

Economics of net neutrality: A review

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Abstract

Network neutrality has been at the center of US telecommunications policy for several years, culminating in a recent FCC order imposing a limited form of net neutrality on US broadband Internet Service Providers (ISPs). The regulatory imposition of non-discrimination and price regulation (the core of net neutrality) on ISPs has been hotly debated. In this paper, I review the recent economics literature on net neutrality. There is little evidence that violations of net neutrality have actually occurred, several papers suggest that there could be potential problems in the future. Most papers, however, suggest that prophylactic net neutrality regulation is unnecessary and may well be welfare-reducing. Most papers suggest that waiting for actual ex post evidence before regulatory interventions is the soundest policy.

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Introduction

Residential Broadband access to the Internet emerged in the US market in the late 1990s, offered over facilities provided by either cable firms (cable) or telephone companies (DSL), using in-house Internet Service Providers (ISPs).¹⁾ Up to that point, access to the Internet for residential customers was offered over voice telephone lines, subject to common carriage, by independent ISPs. Barriers to this industry were low, and soon thousands of telephone-based ISPs offered their services to customers.

However, cable broadband facilities were not subject to common carriage, so independent ISPs

could be denied access to cable company facilities. Initially, telephone company DSL lines were subject to common carrier regulation, and were required to provide “open access”, permitting independent ISPs to use their DSL line to provide broadband service (as earlier ISPs had used voice lines to provide Internet access).

The concern of regulators, technologists and legal scholars active in Internet policy was that the very limited number of broadband ISPs would lead to monopolistic constraints on Internet access, destroying the very freedom which made the Internet such a valued resource and fountain of innovation. “Open

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1) Incumbent firms were able to leverage their existing facilities, either cable television connections or telephone connections into the home to offer services. These two technologies are quite different; cable systems dedicated a portion of their considerable bandwidth (usually, 6-12 MHz) to two-way Internet traffic via a cable modem at the home, while simultaneously supporting video distribution. Telephone companies used Digital Subscriber Line (DSL) technology which involved electronics installed at the central office and the home (DSL modem) which exploited the unused frequency on telephone access lines to support Internet traffic, while simultaneously supporting voice traffic.

access” was a regulatory strategem to bring ISP competition to broadband services, even if the facilities basis of such services was duopolistic/ monopolistic.²⁾

The FCC classified cable modem service as an information service, and thus not subject to open access/line sharing. This decision was challenged but upheld by the *Brand X* (2005) decision. Meanwhile, the FCC relaxed DSL line sharing rules in 2003 and 2005, in order to “level the playing field” between cable and DSL.

Commentators, analysts and academics were still concerned with potential abuse of the market power of incumbent broadband ISPs, fearful that such powerful gatekeepers would change forever the free and open Internet. “Network neutrality” became the new policy advocated by those previously in favor of open access. Its intellectual foundation is the “end-to-end” (e2e) principle, first expounded in Saltzer, et al. (1984) and revisited by Blumenthal and Clark (2001), which emerged as a design tool for use by network engineers, and not a policy tool. However, net neutrality advocates claimed it as their own; the initial principle was that the transmission and routing of Internet traffic should be “dumb” and all intelligence in the network should be lodged at the end-points (i.e., the computers or other devices of Internet customers). In this view, broadband ISPs should be enjoined from any network control; their job was simply to deliver bits and not to “manage” them. In this view, net neutrality would remove the power of duopolistic/monopolistic broadband ISPs to alter or control any Internet content. Only customers and Internet content/application providers (such as Google, Yahoo, eBay, etc.) could control content, not ISPs. As content providers entered the net neutrality fray, the debate morphed yet again so that

net neutrality was taken to include that ISPs could not offer content providers optional superior services for a fee, such as faster delivery (similar to Federal Express in the mail/package carriage industry) nor could they charge content providers for the delivery of their information to the ISP’s customers.

Curiously, economists were relatively silent during the early stages of these debates. Few economists analyzed the effects of mandated broadband open access. Although the Federal Trade Commission required Time Warner cable to carry at least one independent ISP on its broadband cable (Earthlink) as a condition of approval of the AOL-Time Warner merger in 2001, there was no economic analysis to support that requirement. The rationale for the FCC lifting line sharing restrictions on DSL providers rested upon economic arguments in favor of competition.³⁾ Mandated line sharing was the topic of a number of economic papers, most notably Hausman and Sidak (2003) which examined the empirical evidence on the regulatory rationales for mandatory unbundling in five countries, and found that none of the rationales could be supported by the evidence. Identical conclusions are reached in the later paper by Hazlett & Caliskan (2008), which examines the impact of removing mandated unbundling restrictions on DSL in the US and found that mandated unbundling significantly reduced investment incentives, and DSL lagged far behind cable in broadband deployment. Once mandated unbundling was removed, telcos ramped up their investment in DSL.⁴⁾

The advent of the network neutrality debate brought economists into the fray. The economics articles published in this area vary widely in their emphasis and in the position the authors take on net

2) This mirrored a policy adopted by the FCC pursuant to the Telecommunications Act which mandated “line sharing” for voice access lines (essentially, open access for voice traffic). As late as 2001, this policy of line sharing was being touted as a great success by the FCC, and other countries adopted it. More recently, line sharing is seen as something of a dead end (at least in the US), compared to other forms of competition in voice telephony (see Faulhaber (2009)). Open access for broadband was designed to mimic this policy for voice telephony.

3) In this context, “competition” refers to competition among facilities providers. Many have used the term competition to refer to competition among service providers delivering services over the same (monopoly) facilities. In this latter case, there is no competition among the providers of facilities, only among service providers. Many economists (including the author) are reluctant to call this competition.

4) It is tempting to apply the conclusions from this work on the effects of mandated unbundling to the possible effects of net neutrality, as they are somewhat similar policies. However, the two are not the same policy and any such inferences are merely suggestive.

neutrality. As economists were rather late to this debate, the issues had already been framed in non-economic terms, and economic analysis has had somewhat less impact on the debates than it had on previous regulatory issues such as competition and deregulation.

I review the FCC's recently-enacted regulation on network neutrality. Advocates of net neutrality generally view the regulations as not going far enough, while critics, of course, view the regulation as not going far enough. I then turn to the economic debate, which has focused on three major issues, to which we turn in the next three sections:

- What economic problem is net neutrality designed to solve? What is the empirical evidence concerning this problem?
- What can economic *theory* tell us about potential problems in the broadband ISP market?
- What can *empirical political economy* tell us about likely outcomes of net neutrality policy interventions?

Current FCC net neutrality regulations

Since net neutrality first appeared in policy debates, its meaning has been less than crystal clear. Some advocates have argued that net neutrality demands that broadband ISPs treat all bits equally: "a bit is a bit is a bit," while others make exceptions for malware bits, spam bits, child porn bits, etc. Some advocates have argued that net neutrality must apply not only to wired broadband ISPs (cable, DSL and fiber) but to wireless broadband providers as well, while others recognize that wireless broadband has a unique technological structure that requires more stringent and flexible capacity management than is consistent with "a bit is a bit is a bit."

The FCC has recently issued a Report and Order (2010) (R&O) promulgating its network neutrality

rules,⁵⁾ which as might be expected strikes a middle ground between purists on each side of the debate. But the adoption of these rules at least permits us to focus on one specific definition of network neutrality: that of the FCC Order.

The R&O specifies four "principles":

Transparency "...broadband Internet access service shall publicly disclose accurate information regarding the network management practices, performance, and commercial terms of its broadband Internet access services sufficient for consumers to make informed choices..."⁶⁾ Broadband ISPs are required to publicly disclose the following:

- *Network Practices*, such as congestion management, application-specific behavior, device attachment rules, and security.
- *Performance Characteristics*, such as technology, speed, usefulness for certain applications, and what other specialized services are available.
- *Commercial Terms*, such as pricing, privacy policy and redress options should disputes arise.

The transparency rules are relatively flexible; some have argued for much more specific and detailed disclosures and are disappointed in the flexibility of the adopted rules. But generally, this principle of disclosure is rather close to best practice in the broadband ISP industry today, and the principle is strongly supported by scholarly work (see Faulhaber (2009, 2010), Faulhaber & Farber (2010a), among many others). The transparency principle is the least controversial of the FCC's network neutrality rules.

No blocking and no unreasonable discrimination

No Blocking "...[a] broadband Internet access service [provider] ... shall not block lawful content, applications, services, or nonharmful devices, subject

5) Curiously, the FCC itself seems to have foresworn the use of the term "network neutrality," preferring to adopt phrases such as "preserving the Open Internet," or "Open Internet rules." In this paper, I continue to use the traditional terminology.

6) FCC, *op cit.*, §§54ff.

to reasonable network management.” This rule is also interpreted to prohibit broadband ISPs from degrading service (e.g., slowing it down) of applications, etc. Broadband ISPs are also prohibited from charging a fee in order to carry an application, etc. (i.e., blocking the application unless a fee is paid).

No Unreasonable Discrimination “...[a] broadband Internet access service [provider]... shall not unreasonably discriminate in transmitting lawful network traffic over a consumer’s broadband Internet access service. Reasonable network management shall not constitute unreasonable discrimination.” This rule contains a blockbuster clause: broadband ISPs are not permitted to charge application/content providers for access to their customers. I discuss this more below on two-sided markets.

While this rule seems a bit vague (note the use of the term “unreasonable/reasonable,” the R&O does specify ISP behaviors that help them become “reasonable”: transparency, end-user (i.e., customer) control, use-agnostic discrimination, and adoption of industry best-practice standards.

The FCC suggests that any attempt by broadband ISPs to offer application/content providers services over and above plain-vanilla Internet (i.e., pay for priority service, such as QoS (quality of service)), while not *per se* forbidden, would be looked upon quite negatively by the FCC.⁷⁾

Reasonable Network Management “A network management practice is reasonable if it is appropriate and tailored to achieving a legitimate network management purpose, taking into account the particular network architecture and technology of the broadband Internet access service.”

Network management is a core function for any network operator, be it voice telephony or Internet data, which is poorly understood by the public and indeed many advocates for net neutrality. The FCC specifies the principles of transparency, end-user control, and use-agnostic methods as determinative of reasonableness. They also specify network management

functions relating to network security, congestion management, and (customer-) unwanted traffic as the appropriate scope for network management.

While some net neutrality advocates believe network management is a thinly disguised cover for bad action on the part of broadband ISPs, the FCC has chosen an approach that recognizes the need for network management while seeking to ensure it is not misused for nefarious ends. Broadly speaking, the rule as written appears close to today’s best practice by broadband ISPs.

Mobile Broadband The FCC rules apply only the transparency rule and the no blocking rule to mobile broadband, relaxing the rules on discrimination and network management. This relaxation of rules for mobile reflects a view that mobile broadband is a different technology with different (and more significant) constraints than wired broadband. This is not a topic I cover in this paper, but see Faulhaber and Farber (2010b).

To what problem is net neutrality the solution?

Given the level of interest in network neutrality, one could be forgiven that the Internet is being violated by rapacious broadband ISPs and there is not a moment to lose in protecting its openness. Since we have had broadband ISPs in the US for over a decade, one might think that the practices of blocking, discrimination, and disadvantaging competitors would be rife, and such practices well-documented. One might think, but one would be wrong.

The R&O (*op. cit.*, §§21-32) cites chapter and verse of all the incentives and opportunities that broadband ISPs have to abuse their position to enhance their profits at the expense of application/content providers and their own customers.⁸⁾ The concerns expressed are concerns about the economics of broadband ISPs, but nowhere in the R&O can we find anything

7) FCC R&O (2010, §76), “...as a general matter, it is unlikely that pay for priority would satisfy the ‘no unreasonable discrimination’ standard.”

8) Perhaps the most persuasive and complete list of concerns about broadband ISP behavior is in van Schewick (2007).

approaching an economic analysis of these hypotheses (or allegations). In fact, one has to read the R&O very closely to find any empirical support whatsoever that any of the suspect behaviors the FCC seeks to prevent have actually occurred. In fact, the FCC produces four examples:⁹⁾

- In 2005, Madison River Communications., in its role as a broadband ISP in North Carolina, blocked its customers from using Vonage, a VoIP voice phone provider that competed with Madison River's main telephone business. After complaints to the FCC, Madison River paid a \$15,000 fine and stopped the practice.
- In 2007-08, Comcast was interfering with BitTorrent traffic (a video P2P site) it claimed was congesting its network. The FCC issued an order prohibiting their network management practices. Comcast duly changed its practices but took the FCC to court claiming it lacked jurisdiction. The DC District Court agreed, and the issue was remanded to the FCC.
- A letter from the ACLU alleged that a mobile service provider had blocked the use of an application because it had a competing application. This issue apparently never made it to the formal complain stage.
- In 2009, Apple and AT&T blocked the use of WiFi connectivity rather than AT&T's own 2G and 3G services on their successful mobile iPhone. The issue was resolved by the FCC.

So in over a decade, there were only four examples of purported misconduct (one which was denied by the courts and another which didn't even rise to the level of a complaint) for the entire broadband ISP industry. By any standard, four complaints about an entire industry in over a decade would seem to

be cause for a commendation, not for restrictive regulations.

The FCC acknowledges this lack of evidence of actual wrongdoing by referring in the R&O to the proposed rules as "prophylactic," or preventive. Their purpose, therefore, is to prevent things from happening that haven't actually happened thus far. Further, the R&O (§4) acknowledges explicitly that "...[the rules] incorporate longstanding openness principles that are generally in line with current practices and with norms endorsed by many broadband providers." If the rules are indeed aligned with current practices and norms, then why, it might be asked, do we need them?¹⁰⁾

If we have had a decade of experience with broadband ISPs with little evidence of wrongdoing, how can network neutrality advocates support their demands for government net neutrality regulation? If there has been no problem for the past decade, is there any reason to suspect that such problems are right around the corner?

Several explanations for this lack of evidence have been offered.¹¹⁾ Some offer the opinion that broadband ISPs have not engaged in bad behavior because they know the regulators/legislators are watching and will enact punitive regulations should the ISPs engage in bad practices. Of course, this actually argues against actual regulations; if the mere threat of unnamed punitive regulations is sufficient to deter bad behavior, then perhaps we should stick with mere threats. Others have suggested that broadband ISPs formerly were subject to common carrier obligations, which are tantamount to network neutrality. In fact, cable firms have never been subject to common carrier obligations, and telephone companies' DSL service, while temporarily subject to mandated line-sharing, was never formally designated as a common carriage service. This suggestion is historically

9) R&O, *op. cit.*, §35.

10) It might also be asked, if the rules are in accord with current practices, then what is the harm of having them? I address this issue below, in discussing the political economy of regulation; the answer to the question, in short, is that there can be plenty of harm from unneeded rules.

11) These "explanations" have not, to the author's knowledge, made it into scholarly print. They mainly surface at conferences and panels where such observations are offered with little support.

false. Still others have argued that new technology for “deep packet inspection”¹²⁾ permits ISPs to discriminate among data being delivered from application/content providers to their customers and therefore discriminate against competitive services. In fact, providers of Internet servers such as Cisco have sold ISPs servers with the capability of detailed tracking of their data traffic since at least 1999. Packet inspection is an old technology, dating to the earliest days of broadband ISPs.¹³⁾ It does not pose a new threat that might upset long-established behaviors in this market.

The question posed by the title of this section is that it does not appear to be an actual problem that needs to be solved by net neutrality. The litany of evils imagined that might occur in the future have almost never occurred in the past, and there is no evidence that the market environment of broadband ISPs is undergoing a change that might justify concerns about as-yet-unrealized threats. Are the problems that net neutrality purports to solve purely imaginary? Are “prophylactic” remedies to non-problems needed? I leave it to the reader to decide.

Economics: The theory

A brief note on methodology If the question is: should we impose net neutrality regulation on broadband ISPs?, economists will attempt to compare the benefits of the policy with its costs. To do so, economists use both theory and empirical work in tandem: the theory attempts to model the incentives of all players in the market and determine market equilibrium outcomes, in order to model both benefits and costs. Usually, theory is insufficient to determine whether or not benefits exceed costs or not, because that comparison depends upon the actual values of the

model parameters, such as demand elasticities, cost functions, market interactions, etc. Empirical work is necessary to determine the actual values of these parameters, and thus provide an answer to the benefit/cost question. Without both theory and empirics, the question cannot be answered.¹⁴⁾

But how do economists determine benefits and costs? In the past few decades, economists have generally focused on efficiency issues, and foresworn grander welfare assertions about broader social goals. While not denying the importance of such goals, economic analysis tends to focus on what it can do best: measure relative efficiencies, rather than pronounce on grand social goals. The challenge for policymakers, then, is if such goals are desired, what are the efficiency costs of pursuing those goals, and are they worth the cost? To the extent such goals can actually be quantified and measured, so much the better. But generally, economic analysis focuses on efficiency considerations, and the economics literature on net neutrality is so focused.

Generally, there are three rather separate efficiency issues, each of which is important to the Internet and the net neutrality debate.

- *Static efficiency*: The standard economic model of a market is focused on static issues. Are there efficiency losses due to monopoly? Are there externalities in the market that could lead to efficiency losses? Is this a *two-sided* market and will that generate efficiency losses in market equilibrium? And if there are efficiency losses, who bears them: customers, incumbent firms, and/or entering firms?
- *Investment efficiency*: Investment by firms affects markets both today and in the future; if conditions are not conducive to investment, then markets may not develop optimally. Thus, there is a question of

12) Deep packet inspection permits an ISP to inspect actual data packets that transit its servers to determine source, destination, content and other data associated with that packet.

13) See, e.g., “1999 Cisco White Paper – Controlling Traffic,” at http://webcache.googleusercontent.com/search?q=cache:u-9EFzlrHjUJ:www.democraticmedia.org/current_projects/net_neutrality/1999_cisco_control_traffic+cisco+white+paper&hl=en&client=firefox-a&gl=us&strip=0

14) Lack of evidence did not deter the FCC from simply *alleging* in the R&O (*op. cit.*, §§38-42) that benefits exceed costs with neither theoretical nor empirical support (but lengthy allegations). Even the otherwise excellent work of van Schewick (*op cit.*) claims that benefits exceed costs but without analytical justification for this claim.

the optimal investment path, and do regulations cause deviations from that optimal investment path? It is the multi-period nature of investment that distinguishes this from static efficiency. Many economic models do not examine investment issues, either because it is not an issue to be addressed or it is too difficult to implement. In the case of the Internet and net neutrality, it certainly is an issue to be addressed.

- *Innovation efficiency*: This is the most difficult of efficiency issues for economic analysis to address, since there is no standard model of how innovation functions in the economy. Since Schumpeter's (1942) work, economists have known that innovation is likely the greatest source of economic growth, and yet it has defied incorporation into the body of economic analysis. Economists generally believe that the incentives to innovate are likely too low, as inventors/innovators have difficulty capturing the rents from their innovations (hence the importance of intellectual property laws). But in some circumstances, there can be too much innovation (i.e., the costs of innovation exceed the benefits, such as in winner-take-all competition). Unfortunately, innovation on the Internet is fundamental to the net neutrality debate, so we must make do with incomplete analytic tools to address this issue.

An additional problem can occur if regulation is imposed on a market which is still evolving, in that the regulations designed for today's Internet inadvertently may stifle future innovations, either in the network or applications. For example, suppose (as has been proposed) that net neutrality regulations prohibit broadband ISPs from offering a guaranteed QoS (Quality of Service) option to application/content providers. Future applications, such as remote medical sensing and treatment, may require QoS-type service which would be prohibited by net neutrality regulations that were adopted prior to the

deployment of QoS systems and innovative services.

Theory without empirical support

In the previous section, I established that there does not seem to be an actual problem with broadband ISPs and Internet openness. This would seem to make this section unnecessary. If there is no problem to be fixed, then there are no possible benefits to be obtained from net neutrality regulation, and therefore, costs of such regulation will always exceed benefits: end of story.

Is there any way a prophylactic policy could be justified, in light of this lack of evidence? It is possible that the Internet environment is changing in ways that suggest data from the past is not a good guide to future performance. There are two changes that could have an impact on broadband ISP behavior, at least in theory. (i) available applications are coming onstream that use far more bandwidth (i.e., broadband ISP capacity) than on average, such as streaming video. These are not new; BitTorrent is the downloadable version of this, but BitTorrent has generally appealed to a fairly small market segment. If IP video becomes very popular, then the difference in costs between IP video services and plain and simple e-mail and web browsing services will become huge.¹⁵⁾ (ii) New services could be offered by application/content providers that compete effectively against offerings by ISPs; again, IP video is a good example. Again, this problem was faced when VoIP services gained traction on the Internet, and it does not seem to be a problem. However, perhaps something is different about IP video that could lead to bad behavior by broadband ISPs that we have not seen before.¹⁶⁾

The scope for economic analysis is thus constrained, in two significant ways:

1. Any economic model that concludes that broadband

15) One obvious method to accommodate large discrepancies in usage is to charge customers according to their data usage, or by charging for different "buckets" of data usage, as is done for cell phones. Since many ISPs are already doing this, it is unlikely that ISPs would take action against application/content providers to solve this problem

16) While the FCC recognized in the R&O (*op cit.*) that its rules were prophylactic and there were only four recorded cases of bad behavior in the past decade, their litany of *potential* bad behavior made no reference to this lack of evidence, nor to any concerns that the Internet was changing in ways that increased the risk of such behavior.

ISPs may engage in bad behavior must explicitly support that conclusion on how the Internet is or will be changing. Conclusions about bad behavior that are *not* based on purported changing Internet characteristics are simply not credible, based on existing evidence.

2. Any economic model that points to bad behavior by broadband ISPs based on projected future changes in the Internet environment *cannot be verified empirically*, simply because those changes have yet to occur. Results of such models would be purely theoretical, and not supportable by facts, and therefore not a good basis for policymaking. To reiterate: an economic model that points to bad behavior by ISPs based on past and current practices is disconfirmed by the lack of any supporting evidence in the record thus far.

Economics of Vertical Relationships In the (relevant) field of industrial economics, antitrust analysis suggests two sources of suspect behavior. *Horizontal* actions, such as mergers of firms within the same market or exclusionary practices within a market in order to drive direct competitors out of the market; and *vertical* actions, such as acquisition of a supplier or distributor or actions to foreclose competitive suppliers in downstream markets.

In the post-war era, US antitrust actions targeted both horizontal and vertical cases. However, in the 1980s, the ascendant Chicago School held that vertical case were largely without merit. The basic argument was the “one monopoly rent” hypothesis, which holds that there is only one monopoly rent in the downstream market and vertical integration or other actions can at best redistribute those rents but cannot increase them. Therefore, the story goes, vertical actions can cause no (additional) harm to

customers. This wisdom was soon challenged, using the then-new tools of game theory, to demonstrate that indeed harms could occur from vertical relationships, even though there were clearly efficiency gains to, for example, vertical mergers.¹⁷⁾ Unfortunately, the literature on vertical issues is largely “it depends.” Various models and theories could produce results in which vertical actions were harmful or results that showed vertical actions were efficiency-enhancing. It all depended upon the model and the values of the parameters, which were often difficult or impossible to measure. Antitrust opinion in the US began to adapt, moving away from vertical cases. The most recent version of the *Non-Horizontal Merger Guidelines* (1984), established rather strict guidelines for bringing vertical cases on the basis that almost all such cases may have both efficiency rationales as well as potential harms, and the balance will be very difficult to sort out empirically. In fact, the last big vertical case brought by the US Department of Justice was *US v. AT&T*.¹⁸⁾

Network neutrality governs the relationships between broadband ISPs and application/content providers, and is therefore a vertical issue.¹⁹⁾ This suggests that economic *theory* will have a tough time sorting this issue out. We can expect lots of papers (because this is an interesting and important topic) but we can also expect very different answers, depending upon the form of the models and the values of parameters. This suggests that pure modeling without empirical verification is unlikely to lead to a definitive answer to the underlying policy question.

Unsurprisingly (but unfortunately), this is what I find when I review the recent economic modeling literature on network neutrality. The theoretical literature contains papers to support whichever position you may favor, and it is unlikely that we may

17) For an excellent discussion of vertical economic issues in the context of open access, see Farrell & Weiser (2003).

18) The *U.S. v. Microsoft* case had elements of both vertical and horizontal issues. The most well-known issue in the case was allegations that Microsoft through its Windows operating system disadvantaged the Netscape web browser in favor of its own Internet Explorer browser (which has both a vertical and a horizontal component). However, the case was ultimately decided on horizontal grounds (exclusionary practices) and not on vertical (Netscape) grounds.

19) To be perfectly clear, Google, Yahoo and eBay do *not* compete in the same market as Verizon, Comcast and AT&T. The former firms use the latter firms as *distribution channels* for their product to reach customers; their relationship is therefore vertical, not horizontal.

expect a definitive answer from this research. Owen (2010)²⁰⁾ found much the same in his review of the economics of net neutrality, and his summary is worth quoting:

While there is no shortage of theoretical models in which vertical integration may be harmful, most such models have restrictive assumptions and ambiguous welfare predictions—even when market power is assumed to be present. Empirical evidence that vertical integration or vertical restraints are harmful is weak, compared to evidence that vertical integration is beneficial—again, even in cases where market power appears to be present. Thus, it is reasonable to conclude that prophylactic regulation is not necessary, and may well reduce welfare. Sound policy is to wait for ex post evidence of harm to justify interventions in specific cases.

The role of competition

Central to the issue of “bad behavior” on the part of broadband ISPs, at least for economists, is the questionable level of competition in the provision of wired broadband. Almost no markets have more than two providers: cable and DSL, and many markets have only one (or none).²¹⁾ While there is clearly rivalrous behavior in this market, competition could be substantially improved.²²⁾ Indeed, the inclination of economists is to see this problem as imbued with market power problems, and that network neutrality is a tool, albeit an imperfect one, for addressing these market power issues. There may well be other market imperfections (such as externalities associated with two-sided markets), but market power and the ability to behave anticompetitively is how many economists see the issue of net neutrality.

For the economist, then, competition in a market (absent externalities) will give customers what they demand; not because firms are generous but because competition forces them best satisfy customers’ demand. Only in the presence of a serious market failure such as monopoly might firms get away with bad behavior. In a competitive market, then, if customers want net neutrality, firms will (eventually) be driven by market forces to supply it. If customers want some parts of net neutrality but not others, then that’s what they will get. But is competition enough to give customers those aspects of net neutrality they want? In fact, evidence from the US wireless market very strongly shows that customers will get the net neutrality they want. Faulhaber & Farber (2010a) state:

The wireless broadband market itself provides strong recent evidence of how competition drives the market to serve the needs of customers: While advocates demanded that wireless carriers should accept any devices and applications (that met standards) the customer brings (see Wu, 2007), it has been the competitive market in wireless that has delivered what customers want, not advocates. Since the introduction of the iPhone and Apple’s app store, virtually all carriers and all device manufacturers have followed suit, opening up their networks to third party applications. Independently, they are now permitting outside devices to be brought to their networks. These steps were not the result of regulation. However, other practices advocated by network neutrality pundits have not been adopted, as customers have not demanded them. Customers have had their say, and firms in this competitive market were forced to listen.

If there is a problem in the wired broadband ISP market, then, it is a problem of insufficient competition, which could lead to anticompetitive behavior. Some economists have argued that if anticompeti-

20) This paper is a fine introduction to economics of vertical relationships.

21) See Faulhaber (2009) for a more complete discussion of the competitiveness of the broadband ISP market. In brief, it is more competitive than net neutrality advocates claim, and less competitive than industry advocates claim.

22) In (much) earlier work, Faulhaber & Hogenorn (2000) analyzed the expected market structure of the then-nascent broadband ISP market and concluded (based on the sketchiest of evidence then available) that the market could support at most two or three wireline broadband ISPs in the US. This prediction has proved quite accurate, despite efforts to introduce competition via, say, broadband over powerline or fiber to the home. I have argued elsewhere (Faulhaber (2009) and Faulhaber & Farber (2010a) that the advent of 4G wireless (true high-speed wireless broadband) will significantly change the economics of broadband distribution and significantly increase the number of broadband ISPs and therefore the competitiveness of this market.

tive behavior is observed, it is the responsibility of antitrust authorities (Department of Justice or Federal Trade Commission) to seek remedies. These are, of course, the specialist agencies in dealing with anti-competitive behavior when it is actually observed. In fact, the Chairperson Deborah Majoras (2006) of the Federal Trade Commission has made this crystal clear:

let me make clear that if broadband providers engage in anticompetitive conduct, we will not hesitate to act using our existing authority. But I have to say, thus far, proponents of net neutrality regulation have not come to us to explain where the market is failing or what anticompetitive conduct we should challenge; we are open to hearing from them (p. 20).

Is the FCC still pro-competitive? One might expect that the FCC, with its track record of promoting competition over the last decade, would be in full agreement with this view of their sister agency. One might expect the FCC to view the problem of wireline broadband ISP market as one of increasing competition, not enacting net neutrality rules.

One might expect, but one would be wrong. Apparently, however, the FCC does not believe that protecting markets against anticompetitive behavior is enough. "We also reject the argument that only 'anticompetitive' discrimination yielding 'substantial consumer harm' should be prohibited by our rules. We are persuaded those proposed limiting terms are unduly narrow and could allow discriminatory conduct that is contrary to the public interest" (R&O, §78). So if competition is what gives customers what they want, then what else is in the "public interest"? Are we to conclude that the FCC does not trust customers to make informed choices of "social, cultural and political potential" (R&O, fn. 243, quoting van Schewick)? Is the FCC backing away from reliance on competitive markets and customer choice to fulfill its mission?

Further evidence that the FCC has abandoned its traditional reliance on competition to ensure good market performance comes from its treatment of

mobile service in the R&O. The FCC exempts the wireless broadband market from much of the network neutrality regulation it imposes on wireline broadband ISPs, but it's rationale for doing so is that this market is still new and evolving. Surprisingly, no mention is made in the R&O of the competitiveness of this market. Most economists would conclude that a competitive market (such as wireless) will yield outcomes that customers want, and therefore customers would get just the net neutrality that they demanded. A competitive market would solve whatever problems that might occur without need of regulation. And yet the FCC chose not to make this argument, even though the evidence that the wireless market is competitive is quite compelling.²³⁾

It is also surprising that the FCC did not make the argument that it has been competition in the wireless market that has not only driven innovation generally but innovation in areas of net neutrality. Wu's (2007) paper on wireless network neutrality laid out a number of issues in which wireless carriers were not network neutral, and he suggested regulation to solve this problem. Re-reading Wu's paper today shows that most of the openness policies he suggested be regulated have in fact been adopted by the competitive wireless industry as a result of pressures from the competitive market.²⁴⁾ I take this as very strong evidence that in competitive markets, customers will get the net neutrality they want (and no more); the FCC needs only to encourage (and recognize) competition in markets to achieve the appropriate level and structure of openness, based on what customers want. Unfortunately, the FCC appears to be abandoning its decades-old policy of encouraging and relying on competitive markets to achieve its policy ends.

The economics literature on net neutrality

Two-sided markets

Understanding two-sided markets is fundamental to

23) The evidence regarding the competitiveness of wireless is presented in Faulhaber (2009), pp. 747, 752 and more extensively in Faulhaber & Farber (2010b), pp. 86-89

24) See Faulhaber & Farber (2010b), pp. 99-100.

understanding the economics of Internet markets, and the broadband ISP market in particular. The idea of two-sided markets is simple: an *intermediary* offers *interconnection* services to two (or more) distinct groups of customers, the function of which is to connect the groups together for purposes of communication and transaction. Examples include a cable TV operator that connects network providers (such as ABC, Animal Planet, ESPN) to retail viewers; eBay, which connects buyers and sellers online; credit card networks, which connect retail establishments to customers' banks; dating services, which connect men and women seeking companionship; and newspapers (and websites), which connect advertisers with readers. Broadband ISPs are intermediaries that connect application/content providers to retail customers, and retail customers with each other via e-mail and social networking.

Intermediaries in two-sided markets have an interest in attracting as many customers on each side of the network as possible. An online auction site wants as many buyers as possible in order to attract sellers, and as many sellers as possible in order to attract buyers. This is a classic "network effect," by which the very size of the customer base(s) creates value for customers and for the intermediary firm(s). Generally, an intermediary has no interest in discouraging participation on either side of the market, as such discouragement actually reduces the intermediary's profit.

The basic economics of two-sided markets was introduced by Rochet & Tirole (2003) and more recently elucidated in Evans (2010).²⁵⁾

Discrimination An exception to this could possibly occur if the intermediary offered a service

(such as VoIP telephony) which competed with some application/content providers that used this intermediary (such as, e.g., Vonage or other independent VoIP provider). Should the broadband ISP (intermediary) deny or degrade the ability of the application/content provider, they could theoretically increase their own VoIP business, but of course they would also reduce the value to their own customers by thus reducing the applications available to them. It is just such discrimination that Madison River Communications attempted,²⁶⁾ and was thwarted by the FCC.

This is a standard industrial organization problem of vertical relationships: would a distributor which sells its own house brand refuse to carry the competitive products of an independent manufacturer? For example, would Sears Roebuck, which sells its own Kenmore brand of refrigerator, refuse to sell GE or Frigidaire refrigerators? In general, the answer is "no." We seldom see such refusals to deal. The reason is simple: the distributor simply ensures that the prices of its product and the competitive products are priced so as to maximize its profits. Sales of both products then increase the distributor's profits.²⁷⁾

Pricing In practice, an intermediary may set a price for each side of the market, and the price need not be positive. In the case of online auctions, eBay charges sellers a fee but not buyers. In the case of newspapers, both readers and advertisers are charged prices. In the case of cable TV, subscribers are charged a price, but the cable TV carrier pays the network provider a fee for its content (a negative "price"). Currently, in the case of broadband ISPs, subscribers are charged but content providers are not.

So how *are* prices determined in a two-sided market? As is usual in economics, the answer depends

25) The publication of the Evans book is in itself an interesting example of intermodal competition and innovation in two-sided markets. Traditionally, a scholarly book would be written by its author(s) and published in book format (paper) by an intermediary (publisher) who, after a lengthy production process, would sell the book to libraries and other scholars. David Evans chose to distribute his book directly online through the well-known Social Science Research Network (SSRN) which makes it (and thousands of other social science works) available to subscribing scholars and institutions via the Internet, thereby eliminating the lengthy production process of traditional book publication. Evans thus has switched intermediaries (from traditional book publishing to SSRN), indeed switched the mode of intermediation (from print to electronic), which is made possible by new technology in digital distribution of written material.

26) *supra*

27) Discrimination against a competitor's product is equivalent to selling the competitor's product at an infinite price. Only in rare circumstances would such a pricing strategy be profit-optimal.

upon elasticities of demand. In this case, however, there are two relevant elasticities, for each of the two relevant customer groups: (i) the elasticity of demand for each group with respect to price changes; and (ii) the elasticity of demand for each group with respect to changes in the size of the complementary group. Clearly, the intermediary would like to do as much business as it can, and therefore have as many of each customer group as possible. If one side of the market is more price-elastic than the other, then *ceteris paribus* we would expect that the intermediary would charge the less elastic customer group more. But the intermediary needs to consider the impact of losing customers in the less elastic group on the demand for service by the complementary group. In the case of eBay, we expect that sellers are less price-elastic than buyers, so charging sellers (rather than buyers) discourages rather fewer sellers; and having rather fewer sellers apparently does not significantly reduce the number of buyers. If buyers were also charged, we might expect both fewer buyers, and therefore fewer sellers, resulting in lower profits to eBay. More generally, the pricing on each side of the market depends upon the interaction of the two elasticities for each of the two groups.

Recent Papers on net neutrality

There has been over a dozen economics articles over the last several years addressing various aspects of net neutrality. Much of this literature has focused on the two-sided nature of the broadband ISP market. In this paper, I choose to review the very latest papers by leading scholars in the field on both sides of the debate. I do so because I rely heavily on the excellent survey by Schuett (2010) which reviews the most significant pre-2010 literature without bias and with attention to the available evidence and theory, *infra*.

Network Neutrality: A Survey of the Economic Literature (F. Schuett, 2010) focuses attention on two aspects of net neutrality, noting that the economic issues tend to flow from these: the *zero-price* rule (broadband ISPs may not charge application/content providers for connecting to their customers) and a

non-discrimination rule (broadband ISPs may not offer multiple service levels to application/content providers).

- Economides and Tåg (2009) consider a model in which either monopoly or duopoly ISPs may be restricted to charge a zero fee to application/content providers, and find that this restriction may be welfare-enhancing. However, the conditions under which the restriction is welfare-enhancing are rather restrictive, and as Caves (2010) has pointed out, we cannot assess how reasonable these conditions are. Even when welfare-enhancing, however, such a restriction will hurt consumers. Note the dependence of the model's welfare results on unobserved parameters, similar to many other models of vertical relationships, as noted *supra*.
- Musacchio, Schwartz, and Walrand (2009) examine the externality that ISPs charging application/content providers impose on other ISPs, viz., the charging ISP internalizes the revenues but not the full costs of the resulting reduction in application/content providers, which is spread among all ISPs. Both their positive results and welfare results are ambiguous; the optimal fees may be positive or negative, depending upon high or low advertising revenues available to the application/content providers. Again, note the ambiguities typical of vertical relationship models.
- Lee and Wu (2009) present the argument against fees based on the entry barrier thus created to new and innovative entrants. They present no evidence to support this position, but they (as have many others) note that the Internet has given rise to an explosion of innovation, and fear that fees for application/content providers could jeopardize that innovation explosion. They do not consider the possibility that broadband ISPs could price discriminate among application/content providers, ensuring that small, innovative firms that could ill afford large ISP fees would be charged nothing, while larger application/content providers may be charged substantial fees. This would no doubt be profit-optimal for ISPs, since excluding small

application/content providers reduces the value of their network to subscribers. It is unlikely, therefore, that innovators would be discouraged from entry because of high terminating ISP fees.

- Hermalin and Katz (2007) introduce a model of discrimination, in which ISPs may offer a menu of quality options to application/content providers. Relative to the ISP being forced to offer only a single quality level, the welfare effects are ambiguous. They also find that requiring ISPs to offer only the highest level of service is inefficient, as the resulting increased costs could price subscribers who desire only lower quality service out of the market. Further, forcing firms to charge a zero price to application/content providers ensures that there will be only one quality of service offered and it would be inefficiently low. In fact, it would be a lower quality than if a single quality were required but ISPs could charge application/content providers. Again, modeling assumptions that cannot be empirically verified leads to ambiguous results typical of this literature. The general conclusion of this article²⁸⁾ is that virtually all the results of this theorizing are ambiguous. “The policy implication of these ambiguous results is that, given our current understanding, the case for strict net-neutrality regulation is not compelling.” Further, “...the departures from net neutrality that are feared by its proponents are, so far, purely hypothetical.” (p. 11)

*The Economics of Regulation*²⁹⁾ (Economides & Hermalin, 2010): Professor Economides is a leading economist in the area of network economics and a strong advocate of network neutrality. As noted above, he has made substantial contributions to this literature.

The paper first addresses the welfare effects of permitting ISPs to offer two quality levels to application/content providers. They note that if investment is fixed, then providing a “fast lane” service will cause consumers to switch to “fast lane”

application/content providers and thus re-congest the (assumed fixed-capacity) system, thereby decreasing welfare (the Hermalin-Katz model assumed no increase in total demand as a result of quality differentiated offerings). Again, note the assumption of fixed capacity, which appears to drive the welfare result. It again appears that unobserved model parameters determine the welfare outcome, typical of this literature.

Next, the paper addresses the effects of permitting ISPs to charge application/content providers. They find that this results in lower prices to consumers and less congestion. However, they find that such fees are likely to be an entry barrier to new and innovative entry. If this entry barrier is large enough, such fees can be welfare-reducing (even if they result in lower costs to consumers), a point made by Lee and Wu (2009). Again, the possibility that ISPs would charge application/content providers different fees based on ability to pay in order not to exclude new entrants is not considered, and of course would reverse their conclusion.

The paper also addresses the question of investment efficiency. The authors find that permitting fees to application/content providers does increase ISPs incentives to invest and would therefore lead to more capacity available in equilibrium. Whether or not this dynamic efficiency gain outweighs their claimed static inefficiencies is ambiguous.

The Open Internet: A Customer-Centric Framework (Faulhaber & Farber, 2010a) argues that there is no market failure in the broadband ISP market to which network neutrality is the answer. To the extent that increased competition in this market is desirable, the FCC should focus on improving competition rather than imposing unnecessary rules. The paper argues that the emergence of 4G wireless high-speed broadband can provide significant competition in this market and the FCC should focus on enabling such competition via spectrum policy. The authors also argue strongly for transparency by broadband ISPs (as well as other broadband market participants including

28) Several other papers are reviewed in this article, to which I commend the reader.

29) A confusingly popular title; this article was preceded by another of the same title: Hahn & Wallsten (2007), which is much more critical of net neutrality.

application/content providers).

The paper also addresses the issue of investment efficiency. The claim by opponents of net neutrality is that the adoption of net neutrality rules will reduce the potential value of assets so encumbered and therefore reduce incentives to invest. This paper brings direct empirical evidence³⁰⁾ from spectrum markets to bear on this hypothesis, which seems to be the only empirical evidence available on this issue.

In March 2008, the FCC conducted what amounted to a natural experiment in network neutrality regulation: It held an auction for the 700MHz spectrum in which it encumbered the winner of the C block to operate under open access network neutrality regulation. No such regulation was imposed on the A and B blocks of the same 700MHz spectrum. A perfect natural experiment of the effect on the value of a telecoms asset of imposing network neutrality regulation. The result? Verizon paid \$0.76/MHz-Pop for the encumbered spectrum; the mean winning bid price of the A and B block spectrum was \$1.89/MHz-Pop (Levin, 2008). Network neutrality regulation thus decreased the value of the spectrum asset by 60%. The evidence speaks loudly and eloquently: imposing network neutrality regulation reduces the value of the affected telecommunication asset and thus reduces the incentive to invest in such assets (p. 331).

This result provides empirical support for the Economides-Hermalin finding that net neutrality rules reduce investment incentives, thereby lowering investment in broadband capacity.³¹⁾

Spillovers and Network Neutrality (Hogendorn, 2010) notes that the Internet and the services it provides are suffused with *spillovers*, or externalities: economic effects that accrue to others not involved in specific transactions. For example, if a broadband ISP charges a fee to application/service providers and as a consequence some providers exit the market and other innovative providers do not find it profitable to enter, this decision not only affects the broadband

ISP doing the charging, but all other customers throughout the Internet who have now lost these services. That cost is a *public* cost that is not internalized in the *private* cost of the transaction to the broadband ISP. This private transaction thus imposes costs on others that the individual transacting parties do not see and therefore do not internalize.

Hogendorn mentions three kinds of spillovers: (i) the Internet as a *general purpose technology*, having effects far beyond individual transacting parties; (ii) *network effects*, in which the size of each customer group has an effect on the size of the complementary group (as discussed *supra*); and (iii) *innovation-spawning* technology, so current activities represent only a small part of the future value of the Internet. He argues that these spillovers can lead private markets to be highly inefficient be corrected (in part) by net neutrality regulation. Competition, far from being the panacea for broadband ISPs as claimed in Faulhaber-Farber (*op. cit.*), does nothing to relieve inefficiencies cause by spillovers, and in fact are likely to exacerbate them.

This paper is a tutorial on solid economic analysis of spillovers in network industries, and I commend this paper to the reader. It would be difficult to find a more compelling paper that argues competition may in fact not be the solution to all Internet inefficiencies. There are, however, two significant caveats: (i) the author uses extensive evidence *from other industries* to demonstrate how important spillovers are and by how much public benefits differ from private benefits; but there is no evidence regarding the case at hand. The results are suggestive, even highly suggestive, but at the end of the day, the author brings no evidence to bear on this particular industry. (ii) The author fails to show how net neutrality regulation addresses any of the spillover problems he outlines. He suggest that the presence of spillovers may warrant efficiency-enhancing government intervention, but the

30) Hazlett & Caliskan (2008) presents empirical evidence that *open access* rules result in lower investment. Open access and net neutrality are sufficiently different that I view this evidence as suggestive regarding net neutrality but not dispositive.

31) Similarly, this result suggests that incentives to innovate in the network are likely reduced by net neutrality rules. Innovation is less likely for at least two reasons: (i) the asset to which the innovation applies is less valuable because of the rules; and (ii) the innovation itself may be forbidden by the rules.

form of such intervention, nor its efficacy is discussed. Nevertheless, the paper presents a most compelling case that Internet markets may be subject to market failures uncorrectable by more competition and deserves careful attention.

Network Neutrality and Consumer Welfare Becker, Carlton and Sider (2010) presents a number of points:

- Broadband is growing very rapidly and price per Mb is declining.
- Competition in the broadband ISP market is rather active, and with the deployment of 4G currently and in the near future is likely to become more competitive. Consumers have choices today and more choices in the future.
- Customers are apparently willing to switch broadband ISPs relatively easily; on average, about 2-2½% of customers switch per month, or an annual rate of 27-34%. The relative ease with which customers can switch suggests that broadband ISPs have to fight hard to keep their customers, which is, after all, what competition is all about.
- Alternatives to net neutrality regulation exist: (i) customer-level testing and transparency regarding questionable practices permits “naming and shaming” of firms that are doing things customers don’t like, which often leads to prompt corrective action; (ii) antitrust enforcement should firms engage in anticompetitive practices.
- Authors reiterate a point well-known to economists: regulation often stifles innovation, delays benefits to customers, reduces incentives to invest, and may provide a rule-bound “straitjacket” for industries such as broadband ISPs which are in a state of growth and change. Will today’s regulations fit what the Internet wants to be in 5 or 10 years? With regulation, that evolution is unlikely to happen; without regulation, the market can adapt to changes in demand, services and technology.
- Authors refute the argument that if broadband ISPs charge application/content providers, they will set their prices too high because they are not taking

account of the spillovers that additional application/content providers (that presumably would leave the market if charged) cause by increasing the value of all networks. They note there are a number of spillovers, the analysis of which is more complex than network neutrality advocates take into account. The result of accounting for all spillovers on consumer welfare is thus ambiguous.

- Not only will incentives for investment in the network be reduced by regulation, but incentives for investment/innovation in applications and content will also be reduced. If innovators who wish to offer highly time-sensitive (i.e., low latency) applications but cannot obtain guaranteed delivery times from ISPs because of regulation, those innovations will not be made.

Transparency Regulation as a Remedy for Network Neutrality Concerns: Experimental Results Sluijs, Schuett, & Henze (2011) tests the hypothesis that requiring full transparency of broadband ISPs increases consumer welfare by conducting an experiment. They find the hypothesis confirmed, with the primary component of increasing welfare due to ISP’s provision of higher quality service as a result of greater transparency. This result provides evidence that supports the assertion about transparency in Becker, Carlton & Sider (2010, *supra*) as well as similar assertions in Faulhaber & Farber (2010a, 309, 315-16).

Network Neutrality Regulation: The Economic Evidence (Brito et al., 2010) was filed with the FCC; it was signed by 21 economists who have spent their career in telecommunications and Internet economics, and is thus a good capstone reference for this section on the review of the net neutrality economics literature. The group has three conclusions:

1. “...the evidence provides no support for the existence of market failure sufficient to warrant *ex ante* [net neutrality] regulation...” (p. 1)
2. “...the practices that would be banned under the [proposed regulations] are likely, in most circumstances, to be welfare-enhancing.” (p. 1)

3. "...to the extent potentially welfare-reducing conduct does emerge, such practices are amenable to a variety of case-by-case remedies under existing law and regulation." (p. 2)

The body of the paper presents evidence to support these conclusions, much as this paper has done. The objective of the paper was to ensure that the FCC had available the best economic intelligence as they made their decision regarding net neutrality regulation. Unfortunately, the FCC opted for regulation, in spite of the collective intelligence of the economics profession (which included two of the authors in this Special Issue of this journal).

Regulation and rent-seeking

Almost all of the economic analysis has focused on the actual net neutrality regulations themselves and their potential impact. It is likely, however, that the real costs of regulation will arise from the *presence of a regulator positioned to intervene in the broadband ISP market*, whatever the actual regulations are. In short, the presence of a regulator in a market ensures that market participants (buyers, sellers, employees, special interest groups and competitors) will petition the regulator for actions against others (e.g., competitors) that will give the petitioners market advantage (or otherwise forward the petitioner's agenda). If the FCC shows itself as willing to wield government power in the broadband ISP market, there will be no shortage of supplicants demanding the FCC use its power to force others to serve their interests, claiming, of course, that their demands are in the "public interest." Virtually all regulation since its inception has been suffused with such "rent-seeking", in which interest groups seek to create rents for themselves by suborning government power via the regulators on their own behalf.

Economists have known about these costs of regulation for decades. The definitive works on this issue are Noll (1989) and Carlton & Perloff (2005). Faulhaber and Farber (2010a) describe the problem:

Regulation...opens wide opportunities for regulatory

rent-seeking, in which firms seek market advantage via regulation, rather than via serving customers well. When regulators are open for business, firms understand that pleasing/manipulating the regulators is far more important than innovating, investing, and pleasing customers. It is precisely because regulators have *not* been open for business on the Internet that it has been such an innovative and successful enterprise.

Advocates of regulation often ignore this seamy side of regulation, hoping that proposed network neutrality regulation will work perfectly, with no unintended consequences, implemented by an all-wise, lobby-proof, above-politics FCC. Those of us with actual experience with regulators (such as the author) find this Pollyanna attitude naïve in the extreme (p. 313).

In the short time that the FCC has announced its new net neutrality regulations, one would expect that there has not been sufficient time for rent-seeking to get under way. One would expect, but one would be wrong; several attempts to press the FCC to order changes in commercial arrangements have already occurred. A particularly egregious example involves Level 3, a firm heretofore an Internet backbone provider who recently agreed to distribute movies for Netflix, which makes them a content delivery network (CDN). Level 3 was notified by Comcast that it would no longer "peer" with Level 3 (in which traffic is exchanged between peers without charge), as their new CDN status made them a "transit" network (in which the transit network is charged a fee by the backbone). For the past twenty-five years, the basis of peering relationships has been rough equality of traffic flows. If traffic flows are unbalanced, as would occur with a CDN, the network generating the excess traffic is a transit network and is charged a fee, according to long-standing contracts and industry practice.

In this case (just after the FCC announced its new net neutrality rules), Level 3 complained to the FCC that Comcast was violating the net neutrality rules by charging them to carry their content. Although these rules were explicitly to apply only to last-mile ISPs and not backbone networks, Level 3 asked for FCC intervention so they could continue to get free carriage of their traffic even though their business model had

changed. The issue was described eloquently in a recent blog by Mueller (2010):

On Tuesday (November 30) Internet backbone provider Level3 publicly accused cable-based ISP Comcast of trying to thwart competing video services delivered through the internet. Comcast was, according to Level 3, suddenly choosing to charge it more because of its carriage of Netflix traffic. The accusation was consciously framed to raise net neutrality alarms. It appeared as if a cable TV giant was using its control of internet access to make access to a competing, over the top video service more expensive,

Then the full story came out. This was a peering dispute. In peering agreements, two ISPs exchange traffic without paying each other, on the assumption that both parties have roughly balanced traffic and benefit equally from the interconnection. When there is no balance—that is, when ISP A reaps more benefit from the interconnection than ISP B—it is common practice for ISP A to pay ISP B for the service.

The Level 3 maneuver is a good example of what can and will happen with an over-regulated internet: one business interest complains about another about a commercial negotiation and attempts to bring in the feds simply to get a better business deal. Opening up these contractual arrangements to political mediation is a slippery slope. The scope of regulation—and the costs of participating in the industry—steadily rise as more and more aspects of the industry are sucked into this vortex.

As of this writing, it is unclear what the FCC intends to do about it. It was reported by Kang (2011) that the Julius Genachowski, chair of the FCC, had testified before Congress that the FCC had no intention of interfering in contract disputes among backbone providers, but later commentators suggested he didn't really say this. Regardless of the outcome of this particular issue, we can rest assured that very soon, the FCC will be "...sucked into this vortex", in Mueller's words. And it is this ineluctable process which creates the true costs of regulation, not the actual regulations themselves. The ultimate tragedy of the FCC's net neutrality regulation is that the FCC will slide down the slippery slope to the depths of rent-seeking whether it wishes to or not.

Conclusion

This review of the economic literature on net neutrality has necessarily been selective and brief, although I do believe representative of the various sides of the debate. The conclusion of this review is clear: *the economic evidence does not support prophylactic net neutrality regulation*. In the absence of significant evidence of "bad behavior" by broadband ISPs over the past decade, the extensive literature is unable to support such regulation. Even articles specifically arguing for net neutrality regulation cannot make an unambiguous case for regulation, as this review demonstrates. I again rely on Owen (2010, *supra*) to state it best:

Thus, it is reasonable to conclude that prophylactic regulation is not necessary, and may well reduce welfare. Sound policy is to wait for ex post evidence of harm to justify interventions in specific cases.

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