.

To the contrary, if the ISP can manage to extract more value by matching the demand and supply for QoS-sensitive applications, overall welfare would certainly increase. This, however, requires that ISPs are able to efficiently discriminate between applications by prioritising some forms of traffic over others – something net neutrality advocates would not welcome.

But how can ISPs achieve this efficient discrimination? Overall, they should locate the existing demand for higher-than-average quality services and the corresponding supply. Secondly, they should anticipate the emerging new sources of demand for these services, and conceive an efficient response to this trend.

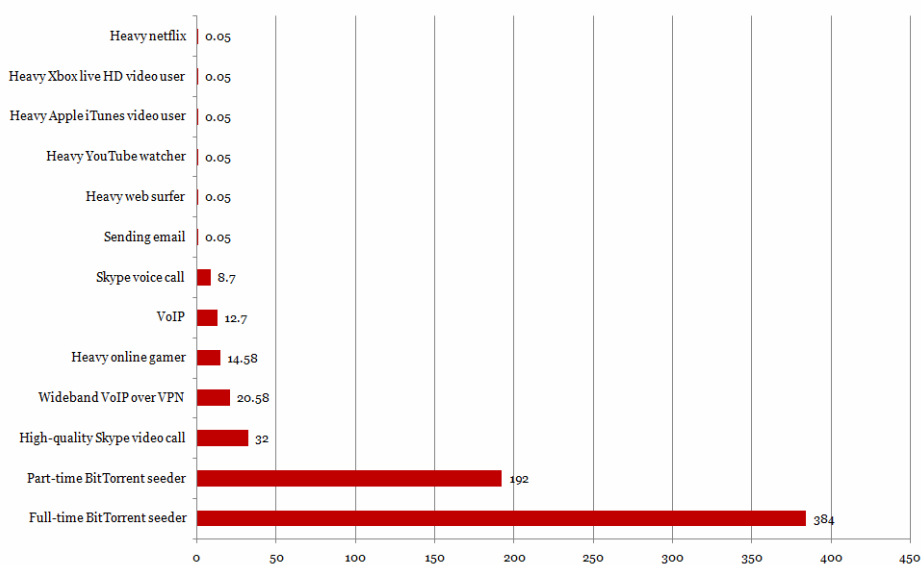
- As regards the existing demand from the end user side, caching services such as those provided by Akamai or prioritisation services offered by PlusNet confirm the growing need for “better than best-effort” services⁴⁰. Business users wishing to enjoy higher QoS – including reliability, security of data transfer, timeliness of voice signals in conference calls, etc. – need sufficient speed and security to efficiently migrate to new services: are we sure that denying the possibility of a business class ticket on the Internet is welfare-enhancing? The same can be said for residential users having to decide whether to abandon traditional voice telephony for VoIP, or analogue TV for IPTV: only a high QoS can lead them to the water.
- Alongside with this increased demand, the heterogeneity of end users has also remarkably increased: some users require only modest bandwidth (*e.g.* for checking their email and reading online news); whereas so-called “bandwidth hogs” consume much more (*e.g.* for movie downloads, p2p exchange, etc.). Figure 3 below shows an elaboration by George Ou (2007) of ZDNet, completed in occasion of the FCC hearings on Comcast’s network management practices at Harvard University in February 2008. As shown in the picture, some applications such as BitTorrent are way more bandwidth-intensive than others⁴¹.

³⁹ See Faulhaber (2007), stating that “Actions which make their offering less attractive to customers hurts the profitability of the firm both directly (lost customer revenues) and indirectly (reduction in their attractiveness to application providers).”

⁴⁰ See Haas (2008). Akamai Technologies delivers content on behalf of its customers using a widely dispersed network of servers. Akamai’s acceleration services improve both performance and reliability for content providers by delivering content to end users with enforced QoS and distributed delivery. Akamai’s site accelerator service can cache a content provider’s data on Akamai’s worldwide network of servers. Its enhanced QoS service provides customers with “high performance and reliability” that it has described as critical to user experiences.

⁴¹ For Wideband VoIP over VPN, Ou (2008) used Corporate VPN telecommuter worker using G.722 codec at 64 Kbps payload and 33.8 Kbps packetization overhead; VoIP is obtained with reference to Vonage or Lingo SIP-based VoIP service with G.726 codec at 32 Kbps payload and 18.8 Kbps packetization overhead. In addition, email sending considers 29,976 kilobytes of mail over a 56-days timeframe, averaging 0.04956 Kbps.

Figure 3 – average upstream Kbps



Source: Ou (2008)

Table 3 below, also developed by Ou, illustrates the different usage patterns associated with different applications, including downloads. As shown in the table, applications like Netflix Video on Demand or P2P downloading currently consume a lot of bandwidth. Compared with monthly caps such as those applied by cable operators Comcast and Time Warner in the US, this yields a daily “budget” of less than 5 hours. This suggests that also in Europe, as flat-price streaming services become more widespread – as is likely to occur for video streaming in an NGN environment – users will become more like the current P2P “bandwidth hogs”.

Table 1 – bandwidth and usage intensity for some applications

	Bandwidth (Kbps)	GB per month (nonstop usage)	Comcast daily budget (hours)	Time Warner pre-metered daily budget (hours)
VoIP or Online Gaming	80	25.92	No limit	No limit
YouTube Standard	320	103.68	No limit	9.26
YouTube High Quality	640	207.36	No limit	4.63
Netflix Video on Demand	4000	1296	4.63	0.74
P2P upload	384	124.416	No limit	7.72
P2P download	6000	1944	3.09	0.49

George Ou, Senior Analyst
 Information Technology and Innovation Foundation
 www.itif.org

Comcast 250 GB monthly
 Time Warner 40 GB monthly

Absent any traffic shaping by ISPs, problems would skyrocket: in particular, as already occurs (especially in European countries), very intensive users may eat up most of the bandwidth and negatively affect the user experience of other, less demanding users – have you ever experienced a slowdown in your

service because someone else in house was downloading a movie from BitTorrent? Traffic shaping may take different forms in this case, all of which are potentially desirable: (i) on the one hand, peak load pricing can prove useful in times of congestion, as occurs, for example, in electricity markets; (ii) volume-based pricing is already being used by US carriers in order to more effectively segment the demand and avoid both congestion and cross-subsidisation between heavy users and lighter ones⁴², though this option is unlikely to tackle all problems of congestion, and especially “jitter”⁴³; and (iii) bandwidth caps for p2p traffic are also being experimented to avoid degrading the quality of user experience for all users wishing to use other, less bandwidth-intensive services.

- Concerning other sides of all-IP platforms, ISPs also face strong demand for high-QoS services from IAPs and ICPs. Assuming competition between ISPs, content and application producers will pretend, when negotiating distribution through the ISP, a sufficient QoS – and this is what they actually do. If ISP are not able to reserve part of the bandwidth to ensure that these services are supplied efficiently, economically efficient transactions would not be possible, to the detriment of consumer and social welfare.

In conclusion, ISPs face a very differentiated demand from platform users, encompassing end users, on one side, and IAPs/ICPs on the other. In addition, with the advent of new services such as IPTV, this demand is likely to become stronger in the future. And especially for IPTV, the impossibility to prioritise packets may determine the impossibility of providing a satisfactory experience to end users, due to the high bandwidth and very low delay requirements⁴⁴.

All these developments lead to a torturing dilemma: on the one hand, everything seems to suggest that traffic management and prioritisation of certain bits over others is the only possible way to ensure that the emerging demand for new services is satisfied, and consumer welfare thus served. On the other hand, this also means that the Internet may become a “two-speed” network, where some services enjoy priority over others. This, according to some commentators, may deprive the Internet of its stunning revolutionary potential to enable the bottom-up emergence of new services such as the “next” Napster, YouTube and MySpace, which would inevitably be left in the “dirt track” of the Internet.

⁴² Recently, Comcast announced it has begun a test to slow the transfer of files to individual subscribers who are its heaviest users during congested periods. Also Time Warner Cable announced that it plans to start testing metered Internet access, charging consumers \$1 for each gigabyte of content over their allotment. However, it must be recalled that volume caps or metered pricing only deal with average consumption over the course of an hour or a day, not peak consumption on the network, which causes problematic congestion.

⁴³ Metered pricing cannot deal with microscopic congestion storms called “jitter” that last from 0.1 seconds to 2 seconds. During these sub-second congestion storms, delay-sensitive applications such as online gaming or VoIP will break. See, *i.a.*, Felten (2006), at 4.

⁴⁴ See, *e.g.* George Ou, *Why HD Movie Downloads are a Big Lie*, ZDNet Blog Post, March 31st, 2007.

The latter argument is however misleading both in the premises and in the conclusions. Since the net is not neutral today, why hasn't the Internet become a two-speed machine with a dirt track and a fast lane? If net diversity is not a (bad) future prospect, but is the continuation of what already occurs today, why should we change it? In short, why fix what ain't broke?

Some explanations for the persistence of a reasonably "open" Internet have already been given – the most acrobatic being that ISPs are trying to behave properly since they are under the spotlight, but will soon change their behaviour in the future⁴⁵. But once the peculiar economics of broadband platforms are duly taken into account, it becomes clear that end users play a very important role in dictating the features and average quality of their Internet experience. In doing this, they exercise a true disciplining effect on market conduct by platform operators: in a nutshell, as recalled by Viviane Reding, end users choose every day what they want to have and see on the Internet: the real challenge for ISPs, IAPs, ICPs and all other players in the value chain is to follow suit with the most effective set of applications and services.

2 Net neutrality and competition

The previous section turned down most of the key concerns expressed by net neutrality proponents, and in particular those related to the end-to-end principle and the dangers of network management. Being platform operators in two-sided markets, ISPs can increase social welfare by engaging in network management and more effectively matching the demand of end users with the demand by IAPs and ICPs. Even without specific regulation, ISPs would be unlikely to block applications or virtually foreclose content from their platforms: to some extent, what is bad for IAPs and ICPs is also bad for the ISP, as indirect network effects ensure that the platform's value to end users increases along with the applications and content available on it. This, alone, suggests that mandating net neutrality through rigid *ex ante* regulation would make little sense from an economic viewpoint.

There is, however, a different side of the story, which can be seen as the pathological degeneration of a physiologically desirable situation. This occurs:

- (1) whenever the ISP is vertically integrated into the higher layers, and has an interest in foreclosing competing IAPs or ICPs to secure that its subscribers use its own services and applications; and
- (2) whenever an IAP or ICP has an interest in "closing" the architecture by paying the ISP to obtain exclusive QoS, which is not available to competitors on the ISP's platform⁴⁶.

Of the two cases, the former is the most commonly cited by net neutrality proponents. Below, I briefly analyse both settings.

⁴⁵ Faulhaber (2007), at 697.

⁴⁶ See Faulhaber (2007) for this case.

2.1 Foreclosure by a vertically integrated ISP

Assume an ISP x is vertically integrated as VoIP provider. This being the case, the ISP could decide to:

- (i) Block competing VoIP providers (as in *Madison River*: x is the only VoIP service available to subscribers of x);
- (ii) Reserve part of the bandwidth only for its VoIP service, thus securing a competitive advantage over rivals (x 's service has guaranteed QoS, the others are provided under "best-effort": all these services are available on x 's platform)⁴⁷;
- (iii) Ask competing VoIP services to pay for QoS, if they wish to compete with x 's VoIP with the same QoS level (x 's service and also competing services have guaranteed QoS, and all are available on x 's platform).

Of the three conducts mentioned above, the first is the least likely to occur. This is confirmed both by theory and evidence. By theory, since reducing the number of applications available on an ISP's network also means reducing the value of the platform to end users. By evidence, since the *Madison River* case has remained an isolated case – and only wireless operators have decided to block Skype in some cases, due to its "supernode" features, problems of bandwidth and business model⁴⁸.

The second case are indeed likely to occur – and actually do occur in practice. For example, cable operators in the US create a different circuit-switched network for their own phone and TV service, reserving often more than 90% of their frequency spectrum over their cable infrastructure, and leaving only a few channels to their Internet service, where other players can rely on best-effort service⁴⁹.

The latter case may occur in a future NGN environment, especially if net neutrality is not mandated by legislation. This scenario would possess the rare virtue of allowing for sustainable competition between infrastructure-based providers (the ISP) and nomadic players (the "Googles" and "Yahoos") in the provision of competing services. One of the consequences of this scenario would be that the price applied by ISPs to competing VoIP providers would have to be such as to create a "level-playing-field" between players facing completely

⁴⁷ A similar case occurs when the ISP intentionally degrades the quality of competing VoIP services, by denying priority to their services. This may occur also if an ISP does not offer jitter-correction services to VoIP providers for their applications.

⁴⁸ For wireless operators, the "walled garden" model is often a forced choice, due to bandwidth limitations. As stated by the OECD, "[t]here is a difference between fixed and mobile networks in that mobile operators must rely on scarce spectrum resources through licensing requirements and may find it more difficult to expand capacity to meet demand growth". See OECD, *Mobile multiple Play: new service pricing and policy implications*, DSTI/ICCP/TISP(2006)1/FINAL, at 40. Skype or other applications have been blocked also due to problems with the phone vendor: this was the case of Apple, as long as the iPhone store was not entirely set up.

⁴⁹ Also telecom operators may do this by using a different and dedicated frequency for analog phone.

different cost structures. Another consequence is that the free-rider problem often denounced by ISPs would be solved, at least as regards services for which the ISP competes with nomadic players.

In all scenarios, the solutions devised by the ISP will be dictated by its own profit-maximising incentives, given market conditions. For example, if there are many competing ISPs, and some of them allow a number of VoIP providers to compete with high QoS, also x may decide to follow a similar strategy, and the negotiated price for QoS will be likely to approximate the competitive level, thus creating a true level-playing field for VoIP providers on x 's platform.

However, if the ISP has market power, it may use such power *vis à vis* nomadic providers, thus placing them at a competitive disadvantage. If VoIP providers have no countervailing buyer power, this may result in undesirable outcomes such as margin squeeze – *i.e.*, the “wholesale” price paid by nomadic VoIP providers to x is too high to allow them to price competitively at retail level; or non-price discrimination – *i.e.* intentional degradation of the QoS granted to competing VoIP providers to encourage end users to switch to x 's service.

All in all, this appears to me as a textbook case for antitrust enforcement against vertical integration by a firm enjoying market power in a primary market – in our case, access to broadband. As a result, far from calling for new legislation, this problem can be solved either by applying competition policy or, if any condition is found to warrant a more structural and systematic intervention, through *ex ante* price regulation – the latter case being made even more complicated by the multi-sided nature of the market at hand⁵⁰.

2.2 IAPs/ICPs looking for exclusivity or preferential treatment

Most of the net neutrality debate focuses on cases in which ISPs can allegedly stifle competition by discriminating against weaker IAPs or ICPs. However, as widely acknowledged, the Web is populated by very powerful champions of the application and content layer, which may enjoy rather strong bargaining power *vis-à-vis* ISPs, especially if the latter compete with other providers in the primary market for Internet access. In layered architectures, market power can come from any of the layers, and conditions for service provisions may be dictated by players other than the ISP⁵¹.

In particular, in order to set up a successful broadband platform, an ISP needs to secure that key applications and premium content are made available on that platform: as a matter of fact, user demand is driven much more by the applications and content available on a platform than by the ISP itself.

Against this background, one of the potential consequences of a non-neutral Internet is that one IAP or ICP could try to achieve or preserve a paramount position in its own relevant market by securing a privileged treatment by the

⁵⁰ In particular, the literature on multi-sided platforms suggests that for these markets, common cost allocation, cost-based pricing and many other traditional regulatory methods are not indicated. See *infra*, section 3.

⁵¹ Renda (2006).

ISP. This can lead to the following outcomes, very well known to scholars in the IT field:

- A very powerful IAP/ICP threatens to leave a platform if the ISP awards similar treatment to its competitors;
- A IAP/ICP pays a fee to the ISP to become its preferential provider in its own relevant market; or
- An IAP/ICP pays a fee to the ISP to obtain exclusivity.

The first case is very similar to what occurred in the US *Microsoft* case, where one of the alleged conducts was that Microsoft threatened OEMs to withdraw or modify the license for Windows, if they preinstalled Netscape Navigator in their browsers⁵². I thus assume this would become a matter for antitrust, not regulation, should such a behaviour occur in the broadband market. Such a conduct would be likely to create antitrust concerns whenever it risks foreclosing competitors from the relevant market, and thus also whenever the conduct is aimed at most or all ISPs active in the broadband market.

The second case corresponds to a widespread practice in the IT world. For example, Google pays a fee to be the preferential search engine of Mozilla Firefox and YouTube, and could decide to do it also with ISPs. This conduct is unlikely to create competition concerns, to the extent that it does not lead to foreclosure of competitors in the relevant market. However, when the IAP/ICP seeks exclusivity in a highly concentrated market for broadband access, end users may face an unacceptable restriction of competition: for example, they may have only one platform of choice (the ISP is a monopolist), and one search engine of choice (because it has secured exclusivity). In this extreme case, if demand for the broadband platform is sufficiently strong and rigid, the final outcome would portrait a world without choice, which certainly does not serve the interest of consumers.

Also this case, however, would be qualified as a case of vertical foreclosure and tackled by antitrust authorities as a standard textbook case. Accordingly, also in this case no specific regulation would be needed.

2.3 Conclusion: a solution in search of a problem?

Under the lens of economic theory and individual incentives, mandatory net neutrality does not pass muster. Although it is theoretically possible to imagine situations in which network operators would have an incentive to discriminate between applications or content, or even engage in port blocking, this does not seem to portrait a situation different from that occurring in many other markets. As a matter of fact, in all markets things can go wrong, but before intervening regulators normally wait for things to go wrong.

This section suggests that mandating net neutrality would not be a desirable option. For the problems that may arise, indeed a much softer form of

⁵² See Renda (2004) and Pardolesi and Renda (2005).

regulation could be needed – *e.g.* ensuring that end users are effectively informed of usage restrictions on available broadband platforms, and can compare available offers in the most informed way. And in addition, antitrust scrutiny is there to ensure that competition is not stifled by any of the players active on the complex value chain of multi-sided broadband platforms.

3 Do we need any new regulation?

The previous section has shown that what raises concerns among net neutrality advocates is mostly the risk of discriminatory conduct by ISPs holding market power in broadband Internet access. This corresponds to conduct considered as anticompetitive under ordinary antitrust rules: as a matter of fact, the fact that the debate emerged in the US is not surprising, given that on that side of the Atlantic antitrust laws have not been applied very often to telecommunication and information services, since *ad hoc* regulation – in particular, the 1996 Telecommunications Act – was in place⁵³. In 2004, the Supreme Court decision in *Trinko* clarified the boundaries existing between the FCC competences and conduct falling under antitrust laws⁵⁴. In addition, in the US broadband networks have been deregulated by the FCC since 2003, starting with FTTH and FTTB and lately also extended to DSL.

These features of the US market – in particular, no overlap with antitrust laws and extensive deregulation of broadband networks through “regulatory holidays” – are very far away from the European situation. In the EU, the 2002 regulatory framework is in place as an *ex ante* complement to *ex post* antitrust scrutiny, and antitrust laws have been extensively applied in the e-communications sector in the past years. This type of scrutiny has usefully complemented the reach of *ex ante* regulation, which in turn borrows most of its tools from antitrust practice.

Moreover, European antitrust laws are conceived and – most importantly – applied in a way that differs substantially from what occurs in the US. This is particularly evident when it comes to unilateral conduct (monopolization in the US *v.* abuse of dominance in the EU) and vertical agreements, *i.e.* the two types of conduct that are most closely related to the net neutrality debate⁵⁵. The more pervasive reach of antitrust in Europe, though often criticised, provides an additional guarantee that neutrality concerns would have an adequate forum for scrutiny, where appropriate.

Finally, also the peculiar design and scope of the EU regulatory framework for e-communications, and in particular its comprehensive set of remedies for cases of discrimination by a firm holding significant market power (SMP), or even in cases where no firm has SMP, constitutes a more solid safety net for end users, should discriminatory conduct emerge.

⁵³ See Renda (2006, 2007) for an overview.

⁵⁴ See *Verizon Communications v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398 (2004).

⁵⁵ See, *i.a.*, Fox, E. M. (2006), *Monopolization, Abuse of Dominance, and the Indeterminacy of Economics: The U.S./E.U. Divide*, Utah L.R. Vol. 3, 725.

This section briefly considers whether existing rules – both the *ex ante* regulation and *ex post* antitrust scrutiny – are sufficient to tackle net neutrality concerns in Europe. Section 2.1 describes antitrust rules, whereas Section 2.2 describes the existing rules contained in the 2002 regulatory framework for e-communications, and the current proposal advanced by the European Commission.

3.1 Antitrust law

Discriminatory conducts identified as relevant for net neutrality, if adopted by a dominant ISP, correspond to items in the EU trustbuster’s toolkit. In particular, port blocking by a dominant ISP would be addressed as refusal to deal under Article 82; intentional quality degradation and tiering would be defined as discrimination, also covered by Article 82 (*i.e.* “applying different conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage”); exclusive agreements between a dominant ISP and IAPs/ICPs may fall under Article 81, and could be justified only if, as specified at Art. 81(3), they lead to efficiencies that are shared, to a large extent, by end users.

As confirmed by developments in the case law of the European Court of Justice, dominant firms in the EU are considered to hold a special responsibility *vis à vis* their rivals and end users, which – however vaguely defined – should lead to an enhanced attention towards preserving competition in the relevant market. The “special responsibility” is often recalled in instances of “essential facilities”, where the scrutinised undertaking holds an asset that is not easy to replicate in a way that is both technically and economically viable. Both concepts (special responsibility and essential facility) are subject to debate in the EU, and have in practice been applied in several cases by the European Court of Justice. In particular, if applied to the net neutrality setting, the essential facility doctrine would lead – where appropriate – to mandating competitor access at FRAND conditions on the dominant ISP’s network, and to the impossibility of discriminating between IAPs and ICPs unless very specific circumstances are verified.

The cases in which Article 82 can be applied to the net neutrality setting are briefly described below.

3.1.1 Refusal to deal

In order for port blocking to be considered as a refusal to deal under Article 82, a number of conditions have to be verified. In particular, the doctrine of refusal to supply has been shaped under the essential facility heading in cases such as *Bronner*, *Magill*, *IMS Health* and, lately, *Microsoft*. The four conditions that need to be observed for an antitrust authority to sanction an ISP for anticompetitive refusal to supply are the following:

- The ISP refusing access must be dominant in its relevant market – this means, *i.a.* holding a significant market share, being shielded from potential

entry of competitors in the short to medium-term, and facing no significant countervailing buyer power from IAPs/ICPs that lament exclusion;

- The refusal must have fallen on an essential element, without which the alleged victim cannot reasonably operate in the relevant market;
- The effect of the refusal must be that of impeding the entry into the relevant market of a new product, potentially subject to significant stand-alone demand by end-users; and
- The refusal must not be “objectively justified”.

For some years, especially after the ECJ decision in *Magill* and *IMS Health*, the application of these criteria has been rather intuitive. In particular, the first two conditions would occur whenever there is virtually no alternative to reach end users than to rely on the refusing ISP’s network: this immediately leads to the foreclosure of IAPs/ICPs that have been refused access from the relevant market. However, based on *Magill*, the ISP’s refusal would have to prevent a new product from entering the relevant market – which could sometimes be the case for ICPs, but is unlikely to be often the case for IAPs, unless the application they wish to use on the ISP’s network is a brand new one.

However, the recent CFI decision in *Microsoft* has changes significantly the interpretation of the “new product” screen in cases of refusal to grant interoperability. The CFI, in particular, affirmed that for the new product test to be satisfied, it suffices that the ISP’s conduct deprives competitors in a secondary market of the possibility to compete on an equal footing: no proof of a really “new” product or service is needed, if not the proof that, absent the refusal opposed by the dominant undertaking, competitors could reorganise themselves and eventually offer new products and contribute to technological advancements in the market at hand⁵⁶. If this interpretation will be confirmed in future judgments, excluded IAPs/ICPs would not need to prove that the product being foreclosed was actually “new”.

Finally, the “objective justification” screen has been very narrowly interpreted in past cases and in the literature, and is mostly confined to reasons of security and integrity of one’s own product. This also means that, if an ISP blocks an IAP/ICP because granting access would seriously threaten the security or integrity of its own network, then such refusal would not be considered unreasonable under community antitrust laws⁵⁷.

In conclusion, in principle port blocking by a dominant ISP can be effectively tackled by Article 82 under the “refusal to deal” heading, provided that some

⁵⁶ See Pardolesi and Renda (2004); and more recently, C. Ahlborn and D.S. Evans, (2008), *The Microsoft Judgment and its Implications for Competition Policy Towards Dominant Firms in Europe*, at <http://ssrn.com/abstract=1115867>.

⁵⁷ As one of the most famous advocates of net neutrality regulation, Tim Wu, recently explained, exceptions could be foreseen whenever neutrality could impair network integrity and/or security, or when derogating from neutrality can prevent users from interfering with others by implementing bandwidth limits, spam, worm, and virus protection, and limits on denial of service attacks. Tim Wu (2004), *The Broadband Debate: A User’s Guide*, 3 J. ON TELECOMM. & HIGH TECH. L. 69, at 95.

clarifications are introduced on the meaning of “new product” and “objective justification”.

3.1.2 Leveraging, discrimination and quality degradation

Article 82 also covers cases in which a dominant undertaking applies “different conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage”, as recalled by the ECJ in *Tetra Pak*. This, in turn, means that an IAP/ICP that was discriminated by a dominant ISP (especially if vertically integrated) through quality degradation could claim that it was placed at a competitive disadvantage by conduct, the purpose of which was to apply different conditions to transactions that – even if not identical – were equivalent.

Note that this conduct would only be sanctioned in antitrust terms whenever the quality-degraded application is in the same relevant market of other applications (for example, the ISP’s own application) that are granted higher QoS. Antitrust only challenges these situations, not cases in which traffic is prioritised to award precedence to some “relevant markets” over others⁵⁸.

As a result, the statement according to which antitrust laws can tackle all behaviours contested by net neutrality proponents is imprecise. Application-tiering is not covered by the scope of antitrust laws, if not in cases where the ISP favours its own (or its preferred) service over competing ones, which are placed at a competitive disadvantaged.

This case would mostly fall under the “leveraging” heading. Article 82 has been often applied to conduct aimed at leveraging market power from a primary market into an adjacent market (or an aftermarket). As we concluded in the previous sections, an ISP holding market power at the physical layer may have an incentive to monopolize an adjacent market or, at least, to vertically integrate to seek more profits at the expenses of competitors⁵⁹. In antitrust terms, this conduct is termed (offensive) leveraging of market power. The possibility of welfare-reducing leveraging is a recurrent argument used by post-Chicago economists to challenge the Chicago “single monopoly profit” theorem, according to which a monopolist in a primary market would have no incentive to attempt to monopolise an adjacent competitive market, as there is only one monopoly profit to be reaped⁶⁰.

Against this background, the European Commission has had the chance to clarify its position on leveraging during the EU Microsoft case decided in 2004 and later by the CFI in 2007. As already clarified *supra* for refusal to deal, here the recent CFI decision seems to suggest that a more openness-oriented

⁵⁸ The same, as observed by Huo et al. (2008), would occur for cases in which the ISP intentionally degrades the QoS of all non-prioritised traffic to encourage firms to buy prioritisation services.

⁵⁹ Van Schewick (2007).

⁶⁰ See M.D. Whinston, “Tying, Foreclosure, and Exclusion”, *American Economic Review*, Vol. 80, No. 4, 1990, pp. 837-859.

approach will be adopted by the Commission in leveraging cases entailing interoperability. Following the (rather awkward) rationale of the CFI in *Microsoft*, it appears obvious that a dominant ISP that adopts leveraging strategies to expand its dominion to higher layers will be sanctioned also if the ISP does not block any port, but uses contractual conditions and traffic management in order to achieve a paramount position in the target market, unduly discriminating against its competitors.

3.1.3 Vertical arrangements

Finally, net neutrality issues may arise, according to “openists”, whenever ISPs conclude preferential distribution agreements with IAPs or, most often, ICPs. This would occur, for example, if an ISP concluded a contract with a premium content owner to distribute some content with higher QoS than other types of content. Similar behaviour also occurs at higher layers – think, as one example, about Google’s contracts with YouTube or Mozilla Firefox to be the latter’s preferential search engine.

In any event, these types of agreements would be considered as vertical agreements under antitrust laws, and thus potentially subject to Article 81 EU Treaty. In particular, agreements exceeding the threshold for exemption are scrutinised under Article 81(1), based on their potential to foreclose rivals⁶¹. As stated by the ECJ in the famous *Delimitis* judgment, agreements that do not completely impede entry of new competitors (to the ICP) are very unlikely to be found restricting competition.

Overall, it seems that antitrust laws would not be sufficient to tackle preferential agreements between ISPs and ICPs for traffic prioritisation, unless these agreements seriously affect competition. This is not necessarily a bad thing: perhaps the fact that antitrust rules would not sanction this type of conduct means that it should not be challenged?

3.2 Sector-specific regulation

In force since 2003, the EU regulatory framework for electronic communications borrows most of its tools from antitrust scrutiny, and is firmly based in the principle of technology neutrality and – when appropriate – network openness. The framework rotates around the concept of Significant Market Power (SMP), explicitly equated to dominance under Art. 82 EU Treaty. The Commission has initially segmented the telecoms and media sector into a number of pre-defined relevant markets, which National Regulatory Authorities (NRAs) used as a default list of markets warranting *ex ante* regulation whenever SMP players are found to be existing.

⁶¹ Vertical agreements between ISPs and ICPs, where the ISP’s market share does not exceed 30%, would fall under the Block Exemption regulation 2790/1999 for vertical restraints, and as such would not be challenged by antitrust laws if a number of conditions are met (for example, the duration of the agreement should be less than 5 years).

Net neutrality mostly deals with cases in which there is SMP in the retail broadband market⁶². The list of markets provided by the Commission 2003 Recommendation, however, did not contain any retail broadband market. In November 2007, the Commission shortened the list by eliminating almost all retail markets, but kept a revised (and broader) version of the retail fixed-line market (market 1). This market does not coincide with retail broadband access, but the latter market could always be identified and defined by a NRA. If this is the case, under the 2002 regulatory framework ISPs notified as SMP players are automatically subject to remedies that are sufficient to tackle net neutrality concerns, including non-discrimination obligations, mandatory access and price control.

Even when no SMP is found, the current regulatory framework allows for the imposition of remedies under article 5 of the Access Directive: in particular, whenever end-to-end connectivity is jeopardised, NRAs can decide to mandate network interconnection to operators that control access to end-users. In addition, as regards content, access to specific digital radio and television broadcasting services can be mandated at fair, reasonable and non-discriminatory (FRAND) prices by NRAs if needed.

If no such market definition is reached by the NRA, then the matter will be left to *ex post* competition policy. This is a likely – and desirable – outcome, since a systematic application of remedies on dominant ISPs would hardly match the economics of net neutrality, according to which real competition problems may arise only under some, rather specific circumstances. In *Wanadoo*, the Commission has already clarified that activities in the retail broadband market pertain to the realm of antitrust scrutiny, more than to the one of *ex ante* sector-specific regulation⁶³.

3.2.1 The current proposal

Faced with a mounting debate, the European Commission has sought to clarify its approach to network neutrality in the recently proposed review of the e-communications regulatory framework in place since 2003. In particular, the Commission proposes to:

- Amend article 22 of the Universal Service Directive to allow NRAs to intervene and set minimum QoS standards whenever ISPs degrade quality to an unacceptable level, “thereby frustrating the delivery of services from third parties”⁶⁴.
- Amend article 20 of the same Directive by allowing member states to impose obligations of transparency, according to which end users have to be

⁶² Hou et al. (2008)

⁶³ See COMP/38.233, *Wanadoo Interactive*, 16 July 2003.

⁶⁴ The technical implementation of minimal QoS is still uncertain, and certainly does not lend itself to any “one-size-fits-all” solution. Accordingly, the Commission would have to study the matter in depth and possibly issue guidance for NRAs on how to define and monitor “minimal QoS” provisions.

clearly informed of whatever limitation imposed by their ISP on their ability to access any content and/or run any lawful application or service of their choice.

The Commission also clarifies in several passages of its impact assessment document that product differentiation through traffic prioritisation and network management can, in general, open up new opportunities for ICPs, increasing choice for consumers. As in all markets, investments to differentiate products and increase service quality and variety cannot be seen with disfavour, unless they lead to a reduction in customer choice and welfare. Accordingly, the Commission proposals appear meaningful, as they address the only “hole” in the available remedies at EU level – both regulation and antitrust.

However, the European Parliament is reportedly working on further amendments to the Universal Service Directive, which would introduce more rigid rules favouring net neutrality⁶⁵. Whether this precludes to a new wave of neutrality proposals, it remains to be seen. This paper has shown that such a move would be, at best, ill-advised.

3.2.2 Potential refinements

Even when competition law or sectoral regulation is applied to challenge behaviour by an ISP, this does not mean that the remedy should consist in reverting to fully “neutral” Internet, *i.e.* no traffic management. To the contrary, EU institutions may develop a set of remedies that could be applied in case market facts suggest the need to intervene. One such remedy could be prohibiting some forms of network management (*e.g.* shaping traffic according to the type of application) and allowing only protocol-agnostic network management (*i.e.* based on volume of traffic, not on type of traffic). Such a remedy, when needed, would still preserve the possibility, for ISPs, to manage their networks and provide each user with the best possible experience at a reasonable price⁶⁶. But absent evidence of a market failure, it would still be ill-advised to mandate it as the only possible way of shaping traffic.

Another possible refinement could be the adoption of a document setting policy principles that will be applied in the years to come, similar to the FCC’s 2005 Internet Policy statement. At European level, this document would take the form of a Commission communication, which would not bound NRAs and national governments, but would represent a key reference for all industry players and regulators in European member states. The forthcoming

⁶⁵ Already in the Trautmann report approved by the Parliament in July 2008, and which still does not address the Universal Service Directive, one of the key objectives of the regulatory framework has been changed: instead of “ensuring that there is no distortion or restriction of competition in the electronic communications sector, in particular for the delivery of content”, the Parliament added “the delivery and access to content and services across all networks”.

⁶⁶ Time Warner Cable said it will launch a service that charges new consumers of high-speed Internet service based on their usage. Broadband subscribers in Beaumont, Texas, will be charged \$1 per gigabyte above monthly allowances.

Commission communication on NGNs may already contain some of these useful indications.

4 Conclusion: A “holistic view” on net neutrality

The debate on net neutrality has dominated the scene for years in the US, but the claims of net neutrality advocates appear to be often missing the target in economic terms. As recalled by Tim Berners Lee on several occasions, network management and discrimination have always been a feature of the Internet, and at least some forms of discrimination and product differentiation are the very basis on which the whole “netiquette” is built. The fragile grounds on which mandatory net neutrality is built becomes even more evident, if one looks at how neutrality champions behave in their own markets: why should discrimination patterns and preferential lanes be allowed in higher layers, but not at the physical layer? From this viewpoint, claims of net neutrality appear more like the echo of a “NIMBY” syndrome – with players claiming that the Internet should be left open, but never mentioning their own markets.

This paper has shown that mandatory net neutrality is a competition and investment problem, not a regulatory issue. On the one hand, net neutrality seriously affects the degree and phenomenology of competition at the different layer of the value chain, and prevents ISPs from concluding both desirable and – in some cases – undesirable transactions with IAPs and ICPs. At the same time, competition affects neutrality, since the existence of strongly competitive markets at all layers of the value chain is likely to encourage ISPs to open up their networks and manage traffic more effectively, striking the most efficient balance between traffic shaping and network openness. This is a very well-known story after two decades of information revolution: many industries evolved from proprietary to more open architectures, as their basic technology becomes more mature. But without the possibility of establishing privileged links between complementary products, modular innovations such as the iTunes-FairPlay-iPod system would never have reached the market⁶⁷.

From the rationale exposed in previous sections, it also follows that the regulatory approach to net neutrality makes a real difference when it comes to incentives to invest in NGNs. Suffice it to say that:

- Those who invest in high-speed broadband platforms (especially if this includes network investment) reportedly do it to differentiate their products from competing ones;
- As already recalled, under mandatory network neutrality obligations ISPs would not be able to reach an optimal pricing structure, since they can charge only one side of the platform.

⁶⁷ See Poel, Renda and Ballon (2007). iTunes, with a proprietary architecture, now faces competition from products with semi-open architectures (*e.g.* DRM 10), and its users demand more openness, forcing Apple to revise constantly its DRM FairPlay. Likewise, the history of the PC industry testifies of modular architectures gradually been opened up to competition.

- In addition, the impossibility to price discriminate reduces (better, eliminate) the extent to which ISPs can appropriate part of the surplus generated by exchanges on their platforms for IAPs and ICPs.

Therefore, under mandatory net neutrality, ISPs would have very little incentives to invest in new digital platforms: as a matter of fact, they would have to cope with end users' own demand elasticity, and with the impossibility to charge IAPs/ICPs that use the ISP's network to reap enormous profits in exchanges with consumers. It doesn't take an experienced venture capitalist to conclude that an investment in infrastructure would be, to say the least, ill-advised.

The problem is even more delicate if approached from a "holistic" perspective: if the approach to net neutrality is coupled with the impact of other policies, the right "policy mix" can be more effectively identified. In the case of Europe, the fact that regulatory holidays are not considered to be an option to be pursued by NRAs and national government will arguably trigger service-based competition at the physical layer; given this regulatory approach at the physical layer, mandating net neutrality at higher layers would simply mean depriving ISPs of any incentive to invest in NGNs: they would not be able to draw significant revenues from wholesale access, nor from QoS fees, nor from access prices to consumers. The existing approach to regulation at the infrastructure layer – including the current discussion of functional separation as a potential remedy available to NRAs – is another important reason why Europe should not proceed in the direction of mandatory net neutrality.

In summary, mandatory net neutrality significantly distorts intra- and inter-platform competition, hampers optimal pricing structures by ISPs, reduces demand for NGNs by end users, allows for free riding by IAPs and ICP on ISPs' investment costs, and consequently stifles incentives to invest in NGNs by network owners. But perhaps one of the most undesirable (and probably unintended) consequences of net neutrality regulation is that it would not only hamper harmful conduct, but also many efficient transactions between ISPs and IAPs/ICPs, which would redistribute the cost of new broadband platforms in a more sustainable way between all users of new platforms⁶⁸. Such a solution would thus amount, in a word, to throwing the baby with the bath water. In the attempt to solve a potential problem, regulators would end up devising a cure that is much worse than the alleged disease.

For this reason, the solution originally devised by the European Commission – based on the provision of sufficient information to end users – seems to be the right, light-touch approach to a problem that remains more theoretical than

⁶⁸ For example, Ford, Koutski and Spiwak (2007) conclude that "consumers would pay higher prices, the profits of the broadband service provider would decline, and the sales of Internet content providers would also decline. Moreover, rules that prohibit the market from contracting efficiently may shift sales from content providers to the broadband provider's content affiliate, a result entirely inconsistent with the stated desire of network neutrality proponents. As the model shows, these unintended consequences of such network neutrality rules are the result of shifting costs to consumers that are more efficiently borne in the exchange between content and broadband providers".

practical. This approach, echoed also by the FCC in its recent judgment on Comcast, should be endorsed also by the European Parliament, without indulging in more pro-neutrality stances that, at the end of the story, are not in the interest of end users⁶⁹.

⁶⁹ See the FCC's press release of 1 August 2008, at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-284286A1.pdf.

Selected references

- Armstrong, M. (2006), “Competition in Two-Sided Markets, *Rand Journal of Economics*, Vol. 37, No. 3, Autumn 2006 pp. 668–691.
- Atkinson, Robert D. and Weiser, Phil (2006), *A 'Third Way' on Network Neutrality*, 30 May (available at SSRN: <http://ssrn.com/abstract=1004522>).
- Baumol, William J., Cave, Martin E., Cramton, Peter C., Hahn, Robert W., Hazlett, Thomas W., Joskow, Paul L., Kahn, Alfred E., Litan, Robert E., Mayo, John W., Messerlin, Patrick A.A., Owen, Bruce M., Pindyck, Robert S., Smith, Vernon, Wallsten, Scott J., Waverman, Leonard and Lawrence J. White (2007), *Economists' Statement on Network Neutrality Policy* (March), AEI-Brookings Joint Center Working Paper No. RP07-08.
- Botterman, Anderson, van Binst, Cave, Libicki, Ligtoet, te Velde, de Vries (2003), *Enabling the Information Society by Stimulating the Creation of a Broadband Environment in Europe: Analyses of Evolution Scenarios for Future Networking Technologies and Networks in Europe*, DG Information Society (MR-1579). Santa Monica: RAND.
- Cheng, H., S. Bandyopadhyay and S. Guo (2007), “The Debate on Net Neutrality: A Policy Perspective” (<http://ssrn.com/abstract=959944>).
- Cherry, Barbara A. (2006), “Misusing Network Neutrality to Eliminate Common Carriage Threatens Free Speech and the Postal System”, *N. KY. L. Rev.* 33: 483.
- Choi and Kim (2007), “An Economic Analysis of Net Neutrality and Investment Incentives: Who is right?” (available at <http://www.msu.edu/~kimbyun4/NN.pdf>).
- Clark, David (2006), “Net neutrality”, Keynote speech, Telecommunications Policy Research Conference, GMU Law School, Alexandria, Virginia, 28 September.
- Clark, David (2007), “The end-to-end argument in today's world: Do we have to destroy the principle to save it?”, 28 February (<http://www.communicationsresearch.net/events/article/default.aspx?objid=1835>).
- Crowcroft, Jon (2007), *Net Neutrality: the technical side of the debate. A white paper*, 37 ACM SIGCOMM Computer Communication Review 1, at 49 – 56.
- Economides, N. (2007), *Net neutrality, Non-Discrimination and Digital Distribution of Content Through the Internet* (http://www.stern.nyu.edu/networks/Economides_Net_Neutrality.pdf).
- European Commission (2006), ‘Staff Working Document’, 28 June. http://ec.europa.eu/comm/avpolicy/reg/tvwf/modernisation/consultation_2005/index_en.htm, at section 6.4, Net Neutrality.

- European Commission (2007), Proposal for a Directive Of The European Parliament and of the Council amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks, Directive 2002/58/EC concerning the processing of personal data and the protection of privacy in the electronic communications sector and Regulation (EC) No 2006/2004 on consumer protection cooperation.
- European Regulators Group (2007), 07(01) Working Programme for 2007. http://erg.eu.int/doc/work_progr_2007/erg_07_01_work_programme_2007.pdf, at 7.
- Felten, Edward W. (2006), "Nuts And Bolts Of Network Neutrality", Practising Law Institute, 24th Annual Institute on Telecommunications Policy & Regulation, *PLI/PAT*887 (317): 326.
- Ford, G., T. Kowtsky and L. Spiwak (2006), "*Network Neutrality and Industry Structure*" Phoenix Center Policy Paper Number 24.
- Frischmann, Brett and Barbara van Schewick (2007), "Yoo's Frame and What It Ignores: Network Neutrality and the Economics of an Information Superhighway", *Jurimetrics J.* 47.
- Hahn, R. and R. Litan (2006),. *The Myth of Network Neutrality and What We Should Do About It*, AEI-Brookings Joint Center Working Paper No. RP06-33.
- Hahn, Robert and Scott Wallsten (2006), *The Economics of Net Neutrality*, Washington, DC: AEI Brookings Joint Center for Regulatory Studies, April 2006.
- Hass, D. (2007), "The Never-Was-Neutral Net and Why Informed End Users Can End the Net Neutrality Debates", *Berkeley Technology Law Journal*, 22 (4).
- Hermann, B. (2007), "Opening Bottlenecks: On Behalf of Mandated Network Neutrality", *Federal Communications Law Journal* 59 (1).
- Hogendorn, C. (2006), *Broadband Internet: Net Neutrality versus Open Access*, CNI-Working Paper No. 2006-09.
- Jordan, S. (2007), "A layered network approach to net neutrality", *International Journal of Communication* 1, 427-460.
- Laxton (2007), *The end of Net Neutrality*, 15 Duke L. & Tech. J.
- Lemley, Mark A. and Lawrence Lessig (2001), "The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era", *UCLA L. REV.* 48: 925.
- Lenard, T. and R. May (eds.) (2002), *Net Neutrality or Net Neutering: Should Broadband Internet Services be Regulated*, Springer.
- Litan, R. and H. Singer (2007), "Unintended Consequences of Net Neutrality Regulation", forthcoming *Journal on Telecommunications & High Technology Law*.

- *Madison River Communications, LLC*, Order, DA 05-543, 20 FCC Rcd 4295 (2005) (http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-543A1.pdf).
- Marsden, C. (2007), *Net Neutrality and Consumer Access to Content*, Script-ed, 4:4.
- Marsden, C. and J. Cave (2007), “Beyond the ‘net neutrality’ debate: Price and quality discrimination in next generation internet access”, prepared for Telecoms Policy Research Conference, Alexandria, Virginia, 29 September.
- McTaggart, Craig. (2006), “Was The Internet Ever Neutral?”, paper presented at the 34th Research Conference on Communication, Information and Internet Policy, George Mason University School of Law, Arlington, Virginia. September 30 (<http://web.si.umich.edu/tprc/papers/2006/593/mctaggart-tprc06rev.pdf>).
- Meinrath, S. and V. Pickard (2007), *The New Network Neutrality: Criteria for Internet Freedom* (<http://web.si.umich.edu/tprc/papers/2006/614/The%20New%20Network%20Neutrality%20v4.4.pdf>).
- Owen, B. and Rosston (2002), “Local Broadband Access: *Primum Non Nocere* or *Primum Processi*? A Property Rights Approach” Stanford Institute for Economic Policy Research working paper 02-37. in T. Lenard and R. May (eds), *Net Neutrality or Net Neutering: Should Broadband Internet Services be Regulated*, Springer.
- Pardolesi, R. And A. Renda (2004), “The European Commission’s Case Against Microsoft: Kill Bill?”, *World Competition*.
- Poel, M., A. Renda and P. Ballon (2007), *Business model analysis as a tool for policy evaluation*, INFO, 2/2007.
- Renda, A. (2006), *Last Call for Lisbon?*, Final Report of the CEPS Task Force on e-Communications, CEPS, June.
- Renda, A. (2007), “The Costs and Benefits of Transatlantic Convergence in Telecom Services”, in *Sleeping Giant: Awakening the Transatlantic Services Economy*, in Dan Hamilton and Joseph Quinlan (eds), Johns Hopkins University and Brookings, November 2007.
- Renda, A. (2008a), *Achieving the Internal Market for e-Communications in Europe*, CEPS Task Force Report, CEPS, May.
- Renda, A. (2008b), *Telecommunications*, Encyclopaedia of Law and Economics, Edward Elgar, forthcoming November 2008.
- Rochet, J.-C. and J. Tirole (2004), *Two-Sided Markets: An Overview* (http://faculty.haas.berkeley.edu/hermalin/rochet_tirole.pdf).
- Roycroft, T. (2006), *Economic Analysis And Network Neutrality: Separating Empirical Facts from Theoretical Fiction* (http://nsawatch.org/images/asset_upload_file322_26830.pdf).

- Schewick, B. van (2007), “Towards an Economic Framework for Network Neutrality Regulation”, *Journal on Telecommunications and High Technology Law*, 5.
- Sidak, J.G. (2006), “A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet”, *Journal of Competition Law & Economics* 2 (3): 349.
- Thierer, A. (2004), “Net Neutrality: Digital Discrimination or Regulatory Gamesmanship in Cyberspace?”, *Policy Analysis* 507.
- Thierer, A. (2005), “Are ‘Dumb Pipe’ Mandates Smart Public Policy? Vertical Integration, Net Neutrality, and the Network Layers Model”, *Journal on Telecommunications & High Technology Law* 3: 275.
- Weiser, P.J. (2002), “Law and Information Platforms”, *Journal on Telecommunications & High Technology Law* 1.
- Wong, R. and D. Garrie (2008), “Network Neutrality: Laissez-Faire Approach or Not?”, forthcoming in Rutgers University’s *Computer & Technology Law Journal* (available at SSRN: <http://ssrn.com/abstract=1180362>).
- Wu, T. (2003), “Network Neutrality and Broadband Discrimination”, *Journal on Telecommunications & High Technology Law* 2: at p. 141.
- Wu, T. (2004) “The Broadband Debate: A User's Guide”, *Journal on Telecommunications & High Technology Law*.
- Wu, T. (2007), “Wireless Carterfone”, *International Journal of Communication*, Vol. 1, p. 389, Available at SSRN: <http://ssrn.com/abstract=962027>.
- Yoo, C.S. (2004), “Would Mandating Broadband Network Neutrality Help or Hurt Competition? A Comment on the End-to-End Debate”, *Journal on Telecommunications & High Technology Law* 3: 23.
- Yoo, C.S. (2005), Beyond Network Neutrality”, *Harvard Journal of Law & Technology* 19 (1).
- Yoo, C.S. (2006), *Network Neutrality and the Economics of Congestion*. 94 GEO. L.J. 1847.

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