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net neutrality issue

What Is the Network Neutrality Debate Really About?

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In the debate over network neutrality, the real issue of consequence is how owners of broadband access networks will shift their business models away from a subscriber-funded model to a model that relies more on advertising. That clash with the other players in the market is the heart of the network neutrality controversy.

Network neutrality is something new and something old. It is something old in the sense that there are familiar problems of pricing and cost recovery, and potentially problems of discrimination, in vertically integrated markets. There is also the traditional problem of recovering the sunk investment in a network that supports many products. With economies of scope and large sunk costs, marginal cost pricing is not possible, as the network operator will not recoup its investment costs. So we face the traditional Ramsay pricing challenge of determining through which prices the network operator shall attempt to recover its sunk costs.[1]

One interesting facet of the network neutrality debate is the two-sidedness of the market.[2] Virtually all telecommunications services have some aspect of two-sidedness. There is a caller and a recipient of the call. Each values the telephone call, but they do not necessarily have an equal willingness to pay or an equal ability to pay. We have seen this discussion play out in telecommunications controversies, such as proceedings to reduce mobile termination rates. Two-sided demand is a very

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1. Frank Ramsey, *A Contribution to the Theory of Taxation*, 37 ECON. J. 47 (1927). The relevance of Ramsey's seminal article to public utility pricing was first enunciated in Marcel Boiteux, *Sur la Gestion des Monoples Publics Astreints à l'Equilibre Budgétaire,* 24 ECONOMETRICA 22 (1956), *republished in English as* Marcel Boiteux, *On the Management of Public Monopolies Subject to Budgetary Constraints*, 3 J. ECON. THEORY 219 (1971).

2. *See, e.g.*, David S. Evans, *The Antitrust Economics of Multi-Sided Platform Markets*, 20 YALE J. ON REG. 325 (2003); Jean-Charles Rochet & Jean Tirole, *Platform Competition in Two-Sided Markets*, 4 J. EUR. ECON. ASS'N 990 (2003). The seminal article on two-sided markets is William F. Baxter, *Bank Interchange of Transactional Paper: Legal and Economic Perspectives*, 26 J.L. & ECON. 541 (1983).

important economic feature of the network neutrality discussion, yet it is poorly understood in the popular discussion of the issue in newspapers and congressional testimony. Perhaps economic literacy on the topic will improve in the coming years.

Who advocates network neutrality regulation? Among companies, Google is recognized as the most articulate and forceful proponent, although Amazon and eBay (which owns Skype) are also outspoken. In terms of the intellectuals, Lawrence Lessig of Stanford and Tim Wu of Columbia are the leaders of the network neutrality movement.

In addition, there are political groups that form a coalition uniting the far left and the far right. Increasingly in the United States, the Internet is becoming a powerful tool for political campaigning and political fundraising. In the last presidential election, on the right were the Swift Boat Veterans for Truth, campaigning against John Kerry by streaming 25-minute videos for free and soliciting millions of dollars in contributions to continue doing so until Election Day. On the left was Moveon.org, which used e-mail for dissemination of political messages and the Internet for fundraising. More recently, in the midterm elections in 2006, YouTube provided a quick, inexpensive, and effective alternative to paid television advertisements for lampooning specific candidates. So the network neutrality debate is unlike traditional Ramsey pricing problems in telecommunications regulatory issues because there is a political speech overtone. Ignoring this political dimension of the network neutrality debate would produce a very incomplete picture.

The network neutrality debate appears to reflect the clash of two cultures: the high-tech, entrepreneurial Silicon Valley culture versus the Washington regulatory culture. In traditional telecommunications regulatory terms, we regard the objective function for a particular regulation as being some version of consumer welfare maximization. The analysis is typically static in the sense that the goods and services are fixed. So we ask what would happen to the welfare of the marginal consumer if we calibrated a particular policy instrument, such as price, in a particular way. From a traditional telecommunications regulatory perspective, we would ask, “How do we improve the welfare of that marginal consumer?” We might then ask, “What would make broadband more affordable? What would increase the penetration and usage?”

However, the approach of the Silicon Valley, high-tech constituency to the network neutrality debate is to ask a different set of questions. Instead, one hears talk about “innovation on the edges of the network.” Being at the edge of the network is contrasted with being inside—or at the core of—the network. The edges of the network are applications and content, the Googles of this world. So this argument is sometimes presented in terms of: Will there be “the next Google” if there is not network neutrality regulation imposed to preserve the Internet as the open platform that network neutrality proponents say that it has been for several decades?

In short, there is a clash over the importance of the goal of static consumer welfare maximization and the importance of a certain category of innovative activity.

What do the proponents of network neutrality specifically want? As of mid-2007, that answer is comprised of three things. The first is the prohibition against blockage of content or applications. This objective is sometimes described as the consumer's "Internet freedoms." The idea is that the cable company, or the DSL company, or the wireless Internet access provider (if there is one) should not deny the end-user access to any lawful content. The real debate is not about censorship of particular messages, but rather content and applications that are bandwidth-intensive.

The second goal of network neutrality advocates is a statutory prohibition on a practice, not yet followed, that has been dubbed "access tiering." By statute, the telephone company or cable company would be prohibited from directly contracting with the provider of content or applications for speedier delivery of its content on the local access network. This topic is called access tiering because the idea is that different tiers of pricing would reflect different levels of quality of service—or "QoS"—offered by the owner of the broadband access network.

Internet networks use packet technology under a "best-efforts" delivery standard. It is a little bit like mailing a regular letter. If it gets lost in the mail, the U.S. Postal Service does not come to you and say, "Your letter got dropped. We do not know where it is." Best-efforts delivery of packets is like that. There is no tracing of packets that do not get delivered. "Quality of service" is the phrase that is used to describe something superior to best-efforts delivery of packets. Banning access tiering would prohibit transactions for QoS between the owner of the broadband access network and the supplier of content or applications. But access tiering would *not* prohibit such transactions between that network operator and the end-user. That is an important distinction that relates to the two-sidedness of the market, about which I will say more in a moment.

The third theme of the advocates for network neutrality is to restrict or constrain the ability of network operators to integrate vertically into the production of content or applications. This objective is a line-of-business restriction—a statutory barrier to entry. When the Bell System was broken up in 1984, the local access network (the Bell operating companies) were prohibited from entering vertical markets, like long-distance services. In general, statutory barriers to entry are strongly disfavored by scholars of regulatory economics. In practice, they are surprisingly costly to implement in technologically dynamic industries, they invite abuse through rent-seeking behavior, and they run the risk of harming consumer welfare.

Returning to the first theme—blocking of content and applications—the major development in the rhetoric of network neutrality in 2007 has been to take aim at wireless providers and argue that they should be obligated to support VoIP over wireless data services. This controversy is currently a big issue for Skype, but it is not the central focus of the network neutrality debate in the United States as it pertains to wireline providers of broadband access—that is, the telephone companies and the cable television companies.

In terms of basic microeconomics, it would be the case that the content and applications usually will be complementary to usage of the access network. So in a competitive market, it will not be in the economic interest of the owner of the access network to constrain a customer's ability to access particular

content. One exception is if there is vertical integration into the production content for reasons that are familiar in the cable television industry, for example. The other exception would be if the content or application is actually a substitute for something that the network operator is already offering customers. That is the *Madison River* case.[3] A rural telephone company in Alabama blocked its DSL customers' ability to use Vonage VoIP telephone service. A complaint was filed by the customers and Vonage, and the FCC commenced an investigation that resulted in a consent decree and so-called "voluntary payment" to the U.S. Treasury.

That is the only recorded case in the United States of a blockage of content or applications by a wireline network operator. It does not support much extrapolation because in Madison River's particular market there was no digitized cable system capable of providing cable modem competition for the DSL service offered by Madison River. That is, the DSL provider was a local monopoly provider of broadband connection service. But *Madison River* is the exception rather than the rule. In the vast majority of population centers in the United States, there is platform competition between both cable modem and DSL service. If consumers have a choice and could switch from DSL to cable modem service (or vice versa), then that competitive constraint undercuts the ability and incentive of the network operator to block such applications. Despite that limited analytical relevance, *Madison River* is significant for political reasons because it generates a visceral reaction. It makes a good slogan that resonates with journalists.

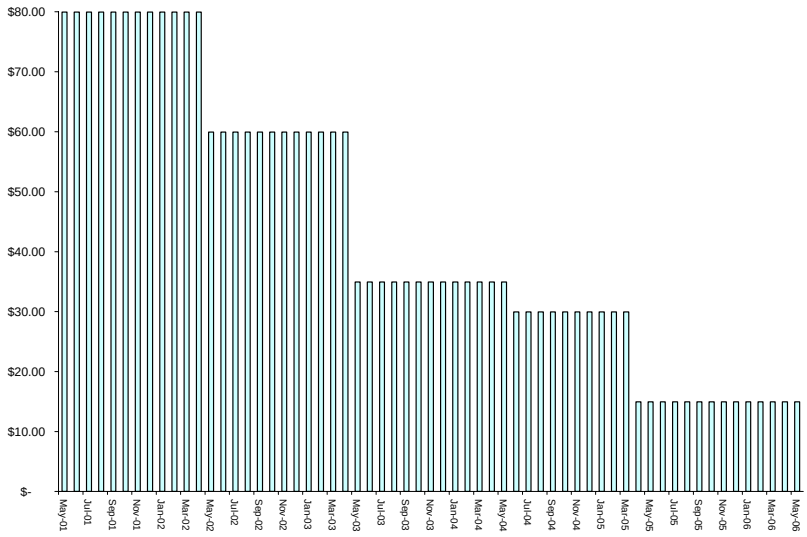
The bigger economic controversy in the network neutrality debate is the prohibiting of the transactions for better than best-efforts delivery. Related to that objective is the impending migration of network operators to a different kind of business model that is both based on revenues from both advertising and subscription fees.

Why would network neutrality regulation be justified? What allegations of market failures are presented in its support? Two are offered. One is that there is not a competitive market for the supply of broadband access in the United States. The second argument is the investment argument—the next Google argument.

Consider first the access competition argument. In the United States, the FCC deregulated DSL in 2005, so it is free of any price regulation. The basis for that ruling was the conclusion that significant competition existed between cable modem and DSL service. So we have the expert regulatory agency making this determination.

3. Madison River Communications, L.L.C. and Affiliated Companies, Order, File No. EB-05-IH-0110, 20 F.C.C.R. 4295 (Enforcement Bureau, 2005).

VERIZON'S MONTHLY PRICE FOR 1.5 MBPS DSL ACCESS, MAY 2001-MAY 2006

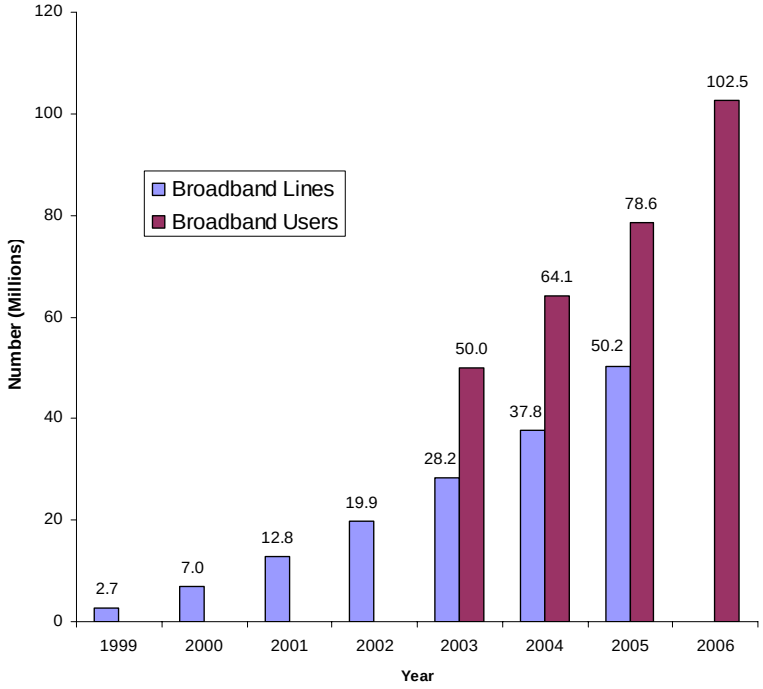


Source: BEAR STEARNS, MARCH BROADBAND BUZZ: A MONTHLY UPDATE ON CRITICAL BROADBAND ISSUES 6 (2006)

Note: In April 2005, Verizon began offering 3.0 Mbps DSL access for the same price that it had been offering 1.5 Mbps DSL access, thus doubling the performance of its entry-level DSL product. Figure 1 treats this repricing as halving the price of 1.5 Mbps DSL access. *See* Press Release, Verizon, Verizon Online Offers Twice the Speed of Its Basic Consumer DSL Service for the Same Price (Apr. 4, 2005), *available at* http://newscenter.verizon.com/proactive/newsroom/release.vtml?id=90158. In addition, some of these prices may have been limited-time promotional rates.

This figure shows prices for 1.5 Mbps from Verizon over a five-year period. The price at the top is $80 per month. It declines in a stair step to about $15 per month over five years.

BROADBAND LINES AND BROADBAND USERS, UNITED STATES, 2000-2006



Source: Wireline Competition Bureau, FCC, High Speed Services For Internet Access: Status as of Dec. 31, 2005 (2006); Q4 2003 NetRatings Earnings Conference Call – Final, Fair Disclosure Wire, Feb. 26, 2004; *U.S. Broadband Penetration Tops 40%,* Editor and Publisher, Sept. 28, 2005; Carol Wilson, *Nielson: Broadband Use Nears 75%*, Prism Insight, Jun. 22, 2006.

The next figure shows what has happened in terms of the number of broadband users and broadband lines in the United States. Users are the red bars. The blue bars are broadband access lines. Since the FCC deregulated DSL, there has been a substantial increase in uptake.

So the *prima facie* evidence from these two figures is that there is competition: we observe falling prices and increasing output levels.

In addition to those DSL and cable modem figures, there has also been a recent announcement from Sprint that it will build a nationwide WiMax network by 2008. Additionally, entry is occurring from a variety of technologies and from large established players. There is the possibility of community WiFi mesh networks. Google itself has built a WiFi mesh network in its hometown of Mountain View, California, which provides free service to 72,000 people. This network cost about a million dollars, according to the Google executive in charge, which is roughly the cost of a pizza for each one of those 72,000 people. Ironically, Google said that it does not have any intention of replicating these WiFi mesh networks around the country; it built the Mountain View network to show that access competition is possible. Thus, at least in markets with similar population densities and build-out costs, if access competition from completely

new entrants is this simple, then Google itself has knocked down the first of the two market failure arguments given to justify network neutrality legislation.

What about the second market failure argument, relating to innovation on the edges of the network? This argument confuses various economic principles. The argument is made that some pair of entrepreneurs who would make the next Google are ready to start their company in a garage in Palo Alto. But they are deterred from doing so because of the mere threat that access tiering will be adopted and require them to pay for prioritized delivery of their packets. This reasoning confuses ability to pay and willingness to pay. It also begs the question: Why must that prioritized delivery of packets be offered at no cost or, in the alternative, why must the possibility of buying prioritized delivery of packets be foreclosed through legislation?

Of course, that might be the whole point: Incumbent providers of Internet content and applications would prefer not to face competition from new entrants who have the willingness and ability to pay to differentiate their products in a manner that consumers value. Notice here that the standard response is the next Google will be strangled in its cradle. That is, if unlimited price discrimination is allowed, then network operators will leverage their ownership of the end-user to charge discriminatory prices that appropriates the innovator's possible economic rent, and thus reduces the incentive to innovate on the edges of the network in the first place. Therefore some innovations will never be brought to the market.

Implicit in this argument is the welfare calculus that the consumer welfare gains from differentiated products that are launched are less than the consumer welfare gains from more Internet content that is undifferentiated by QoS. I have seen no economic evidence or any theoretical analysis that supports this conclusion.

Indeed, I doubt there is any way one can falsify the "next Google" hypothesis. Is it something that is even susceptible to empirical testing? Larry Lessig wrote in December of 2001 that "the Internet revolution has ended just as surprisingly as it began." So we have the "death of the Internet" by the end of 2001. In February 2005, YouTube starts in Palo Alto—not in a garage, but above a pizza parlor. In February 2006, I testified at a U.S. Senate hearing with Lessig, where he said that the threat of access tiering will reduce innovation. By October 2006, YouTube sold for $1.6 dollars to Google. Is YouTube evidence of too little innovation at the edges of the network? Is the lure of selling out for $1.6 billion eighteen months after starting a new content company enough for entrepreneurs at the edge of the network to overcome the fear that they might have to pay for prioritized delivery at some future date? To date we have no way of knowing, but the growth and successful sale of YouTube casts doubt on this argument.

Second, there is the related "zero sum game" argument, propounded by Amazon, that prioritization necessarily implies degradation. If you have 100 packets and want to move one to the front of the queue, then some subset of the other 99 packets must be moved back a slot. And so, the argument concludes, you do not make society better off. It is a wash, a zero-sum game.

When I heard that argument for the first time in 2006, I realized how it provides a classic example of the different perspectives of the high-tech Internet community in Silicon Valley and the economic regulatory community in cities like Washington, Paris, or Brussels. Is every packet of information created equal? If you are a computer scientist or engineer, you might assume so, or you might never even stop to ponder the question.

But an economist would have a different view. Economists assign different values to the packets of information because they have value only to the human beings who send and receive them. Some packets contain information that is more valuable than others and therefore reflects a willingness on the part of the sender or receiver (or both) to pay more for their delivery. So in that sense, when that valued packet goes to the beginning of the queue, there is an increase in societal welfare. So permitting transactions for QoS is not a zero-sum game. It is a positive-sum game.

The access tiering argument takes several different forms. The strong form is that there cannot be any transaction between the network operator and the supplier of content or applications to prioritize delivery. A weaker form would say that there can be such transactions, but they cannot discriminate between companies that would fall within the same class. I question whether that qualification helps much. It is reminiscent of the Interstate Commerce Commission deciding whether an unfair rate was being charged to transport a pound of nails from Cleveland to Pittsburgh. The idea of creating a classification scheme that would be overseen by the FCC or some other regulatory body for the Internet would require enormous effort and produce much mischief—just as the ICC did with railroad ratemaking.

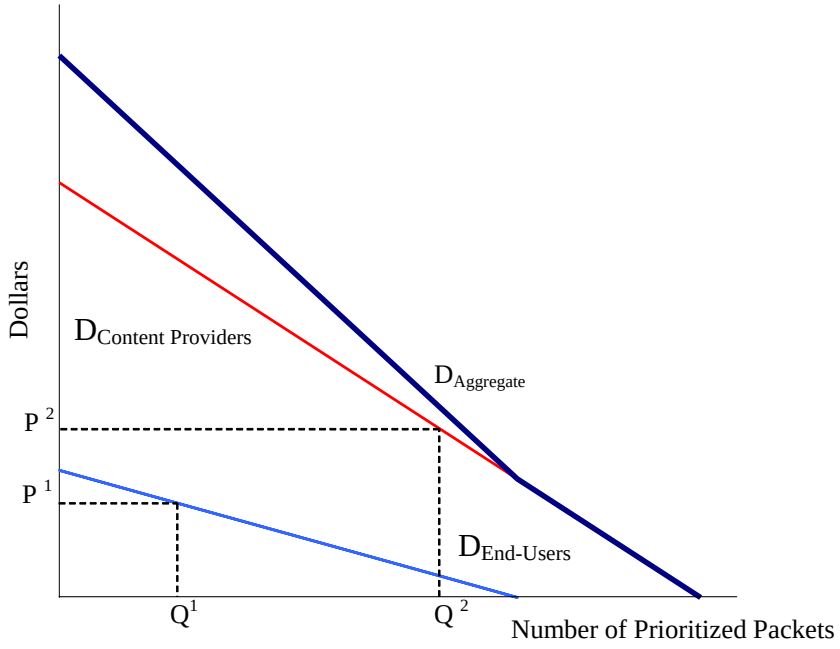
HOW SHOULD NETWORK OPERATORS CHARGE END-USERS AND CONTENT PROVIDERS FOR BANDWIDTH AND PRIORITY DELIVERY?

	Content Provider	End-User
Bandwidth	Allow	Allow
Priority	Ban	Allow

Schematically, we are really only concerned with the southwest quadrant of this matrix of possible transactions. You can imagine the end-user wanting to buy more bandwidth. That transaction would be permitted in the eyes of network neutrality proponents. The end-user might even be willing to pay for priority of delivery. The content provider certainly is free to buy more bandwidth. Network neutrality proponents object only to the transaction where the content provider wants to pay for prioritized delivery rather than leaving it to the end-user to pay. That peculiar set of preferences invites

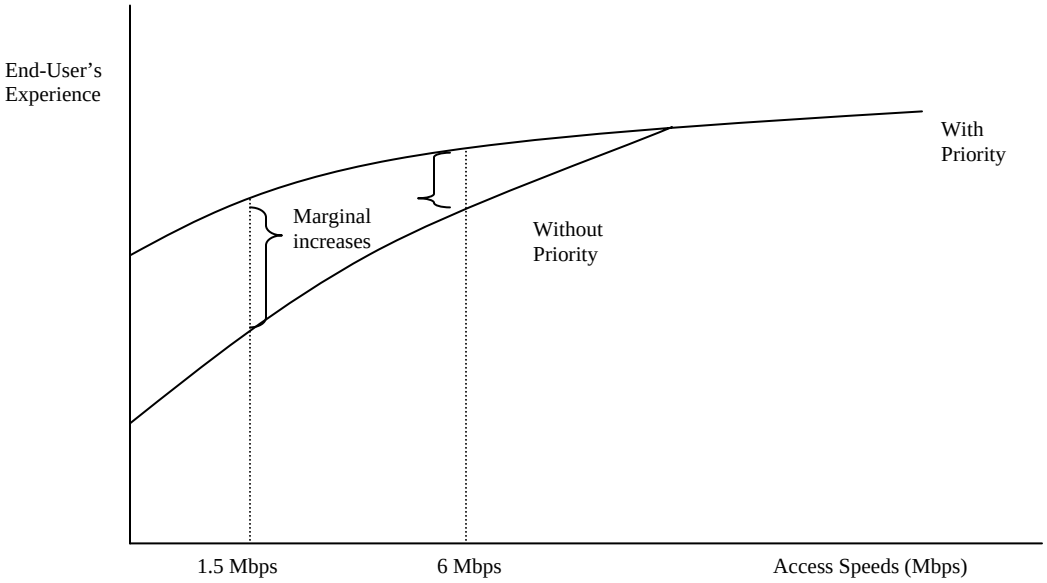
the question: What is it about prioritization as opposed to bandwidth that is so much more competitively threatening in the eyes of proponents of network neutrality regulation?

THE EFFECT OF PROHIBITING A BROADBAND NETWORK OPERATOR
FROM CHARGING CONTENT PROVIDERS FOR PRIORITY DELIVERY OF PACKETS IN A MARKET WITH TWO-SIDED DEMAND



So we return to the issue of two-sided markets. Why is it important that the southwest cell becomes eliminated as a possible transaction? It is because the demand curves are likely to look very different for the two sets of potential buyers of prioritization. In the two-sided market, the kinked dark blue demand curve is the vertical summation of the two parties in that market. End-users have a relatively flat demand curve, shown in light blue. Content providers have a demand curve that is further out from the origin and is not as price sensitive, shown in red. Suppose the government prohibits transactions with content providers. At a price of P_2, a content provider would be willing to buy Q_2 units of prioritized packets. But that price-output combination is completely off the demand schedule for end-users—such that *no* transactions for prioritization would occur. Of course, the total welfare at stake is the entire area under the combined demand curve. Therefore imposing a ban on charging the content provider for prioritized service leads to a social cost, as there are too few transmissions of prioritized packets being sent.

MARGINAL EFFECT OF PRIORITY DELIVERY ON END-USER'S EXPERIENCE WITH INCREASING ACCESS SPEEDS



Here is a further consideration: How valuable is prioritization given a particular amount of bandwidth? If you have a great big pipe, then prioritization of packets through the pipe is less valuable than if you have a very tiny pipe. In economic terms, what is the marginal value of prioritization as bandwidth changes? This question is the economic way to say what is obvious: The bigger the pipe, the less valuable it is to be first in the queue.

That relationship between bandwidth and prioritization raises the question: Are there any applications right now for which it is necessary to have prioritization? How many transactions do we see currently between network operators and suppliers of content or applications to prioritize traffic? The answer is, I think, zero. There are other technologies that are substitutes to prioritization, such as local caching of content by a company called Akamai.

Put another way, the value of prioritization depends on how close you are to the capacity constraint. It is hard to say whether the end-user will ever derive great incremental value from prioritization of packet delivery. Suppose you are interested in buying a sports car. You want to download some exciting streaming video of the sports car zooming through the Alps. How much would you pay for download if the quality of the viewing experience depended a lot on it not being subject to jitter or delay? It is probably safe to say that you would not pay nearly so much as would the sports car manufacturer who wants to sell you the car. The car manufacturer wants to give you that content in the most compelling manner—and to do so at no cost to you. But even the content provider will not have much demand for packet prioritization if there is no capacity constraint on bandwidth.

So we see the flip side of the concern about innovation on the edges of the network: If we do have the potential bandwidth constraints, and if we prohibit prioritization transactions between the network operator and the content provider, then we will also prevent a way of differentiating new kinds of content and applications, particularly ones that must be experienced in real time.

What are the competitive ramifications of banning this QoS transaction? Years ago, the U.S. Congress passed a law forbidding television advertisements for cigarettes. The tobacco companies actually liked this law very much. A number of econometric studies found positive abnormal returns to tobacco companies upon enactment of the television ad ban.[4] In other words, shareholders of tobacco companies benefited when Congress enacted a law commanding the tobacco companies to stop buying television ads. The new equilibrium was that no tobacco company would try to differentiate its product through television advertising. All of the tobacco companies therefore ended up saving money. The economic studies also found that it became much harder for smaller tobacco companies to grow market share or for entry to occur.

The same kind of equilibrium could emerge with respect to Internet commerce. A small number of very large and successful incumbent Internet companies dominate the industry. They would prefer an equilibrium in which they did not need to compete against one another on the additional dimension of purchasing prioritized delivery. An equilibrium in which the Internet firms do not need to worry about prioritization means that there will be fewer dimensions over which competition takes place.

Return now to the third theme in the network neutrality debate: vertical integration by network operators. This theme is the least developed of the three in the current debate, but it certainly can be found in some of Lessig's writings, for example. There are obvious costs to prohibitions on vertical integration that we know from other network industry situations, so I will not belabor them. They involve economies of scope, elimination of double marginalization, coordination of investment and production, and so forth.[5] I mentioned the benefit to the Internet companies like Google and Amazon if they do not have to compete against one another with respect to prioritization. But what if those companies need not contend with vertical integration by network operators, such as AT&T, Verizon, and Comcast?

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4. *See* Stephen J. Farr, Carol H. Tremblay & Victor J. Tremblay, *The Welfare Effects of Advertising Restrictions in the U.S. Cigarette Industry,* 18 REV. INDUS. ORG. 147, 147-60 (2001); E. Woodrow Eckard, Jr., *Competition and the Cigarette TV Advertising Ban*, 29 ECON. INQUIRY 119 (1991); J. Harold Mulherin & Mark Mitchell, *Finessing the Political System: The Cigarette Advertising Ban*, 54 S. ECON. J. 855, 855-62 (1988); Roger H. Porter, *The Impact of Government Policy on the U.S. Cigarette Industry*, *in* EMPIRICAL APPROACHES TO CONSUMER PROTECTION ECONOMICS 447 (Pauline M. Ippolito & David T. Scheffman eds., 1986).

5. *See, e.g.,* Robert W. Crandall & J. Gregory Sidak, *Is Structural Separation of Incumbent Local Exchange Carriers Necessary for Competition?*, 19 YALE J. ON REG. 335 (2002) (discussing efficiency losses in telecommunications networks from restrictions on vertical integration); Howard A. Shelanski & J. Gregory Sidak, *Antitrust Divestiture in Network Industries*, 68 U. CHI. L. REV. 1 (2001) (discussing efficiency losses in operating systems and applications software from restrictions on vertical integration).

Consider all of the customer accounts that a network operator has. Those are all relationships that can be leveraged into a broader array of potential transactions. For example, in Japan, NTT DoCoMo is the biggest wireless carrier. But it also issues credit cards and has its own eBay-style auction site. So DoCoMo clearly has seen the opportunity to present its existing customer base with a new value proposition.

Obviously eBay has done the same thing. It started out as an auction site. It bought PayPal, which is a virtual bank. It bought Skype, which is essentially an applications-based long-distance company. We are seeing the early stages of a clash between two sets of companies. Some start from a traditionally regulated background and others start from a completely unregulated, entrepreneurial background in Silicon Valley. The Silicon Valley firms are moving in the direction of bundling a wider array of services, some of which they price at zero. Obviously, to pay for those kinds of services, one needs some other revenue stream. The revenue stream for Google, for example, is search-based advertising.

Will the network operators be able to gravitate toward an advertiser-supported business model and move away from the subscription-based model on which they now rely? In a sense they have no choice. If Skype is taking away your very lucrative, overseas long-distance revenues, what can you do but seek alternative revenue streams?

What should a regulator do with this situation? My advice is to return to first principles. Try to ground the debate in terms of the effects on consumer welfare. Work on setting up the terms of the debate in concepts that can be clearly defined and are subject to empirical measurement. Work toward hypotheses that are testable and get away from some of the more nebulous discourse that we have heard in the last year or so. It is important to state clearly what the role of innovation shall be in the overall social welfare evaluation that regulators or legislators undertake. The debate in the United States has not matured to this stage.

The last point is very important. The call for network neutrality regulation is a classic example of a situation where making ex ante prohibitions could be very socially costly. We do not know how these markets will evolve. We do not know all of the consumer welfare implications of preventing certain kinds of transactions and potentially preventing certain kinds of products from coming into being. To use a cliché that is far more appropriate here than in many of the instances in which it is uttered, the network neutrality debate exists because of the convergence that is occurring among two very different sets of players in telecommunications and media that currently employ different business models. The decisions that competition and regulatory authorities make will determine whether a vast measure of consumer welfare will be created or forgone.