THE ECONOMIC CONSEQUENCES OF NETWORK NEUTRALITY REGULATION

by

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B.S., Kansas State University, 2010

A REPORT

submitted in partial fulfillment of the requirements for the degree

MASTER OF ARTS

Department of Economics
College of Arts and Sciences

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2012

Approved by:

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Abstract

The Internet is a network that consists of content providers and users connected to each other through the communication lines managed by network providers. Network neutrality rules are designed to protect independent content providers from unjust discrimination by network providers. This report explores the economic rationale for net neutrality rules, how the regulation should be enforced, and its potential effects on competition. The report finds that net neutrality encourages competition among content providers by subsidizing content provider access but concentrates the market for network providers by forcing network providers to compete primarily through price competition. It considers this to be a beneficial arrangement for economic growth, but observes that there is a potential for all sides of the market to be subsidized by advertiser fees. It also shows that despite the Federal Communications Commission's heavy involvement with network neutrality rules, these rules are actually based in a long history of antitrust regulation. It concludes, however, that the current regulatory environment is sufficient for enforcing net neutrality rules.

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Acknowledgements

I would like to thank my Major Professor, Dr. Dennis L. Weisman, for his useful advice and continuous support. I would also like to thank Kansas State University and its Economics Department for providing the opportunity to write this report.

Chapter 1 - Introduction

Network Neutrality, the basic belief that no Internet user should be given preferential treatment, is a controversial issue that has attracted a wide range of attention from consumer advocates, corporations, government agencies, and the court system. The arguments, often politicized, have generally been framed by the basis of who benefits, who should benefit, and who should be deciding who benefits from net neutrality protections. This is understandably driven partly by economics, but also by self-interest and political ideology. The principle objective of this report is to focus primarily on the economic arguments that underlie the net neutrality debate and provide a balanced review of the literature.

The remainder of this report is organized as follows: The history of the net neutrality principle, both regulatory and economic, is discussed in Chapter 2. Chapter 3 provides the technical foundations and consistent themes given to define net neutrality. In Chapter 4, the critical market characteristics are described. Once this base is constructed, the question of which agency is in the best position to regulate net neutrality is examined in Chapter 5; Chapter 6 discusses the effects of net neutrality on competition and innovation, and Chapter 7 concludes with comments on the future of the net neutrality debate.

Chapter 2 - The History of Net Neutrality

The background behind net neutrality is divided into two parts. The first part is the economic history and it traces its origins back many years. It covers the economic origins of net neutrality ideas that developed in industries that existed long before the Internet and parallels the arguments with today's telecommunications industry. The second part is the more recent regulatory history. It describes how these ideas have been applied over the past decade.

Economic History

The economic issues surrounding net neutrality predate the rise of the Internet. The arguments, while very different from a technological standpoint, are in an economic sense strikingly similar to what faced the railroad industry during the Industrial Revolution and the spread of the electric utilities and telephone networks many years later (Owen 2007; Lee and Wu 2009). The main economic idea is a network that facilitates the growth of the entire economy and

plays an integral part in the everyday life of consumers. These networks are described as common carriers (Speta 2002; Lee and Wu 2009).

Common carrier rules "to serve and to interconnect" are primarily based on concerns about abuse of market power and "a duty to serve the public interest" (Speta 2002; Lee and Wu 2009). Throughout history, the case for market power and the government's role in limiting its exercise was well-founded. In many areas and over long periods of time, railroads and telephone companies were local monopolies. In terms of public interest, there was "the possibility of new services that used the carrier as an important input" (Speta 2002, p. 273). And when connecting these early ideas to the net neutrality debate, the FCC contends that "[l]ike electricity and the computer, the Internet is a 'general purpose technology' that enables new methods of production that have a major impact on the entire economy" (FCC 2010a, p. 5).

The economic rationale for economic regulation is summarized by Professor Alfred Kahn (1970, p. 11):

> The importance of these industries, as measured not merely by their own sizable share in total national output, but also by their very great influence, as suppliers of essential inputs to other industries, on the size and growth of the entire economy. These industries constitute a large part of the "infrastructure" uniquely prerequisite to economic development. . .

But in what way are the historical common carriers similar to today's Internet? In all cases, it begins with a concern that firms will use their market power for "unjust discrimination" (Owen 2007). A focus on the idea that standardization across the network, including for example the standard rail gauges, allows a greater degree of expansion. And the presence of strong network effects that enable increasing returns to scale. Many authors argue that each of these is present in the current economic environment.[1] Chapter 4 of this report takes a much closer look at the economic characteristics of the Internet's market.

Regulatory History

The regulatory history of net neutrality has been shaped by the Federal Communications Commission (FCC). Historically, the FCC has been the primary regulator of television and radio

[1] See Speta (2002), Lee and Wu (2009), and Van Schewick (2007) for more detailed comparisons between net neutrality and common carrier rules.

broadcast stations, wired telephone services, and wireless services (FCC 2010b). More recently, as Internet access became more universal, the Telecommunications Act of 1996 expanded the FCC's regulatory power by clarifying the difference between content providers and network providers. The act created a "distinction between 'telecommunications services' used to transmit information and 'information services' that run over the network" (FCC 2010b, p. 6). This enabled the FCC to regulate Internet connections in essentially whatever way the agency deemed appropriate. The FCC chose to focus on net neutrality.

Over the past decade, there are three known cases of the FCC exercising its regulatory power to enforce net neutrality:

- In 2005, Madison River Communications blocked its customers from using a competing phone company's services over their network. The FCC fined Madison River $15,000 (Weisman and Robinson 2009; Faulhaber 2011).
- In 2008, Comcast intentionally downgraded specific Internet services for the purpose of network management. Comcast was not punished, but was required to disclose its network management practices. Comcast then challenged the FCC's jurisdiction (Weisman and Robinson 2009; Faulhaber 2011).
- In 2009, AT&T blocked iPhone access to competing WiFi connections. This was resolved by the FCC (Faulhaber 2011).

Between these three cases, the FCC's guidelines have been repeatedly challenged in court. In the 2005 Brand X case, the first major challenge to net neutrality, the majority ruling upheld the FCC's legal right to regulate Internet connections by stating that "[a]mbiguities in statutes within an agency's jurisdiction to administer are delegations of authority to the agency to fill the statutory gap in reasonable fashion. Filling these gaps . . . involves difficult policy choices that agencies are better equipped to make than courts" (Brand X 2005: discussing Chevron U.S.A., Inc. v. Natural Res. Def. Council, Inc., 467 U.S. 837 (1984)).

Since then the courts have vacillated between supporting the FCC's directives and scaling back its influence. The latest such ruling on net neutrality came in 2010, two years after the FCC accused Comcast of violating net neutrality rules by improperly managing network traffic. In this case, the Court of Appeals ruled that the FCC did not have the jurisdiction to enforce net neutrality rules. The court did not comment on the rules themselves, but only stated that the FCC did not have the authority to impose such restrictions (Shelanski 2011; Comcast v. FCC 2010).

This ruling left the FCC with only a few options for enforcing their net neutrality principles. They could appeal the court's decision, ask for new authority through legislation, or rewrite the broadband rules. Because of the delays involved with working through the courts and/or Congress, the FCC ultimately decided to rewrite the rules. This case also led the FCC to pursue what has been called a “compromise” in their most recent rules revision. Despite the compromise, both consumer advocates and large telecom companies were displeased with the new rules. Proponents of net neutrality did not think it went far enough to protect consumer rights and large corporations believed that it was only another step towards a complete government takeover of the Internet (Gustin 2010).

While the boundaries of the FCC's jurisdiction are somewhat uncertain, the FCC's current net neutrality goals are clear. It is the official position of the FCC that net neutrality guidelines should encourage broadband expansion, foster application and content development, “preserve and promote the open and interconnected nature of the public Internet . . . [and] insure consumers benefit from the innovation that comes from competition” (FCC 2010b, p. 11). To see how the FCC's mission relates to the Internet marketplace, this report focuses on the economic arguments related to economic regulation, the competitive process, and innovation. If network neutrality regulation does not serve to further the FCC's goals, there may be alternative methods to reaching those goals.

Chapter 3 - Net Neutrality Definition

Net neutrality is a vague term with varying descriptions, but the net neutrality principle has become so well known that it is now clearly defined in the Oxford Dictionary as "the principle that Internet service providers should enable access to all content and applications regardless of the source, and without favoring or blocking particular products or websites” (Oxford 2011). As noted above, this description fits closely with the history of common carrier rules. This section examines why that definition is important as a technical legacy to Internet connectivity, explores the major themes within the broad description of net neutrality, and discusses some potential problems with how net neutrality is defined.

Foundations

Net neutrality principles are embedded into the Internet's design. From the beginning, "[t]he Internet's founders intentionally built a network that is open, in the sense that it has no gatekeepers limiting innovation and communication through the network" (FCC 2010a, p 5). David Weinberger's (2003, p. 148) technical description of the Internet emphasizes this idea:

> The Internet is designed to move bits *and not* decide which bits to move, which bits to block, what is done with the bits, and whether anyone should have to pay for receiving particular bits. It's the Internet's job to allow such capabilities to be added by the people who want them. Thus, by design, all the Internet's bits know is what they need to know to travel from point A to B . . . [T]hey don't know what information they represent, whether the information is vital to the national security or just another dumb joke, or who owns the information; all they know is they need to get somewhere.

The information contained in bits (more commonly referred to as packets) has no connection to how those bits are transferred. This is often referred to as the "end-to-end principle" (Yoo 2004; Economides and Tag 2009; Wu 2003). The initial premise "can be stated as follows: absent evidence of harm to the local network or the interests of other users, broadband carriers should not discriminate in how they treat traffic on their broadband network" (Wu 2003, p. 171). The term end-to-end comes from the idea that "computers attached to the Internet that are sending and receiving information packets [do] not need to know the structure of the network and could just interact end-to-end"(Economides and Tag 2009, p. 3). For example, "[t]he Internet Protocol suite (IP) was designed to follow the end-to-end principle, and is famously indifferent both to the physical communications medium 'below' it, and the applications running 'above' it" (Wu 2003, p. 146). This basic neutral, non-discrimination platform, carried over from the long economic history of common carriers, is the foundation on which all subsequent net neutrality themes are built.

Key Themes

Despite the relatively vague notion of non-discrimination, there are key methods behind achieving that goal. These methods are categorized into three main rule-based net neutrality themes. These rules prevent ISP's from "(1) denying or degrading access of end-users to specific content or applications on the Internet, (2) conditioning the quality of service for the delivery of

content upon the payment of a fee, and (3) vertically integrating into the production of content and applications" (Sidak 2006, p. 56). A more detailed examination of these key themes follows.

Blocking or Degrading Content

The ability to alter an end user's experience by blocking or degrading Internet content is central to most net neutrality proposals. ISP's and network operators currently have the technology available "to distinguish between the different applications using the network and to control their execution. For example, network providers can slow down selected applications or content, speed them up or exclude them from the network completely" (Van Schewick 2007, p. 3-4). In other words, network providers can technically choose to discriminate among applications or content providers.

Under net neutrality rules, this form of network management is prohibited. Referred to as "anti-blocking" rules, these rules are aimed at "efforts by a broadband provider to impede its subscribers' access to particular Internet content or applications" (Nuechterlein 2009, p. 7). The FCC enforces these rules based on the belief that "[t]he freedom to send and receive lawful content and to use and provide applications and services without fear of blocking is essential to the Internet's openness and to competition in adjacent markets" (FCC 2010a, p. 37). This belief is based on the end-to-end principle described in the previous section.

Empirically, the complaints of blocking that have been issued have come from "two broad categories. The first is the blocking of Voice over IP (VoIP) service by a provider of DSL service. The second is the blocking, by a provider of cable modem service, of access to virtual private networks (VPNs), home networking, and online gaming services" (Sidak 2006, p. 60). The reasons are varied. In the first category, VoIP services that utilize an internet connection as a phone line are often in competition with the traditional telephone network (Van Schewick 2007). In the second category, it is often an attempt to limit bandwidth usage (Yoo 2006). Of the FCC cases listed above, the Madison River case falls into the first category; the Comcast decision in the second. These issues are detailed in Chapter 6.

A Ban on Access Tiering and Differential Pricing

Under the current pricing system, users and content providers pay ISPs fixed access fees to connect to the Internet, but are not charged based on their level of network usage (Lee and Wu 2009; Nuechterlein 2009). Net neutrality advocates argue that this current pricing system

encourages economic growth (Van Schewick 2007). They consider additional usage-based fees to be unfair discrimination.

The second major theme is a ban on access tiering and differential pricing. Access tiering is the practice of charging content providers for priority delivery. Priority delivery is different from a standard increase in bandwidth or speed because priority means giving preference to some packets over others that are using the same internet connection. In other words, with a ban on access tiering and price discrimination, content providers would still be able to provide better service by paying for more bandwidth or a faster connection, but would not have the option of paying a fee to give their packets priority delivery on lines of the same speed (Sidak 2006).

Even among net neutrality supporters there is disagreement about how far a ban on access tiering should go. Some net neutrality advocates "seek restrictions on *any* differential treatment of Internet traffic, such as differential pricing of different types of Internet services"(Weisman and Robinson 2009, p. 25). This is considered the "strong form" of a ban on access tiering. "In contrast, the 'weak' form of access-tiering regulation would permit broadband networks to strike business-to-business deals . . . [but] the broadband network would be required to offer the same deal on the same contractual terms to other willing buyers" (Nuechterlein 2009, p. 13). This pricing problem will be reviewed further in Chapter 6.

A Ban on Vertical Integration Between ISP's and Content Providers

Historically, "[c]ommon carriers were permitted to offer data processing services, so long as they separated their carrier operations to protect against cross-subsidy and discrimination" (Speta 2002, p. 265). Nonetheless, the FCC contends that "delivery networks that are vertically integrated with content providers . . . have incentives to favor their own affiliated content" (FCC 2010a, p. 14). Because of these perceived incentives, a ban on vertical integration is considered a policy instrument that could avoid the conflict of interest that arises between affiliated content providers and ISPs.

On the other side, opponents argue that "as a normative matter, a network operator should have the right to use capacity on its network to vertically integrate into the provision of content or applications" (Sidak 2006, p. 32). But even with such a normative right, the concern is that "network operators and ISPs [would] use their power over the transmission technology to negatively affect competition in complementary markets for applications, content and portals"

(Van Schewick 2007, p. 1). Whether vertical integration improves the competitive process and induces innovation is also examined in Chapter 6.

Complexities

A comprehensive discussion of net neutrality must include some of the potential problems with the neutral ideal. From an economic perspective, the fact that all information should be considered equal is problematic when there are very clear differences in the marginal utility between a simple music download and something that is vital to national security. In addition to the different levels of marginal utility, there is also the possibility that when net neutrality is applied across different types of applications, it is in fact no longer neutral.

Wu (2003, p. 149) addresses the second point:

> A policy that appears neutral in a certain time period, like 'all men may vote', may lose its neutrality in a later time period, when the range of subjects is enlarged. This problem afflicts the network neutrality embodied in the IP protocols. As the universe of applications has grown, the original conception of IP neutrality has dated: for IP was only neutral among *data* applications. Internet networks tend to favor, as a class, applications insensitive to latency (delay) or jitter (signal distortion). Consider that it doesn't matter whether an email arrives now or a few milliseconds later. But it certainly matters for applications that want to carry voice or video. In a universe of applications, that includes both latency-sensitive and insensitive applications, it is difficult to regard the IP suite as truly neutral as among all applications.

As the Internet evolves, it may be necessary to redefine net neutrality principles in ways that are consistent with both the value contained within information sent over the networks and the expansion of time sensitive applications. Wu's (2003) conclusion on the matter is that what is currently described as a neutral system may in fact be inherently discriminatory. There is also an open question of who should decide what is neutral. This question is reviewed in Chapter 5.

Chapter 4 - Market Characteristics

The net neutrality debate is often guided by a combination of economic factors that are based on well-understood economic ideas. Both sides generally agree about which factors are important and employ a similar analysis. The disagreement, in many cases, arises not from the method of analysis, but from the internal values placed on who should receive the benefits of net neutrality regulation. This section examines the network structure, the existence of market

power, externalities of Internet connections, and the characteristics of two-sided markets. Each market condition has a significant effect on the net neutrality idea and will be used as a basis for the analytical sections of this paper.

Network Structure

The Internet is a large network that can be categorized in a number of different ways. To keep the analysis as simple as possible without sacrificing the core of the net neutrality debate, this report will adopt a modified form of the network structure used by Van Schewick (2007) and Lee and Wu (2009) that focuses on only three general parties: content providers that supply the Internet applications, Internet Service Providers (ISPs) that provide the network connectivity, and end users. In addition, we proceed "with the critical understanding that users can also act as content providers" (Lee and Wu 2009, p. 62). To see how these modifications are possible, it is useful to illustrate some of the more complex definitions of the network structure. A few of these alternative definitions are described here.

According to Yoo (2004), there are two basic analogies used to explain the interactions between network providers and content providers. Which analogy is used depends on the principles that one is attempting to convey. One way to describe the broadband network is as "a traditional, three-step chain of distribution, in which the ISPs act as a wholesaler and the last-mile providers play the role of the retailer" (Yoo 2004, p. 47). The other way to describe the broadband industry is through a layered model.

The three-step model is analogous to the manufacturing industry. Following this analogy, the manufacturing stage includes companies that create websites and Internet services. The wholesale stage, where content and applications are aggregated, is covered by ISPs and large telecom companies. And the final retail stage is covered by the last mile providers that act as a delivery service to end consumers (Yoo 2004).

In contrast, the layered model describes the Internet as a series of layers grouped horizontally by the type of service provider. The bottom layer is the physical layer, which are the physical wires, computers, and equipment that is used to carry data. The second layer is the logical layer, which are the instructions that guide the flow of traffic through the physical layer. The third layer is the applications layer. It is composed of software programs that the end

consumer uses to interact with the network. The top layer is the content layer. It includes the specific information passing through the other layers (Yoo 2004).

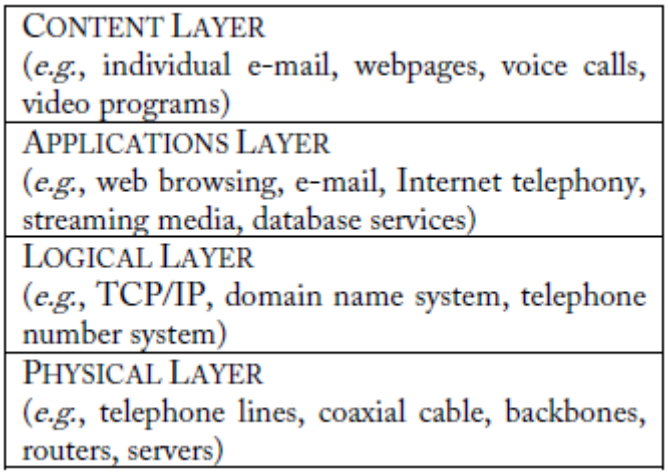

Figure 4.1 The Layered Model of Broadband Architecture *Source: Yoo 2004.*

The basic architecture of the Internet can also be described as a series of steps. Based on the FCC's own network provider categories, this model explains the flow of information through the Internet. The end user's request for a webpage goes through the system to the file server, and the information contained in that webpage is returned back to the end user. This process can take multiple routes, but typically passes through the end user's local last mile provider, through a regional access middle mile connection, and then uses large backbone providers to reach the file server. This process is mirrored on the other side of the backbone (Yoo 2006).

Nuechterlein (2009, p. 4) provides more details on the specific agents involved with this multistep process:

> *Internet backbone networks*—such as AT&T, Level 3, Global Crossing, and SAVVIS—use long-distance fiber-optic cable to connect other, geographically dispersed networks, including the networks of large businesses, Internet access providers, and other backbone providers . . . [and] most end users rely on an *access network* to bridge the "last mile" gap between them and an Internet backbone network (which in turn connects them to the rest of the Internet).

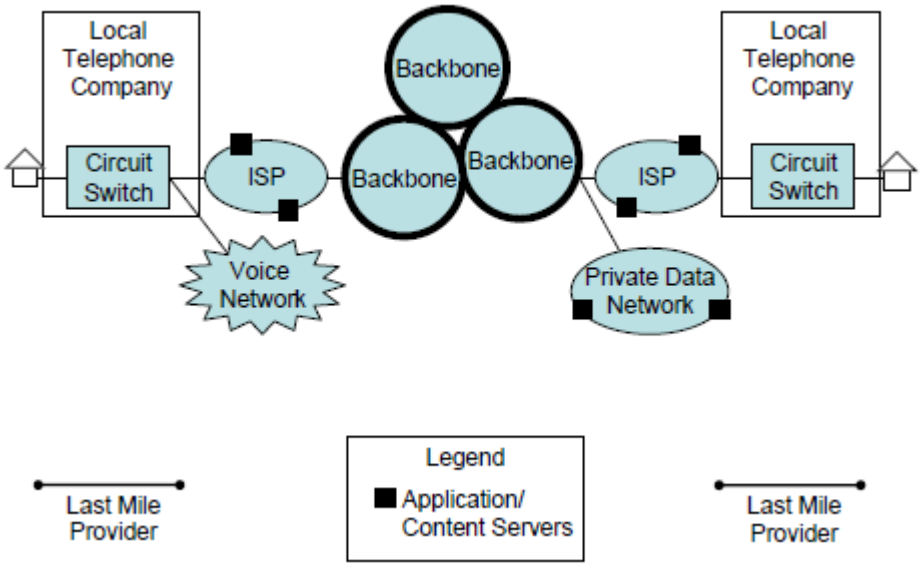

Figure 4.2 The Basic Architecture of the Internet *Source: Yoo 2004*

Others use a more straightforward definition of the Internet's categories. Hahn and Wallsten (2006, p. 1) group the Internet into four parts: "Content providers like Google, Amazon, and eBay; the Internet backbone networks managed by a host of companies including Level3, AT&T, Sprint, Verizon, and Qwest; broadband service providers like AT&T, Verizon, and Comcast; and end-users—that is, consumers and business." This report uses similar categories, but because of the significant overlap in backbone network providers and broadband providers, these two parts are grouped together. This change results in three broad categories: content providers, ISPs, and end users. Despite the inherent complexity involved with the Internet, this model should still yield relevant insights into the nature of the Internet's competitive marketplaces.

Market Power

Market power is defined by the Department of Justice (DoJ) as the ability of "one or more firms to raise price, reduce output, diminish innovation, or otherwise harm customers as a result of diminished competitive constraints or incentives" (DoJ 2010, p. 2). The absence or existence of market power, when measured by the concentration of market share, depends primarily on the size and range of the market. When a firm can presumably be shown to have market power in a strictly local market definition, it can also be proven to have no market power in a nationally defined market. One of the difficulties with net neutrality proposals comes from

deciding which size of market is relevant to the measure of market power, and whether market share is an appropriate measure for market power.

Because market share and market concentration are the DoJ's most commonly used methods for defining market power, this pushes the debate about market power into a debate about market concentration. However, market concentration is related to the size of the market, and defining the market boundaries depends on what is relevant to the end consumer. This section examines the difference between a locally defined ISP market and a nationally defined ISP market.

Hahn and Wallsten (2006) use the number of broadband providers per zip code as a proxy for the degree of local market concentration. Citing FCC statistics, they show that even as late as 2005, "nearly 90 percent of all zip codes in the U.S. had two or more broadband providers, and 75 percent had three or more" (Hahn and Wallsten 2006, p. 5). A more refined analysis showed that "only 5.6 percent of zip codes have access to only one high-speed Internet provider and 93.3 percent of zip codes have access to two or more high-speed Internet providers" (Sidak 2006, p. 37). It should be noted, however, that having multiple providers in the same location does not imply that those providers compete directly, and that the true level of local market power may be higher than what would be suggested by this measure (Hahn and Wallsten 2006).

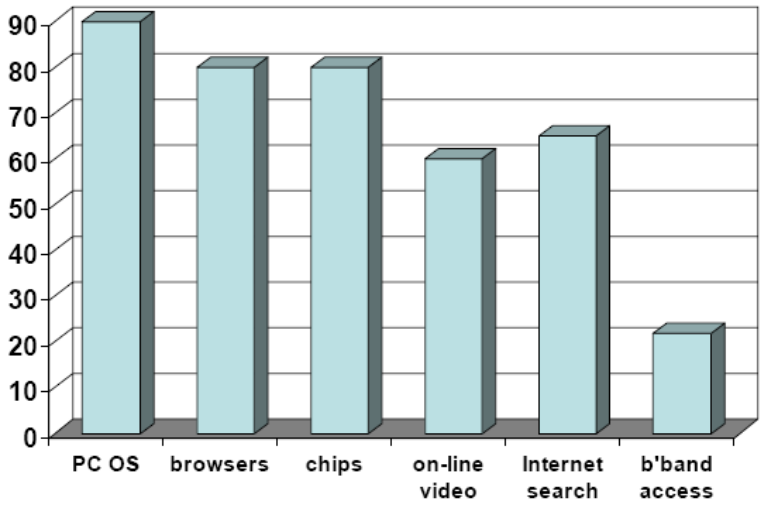

Figure 4.3 The Market Share of the Largest National Providers in Internet Industries
Source: Nuechterlein 2009

Nuechterlein (2009) uses a nationally defined market to examine the existence of market power. By looking at "the national market share of the largest providers in selected Internet-related markets," he compares the competitive landscape from different computer industries (Nuechterlein 2009, p. 40). From a broad, nationally defined ISP market, the market concentration for broadband access appears relatively benign. But what level of concentration implies market power is still an open question. The implications that this discussion has for net neutrality regulation is explored in Chapter 5.

Externalities

Any discussion about regulation is incomplete without some mention of externalities. Externalities are a source of market failure that often justifies some form of regulation. For the Internet, there are two primary sources of externalities: network effects and bottlenecks. Network effects are the idea that connecting two users together will increase the total value of the network by more than the combined value to each user (Sidak 2006; Yoo 2004; Nuechterlein 2009; Van Schewick 2007; Lee and Wu 2009). [2] Bottlenecks are the congestion that occurs when too many users attempt to use the same communications connection simultaneously (Yoo 2006; Lee and Wu 2009).

Network effects can come in two forms: direct network effects and indirect network effects. For example, a direct network effect would come from service such as instant messengers or telephones, where the value of the service is based on the number of people who can be directly contacted. "Viewers for multimedia content are subject to indirect network effects. The larger the catalogue of content available in a particular format, the more users value owning viewers compatible with that format" (Van Schewick 2007, p. 13).

Network effects have a pronounced impact on the Internet. A user's choice to connect to the network is based on the content providers that are already connected, and a content provider's investment decision is based on the number of users it can reach. What results from

[2] For example, let N be the number of local telephone subscribers. Then the number of possible connections between the N subscribers is given by P(N) = N(N-1)/2. Hence, when N = 2, there is only one possible connection between the two subscribers. When N = 10, there are 45 possible connections. And when N = 11, there are 55 possible connections. Therefore, the addition of the eleventh subscriber makes 10 additional connections possible.

these choices is a virtuous circle of network growth where each additional user and content provider increases the value of the overall network (Lee and Wu 2009).

While network effects increase the value of the network based on the number of additional users, there is a point at which these extra benefits no longer exist. When capacity is constrained and the amount of user traffic exceeds this capacity, bottlenecks will occur. Yoo (2006, p. 1862) provides the details of this transition:

> For example, the bandwidth of each component of the physical transmission media (e.g., the wires and fiber nodes comprising the network) is limited. The number of packets and requests that routers and content servers can fulfill at any time is similarly constrained. When data packets arrive at a rate that exceeds the capacity of any particular element, they form a queue. The resulting delay in the speed with which the requests are fulfilled causes degradation in the quality of service provided by the network.

Thus, as the network grows, network effects increase the value of the network up to the congestion point. After the point of congestion, the network's traffic is constrained by the limits of the network's technology. It is at these bottleneck points where the net neutrality debate becomes most controversial, because this is where network operators are forced to decide which packets to send first. Net neutrality rules say that this decision must be based on a first come first serve basis. Whether this is the appropriate method for network management is one of the primary questions addressed by this report.

Two-Sided Markets

The description of two-sided markets is related to network effects, but it is based on the network operator's point of view. These are "markets in which a platform provider needs to attract two types of participants, and the presence of more of one type makes the platform more valuable to the other type" (Mussachio et. al. 2009, p. 23). The Internet broadband network is a two-sided market that consists of content providers on one side and users on the other (Economides and Tag 2009). As a frame of reference, Lee and Wu (2009, p. 64) describe many other well-known two-sided markets:

> [p]ayment systems, such as credit cards or online services; hardware-software markets like videogames or operating systems; retail marketplaces such as bazaars, shopping malls, or auction houses; matching markets, such as nightclubs or job sites; and advertising exchanges, such as online advertising platforms as well as commercial telephone books.

The way that a two-sided market is managed depends on the pricing scheme set by the platform operator. Weisman and Kulick (2010, p. 10) describe such a system in mathematical terms:

> Let the price level of the transaction be given by $p = p^B + p^S$, where p^B is the transaction price to the buyer and p^S is the transaction price to the seller. The price structure is the particular allocation of p between p^B and p^S. . . [I]f the volume of transactions varies with p^B while p is kept constant, the market is said to be two-sided

When a two-sided market exists, the intermediary between the two sides can choose to either extract revenue from both sides, partially subsidize one side of the market by setting a lower price on the other side, or fully subsidize one side of the market by setting a price of zero on the other side (Mussachio et. al. 2009; Lee and Wu 2009; Economides and Tag 2009; Weisman and Kulick). This is a sensitive issue, because "charging fees to one side as opposed to the other—even if the sum of prices across sides is the same—can affect who uses the network, overall transaction volume, and ultimately the efficiency of the market" (Lee and Wu 2009, p. 64). Each economic actor, including the intermediaries and the regulatory agencies, has an interest in guiding network development.

If prices are set efficiently, "the side of the market with the greater willingness to participate (i.e., the more inelastic demand) pays the higher price and *vice versa*" (Weisman and Kulick, p. 12; Weisman 2010). However, when consumer protection is involved, it will ultimately be government regulators who have the largest impact on pricing decisions. Currently, the FCC's position is to support net neutrality pricing. In the context of two-sided markets, "net neutrality is defined as a restriction that Internet Service providers cannot directly charge content providers for access to consumers, i.e., the price on one side of the market is constrained to zero" (Economides and Tag 2009, p. 5). Net neutrality is, in other words, an implicit subsidy for content providers (Lee and Wu 2009). The effects of this subsidy are examined in Chapter 6.

Chapter 5 - Regulation

This chapter explores the impact of regulation on achieving net neutrality goals. While social regulation such as adequate disclosure is an important issue, this report's focus is limited to economic regulation. In these terms, all sides agree that regulation is justified only if the

benefits from regulatory intervention exceed the costs. Where the disagreements begin are in determining when regulatory intervention is necessary, who should regulate, and what goals can be accomplished through regulation.

The need for some regulatory intervention comes from two sources: the externalities described earlier in this report and the empirical proof that network operators have engaged in anticompetitive behavior. A general example of anticompetitive behavior in this market is a tendency to ban new or emerging network technologies such as WiFi devices. The results of such bans inevitably distort the natural flow of network development (Wu 2003).

When regulatory intervention should occur and who should regulate is in reality the same question. "The threshold choice is between a[n] antitrust agency with general jurisdiction over multiple economic sectors," such as the Department of Justice, and an industry specific regulator with jurisdiction over one economic sector, such as the FCC (Nuechterlein 2009, p. 37). An antitrust agency acts on an ex post basis, after an economic injustice occurs, while an industry-specific industry regulator is charged with ex ante regulation designed to prevent economic harm in the first place or correcting a market failure. In either case, "[t]he effort is to strike a balance: to forbid broadband operators . . . from restricting what users do with their Internet connection, while giving the operator general freedom to manage bandwidth consumption" (Wu 2003, p. 167-168). However, regulators must also be careful to ensure that net neutrality is used to encourage competition and not used as a means to dictate specific market outcomes (Weisman and Robinson 2009).

This chapter considers which agency might have the proper tools to reach net neutrality goals. It is divided into three parts. The first part explains the FCC's role in shaping the debate, the second part considers how the DoJ should be involved, and the third part weighs the costs and benefits of ex ante regulation versus ex post regulation.

The FCC's Role

The FCC has taken the lead in supporting net neutrality regulation. The arguments for allowing the FCC to continue as the primary regulator of Internet communications come from the agency's specialized industry knowledge. This knowledge results in a comprehensive understanding of the marketplace (Speta 2002). The arguments against the FCC stem from a concern that "[r]egulatory agencies often settle into a well-established pattern of subservience to

politically influential economic interests" (Owen 2007, Abstract). An overview of both sides of the debate is instructive.

The primary advantage of the FCC's involvement is that when there are antitrust suits in play, the technical details of telecommunications cases require the input of an agency with expert knowledge (Speta 2002). The specialized industry knowledge of the FCC speeds up the regulatory process and encourages a more efficient outcome. Being closely connected with the telecommunications industry also allows the FCC to anticipate potential market distortions and take action before these distortions become problematic. It is the ability to prevent the abuse of market power rather than react to it that makes the FCC an appropriate choice of regulator. The FCC does this through enforcing net neutrality rules on an ex ante basis.

Nonetheless, there are some drawbacks to using an expert agency so closely tied to a single industry. A focused agency such as the FCC could become so involved with the telecommunications industry that its policies begin to deviate from consumer interests. This result could come from either a desire to please political constituents or a need to justify the magnitude of its regulatory authority.

The criticism is grounded in the concern that the FCC focuses more on the political advantages of their decisions than on the economic reality. Unfortunately, these political advantages often conflict with their stated goal of protecting consumer interests. In addition, Nuechterlein (2009, p. 38) states that,

> whereas the Justice Department and the FTC must ask, 'which competition offenses across the economy threaten the greatest harm to consumer welfare?', the FCC too often asks: 'what do we need to do in order to remain important players in the telecommunications industry?' Here, too, the answer to that question will often diverge from the answer that would best serve long-term consumer welfare.

Ultimately, "the FCC's narrow focus on a single industry creates incentives for the agency to keep itself relevant by erring on the side of market intervention in close cases" (Nuechterlein 2009, p. 38). This can undoubtedly result in too much regulation. But whether the problems with this incentive can be overcome by the benefits of the FCC's specialized knowledge - knowledge that should provide it with the ability to prevent market distortions - remains an open question. The FCC steadfastly believes that it can strike the appropriate balance (FCC 2010a).

The DoJ's Role

The alternative to FCC regulation is to allow the market to regulate itself and use the current anti-trust laws to counteract any anti-competitive effects on an ex post basis. Taking this route would make the DoJ responsible for oversight of the telecommunications industry. At the moment, because of the FCC's heavy involvement in regulation, the DoJ appears to take a supporting role. It is unlikely that the FCC will voluntarily give up control of its regulatory jurisdiction, but it is useful to consider how the DoJ might use anti-trust laws to reach the same goals as the FCC.

Some economists prefer this approach because they believe that "the net neutrality debate . . . is fundamentally about core antitrust concepts: about market power, market failures, market definition, and the costs and benefits of government intervention in a rapidly evolving, high-technology market" (Nuechterlein 2009, p. 22-23). And since antitrust laws have a long, well understood history, it would seem appropriate to allow the Internet's design to be governed by those laws. The advantage of using this method would be to prevent over-regulation. The drawback is that antitrust regulation could be too slow to have any real effect.

The advantage of the DoJ approach is that they are required to accept only very serious cases. Because of their limited resources and broad scope, they cannot review every case (Nuechterlein 2009). This means that when there are marginal cases in the telecommunications industry, the DoJ will choose not to take any regulatory action. This contrasts sharply with the FCC's narrow focus, which creates the incentive to take more action than what is necessary. Nuechterlein (2009, Executive Summary) also describes political advantages involved with DoJ regulation:

> Because [antitrust] agencies regulate the economy at large rather than a single industry, they are less vulnerable than the FCC to capture by industry factions; they are less likely to develop industry-specific bureaucracies with incentives to keep themselves relevant through over-regulation; and, because of their firm grounding in antitrust enforcement, they are more likely to resolve competition-oriented disputes dispassionately and on their economic merits.

However, there is one significant problem with using only antitrust authorities to regulate the Internet. The process is very slow. For example, "AT&T did agree to divest itself of the Bell companies as the result of government antitrust litigation, but that result came eight years after the government instituted the case" (Speta 2002, p. 277). In today's telecommunications industry,

especially the market for Internet applications, eight years is simply too long. When it can take only one or two years for a market leader to be naturally displaced, an antitrust suit may not be relevant by the time it is resolved. In such cases, any intervention would likely fail the cost-benefit analysis.

Ex Ante vs. Ex Post

The previous discussion prompts an important question. Assuming regulation is necessary, when should it occur? Should regulation be ex post, after anticompetitive behavior has already occurred, or ex ante, designed to prevent the behavior from occurring in the first place? Ex ante regulation is based on broad rules that are applied to every player in the market while ex post regulation operates on a case-by-case basis (Sidak 2006). Net neutrality supporters tend to argue for ex ante regulation.

The argument for ex ante regulation that anticipates market inefficiencies is based on the following assumptions: A high probability of anticompetitive behavior; a high level of social harm resulting from anticompetitive behavior; and a small danger of false positives (Sidak 2006). The FCC contends that each of these assumptions apply to the Internet (FCC 2010a).

However, opponents of net neutrality tend to argue that a case-by-case approach leads to fewer market distortions. They claim that broad regulations cannot keep up with the pace of market innovation, that rule-based regulation interferes with investment incentives, and that these problems will reduce the long run consumer welfare. They conclude that ex ante regulation cannot match the flexibility of ex post regulation (Nuechterlein 2009).

Weighing the difference of these two sides is difficult. The result is highly dependent upon what one believes to be the true magnitude and frequency of anticompetitive damage. If the frequency of misconduct is high, this would favor an ex ante approach to regulation, but when the frequency of abuse is low, then ex post regulation is more appropriate. Regulation on a case by case basis is less costly when there is a low frequency of abuse. And because there have been only a small number of net neutrality cases that required regulatory attention, ex post regulation may be preferable. However, if the industry is not under careful supervision, ex post regulation could also lack foresight. Therefore, some combination of two approaches may be the most appropriate.

Chapter 6 - Competition and Innovation

A central point in the net neutrality debate is the origin of innovation. While many net neutrality ideas are open to compromise, questions about the primary source of innovation are based on fundamental beliefs. And unfortunately, there is "a trade-off: On the one hand, network neutrality regulation increases the amount of application-level innovation . . . On the other hand, it decreases network providers' incentives to innovate at the network level" (Van Schewick 2007, p. 38). This trade-off requires policymakers to choose which level of innovation is more important. Someone who favors innovation at the content provider level will likely support net neutrality, while someone who prefers innovation at the ISP level will oppose net neutrality. These diverging viewpoints are summarized by Tim Wu in a debate with Christopher Yoo (2007, p. 581):

> A lot of the difference between Christopher's view and my own stems from how we think the process of innovation occurs . . . Christopher thinks incumbents like AT&T will rarely or perhaps never threaten innovation. Instead he views them as the driving force of the technologies of tomorrow. I am skeptical. I think this view of incumbent behavior has been discredited, and that in general, incumbents, particularly in a monopoly position, have a strong incentive to block market entry and innovative technologies that threaten their existing business model.

Innovation, in a general way, *is* competition. It is competition through the introduction of new products and services.[3] And one of the main issues regarding net neutrality regulation is the effect on competition. The most important one to consider is whether net neutrality regulation is designed to protect a certain class of competitors, rather than to promote a competitive process.

To some, net neutrality's universal support among large content providers suggests that net neutrality benefits the largest market participants (Sidak 2006). Because of the network effects involved with Internet markets, the larger network is more attractive to users, causing it to grow faster. "Once this positive feedback loop sets in, the [largest firm] will quickly pull away from its rivals in market share, ultimately dominating the market" (Van Schewick 2007, p. 14-

[3] This idea can be traced back to Joseph Schumpeter and his views on the importance of competition through new products and processes. For example: "In the case of retail trade the competition that matters arises not from additional shops of the same type, but from the department store, the chain store, the mail-order house and the supermarket which are bound to destroy those pyramids sooner or later" (Schumpeter 2003, p. 85).

15). When the market has finally matured, it is highly concentrated. However, because ISP's are forbidden from offering networks tailored to specific user needs, net neutrality denies new ISP entrants the opportunity to compete in ways other than price. And by forcing competition based on price, "network neutrality reinforces the advantages already enjoyed by the largest players. Conversely, allowing network heterogeneity can provide new last-mile platforms . . . with a strategy for survival" (Yoo 2004, p. 54).

It is also difficult to support a desire for fairness in the marketplace when the very way of defining fairness can ultimately depend on the goals of the argument. On the one hand, in cases where network congestion arises, the optimal economic solution would be to find some way to differentiate high value information from low value information. "On the other hand, if there is sufficient bandwidth even during peak hours, then it doesn't matter if providers give their content or applications priority, but giving all content equal bandwidth availability is actually the fairest method of all" (Rose 2010, p. 4). There are many conditional possibilities to consider.

This section focuses on how net neutrality shapes competition and drives innovation. The first part provides an overview of competition and innovation among ISP's. The second part looks specifically at competition and innovation among content providers. The third part follows a discussion on competition based on quality, including observations as to how net neutrality acts as a subsidy for creativity. The final part shows how restrictions on vertical integration might complicate the net neutrality discussion and affect the distribution of investment returns.

Competition and Innovation of ISPs

The concentration of market share has already been documented in the section about market power. What this section aims to clarify is how net neutrality affects the level of competition and innovation among ISP's. Some arguments suggest that the national level competition among ISP's is quite robust, and the most concentrated part of the market is the "last-mile" providers that connect to end consumers. The idea is that net neutrality promotes competition among ISP's in the markets that are already competitive and limits competition in the markets that tend toward natural monopolies (Yoo 2004).

Net neutrality rules reduce the ability of last-mile providers to differentiate their products. Even if they choose to differentiate their products, one cannot charge a significantly different price from another. Yoo (2004, p. 63) explains the effects of this rule:

> Put another way, protocol standardization tends to commodify network services. By focusing competition solely on price, it tends to accentuate the pricing advantages created by declining average costs, which in turn reinforces the market's tendency towards concentration. Conversely, increasing the dimensions along which networks can compete by allowing them to deploy a broader range of architectures may make it easier for multiple last-mile providers to co-exist.

Based on this analysis, economies of scale is what makes it so difficult for new entrants to engage in price competition. For example, recovering a $100 million investment would require charging an average of $100 per customer if there were only one million subscribers, but the same investment could be recovered at an average charge of $10 per customer if there were ten million subscribers. Under this scenario, if a new provider is forced by regulation to offer a price of $10 per customer, but cannot reach the scale required to become profitable, it will choose not to enter the market. However, if given the freedom to choose their own price, the new ISP could plausibly find other ways to increase the value of their network that would make up for the difference in cost. Therefore, "[t]argeting those customers who value the differentiated services makes it possible for smaller networks to survive despite the greater inherent appeal of larger networks" (Yoo 2004, p. 65).

However, allowing differentiated services and different pricing schemes also gives ISPs the opportunity to engage in anticompetitive behavior by designing their networks to favor their own content (Van Schewick 2007). It can be argued that network operators have the right to design their network in any way that they choose. But according to Lee and Wu (2009, p. 71),

> [S]ervice providers face a prisoner's dilemma: it might be individually optimal for one provider to defect and charge positive fees to content providers, although if all content providers charged such fees, the outcome would be worse than had all providers refrained from doing so. In this sense, the existing de facto practice of zero-pricing for content providers on the Internet can be understood as a solution to this collective action problem. Given the temptation to defect, regulation in support of net neutrality—or the threat of such regulation—can play a useful role in maintaining a cooperative solution.

When focusing on innovation, net neutrality opponents also broadly assume that "net neutrality would reduce the profitability of broadband networks, and thus discourage network investment by ISPs" (Litan and Singer 2010, p. 3). The reasoning behind this belief is that net neutrality does not allow network providers to offer substantially differentiated services. For example, network providers have several options for differentiating their products. "One way is

by entering into exclusivity arrangements with respect to content . . . Another way that last-mile providers can differentiate the services they provide is by optimizing the architecture of their networks for different types of applications" (Yoo 2004, p. 62). But under net neutrality rules, these avenues for innovation are closed. As a technical matter it is possible to provide some level of differentiation, but ISPs cannot charge an extra fee for offering enhanced services, and "so long as ISPs are barred from charging for enhanced services, they won't offer them" (Litan and Singer 2010, p. 2-3). ISPs must instead compete solely by the prices they charge for connection to the network, and in this market there is evidence that price competition has been very strong. Sidak (2006, p. 41) provides the data:

> In 1999, the average price for a broadband connection was nearly $80 per month, whereas the price for broadband access in 2005 was . . . roughly $25 per month. Put in 1999 dollars, the price of broadband Internet access in 2005 was only $21.33 per month. In other words, the price of broadband access in 2005 had fallen to nearly one-fourth of its inflation-adjusted price in 1999.

Presumably, these major price reductions have decreased the potential profitability of smaller ISP's by taking away any potential niche markets that might have been available without net neutrality. And with the existence of economies of scale, the ISP market is pushed towards greater concentration. But how does a greater level of concentration affect ISP innovation? Net neutrality advocates say that it makes no difference. In a simplistic way, broadband providers have an incentive to expand their capacity because higher capacity leads to less congestion. When congestion is reduced, Internet connections and services are more valuable (Economides and Tag 2009). In other words, by denying ISP's the ability to manage and charge for congestion, their incentives are shifted to network innovation and expansion that are driven by network effects. But this conclusion is hotly debated. Innovation could also be driven by the desire to manage congestion in ways that do not include network expansion.

A much stronger argument suggests that network technology is a "general-purpose" technology that is used by everyone. Because it is widely used technology, there is an established science driving innovation (Van Schewick 2007; FCC 2010a). Van Schewick (2007, p. 38) observes that as a general example,

> the science and engineering base of hardware technologies is more developed than the science base of software engineering and of finding attractive business uses. Second, due to their generality, general-purpose technologies have larger markets than the individual applications; after all, while not all users of a general-

purpose technology need all applications, all users need the general-purpose technology.

Under this analysis, net neutrality has a negligible effect on network innovation because the incentives to innovate are already established and embedded in the network's value. What net neutrality does in this case is create incentives for innovation at the content provider level without substantially reducing the incentives for network innovation.

Competition Between Content Providers

The question of who net neutrality benefits is also relevant for the discussion about competition between content providers. It is widely accepted that net neutrality's primary goal is to facilitate competition between content providers (Lee and Wu 2009; Yoo 2004). However, net neutrality opponents often say that the "markets for applications and content have long been the most competitive segments of the entire industry, marked by low levels of concentration and low barriers to entry" (Yoo 2004, p. 53). This section explores whether these markets are competitive as a result of net neutrality ideals or in spite of net neutrality rules.

If there is one unique issue arises from this dispute, it is that "the bandwidth used by any one content provider is dynamic and proportional to its popularity: only content that is visited or popular consumes common resources, whereas sites that are never accessed utilize zero network bandwidth" (Lee and Wu 2007, p. 74). Larger content providers have more users and consume more network resources, but pay the same network connection fees as smaller content providers. Because of this discrepancy, should ISP's be allowed to charge content providers based on their popularity? Elements of this usage-based pricing problem are examined throughout this section.

Innovation at the Content Provider Level

The primary goal of net neutrality regulation is to encourage content innovation even if it comes at the expense of network innovation. One of the main reasons behind this goal is that "application-level innovation is the main determinant of economic growth. This suggests that increasing the amount of application-level innovation is relatively more important than increasing innovation at the network level" (Van Schewick 2007, p. 39). So for net neutrality proponents, application-level or content provider innovation produces a greater overall benefit than network innovation.

However, there is a problem with this theory. It is difficult to determine whether a change in application investment is cause by potential discrimination or by a general change in available capital (Sidak 2006). In other words, for net neutrality opponents, it is difficult to see whether net neutrality's effect on content provider investment is significantly different from what would result if network providers were allowed to discriminate. The response to this criticism is that even if it cannot be properly quantified, the threat of discrimination still "reduces the amount of application-level innovation by independent producers [and] increases network providers' incentives to engage in application-level innovation [but] this increase cannot offset the reduction in innovation by independent producers" (Van Schewick 2007, p. 2).

If net neutrality advocates are correct, then a reduction in investment caused by discrimination will reduce the overall growth of the economy. This would confirm that the Internet is what Kahn (1970) described as an "infrastructure" industry, and lead one to conclude that net neutrality is good for economic growth. Assuming this analysis holds, then the next set of problems to consider is if net neutrality boosts the level of content provider investment, why are extra incentives required and how does it work?

Price Discrimination and the Akamai Paradox

The strong form of a ban on access tiering would eliminate the possibility of content providers paying extra for better access to their customers. This would be a ban on price discrimination. Price discrimination, when a firm charges different prices for the same quality of service, should not be confused with differential pricing, when a firm charges different prices for different levels of service (Weisman and Kulick 2010). And "while price discrimination among applications may not be troubling from a static perspective (as between existing consumers and producers), it may have dynamic consequences, for the competitive development of new applications" (Wu 2003, p. 154). These dynamic consequences can be examined. Third-party providers such as Akamai have been offering faster content delivery for many years. "Indeed, as of 2004, 15 percent of all Internet traffic went to an end-user's computer not from the website that the end user was visiting, but from Akamai's servers. Akamai stores the contents of its clients' websites on a network of 18,000 servers spread over 69 countries" (Sidak 2006, p. 85).

The advantage that this service provides for the large content providers is that when rivals do not or cannot pay these costs, "their consumers receive faster and more reliable access to

applications and content" (Nuechterlein 2009, p. 5). So while network providers are banned from offering tiered access services, the market itself has found a way to guarantee quality of service. However, the fact that network providers are unable to provide this function on their own causes distortions in the usage of the network. "If hypothetically a network could recognize and prioritize packets more sensitive to delay, like video packets, over packets that are insensitive, like email, the network would in theory function better" (Lee and Wu 2009, p. 73). In addition, a flat rate price structure implicitly subsidizes the heaviest users of network bandwidth. For example, an ISP funded study showed that in 2008, Google's share of all U.S. consumer bandwidth usage was 16.5%, about 21 times greater Google's 0.8% share of consumer bandwidth costs (Cleland 2008). This implies a subsidy, paid by ISPs and consumers, of about $6.9 billion for Google alone (Cleland 2008). While there are questions behind the reliability of this study, the fact remains that some Internet users and content providers cause significantly more traffic than others. Charging all content providers the same connection fee for different quantities of traffic reinforces the conclusion that network neutrality rules protect the interests of the incumbent (larger) content providers.

There is another market-based solution to this network management problem. One way to alleviate network congestion is to create a tiered network structure. An example of this is a proposal that would allow ISPs to offer their average level of service, but also include the ability to charge an extra fee for access to a "fast lane" connection (Lee and Wu 2009). As long as this fee does not depend on the identity of the content provider, it should not conflict with net neutrality rules because firms would not be blocked from regular Internet access, and would only pay an extra fee if it was required to run their applications.

This proposal, considered a "weak form" of access tiering, may provide a compromise. With the network structure already in place, Akamai's caching service currently represents a competitive substitute to packet prioritization provided by an ISP. If the ISP sets the price of prioritization too high, content providers will switch to Akamai's service (Sidak 2006). For the average content provider, this is a suitable alternative. And as long as there is no access fee, many net neutrality advocates agree that even though this compromise gives some content providers an advantage, "the services are only worthwhile for content providers with significant traffic and bandwidth demands; for new entrants with low bandwidth requirements, such services provide little benefit and are a nonissue" (Lee and Wu 2009, p. 73).

When the two sides of the argument are brought together, the major disagreements about access tiering are more open to reconciliation. A complete ban on price differences favors the incumbent content providers with the most heavily used websites and distorts the efficient use of a congested network. Those who are willing to pay for enhanced network quality are in many cases already doing so through the use of Akamai's caching services. To allow network operators to offer similar quality of service guarantees is a reasonable compromise. Indeed, a "network operator could potentially use the revenues from this surcharge on prioritization to subsidize the cost of broadband access to end-users" (Sidak 2006, p. 102). With the network effects that are embedded into the Internet, this would likely have a positive long-term effect on social welfare.

Net Neutrality as a Subsidy for Creativity

A common theme that arises in the course of net neutrality debates is the question of whether an absence of access fees is necessary in the first place. The potential consequences of access tiering have already been discussed, but what are the benefits that result from this form of price regulation? Since net neutrality explicitly favors content and application providers, it is often described as a subsidy for creativity (Lee and Wu 2009). For those who take the view that this layer of the network is the most important layer for economic growth, such as Van Schewick (2007), it is a necessary subsidy.

Lee and Wu (2009, p. 67) provide some qualified evidence that the absence of access fees improves the quality of Internet content:

> Given that the returns to content production are skewed and the expected value of a new online venture is low, sufficiently low costs of entry may have been and may continue to be crucial [because] social media sites such as MySpace and Facebook may not have been able to launch before the viability of their sites had been established.

This argument reveals an interesting side-effect of net neutrality regulations. Because there are no explicit fees to ISPs for creating a new content provider service, and the potential benefits of new entrants is largely unknown, there is also no subsequent need for an expansive cost-benefit analysis. This excludes an over-conservative bureaucracy from blocking important developments in the creation of web content and allows the small participants that have relatively few resources to compete on an even playing field. And considering that "more than 60 percent

of Web content is created by regular people [instead of] corporations," the small participants play a very large role in the growth of the Internet (Lessig and McChesney 2006).

Furthermore, net neutrality supporters contend that it is the growth of applications and content providers that drives the growth of the overall network (Van Schewick 2007). Focusing on content providers draws the extra benefits from the network effects embedded into the Internet. By subsidizing entry, the network becomes more valuable to every user.

There are however some problems with this approach. Two of these problems are as follows: If the subsidy is necessary, then which firms should pay for it? Should the ISP's subsidize the growth of content and applications on their networks, or should the government step in? The other is a matter of quality. A zero price will certainly attract some content which provides no extra value.

Deciding who should pay the content provider subsidy is a challenging regulatory question. One argument is that the development of network technology can be paid for by advertising fees. Crandall and Sidak (1995, p. 1219-20) discuss this option:

> [P]olicymakers should consider that advertisers are, in a manner of speaking, a potential source of subsidies for access to, and usage of, interactive broadband networks. Advertisers, of course, have long subsidized the consumption of "free" programming offered by radio broadcasters and over-the-air television stations. Similarly, the presence of advertising on cable television enables consumers to pay a lower subscription fee than they otherwise would be charged. Moreover, the interests of advertisers are closely aligned with those of consumers of programming in the sense that both groups seek policies that expand output and reduce prices for telecommunications services of all kinds, irrespective of the technological mode of signal delivery. Regulation that restricts output in telecommunications markets impairs the welfare of both viewers and advertisers. . . . Access charges and usage charges can be borne either by the advertiser or the subscriber. If, however, the advertiser has the more price-inelastic demand, it is optimal from the perspective of economic efficiency for the advertiser to bear the disproportionate share of those costs. This result may also be considered equitable in the sense that it advances the goal of universal service by keeping the prices of access to, and usage of, interactive broadband networks lower than they would be in the absence of advertiser support.

Employing the see-saw principle, when prices are lower on one side of the market, they must be higher on the other side. Mandating a price of zero on one side requires that the price be higher on the other side. By this logic, the higher price that consumers are currently required to pay is keeping potential consumers from entering the market. If ISPs are allowed to increase the

price they charge to content providers, consumer prices would be lowered, increasing consumer welfare. Alternatively, advertisers could act as an extra source of revenue to subsidize content providers, ISP's, end users, or some combination. Indeed, Google's WiFi plan endorses a market scenario where advertising fees cover all three. With the understanding that different sides of the market inevitably have different demand elasticities, this is a plausible solution (Sidak 2006).

Another problem related to net neutrality, which is true of all subsidies, is the effect on the quality of competition. According to Weisman and Robinson (2009, p. 16 footnote 41),

> When regulators reduce entry barriers artificially in order to jumpstart competition and commoditize the market, they tend to attract an inferior breed of competitor – arbitrageurs rather than innovators. By definition, the type of competitor that enters requires constant nurturing, and regulators comply because they believe that this type of competitor is all they can get. In this manner, the regulator's paternalistic policy becomes a self-fulfilling prophecy. The result is a bad equilibrium in which the weak competitors crowd out the durable competitors.

When this argument is applied to the Internet, it leads to the conclusion that there are many websites which provide no value to the network. In most industries it would be beneficial to allow the weaker competitors to fail, but the Internet is unique. Websites that draw no visitors do not use any network resources. So while net neutrality often results in content development that will in many cases have no value, the subsidy also encourages "identifying potential uses for the Internet" that are a "prerequisite for realizing the enormous growth potential inherent in the Internet as a general-purpose technology" (Van Schewick 2007, p. 37).

Vertical Integration

Vertical integration is a major topic within net neutrality debates. The concern among net neutrality advocates is that if ISP's are allowed to serve in the markets of content providers, then they would use their control of the network to give themselves an unfair (or anticompetitive) advantage in the markets for applications and content. Opponents argue that vertical integration leads to greater efficiency, and that the welfare gains from this increased efficiency would compensate for the losses incurred by unaffiliated content providers.

A very important point to consider is if ISP's have the opportunity to discriminate in favor of their own content, do they still have the incentive to do so? According to Van Schewick's (2007) analysis, even without a monopoly position, network providers can still

profitably discriminate against unaffiliated content providers. The argument follows that a lack of monopoly power in the ISP market actually increases the ISP's incentives to extract discriminatory revenue from content providers. She adds that this can be done profitably because network technology gives ISP's the technical ability to discriminate, and using this technology to give an ISP an unfair advantage will effectively exclude rival content producers. Under this scenario, sales that would go to independent content providers under normal market conditions would instead be gained by the ISP. For example, a local phone company that also offers ISP services must compete with independent companies such as Vonage or Skype that provide Voice over IP (VoIP) telephone services. Because the cost of long-distance calls using VoIP is much lower than using the legacy telephone service, many customers will switch to VoIP (Van Schewick 2007). Therefore, regardless of the firm's level of market power, a network provider with telephone service will have an incentive to discriminate against independent VoIP services.

Opponents argue that this type discrimination runs afoul of the antitrust laws, and for that reason should not be a legitimate concern. They also say that there are very real benefits to allowing integration. "First, vertical integration enables economies of scope, which lowers costs for end-users. Second, a ban on vertical integration would prevent a network operator from providing subsidized broadband access to those consumers who are otherwise priced out of the market" (Sidak 2006, p. 99). Google's WiFi plan exemplifies this second point.

By choosing not to charge customers, and instead using revenue from advertisers to subsidize the development of the network, Google is using the principle of two-sided markets described earlier in this report (Hahn and Wallsten 2006). Instead of having consumers pay for access to the network, advertisers would subsidize the consumer side of the market. The debate behind this proposal is that Google would have complete control over which products are available on the network, and has indicated that it wishes to exercise this control (Hahn and Wallsten 2006; Sidak 2006). Not only will this distort the development of the network to Google's advantage, but the low price of access would also "discourage efficient competing Wi-Fi networks from developing unless they also are predicated on a business model that taps an ancillary revenue stream to subsidize end-user access" (Sidak 2006, p. 104).

On the surface, the free WiFi plan seems to go against the very same anti-discrimination part of net neutrality that Google so forcefully advocates. And while it is difficult to know the

true nature of the company's intentions, the example shows that vertical integration between an ISP network and a content provider can yield an efficient market outcome.

Vertical integration's effect on innovation also mirrors the pricing problems presented earlier in this report. This is not only another question about the source of innovation. It is also a question of which firms should receive the benefits from innovation and about the rights of network operators.

There are currently no laws that prohibit a firm from entering other markets through vertical integration (Sidak 2006). And indeed, "[n]etwork neutrality regulation does not forbid network providers to vertically integrate into complementary markets; it only bans them from using discrimination to increase their sales at the expense of rivals" (Van Schewick 2007, p. 39). In spite of this ban, ISP's are asking for more control over their networks, and have promised to provide a fair form of self-regulation (Sidak 2006).

But can ISPs be trusted to regulate themselves? Senator Al Franken, a Democrat from Minnesota, provides an interesting perspective. His insight suggests that large network providers can potentially threaten independent innovation. Franken (2010) describes an interesting example from personal experience:

> Back in the 1990s, Congress rescinded rules that prevented television networks from owning their own programming. Network executives swore in congressional hearings that they wouldn't give their own programming preferred access to the airwaves. They vowed access to the airwaves would be determined only by the quality of the shows . . . Sure enough, within a couple of years, NBC was the largest supplier of its own prime-time programming. And since these conglomerates owned both the pipes through which Americans received information (in this case, TV networks) and the information itself (in this case, TV shows), they developed a monopoly over what you could watch. Today, if you're an independent producer, it's nearly impossible to get a show on the air unless the network owns at least a piece of it.

If television broadcasting, which is also FCC regulated, can be considered analogous to Internet connections, then this is a plausible scenario. If given the opportunity to set the terms for access to their networks, ISPs could demand partial ownership for any or all content that is provided on their networks. But there are two major differences between other networks and the Internet. In the other networks, charging for access is an acceptable practice, and providing content requires the use of network resources even when no one uses the content. The Internet has neither of these common network features (Lee and Wu 2009).

If ISPs were instead allowed to charge termination fees, it could have the same effect that Franken (2010) describes. Network operators would have full control over their communications lines and the information that passes through them. These providers would then have the incentive and the ability to discriminate against independent content providers (Van Schewick 2007). Excluding unaffiliated content providers from the network explicitly favors those that have some connection to the ISP.

Sidak (2006, p. 112) responds to these concerns with an argument for consumer welfare:

> [U]nder a procompetitive hypothesis, network operators wish to embrace the very business models—namely, advertiser-funded models that heavily subsidize end-user access—that have benefited Google and other vocal proponents of network neutrality regulation. Vertically integrating into content applications could enable a network operator to subsidize the price that it charges end-users for broadband access. Entry by network operators into the markets for content and applications would also benefit advertisers by decreasing Internet advertising rates.

Both sides set advance reasonable arguments. Allowing vertical integration can reduce innovation by unaffiliated content providers, but can also increase consumer welfare by subsidizing access. The core of the debate once again hinges on which type of firm can provide higher quality content and what value should be placed on consumer welfare. Agreement on this point may prove elusive.

Chapter 7 - Conclusion

Net neutrality rules are designed to protect the interests of independent content providers. Without net neutrality, ISP's would have the theoretical ability and incentive to block or impose extra fees on unaffiliated content providers. The small number of major empirical cases casts doubt on the need for net neutrality rules, but as a general purpose or infrastructure technology, content and application providers deserve attention in light of their contributions to economic growth.

Net neutrality also modifies investment incentives for both ISP's and content providers. It promotes competition among content providers by subsidizing the development of new content and denies ISP's the ability to compete through the introduction of new Internet protocols. Content providers are encouraged to compete by finding new ways to use the network while ISP's are limited to price competition. The first form of competition favors smaller firms while the second favors larger firms and encourages market concentration.

Subsidizing content providers utilizes the network effects of the Internet, increasing the total value of the system. But because the see-saw principle of two-sided markets shifts some of the burden to end users, the end result may not be efficient. Therefore, alternatives pricing strategies, such as Google's advertiser-funded model, may provide a more efficient market outcome.

A more complicated question is which government agency has the appropriate tools to encourage net neutrality goals. Many of the net neutrality rules, such as the anti-blocking principle, are already covered by general anti-trust laws that are enforced by the DoJ. However, cases involving the telecommunications industry also require the specialized industry knowledge possessed by the FCC.

The DoJ takes a passive role in Internet regulation, responding on an ex post basis after major complaints are issued. This is the method that ISP's would prefer because it would allow them to shape the growth of their networks. The FCC, however, is actively involved with setting the standards for Internet competition. It has the ability to anticipate threats to the competitive process and act quickly to resolve potential or ongoing problems.

The amount of time required to resolve disputes is an important factor for regulatory efficiency. Anti-trust cases take many years to resolve. By the time a decision is made, market conditions have often changed so dramatically that the initial inquiry is no longer relevant, and any DoJ decisions could result in unnecessary competitive remedies. By this measure the FCC would be a more effective primary regulator *as long as its actions are consistent with its goals*. The DoJ would continue to take a supporting role.

In the end, the broadest remaining question is: who will decide who should regulate? "There are two ways to resolve that uncertainty. One [way] is to let the courts sort it out. . . . The second [way] is for Congress to clarify precisely who does, and who does not, have authority to address the antitrust-oriented concerns at the heart of net neutrality proposals" (Nuechterlein 2009, p. 32). Following the recent history of net neutrality regulation, the short term will likely see the court system answer such jurisdictional questions. How congress chooses to respond remains to be seen.

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