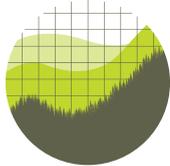


# The Value of Open:

## *An Update on Net Neutrality*



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This policy brief updates Policy Integrity’s analysis of the Federal Communication Commission’s proposed net neutrality rules<sup>1</sup> in light of the on-going discussion over the Commission’s role. *Free to Invest: The Economic Benefits of Preserving Net Neutrality* (Policy Integrity Report No. 4, Jan. 2010) examined the fundamental tradeoffs inherent in Internet policy and concluded that the FCC’s proposed rules would best facilitate the growth of the Internet.

Over the course of 2010, the debate about net neutrality has raged on. Not only is there vehement dispute over the economic consequences of the rules, but the FCC’s legal authority to issue those rules has also been questioned after a recent decision by a federal appeals court.<sup>2</sup> Last month Google and Verizon agreed to a “Legislative Framework Proposal” that provides some support for net neutrality but also creates several large exceptions.<sup>3</sup>

This policy brief confirms and expands on the original analysis in *Free to Invest* and offers additional ideas on how to best ensure that federal rules maximize the value of the Internet, finding:

- Voices in the debate over net neutrality often overlook a basic yet critical point: net neutrality is already effectively in place and has worked very well to facilitate the growth of the Internet.
- Market failures inherent in the Internet market create a need for the government to act. While these underlying market failures—network effects and positive externalities—cause underinvestment in the Internet, these failures can be addressed in part through net neutrality rules.
- The FCC’s policy should preserve net neutrality as the default scenario, with narrow exceptions that will promote and facilitate sound investment. These exceptions should be well-delineated to encourage the continuing growth of our current open Internet architecture. Further, there is no clear economic rationale to provide an exception for wireless services.

Instituting policies to ensure that the open nature of the Internet endures, and continues to provide billions of dollars in value, will deliver undeniably important benefits to American consumers. The net neutrality framework proposed by the FCC is an important step toward this goal.

# Understanding the Status Quo

Net Neutrality Has Helped Create  
the Internet We Have Today

Much of the debate over whether the government should enact net neutrality rules seems to leave out, or obscure, a fundamental yet critical point: our current Internet is already effectively “net neutral.” It is this neutrality that has allowed for the Internet industry to explode over the last two decades. Not only do the market players sometimes miss this point, but lawmakers do so as well.<sup>4</sup>

Most internet service providers (“ISPs”) do not currently engage in the prioritization or price discrimination tactics that would be restricted under the proposed rules and have not publically announced any plans to change. The question therefore is not whether to impose network neutrality on the Internet; rather, the issue is *whether ISPs should be allowed to eliminate it*. ISPs profit from selling access to the Internet. They sell to content sites, as well as consumers, and have no public plans to change their models. Nevertheless, ISPs have strongly objected to the FCC’s proposal to codify the current framework of net neutrality rules.

Currently, websites pay ISPs for access to the Internet. This is generic access that allows websites to upload content that anyone using the Internet can see. Without net neutrality, ISPs would be allowed to engage in pricing practices that charge content providers extra fees in order to access users. Under this scenario, a company like the *New York Times* could be forced to pay a company like Verizon to reach Verizon’s Internet subscribers. While large content providers, like the *Times*, might be able to pay that fee, smaller content providers might lack the financial wherewithal to do so. Such fees would also likely deter would-be content providers from launching new sites, and inhibit the ability of current providers to enhance existing sites. This will in turn affect the competitiveness of American firms on the Internet, as smaller upstarts get sidelined by the better capitalized incumbents.

Usually a government does not need to issue new rules to preserve a status quo. However, in the case of the Internet, two recent developments threaten to fundamentally alter the existing landscape, making intervention necessary and timely. First, technologies allowing ISPs to price discriminate have been created and put into use. For example, Deep Packet Inspection (DPI) technology has become increasingly sophisticated over the last decade. DPI and similar technologies allow ISPs to distinguish between Internet traffic on the basis of its data content, as well as the location where it originated. Once traffic is identified, it can be prioritized in a manner that was not possible before—for example, by creating a fast lane and a slow lane for certain content.<sup>5</sup> Given ISPs’ financial incentives to discriminate between content providers,<sup>6</sup> and significant advancements in their ability to do so, agency action is needed.

This action should be prompt. ISPs have already attempted to use these technologies to discriminate based on content. It was DPI that enabled Comcast, in 2007, to identify peer-to-peer uploads in order to terminate them.<sup>7</sup> Although the FCC subsequently found that Comcast’s actions violated a 2005 FCC Policy Statement,<sup>8</sup> Comcast successfully challenged that determination in court. In a

recent decision, the federal appeals court for the District of Columbia sided with Comcast, on the ground that under the FCC's current regulatory framework, it lacks authority to prevent ISPs from engaging in this type of discrimination.<sup>9</sup>

The court's decision is another reason the FCC should act now. First, the Commission should clarify and reaffirm its authority to ban activity like that engaged in by Comcast.<sup>10</sup> Then, the FCC must exercise that authority by establishing a regime that protects an open Internet.

Furthermore, since net neutrality is the status quo, changing over to a non-neutral system would create a large amount of uncertainty—a significant cost. There are greater uncertainties involved in switching over to an untested price discrimination regime than there are in preserving our current net neutrality regime. The Internet market in the United States has always functioned under net neutrality; switching to a new system would generate a host of unknowns, including whether ISPs could price discriminate perfectly, whether ISPs would invest their additional revenue in infrastructure, and whether eliminating net neutrality would increase competition in broadband. Naturally, all estimates of the benefits or costs to consumers of transitioning to a non-neutral architecture are entirely speculative.<sup>11</sup> Given current understanding, changing the status quo would beget much more uncertainty than maintaining it.<sup>12</sup>

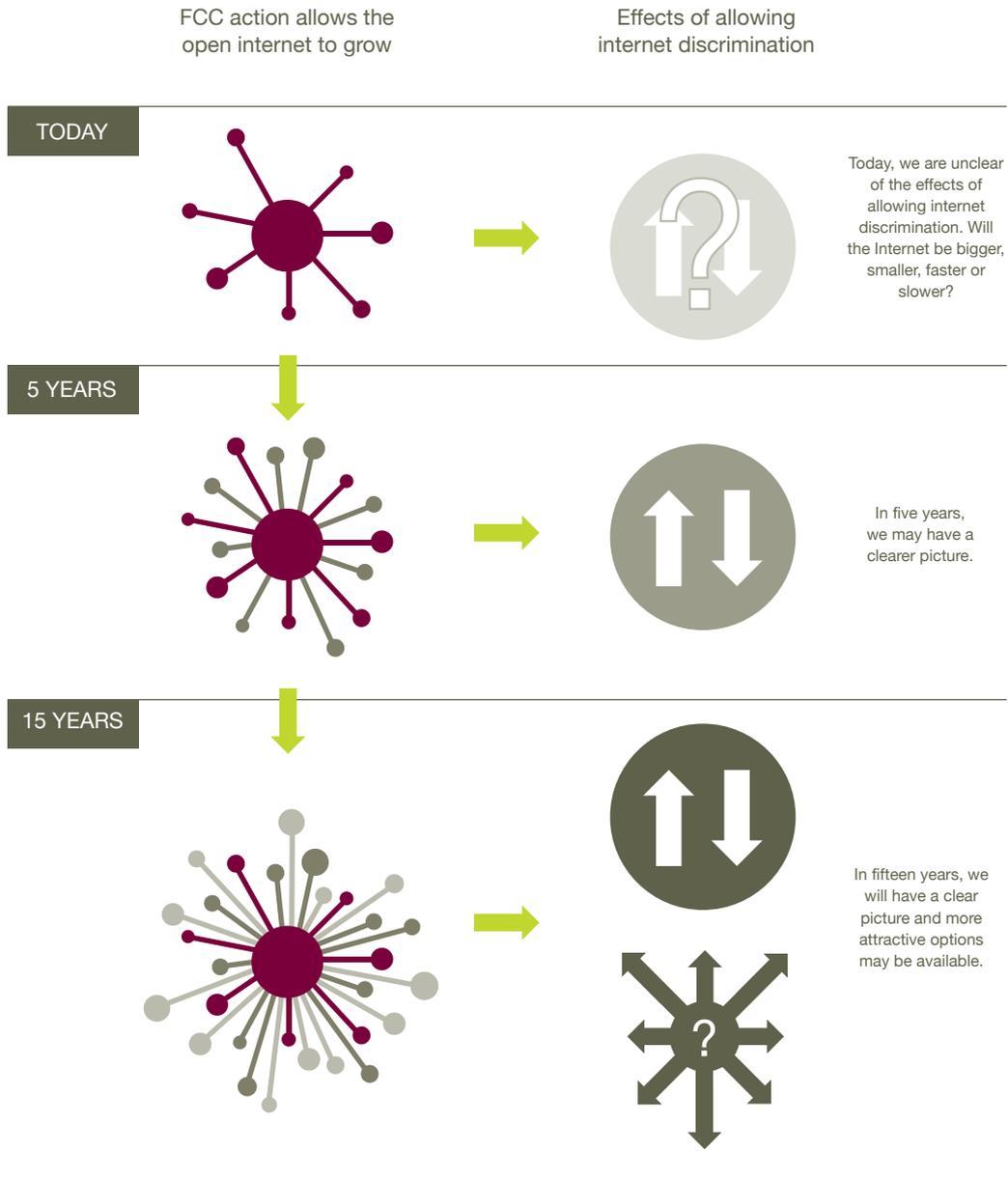
The scarcity of data compounds the uncertainty about the effects of public policy on the Internet. Because this technology is relatively new, little is known about how market participants would respond to shifting incentives. In the future, as familiarity with the Internet grows, and differences at the international level offer insight into the effects of Internet policies, more information about the potential consequences of a non-neutral regime will be available, reducing some of the uncertainty currently associated with shifting from the status quo.

A decision to do nothing now may also irreversibly alter the nature of the Internet. Once ISPs begin instituting non-neutral pricing and making decisions in an environment that lacks net neutrality protections, it will be extremely difficult, if not impossible, for a host of practical and political reasons, for an administrative entity like the FCC, or a legislative body like Congress, to institute new rules. Without action on the part of the FCC now, the American public may become locked into a non-neutral Internet, with all of its attendant risks.

At the same time, a decision to preserve net neutrality allows for more flexibility in the future. The technology that gives ISPs the power to discriminate against content providers will continue to exist, regardless of the policies implemented by the FCC. As more becomes known about the Internet ecosystem, the option to revise net neutrality rules will still be available.

Where a decision is made under conditions of uncertainty and irreversibility, there may be value in preserving the status quo while more information is gathered, and policy options expand. This is the case here. Even if there could be some upsides to a non-neutral Internet architecture, significant potential downsides have also been identified. Both these upsides and downsides are extremely unpredictable. Given the vast value that the Internet contributes to American society, a cautious approach that allows for information gathering and reduced uncertainty should be preferred over a sudden departure from the status quo.

**Figure 1: What's the hurry? Discrimination and Irreversibility**



Given the advent of the technological ability to price discriminate, in an environment that lacks rules against content discrimination, ISPs may begin manipulating Internet traffic in ways that would make some content less accessible. Through their opposition to net neutrality, telecommunications companies have shown some desire to embark on such practices. Deviating from net neutrality could fundamentally change how the Internet works. The consequences of such a change are impossible to predict with certainty, yet they could also be large, undesirable, and effectively irrevocable.

# Market Failures

## Key Problems Lead to Underinvestment

The Internet is characterized by two primary market imperfections—network effects and information externalities—that net neutrality rules would help address. Economists generally agree that markets function best when they are left alone; however, these failures in the Internet market justify particularized government intervention.

The Internet is a peculiar market. It consists of two complementary goods: network access provided by Internet service providers (ISPs) and Internet content provided by a wide array of applications, developers, and websites. Internet content provides significant value to end-users in the form of information. Internet transmission services make accessing this information possible. Such markets, in which a central platform provider (in this case, an ISP) can charge two different user groups (content providers and end-users), each of whom provides benefits to the other, are known as “two-sided markets.”<sup>13</sup>

When considering the impacts of net neutrality, or any action that affects the Internet, a decisionmaker must recognize the complementary nature of the goods that comprise the Internet. Policies that would reduce content without enhancing access, or reduce access without improving content, will reduce the overall value of the network. Optimally, both should be enhanced together.

Against the backdrop of a two-sided market, the Internet exhibits two failures. First, the Internet market exhibits a “network effect.” A network effect occurs in markets where the value of a good increases in proportion to the number of people who use it.<sup>14</sup> The Internet provides a classic example of a network effect: the more people who use it, the greater the benefits it can offer all users. Thus, if a content provider, or would-be content provider, is forced to exit or avoid the Internet due to an ISP’s pricing practices, it affects all users—not just the customers of that particular ISP.<sup>15</sup>

Second, the Internet market is characterized by an information externality, meaning information can be distributed and shared, for free, without its value diminishing, but also without compensation being directed back to the information’s creator. This information externality arises from the public good nature of information. Information is considered a public good in economic terms because it is both non-rival (one person’s consumption of that information does not impact any other person’s consumption) and non-excludable (it is impossible to effectively exclude individuals from learning a piece of information).<sup>16</sup> Public goods tend to be subject to the free rider problem:<sup>17</sup> consumers know that even if they do not pay for information, they will nonetheless be able to consume it after someone else purchases and shares it with them. As a result of the free rider phenomenon, public goods, such as information, tend to be underprovided by free markets. In the case of the Internet, information that first appears online can be disseminated far beyond the scope of an individual ISP’s network, and far outside the bounds of the Internet market. As a consequence, content providers have less incentive to invest in creating quality

content than would be optimal.

These two externalities prevent the Internet market from reaching an economically efficient outcome. In the presence of such externalities, market agents cannot attain these outcomes without some sort of external intervention.<sup>18</sup> If the government can address this problem cost-effectively, it should do so.

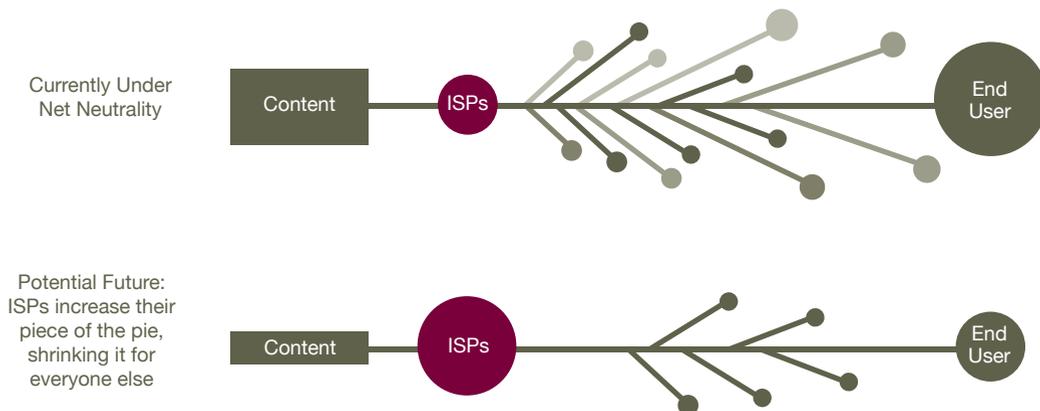
In the context of positive externalities, like those implicated by the public good nature of information, the classic way for the government to correct this problem is by providing support for the good that is subject to market failure.<sup>19</sup> This support can correct the market's failure to provide the good at the socially optimal level by encouraging additional output.

Economic theory suggests that the government could subsidize either side of a two-sided market to correct the market failure.<sup>20</sup> The question of what form this subsidy should take is, however, uniquely complicated in the Internet context. The Internet is not just one good. Theory does not dictate whether the best way to correct the failure would be through government support for additional content, better content, additional Internet access, better Internet service, or some sort of combination. The answer to this question requires significant data to estimate the relative impact of each of these components on the market. Since this data does not currently exist, economic theory does not, in itself, offer clear guidance on how to best correct the market failure.

Yet as a practical matter, supporting Internet content could be extremely difficult. Previous federal efforts to support content, such as the Corporation for Public Broadcasting and the National Endowment for the Arts, have been relatively small-scale. But large-scale efforts would be needed to correct for externalities in the Internet market. Furthermore, while these programs have been arguably successful at promoting development in the targeted sector, the results have been controversial and continued funding is not assured. These same difficulties would likely extend to any effort to subsidize Internet content.<sup>21</sup>

Network neutrality also supports content, but in a far less cumbersome way than a direct

**Figure 2: Shrinking the size of the pie**



government subsidy. By protecting the revenues generated by Internet content providers, and preventing ISPs from extracting rents from applications developers and websites, net neutrality increases the incentives of content developers to invest. By contrast, eliminating net neutrality will allow ISPs to charge content developers fees for access to end-users. ISPs could charge content providers different prices for access, depending on an individual content provider's ability and willingness-to-pay. ISPs could, and likely would, set prices to extract maximum profits, capturing profits that would normally be realized by content providers. In other words, the profits that content providers previously earned from their products would be redirected to ISPs. In the absence of a market failure, this redirection of resources would simply be a wealth transfer, with no net impact on society. However, given the twin network and information externalities in the Internet market, this wealth transfer moves resources away from an easy-to-support side of the market (infrastructure) to a hard-to-support side of the market (content), heightening the difficulty of correcting the externalities affecting the Internet market.

The new ability of ISPs to extract rents from content providers would significantly alter market players' incentives to invest in the Internet market. Because ISPs would be able to extract rents from content providers, ISPs' returns from existing infrastructure would increase. It is possible that some ISPs may use a portion of this extra income to invest in new infrastructure; they could also charge their subscribers lower prices. Or they could distribute this additional revenue to shareholders. However, content providers would have higher costs, in the form of fees paid to various ISPs to access end-users across ISPs' private networks; as a result, content providers' returns on investment in Internet content would decrease.

A combination of economic theory and practical concerns suggest that the optimal way for government to address the market failure endemic in the Internet is through the twin approach of 1) network neutrality rules that support content by protecting an open Internet; and 2) government programs that directly support Internet infrastructure. While there is no unequivocal justification, grounded in pure economic theory, for directly subsidizing either side of a two-sided market, there is an important practical consideration at play as government funding for infrastructure is easier to implement than programs to support content. Whereas supporting Internet infrastructure is straightforward,<sup>22</sup> efforts to support content are likely to be quite difficult. For these reasons, a network neutrality regulatory regime, coupled with a government program to expand broadband access, are a strong set of complementary tools that would increase the long-term value of the Internet.

# Exceptions to the Rule

## Improving Flexibility Without Undercutting Openness

Any good rule has reasonable exceptions. Rules governing an Internet regime should give private actors the correct incentives to continue to invest in the Internet, while also retaining flexibility to ensure that incentives to create new technologies remain appropriately high. The FCC's rules enshrining net neutrality on the entire network, while allowing exceptions for ISPs to regulate Internet traffic as part of "reasonable network management" and for sufficiently unique Internet content ("managed services") create this important flexibility.

The Google-Verizon proposal offers a commitment to net neutrality, with limited enforcement authority for the FCC and exceptions for "reasonable network management" and "additional or differentiated services." These exceptions are appropriate and should be construed to forward the goal of maximizing the surplus generated by the Internet market. The current "best effort network" has allowed a wide variety of technologies to proliferate. The FCC should allow narrow, well-delineated exceptions to network neutrality policies if it believes that certain valuable technologies could not succeed on the best effort network. The exception must be narrow; otherwise, if every technology or service were defined as a "managed service," the exception would not only gut the purpose of network neutrality rules, but would also reduce incentives to invest in the open network.

One of the more controversial aspects of the Google-Verizon plan, and a key difference from the FCC's proposed rules, is an exemption for the wireless industry. It is unclear whether there is a sufficiently compelling economic reason why wireless and wired Internet should operate under different management rules. This differentiation may also create perverse incentives. Maintaining net neutrality on wired networks while eliminating it on wireless networks changes the incentives for investment in both platforms. This may lead to negative outcomes. In such a world, Internet content providers would prefer to deliver their content over neutral wired networks, and thus they would invest more of their resources in preparing content specifically for that type of network. ISPs, on the other hand, would find it more attractive to invest in wireless networks, where they could extract additional revenue from content providers. Because the Internet includes both content and infrastructure, changing the relative investment incentives risks creating two disparate networks (wired and wireless), neither of which would be as valuable to consumers as would be a single network. Enshrining net neutrality as law for both wired and wireless networks would prevent this fragmentation and encourage both content providers and ISPs to invest in the Internet marketplace, regardless of the type of network on which they run.

Although the wireless industry is currently growing more rapidly than the wired industry (Fig. 3), this growth differential does not suggest that neutrality rules should treat wireless differently. Both wired and wireless Internet face capacity constraints and they both benefit from the existence of the other. Both also need new content to attract consumers to join them. The best way to address these issues is to create network neutrality rules that will incentivize content developers to produce

wireless as well as wired content. The rapid growth of wireless under the existing neutrality regime suggests that there is little need to further incentivize ISPs to invest more in infrastructure, especially when doing so would reduce returns for content providers.<sup>23</sup>

There is a second key difference between the FCC's proposed rules and the Google-Verizon proposal: they offer different defaults. The Google-Verizon proposal would allow ISPs free reign to manage traffic unless or until the FCC receives a complaint.<sup>24</sup> This default puts the burden of proof on end-users or content-providers to show that an ISP has violated net neutrality in an actionable manner. The FCC's proposed rules, on the other hand, place the burden of proof on ISPs: if ISPs choose to discriminate, they must prove that their actions fit within an exception.

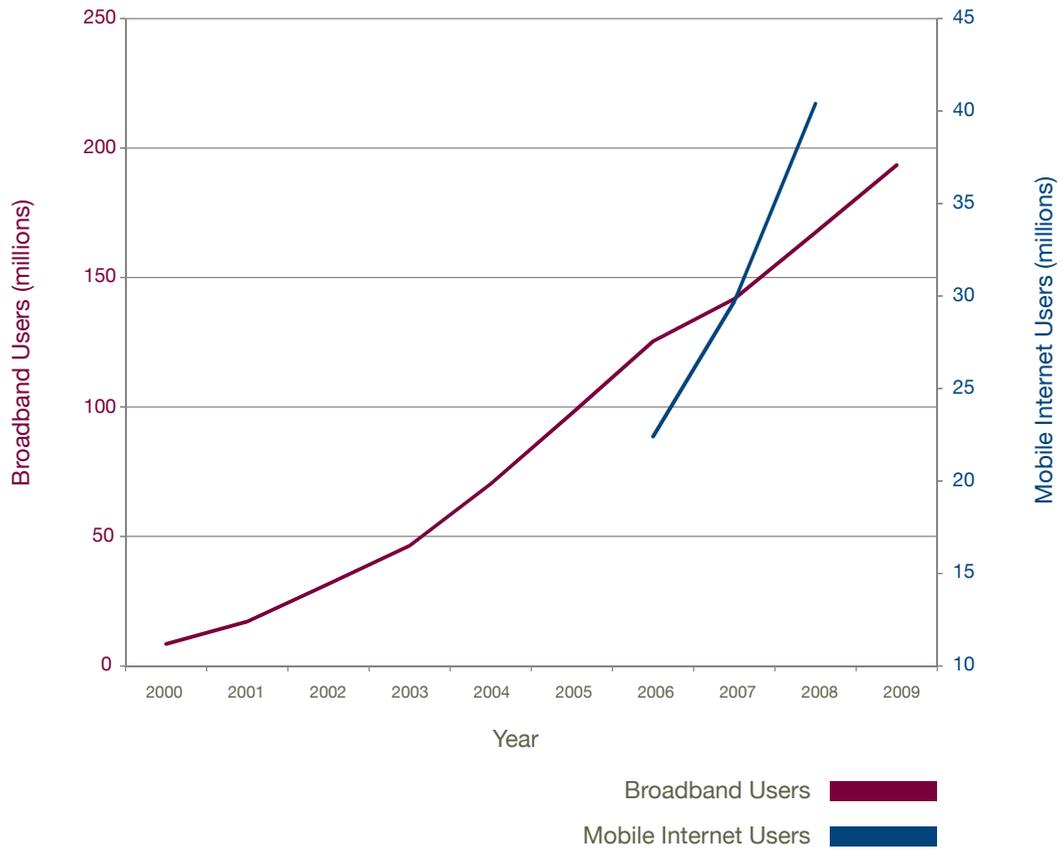
Given the significant uncertainty associated with allowing a price discrimination regime, the burden should fall on ISPs to explain how their practices fall within either the "reasonable network management" or "managed services" exception. Both of these exceptions should be well-defined and carefully circumscribed. Allowing ISPs to operate under a regime where there is a presumption in favor of their practices—such that small and under-capitalized firms and consumers are put in a position of having to affirmatively challenge ISP practices that breach neutrality—will create disincentives for content providers to enter the market.

There is some risk that net neutrality rules would prevent some beneficial technologies from developing—just as there is risk that prioritization would force some players out of the market who would have contributed important innovations. There is no Internet policy regime that would not create some potential negative effects on these technologies.

However, the current "best effort network" has allowed a wide variety of technologies to proliferate. These technologies have been, and are being, created to run on the current Internet system. If the FCC believes that certain valuable technologies could not succeed on the best effort network, the FCC can choose to place these technologies into a "managed or specialized services" exception to the rule. The FCC, however, should narrowly construe this exception to include only technologies that cannot prosper over the best effort network. At the very least, such rules would ensure content is allowed to continue developing at the same speed as it has to date.

Allowing ISPs to manipulate traffic without needing to prove that their actions comport with net neutrality will create a great deal of market uncertainty. ISPs will have the power to set the new status quo, while complaints work their way through lengthy administrative and litigation processes. This uncertainty could have the effect of depressing investment in both content and infrastructure. While some degree of uncertainty is inherent in any rule that allows for exceptions, placing the burden on ISPs keeps the current, open Internet structure as the default. At the same time, carving out space for innovation on a case-by-case basis will provide a degree of balance between clarity and flexibility in the rule.

Figure 3: US broadband and mobile internet\* growth



\* the term "mobile internet" as used here is synonymous with "wireless"

# Net Neutrality

## Rules to Preserve the Economic Value of the Internet

Because of externalities particular to the Internet market, net neutrality rules established and enforced by the FCC can play an important role in ensuring efficient levels of investment in both Internet content and infrastructure. The current rapid expansion of the Internet industry does not weigh against the need for government protections; market failures can exist even in a thriving economic sector. Without net neutrality rules, these market failures will continue to reduce incentives to invest in the Internet market.<sup>25</sup>

Most voices against net neutrality do not distinguish between *types* of investment (infrastructure versus content), and thus do not explore the fundamental problem of investment tradeoffs in the Internet market. Efficient amounts of investment in both infrastructure and content are necessary to maximize surplus from the Internet market. Given the relative ease of direct government support for investment in infrastructure as compared to content, enacting explicit net neutrality protections is the best way the government can address failures in the Internet market. Such a policy will keep money in the hands of content providers (who can then reinvest that wealth in more content), while simultaneously providing direct support to infrastructure.<sup>26</sup> This dual approach will help ensure appropriate amounts of investment are directed to both facets of the Internet.

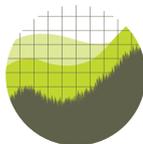
Additionally, arguments that the Internet has thrived, thus far, without rules governing discrimination ignore the reality that since its inception, the Internet has operated and thrived under a *de facto* net neutrality regime. Currently, there are two threats to this status quo: the advent of Deep Packet Inspection and similar technologies that allow ISPs to segregate types of Internet traffic and price discriminate, and the D.C. Circuit's recent decision. These two developments, coupled with the market failures inherent in the Internet, make a strong case for the FCC to enact net neutrality rules now.

As for allowing carriers flexibility to deviate from the rule, the FCC must continuously weigh the benefits of flexibility against the social welfare gains generated by having clear rules in place. The FCC should balance these two goals as it moves forward in crafting narrow exceptions to an overall neutrality mandate.

# Notes

- <sup>1</sup> Preserving the Open Internet, Broadband Industry Practices, 74 Fed. Reg. 62,638, 62,638 (proposed Nov. 30, 2009) (to be codified at 47 C.F.R. pt. 8).
- <sup>2</sup> *Comcast Corp. v. Federal Communications Commission*, 600 F.3d 642 (D.C. Cir. 2010).
- <sup>3</sup> *Verizon-Google Legislative Framework Proposal* (rel. Aug. 9, 2010), available at <http://www.scribd.com/doc/35599242/Google-Verizon-Legislative-Framework-Proposal> [hereinafter *Verizon-Google Proposal*].
- <sup>4</sup> For example, in May 74 members of the House of Representatives sent a letter to the FCC asking it to refrain from moving forward with network neutrality rules. Letter from Representatives to Julius Genachowski, Chairman, Federal Communications Commission (May 24, 2010), available at [http://www.policybytes.org/Blog/PolicyBytes.nsf/dx/TitleII\\_FCC\\_24May2010.pdf/\\$file/TitleII\\_FCC\\_24May2010.pdf](http://www.policybytes.org/Blog/PolicyBytes.nsf/dx/TitleII_FCC_24May2010.pdf/$file/TitleII_FCC_24May2010.pdf). However, the signed Representatives based their analysis on a misunderstanding of the current economic conditions of the Internet, and thus it does not accurately reflect the economic impacts of network neutrality. Joint Letter from Economists to Julius Genachowski, Chairman, Federal Communications Commission (July 7, 2010), available at [http://policyintegrity.org/documents/Economist\\_Net\\_Neutrality\\_Letter\\_-\\_AMENDED.pdf](http://policyintegrity.org/documents/Economist_Net_Neutrality_Letter_-_AMENDED.pdf).
- <sup>5</sup> M. CHRIS RILEY & BEN SCOTT, *FREE PRESS, DEEP PACKET INSPECTION: THE END OF THE INTERNET AS WE KNOW IT?* 3 (2009).
- <sup>6</sup> See Inimai M. Chettiar & J. Scott Holladay, *Free to Invest: The Economic Benefits of Preserving Net Neutrality* 24-32 (Institute for Policy Integrity, Report No. 4, 2010), available at [http://www.policyintegrity.org/documents/Free\\_to\\_Invest.pdf](http://www.policyintegrity.org/documents/Free_to_Invest.pdf) [hereinafter “Free to Invest”] (discussing these incentives in detail).
- <sup>7</sup> Formal Complaint of Free Press and Public Knowledge Against Comcast Corporation for Secretly Degrading Peer-to-Peer Applications, 23 F.C.C.R. 13,028, 13,051 (2008) [hereinafter *Comcast Order*] (“When Comcast judges that there are too many peer-to-peer uploads in a given area, Comcast’s equipment terminates some of these connections by sending RST packets”).
- <sup>8</sup> *Id.* at 13,044.
- <sup>9</sup> *Id.* at 13,028 (requiring Comcast to terminate its current DPI practices).
- <sup>10</sup> The FCC’s proposed “Third Way” regulatory approach would give it the appropriate and necessary foundation to resume its efforts to protect an open Internet. Framework for Broadband Internet Service, Notice of Inquiry, GN Docket No. 10-127, FCC 10-114 (proposed June 17, 2010) (proposing to reclassify the transmission component of broadband access service as a “telecommunications” service under Title II of the Communications Act, with forbearance from unnecessary Title II provisions).
- <sup>11</sup> See George S. Ford, Thomas M. Koutsky & Lawrence J. Spiwak, *The Efficiency Risk of Net Neutrality Rules* 16 (Phoenix Ctr. Policy Bulletin, Working Paper No. 16, 2006), available at <http://www.phoenix-center.org/PolicyBulletin/PCPB16Final.pdf>.
- <sup>12</sup> This is not always the case; climate change is a notable example. See, e.g., Comments from Institute for Policy Integrity and Environmental Defense Fund, to Carol M. Browner, Assistant to the President, Office of Energy and Climate Change Policy on Federal Interagency Review on the Social Cost of Carbon 6-7 (Sept. 11, 2009) (discussing uncertainty and costs of climate change).
- <sup>13</sup> Examples of two-sided markets include credit cards, computer operating systems, video games, and telephone networks.
- <sup>14</sup> Marc Rysman, *The Economics of Two-Sided Markets*, 25 J. ECON. PERSP. 125 (2009).
- <sup>15</sup> Since the benefits generated by content providers extend well beyond the network managed by their own ISPs, it “seems implausible that Internet service providers have appropriate incentives to price according to the social optimum.” Robin S. Lee & Tim Wu, *Subsidizing Creativity through Network Design: Zero-Pricing and Net Neutrality*, 23 J. ECON. PERSP. 61, 70 (2009).

- <sup>16</sup> George J. Stigler, *The Economics of Information*, 69 J. POL. ECON. 213 (1961); Ellen Sewell & Charles Bodkin, *The Internet's Impact on Competition, Free Riding and The Future of Sales Service in Retail Automobile Markets*, 35 EASTERN ECON. J. 96 (2010); Joseph E. Stiglitz, *The Contributions of the Economics of Information to Twentieth Century Economics*, 115 Q.J. ECON. 1441 (2000).
- <sup>17</sup> Paul A. Samuelson, *The Pure Theory of Public Expenditure*, 36 REV. ECON. & STAT. 387 (1954).
- <sup>18</sup> A.C. PIGOU, *THE ECONOMICS OF WELFARE*, pts. II.VII–VIII (4th ed. 1960).
- <sup>19</sup> Philip H. Dybvig & Chester S. Spatt, *Adoption Externalities as Public Goods*, 20 J. PUBLIC ECON. 231 (1983).
- <sup>20</sup> Malte Krueger, *The Elasticity Rule for Two-Sided Markets: A Note*, 8 REV. NET. ECON. 271–78 (2009).
- <sup>21</sup> For a more complete discussion of these government programs, see *Free to Invest*, supra note 7, at 37-8. : *The Economic Benefits of Preserving Net Neutrality* 37–8. See also Comments from Institute for Policy Integrity to Julius Genachowski, Federal Communications Commission, on “Preserving the Open Internet, Broadband Industry Practices,” 74 Fed. Reg. 62,638 (Jan. 14, 2010) (GN Docket No. 09-191, WC Docket No. 07-52, FCC 09-93), available at <http://policyintegrity.org/what-we-do/update/comments-in-support-of-net-neutrality-rule/>.
- <sup>22</sup> See FCC, *CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN* (Mar. 2010), available at <http://www.broadband.gov/download-plan/>.
- <sup>23</sup> Verizon and Google argue that wireless network operators should not be compelled to be neutral when wireless operating system developers are not. Of course, two wrongs do not make a right. The more appropriate response to the non-neutral behavior of wireless operating system owners is to encourage them to be neutral so that efficient investment decisions can be made in the wireless realm as well as the wired. *Verizon-Google Proposal*, supra note 3.
- <sup>24</sup> See *id.*
- <sup>25</sup> For further discussion on the externalities in the Internet market, see *Free to Invest*, supra note 7, at Part I.B.
- <sup>26</sup> For further discussion on the tradeoffs between investment in Internet content and infrastructure, see *id.* at Part I.I.C.



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