Exhibit 3

Declaration of Marius Schwartz

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Preserving the Open Internet	)	GN Docket No. 09-191
	)	
Broadband Industry Practices	)	WC Docket No. 07-52

DECLARATION OF MARIUS SCHWARTZ

January 14, 2010

TABLE OF CONTENTS

I. INTRODUCTION

The Federal Communications Commission (Commission or FCC) has issued a Notice of Proposed Rulemaking affecting broadband industry practices.[1] I have been asked by counsel for AT&T to provide an economic analysis of the need for the proposed rules on public policy grounds and their likely effects.[2]

A. Professional Qualifications

I am a Professor of Economics at Georgetown University. I hold a B.Sc. degree from the London School of Economics with 1st class honors, and a Ph.D. from UCLA, also in economics. My teaching and research specialties are in industrial organization, competition, and regulation. I have published widely in these areas and serve on the Editorial Board of the *Review of Network Economics*. From September 1998 to April 2000, I served at the Antitrust Division of the U.S. Department of Justice (DOJ) as the Economics Director of Enforcement, and for six months also as the Acting Deputy Assistant Attorney General for Economics (chief economist). From April 1995 to June 1996, I served at the President's Council of Economic Advisers as the Senior Economist for industrial organization matters. My curriculum vitae is attached as an appendix.

I have been involved in telecommunications research and policy in academia, government, and consulting. At the President's Council of Economic Advisers I worked extensively on the 1996 Telecommunications Act. From 1996 to 1997, I was the DOJ's main economic outside expert on Bell entry into long-distance services. In 2000, I prepared to serve as the DOJ's testifying economic expert on Internet backbone issues in the proposed merger between WorldCom and Sprint. I have also consulted for the private sector on significant telecom matters, such as competition in international satellite services, international settlement rates, and the FCC's television station ownership cap. I am familiar with the debate on the broad issue of Net Neutrality. I co-edited a March 2009 special issue of the *Review of Network Economics* devoted to this topic. I also presented at workshops on broadband competition at the

---

[1] Federal Communications Commission, Notice of Proposed Rulemaking, *In the Matter of Preserving the Open Internet: Broadband Industry Practices*, FCC 09-93, GN Docket No. 09-191, WC Docket No. 07-52 (rel. Oct. 22, 2009) [hereinafter, NPRM or Notice].

[2] For valuable comments and assistance I thank David Barth, Lynn Charytan, Richard Clarke, Yan Chen, Bobby Filipi, David Lawson, Federico Mini, Jon Nuechterlein, Dan Vincent, and Jack Zinman.

FCC (October 2009) and at the Federal Trade Commission (February 2007), and filed a declaration on behalf of AT&T in the FCC's proceeding on the Skype petition (May 2007).

B. Overview of Analysis and Conclusions

Under the rubric of "nondiscrimination" the NPRM proposes sweeping rules governing any broadband Internet access service provider (hereinafter, broadband provider or broadband ISP). The rules would bar a broadband provider from offering differential treatment of Internet traffic on certain portions of its network, subject only to a narrowly construed exception of "reasonable network management." The NPRM further interprets this "nondiscrimination" rule categorically to ban charges to any content, application, or service provider (hereinafter, content provider) for prioritized or enhanced access. (NPRM, ¶¶ 104–107, 109–110.) The rules would apply not only to landline broadband facilities but also to wireless facilities (¶¶ 100, 154), a segment where common carrier-type regulation was withheld from the outset and competition and innovation have thrived. While the Commission's goal of fostering an open and vibrant Internet is laudable, the relevant question is whether the proposed rules help or hurt. I conclude that they are likely to cause, rather than avert, harm.

The terms "nondiscrimination" and "neutrality" which have featured so prominently in this debate have appealing connotations; but precisely what do they mean? The Internet is being used to deliver increasingly diverse types of traffic, with different demands for network performance in dimensions such as delay or packet loss. For example, real-time, interactive applications such as VoIP are far less tolerant of delay or jitter (variation in delay), than is Email or Peer-to-Peer file transfers. Thus, uniform or superficially nondiscriminatory treatment of all traffic would *not* be neutral in any economically meaningful sense because it would penalize applications that require better performance. Likewise, payments from content providers for prioritization or network enhancements also need not be economically harmful discrimination. Such payments can enable valuable and mutually beneficial arrangements, for example, by allocating scarce network capacity efficiently and avoiding the need for costly overbuilding, and by funding network enhancements desired by particular content providers.

The NPRM appears to reject the simplistic notion, associated with crude versions of the so-called "end-to-end principle," that the Internet should be a dumb network with rigidly uniform service quality and pricing. It notes: "The key issue we face is distinguishing socially beneficial

discrimination from socially harmful discrimination in a workable manner." (¶ 103.) Yet it proposes essentially to bar certain practices as inherently undesirable discrimination.[3] Why? What is the impetus for such intervention now?

One claim is that "tools that enable network operators to prioritize or degrade transmissions are increasingly available and widely deployed." (¶ 8.) This is certainly not enough to justify intrusive regulation. Network management tools have long existed without evidence of ostensible harm and, as noted, intelligent network management has clear efficiency roles. The Notice also suggests broadband providers may possess substantial market power, which accentuates concerns with harmful discrimination.[4] However, no analysis of the effectiveness of competition in the broadband marketplace is presented — a serious deficiency when contemplating sweeping rules that would apply to an industry characterized by considerable rivalry and prospects for more to come with the rise of wireless broadband.

Beyond the market power question, consider the theories of harm. One category is that broadband providers may use latitude in service quality to extract involuntary fees from content providers, either uniformly (¶¶ 63, 66, 70) or through price discrimination (NPRM, ¶ 71). These arguments cannot justify the proposed intervention for several reasons. *First*, the postulated behavior is not presumptively harmful. For example, positive fees to content providers would result in lower prices to broadband consumers, advancing the Commission's goal of expanding broadband penetration and use especially among economically disadvantaged groups. (¶ 82.) *Second*, the same practices can serve clearly efficient purposes — for example, using QoS tiers to allocate congested or otherwise scarce network capacity — so a rigid ban would threaten large collateral damage by convicting-the-innocent. In addition, payments by content providers encourage the provision of services that require enhanced network capabilities that best-effort networks are simply unable to support. *Third*, market forces and existing norms against arbitrarily blocking or degrading traffic greatly constrain the ability to impose significant

---

[3] NPRM ¶ 104 states: "Subject to reasonable network management, a provider of broadband Internet access service must treat lawful content, applications, and services in a nondiscriminatory manner." ¶ 106 adds: "We understand the term "nondiscriminatory" to mean that a broadband Internet access service provider may not charge a content, application, or service provider for enhanced or prioritized access" to its subscribers.

[4] "In many parts of the United States, customers have limited options" for broadband service. NPRM ¶ 7. "Where effective competition is lacking . . . it is more likely that price and quality discrimination will have socially adverse effects." NPRM ¶ 70. See also NPRM ¶ 71.

unwarranted fees. In the absence of blocking or targeting of individual data packets, a key tactic hypothesized for extracting such fees is to degrade best-efforts Internet access quality below the level that would prevail in a world where payments from content providers were barred (¶ 71). But such actions can be very costly to a broadband provider, and the Notice has offered no evidence of them.

The other main expressed concern is that broadband providers may have incentives to engage in *anti-competitive discrimination* against unaffiliated providers of Internet content or applications that compete with non-access services offered by the broadband providers (¶¶ 63, 72). Anti-competitive discrimination by the vertically integrated regulated-monopoly Bell system was, of course, a central concern of U.S. telecom policy and over the years led to behavioral and structural remedies imposed by the FCC and the U.S. Department of Justice. But one cannot simply transplant precepts from a regulated monopoly era into today's rivalrous broadband market. For one thing, vertical integration of broadband ISPs into the types of Internet content or applications at the forefront of the net neutrality debate is quite limited, so the proposed ban on charging is an overly broad response to such concerns. Moreover, anti-competitive discrimination that reduces or degrades the quality of content available to end-users is a costly strategy when customers can switch to a rival provider — which is one reason why intrusive regulation to guard against anti-competitive discrimination is a drastic remedy typically reserved for industries with a single dominant provider.

Beyond these *a priori* objections, and perhaps most important, is the striking lack of evidence for the postulated harms. The Notice states that "Despite our efforts to date, some conduct is occurring … that warrants closer attention and could call for additional action by the Commission, including instances in which some Internet access providers have been blocking or degrading Internet traffic" (¶ 50). But it cites just two examples: *Madison River* from 2005 and the more recent *Comcast/BitTorrent*. This is a remarkably thin record on which to even contemplate the far-reaching regulation. Furthermore, both incidents were swiftly addressed in the absence of the proposed rules, further spotlighting the glaring gap between the proffered rationale for intervention and the proposed rules.

The remainder of this Declaration is divided into two main parts. Section II develops the argument for why the proposed regulation is entirely overbroad. I first note that a virtual ban on differential treatment and pricing would constitute a radical departure from established policy

norms in both regulatory settings and antitrust. Next, I explain why such a ban would impose serious harm in this particular case. Paid prioritization, akin to peak-load pricing, can help allocate scarce network resources in an efficient cost-based manner.[5] Payments by content providers can also help fund investments in network enhancements needed to support their specific service requirements. Thus, barring such practices is likely to raise costs and preclude new services. While these losses from restricting contracting flexibility cannot be quantified in advance, regulatory experience from other industries indicates the losses are likely to be substantial. In addition, prohibiting payments from content providers is likely to result in higher prices or other worse terms to consumers and discourage broadband adoption and use.

Finally, I scrutinize arguments based on two-sided pricing and externalities that have been invoked for banning charges to content providers. There is neither a consensus from the economics literature nor an empirical basis to support a ban on such charges even if they were involuntary "fees." Arguments that focus on the potential harm to content providers ignore the opposing beneficial effects on network investment and on lower prices to consumers. Moreover, as noted, charges to content providers need *not* constitute "fees" but can support mutually beneficial arrangements in QoS options and network enhancements. It therefore is not sensible to ban payments from content providers as inherently undesirable. At best, the proposed rule is entirely disproportional.

Section III argues that the case has not been made even for more targeted net neutrality intervention. A basic question is whether an industry should bear the burden of justifying non-regulation, or whether the burden should fall on those seeking regulation. Given the costs of any intrusive regulation, sound economic policy demands — as a prerequisite for contemplating such intervention — convincing evidence of a significant and durable problem in the absence of intervention. This threshold condition has not been met. The broadband industry is presumptively not a candidate for intrusive regulation for at least two reasons.

First, like Sherlock Holmes' dog that didn't bark, the record of "bad discrimination" is striking by its absence. Second, there are good reasons to think this will continue. Today's

---

[5] It is "cost based" because allocating resources to one use during network congestion entails an opportunity cost — the value of alternative uses as revealed by the willingness to pay for the guaranteed quality when the option is generally available. See, e.g., Jon Peha, "The Benefits and Risks of Mandating Network Neutrality, and the Quest for a Balanced Policy," *International Journal of Communications* vol. 1 (2007): 651–52 (Peha 2007).

broadband industry is far removed from the traditional monopoly setting that invited regulatory interventions of the type urged here. Landline residential broadband — the traditional target for intervention because of its "duopoly" structure in many local areas — in fact displays vigorous competitive rivalry. Wireless broadband already has multiple competitors, is rapidly growing, and there is increasing competition between it and landline broadband access to attract consumers. Moreover, since many consumers are likely to adopt wireless broadband in addition to their landline connections, content and application providers will have additional paths to reach individual consumers.

Section IV concludes there is no need for even more targeted net neutrality regulation ahead of convincing signs of serious harm. Even with the best intentions such regulation would be costly. By limiting the flexibility of industry participants to experiment with customized options and new arrangements, it risks impeding the Internet's efficient adaptation to meet the growing heterogeneity of uses and their diverse performance requirements. Instead of protecting the Internet's neutrality in a meaningful sense, preemptive regulation could impose rigid and costly uniformity, degrading the Internet's capabilities and discouraging its adoption and use,

II. THE PROPOSED REGULATION IS OVERLY BROAD AND IS LIKELY TO CAUSE SERIOUS HARM

Underlying the proposed regulation is an implicit view that the predominant effects of allowing broadband providers to provide differential treatment of traffic or to charge content providers are undesirable. It is vital to appreciate at the outset that there are pure efficiency reasons for such practices and arrangements from which all parties can benefit.[6]

[6] For example, an OECD report observes: "There is likely a wide range of future innovations that will require better quality of service than the current Internet can provide. Certain Internet providers have even put forward that they believe traffic prioritisation is inevitable for the future functioning of the Internet. The ability to designate priority to certain applications will be a boon for consumers and providers as long as there is sufficient competition in the market." Organisation for Economic Co-operation and Development, *Internet Traffic Prioritisation: An Overview,* April 2007, page 4.

A. Uniform Treatment of Internet Traffic Is Neither Neutral Nor Nondiscriminatory in Any Economically Meaningful Sense

Economists (and established regulatory policy) typically define discrimination as treating *like* things differently (or, conversely, treating unlike things the same). The Internet is a shared, congestible environment that is being used to deliver increasingly diverse types of traffic, with different demands for network performance in dimensions such as delay or packet loss. As noted, for example, real-time, interactive applications such as VoIP are far less tolerant of delay or jitter than is Email or Peer-to-Peer file transfers. Therefore, uniform or superficially nondiscriminatory treatment of all traffic would *not* be neutral in any economically meaningful sense because it would penalize applications that require better performance.[7]

But the proposed rule appears to contemplate a regime that generally proscribes treating different things differently, subject only to fitting within one of a handful of ill-defined exceptions. See ¶ 104 ("we propose a general rule prohibiting a broadband Internet access service provider from discriminating against, or in favor of, *any* content, application, or service, subject to reasonable network management") (emphasis added). And some network neutrality proponents have been quite explicit in contending that broadband ISPs should be forbidden from favoring latency-sensitive traffic in congestion situations or otherwise responding to the different characteristics and performance requirements of different types of Internet applications. Taken literally, this approach would *mandate*, not prohibit, economic discrimination, and the resulting harms would be obvious and substantial.

B. A Per Se Ban on Differential Treatment and Pricing Would Be a Radical Departure from Economic Policy Norms Even in Monopoly Contexts

It is widely appreciated in economics and regulatory policy that differential treatment and pricing can be presumptively benign or beneficial for a number of reasons. Policy interventions

---

[7] See, e.g., Tim Wu, "Network Neutrality, Broadband Discrimination," *Journal on Telecommunications and High Technology Law* vol. 2, no. 1 (2003): 141–79; and Christopher Yoo, "Network Neutrality and the Economics of Congestion," *Georgetown Law Journal* vol. 94, no. 6 (August 2006): 1847–1908.

thus have typically circumscribed only differences that might entail anti-competitive discrimination[8] or otherwise undesirable discrimination.

For example, even monopolists regulated as common carriers have been afforded considerable latitude to engage in price discrimination, loosely defined by economists as differences in a firm's prices that do not reflect cost differences. They typically have been allowed to offer menus of options at different prices, provided the offers are made available to all similarly situated customers, although such menus can be used to implement what economists call indirect (or "second degree") price discrimination.[9] Some selective offers that can implement direct (or "third degree") price discrimination have also been permitted, such as railroad rates based on the type of the commodity being shipped.[10] The Notice acknowledges (¶ 109) that the usual standard governing common carriers prohibits only "*unjust or unreasonable* discrimination," yet proposes rules that are far more stringent. Similarly, outside of regulated monopoly settings, the main U.S. antitrust law governing price discrimination (the Clayton Act, as amended by the Robinson-Patman Act) prohibits the practice only where it may "substantially lessen competition."

There are sound reasons for rejecting the Notice's proposed approach. First, even if differential treatment and pricing were primarily driven by price discrimination, this would not provide a compelling basis for a rigid ban because price discrimination has beneficial aspects. Second, and at least as important, differential treatment and pricing can be motivated by reasons other than price discrimination and which are presumptively desirable. Consider these points in turn.

"Price discrimination" has pejorative connotations — value of service pricing sounds much more benign — but its economic effects are not presumptively harmful. The net impact on overall welfare and even on consumer welfare can be positive. A key beneficial aspect of price

---

[8] Anti-competitive discrimination by a vertically integrated monopolist against independents that require access to its bottleneck facilities in order to compete with its affiliate(s) in offering adjacent services is a scenario that motivated much of the regulatory intervention in telecommunications. I will discuss this scenario in Section III, showing that it does not justify network neutrality regulation.

[9] See, e.g., Jean Tirole, *The Theory of Industrial Organization* (Cambridge, MA: MIT Press, 1988).

[10] David Levinson, "Network Neutrality: Lessons from Transportation," *Review of Network Economics* vol. 8, no. 1 (2009): 13–21.

discrimination is its scope to expand total output by permitting selectively lower prices to consumers who are more price-sensitive and higher prices to other consumers.[11]

The Notice seems to envision a scenario in which a broadband provider allowed to charge content providers would engage in indirect price discrimination, inefficiently lowering the quality of its lowest available tier so as to reduce its appeal to buyers who choose higher quality and, hence, charge them more for the higher tiers.[12] But even if the only motivation for the hypothesized price-quality tiers were price discrimination, the net effect of price-quality tiers relative to uniform pricing can be beneficial because a seller would typically choose to serve a broader range of customers than if restricted to a single quality and price.[13] Hermalin and Katz (2007) provide a rigorous analysis of the issue in the context of net neutrality and conclude that if quality tiers are banned, "harm to welfare is likely."[14]

This discussion shows the overbreadth of the proposed rules even if quality tiers were used solely for purposes of indirect price discrimination among content providers. Moreover, as discussed below in Section C, there are non-price discrimination reasons for employing price-quality tiers, including presumptively efficient reasons that go beyond narrow notions of "reasonable network management." Distinguishing such cases from those where price-quality

---

[11] This principle underlies the well-known theory of Ramsey pricing, which has been applied in regulated industries. Even price discrimination by an unconstrained monopolist can raise welfare relative to uniform pricing due to output expansion, for example, by serving relatively low demand (price elastic) markets that would not be served if the firm had to set a uniform price. See, e.g., David Malueg and Marius Schwartz, "Parallel Imports, Demand Dispersion, and International Price Discrimination," *Journal of International Economics* vol. 37, no. 3–4 (1994): 167–95.

[12] Broadband providers may "reduce or fail to increase the transmission capacity available for standard best effort Internet access . . . in order to increase the revenue obtained from . . . users who desire a higher quality of service." (¶ 71)

[13] This market expansion aspect makes it theoretically possible that *all* consumers can be better off under quality discrimination than under uniformity. See Raymond Deneckere and Preston McAfee, "Damaged Goods," *Journal of Economics & Management Strategy* vol. 5, no. 2 (1996): 149–74.

[14] Benjamin Hermalin and Michael Katz, "The Economics of Product-Line Restrictions with An Application to the Network Neutrality Debate," *Information Economics and Policy* vol. 19, no. 2 (2007): 215–48 (see Abstract, and p. 2: "we find that the negative effects frequently dominate"). They show that, relative to uniform pricing, banning quality tiers will lead to an intermediate quality and price. Content providers that would have purchased intermediate qualities will obtain a higher and more efficient quality. However, those content providers who would have chosen high qualities are inefficiently forced to a lower quality; and those who would have chosen low qualities at lower prices will now be priced out of the market altogether, because they cannot afford to pay the price that would be charged when a single quality is offered. The reduced variety of content also harms consumers.

tiers are used for price discrimination can be very hard, and a complete ban would therefore condemn clearly beneficial conduct. This risk of "false positives" is another powerful reason why policy interventions typically tread more cautiously in proscribing differential treatment or pricing.

The Notice recognizes that discrimination can be socially harmful or beneficial (¶ 103). Yet it argues that "a bright line against discrimination subject to enumerated exceptions, may better fit the unique characteristics of the Internet which differs from other communication network in that it was not initially designed to support just one application." (¶ 109.) This argument, however, cuts in exactly the opposite direction: diverse and rapidly evolving uses of broadband networks with heterogeneous performance requirements likely signals more circumstances in which differential treatment is required for efficiency.

The real debate, then, should not be over uniform treatment and pricing, but over whether anticompetitive or other socially harmful discrimination is likely and, if so, whether *targeted* regulation is likely to help on balance. The proposed rules are vastly overbroad, throwing the baby out with the bathwater (or, to use a more colorful metaphor, burning down the barn to kill the imagined rats). Such a stance is particularly unwarranted given the striking lack of evidence for harmful discrimination.

C. There Are Clearly Efficient, Pro-Consumer Reasons for Differential Treatment and Paid Prioritization/Enhancements of Internet Traffic

Just as discrimination is not declared conclusively or even presumptively bad in other areas of economic activity, including monopoly contexts, there is no rational basis to declare it conclusively or presumptively bad in the Internet context. Indeed, there are particularly obvious and substantial benefits of differential treatment of dissimilar Internet traffic.[15]

As noted, Internet networks are shared, congestible resources that support an increasingly diverse range of applications with different performance requirements. The full efficiencies of a converged IP network can only be realized if the network can accommodate the different performance requirements of the various services. Prioritization and other network management practices can allow such heterogeneous uses to coexist efficiently in the face of inevitable

[15] See, e.g., Peha (2007), 650–52.

periodic congestion. The increased diversity of uses can be expected to magnify the importance of Quality of Service (QoS) options in supporting efficient sharing of network capacity.

Some extreme skeptics oppose any differential treatment of traffic, claiming that a superior alternative is to simply build higher capacity networks so that peak traffic levels can be accommodated without the need for congestion management. Even if this view were plausible (which I believe it is not), policy makers would be unwise to prejudge such engineering and economic tradeoffs by banning QoS options at the outset. Experimentation with alternative solutions should be encouraged, not discouraged. Moreover, there are good reasons to expect that exclusive reliance on such an "over-sizing" approach would be economically wasteful. Eliminating network congestion at all times would require maintaining costly excess capacity on average that would require raising prices to users. Network management tools, including prioritization, can help economize on capacity while maintaining good overall network performance during times of congestion.[16]

Most skeptics concede the potential value of prioritization or other differential treatment and would allow it in at least some circumstances, but would bar payments. This is a major focus of the Notice, which states that the proposed nondiscrimination regulation would prohibit broadband ISPs from charging content or application providers (NPRM, ¶¶ 104, 106). It is important to recognize that this is not a nondiscrimination rule at all, as it would apparently ban even nondiscriminatory charging. But whatever the label, there are clearly pro-consumer reasons for allowing such charging, and the proposed across-the-board prohibition on charging, like the proposed nondiscrimination rule itself, is thus clearly overbroad.

1. Efficient Sharing of Network Capacity Among Diverse Uses

Once one recognizes that prioritization can be beneficial, how are we to decide which content or applications are most "deserving" of prioritization? Prices play a vital role in allocating scarce resources to highest valued uses by revealing users' valuations, and one can

[16] At a conceptual level, the claim that one should just add more capacity exhibits considerable tension with a core advantage attributed to packet switched networks such as the Internet (over the traditional circuit-switched telephone network) — their ability to economize on capacity by allowing diverse data packets to utilize otherwise unused bandwidth. The benefits from economizing on capacity would be trivial if capacity were extremely cheap as claimed. In reality, of course, capacity is not free.

expect prices to play a similar role here — to help identify which traffic should get higher quality from the network in the ultimate best interests of consumers.[17]

Generally available paid QoS tiers can serve the valuable role of assuring users of guaranteed performance in exchange for a payment that reflects the opportunity cost of reserving resources for their use. For example, in allocating capacity rights in natural gas pipelines or electricity transmission grids, certain industrial customers may contract for different levels of service reliability (such as firm versus interruptible capacity rights) at different prices (see Section II.C.3 below).

Some observers who recognize the valuable role that paid QoS options can play in revealing which content (or applications) are judged by users to merit priority nevertheless would allow broadband ISPs to offer such options only to "users" but not to content providers. The underlying premise seems to be that if broadband ISPs are allowed to offer content providers different qualities in exchange for payments, they might use such discretion to extract higher payments for improper reasons. The proposed remedy is to allow consumers ("users") to decide which content (or applications) they deem worthy of priority — so as to preserve the beneficial role of prices in guiding network resource allocation — but to prevent prices from being used purely to extract revenue from content providers.

There are several prima facie problems with such an approach that tries to confine QoS contracting to one side of the market. Most obviously, contracting with content providers may be necessary to implement the relevant arrangements. A content provider is likely to be in a much better position than end users to know what performance requirements are needed for its service to work well. Most consumers are not network engineers, and will rationally delegate to a content provider the task of making whatever arrangements with network providers are needed for them to enjoy its service. Aside from the information issues, the transaction costs of contracting for such arrangements are likely to be much lower when dealing with a content

[17] In the absence of such price signals, all applications and content providers — indeed, all users on the network — would have an incentive to "cheat" by marking each of their packets as belonging to the highest-quality tier within any given network, because they would internalize none of the opportunity costs of doing so. That would lead to *no* packets receiving any special handling, and thus deny performance-sensitive applications the handling they need to function well for users.

provider than with a host of end users.[18] Denying the ability to contract with content providers, therefore, may render the arrangements infeasible and foreclose valuable options.[19]

2. Investments in Network Enhancements and Versatility

The above discussion addressed the risk that the rule poses to practices that help efficiently manage existing network resources. There is an additional risk of discouraging valuable investments that would make the network more versatile and improve performance and consumers' overall experience.

Certain enhancements to the network may be demanded by particular types of application or content providers, and can entail *incremental costs*. Economic efficiency suggests that such incremental costs should be charged to the particular services that benefit from those enhancements. Contracting with the end users of these services may well be impractical, particularly in the case of investments needed to support new services unfamiliar to consumers. A broadband provider will be reluctant to make the investment unless it was confident that a critical mass of consumers would be willing to pay. And consumers may not be willing to pay for the enhancement without the assurance that the content will be forthcoming. There will therefore be a bias against investment in such enhancements because of the artificial restriction that prevent some natural would-be beneficiaries — the content providers — from willingly helping to fund such investments.

More generally, limitations on charging for prioritization and enhancements could skew investments away from "smart" functionalities (e.g., in routers), functionalities that promote the goals of public safety, national security, and other goals desired by the Commission. Because many of the same smart functionalities would also be used for commercial arrangements such as paid QoS, limiting the latter undermines the business case for such investments.

---

[18] For example, it is likely that Amazon.com is able to negotiate a much more favorable rate with UPS or FedEx for shipping its products to consumers than those consumers could negotiate on their own.

[19] The Notice (¶ 63) cites a concern of van Schewick that paid prioritization will lead broadband providers to optimize the network in favor of some applications instead of making it general purpose. However, prioritization and other network management promote versatility, thereby allowing networks to efficiently accommodate more uses while economizing on capacity — a savings that can benefit all uses.

3. Experience from Other Industries Illustrates the Benefits of Contracting Flexibility

The Notice asks for comments identifying current and planned services that are particularly sensitive to service quality (¶¶ 112–13). Internet technology and business arrangements are in great flux, which makes it inherently difficult to predict the set of future services and their performance requirements and, hence, to anticipate all the value that greater flexibility could bring. However, historical examples from other network industries show that the value can be substantial, as evidenced by the efficiencies that arose once regulatory constraints were relaxed.

The freight railroad industry provides an instructive case study. To maintain the focus on the Internet here, the details of the railroad experience are deferred to Appendix 1. However, the main lessons are worth noting. The Staggers Rail Act of 1980 relaxed much of the traditional common carrier regulation of freight railroads and, among other things, permitted them and shippers to negotiate bilateral contracts. Contracts generally cover shipment volumes, pricing, and service options governing various dimensions such as liability, traffic routing, and guaranteed levels of service. The majority of traffic shifted from tariffs to bilateral contracts. By various indicators, railroad performance improved dramatically, benefitting both the railroads and shippers: shipping rates fell significantly; the long downward trend in railroads' share of all freight transportation reversed course; service quality improved greatly in speed, reliability, and other dimensions; and service options expanded.

Many of these gains were enabled by the flexibility to contract for customized options and prices. For example, the pre-1980 regime obliged railroads to set uniform rates for all possible routings between a particular origin and destination. The Staggers Act authorized route-specific rates. These newly available price signals allowed railroads to steer traffic onto routes that reduced travel time, improved reliability, and reduced operating costs — benefitting both railroads and shippers. The contracting flexibility also induced complementary investments by both sides (as explained in Appendix 1), as well as innovation. A striking example is intermodal traffic (that travels by rail and another mode such as trucks for different parts of the route). Service reliability and shorter transit times for intermodal trains were achieved by giving intermodal trains priority over other trains. Moreover, railroads had to develop new logistics

technologies to support this prioritized service, and the increased pricing flexibility since the Staggers Act provided stronger incentives to undertake these necessary investments.

While the parallels between any two industries are never exact, the lesson from railroads provides a sobering cautionary note of the risks from restricting contracting flexibility. Loss of flexibility is likely to be particularly damaging in dynamic markets like the Internet — especially in the wireless segments where technology and business arrangements are evolving so rapidly and where customized arrangements between networks and "edge" applications and devices have played such a central role in innovation and service quality improvement.[20] Finally, note that the tariff regime that governed railroads before the Staggers Act allowed some heterogeneity of options and prices provided they were made available to all shippers. The regulation proposed in the Notice is considerably more restrictive than even that regime.

The benefits of allowing flexible service options similar to QoS tiers in broadband have been recognized in additional network industries, such as natural gas pipelines[21] and electricity transmission.[22]

---

[20] See, e.g., Michael Katz, "Public Policy Principles for Promoting Efficient Wireless Innovation and Investment," (¶¶ 54–58) ("Katz Innovation White Paper") and Gerald Faulhaber and David Farber, "Innovation in the Wireless Ecosystem: A Customer-Centric Framework," (pp. 12–13). Both papers were submitted with Comments of AT&T, Inc., Fostering Innovation and Investment in the Wireless Communications Market; A National Broadband Plan For Our Future, GN Docket Nos. 09-157, 09-51, Sept. 2009.

[21] The Federal Energy Regulatory Commission (FERC) acknowledged the role that firm and interruptible purchase rights play in allocating scarce capacity on gas pipelines. (See FERC Order 636, pp. 16, 28–29, and 32–38. "Interruptible" refers to transactions in which either party can interrupt deliveries or receipts of natural gas or electricity at any time provided it gave a timely notice of its interruption. "Firm" refers to transactions where each party is obligated to deliver and receive the agreed upon quantity. Federal Energy Regulatory Commission, Order No. 636, Final Rule, April 8, 1992, Docket Nos. RM91-11-000 and RM87-34-065.) FERC required pipelines to offer the same menu of offers to all customers but allowed interruptible rates to be set through bilateral negotiation, with relatively minimal constraints on the negotiated prices. FERC further stimulated the growth of variety in service options by allowing customers to contract for storage capacity and flexibly release or reassign their usage demands to alternate locations (Order 636). These initiatives illustrate FERC's recognition of the value of flexibility and its acknowledgment that, under rigid regulation, gas markets were unable to effectively respond to short-term changes in demand. (See Margaret Jess, "Restructuring Energy Industries: Lessons from Natural Gas," *Natural Gas Monthly*, Energy Information Administration, May 1997, pp. vii–xxi.) As a result, customers have access to a full spectrum of choices about flexibility and risk, and the efficiency of pipeline use has improved. (See Jeffrey Leitzinger, "A Retrospective Look at Wholesale Gas: Industry Restructuring," *Journal of Regulatory Economics* vol. 21, no. 1 (2002): 99 ("The most striking changes brought about by restructuring in gas wholesale markets are variety in product offerings and supply alternatives. Wholesale customers today can enter into delivered supply arrangements from a large variety of potential suppliers incorporating a full spectrum of choices about flexibility and risk. In

4. Payments from Content Providers for Prioritization or Enhancements Are Likely to Benefit Consumers and Promote Broadband Adoption

Consumers can be expected to benefit directly from the efficiencies enabled by prioritization and network enhancements discussed earlier — the cost savings on network capacity and the advent of new or improved services. There is a further reason why consumers are likely to benefit. It flows specifically from the fact that content providers would pay broadband providers for enabling these mutually beneficial arrangements: the payments give broadband providers an added incentive to expand broadband adoption and stimulate its use by consumers.

The causality is fairly straightforward. The new or enhanced services enabled by QoS arrangements or network investments will benefit content providers *and* these benefits will likely increase with the number of broadband consumers or their intensity of broadband use. That is, a content provider typically gains more from a network enhancement needed for its service if the service is available to more consumers or if consumers use broadband more intensively. If a broadband provider can share in these gains, by receiving a larger total payment for a network enhancement the larger is its user base, it will seek to expand this base and stimulate broadband use — by offering consumers lower prices, higher speeds, or other inducements. Improved terms to consumers will advance the FCC's goal of fostering broadband adoption.

D. Two-sided Pricing and Externality Arguments Do Not Justify A Radical Departure from Established Economic Policy

The relatively young economics literature on two-sided markets studies an intermediary or platform that enables interaction between two groups of agents, at least one of whom values

---

addition, customers can self-design a delivery service by contracting separately for commodity, storage and transportation."))

[22] See, e.g., Ross Baldick, Sergey Kolos, and Stathis Tompaidis, "Interruptible Electricity Contracts from an Electricity Retailer's Point of View: Valuation and Optimal Interruption," *Operations Research* vol. 54, no. 4 (2006): 627-642; and Mark Bykowsky and Michael Marcus, "Facilitating Spectrum Management Reform via Callable/Interruptible Spectrum," Telecommunications Policy Research Conference, 2002, http://intel.si.umich.edu/tprc/papers/2002/147/SpectrumMgmtReform.pdf (pp. 18–19).

access to the other group.[23] For example, a newspaper links readers ("eyeballs") with advertisers. Similarly, a residential broadband provider enables consumers ("users" or "eyeballs") to reach content providers and vice versa, and both sides typically benefit: consumers desire content, and content providers earn advertising revenue when consumers visit their sites (or, in some cases, earn subscription revenue for their online services). The literature analyzes what factors govern the relative prices a platform provider will set to the two sides, and how this pricing structure compares with the structure that would maximize overall welfare.[24]

Some have hypothesized that the two-sided nature of the Internet supports a categorical ban on charging one side ("content") even if such categorical bans have been rejected in more traditional regulated industries. But the modern world is flush with two-sided markets, and that alone has never been thought sufficient to warrant regulatory mandates that the charging occur only one side. In some two-sided markets both sides pay, in others only one side pays, and the charging conventions can vary over time. Neither the articles cited in the NPRM nor the broader economic literature on two-sided markets support a policy of banning charges from broadband providers to content providers or vice versa.

---

[23] Some of the pioneering analyses are: Bernard Caillaud and Bruno Jullien, "Chicken and Egg: Competition Among Intermediation Service Providers," *RAND Journal of Economics* vol. 34, no. 2 (2003); 309–28; Jean-Charles Rochet and Jean Tirole, "Platform Competition in Two-Sided Markets," *Journal of the European Economic Association* vol. 1, no. 4 (2003): 990–1029; Julian Wright, "One-Sided Logic in Two-Sided Markets," *Review of Network Economics* vol. 3, no. 1 (2004): 44–64; Simon Anderson and Stephen Coate, "Market Provision of Broadcasting: A Welfare Analysis," *Review of Economic Studies* vol. 72, no. 4 (2005): 947–72; Mark Armstrong, "Competition in Two-Sided Markets," *RAND Journal of Economics* vol. 37, no. 3 (2006): 668–91 (Armstrong 2006); Jean-Charles Rochet and Jean Tirole, "Two-Sided Markets: A Progress Report," *RAND Journal of Economics* vol. 37, no. 3 (2006): 645–67 (Rochet and Tirole 2006). For a recent survey, see Mark Rysman, "The Economics of Two-Sided Markets," *Journal of Economic Perspectives* vol. 23, no. 3 (2009): 125–43.

[24] The literature also shows that under certain conditions, only the sum of prices to the two sides matters, the division of this total charge — the pricing *structure* — is irrelevant, or "neutral" in the parlance of that literature. (For a discussion of neutrality conditions, see Rochet and Tirole 2006, 648–50). This requires that there be a direct flow of payments between the two sides of the platform, in parallel to any charge that each pays the platform (or gets from it). In some such cases, if the platform raised price by some amount X to one side and cut it by X to the other, this would cause an equal and offsetting adjustment in the price by one side to the other. The discussion in the text applies to cases where the pricing structure does matter.

1. Fees to Content Providers Would Reduce Prices to Consumers

Section II.C discussed the efficiencies of allowing content providers to pay for prioritization or network enhancements that benefit all sides by expanding their available options. Some critics fear that broadband providers might use an ability to charge content providers to extract fees unrelated to any network improvements, thereby harming content providers. Assuming for the sake of argument an ability to impose such pure fees, what would be the consequences?

A key point to recognize is that if broadband providers were to charge fees to content providers (and, indirectly, online advertisers), the likely result would be lower prices or other improved terms to consumers. The logic is similar to that in Section II.C.4 above, which examined payments from content providers for arrangements that are mutually beneficial: the price to one side of a two-sided market will be reduced if the profit margin earned from the other side increases — whatever the reason for the increase.

This linkage of prices is a robust implication from the economic analysis of two-sided markets.[25] While the degree of competition between broadband platforms can influence the size of the price reduction to consumers in response to increased profit from content providers, the implication that some price reduction will occur is quite general. It follows simply because the two sides of the market are complementary: greater consumer adoption and use of broadband yields higher profit to content providers. Therefore, if a broadband provider can share in this gain by charging content providers, it will have a stronger incentive to promote broadband by offering lower prices or other inducements, such as higher speeds at the same price. Any of these inducements would advance the FCC's goal of encouraging broadband adoption and use by economically disadvantaged groups (NPRM, ¶ 82).

2. Investment Incentives Matter in Both the Network Edge and the Core

In various places the Notice expresses concern that charges to content providers would reduce their investments and innovation. Here, too, the discussion of this two-sided market is rather one-sided. The Internet's success requires complementary investments both in content

[25] For example, Rochet and Tirole (2006, 659) state: "a factor that . . . raises the platform's margin on that side, tends also to call for a lower price on the other side as attracting members on that other side becomes more profitable."

and applications (the network's "edge") as well as in infrastructure (the "core"). In order for the edge to flourish, broadband providers will have to make large recurring investments in upgrading the bandwidth and capabilities of residential broadband networks.

Despite cautions about the ability to raise funds for network upgrades given Wall Street's perception that "there is too much competition,"[26] carriers have continued to invest heavily in landline broadband. In 2008, landline broadband access providers invested approximately $40 billion in their networks.[27] In June 2009, Verizon stated it would invest over $23 billion to pass 18 million homes with its all-fiber FiOS network by the end of 2010.[28] Wireless carriers are likewise investing significant amounts to expand broadband access. In 2008, U.S. wireless carriers reported incremental capital expenditures of over $20 billion on their networks to upgrade their speed, capacity, and coverage.[29] AT&T stated in March 2009 that it planned to invest approximately $12 billion during 2009 to extend and enhance its wireless and wired broadband networks.[30]

These investments are enabling new types of digital and data communications. Verizon's FiOS and AT&T's U-verse, for example, enable "triple play" delivery of high-speed Internet, television, and phone service.[31] Verizon and AT&T offer these services by deploying fiber optic

---

[26] Remarks of Matt Niehaus, a partner at the private equity group Battery Ventures, during the session "Private Investment: The Backbone of Broadband Deployment" at the Supercomm 2009 conference in Chicago (Oct. 2009), as reported by Telecom TV news, http://www.telecomtv.com/comspace_newsDetail.aspx?n=45650&id=e9381817-0593-417a-8639-c4c53e2a2a10#.

[27] The U.S. Chamber of Commerce reports that all U.S. communications companies have invested upwards of $60 billion in communications infrastructure in 2008, while the CTIA-The Wireless Association reports that about $20 billion came from wireless network providers. See Charles M. Davidson and Michael J. Santorelli, "Network Effects: An Introduction To Broadband Technology & Regulation," A Study Commissioned by the U.S. Chamber of Commerce, Dec. 2008, at 2, http://www.uschamber.com/assets/env/introbroadband.pdf; Comments of CTIA-The Wireless Association, *In the Matter of Annual Report and Analysis of Competitive Market Conditions with respect to Commercial Mobile Wireless Services*, WT Docket No. 09-66, June 15, 2009, at 13.

[28] Comments of Verizon and Verizon Wireless on a National Broadband Plan, GN Docket No. 09-51, June 8, 2009, at 20.

[29] Katz Innovation White Paper, ¶22, citing "Comments of CTIA-The Wireless Association," *In the Matter of Annual Report and Analysis of Competitive Market Conditions with respect to Commercial Mobile Wireless Services*, WT Docket No. 09-66, June 15, 2009, at 13.

[30] AT&T, "*AT&T to Invest More Than $17 Billion in 2009 to Drive Economic Growth*," news release, March 10, 2009.

[31] AT&T, *Explore U-verse*, http://www.att.com/u-verse/explore/default.jsp; Verizon, *Bundles*, at

cable to the premises or to a nearby node.[32] A number of wireless carriers, including AT&T, Verizon, and Sprint/Clearwire, are planning to commercially deploy fourth generation networks in 2010–2011.[33] Those networks are "designed specifically to accommodate high-bandwidth applications such as multimedia messaging service, video chat, mobile TV and digital video broadcasting."[34] The requisite investment expenses are considerable: tens of billions of dollars of private investment will be needed to augment existing third generation networks and deploy fourth generation networks.[35]

Investments by providers of network infrastructure — the network "core" — are large when compared to the investments made by content providers. The Communications Workers of America reports that from 2007 through the first half of 2009, six infrastructure providers — Comcast, Time Warner, AT&T, Verizon, Sprint, and T-Mobile — each spent more on capital investment than did Google, Yahoo!, and Amazon in aggregate.[36] Infrastructure providers also invested more than "edge" companies as a percentage of revenue.[37]

Claims that charges to content providers should be opposed because they would reduce incentives to invest in the edge either expressly or implicitly minimize the importance of incentives for investment in network infrastructure with no justification.

---

http://www22.verizon.com/residential/bundles/bundlesoverview/bundlesoverview.htm.

[32] Verizon, *About FiOS*, http://www22.verizon.com/Residential/FiOSTV/Details/Details.htm; AT&T, *How AT&T U-verse TV is Delivered*, http://www.att.com/Uverse/files/HowUverseIsDelivered_2-22.pdf.

[33] Katz Innovation White Paper, ¶ 20 and Table 4, citing Goldman Sachs, "Mobile Broadband Update: 4G Wireless Ecosystems Taking Shape," May 26, 2009, at 9, and http://news.cnet.com/8301-10784_3-9938068-7.html.

[34] Katz Innovation White Paper, ¶ 25.

[35] Id. at ¶ 26, citing Morgan Stanley, "Telecom Services 1Q Trend Tracker," June 5, 2009, at 87, and Morgan Stanley, "Telecom Services 2Q Trend Tracker," Aug. 31, 2009, at 87.

[36] Communication Workers of America, *The U.S. Broadband Industry Investment and Employment*, (Nov. 2009). This source reports that Comcast and Time Warner spent $14.2 billion and $8.5 billion; A&T and Verizon spent $44.4 billion and $42.9 billion (on landline and wireless facilities); and Sprint and T-Mobile spent $10.1 billion and $8.5 billion. By contrast, content providers Google, Yahoo!, and Amazon spent $5.2 billion, $1.4 billion, and $0.7 billion — collectively $7.3 billion. These three companies were the largest "edge" companies based on employment (see the next footnote).

[37] For the same period (2007 through the first half of 2009), Sprint's investment/revenue ratio was 11% and the five other infrastructure providers had shares of 15% or higher. Among "edge" companies, the top six based on the number of employees had the following investment/revenue figures: (1) Google 11%; (2) Yahoo! 8%; (3) Amazon 2%; (4) Ebay 8%; (5) Expedia 4%; (6) IAC 6%. Source: SEC filings.

3. The Economic Literature Does Not Support a Rigid Rule Mandating One-Sided Charging on the Basis of Overall Welfare

The effect of the Internet pricing structure on overall social welfare must consider all relevant parties, including consumers, broadband providers and content providers. The Notice states that "imposing a fee on content, application, and service providers could reduce total welfare more than imposing the same fee on the end users and no fee on the content, application, and service providers." (¶ 70.) But one cannot presume a systematic tendency in this direction. It is true that higher fees to content providers — unaccompanied by incremental performance or other benefits — would tend to discourage their participation; but the same is true on the consumer side if higher prices are charged to them. By themselves, these observations clearly are not sufficient to guide policy.

The economic analysis of two-sided markets (e.g., Rochet and Tirole 2006) suggests the following principles. The "right" price structure for maximizing overall welfare depends in complex ways not only on the incremental costs of providing access at each end but also on demand conditions on each side. Key demand side factors are (i) the relative sensitivity ("elasticity") of each side to the price it faces *and* (ii) the relative value each side places on the number of participants on the other side ("membership") and how intensively they use the platform ("usage") — the relative strength of "cross-side externalities." For example, if advertisers value access to a newspaper's readers more than vice versa, then a newspaper will be expected to charge advertisers more and readers less; the same pattern holds if readers are more sensitive to price increases than are advertisers. Since these parameters vary widely across industries, so will the "right" pricing structure.

Suggestions that prices should be set to favor content providers do not follow merely from invoking externalities, because externalities are present in both directions.[38] The Notice cites several recent papers that conclude that overall social welfare may be improved by prohibiting broadband ISPs from charging content providers. But as the author of one of those

[38] At times, the Notice seems to overlook this fundamental point: "For example, the benefit that end users receive from subscribing to a broadband Internet access service may depend importantly on the number of content providers to which the subscribers has access. Under such conditions, efficiency may dictate charging content providers a price that is below the cost of providing service to them." (NPRM ¶ 66, n. 155.) As with the newspaper example, efficiency could, instead, dictate subsidizing the "eyeballs."

papers points out elsewhere, "the literature on economic analysis of this issue is thin" with the few studies that have been published reaching diverse conclusions.[39] The efficient pricing pattern in two-sided markets depends in complex and subtle ways on specific conditions in an industry. Theoretical analyses that yield strong prescriptions hinge on special assumptions.[40]

To appreciate the role of assumptions, consider the careful theoretical analysis by Armstrong (2006) whose article is cited in the NPRM (¶ 66, n. 155) (although Armstrong does not apply his model to broadband Internet services). Armstrong considers a model in which two platforms compete to attract two groups of users. Each group-1 member will subscribe only to one platform (is "single-homed"), but users on the other side of the market, group-2, want to reach all members of group-1, hence demand access to both platforms (are "multi-homed"). Under Armstrong's model, each platform sets prices to maximize the joint gain to it and its group-1 subscribers, while ignoring the interests of group-2 (the intensity of competition between the platforms determines the split of the total gain between a platform and its group-1

---

[39] Nicholas Economides and Joacim Tag, "Net Neutrality on the Internet: A Two-sided Market Analysis," Net Institute Working Paper 07-14, revised May 2009, 1–45 (see pp. 6–8). This paper (not cited in the Notice) relies on the same modeling framework as Armstrong (2006), discussed below. The NPRM (¶ 70, n. 162) cites a different paper by Economides. Nicholas Economides, "'Net Neutrality,' Non-Discrimination and Digital Distribution of Content through the Internet," *I/SA Journal of Law & Policy for the Information Society* vol. 4, no. 2 (2008): 209–33 (Economides 2008). I discuss that paper below.

[40] The Notice (¶ 70, n. 162) cites Economides (2008) for the proposition that "imposing a fee on content, application, and service providers could reduce total welfare more than imposing the same fee on the end users and no fee on the content, application, and service providers." It is important to appreciate that, like all papers in this area, Economides' conclusion rests on strong assumptions. His model considers a monopolist provider of network access (broadband) and a monopolist content provider. The network provider sets separate access prices to consumers and to the content provider. The content provider charges consumers for its service (thus, the analysis assumes subscription-based rather than advertising-funded content). Consumers' demand for each service is a reduced-form linear function of the price for content and broadband. The network provider's price to consumers embodies a monopoly margin over its marginal cost of providing access. However, the content provider's price to consumers reflects *double marginalization* — the access provider charges a monopoly margin to the content provider that, in turn, adds its own margin when setting its price to consumers. The fact that access pricing entails double marginalization when sold to the content provider but only a single monopoly margin when sold to consumers is responsible for the conclusion that the access price to the content provider will be too high *relative* to the access price to consumers. Thus, the results are driven by the special assumption that there is double marginalization only on the content side. The same logic would imply that: (1) as the power over price enjoyed by the content provider(s) declines, the double-marginalization inefficiency vanishes; and, alternatively, (2) if the content providers retain significant power over price, then an equally effective approach — instead of regulating the access price charged to them — would be to limit their pricing power by requiring them to price at cost or even by forcing them to subsidize broadband providers.

members). The intuition is that each platform has a monopoly over access to its group-1 subscribers (who, by assumption, are single homed), hence will set a high price to group-2 which, again by assumption, demand access to all group-1 members. Armstrong concludes that under certain conditions competition among platforms can tilt the pricing structure against one side of the market.

As Armstrong is careful to note, his analysis rests on highly stylized assumptions (for further caveats, see Rochet and Tirole 2006). These assumptions do not describe interactions in the Internet broadband industry today, let alone in the future. For example: (a) The number of group-1 members and their activity on the platform are assumed fixed. Thus, a price reduction to them cannot increase overall welfare, because it cannot increase "output." By contrast, lowering prices to Internet consumers will expand Internet penetration and use — both of which benefit also content providers. (b) The stark asymmetry between single-homing by consumers and multi-homing by content providers also does not fit. For example, many consumers use more than one Internet access connection, such as at home and at work, so their residential broadband provider does not have a monopoly over content providers' access to them. Such multi-homing by consumers is likely to grow as consumers adopt wireless broadband in addition to their landline service. In addition, many content providers may not demand access to 100% of eyeballs (as evidenced by the success of mobile content available only on iPhone or Android platforms that are not available from every carrier), which weakens the leverage of broadband providers. (c) Armstrong assumes a platform can dictate access pricing to content providers. This assumption may greatly overstate a platform's pricing discretion for at least two reasons: the countervailing bargaining power of some content providers, who have the unilateral ability to steer some broadband subscribers from one platform to another; and longstanding no-blocking norms (reflected in the current principles in the FCC's *Internet Policy Statement*) that can exist in the absence of regulation that likewise may prevent a platform's ability to unilaterally dictate terms.

In sum, the theoretical analysis of two-sided markets — while offering insights — is not yet settled, is quite complex, and the results are highly sensitive to conditions about which regulators are likely to have highly imperfect information. The application of such analysis to the particular facts of the Internet is even less developed and market conditions are rapidly changing. Given that there is no economic majority opinion, let alone consensus, it would be entirely premature to conclude that prohibiting content charges is likely to raise social welfare,

even putting aside the collateral damage caused by precluding the clearly efficient roles for charges discussed in above.

4. Zero Price Restrictions as a Subsidy to Content Providers

Some proponents of a mandated zero charge recognize that such a policy may constitute a tax on broadband providers and consumers to subsidize content providers, and advocate such a policy on grounds that the "creative and entrepreneurial" should inherently be rewarded.[41] This is a value judgment, not an economic argument, so I leave it for others to assess.

The Notice does suggest a potential economic justification for zero pricing to content providers, based on possible externalities and public goods (¶¶ 68–69). The argument has two components. First, broadband users benefit from expanded supply of content — a standard externality present in two-sided markets. Second, content typically is supplied more widely than to subscribers of any individual broadband provider, so the profitability of content investments depends on the choices of multiple broadband providers, which introduces a second externality. An individual provider ignores the fact that a decrease in its fee to content suppliers from any hypothesized level (or an increase in the fee it pays them) would — by increasing the incentive to invest in content — benefit also subscribers of other broadband providers, thereby generating spillovers across broadband platforms.[42] This externality-based argument also falls short of justifying intrusive zero price restrictions for several reasons.

First, there are positive externalities also from the actions of any broadband provider that expand broadband adoption or use. (a) Content providers benefit (as discussed in the prior discussion of two-sided markets) and have increased incentives to invest, which generates positive spillovers across broadband platforms. (b) In addition, subscribers to other platforms will gain directly from the ability to communicate with more users. Such direct network effects — the benefits of broader connectivity — have been a leading justification for subsidizing infrastructure deployment in communications industries. Since mandating a zero fee to content providers (from hypothesized positive levels) constitutes a subsidy to content but a simultaneous

---

[41] Robin Lee and Tim Wu, "Subsidizing Creativity Through Network Design: Zero-Pricing and Net Neutrality," *Journal of Economic Perspectives* vol. 23, no. 3 (2009): 67.

[42] See, e.g., John Musacchio, Galina Schwartz, and Jean Warland, "A Two-Sided Market Analysis of Provider Investment Incentives with an Application to the Net-Neutrality Issue," *Review of Network Economics* vol. 8, no. 1 (2009): 1–12 (Musacchio et al. 2009).

tax on broadband providers and users, it would discourage broadband deployment and use. Therefore, justifying such a policy would require confidence about the magnitudes of the various externalities, in particular, that positive spillovers from content are the dominant externality.[43] But no evidence has been offered that the supply of Internet content is deficient *relative* to that of broadband infrastructure, nor are there strong reasons to believe that this pattern would hold if charges to content providers were implemented.[44] Furthermore, even if it could be shown that the dominant externality was from content provision to broadband and not vice versa, that alone still would not justify regulatory intervention. Externalities are commonplace in a wide range of markets and there remains healthy economic wariness against intervention because intervention policies themselves can be quite costly.

Second, to the extent a consensus can be developed that Internet content is sufficiently under-provided so as to warrant a subsidy, the standard economic recommendation would apply. Such a subsidy should be provided not through a narrow and hidden tax in the form of regulating broadband providers' pricing, but through a transparent and broad-based funding mechanism.

---

[43] In addition to externalities, other factors are also important for the welfare analysis. To illustrate, consider the theoretical analysis of Musacchio et al. (2009), which incorporates spillovers across broadband platforms and investments by content providers and broadband platforms. Their paper compares welfare to various parties under two regimes: (a) unconstrained two-sided pricing (whereby broadband providers can charge or pay content providers) and (b) a mandated zero price. The welfare ranking depends in complex ways on parameters that represent: the value to users of investments by broadband providers and by content providers; users price sensitivity; content providers' revenue from online advertising (enabled by broadband use); and the number of broadband platforms. For example, if users are relatively price sensitive and content providers derive large gains from online advertising, then unconstrained two-sided pricing yields a positive charge to content providers *and* all parties (including content providers) are better off than with a mandated zero charge. Of course, other parameter assumptions yield different results. A key message from this paper is that welfare rankings are likely to be context specific and assessing such rankings would require highly detailed information.

[44] For example, there is also no showing that lack of content or applications is a greater obstacle to broadband adoption and use than is affordability. Indeed, the fact that so much of the Internet's content and applications is funded by advertising rather than by user subscriptions may suggest that users, on average, do not value interaction with content providers as much as advertisers value access to users. If so, the newspaper model would be an apt analogy, where the platform's price structure favors "eyeballs."

III. THE CASE HAS NOT BEEN MADE EVEN FOR MORE TARGETED PREEMPTIVE INTERVENTION

Section II above demonstrates that the proposed categorical bans on discrimination and charging are plainly overbroad and would ban practices and arrangements that are clearly beneficial. Here I examine whether any of the theories advanced in support of net neutrality regulation — anticompetitive discrimination, other price discrimination, and externalities — could justify more targeted rules directed at the particular types of harmful conduct that have been posited, and conclude that they do not. In subsection A, I address the general threshold for regulatory intervention. Subsection B demonstrates that there is no track record of the hypothesized harms occurring during the decade of broadband experience. Subsection C examines trends in broadband rivalry and concentration and concludes that they do not support speculation that future harm is likely.

A. The Appropriate Threshold for Regulatory Intervention

An overarching question, in this proceeding and in the broader Net Neutrality debate, is this: what threshold should be set for considering intrusive government intervention in an industry? Is it enough to hypothesize that harms may otherwise occur, or does one require more?

In my view, the threshold should be set quite high. Intrusive intervention in any industry should be considered only when there is both clear evidence of serious market failure, and a reasonable degree of confidence that regulation, on balance, will improve matters.[45]

There are compelling reasons for such a stance. First, there may not be any initial market failure, so intervention risks needlessly condemning or prohibiting good practices. Given the risks of erroneously diagnosing "market failure," intervention should not be contemplated unless there is reasonable confidence that the target practices on balance are undesirable for consumers *and* that they reflect an enduring market failure. The onus should not be shifted to the industry to justify non-regulation. Proponents of regulation should provide a clear articulation of the specific market failure(s) and significant evidence. Setting a low threshold invites wasteful rent seeking as well as the aforementioned risk of convicting-the-innocent.

---

[45] For similar themes, see Robert Hahn and Scott Wallsten, "The Economics of Net Neutrality," *The Economists' Voice*, June 2006, 1–7, listed again as the Featured Article in the September 2009 volume.

Second, and just as important, it is not enough to point to a market imperfection and presume that the government can do better — the so-called "Nirvana approach" to government policy. Even well intended regulation is a blunt instrument, which can impose substantial damage.[46] This is particularly likely when, as here, the industry is technologically complex and rapidly changing.

In telecommunications policy the primary basis for imposing access regulation, such as network unbundling obligations, has been to combat anti-competitive discrimination in circumstances where there is a durable monopolist or single dominant firm. It is therefore useful to start by examining the broadband access industry to see if there is clear evidence of anti-competitive discrimination and near-monopoly conditions. Sections III.B and III.C below demonstrate that the answer to both questions is No.

B. There Is No Evidence of Anti-Competitive Discrimination or Other Hypothesized Harms

Broadband services have been provided for roughly a decade without net neutrality rules. In assessing the likelihood of hypothesized misconduct that net neutrality proponents assert, it is therefore important to examine the industry's track record.

The Notice states that "Despite our efforts to date, some conduct is occurring … that warrants closer attention and could call for additional action by the Commission, including instances in which some Internet access providers have been blocking or degrading Internet traffic" (¶ 50) — but cites just two examples: *Madison River* from 2005 and the more recent but procedurally controversial *Comcast/BitTorrent*.[47] Moreover, both incidents were swiftly addressed in the absence of net neutrality regulation — casting further doubt on the need for restrictive new rules that run the serious risk of stifling legitimate practices. This is a remarkably sparse record on which to contemplate new regulation.[48]

---

[46] See, e.g., Clifford Winston, *Government Failures versus Market Failure: Microeconomics Policy Research and Government Performance*, AEI-Brookings Joint Center for Regulatory Studies (2006).

[47] See Philip J. Weiser, "Institutional Design, FCC Reform, and the Hidden Side of the Administrative State," University of Colorado Law School Working Paper 09-01, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1336820.

[48] To the extent that anti-competitive discrimination concerns may grow as broadband providers integrate into content or applications or as Internet-based services develop to compete more strongly

The Notice recaps the Commission's interventions, such as its *Carterfone* rules, against anti-competitive discrimination by the vertically integrated Bell system against independent providers of complementary services that require access to local phone networks (¶¶ 25–27, 47), and expresses concerns that broadband providers today may engage in anti-competitive discrimination against unaffiliated providers of content or applications (¶ 63, 72). However, experience from the regulated-monopoly era cannot serve as the basis for the regulation contemplated here, for at least two reasons.

First, economic logic implies that a broadband provider's incentive to engage in anti-competitive discrimination is much weaker than was true for the monopoly Bell system. It is well known that the type of price regulation applied to the Bell system will bias a monopolist to integrate into adjacent services that require access to the core monopoly service and stifle competition in those services. The vertically integrated AT&T was very tightly regulated in its prices for the monopoly local phone service (which reportedly were close to marginal cost or lower), but less so for its long-distance and other services. That created strong incentives to restrict competitors' access to the monopoly service in order to boost its own sales of those adjacent services.

Such strong foreclosure incentives *cannot* be extrapolated to today's broadband carriers. Discriminating against independent providers of content or applications — services that are complementary to broadband access — would reduce the value of broadband to users and depress sales on which the broadband provider earns a margin above marginal cost (needed to cover the large fixed costs of broadband access). Thus, discrimination would be quite costly to an unregulated broadband provider.[49] Moreover, if a rivalrous broadband provider did engage in anti-competitive discrimination, it would lose substantially more subscribers than would a monopolist because consumers now have the added option of switching to competitors. Contrary

---

against broadband providers' current services (e.g., Internet-delivered video), the proper policy response would be a combination of (a) reviewing transactions that involve integration and (b) ex post enforcement against anti-competitive conduct if and when it arises, as occurred with *Madison River*.

[49] In contrast, as noted earlier, such a decrease in demand would not significantly reduce profit for a firm whose price for the core service is tightly regulated close to marginal cost. See, e.g., Joseph Farrell and Philip J. Weiser, "Modularity, Vertical Integration, and Open Access Policies: Towards a Convergence of Antitrust and Regulation in the Internet Age," *Harvard Journal of Law & Technology* vol. 17, no. 1 (2003): 85–134.

to common beliefs, there is a high degree of customer switching ("churn") in landline broadband (see Section III.C.1.d below).

The Notice cites an article by van Schewick extensively,[50] including for the specific proposition that broadband providers may have incentives to engage in anti-competitive discrimination (n. 167). It is noteworthy that van Schewick defines network neutrality rules narrowly, as rules that only prevent anti-competitive discrimination against third-party content or applications (i.e., prevent foreclosure by a vertically-integrated platform):

> By contrast, network neutrality opponents sometimes use a much broader definition of network neutrality that includes mandated interconnection, non-discrimination, [and] rate regulation . . . While providing a convenient straw man for attack, this definition goes far beyond what network neutrality proponents want to achieve: the measures included in the broad definition constitute heavy forms of regulation. (van Schewick 2007, pp. 333–34.)

Unfortunately, the rules proposed in the NPRM show that the straw man is real: they would mandate the very form of heavy regulation that van Schewick shuns.

On the specific issue of anti-competitive discrimination, van Schewick's article offers a useful compilation of theories that are quite familiar to industrial organization economists. But she does not attempt to establish their applicability, stating that there are circumstances in which incentives to engage in anti-competitive discrimination "may" exist, but "[w]hether the conditions … are present in a real life situation, is an empirical question." (Id., p. 377–78.) But there are wide gaps between the assumptions underlying the theories and the actual facts.[51]

---

[50] Barbara van Schewick, "Towards an Economic Framework for Network Neutrality Regulation," *Journal on Telecommunications & High Technology Law* vol. 5, no. 2 (2007): 329–391 (van Schewick 2007) (NPRM, nns. 146, 148, 149, 162, and 167).

[51] To take one example, consider the discussion of monopolizing a complementary market (pp. 347–352). The scenario has been addressed in the economics literature. Applied to the broadband context, it runs as follows. A local broadband monopolist M also sells complementary content or applications beyond its geographic footprint, to consumers that do not subscribe to its local monopoly service (van Schewick's "affiliated product" case, p. 339). By discriminating in access to its broadband facilities against independent providers of these complementary services, firm M drives them out or severely weakens them from the broader market, thereby monopolizing those services and extracting profits from customers who do not purchase its broadband service. Aside from the limited vertical integration by broadband providers noted earlier, as well as the presence of local broadband competition, there is another dubious assumption — the ability to monopolize the complementary markets. Even the largest broadband provider in the U.S. serves less than a quarter of the nation's broadband customers, and the market for much Internet content and applications may well extend beyond just the U.S. Thus, it is far

Accepting that intervention could reduce investment and innovation by network providers, van Schewick nevertheless contends that increasing application-level innovation is more important (p. 390), but, again, with no empirical foundation. Finally, she acknowledges that regulatory costs associated with intervention "are not covered in detail" (p. 336), but disturbingly seems to assume away such costs by contending that regulation aimed at anti-competitive discrimination will not condemn good conduct nor discourage investment.[52] This is a strikingly optimistic view of the efficacy of regulation.

Besides anticompetitive discrimination, the Notice expressed concerns about involuntary charges to content providers, whether uniform or involving price discrimination (as discussed above in Section II). But there have been no reported instances of broadband ISPs demanding *any* charges from content providers or threatening to block traffic if such charges are not paid. Concerns have been voiced that broadband providers might nevertheless seek to implement price discrimination, either indirectly through offering menus of price-quality options, or directly by threatening to degrade the quality of transmission to end users from content providers who refuse to pay a higher price.[53] This threat of relegation to a "dirt road" has also been invoked, at least implicitly, to argue that broadband providers might force content providers to pay for access to end users — even in a nondiscriminatory fashion — despite the presence of no-blocking principles.[54] To be potentially harmful, these scenarios hinge on an ability to degrade the quality of Internet best-efforts transmission significantly below that in a world with no charges. But here, too, the evidence is lacking and, indeed, all signs are to the contrary: without regulation, broadband speeds and quality have been rapidly *increasing*.

---

from evident that any individual broadband provider could, even if it tried, have any realistic chance of monopolizing a market for content or applications.

[52] This thinking is illustrated in her claim that there is a logical inconsistency between arguing both (a) that network owners have no incentive to discriminate against independent applications, and (b) that regulation would reduce their incentives to invest. "If network owners do not have an incentive to discriminate [anti-competitively] against independent applications anyway, the imposition of a network neutrality regime will not reduce their profits." (p. 332, n. 6) This, of course, assumes counterfactually that all discrimination and, in fact, all charging, is necessarily harmful. It also ignores inevitable regulatory errors and that the resulting uncertainty will discourage investment.

[53] NPRM, ¶¶ 70–71.

[54] NPRM ¶ 63 (some individuals and entities "could choose not to innovate if faced with fees from Internet access service providers for equal access to end users"), ¶¶ 68–69, ¶ 70.

C. Observed Broadband Rivalry and Trends in Broadband Concentration Do Not Support Speculation that Future Harm Is Likely

If the hypothesized misconduct has not occurred in the past, is there nonetheless reason to believe that it is likely in the future? Has something changed that could support a conclusion that the marketplace dynamic is now altogether different and rampant misconduct is right around the corner? Some point to the "duopoly" market structure of landline broadband in most local markets. But that is nothing new. And, in fact, the observable market conduct suggests that the landline broadband industry is quite rivalrous with each provider competing vigorously to attract and retain customers, producing more robust broadband services at lower prices, high churn rates, and advertising targeted at pointing out competitors' deficiencies. If duopoly did not produce real world manifestations of the harmful incentives and abilities posited in the NPRM in the last 10 years, why would it do so in the next few years? Healthy skepticism of such alarmism is in order, especially since the proposed regulations would extend to wireless broadband, a sector that already contains multiple competitors.

My goal here is not to attempt a comprehensive assessment of broadband competition but to demonstrate two points. First, broadband access providers display clear signs of vigorous competitive rivalry, in both the landline and the wireless segments. Second, with the spread of wireless broadband and all four national carriers upgrading their networks, the trend is towards a larger rather than smaller number of competitors in the provision of broadband access.

1. Landline Broadband Exhibits Vigorous Rivalry

The focus on broadband in the net neutrality debate stems largely from an erroneous perception by some observers that landline (or "wireline") broadband access is a "cozy" and durable duopoly, dominated in each region by the local telephone and cable companies. This view is deficient on two counts. First and most important, as regards the "cozy" duopoly portrayal, it is misguided to claim that duopoly is "just one removed from monopoly." That is true arithmetically, but not in any meaningful economic sense. A duopoly market can exhibit vigorous competition, and such competition certainly exists in landline broadband as explained next. Second, the durable duopoly premise is highly dubious given the real prospects of growing competition from wireless broadband as discussed shortly.

a. Comparative Advertising

Broadband providers advertise heavily their network qualities.[55] Importantly, such advertising is aimed not only, or even primarily, at drawing new customers, but also at persuading rivals' customers to switch or dissuading one's own customers from switching. The distinctive feature is that the advertising is often comparative in nature — a broadband access provider will compare its quality or other features to that of another, often by name. This is telling evidence of competition. If advertising were aimed at attracting brand new customers, we would not expect to see exhortations for customers to "switch" or the naming of particular competitor in one's advertising. Yet we observe a considerable amount of such advertising, signifying attempts to *divert* customers from competitors or prevent such diversion of one's own customers, the hallmark of competitive behavior.

Recent examples of comparative advertising, often quite colorful, include the following:

- Verizon runs ads where a friendly and smart FiOS installer explains the benefits of Verizon service to a dimwitted cable guy.
- Comcast has responded with a "Don't fall for FiOS" campaign consisting of ads showing cable subscribers defending themselves from pushy Verizon installers.[56]
- Verizon countered with an ad where the smart FiOS installer has the dimwitted cable guy admit that his attempts to convince subscribers not to switch to fiber violate truth-in-advertising principles.[57]
- Comcast has run ads featuring an animated family of turtles, the "Slowkys," who subscribe to DSL broadband.[58]

---

[55] The Television Bureau of Advertising reports that Verizon ($63.8 million), Comcast ($44.8 million), and AT&T ($44.6 million) ranked respectively first, third and fourth out of the top 25 TV broadcast advertisers in the second quarter of 2009. Time Warner and DirecTV, other two major broadband access providers, ranked ninth and twelfth ($24.0 million and $21.2 million in advertising spend in 2Q09, respectively). See http://www.tvb.org.

[56] Johnny Diaz, "Comcast, Verizon Duke It Out; Ad Blitz Gets Personal as Firms Spar for Cable Customers," Boston Globe, Sept. 1, 2009.

[57] Verizon had threatened Comcast with legal action alleging its ads were misleading. See Eric Rabe, *Comcast False Advertising*, Verizon PolicyBlog, June 8, 2009. The Verizon "truth in advertising" ad can be seen here: http://www.youtube.com/watch?v=V94qtRatK_4.

[58] To many children's delight, the Slowskys have their own website:

b. Technology Upgrades in Response to Competitors

The pattern of broadband network upgrades in response to competitors in just the second half of 2009 brings out vividly the competitive dynamics in the industry:

- In early July, shortly after Verizon signed a franchise agreement to wire all of New York City by 2014 with FiOS, Time Warner announced that it had begun testing its upgraded NYC broadband network (based on DOCSIS 3.0 technology) with a view to delivering 100Mbps speeds by the end of the year, instead of the previously planned top speed of 20Mbps.[59]

- In mid July, Qwest introduced the next evolution of its high-speed Internet services, doubling its downstream connection speeds to 40 Mbps and offering upstream speeds up to 20 Mbps, targeting areas where Comcast or Cox had started deploying wideband service.[60]

- In mid August, Cox responded to Qwest network upgrades in Arizona by launching PowerBoost, a patented technology that taps into unused network capacity to reach downstream speeds as high as 55 Mbps.[61]

- In early August, Comcast announced that it had sped up deployment of its wideband network (based on DOCSIS 3.0 technology) to reach about 80% of homes in its service areas by the end of 2009, instead of the originally planned 65%.[62]

- In December, AT&T announced the launch of AT&T U-verse High Speed Internet

---

http://www.theslowskys.com/home/.

[59] Karl Bode, *Still Waiting On Time Warner Cable DOCSIS 3.0*, Broadband DSLReports.com, July 1, 2009.

[60] Jeff Baumgartner, "Qwest Attacks Comcast With 40 Mbit/s," *Cable Digital News*, July 20, 2009.

[61] Jeff Baumgartner, "Cox Kicks at Qwest," *Cable Digital News*, Aug. 20, 2009; S. Buckley, "Cox Launches DOCSIS 3.0 Attack on Qwest," *FierceTelecom*, Aug. 21, 2009.

[62] Jeff Baumgartner, "Comcast Speeds Up '09 Wideband Goal," *Cable Digital News*, Aug. 6, 2009. A couple of months earlier Comcast had put "pressure to its DSL- and fiber-fed high speed Internet competition by reducing the price of its Extreme 50 DOCSIS 3.0 service to $99.95 per month when bundled with its video or voice service." See Jeff Baumgartner, "Comcast Trims Wideband Pricing," *Cable Digital News*, June 9, 2009.

Max Turbo, which offers broadband speeds of up to 24 Mbps downstream and up to 3 Mbps upstream.[63]

c. Price Responses to Competitors

Besides network quality, broadband providers frequently tout also their prices as superior to those of competitors. For example, in June 2009, Comcast reduced the monthly charge for its stand-alone wideband service by more than $20 in an attempt to apply "pressure to its DSL- and fiber-fed high speed Internet competition."[64] In August 2009, Cox started offering 50 Mbps downstream and 5 Mbps upstream broadband service for $89.99 per month to "to outgun Qwest, which is launching a VDSL2 service of 40 Mbps downstream and 20 Mbps upstream for an "introductory" price of $109.99 per month when it's bundled with home phone service."[65]

d. Customer Switching

For some time, there was a lingering perception that broadband access was a highly "sticky" service, so that once consumers selected a provider they were largely locked in. This perception is belied by the actual data. The industry displays considerable switching by subscribers, which indicates a competitively fluid landscape with considerable scope for competition.[66]

---

63 AT&T, "AT&T U-verse TV Marks 2 Million Customer Milestone," news release, Dec. 9, 2009.

64 Jeff Baumgartner, "Comcast Trims Wideband Pricing," *Cable Digital News*, June 9, 2009.

65 Jeff Baumgartner, "Cox Kicks at Qwest," *Cable Digital News*, Aug. 20, 2009; S. Buckley, "Cox Launches DOCSIS 3.0 Attack on Qwest," *FierceTelecom*, Aug. 21, 2009.

66 AT&T notes in its comments in this proceeding that industry sources have estimated broadband subscriber churn in the cable sector, for example, at two to three percent per month, implying annual churn rates of 24 to 36 percent. Note that a low churn rate, however, need not reflect lack of competition, e.g., if customers' demands are well matched with their existing providers.

2. Wireless Broadband Is Growing Rapidly

The FCC has long acknowledged the vibrant competition in the wireless industry generally,[67] so it is not worth belaboring the point except to note that rivalry extends to wireless *broadband* offerings. The same indicators of competitive jockeying are present as in landline broadband. For example, consider comparative advertising:

- Verizon Wireless highlights that its fast 3G network has a wider coverage than AT&T 3G network in the familiar commercial "There is a map for that."[68]
- In November 2009, AT&T aired a commercial comparing AT&T and Verizon side by side and saying AT&T has the nation's fastest 3G network.[69] In addition, AT&T touted that simultaneous talking and web surfing was available on its wireless network but not Verizon's.
- In November 2009, Verizon challenged a Sprint ad where Sprint calls itself "America's most dependable 3G network".[70]
- In October 2009, Verizon released an ad listing features that the iPhone lacks, but that are available on Droid, Verizon's new handset using the Android operating system.[71]

---

[67] The first paragraph of the FCC's *Thirteenth Annual Report* to Congress on the state of competition in the Commercial Mobile Radio Services ("CMRS") marketplace (Jan. 16, 2009) states that "U.S. consumers continue to reap significant benefits — including low prices, new technologies, improved service quality, and choice among providers — from competition in the CMRS marketplace, both terrestrial and satellite CMRS. The metrics below indicate that there is effective competition in the CMRS market and demonstrate the increasingly significant role that wireless services play in the lives of American consumers. In particular, these metrics indicate that wireless technology is increasingly being used to provide a range of mobile broadband services." This conclusion echoes what the FCC found in the *Twelfth Report* (¶ 1) and in the *Eleventh Report*, where the "Commission concludes that there is effective competition in the CMRS marketplace." (¶ 2)

[68] The ad first aired in October 2009. See http:// www.msnbc.msn.com/id/34154174/ns/business-us_business/, Nov. 27, 2009.

[69] See http://www.msnbc.msn.com/id/34154174/ns/business-us_business/, Nov. 27, 2009.

[70] See http://www.phonescoop.com/news/item.php?n=5183, Nov. 24, 2009.

[71] See http://www.internetnews.com/mobility/article.php/3844381/Verizons+Droid+Ads+Take+Aim+at+iPhone.htm, Oct. 19, 2009.

Moreover, all four national wireless carriers, as well as some regional ones, are expanding and upgrading their broadband networks.[72] The FCC reports that as of June 2008, users in 58.2% of the US zip codes could choose from *at least three* wireless broadband providers.[73] As of May 2008, T-Mobile, one of the four national wireless carriers, had just begun deploying its commercial 3G network.[74] T-Mobile's 3G network now covers 170 million people in the U.S. and the company plans to cover approximately 200 million people across the U.S.[75] Most U.S. consumers today can choose among *at least four* wireless broadband providers.

Wireless carriers are racing to upgrade their broadband networks beyond 3G.[76] The Commission recognizes the growth of wireless broadband as an access platform to the Internet:

> In the past four years, the number of mobile devices capable of high-speed Internet access grew from approximately 400,000 to more than 59 million by the end of June 2008. 3G networks have enabled speeds comparable to some fixed access networks, offering a robust Internet experience. And in the future, with new 3.5G and 4G networks, some consumers may use mobile wireless devices for all of their Internet access services. (¶ 158, footnotes omitted.)

---

[72] "The four nationwide mobile operators, together with other U.S. mobile providers, have continued to deploy next-generation network technologies over the past year." (*FCC Thirteenth Report*, ¶ 134). The FCC reports that regional mobile operators that have upgraded their networks to support mobile broadband include Alltel, Alaska Communications Systems, and Cellular South (*FCC Thirteenth Report*, ¶ 138).

[73] FCC Industry Analysis and Technology Division Wireline Competition Bureau, *High-Speed Services for Internet Access: Status as of June 30, 2008*, July 2009 ("FCC Broadband Internet Access Report"), Table 16.

[74] T-Mobile, "T-Mobile USA Begins Commercial 3G Network Rollout," news release, May 5, 2008.

[75] T-Mobile, "New BlackBerry Bold 9700 from T-Mobile Delivers 3G Speeds, Wi-Fi Calling, GPS and More," news release, Oct. 21, 2009.

[76] For example: (1) Sprint was the first mobile operator in the country to provide 4G services, launching its WiMAX technology for the first time in Baltimore in September 2008 (http://news.softpedia.com/news/Sprint-039-s-4G-Services-Now-Available-in-Waco-123404.shtml); (2) Verizon is preparing to launch 4G technology in 20 to 30 markets in 2010 (http://blip.tv/file/2174655); (3) in May 2008, AT&T decided to accelerate its ramp up of LTE and placed it in a head-to-head competition with Verizon Wireless. AT&T plans trials of 4G network in 2010, and expects to begin deployment in 2011. (http://www.informationweek.com/news/telecom/business/showArticle.jhtml?articleID=217700714); and (4) in September 2009, T-Mobile hinted at 4G wireless plans using the LTE technology. (http://gigaom.com/2009/09/22/t-mobile-usa-hints-at-4g-wireless-plans/)

Some analysts concur that wireless broadband may pose a competitive threat to landline broadband:

- Much like how cell phones are now replacing landlines, 4G can potentially replace wired broadband lines for many customers with its faster download speeds and upload speeds as well as unlimited data capabilities.[77]
- According to a forecast by OVUM Strategy Analytics and the wireless phone manufacturer Ericsson, the number of mobile wireless broadband users is growing much faster than fixed (landline) broadband users. By 2012, there will be over 1.8 billion broadband Internet users worldwide and more people will be using mobile wireless broadband than landline broadband.[78]
- The performance and capabilities of WiMax and Long Term Evolution technology will only get better over time, and will represent a direct competitive threat to the existing broadband services.[79]

To be sure, some other industry observers doubt that wireless broadband will emerge as a complete substitute, arguing that wireline will always offer much larger bandwidth. However, the following points should be noted when assessing the prospects for substitution.

First, similar skepticism was expressed about wireless voice, that it would never substitute for wireline service. Over time, however, many consumers have dropped their landlines altogether.

Second, in order for two services to be substitutes, their attributes need not be identical. Consumers value multiple attributes, and even if landline facilities always were to retain an advantage in bandwidth, wireless offers the advantage of mobility. Moreover, consumers differ in the relative importance they place on bandwidth versus mobility, so even if some do not deem wireless to be a good substitute, others may. Importantly, for two services to be substitutes —

---

[77] See http://pocketnow.com/tech-news/verizon-ambitious-with-4g-lte-launch-all-markets-at-once, Sept. 25, 2009.

[78] See http://www.explainthatstuff.com/mobilebroadband.html, March 26, 2009.

[79] See http://gigaom.com/2008/03/05/a-little-4g-sibling-rivalry/, March 5, 2008.

and constrain each other's price — it is not necessary that all consumers view them as close substitutes. It suffices that there be enough consumers who are on the margin and willing to switch between the two services.

Third, and highly relevant, in order for wireless to be a substitute for landline broadband from the standpoint of *content providers* seeking to reach consumers it is not necessary that consumers discard their landlines — provided they utilize both, they can be reached through either platform. The notion that a typical consumer only uses a single connection (its residential broadband) to reach the Internet is counterfactual today and likely to be increasingly rare.

I am not suggesting that wireless broadband is a close enough substitute to landline today for purposes, say, of analyzing a merger between two landline providers or two wireless providers. Nor can anyone predict with certainty the degree of future competition between these two platforms. However, the industry is changing rapidly and this proceeding contemplates rules that would affect the industry for years to come. In assessing the wisdom of imposing such rules, it is therefore appropriate to look forward a few years (especially since regulation, once imposed, has a stubborn tendency to stick long beyond its useful life).

Over that horizon, there are reasonable prospects for substantial competition between landline and wireless broadband for accessing the Internet, as the FCC emphasizes, and the proposed rules would apply to both access technologies. In a universe comprised of both landline and wireless broadband, the great majority of consumers today enjoy at least five competing providers.[80] Given the rapidly changing conditions and fluid boundaries between landline and wireless, is it truly wise to contemplate access regulation in an industry that would offer consumers at least five robust competitors?

[80] In localities where the phone company is AT&T or Verizon, that each owns a national wireless provider, there will be three additional national wireless providers and perhaps some regional ones. In localities where a different local phone company provides landline broadband (such as Qwest), the number of independent national wireless broadband providers is typically four rather than three.

IV. CONCLUSIONS

The importance and phenomenal success of the Internet are undisputed. The question before us is how to best sustain this progress. To date, there is virtually no evidence of conduct by broadband providers that would justify the imposition of intrusive regulation on a market that in recent years has been largely unregulated. While the Notice states that the new approach "may offer an appropriately light and flexible" regulatory policy (¶ 108),[81] economic reasoning, common sense and historical experience all predict that such regulation would impose considerable costs. Rather than promoting an open and innovative Internet, they risk ossifying the structure of the Internet.

The arguments for such regulation either are premised on an unsupported assumption of a high degree of enduring market power, or invoke economic theories of pricing behavior (such as two-sided pricing) whose implications are *not* presumptively harmful to consumers or to overall welfare. Nor is it convincing to claim that even if no harm has occurred yet, preemptive regulation is justified because the risk of inaction is so large. Generalized references to future irreversible harm should not suffice to justify intrusive regulation in advance of clear evidence of a problem, especially when similar alarms have consistently been proved wrong. The FCC has demonstrated that it vigilantly monitors the industry and is ready and willing to act promptly when it perceives a problem. This watchful oversight stance has worked well and the wise policy is to maintain this course.

---

[81] "We believe that the proposed nondiscrimination rule, subject to reasonable network management … and our proposal for a separate category of 'managed' or 'specialized' services . . . may offer an appropriately light and flexible [regulatory] policy." (¶ 108)

Appendix 1

Benefits of Contracting Flexibility: Lessons from Railroad Regulation

The Staggers Rail Act of 1980 relaxed much of the traditional common carrier regulation and allowed railroads increased flexibility in routing decisions, what services to offer, and in pricing.[82] Notably, the Act permitted railroads and shippers to negotiate bilateral contracts. The terms and conditions of those contracts vary greatly but generally include minimum or maximum shipment volumes, base rates and escalator clauses, and service options governing a variety of dimensions such as shipment liability, traffic routing, equipment, and guaranteed levels of service.[83]

The majority of traffic shifted to bilateral contracts. The percentage of all rail traffic transported under contracts was approximately 60% in 1991 and grew to 70% by 1997.[84] The inflation-adjusted average rates per ton-mile fell by 49% from 1981 to 2008.[85] And railroads' share of all freight transportation, which had declined steadily prior to the Staggers Act, reversed course and rose from 27% of all ton-miles in 1980 to 38% in 2005.[86] While it is virtually impossible to disentangle precisely how much of these gains are due to contracting flexibility as

---

[82] See, e.g., Federal Railroad Administration, Department of Transportation, policy paper, "Impact of the Staggers Rail Act of 1980," March 23, 2004, http://www.fra.dot.gov/Downloads/Policy/staggers_rail_act_impact.pdf. To be sure, some aspects of deregulation since then have been controversial, such as increased market power that may have resulted from some mergers. But there is broad consensus about the gains from flexibility described next.

[83] Laurence Phillips, "Contractual Relationships in the Deregulated Transportation Marketplace," *Journal of Law and Economics* vol. 34, no. 2 (October 1991): 535–64 (Phillips 1991).

[84] Phillips (1991) and Jerry Ellig, "Railroad Deregulation and Consumer Welfare." *Journal of Regulatory Economics* vol. 21, no. 2 (March 2002): 143–67 (Ellig 2002). For some commodities, such as coal, the share was considerably higher. It is estimated that 62% of coal was transported under contracts in 1986 and the share reached 86% in 1991. Donald Harper and James Johnson, "The Potential Consequences of Deregulation of Transportation Revisited." *Land Economics* vol. 63, no. 2 (May 1987): 137–46, and Phillips (1991).

[85] Association of American Railroads, "A Short History of U.S. Freight Railroads," May 2009, http://www.aar.org/~/media/AAR/BackgroundPapers/Railroad%20History%20%20May%202009.ashx.

[86] Laurits R. Christensen Associates, Inc, *A Study of Competition in the U.S. Freight Railroad Industry and Analysis of Proposals that Might Enhance Competition*, *Revised Final Report*, prepared for The Surface Transportation Board, Nov. 2009, http://www.stb.dot.gov/stb/docs/CompetitionStudy/Volume%201.pdf.

opposed to other changes, the qualitative evidence below suggests that contracting flexibility played a significant role and was a very favorable development for both railroads and shippers.

Various indicators suggest that quality of service improved greatly in dimensions such as speed of service, reliability, and car supply.[87] For example, average transit time fell by 20%, and the standard deviation of transit time fell by even more than 20% — reflecting more predictable delivery times.[88] The benefits to shippers from lower rates and reductions in travel time were estimated at over $12 billion in the first decade after deregulation.[89]

There was also a notable expansion in service options. Negotiated contract rates facilitated more efficient utilization of capacity and the development of services tailored to shippers' specific production and inventory policies (Winston 1998). The improvements in shipping speeds and service reliability are credited with contributing to the widespread use of just-in-time delivery policies that slash inventory costs.[90]

All of these improvements can be traced to the increased flexibility to contract for customized options and corresponding prices.

For example, the "open routing" requirements in the pre-1980 tariffs regime obliged railroads to make available all possible combinations of routings between a particular origin and destination and *constrained the rates on all routes to be the same*.[91] The Staggers Act gave railroads the ability to set route-specific rates in response to demand and costs, including the ability to offer discounts to shippers who agreed to give the railroad the flexibility to route

---

87 Comparing surveys before and after the Act, one study found that approximately 30% of shippers reported improved service and less than 10% reported a decline in *any* of the service quality dimensions. C. M. Grimm and K. G. Smith, "The Impact of Rail Regulatory Reform on Rates, Service Quality, and Management Performance: A Shipper Perspective," *Logistics and Transportation Review* vol. 22, no. 1 (March 1986): 57–68, cited in Ellig (2002). See also Ronald Braeutigam, "Consequences of Regulatory Reform in the American Railroad Industry," *Southern Economic Journal* vol. 59, no. 3 (January 1993): 468–80 (shipper service has generally improved, including reduced transit times).

88 Clifford Winston, "U.S. Industry Adjustment to Economic Deregulation," *Journal of Economic Perspectives* vol. 12, no. 3 (Summer 1998): 89–110 (Winston 1998).

89 Clifford Winston, Thomas Corsi, Curtis Grimm, and Carol Evans, *The Economic Effects of Surface Freight Deregulation* (Washington DC: Brookings Institution Press, 1990).

90 John Meyer, Jose Gomez-Ibanez, William Tye, and Clifford Winston, *Essays in Transportation Economics and Policy: A Handbook in Honor of John R. Meyer* (Washington DC: Brookings Institution Press, 1999).

91 Kent Woodman and Jane Starke, "The Competitive Access Debate: A "Backdoor" Approach to Rate Regulation," *Transportation Law Journal* vol. 16, no. 2 (1988): 263–90.

shipments itself.[92] Railroads and shippers used these newly available price signals to reach mutually improved outcomes. Specifically, they consolidated shipments and directed traffic flows to high-density routes (Ellig 2002). These changes led to reduced travel time, improved reliability, and lower operating costs through economies of density.[93]

Contracts for *long-term* use of rail cars reduced logistical uncertainty. Shippers could count on having access to rail cars when they needed them. Also, railroads were able to better manage the flow of traffic across their networks by knowing the capacity that would be demanded at certain times and on certain routes.

Further improvements in travel speed were enabled by *railroad investments* stimulated by flexible contractual rates permitted only since the Staggers Act. For example, railroads invested in double stack rail cars that provided a larger freight capacity and greater cargo safety than the regular rail cars. A large shipment that would have required two regular car trains may have been transported more economically on a single double stack car train. However, since double stack cars were more expensive than regular cars and the regulation in place prior to the Staggers Act prohibited railroads from passing on these additional costs to shippers, railroads had little incentive to use double stack cars.

Flexible contract pricing also stimulated *investments by shippers*. For example, the widespread use of unit trains was made possible by shipper investments facilitating their use. Unit trains offer a low-cost way for shipping bulk commodities like coal and grain. However, an economical use of unit trains requires shippers to invest in specialized loading equipment and inventory warehouses to concentrate their traffic at particular locations and times. The deregulation permitted railroads to offer the rate reductions necessary to induce shippers to invest in those facilities (Ellig 2002).

There was also remarkable innovation in intermodal traffic.[94] Intermodal traffic tripled from 1980 to 2001 (accounting for about 20% of railroad revenue in 2001).[95] Again, the

---

92 Id.

93 Ellig (2002). Ellig adds that contract rates permitted shippers to obtain faster service by increasing shipment size. For example, an innovation in car design could increase the hauling capacity and reduce transit time, but the car would cost more to purchase. To exploit the innovation, a railroad might want to induce volume by lowering rates for the intended traffic. However, the common carrier regulation prohibited such rate reductions.

94 "Intermodal" refers to traffic traveling on both rail cars and some other means of transportation, such as barges or trucks.

flexibility to set rates was instrumental for this growth. Service reliability and shorter transit times for intermodal trains were achieved by giving intermodal trains priority over those carrying other types of traffic. This required railroads to develop new logistic technologies.[96] When rates were regulated, the incentives to invest in technologies facilitating this prioritized service were weak, but became substantially stronger once rates could be flexibly set to better reflect the costs of those technologies and the opportunity cost of providing the service.[97]

---

[95] Thomas Brown and Anthony Hatch, "The Value of Rail Intermodal to the U.S. Economy," Sept. 2002, http://www.aar.org/pubcommon/documents/govt/brown.pdf.

[96] John C. Spychalski and Evelyn Thomchick, "Drivers of Intermodal Rail Freight Growth in North America," *European Journal of Transport and Infrastructure Research*, vol. 9, no. 1 (March 2009): 63–82.

[97] Clifford Winston, "The Success of the Staggers Rail Act of 1980," Sept. 2005, http://www.aar.org/pubcommon/documents/staggers/Winston_study.pdf.

MARIUS SCHWARTZ

Work: Department of Economics
Georgetown University, ICC 583
37 and O Streets, NW
Washington, DC 20057-1036
tel: (202) 687-6112
e-mail: mariusschwartz@me.com
web page: http://web.me.com/mariusschwartz

Home: 3905 Jocelyn Street, NW
Washington, DC 20015

EDUCATION

University of California, Los Angeles: Ph.D. in Economics, September 1982
University of California, Los Angeles: M.A. in Economics, March 1978
London School of Economics: B.Sc. in Economics (1st Class Honors), August 1976

PROFESSIONAL EXPERIENCE

Georgetown University, Department of Economics

Professor, June 1993–present
Associate Professor, August 1987–May 1993
Assistant Professor, January 1983–July 1987 (part time in fall 1982)

Excellence in Undergraduate Teaching Award, Economics Department, 2001
Director of Graduate Studies: spring 1993-spring 1995

Courses Taught: *Graduate*—Industrial Organization, Microeconomics for executives and policy makers, Macroeconomic Theory I and II, Monetary Policy. *Undergraduate*—Antitrust, Industrial Organization, Mergers & Corporate Control, Microeconomics (Principles, and Intermediate), Topics in Competition and Regulation, International Economics, Macroeconomic Theory

President's Council of Economic Advisers

Senior Staff Economist, June 1995–May 1996 (part-time consultant April & May 1995, June 1996)

Served as the senior economist responsible for antitrust, regulated industries, and other industrial organization matters. Work included: Telecommunications Act of 1996, competition in international satellite services, competition in the electric utility industry, reforming the patent and trademark office, intellectual property rights, international trade disputes, health care.

U.S. Department of Justice, Antitrust Division

Acting Deputy Assistant Attorney General for Economics, January 1999–June 1999

Economics Director of Enforcement, September 1998–April 2000

In these positions, I was responsible for overseeing economic analysis at the Antitrust Division of numerous mergers and non-merger matters in various industries, including:

Mergers & Joint Ventures—Ameritech/SBC, Bell Atlantic/GTE, AT&T/BT, Cargill/Continental, Aetna/Prudential, CBS/Viacom

Monopolization—suit against American Airlines for predatory pricing

Regulatory—Bell entry into long-distance telecommunications services

Outside Expert

UPM-Raflatac/Bemis-MACtac merger, 2003—testified at trial

News Corp-DirecTV partial acquisition, 2003

General Electric/Honeywell merger, 2000-2001

WorldCom/Sprint merger, 2000 (economic expert on the Internet backbone issues)

Bell entry, 1996–1997—DOJ's outside economic expert on Bell entry into long-distance services under section 271 of the Telecommunications Act, and submitted two affidavits to the FCC

Economist, January 1983–May 1995 (part-time), October 1980–December 1982 (full-time).

Expert Testimony: Presented written and oral court testimony in successful challenges of merger and of consent decree

Mergers: Investigated mergers in several industries and helped to design appropriate relief

Business Practices: investigated vertical-restraints (tying, exclusive dealing, resale price maintenance, exclusive territories) and horizontal conduct (collusion and predation)

Legislation, Congressional Matters, Division Reports: Provided input to Antitrust Division's Horizontal Merger Guidelines (1992) and Vertical Restraints Guidelines (1984). Helped draft Division comments on various Congressional legislation and drafted responses to inquiries in several areas, including price discrimination and dealer termination.

Cooperation with Foreign Competition Authorities: Subjects included predatory pricing, price discrimination, distribution systems, sole import distributorships, joint R&D, and the interaction between trade and competition policies

Other Professional Experience

Review of Network Economics, Editorial Board Member (2009-present)

International Competition Network, Merger Working Group, Academic Co-Chair (2009-present)

Bates White LLC, senior Academic Affiliate (2007-present)

New Zealand Commerce Commission: Consultant (2005-6)

Consultant in private antitrust and regulatory matters—details and references available on request

OECD: Lecturer in Seminar on Vertical Restraints for competition officials from Czech Republic, Hungary, Poland, and Slovakia in Cracow, Poland, November 20-22, 1995

ILADES: Participated in designing and teaching a short course in industrial organization to policy makers and executives in Santiago, Chile, June 1994

Pew Freedom Fellows Program: Taught short course in microeconomics to twenty Fellows from transition economies, annually, January 1993–1999. (Fellows hold middle-level or upper-level positions in government and private business.)

Center for Economic Development, Slovakia: Academic Advisory Board

World Bank: Consultant

Abt Associates/USAID: Advised Government of Zimbabwe in Harare on formulating antitrust law, summer 1993 (consultant to Abt, work funded by USAID's Implementing Policy Change Project)

LANGUAGES

French, Hebrew, Romanian (speak and read Hebrew fluently; proficient in French and Romanian)

HONORS

U.S. Department of Justice, Antitrust Division: Special Achievement Awards
Brookings Institution: Research Fellow, 1979-1980
University of California, Los Angeles: Earhart Fellowship, 1977-1978
University of California, Los Angeles: Regents Fellowship, 1976-1977
London School of Economics: Premchand Prize in Monetary Economics, 1976

PUBLICATIONS

Refereed Journals

"Reforming Telecom Regulation: An Essay Review of Nuechterlein and Weiser's *Digital Crossroads*," *Review of Network Economics*, 7 (2008): 415-447. <http://www.rnejournal.com/artman2/uploads/1/schwartz_RNE_sept08.pdf>

"Compatibility Incentives of a Large Network Facing Multiple Rivals," (with David Malueg), *Journal of Industrial Economics*, 54 (2006): 527-567. <http://ssrn.com/abstract=876084>

"The No Surcharge Rule and Card User Rebates: Vertical Control by a Payment Network," (with Daniel Vincent), *Review of Network Economics*, 5 (2006): 72-102. <http://www.rnejournal.com>

"Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity, and Uniformity: Reply," (with R. Preston McAfee), *American Economic Review,* 94 (2004): 802–803.

"International Telecom Settlements: Gaming Incentives, Carrier Alliances, and Pareto-Superior Reform," (with David Malueg), *Journal of Industrial Economics*, 49 (2001): 335-377.

"The Economic Logic for Conditioning Bell Entry into Long Distance on the Prior Opening of Local Markets," *Journal of Regulatory Economics (Practitioners' Section),* 18, no. 3 (2000): 247-288.

"A Quality-Signaling Rationale for Aftermarket Tying," (with Gregory J. Werden), *Antitrust Law Journal,* 64 (1996): 387-404.

"The Non-Existence of Pairwise-Proof Equilibrium," (with R. Preston McAfee), *Economics Letters*, 49 (1995): 251-259

"Equity as a Call Option on Assets: Some Tests for Failed Banks," (with Behzad Diba, Chia-Hsiang Guo), *Economics Letters*, 48 (1995): 389-397.

"Parallel Imports, Demand Dispersion, and International Price Discrimination," (with David Malueg), *Journal of International Economics,* 37 (1994): 167-195.

"Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity, and Uniformity," (with R. Preston McAfee), *American Economic Review,* 84 (1994): 210–230.

"Preemptive Investment, Toehold Entry, and the Mimicking Principle," (with David Malueg), *RAND Journal of Economics,* 22 (1991): 1–13.

"Patent Protection through Discriminatory Exclusion of Imports," *Review of Industrial Organization*, 6, no. 3 (1991): 231–246.

"Third–Degree Price Discrimination and Output: Generalizing a Welfare Result," *American Economic Review,* 80 (1990): 1259-1262.
Reprinted in *Readings in Microeconomic Theory*, Manfredi La Manna Ed., Dryden Press, 1997.

"Investments in Oligopoly: Welfare Effects and Tests for Predation," *Oxford Economic Papers,* 41 (1989): 698-719.

"Entry Deterrence Externalities and Relative Firm Size," (with Michael Baumann), *International Journal of Industrial Organization,* 6 (1988): 181-197.

"The Competitive Effects of Vertical Agreements: Comment," *American Economic Review,* 77 (1987): 1063-1068.

"The Nature and Scope of Contestability Theory," *Oxford Economic Papers,* 38 Supplement (1986): 37-57.
This issue of the journal was published in parallel as *Strategic Behavior and Industrial Competition,* Morris et al. Eds., Oxford University Press, 1986.

"The Perverse Effects of the Robinson-Patman Act," *Antitrust Bulletin,* 31 (1986): 733-757.

"Divisionalization and Entry Deterrence," (with Earl Thompson), *Quarterly Journal of Economics*, 101 (1986): 307-321.

"*Illinois Brick* and the Deterrence of Antitrust Violations," (with Gregory J. Werden) *Hastings Law Journal,* 35 (1984): 629–668.

"Contestable Markets: An Uprising in the Theory of Industry Structure: Comment," (with Robert Reynolds), *American Economic Review,* 73 (1983): 488-490.

Book Chapters, Monographs, and Other Publications

"Introduction to a Special Issue on Network Neutrality," (with Philip Weiser), *Review of Network Economics*, 8, issue 1 (2009): 1-12.

"Quantity 'Forcing' and Exclusion: Bundled Discounts and Nonlinear Pricing," (with Daniel Vincent), in W.D. Collins, Ed., *Issues in Competition Law and Policy*, American Bar Association Antitrust Section, 2008. <http://www.wam.umd.edu/~dvincent/abstracts.htm#qfbundle.pdf>

"Monopsony Concerns in Merger Review," (with Susan M. Davies), American Bar Association Antitrust Section, Clayton Act Committee Newsletter, vol. II, no. 1, Winter 2002.

"Conditioning the Bells' Entry Into Long Distance: Anticompetitive Regulation or Promoting Competition?," in Giuliano Amato and Laraine L. Laudati, Eds., *The Anticompetitive Impact of Regulation*, Edward Elgar, 2001.

"Competitor Cooperation and Exclusion in Communications Industries," in H. Davis and R. Dick, Eds., *E-Commerce Antitrust & Trade Practices: Practical Strategies for Doing Business on the Web*, Practising Law Institute, New York, 2001.

Discussant Comments on papers by Andrew Joskow, by Daniel Rubinfeld, and by Janusz Ordover and Margaret Guerin-Calvert, *Review of Industrial Organization*, Vol. 16 (March 2000): 219-223.

Discussant Comments on papers by Patrick Rey and Ralph Winter and by Robert Anderson et al., in Robert D. Anderson and Nancy T. Gallini, Eds., *Competition Policy and Intellectual Property Rights in the Knowledge-Based Economy*, Calgary: University of Calgary Press, 1998.

"Telecommunications Reform in the United States: Promises and Pitfalls," in Paul J.J. Welfens and George Yarrow, Eds., *Telecommunications and Energy in Systemic Transformation*, Heidelberg and New York: Springer, 1997.

"Protecting Intellectual Property by Excluding Infringing Imports: An Economist's View of Section 337 of the U.S. Tariff Act," *Patent World,* Issue 25 (September 1990): 29-35.

Review Essay of: Jean Tirole, The Theory of Industrial Organization, MIT Press, 1988. *Managerial and Decision Economics,* Vol. 11 (May 1990): 131-139.

Book Review of: J. Stiglitz and F. Mathewson eds., New Developments in the Analysis of Market Structure, MIT Press, 1988. *Journal of Economic Literature,* Vol. 36 (March 1988): 133-135.

"Vertical Restraints," published in German by *Forschungsinstitut fur Wirtschaftsverfassung und Wettbewer* by E.V. Koln, Heft 5, 1984.

DISCUSSION PAPERS AND WORK IN PROGRESS

"Product Innovation Incentives: Monopoly vs. Competition," (with Yongmin Chen), Georgetown University, Department of Economics Working Paper 09-02, April 2009. <http://econ.georgetown.edu/research/33243.html>

"Interconnection Incentives of a Large Network Facing Multiple Rivals," (with David Malueg), Georgetown University, Department of Economics Working Paper 03-01, January 2003. <http://econ.georgetown.edu/research/33243.html>

"Same Price, Cash or Card: Vertical Control in Payment Networks" (with Daniel Vincent), Georgetown University, Department of Economics Working Paper 02-01, February 2002. <http://econ.georgetown.edu/research/33243.html>

"Interconnection Incentives of a Large Network," (with David Malueg), Georgetown University, Department of Economics Working Paper 01-05, revised January 2002. <http://econ.georgetown.edu/research/33243.html>

"Exclusive Dealing, Product Differentiation, and Rent Extraction," in progress (with Serge Moresi and Francis O'Toole).

"Option Values of Deposit Insurance and Market Values of Net Worth: Some Evidence for U.S. Banks," mimeo, December, 1992 (with Behzad Diba and Chia-Hsiang Guo).

"Do Sunk Costs Discourage or Encourage Collusion?" U.S. Department of Justice, Antitrust Division, EPO Discussion Paper 85-10 (September 1985).

"Signaling Equilibria Based on Sensible Beliefs: Limit Pricing Under Incomplete Information," (with Maxim Engers), U.S. Department of Justice, Antitrust Division, EPO Discussion Paper 84-4 (May 1984).

ANTITRUST AND REGULATORY FILINGS & PRESENTATIONS

"Comments on Potential Revisions to the Horizontal Merger Guidelines," (with George Rozanski), submitted to FTC/DOJ, November 9, 2009. <http://www.ftc.gov/os/comments/horizontalmergerguides/index.shtm>

US Magnesium, LLC v. Union Pacific Railroad Company, STB Docket No. 42114, 2009: filed on behalf of Union Pacific an Opening Statement (August 24, 2009), Reply (September 22, 2009), and Rebuttal (October 22, 2009).

"Hanging Up on *Carterfone*: The Economic Case Against Access Regulation in Mobile Wireless," (with Federico Mini), filed by AT&T in Response to Skype Petition, FCC, RM-11261, May 2007. <http://ssrn.com/abstract=984240>

Declaration of Marius Schwartz for AT&T/BellSouth in FCC, WC Docket 06-74, June 2006.

Reply Declaration of Marius Schwartz for SBC/AT&T in FCC, WC Docket 05-65, May 2005. <http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6517601199>

Declaration of Marius Schwartz for SBC/AT&T in FCC, WC Docket 05-65, February 2005. <http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6517309104>

"Should Antitrust Assess Buyer Market Power Differently than Seller Market Power?" presented at DOJ/FTC Workshop on Merger Enforcement, Washington DC, February 2004. <http://www.ftc.gov/bc/mergerenforce/presentations/040217schwartz.pdf>

"The National Television Ownership Cap and Localism," paper submitted with Comments of NAB and NASA to FCC in *2002 Biennial Regulatory Review - Review of the Commission's Broadcast Ownership Rules and Other Rules*, FCC 02-249, Notice of Proposed Rulemaking (rel. Sep. 23, 2002), January 2, 2003 (with Daniel R. Vincent).

"Are Spectrum Limits Needed to Preserve Competition?" paper submitted on behalf of CTIA to FCC in *2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services,* WT Docket No. 01-14, Notice of Proposed Rulemaking (rel. Jan. 23, 2001), April 13, 2001 (with John Gale).

"The Appropriateness of Nondiscriminatory Access Regulation for Interactive Television," paper submitted on behalf of NCTA to FCC in *Nondiscrimination in the Distribution of Interactive Television Services Over Cable,* CS Docket No. 01-7, Notice of Inquiry (rel. Jan. 18, 2001), March 19, 2001 (with John Gale).

"Buyer Power Concerns and the *Aetna-Prudential* Merger," Address presented at 5th Annual Health Care Antitrust Forum, Northwestern University School of Law, October 20, 1999, posted on web site of Antitrust Division, U.S. Department of Justice. <http://www.usdoj.gov/atr/public/speeches/3924.htm>

"Intelsat Restructuring and Comsat's Non-Dominance: Reply to Dr. Owen and Professor Waverman," paper filed on behalf of Comsat Corporation with the FCC*, In the Matter of Comsat Corporation*

Petition for Forbearance from Dominant Carrier Regulation and for Reclassification As a Non-Dominant Carrier, ("Comsat's Forbearance Petition") File No. 60-SAT-ISP-97, March 1998.

"Competition in International Satellite Services: Wither INTELSAT Restructuring?" paper filed on behalf of Comsat with the FCC in Comsat's Forbearance Petition, November 1997.

"Competitive Concerns with Gaming of the International Settlements Process under Asymmetric Liberalization of International Telecommunications and Above-Cost Settlement Rates," Affidavit submitted on behalf of AT&T to FCC, in proceedings on *Rules and Policies on Foreign Participation in the U.S. Telecommunications Market*, IB 97-142, November 18, 1997.

"The 'Open Local Market Standard' for Authorizing BOC InterLATA Entry: Reply to BOC Criticisms," Supplemental Affidavit submitted on behalf of U.S. DOJ to FCC, with DOJ's evaluation of following BOC applications for 271 approval: BellSouth in South Carolina, November 4, 1997 and in Louisiana, December 10, 1997. <www.usdoj.gov/atr/statements/1281.htm>.

"Competitive Implications of Bell Operating Company Entry into Long-Distance Telecommunications Services," Affidavit submitted on behalf of U.S. Department of Justice (DOJ) to FCC, with DOJ's evaluation of following BOC applications for 271 approval: SBC in Oklahoma, May 16, 1997; Ameritech in Michigan, June 25, 1997; and BellSouth in South Carolina, November 4, 1997 and in Louisiana, December 10, 1997. <www.usdoj.gov/atr/statements/Affiwp60.htm>

"Towards Competition in International Satellite Services: Rethinking the Role of INTELSAT," paper distributed at OECD Ad Hoc Meeting of Experts on Competition in Satellite Services, Paris, June 1995 (with Joseph E. Stiglitz and Eric Wolff).

"Competitive Markets in Generation: Economic Theory and Public Policy," presented at conference on "Electric Utility Restructuring: Whither Competition?" organized by International Association for Energy Economics Los Angeles Chapter, and Micronomics Inc., Los Angeles, May 1995.

OTHER SCHOLARLY ACTIVITIES

Seminars Presented

Auburn University
Bellcore
Bureau of Competition Policy, Industry Canada
California State University, Hayward
Center for Strategic and International Studies
Columbia University
ENSAE, Paris
Federal Reserve Bank of Philadelphia
Georgetown University
George Washington University
U.S. International Trade Commission
Johns Hopkins University
New York University – Economics Department
New York University – Stern School of Business
Pennsylvania State University
Simon Fraser University
Tel Aviv University Law School
Tulane University
University of Alberta
University of British Columbia
University of Calgary

University of California, Davis
University of California, Los Angeles
University of Colorado, Boulder
University of Illinois
University of Maryland
University of Montreal
University of Pennsylvania
University of Toronto
University of Virginia
U.S. Department of Justice
U.S. Federal Communications Commission
U.S. Federal Trade Commission

Conferences: Speaker, Discussant, or Panelist

- FTC/DOJ, Horizontal Merger Guidelines Review Project, First Workshop, Washington, DC, December 2009
- Phoenix Center for Advanced Legal & Economic Public Policy Studies, Ninth Annual U.S. Telecoms Symposium, Washington, DC, December 2009
- FCC, Broadband Competition Workshop, Washington, DC, October 2009
- Telecommunications Policy Research Conference, Washington, DC, September 2009
- Bates White, Sixth Annual Antitrust Conference, Washington, DC, June 2009
- American Bar Association, Panel Discussion on "The Google/Yahoo! Agreement and Its Implications for Future Antitrust Enforcement in Online Advertising," Washington, DC, January 2009
- The Interdisciplinary Centre for Competition Law and Policy and Crowell & Moring LLP Annual Conference 2008, "Trends and Developments in Global Competition Law," Brussels, May 2008
- Georgetown University Center for Business and Public Policy, "Spectrum Policy: From its Foundations to its Future," Washington, DC, April 2008
- Bates White, Fourth Annual Antitrust Conference, Washington, DC, June 2007
- International Industrial Organization Conference, Savannah, GA, April 2007
- Georgetown University Center for Business and Public Policy, "What Economics Does and Does Not Tell Us about Net Neutrality," Washington, DC, March 2007
- FTC, Broadband Connectivity Competition Policy Workshop, Washington, DC, February 2007
- George Mason University School of Law, "Stepping Stones or Stumbling Blocks: Lessons from the Telecom Wars," Arlington, VA, September 2006
- Institut d'Economie Industrielle, "Competition Policy in Two-Sided Markets," Toulouse, France, June/July 2006
- Bates White, Third Annual Antitrust Conference, Washington, DC, June 2006
- Federal Reserve Bank of New York, "Antitrust Activity in Card-Based Payment Systems: Causes and Consequences," New York, NY, September 2005
- Institut d'Economie Industrielle, "The Economics of Electronic Communication Markets," Toulouse, France, October 2004
- DOJ/FTC, Merger Enforcement Workshop, Washington, DC, February 2004
- Cosmos' Club, 125th Anniversary Symposium, "The Changing Nature of Business 1878-2003, Washington, DC, December 2004
- DOJ/FTC, Hearings on Health Care and Competition Law and Policy, Washington, DC, April 2003
- International Industrial Organization Conference, Boston, MA, April 2003
- Georgetown University McDonough School of Business, "Integration, Investment and Innovation: Future Directions for the Telecommunications Industry," Washington, DC, February 2003
- University of Colorado School of Law, "The Regulation of Information Platforms," Boulder, CO, January 2002
- Phoenix Center for Advanced Legal & Economic Public Policy Studies, U.S. Telecoms Symposium, Washington, DC, July 2001
- Practising Law Institute, "Antitrust and Trade Practices Issues in Cyberspace," New York, NY, March 2001
- Telecommunications Policy Research Conference, Washington, DC, September 2000

- Schwab Capital Markets LP, Washington Research Group, "Telecom, Internet and Ecommerce Conference," Washington, DC, September 2000
- AEI-Brookings Joint Center for Regulatory Studies and Centre for European Policy Studies, semi-annual meetings, "Experiences with Telecommunications Deregulation," Washington, DC, April 2000
- University of Colorado School of Law, "Telecommunications After Bell Entry," Boulder, CO, April 2000
- American Bar Association Section of Antitrust Law, 48th Annual Antitrust Spring Meeting, Washington, DC, April 2000
- Institute of the Americas, "Telecom-IT Americas '99 Conference," La Jolla, CA, November 1999
- Northwestern University School of Law, 5th Annual Health Care Antitrust Forum, Chicago, IL, October 1999
- OECD, "Regulatory Reform in Japan, Mexico, the Netherlands and the United States," Paris, France, March 1999
- Federal Communications Bar Association Competition Committee, Symposium, Washington DC, January 1999
- Conference on Current Topics in Merger and Antitrust Enforcement, Charles River Associates, Washington DC, December 1998
- Robert Schuman Centre of the European University Institute, Conference on Anticompetitive Regulation, Florence, Italy, September 1999
- American Bar Association Section of Antitrust Law, 47th Annual Antitrust Spring Meeting, Washington, DC, April 1999
- Telecommunications Policy Research Conference, Washington, DC, September 1997
- Canadian Bureau of Competition, Telecommunications seminar series, Ottawa, Canada, September 1997
- The World Bank, Competition Policy Workshop, Washington, DC, June 1997
- Federal Communications Commission, Economics of Interconnection Forum, Washington DC, May 1996
- Canadian Bureau of Competition, Authors' Symposium on Competition Policy and Intellectual Property Rights, Aylmer, Quebec, Canada, May 1996
- Electric Generation Association, Annual Meetings, West Palm Beach, FL, April 1996
- Illinois State University and the Institute of Government and Public Affairs, University of Illinois-Urbana, "Wheeling & Dealing: Opportunities and Challenges in the New Electric Industry," Chicago, April 1996
- OECD, "New Social and Economic Approaches to a Multimedia World," Symposium, Tokyo, Japan, March 1996
- Center for Economic Development, "Telecommunications and Energy Regulation in Transition Economies," Bratislava, Slovakia, October 1995
- International Association for Energy Economics Los Angeles Chapter, and Micronomics Inc., "Electric Utility Restructuring: Whither Competition?" Los Angeles, CA, May 1995
- Canadian Bureau of Competition, "New Learning on Barriers to Entry in Competition Policy," Ottawa, Canada, March 1995
- Southeastern Economic Theory Meetings, Charlottesville, VA, October 1994
- EARIE Conference, Tel Aviv, Israel, September 1993
- Midwest International Economics Meetings, Pittsburgh, PA, October 1992
- Latin American Econometric Society, Mexico City, Mexico, September 1992
- Carleton University, Conference on Industrial Organization, Ottawa, Canada, July 1991
- SUNY at Stony Brook, Workshop on Strategic and Dynamic Aspects of International Trade, Stony Brook, NY, July 1991
- AEI Conference on "Innovation, Intellectual Property and World Competition," Washington, DC, September 1990
- EARIE Conference, Lisbon, Portugal, September 1990
- Conference on International Trade and Technology, Brussels and London, November 1989
- EARIE Conference, Budapest, Hungary, August 1989
- Dundee University, Conference on Strategy and Market Structure, Dundee, Scotland, August 1988
- Stanford University Graduate School of Business, Conference on Firm Ownership and Competition, Palo Alto, CA, Business, June 1987
- EARIE Conference, Berlin, Germany, August 1986

- AEA Annual Meetings, Dallas, TX, December 1984

Referee for Professional Journals

American Economic Review
Canadian Journal of Economics
Economica
Economic Journal
Economics Letters
European Economic Review
European Journal of Political Economy
International Economic Review
International Journal of Industrial Organization
Journal of Business
Journal of Business Economics
Journal of Economic Dynamics and Control
Journal of Economic Education
Journal of Economic Theory
Journal of Economics and Management Strategy
Journal of Industrial Economics
Journal of International Economics
Journal of Law & Economics
Journal of Political Economy
Managerial and Decision Economics
Quarterly Journal of Economics
Quarterly Review of Economics and Business
RAND Journal of Economics
Review of Industrial Organization
Review of International Economics
Scandinavian Journal of Economics
Southern Economic Journal

Outside Evaluator—Research Proposals and Tenure & Promotion Cases

Duke University
INSEAD
National Science Foundation
Northwestern University School of Law
Small Business Administration
Texas A&M University
University of Calgary
University of California at Los Angeles
University of Colorado, Boulder
University of Michigan
University of Virginia

MARIUS SCHWARTZ

Work: Department of Economics
Georgetown University, ICC 583
37 and O Streets, NW
Washington, DC 20057-1036
tel: (202) 687-6112
e-mail: mariusschwartz@me.com
web page: http://web.me.com/mariusschwartz

Home: 3905 Jocelyn Street, NW
Washington, DC 20015

EDUCATION

University of California, Los Angeles: Ph.D. in Economics, September 1982
University of California, Los Angeles: M.A. in Economics, March 1978
London School of Economics: B.Sc. in Economics (1st Class Honors), August 1976

PROFESSIONAL EXPERIENCE

Georgetown University, Department of Economics

Professor, June 1993–present
Associate Professor, August 1987–May 1993
Assistant Professor, January 1983–July 1987 (part time in fall 1982)

Excellence in Undergraduate Teaching Award, Economics Department, 2001
Director of Graduate Studies: spring 1993-spring 1995

Courses Taught: *Graduate*—Industrial Organization, Microeconomics for executives and policy makers, Macroeconomic Theory I and II, Monetary Policy. *Undergraduate*—Antitrust, Industrial Organization, Mergers & Corporate Control, Microeconomics (Principles, and Intermediate), Topics in Competition and Regulation, International Economics, Macroeconomic Theory

President's Council of Economic Advisers

Senior Staff Economist, June 1995–May 1996 (part-time consultant April & May 1995, June 1996)

Served as the senior economist responsible for antitrust, regulated industries, and other industrial organization matters. Work included: Telecommunications Act of 1996, competition in international satellite services, competition in the electric utility industry, reforming the patent and trademark office, intellectual property rights, international trade disputes, health care.

U.S. Department of Justice, Antitrust Division

Acting Deputy Assistant Attorney General for Economics, January 1999–June 1999

Economics Director of Enforcement, September 1998–April 2000

In these positions, I was responsible for overseeing economic analysis at the Antitrust Division of numerous mergers and non-merger matters in various industries, including:

Mergers & Joint Ventures—Ameritech/SBC, Bell Atlantic/GTE, AT&T/BT, Cargill/Continental, Aetna/Prudential, CBS/Viacom

Monopolization—suit against American Airlines for predatory pricing

Regulatory—Bell entry into long-distance telecommunications services

Outside Expert

UPM-Raflatac/Bemis-MACtac merger, 2003—testified at trial

News Corp-DirecTV partial acquisition, 2003

General Electric/Honeywell merger, 2000-2001

WorldCom/Sprint merger, 2000 (economic expert on the Internet backbone issues)

Bell entry, 1996–1997—DOJ's outside economic expert on Bell entry into long-distance services under section 271 of the Telecommunications Act, and submitted two affidavits to the FCC

Economist, January 1983–May 1995 (part-time), October 1980–December 1982 (full-time).

Expert Testimony: Presented written and oral court testimony in successful challenges of merger and of consent decree

Mergers: Investigated mergers in several industries and helped to design appropriate relief

Business Practices: investigated vertical-restraints (tying, exclusive dealing, resale price maintenance, exclusive territories) and horizontal conduct (collusion and predation)

Legislation, Congressional Matters, Division Reports: Provided input to Antitrust Division's Horizontal Merger Guidelines (1992) and Vertical Restraints Guidelines (1984). Helped draft Division comments on various Congressional legislation and drafted responses to inquiries in several areas, including price discrimination and dealer termination.

Cooperation with Foreign Competition Authorities: Subjects included predatory pricing, price discrimination, distribution systems, sole import distributorships, joint R&D, and the interaction between trade and competition policies

Other Professional Experience

Review of Network Economics, Editorial Board Member (2009-present)

International Competition Network, Merger Working Group, Academic Co-Chair (2009-present)

Bates White LLC, senior Academic Affiliate (2007-present)

New Zealand Commerce Commission: Consultant (2005-6)

Consultant in private antitrust and regulatory matters—details and references available on request

OECD: Lecturer in Seminar on Vertical Restraints for competition officials from Czech Republic, Hungary, Poland, and Slovakia in Cracow, Poland, November 20-22, 1995

ILADES: Participated in designing and teaching a short course in industrial organization to policy makers and executives in Santiago, Chile, June 1994

Pew Freedom Fellows Program: Taught short course in microeconomics to twenty Fellows from transition economies, annually, January 1993–1999. (Fellows hold middle-level or upper-level positions in government and private business.)

Center for Economic Development, Slovakia: Academic Advisory Board

World Bank: Consultant

Abt Associates/USAID: Advised Government of Zimbabwe in Harare on formulating antitrust law, summer 1993 (consultant to Abt, work funded by USAID's Implementing Policy Change Project)

LANGUAGES

French, Hebrew, Romanian (speak and read Hebrew fluently; proficient in French and Romanian)

HONORS

U.S. Department of Justice, Antitrust Division: Special Achievement Awards
Brookings Institution: Research Fellow, 1979-1980
University of California, Los Angeles: Earhart Fellowship, 1977-1978
University of California, Los Angeles: Regents Fellowship, 1976-1977
London School of Economics: Premchand Prize in Monetary Economics, 1976

PUBLICATIONS

Refereed Journals

"Reforming Telecom Regulation: An Essay Review of Nuechterlein and Weiser's *Digital Crossroads*," *Review of Network Economics*, 7 (2008): 415-447. <http://www.rnejournal.com/artman2/uploads/1/schwartz_RNE_sept08.pdf>

"Compatibility Incentives of a Large Network Facing Multiple Rivals," (with David Malueg), *Journal of Industrial Economics*, 54 (2006): 527-567. <http://ssrn.com/abstract=876084>

"The No Surcharge Rule and Card User Rebates: Vertical Control by a Payment Network," (with Daniel Vincent), *Review of Network Economics*, 5 (2006): 72-102. <http://www.rnejournal.com>

"Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity, and Uniformity: Reply," (with R. Preston McAfee), *American Economic Review,* 94 (2004): 802–803.

"International Telecom Settlements: Gaming Incentives, Carrier Alliances, and Pareto-Superior Reform," (with David Malueg), *Journal of Industrial Economics*, 49 (2001): 335-377.

"The Economic Logic for Conditioning Bell Entry into Long Distance on the Prior Opening of Local Markets," *Journal of Regulatory Economics (Practitioners' Section),* 18, no. 3 (2000): 247-288.

"A Quality-Signaling Rationale for Aftermarket Tying," (with Gregory J. Werden), *Antitrust Law Journal,* 64 (1996): 387-404.

"The Non-Existence of Pairwise-Proof Equilibrium," (with R. Preston McAfee), *Economics Letters*, 49 (1995): 251-259

"Equity as a Call Option on Assets: Some Tests for Failed Banks," (with Behzad Diba, Chia-Hsiang Guo), *Economics Letters*, 48 (1995): 389-397.

"Parallel Imports, Demand Dispersion, and International Price Discrimination," (with David Malueg), *Journal of International Economics,* 37 (1994): 167-195.

"Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity, and Uniformity," (with R. Preston McAfee), *American Economic Review,* 84 (1994): 210–230.

"Preemptive Investment, Toehold Entry, and the Mimicking Principle," (with David Malueg), *RAND Journal of Economics,* 22 (1991): 1–13.

"Patent Protection through Discriminatory Exclusion of Imports," *Review of Industrial Organization*, 6, no. 3 (1991): 231–246.

"Third–Degree Price Discrimination and Output: Generalizing a Welfare Result," *American Economic Review,* 80 (1990): 1259-1262.
Reprinted in *Readings in Microeconomic Theory*, Manfredi La Manna Ed., Dryden Press, 1997.

"Investments in Oligopoly: Welfare Effects and Tests for Predation," *Oxford Economic Papers,* 41 (1989): 698-719.

"Entry Deterrence Externalities and Relative Firm Size," (with Michael Baumann), *International Journal of Industrial Organization,* 6 (1988): 181-197.

"The Competitive Effects of Vertical Agreements: Comment," *American Economic Review,* 77 (1987): 1063-1068.

"The Nature and Scope of Contestability Theory," *Oxford Economic Papers,* 38 Supplement (1986): 37-57.
This issue of the journal was published in parallel as *Strategic Behavior and Industrial Competition,* Morris et al. Eds., Oxford University Press, 1986.

"The Perverse Effects of the Robinson-Patman Act," *Antitrust Bulletin,* 31 (1986): 733-757.

"Divisionalization and Entry Deterrence," (with Earl Thompson), *Quarterly Journal of Economics*, 101 (1986): 307-321.

"*Illinois Brick* and the Deterrence of Antitrust Violations," (with Gregory J. Werden) *Hastings Law Journal,* 35 (1984): 629–668.

"Contestable Markets: An Uprising in the Theory of Industry Structure: Comment," (with Robert Reynolds), *American Economic Review,* 73 (1983): 488-490.

Book Chapters, Monographs, and Other Publications

"Introduction to a Special Issue on Network Neutrality," (with Philip Weiser), *Review of Network Economics*, 8, issue 1 (2009): 1-12.

"Quantity 'Forcing' and Exclusion: Bundled Discounts and Nonlinear Pricing," (with Daniel Vincent), in W.D. Collins, Ed., *Issues in Competition Law and Policy*, American Bar Association Antitrust Section, 2008. <http://www.wam.umd.edu/~dvincent/abstracts.htm#qfbundle.pdf>

"Monopsony Concerns in Merger Review," (with Susan M. Davies), American Bar Association Antitrust Section, Clayton Act Committee Newsletter, vol. II, no. 1, Winter 2002.

"Conditioning the Bells' Entry Into Long Distance: Anticompetitive Regulation or Promoting Competition?," in Giuliano Amato and Laraine L. Laudati, Eds., *The Anticompetitive Impact of Regulation*, Edward Elgar, 2001.

"Competitor Cooperation and Exclusion in Communications Industries," in H. Davis and R. Dick, Eds., *E-Commerce Antitrust & Trade Practices: Practical Strategies for Doing Business on the Web*, Practising Law Institute, New York, 2001.

Discussant Comments on papers by Andrew Joskow, by Daniel Rubinfeld, and by Janusz Ordover and Margaret Guerin-Calvert, *Review of Industrial Organization*, Vol. 16 (March 2000): 219-223.

Discussant Comments on papers by Patrick Rey and Ralph Winter and by Robert Anderson et al., in Robert D. Anderson and Nancy T. Gallini, Eds., *Competition Policy and Intellectual Property Rights in the Knowledge-Based Economy*, Calgary: University of Calgary Press, 1998.

"Telecommunications Reform in the United States: Promises and Pitfalls," in Paul J.J. Welfens and George Yarrow, Eds., *Telecommunications and Energy in Systemic Transformation*, Heidelberg and New York: Springer, 1997.

"Protecting Intellectual Property by Excluding Infringing Imports: An Economist's View of Section 337 of the U.S. Tariff Act," *Patent World,* Issue 25 (September 1990): 29-35.

Review Essay of: Jean Tirole, The Theory of Industrial Organization, MIT Press, 1988. *Managerial and Decision Economics,* Vol. 11 (May 1990): 131-139.

Book Review of: J. Stiglitz and F. Mathewson eds., New Developments in the Analysis of Market Structure, MIT Press, 1988. *Journal of Economic Literature,* Vol. 36 (March 1988): 133-135.

"Vertical Restraints," published in German by *Forschungsinstitut fur Wirtschaftsverfassung und Wettbewer* by E.V. Koln, Heft 5, 1984.

DISCUSSION PAPERS AND WORK IN PROGRESS

"Product Innovation Incentives: Monopoly vs. Competition," (with Yongmin Chen), Georgetown University, Department of Economics Working Paper 09-02, April 2009. <http://econ.georgetown.edu/research/33243.html>

"Interconnection Incentives of a Large Network Facing Multiple Rivals," (with David Malueg), Georgetown University, Department of Economics Working Paper 03-01, January 2003. <http://econ.georgetown.edu/research/33243.html>

"Same Price, Cash or Card: Vertical Control in Payment Networks" (with Daniel Vincent), Georgetown University, Department of Economics Working Paper 02-01, February 2002. <http://econ.georgetown.edu/research/33243.html>

"Interconnection Incentives of a Large Network," (with David Malueg), Georgetown University, Department of Economics Working Paper 01-05, revised January 2002. <http://econ.georgetown.edu/research/33243.html>

"Exclusive Dealing, Product Differentiation, and Rent Extraction," in progress (with Serge Moresi and Francis O'Toole).

"Option Values of Deposit Insurance and Market Values of Net Worth: Some Evidence for U.S. Banks," mimeo, December, 1992 (with Behzad Diba and Chia-Hsiang Guo).

"Do Sunk Costs Discourage or Encourage Collusion?" U.S. Department of Justice, Antitrust Division, EPO Discussion Paper 85-10 (September 1985).

"Signaling Equilibria Based on Sensible Beliefs: Limit Pricing Under Incomplete Information," (with Maxim Engers), U.S. Department of Justice, Antitrust Division, EPO Discussion Paper 84-4 (May 1984).

ANTITRUST AND REGULATORY FILINGS & PRESENTATIONS

"Comments on Potential Revisions to the Horizontal Merger Guidelines," (with George Rozanski), submitted to FTC/DOJ, November 9, 2009. <http://www.ftc.gov/os/comments/horizontalmergerguides/index.shtm>

US Magnesium, LLC v. Union Pacific Railroad Company, STB Docket No. 42114, 2009: filed on behalf of Union Pacific an Opening Statement (August 24, 2009), Reply (September 22, 2009), and Rebuttal (October 22, 2009).

"Hanging Up on *Carterfone*: The Economic Case Against Access Regulation in Mobile Wireless," (with Federico Mini), filed by AT&T in Response to Skype Petition, FCC, RM-11261, May 2007. <http://ssrn.com/abstract=984240>

Declaration of Marius Schwartz for AT&T/BellSouth in FCC, WC Docket 06-74, June 2006.

Reply Declaration of Marius Schwartz for SBC/AT&T in FCC, WC Docket 05-65, May 2005. <http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6517601199>

Declaration of Marius Schwartz for SBC/AT&T in FCC, WC Docket 05-65, February 2005. <http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6517309104>

"Should Antitrust Assess Buyer Market Power Differently than Seller Market Power?" presented at DOJ/FTC Workshop on Merger Enforcement, Washington DC, February 2004. <http://www.ftc.gov/bc/mergerenforce/presentations/040217schwartz.pdf>

"The National Television Ownership Cap and Localism," paper submitted with Comments of NAB and NASA to FCC in *2002 Biennial Regulatory Review - Review of the Commission's Broadcast Ownership Rules and Other Rules*, FCC 02-249, Notice of Proposed Rulemaking (rel. Sep. 23, 2002), January 2, 2003 (with Daniel R. Vincent).

"Are Spectrum Limits Needed to Preserve Competition?" paper submitted on behalf of CTIA to FCC in *2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services,* WT Docket No. 01-14, Notice of Proposed Rulemaking (rel. Jan. 23, 2001), April 13, 2001 (with John Gale).

"The Appropriateness of Nondiscriminatory Access Regulation for Interactive Television," paper submitted on behalf of NCTA to FCC in *Nondiscrimination in the Distribution of Interactive Television Services Over Cable,* CS Docket No. 01-7, Notice of Inquiry (rel. Jan. 18, 2001), March 19, 2001 (with John Gale).

"Buyer Power Concerns and the *Aetna-Prudential* Merger," Address presented at 5th Annual Health Care Antitrust Forum, Northwestern University School of Law, October 20, 1999, posted on web site of Antitrust Division, U.S. Department of Justice. <http://www.usdoj.gov/atr/public/speeches/3924.htm>

"Intelsat Restructuring and Comsat's Non-Dominance: Reply to Dr. Owen and Professor Waverman," paper filed on behalf of Comsat Corporation with the FCC*, In the Matter of Comsat Corporation*

Petition for Forbearance from Dominant Carrier Regulation and for Reclassification As a Non-Dominant Carrier, ("Comsat's Forbearance Petition") File No. 60-SAT-ISP-97, March 1998.

"Competition in International Satellite Services: Wither INTELSAT Restructuring?" paper filed on behalf of Comsat with the FCC in Comsat's Forbearance Petition, November 1997.

"Competitive Concerns with Gaming of the International Settlements Process under Asymmetric Liberalization of International Telecommunications and Above-Cost Settlement Rates," Affidavit submitted on behalf of AT&T to FCC, in proceedings on *Rules and Policies on Foreign Participation in the U.S. Telecommunications Market*, IB 97-142, November 18, 1997.

"The 'Open Local Market Standard' for Authorizing BOC InterLATA Entry: Reply to BOC Criticisms," Supplemental Affidavit submitted on behalf of U.S. DOJ to FCC, with DOJ's evaluation of following BOC applications for 271 approval: BellSouth in South Carolina, November 4, 1997 and in Louisiana, December 10, 1997. <www.usdoj.gov/atr/statements/1281.htm>.

"Competitive Implications of Bell Operating Company Entry into Long-Distance Telecommunications Services," Affidavit submitted on behalf of U.S. Department of Justice (DOJ) to FCC, with DOJ's evaluation of following BOC applications for 271 approval: SBC in Oklahoma, May 16, 1997; Ameritech in Michigan, June 25, 1997; and BellSouth in South Carolina, November 4, 1997 and in Louisiana, December 10, 1997. <www.usdoj.gov/atr/statements/Affiwp60.htm>

"Towards Competition in International Satellite Services: Rethinking the Role of INTELSAT," paper distributed at OECD Ad Hoc Meeting of Experts on Competition in Satellite Services, Paris, June 1995 (with Joseph E. Stiglitz and Eric Wolff).

"Competitive Markets in Generation: Economic Theory and Public Policy," presented at conference on "Electric Utility Restructuring: Whither Competition?" organized by International Association for Energy Economics Los Angeles Chapter, and Micronomics Inc., Los Angeles, May 1995.

OTHER SCHOLARLY ACTIVITIES

Seminars Presented

Auburn University
Bellcore
Bureau of Competition Policy, Industry Canada
California State University, Hayward
Center for Strategic and International Studies
Columbia University
ENSAE, Paris
Federal Reserve Bank of Philadelphia
Georgetown University
George Washington University
U.S. International Trade Commission
Johns Hopkins University
New York University – Economics Department
New York University – Stern School of Business
Pennsylvania State University
Simon Fraser University
Tel Aviv University Law School
Tulane University
University of Alberta
University of British Columbia
University of Calgary

University of California, Davis
University of California, Los Angeles
University of Colorado, Boulder
University of Illinois
University of Maryland
University of Montreal
University of Pennsylvania
University of Toronto
University of Virginia
U.S. Department of Justice
U.S. Federal Communications Commission
U.S. Federal Trade Commission

Conferences: Speaker, Discussant, or Panelist

- FTC/DOJ, Horizontal Merger Guidelines Review Project, First Workshop, Washington, DC, December 2009
- Phoenix Center for Advanced Legal & Economic Public Policy Studies, Ninth Annual U.S. Telecoms Symposium, Washington, DC, December 2009
- FCC, Broadband Competition Workshop, Washington, DC, October 2009
- Telecommunications Policy Research Conference, Washington, DC, September 2009
- Bates White, Sixth Annual Antitrust Conference, Washington, DC, June 2009
- American Bar Association, Panel Discussion on "The Google/Yahoo! Agreement and Its Implications for Future Antitrust Enforcement in Online Advertising," Washington, DC, January 2009
- The Interdisciplinary Centre for Competition Law and Policy and Crowell & Moring LLP Annual Conference 2008, "Trends and Developments in Global Competition Law," Brussels, May 2008
- Georgetown University Center for Business and Public Policy, "Spectrum Policy: From its Foundations to its Future," Washington, DC, April 2008
- Bates White, Fourth Annual Antitrust Conference, Washington, DC, June 2007
- International Industrial Organization Conference, Savannah, GA, April 2007
- Georgetown University Center for Business and Public Policy, "What Economics Does and Does Not Tell Us about Net Neutrality," Washington, DC, March 2007
- FTC, Broadband Connectivity Competition Policy Workshop, Washington, DC, February 2007
- George Mason University School of Law, "Stepping Stones or Stumbling Blocks: Lessons from the Telecom Wars," Arlington, VA, September 2006
- Institut d'Economie Industrielle, "Competition Policy in Two-Sided Markets," Toulouse, France, June/July 2006
- Bates White, Third Annual Antitrust Conference, Washington, DC, June 2006
- Federal Reserve Bank of New York, "Antitrust Activity in Card-Based Payment Systems: Causes and Consequences," New York, NY, September 2005
- Institut d'Economie Industrielle, "The Economics of Electronic Communication Markets," Toulouse, France, October 2004
- DOJ/FTC, Merger Enforcement Workshop, Washington, DC, February 2004
- Cosmos' Club, 125th Anniversary Symposium, "The Changing Nature of Business 1878-2003, Washington, DC, December 2004
- DOJ/FTC, Hearings on Health Care and Competition Law and Policy, Washington, DC, April 2003
- International Industrial Organization Conference, Boston, MA, April 2003
- Georgetown University McDonough School of Business, "Integration, Investment and Innovation: Future Directions for the Telecommunications Industry," Washington, DC, February 2003
- University of Colorado School of Law, "The Regulation of Information Platforms," Boulder, CO, January 2002
- Phoenix Center for Advanced Legal & Economic Public Policy Studies, U.S. Telecoms Symposium, Washington, DC, July 2001
- Practising Law Institute, "Antitrust and Trade Practices Issues in Cyberspace," New York, NY, March 2001
- Telecommunications Policy Research Conference, Washington, DC, September 2000

- Schwab Capital Markets LP, Washington Research Group, "Telecom, Internet and Ecommerce Conference," Washington, DC, September 2000
- AEI-Brookings Joint Center for Regulatory Studies and Centre for European Policy Studies, semi-annual meetings, "Experiences with Telecommunications Deregulation," Washington, DC, April 2000
- University of Colorado School of Law, "Telecommunications After Bell Entry," Boulder, CO, April 2000
- American Bar Association Section of Antitrust Law, 48th Annual Antitrust Spring Meeting, Washington, DC, April 2000
- Institute of the Americas, "Telecom-IT Americas '99 Conference," La Jolla, CA, November 1999
- Northwestern University School of Law, 5th Annual Health Care Antitrust Forum, Chicago, IL, October 1999
- OECD, "Regulatory Reform in Japan, Mexico, the Netherlands and the United States," Paris, France, March 1999
- Federal Communications Bar Association Competition Committee, Symposium, Washington DC, January 1999
- Conference on Current Topics in Merger and Antitrust Enforcement, Charles River Associates, Washington DC, December 1998
- Robert Schuman Centre of the European University Institute, Conference on Anticompetitive Regulation, Florence, Italy, September 1999
- American Bar Association Section of Antitrust Law, 47th Annual Antitrust Spring Meeting, Washington, DC, April 1999
- Telecommunications Policy Research Conference, Washington, DC, September 1997
- Canadian Bureau of Competition, Telecommunications seminar series, Ottawa, Canada, September 1997
- The World Bank, Competition Policy Workshop, Washington, DC, June 1997
- Federal Communications Commission, Economics of Interconnection Forum, Washington DC, May 1996
- Canadian Bureau of Competition, Authors' Symposium on Competition Policy and Intellectual Property Rights, Aylmer, Quebec, Canada, May 1996
- Electric Generation Association, Annual Meetings, West Palm Beach, FL, April 1996
- Illinois State University and the Institute of Government and Public Affairs, University of Illinois-Urbana, "Wheeling & Dealing: Opportunities and Challenges in the New Electric Industry," Chicago, April 1996
- OECD, "New Social and Economic Approaches to a Multimedia World," Symposium, Tokyo, Japan, March 1996
- Center for Economic Development, "Telecommunications and Energy Regulation in Transition Economies," Bratislava, Slovakia, October 1995
- International Association for Energy Economics Los Angeles Chapter, and Micronomics Inc., "Electric Utility Restructuring: Whither Competition?" Los Angeles, CA, May 1995
- Canadian Bureau of Competition, "New Learning on Barriers to Entry in Competition Policy," Ottawa, Canada, March 1995
- Southeastern Economic Theory Meetings, Charlottesville, VA, October 1994
- EARIE Conference, Tel Aviv, Israel, September 1993
- Midwest International Economics Meetings, Pittsburgh, PA, October 1992
- Latin American Econometric Society, Mexico City, Mexico, September 1992
- Carleton University, Conference on Industrial Organization, Ottawa, Canada, July 1991
- SUNY at Stony Brook, Workshop on Strategic and Dynamic Aspects of International Trade, Stony Brook, NY, July 1991
- AEI Conference on "Innovation, Intellectual Property and World Competition," Washington, DC, September 1990
- EARIE Conference, Lisbon, Portugal, September 1990
- Conference on International Trade and Technology, Brussels and London, November 1989
- EARIE Conference, Budapest, Hungary, August 1989
- Dundee University, Conference on Strategy and Market Structure, Dundee, Scotland, August 1988
- Stanford University Graduate School of Business, Conference on Firm Ownership and Competition, Palo Alto, CA, Business, June 1987
- EARIE Conference, Berlin, Germany, August 1986

- AEA Annual Meetings, Dallas, TX, December 1984

Referee for Professional Journals

American Economic Review
Canadian Journal of Economics
Economica
Economic Journal
Economics Letters
European Economic Review
European Journal of Political Economy
International Economic Review
International Journal of Industrial Organization
Journal of Business
Journal of Business Economics
Journal of Economic Dynamics and Control
Journal of Economic Education
Journal of Economic Theory
Journal of Economics and Management Strategy
Journal of Industrial Economics
Journal of International Economics
Journal of Law & Economics
Journal of Political Economy
Managerial and Decision Economics
Quarterly Journal of Economics
Quarterly Review of Economics and Business
RAND Journal of Economics
Review of Industrial Organization
Review of International Economics
Scandinavian Journal of Economics
Southern Economic Journal

Outside Evaluator—Research Proposals and Tenure & Promotion Cases

Duke University
INSEAD
National Science Foundation
Northwestern University School of Law
Small Business Administration
Texas A&M University
University of Calgary
University of California at Los Angeles
University of Colorado, Boulder
University of Michigan
University of Virginia