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THE IMPACT OF DATA CAPS AND OTHER FORMS OF USAGE-BASED PRICING FOR BROADBAND ACCESS

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The Impact of Data Caps and Other Forms of Usage-Based Pricing for Broadband Access

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Abstract

In recent years, broadband providers have introduced data caps and other plans that charge customers based on use. While regulators have generally approved of this shift, some consumer groups fear that usage-based pricing will lead to higher prices and deteriorating service. They also fear data caps allow companies like Comcast to protect their cable businesses from upstarts like Netflix.

This article evaluates the merits of data caps and other usage-based pricing strategies. Usage-based pricing shifts more network costs onto heavier Internet users. This can reduce costs for others and make broadband more accessible to low-income consumers. Usage-based pricing can also reduce network congestion. While data caps can be used to hurt competition, antitrust law teaches that regulators should intervene only if consumers suffer harm and cannot switch Internet providers. Otherwise, broadband providers should be free to experiment with different pricing strategies to compete for customers and fund future network upgrades.

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Introduction

The United States is in the midst of an explosion in Internet content and applications. In 2011 alone, Internet traffic in the United States grew 52 percent over the previous year, reaching a volume twelve times greater than the entire US Internet in 2005.[1] Peak-time traffic grew even faster,[2] driven by the rising popularity of bandwidth-intensive real-time entertainment such as Netflix, which by itself generates nearly one-third of all downstream traffic during peak hours.[3] And that growth will continue for the foreseeable future: network equipment giant Cisco Systems expects US Internet traffic to nearly triple between now and 2016.[4] Globally, more data will traverse the Internet in 2016 than in every year from 1984 through 2012 *combined*.[5]

This steady growth in demand, and the continuing capital investment required to meet it, has prompted broadband providers to reconsider the flat-rate pricing model that has dominated the Internet access market since the late 1990s. Flat-rate, or all-you-can-eat pricing, has proven popular with consumers, primarily because such plans are simple and predictable. Customers know with certainty that broadband access will be the same fixed cost each month, and can use the Internet without worrying about how each online activity marginally affects the family

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[1] Cisco VNI Forecast Highlights, available at http://www.cisco.com/web/solutions/sp/vni/vni_forecast_highlights/index.html (last visited August 22, 2012). ("In the United States, average Internet traffic grew 52% in 2011... Internet traffic will be 190 Petabytes per day in 2011, up from 125 Petabytes per day in 2010…U.S. Internet traffic in 2011 was equivalent to 12x the volume of the entire U.S. Internet in 2005.")

[2] *Id.* ("In the United States, peak Internet traffic grew 60% in 2011.")

[3] Sandvine Global Internet Phenomena Report Fall 2011, at 7 (32.7 percent). Sandvine defines peak time as the period within which aggregate network traffic is within 5 percent of its highest daily value. On an average day, the peak time for downstream Internet traffic in North American fixed networks is roughly from 9 until 11:30 p.m. *Id.* at 5. Sandvine estimates that peak times are becoming shorter but more intense, as "subscribers are concentrating the same amount of activity within an increasingly narrow slice of time." *Id.* As discussed below, peak times on wireless networks are more varied and unpredictable.

[4] VNI Forecast Highlights, *supra* note 1. ("In the United States, Internet traffic will grow 2.8-fold from 2011 to 2016... Internet traffic will be 533 Petabytes per day in 2016, up from 190 Petabytes per day in 2011… Peak Internet traffic will grow 3.1-fold.")

[5] See Robert Pepper, *Mobile Networks in a Zettabyte World: Trends from Cisco's Visual Networking Index*, June 2012, at 3 ("By 2016, global IP traffic will reach an annual run rate of 1.3 zettabytes per year…More traffic will traverse global networks than from the beginning of the Internet to today [] combined. 1984-2012: 1.2 zettabytes."), available at http://www.gsma.com/spectrum/wp-content/uploads/2012/06/Dr_Robert-_Pepper_Cisco_Public_Policy-Forum_Data_Demand.pdf (last visited August 22, 2012).

budget. But flat-rate unlimited use can also create inefficient network operation. Because price is not tied to online use, consumers have no financial incentive to economize their use of bandwidth. Instead, network costs are spread evenly throughout the customer base, forcing light Internet users to subsidize the data-intensive lifestyles of their heavier-use counterparts.

To address these inefficiencies, broadband providers have begun experimenting with alternative pricing strategies. This movement is most visible in the wireless industry, where the smartphone revolution grew much faster than providers expected. Smartphone use, in turn, spawned a new industry in mobile content and applications and caused wireless broadband demand to outstrip capacity on most networks (a phenomenon sometimes called the "iPhone effect").[6] Tiered pricing has now become the norm in wireless broadband, where consumers face a wide range of potential pricing options.[7] Many residential fixed broadband providers have also explored uniform monthly data caps and overage charges for subscribers.

While regulators[8] and many academics[9] have largely supported this shift, many public interest groups have reacted with skepticism.[10] Groups such as Public Knowledge and Free Press

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[6] Crystal Lyons, *Data Caps—Opportunities and Concerns for Developers*, available at http://bostinno.com/channels/data-caps-opportunities-and-concerns-for-developers/ (last visited August 22, 2012).

[7] See, e.g., Rene Ritchie, AT&T Adds Data Caps, Changes Rates for iPhone Plans, Will Support Tethering for Extra Charge, June 2, 2010, available at http://www.imore.com/2010/06/02/att-adds-data-caps-rates-iphone-plans-plans-support-tethering/ (last visited May 30, 2012).

[8] Yinka Adegoke, FCC Boss Backs Usage-Based Pricing for Cable Internet Access, May 22, 2012, available at http://bottomline.msnbc.msn.com/_news/2012/05/22/11815105-fcc-boss-backs-usage-based-pricing-for-cable-internet-access?lite (last accessed May 22, 2012); Michael Turk, Public Policy Discussion with FTC and FCC Commissioners, available at http://blog.thecableshow.com/2011/06/15/public-policy-discussion-with-ftc-and-fcc-commissioners/.

[9] Hearing on Net Neutrality Before the S. Comm. on Commerce, Science, and Transportation, 109th Cong. (2006) (statement of Professor Lawrence Lessig) ("I believe, for example, that consumer-tiering should be encouraged."); Cecilia Kang, Comcast Illegally Interfered with Web File-Sharing Traffic, FCC Says, *Washington Post*, July 30, 2008, available at http://www.washingtonpost.com/wp-dyn/content/article/2008/07/29/AR2008072902077.html (last visited May 28, 2012), quoting Professor Timothy Wu, who describes usage-based pricing as "probably the fairest system going."

[10] See, e.g., Andrew Odlyzko et al., *Know Your Limits: Considering the Role of Data Caps and Usage Based Billing in Internet Access Service*, Public Knowledge White Paper, May 2012; Letter from Free Press, Consumers Union, Public Knowledge, and New America Foundation to Senator John D. Rockefeller and Senator Kay Bailey Hutchison, April 23, 2012, available at http://www.freepress.net/sites/default/files/fp-legacy/PI_letter_Senate_Commerce_OVDtrends_Apr2012_FINAL.pdf (last visited August 22, 2012).

fear that broadband providers are using data caps to pad profits and avoid the cost of future network upgrades. They also allege that fixed broadband providers may use data caps to shield their cable businesses from Internet-based competitors, an allegation seemingly strengthened by Comcast's recent decision to exempt its Xfinity app from its data cap in certain circumstances.[11] Interest groups asked the Senate to consider these issues as part of an April 2012 hearing on the future of video.[12] More recently, the Justice Department has begun investigating whether these data caps violate antitrust law.[13]

This article explores the implications of this trend toward usage-based pricing. It finds that data caps and other forms of metered consumption are not inherently anti-consumer or anticompetitive. Rather, they reflect different pricing strategies through which a broadband company may recover its costs from its customer base and fund future infrastructure investment. By aligning costs more closely with use, usage-based pricing may effectively shift more network costs onto those consumers who use the network the most. Companies can thus avoid forcing light Internet users to subsidize the data-heavy habits of online gamers and movie torrenters. Usage-based pricing may also help alleviate network congestion by encouraging customers, content providers, and network operators to use broadband more efficiently.

Opponents of usage-based pricing have noted that data caps may be deployed for anticompetitive purposes. But data caps can be a problem only when a firm with market power exploits that power in a way that harms consumers. Absent a specific market failure, which critics have not yet shown, broadband providers should be free to experiment with usage-based

[11] See Odlyzko et al., *supra* note 10, at 47. As discussed in greater detail below, this concern was brought into sharp focus when Comcast announced that customers who subscribe to both broadband and the company's Xfinity cable service would be permitted to watch Xfinity using an app on the Microsoft Xbox without incurring charges against the customer's data cap, even though Netflix and other Internet-based video streamed through the Xbox would be counted against the customer's cap. See Public Knowledge, *Petition to Enforce Merger Conditions*, Federal Communications Commission (filed August 1, 2012).
[12] Letter from Free Press et al., *supra* note 10.
[13] Cecilia Kang, Justice Department Probes Limits on Web Data, *Washington Post*, June 14, 2012, at A16.

pricing and other pricing strategies as tools in their arsenal to meet rising broadband demand. Public policies allowing providers the freedom to experiment best preserve the spirit of innovation that has characterized the Internet since its inception.

I. The Shift to Usage-Based Pricing in Broadband Markets

A. A Taxonomy of Usage-Based Pricing

Usage-based pricing is an umbrella term for any billing system that charges on the basis of consumption. Although Internet access providers abandoned usage-based pricing early in the industry's history,[14] it is common in many other network industries. In its simplest form, known as metering, the firm charges a basic fee per unit consumed. For example, historically telephone companies such as AT&T and Sprint charged a certain rate per minute for long-distance calls. The price per minute became a high-profile point of competition between these carriers.[15]

In more sophisticated variations, companies can use metered pricing to induce particular customer behavior. Many companies offer a per-unit discount on purchases above a certain volume, to encourage greater consumption. Alternatively, some utilities such as water companies charge a higher rate per unit after consumption reaches a certain threshold, to encourage conservation and penalize customers who draw more than their neighbors from the common pool.[16] Some electricity utilities, facing above-capacity demand during peak times, charge a different rate per kilowatt-hour for peak and non-peak electricity use, hoping to induce customers

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[14] During the early 1990s, dial-up Internet providers typically offered Internet access at a per-minute rate. This changed in 1996, when industry leader America Online changed to a flat-rate, unlimited use pricing model. The company was initially unprepared for the increased demand generated by the shift, which led to numerous blackouts and busy signals. See Matthew T. Bodie, *AOL Time Warner and the False God of Shareholder Primacy*, 31 J. CORP. L. 975, 986 (2006), citing Nina Munk, *Fools Rush In: Steve Case, Jerry Levin, and the Unmaking of AOL Time Warner* 84 (2004). But the move nonetheless proved popular with consumers, leading competitors to follow suit. As dial-up yielded to higher-capacity broadband networks, competitors retained the unlimited flat-fee model.

[15] See, e.g., Edward Cavanaugh, *Antitrust Remedies Revisited*, 87 OR. L. REV. 147, 198 (2005), discussing long-distance competition in the wake of the 1984 breakup of the AT&T monopoly.

[16] See Scott Wallsten, *Managing the Network? Rethink Prices, Not Net Neutrality*, Progress & Freedom Foundation Snapshot, October 2007, at 3.

to shift nonessential consumption. Similarly, wireless companies famously offered free nights and weekends to customers, partly to shift call volumes to periods when the telephone network was underutilized.

Alternatively, some companies may adopt a two-part tariff, wherein the customer pays a fixed rate per month for access to the network and an additional fee per unit for consumption on that network. Two-part tariffs are attractive to network industries because the fixed fee ensures that all customers contribute in some measure toward common network costs, while the per-unit fee recovers marginal costs efficiently, and can also shift some network costs onto heavier users. Tiered pricing is one form of a two-part tariff that is common in the wireless telephone industry. Under tiered pricing, customers could choose among wireless plans, each of which offered a certain number of minutes per month at a fixed rate. Each customer received unrestricted calling each month up to his or her plan limit, and then incurred an additional per-minute charge for consumption exceeding that threshold.

B. Usage-Based Pricing for Fixed Broadband Service

In the fixed broadband market, data caps are the most common form of usage-based pricing. The data cap is one way in which a two-part tariff can apply in the broadband industry. A consumer typically purchases a fixed number of gigabytes that he or she may consume monthly, often followed by some penalty if the consumer exceeds the cap.[17] Comcast adopted a 250-gigabyte monthly cap on residential broadband customers in 2008.[18] The company sent

[17] The price of this service often varies based upon the customer's preferred top speeds, which is another form of usage-based pricing that lies largely outside the scope of this article.

[18] See Comcast Corporation, Announcement regarding an Amendment to Our Acceptable Use Policy, August 28, 2008, available at http://xfinity.comcast.net/terms/network/amendment/ (last visited May 20, 2012). The policy took effect on October 1, 2008. This change came shortly after the Federal Communications Commission sanctioned the company for secretly degrading peer-to-peer networking traffic as a method of managing network congestion. See Formal Compl. of Free Press & Public Knowledge against Comcast Corp. for Secretly Degrading Peer-to-Peer Applications, 23 FCC Rcd. 13,028 (2008), vacated, Comcast Corp. v. FCC, 600 F.3d 642 (D.C. Cir. 2010). As a

letters to customers who exceeded the cap[19] and reserved the right to terminate service to repeat offenders,[20] though it is unclear how often it actually did so.[21]

Shortly thereafter, Time Warner Cable experimented with a much lower data cap and overage charge in some markets, but canceled the pilot program after negative customer feedback. [22] AT&T and CenturyLink have also adopted data caps,[23] although Verizon has not. In May 2012, Comcast eliminated its 250-gigabyte cap, but intends to implement a soft cap of 300 gigabytes in the near future, with a per-gigabyte overage charge for exceeding the cap.[24]

Of course, the effectiveness of a data cap depends significantly on customers' understanding of how much data their online activities consume, and how close they come to the cap each month. A recent Sandvine report on network use states that the mean monthly data

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result, many commenters have suggested Comcast adopted its data cap to solve the congestion problems caused by peer-to-peer traffic, although Comcast did not explicitly make this connection.

[19] *Id.*

[20] *Id.*

[21] Public Knowledge, a public interest group that has challenged data caps, has profiled Andre Vrignaud, a gaming consultant whose access was terminated after he exceeded the cap for two consecutive months in 2011. See Odlyzko et al., *supra* note 10, at 3-4. Vrignaud claimed his excessive use stemmed from his reliance on cloud-based storage. See Ryan Singel, Comcast Bans Seattle Man from Internet for his Cloudy Ways, Wired.com, July 13, 2011, available at http://www.wired.com/epicenter/2011/07/seattle-comcast/ (last visited May 30, 2012). After Vrignaud's story received national attention, Comcast offered to restore his service, though he apparently declined the offer. Dean Takahashi, *Who Will Pick Up Paying Customer That Comcast Dropped Because of High Data Usage?* July 29, 2011, available at http://venturebeat.com/2011/07/29/who-will-pick-up-paying-customer-that-comcast-dropped-because-of-high-data-usage/ (last visited August 26, 2012).

[22] In Beaumont, Texas, customers were offered a choice of 5, 10, 20, or 40 gigabytes monthly, with a fee for exceeding the cap. See Chloe Albanesius, Time Warner to Test Usage-Based System, *PC Magazine*, January 17, 2008, available at http://www.pcmag.com/article2/0,2817,2250259,00.asp (last visited May 30, 2012). The company later marketed 100-gigabyte caps in New York and North Carolina. Chloe Albanesius, Time Warner Scraps Bandwidth Cap Testing, *PC Magazine*, April 16, 2009, available at http://www.pcmag.com/article2/0,2817,2345430,00.asp (last visited May 28, 2012).

[23] See Jared Newman, AT&T's U-Verse and DSL Data Caps: Good Deal, Bad Precedent, PCWorld, March 14, 2011, available at http://www.pcworld.com/article/222039/atandts_uverse_and_dsl_data_caps_good_deal_bad_precedent.html (last visited May 30, 2012); CenturyLink Excessive Use Policy, available at http://qwest.centurylink.com/internethelp/eup.html (last visited May 28, 2012).

[24] See Comcast Monthly Data Usage Threshold Suspension, May 17, 2012, available at http://customer.comcast.com/help-and-support/internet/common-questions-excessive-use/ (last visited May 30, 2012).

consumption in 2011 was 22.7 gigabytes.[25] Based on this figure, one could use thirteen times the mean amount of data consumption before running afoul of Comcast's 300-gigabyte limit. According to Netflix, streaming video typically consumes between 0.3 and 1.0 gigabytes per hour, while its high-definition (HD) content streams at 2.3 gigabytes per hour.[26] To reach 300 gigabytes, one would need to stream 130 hours of HD content in one month—or approximately two feature-length movies each day. Alternatively, one could stream between 300 and 1000 hours of non-HD content. Comcast notes that its previous 250-gigabyte data cap permitted a customer to send approximately 50 million emails or download 62,500 songs each month.[27] While it is not inconceivable that a customer would reach these monthly figures, they statistically exceed the amount of content a typical subscriber consumes during a one-month period. To help consumers track their monthly usage and determine how much data individual activities consume, Comcast has created an online Data Usage Meter.[28]

C. Usage-Based Pricing for Wireless Broadband Service

Like fixed broadband service, wireless broadband started as a flat-rate unlimited data plan. But the surprisingly strong surge in mobile data demand driven by the smartphone revolution prompted most wireless carriers to shift to data caps, primarily as a way to slow the growth rate of mobile broadband demand until network capacity can catch up.[29] In 2007, AT&T paid generously to be the exclusive carrier of Apple's iPhone, at a time when the smartphone

[25] Sandvine, *supra* note 3, at 5. While mean monthly data use is 22.7 gigabytes, median monthly data use is a much lower 5.8 gigabytes. This implies that the mean is artificially inflated by heavier users and the median figure is more representative of the "average" household. Nonetheless, to be cautious, this analysis uses the mean figure, particularly in light of the fact that per capita data consumption has likely increased since 2011.

[26] Neil Hunt, Netflix Lowers Data Usage By 2/3 For Members In Canada, *Netflix US & Canada Blog*, March 28, 2011, available at http://blog.netflix.com/2011/03/netflix-lowers-data-usage-by-23-for.html.

[27] See *supra* note 18.

[28] Comcast, Comcast.net Terms Of Service - Data Usage Meter, available at http://networkmanagement.comcast.net/datausagemeter.htm.

[29] See, e.g., Andrew M. Seybold, Wireless Network Congestion, February 2012, available at http://andrewseybold.com/2845-wireless-network-congestion (last visited August 23, 2012).

was in its infancy. While the agreement succeeded in drawing more smartphone customers to AT&T, these customers were generally tech-savvy users with significant data demands.[30] By some reports, the average iPhone user consumed ten times the bandwidth of a typical smartphone user.[31] This concentration of heavy data users on the AT&T network led to much-publicized congestion and a marked service decline in many urban areas, where smartphone users were concentrated. The company explained that 40 percent of the network's traffic was driven by just 3 percent of its smartphone users, forcing the company to examine strategies for either reducing their usage or seeking additional contributions to offset the congestion that they caused.[32] In December 2010, AT&T shifted to a three-tiered pricing plan, with limits at 200 megabytes, 2 gigabytes, and 4 gigabytes, with a per-gigabyte overage charge.[33] Verizon Wireless adopted similar caps the following year,[34] and in mid-2012 both companies added a shared-data option, which allows customers to share their monthly data among as many as ten devices.

Other wireless carriers have embraced different methods of managing consumer data use. Like its competitors, T-Mobile also adopted a tiered pricing system for its customers in 2011. T-Mobile, however, does not assess an overage charge on customers who exceed the cap. Instead, those customers see their speed slowed to 100 kilobytes per second for the rest of the month. Sprint is currently the only major carrier to offer unlimited data at a flat rate. But speed tests

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[30] Brian X. Chen, AT&T Chief Regrets Offering Unlimited Data for iPhone, New York Times Blog, May 4, 2012, available at http://bits.blogs.nytimes.com/2012/05/04/att-randall-stephenson/ (last visited May 28, 2012).
[31] Sam Oliver, AT&T Caps New iPhone, iPad Data Plans at 2GB, Announces Tethering, June 2, 2010, available at http://www.appleinsider.com/articles/10/06/02/att_announces_iphone_tethering_plans_caps_ipad_3g_data_at_2gb.html (last visited May 28, 2012).
[32] *Id.*
[33] *Id.*
[34] Trefis Team, Verizon's Stock Looks Full at $42 as It Readies to Scrap Unlimited Data Plans, Forbes, May 29, 2012, available at http://www.forbes.com/sites/greatspeculations/2012/05/29/verizons-stock-looks-full-at-42-as-it-readies-to-scrap-unlimited-data-plans/ (last visited May 28, 2012). Verizon's data caps came shortly after Apple made the iPhone available on Verizon's network. Both AT&T and Verizon initially grandfathered in the unlimited flat-rate data plans for existing customers, although both sometimes throttle back the speeds of the top five percent of data users still enrolled in these unlimited plans. Verizon Wireless has further announced that these grandfathered customers must surrender their unlimited data plans if they wish to migrate from 3G to the company's new LTE network, meaning many unlimited plans will be phased out over the next few years. *Id.*

often place the Sprint network a distant third behind AT&T and Verizon in most major areas, which suggests these unlimited plans may take a toll on network operations.[35]

II. Usage-Based Pricing as a Cost Recovery Tool

At their core, data caps and other forms of usage-based pricing represent different pricing strategies through which a company can spread its costs over its customer base. Usage-based pricing allows broadband companies to shift more of their network costs onto those who use the network the most. This alternative pricing strategy may prove both more efficient for network providers and more attractive to consumers, particularly those who are priced out of the flat-rate system.

A. Distributional Effects of Flat-Rate and Metered Pricing

Under a flat-rate pricing system, lighter users end up paying a disproportionate share of overall network costs. As the Federal Communications Commission has noted, "Requiring all subscribers to pay the same amount for broadband service, regardless of the performance or usage of the service, would force lighter end users of the network to subsidize heavier end users."[36] Heavier users consume more of the network's total capacity than lighter users. Yet light and heavy users contribute equally to cover the network's costs. This means that lighter users pay a higher effective rate per megabyte than heavier users, since they pay the same fee yet consume less service.

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[35] See, e.g., David Goldman, Which iPhone Carrier Is Best in Your City?, May 30, 2012, available at http://money.cnn.com/2012/05/30/technology/iphone-carrier-compare/ (last visited May 30, 2012). *PC Magazine* notes that nationwide tests show Sprint's 3G network is "the slowest of the major wireless providers," with download speeds half of that on Verizon's 3G network. The company is developing a 4G LTE network that will make the company more competitive. The new network is projected to deliver maximum speeds slower than AT&T or Verizon, but is designed to manage traffic so as to deliver a consistent average speed during periods of high demand. Sascha Segan and Alex Colon, Exclusive: Testing Sprint's New 4G LTE Network, June 18, 2012, available at http://www.pcmag.com/article2/0,2817,2405675,00.asp (last visited August 26, 2012).

[36] *Id.*; see In re Preserving the Open Internet: Broadband Industry Practices, 25 FCC Rcd. 17905, 17945 ¶ 72 (2010).

To put the Commission's concern another way, flat-rate pricing forces below-average users to purchase more broadband access than they use.[37] Typically, the network owner will set a price that reflects the bandwidth consumed by the average user.[38] This means that lighter users are charged as if they consume an average amount of bandwidth monthly, although by definition their actual usage is below the average amount.

This disparity could discourage broadband adoption and limit access to the services that broadband makes available, particularly among poorer consumers. If lighter users are forced to purchase more broadband than they need, some lighter users may choose not to purchase access at the single flat rate, even though the benefits they receive would exceed the cost of providing service at their anticipated volume level.[39] These consumers demand less of the Internet each month than the average user and therefore may not place a high premium on unlimited access, though they could pay a lower rate for enough monthly bandwidth to meet their needs.

These effects would be unremarkable if most consumers used roughly the same amount of data. Cross-subsidization is of little importance if there is little absolute difference in data consumption between below-average and above-average users. In that instance, the amount of the subsidy would be small and might cancel out over time if individual users consume slightly below-average amounts of data in one month, and slightly above-average amounts in the next.

But this turns out not to be the case. According to Sandvine's Fall 2011 report on network traffic, the heaviest 1 percent of downstream users account for 15.2 percent of total North American fixed downstream traffic, while the heaviest 1 percent of upstream users account

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[37] Christopher Yoo, *Network Neutrality, Consumers, and Innovation*, 2008 U. CHI. LEGAL FORUM 179, 203.
[38] See *id.*
[39] *Id.*

for almost 43 percent of total upstream use.[40] By comparison, the lightest 60 percent of consumers account for only 10 percent of total North American fixed broadband traffic.[41]

The gulf is vaster in the wireless market. Sandvine notes that median monthly mobile data consumption in North America is 3.1 megabytes. But mean monthly consumption is over one hundred times that figure, at 347 megabytes.[42] This surprising result stems from the fact that the mobile data market is bimodal, consisting of a large number of first-generation feature phones in addition to a customer base of more data-intensive smartphones and tablets. Therefore the mobile data network is dominated by a smaller number of heavy users. In fact, Sandvine estimates that the heaviest 1 percent of mobile data users consume 26.8 percent of upstream and 21.3 percent of downstream mobile traffic. By comparison, the bottom 80 percent of users account for only 10 percent of total traffic combined.[43]

Given the substantial disparity between heavy and light users, it is not surprising that some broadband providers are exploring alternative pricing regimes that would eliminate the cross-subsidy. Commission Chairman Julius Genachowski noted that usage-based pricing can "increase choice and competition, and it can increase fairness. It can . . . result in lower prices for people who consume less broadband, so experimentation in this area with those goals in mind is particularly appropriate."[44] Federal Trade Commission Chairman Jon Leibowitz similarly supports usage-based pricing, noting that the practice would help fund future investment in network expansion and upgrades.[45]

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[40] Sandvine, *supra* note 3,at 5. "Downstream" refers to the flow of information from the Internet to the consumer, while "upstream" refers to the flow of information from the consumer to another destination on the Internet.
[41] *Id.*
[42] *Id.* at 10.
[43] *Id.* at 11.
[44] Usage-Based Pricing Can Help Competition, Genachowski Says, *Communications Daily*, May 23, 2012.
[45] Jonathan Make, Usage Based Billing Seen Being Introduced by U.S. Wireline ISPs, *Communications Daily*, June 21, 2011. *[Does this citation need a page/section number or URL?]*

1. Simple Metered Pricing

There are several usage-based pricing models that could shift more network costs onto heavier users. A simple metered pricing plan, which bills the consumer on a per-megabyte or per-gigabyte basis, would ensure that the amount each consumer pays for broadband access reflects the use the consumer receives from the network. Like water utilities, broadband providers could set a higher per-unit rate on data consumption above a certain amount to recover an even greater proportion of costs from those who draw most upon the common bandwidth pool.

But simple metered pricing might prove difficult to administer. First, the additional transaction costs of real-time tracking and billing at the customer-specific level may offset any revenue gains achieved by price discrimination. Christopher Yoo posits that high transaction costs might be the reason why the local telephone market never moved to per-minute pricing despite a strong case that such pricing would be more efficient and fairer to consumers. He suggests that similar dynamics could also undermine usage-based broadband pricing.[46] Brett Frischmann and Barbara von Schewick have responded that in the broadband market, these transaction costs are probably much lower than Yoo hypothesizes, given that most consumers access the Internet through a single network gateway.[47] They also note that many providers already offer an array of statistics on individual use by consumer.[48] This is particularly true in the wireless industry, where both provider-operated and third-party applications give users real-time information about data use and send warnings as data use approaches important

[46] Christopher Yoo, *Network Neutrality and the Economics of Congestion*, 94 GEO. L.J. 1847, 1868 (2006).
[47] Brett M. Frischmann and Barbara van Schewick, *Network Neutrality and the Economics of an Information Superhighway: A Response to Professor Yoo*, 47 JURISMETRICS 383, 394 (2007).
[48] *Id.*

thresholds.[49] But even with these gains in tracking, providers may find it difficult to set purely volume-based prices in a way that will reasonably assure investors that significant fixed installment costs will be met.

Simple metered pricing also might prove a challenge for consumers. Although many consumers could pay less under a metered system, Andrew Odlyzko stresses the importance of "mental transaction costs," the cost to consumers of the mental effort required to sort out the many available choices in an increasingly complicated world.[50] After facing choices all day, consumers may simply find it fatiguing to have to decide whether downloading a movie in HD rather than standard definition is worth the additional bandwidth cost.[51] Odlyzko also notes that unlimited use has an insurance effect: some customers may prefer to pay more for unlimited service in order to be protected from bill shock during a period of unusually high broadband usage (if, for example, a child unwittingly downloads significant quantities of data).[52] Odlyzko argues that the decision fatigue and insurance effects likely contributed to the results of AT&T studies in the 1970s showing that even light-use consumers preferred flat-rate billing to per-minute billing of local service, though they presumably pay less under a metered regime.[53] Similarly, in the late 1990s AT&T Worldnet dial-up customers typically moved from metered rates to a $19.95 flat rate for unlimited use when their metered rates approached $11-12/month.[54]

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[49] Verizon and AT&T each offer applications, known as My Verizon and myAT&T, respectively, that report a customer's data use as measured by the company's remote servers. Several third-party applications, such as 3G Watchdog, report usage by tracking information as it flows through the device itself. See, e.g., Ed Rhee, How to Track Data Usage on Your Android Phone, http://howto.cnet.com/8301-11310_39-20077775-285/how-to-track-data-usage-on-your-android-phone/ (last visited August 24, 2012).

[50] See Odlyzko et al., *supra* note 10, at 41-42; Andrew Odlyzko, *The History of Communications and Its Implications for the Internet* at 7, 72 (2000), available at http://ssrn.com/abstract=235284. Odlyzko credits Nick Szabo with originating the phrase, to describe the difficulty of implementing micropayment regimes.

[51] Odlyzko et al., *supra* note 10, at 44.

[52] *Id.* at 41.

[53] *Id.*

[54] *Id.*

These studies suggest that many consumers are willing to pay a premium to avoid having to make a cost-benefit analysis of each broadband transaction.

2. Data Caps

Data caps and tiered service also help broadband companies shift more network costs onto heavier users. All customers pay the same flat rate for service up to the cap, and heavier users pay an additional amount per unit for consumption beyond the cap. Like metered pricing, data caps help solve some of the inefficiencies of flat-rate service. The overage charge becomes a way to mitigate the cross-subsidy by recovering a greater portion of network costs from heavier users. Tiered service plans increase customer choice by offering them several different caps from which to choose.

Data caps help ameliorate some of the stress that simple metering places on consumers. A soft data cap set well above the average monthly use provides most users the same predictability of the flat-rate model and spares most subscribers the mental accounting costs of a strictly metered regime. Most consumers will receive peace of mind knowing that unless they dramatically increase their online activity, they will remain under the cap and can predict with certainty their monthly broadband costs. Therefore the high data caps that mark many fixed wireless plans provide most users with an insurance effect similar to flat-rate use and avoid the decision fatigue caused by performing a cost-benefit analysis of every online interaction. But the lower data caps that mark wireless plans force even typical users to think more carefully about their wireless broadband consumption. For example, they lead wireless consumers to use wifi where possible to offload traffic from 3G and 4G networks to less congested fixed broadband networks, which is generally an efficient practice. Of course, even under high fixed data caps, heavier users must monitor their usage and evaluate the cost of activities that might push them over the cap. But the network's heaviest users are likely to be the most technologically savvy and most likely to understand their data consumption patterns. They are therefore less likely than the average user to suffer significant mental fatigue from calculating the megabyte consumption of an online activity or determining whether the activity is worth the price.

B. Recovering Costs through Price Discrimination

1. Marginal and Fixed Broadband Costs

Some commentators have questioned the notion that usage-based pricing helps networks recover their costs more efficiently. They argue that it is a mistake to load more network costs onto heavier users because of the low marginal cost of data consumption. Odlyzko notes that statistical multiplexing allows multiple users to share the same bandwidth simultaneously, meaning that each additional user imposes only trivial marginal costs onto the network. Although as Odlyzko notes, "determining the actual cost of using a broadband network is exceedingly difficult,"[55] a New York Times editorial states that "moving an extra gigabyte of data at off-peak times costs virtually nothing."[56] Similarly, Netflix, which is responsible for almost a third of all peak-time downstream traffic and therefore sees data caps as a threat to business growth, claims that "the marginal cost of providing an extra gigabyte of data . . . is less than one cent, and falling." As a result, Netflix general counsel David Hyman asserts that there is "no good reason for bandwidth caps and fees to take root." [57] For this reason, skeptics claim it is "entirely inaccurate" to suggest that average users subsidize heavier "bandwidth hogs."[58] Free Press, Public Knowledge, and other public interest groups have thus asked regulators and antitrust

[55] Odlyzko et al., *supra* note 10, at 19.
[56] To Cap, or Not: Broadband Limits Need to be Carefully Monitored to Promote Innovation and Competition, *New York Times*, July 21, 2011, at A20.
[57] David Hyman, Why Bandwidth Pricing Is Anti-Competitive, *Wall Street Journal*, July 7, 2011.
[58] Odlyzko et al., *supra* note 10, at 17.

enforcers to investigate the industry's use of data caps because the caps lack any "legitimate economic justification."[59]

As an initial matter, the call for additional oversight on these grounds seemingly reflects a misunderstanding of the role of regulation. Underlying this critique is the unstated premise that equitable cost distribution is the only presumptively "legitimate" broadband pricing strategy, and companies must justify to the regulator any deviation from this model. While an equality standard has an intuitive appeal,[60] there is no reason to believe that it represents the only, or even the best, broadband pricing structure. Generally, when companies experiment with different pricing strategies, they can test potentially more efficient business models.[61] If these new models prove less efficient, companies will abandon them. This experimentation brings consumers the benefits of increased competition and increased choices in the marketplace. Normally, the regulator should intervene only if the practice actually harms consumers, and consumers cannot punish the practice because the company has market power. Otherwise, companies should be presumptively permitted to experiment with alternative forms of cost recovery, as experimentation helps the industry test potentially more efficient methods of operation.

But setting aside this general objection, focusing on only the marginal cost of each gigabyte of capacity tells us little about efficient broadband pricing.[62] It is true that, except during periods of congestion, the marginal costs of additional bandwidth consumption are very small. But emphasizing marginal costs ignores the significant sunk costs required to build and

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[59] Letter from Free Press et al., *supra* note 10, at 2; see also Public Knowledge, Petition to Enforce Merger Conditions, *supra* note 11.

[60] See, e.g., Matthew Edwards, *Price and Prejudice: The Case against Consumer Equality in the Information Age*, 10 LEWIS & CLARK L. REV. 559, 583-85 (2006). Edwards notes an Annenberg Public Policy Center report that concludes consumers "overwhelmingly object" to differential pricing as "ethically wrong." See *id.* at 585, citing Joseph Turow et al., *Open to Exploitation: American Shoppers Online and Offline*, at 4 (2005).

[61] Edwards, *supra* note 60, at 586-91.

[62] Scott Wallsten, Data Caps Aren't Perfect, but That's OK, http://arstechnica.com/tech-policy/2012/05/opinion-data-caps-arent-perfect-but-thats-okay/,

maintain a broadband network. As Gregory Sidak explains, investors will fund these networks only if they can reasonably expect that the company will recover the costs of this investment, including a competitive return on capital.[63] Marginal cost pricing is thus insufficient because it does not provide sufficient revenue to cover the network's fixed costs.[64]

In the broadband industry, those costs are significant. Broadband providers have invested over $300 billion in private capital in the past decade to build and upgrade the nation's broadband networks.[65] These investments include nearly $23 billion that Verizon has invested to replace legacy copper telephone wire with higher-speed fiber optic cable in portions of its footprint, to boost broadband speeds and capacity in those neighborhoods.[66] AT&T has also spent billions in fiber upgrades.[67] In the wireless sector, providers spent nearly $20 billion in 2008 to acquire spectrum when the 700 MHz block was freed up by the digital television transition, and are investing billions more to develop those assets into high-speed LTE data networks.[68] Of course, some broadband companies can recover these costs partly through voice

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[63] J. Gregory Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet*, 2 J. COMP. L. & ECON. 349, 357 (2006).
[64] *Id.*; see also Wallsten, *supra* note 62.
[65] Craig Moffett, *U.S. Telecommunications and Cable & Satellite: Capital Punishment*, Bernstein Research, December 2010, at 6; see also Randolph J. May, Prices and Profits in the Broadband Marketplace, August 11, 2011, available at http://freestatefoundation.blogspot.com/2011/08/prices-and-profits-in-broadband.html (last visited May 28, 2012). The Columbia Institute for Tele-Information estimates that broadband providers invested $69 billion in 2008 and $60 billion in 2009 alone, of which approximately half was attributable to broadband service (as opposed to other services that the companies provide). See Larry F. Darby and Joseph P. Fuhr Jr., *Innovation and National Broadband Policies: Facts, Fiction, and Unanswered Questions in the Net Neutrality Debate*, 20 MEDIA L. & POL. 3, 11-12 (Fall 2011).
[66] Moffett, *supra* note 65, at 28.
[67] As Moffett notes, Verizon's FiOS service provides fiber-optic cable to the consumer's home. By comparison, AT&T's U-Verse project provides fiber-optic cable to a neighborhood node, but relies upon legacy copper wire to transmit data from the node to individual homes. By avoiding the last-mile fiber drop, AT&T has spent much less per subscriber than Verizon. But Verizon's network will deliver greater speeds and capacity as Internet demand continues to grow. As Moffett writes, "Verizon's network is inarguably future-proof. AT&T's is not." *Id.*
[68] Eric Bangeman, 700 MHz Auction Wraps Up, Tops $19.5 Billion, Ars Technica, March 18, 2008, available at http://arstechnica.com/uncategorized/2008/03/700mhz-spectrum-auction-wraps-up-tops-19-5-billion/ (last visited May 30, 2012).

and cable services that network upgrades also make available.[69] But a recent Federal Communications Commission report suggests that "as much as two-thirds of current investments are being made to provide and expand wired and wireless broadband" rather than voice or cable service, and "the trend over the past few years has been growing."[70] Moreover, as subscribership rates fall, it seems likely that telecommunications companies must look increasingly to broadband rates to recover these common costs.[71] Investment analyst Craig Moffett estimates that the return on these investments has been flat to negative over the past decade.[72] Moffett further warns that "companies whose ROICs [Return on Investment Capital] fail to exceed their costs of capital or whose marginal ROICs are weak are likely to face stiff headwinds in the capital markets" and will be unattractive to investors going forward.[73]

These fixed costs are not merely one-time investments. Rather, "sunk investment is made continuously over time" as firms continue to expand and upgrade their networks to meet rising demand.[74] Cisco Systems anticipates that American Internet traffic will almost triple between

[69] See Odlyzko, *supra* note 10, at 20-21. To the extent that these costs are directly attributable to other services alone (such as the cost of new set-top boxes for cable customers), they should be excluded from the broadband cost base. But much of these firms' network investment consists of common costs: upgrades to the network that benefit both broadband and other services. There are many ways that these common costs can be allocated among the company's services. As discussed below, Ramsey pricing suggests that a multiproduct firm should recover its common costs by raising prices on both products in a way that preserves the ratio of consumption that would occur if the rates were priced at marginal cost. This means raising prices more on price-inelastic services than on price-elastic ones. See, e.g., William Baumol and David Bradford, *Optimal Departures from Marginal Cost Pricing*, 60 AM. ECON. REV. 265, 265-83 (1970); Frank Ramsey, *A Contribution to the Theory of Taxation*, 37 ECON. J., 47, 47-61 (1927). Elasticity estimates vary widely among studies, but it is quite possible that broadband service is more inelastic than cable or telephone service, given the wider range of services that broadband makes available. If this is true, then Ramsey pricing suggests much of these common costs should be recovered through broadband prices rather than cable or telephone rates.

[70] Robert C. Atkinson and Ivy E. Schultz, *Broadband in America: Where It Is and Where It Is Going (According to Broadband Providers)*, Report Prepared for FCC's Omnibus Broadband Initiative, at 11 (2009).

[71] See, e.g., Moffett, *supra* note 65, at 11. ("Carriers have no choice but to invest in the network to keep it operational, and are allocating 'growth capital' to it by building-out expensive fiber infrastructures. At the same time, highly profitable traditional voice subscribers are fleeing in droves, leaving the network to support fewer operating profit dollars.")

[72] Moffett, *supra* note 65, at 1.

[73] *Id.* at 12.

[74] Sidak, *supra* note 63, at 357.

2011 and 2016, representing a 21 percent compound annual growth rate.[75] Mobile data will grow at an even faster rate: Cisco estimates that mobile traffic will grow sixteen-fold by 2016, or 74 percent each year between now and then.[76] This increase is driven by consumer demand for greater quantities of and more bandwidth-intensive Internet content and applications, such as streaming video and real-time teleconferencing.[77] According to Sandvine, real-time entertainment comprised 54 percent of peak-time traffic on fixed networks, up from 29 percent in 2009, and 31 percent of peak mobile traffic, up from 11 percent only two years ago.[78] As a result, analysts estimate that broadband providers must continue to invest $30 billion to $40 billion annually to expand and upgrade their networks to meet this growing demand.[79]

2. *The Potential Value of Price Discrimination*

Thus for broadband providers and other industries with significant fixed costs, the challenge is to design a pricing structure that spreads fixed costs intelligently across the company's customer base. There are many possible ways that a company may do so, but there is no economic reason to believe that, because incremental marginal costs are small, fixed costs should be shared equally across all consumers. In fact, writes economist Scott Wallsten, "efficient pricing will, in general, charge users with high demand more than users with low demand *even if those users impose no additional costs on the network*."[80] This practice is known as price discrimination.

[75] Cisco VNI Forecast Highlights, available at http://www.cisco.com/web/solutions/sp/vni/vni_forecast_highlights/index.html (last visited 30 May 2012).
[76] *Id.*
[77] Sandvine, *supra* note 3, at 6.
[78] *Id*. at 6, 10.
[79] See, e.g., May, *supra* note 65; Atkinson and Schultz, *supra* note 70, at 11.
[80] Wallsten, *supra* note 62.

Price discrimination occurs when a company sells similar goods to different buyers based on their willingness to pay, rather than the cost of service.[81] Or in economic terms, it is when a company's sales exhibit different ratios of price to cost.[82] Price discrimination stems from the recognition that different customers have different *reservation prices*, the maximum rate that a customer is willing to pay for a good or service. Its success depends first upon the firm's ability to identify and charge more to those customers who have higher reservation prices, and second on customers' inability to arbitrage the price difference.

Although "price discrimination gets a bad name in part because it sounds so sinister,"[83] it is a fairly common practice throughout society (although sometimes it goes by the more benign term "customer segmentation"). Matthew Edwards notes that many movie theaters provide discounts to senior citizens and children, thus charging adult non-senior customers more for the same good.[84] Publishers offer titles at different rates to consumers and institutional buyers, such as colleges and libraries.[85] And a car dealership may sell the same model automobile to different customers at different prices, if one customer is better at haggling and a discount is needed to close the sale.[86] Although each of these sellers is engaged in "discrimination," these price differences are a legal and largely uncontroversial practice.[87] Price discrimination can be

[81] Edwards, *supra* note 60, at 562.
[82] *Id.*; see also Daniel J. Gifford and Robert T. Kudrle, *The Law and Economics of Price Discrimination in Modern Economies: Time for Reconciliation?* 43 U.C. DAVIS L. REV. 1235, 1239–40 (2010).
[83] See Robert D. Atkinson and Philip J. Weiser, *A "Third Way" on Net Neutrality*, Information Technology and Innovation Foundation, May 30, 2006, at 6 .
[84] Edwards, *supra* note 60, at 563.
[85] *Id.*
[86] *Id.*
[87] *Id.* at 582; see, e.g., Langford v. Rite Aid of Alabama, Inc., 231 F.3d 1308 (11th Cir. 2000) (finding no duty to disclose prices or avoid price discrimination between insured and uninsured purchasers of pharmaceuticals); Bonilla v. Volvo Car Corp., 150 F.3d 62, 71 (1st Cir. 1998) (observing that "there is nothing in the law of fraud that prevents even a single seller from charging different markups in different markets so long as there is no affirmative misrepresentation"). As Professor Edwards notes, the Robinson-Patman Act prohibits price discrimination in certain commercial transactions of commodities, if the two buyers are competitors and the sale harms competition between them. Edwards, *supra* note 60, at 577-78. But this act does not protect end-user consumers (who are not competitors), for good reason. *Id.* at 582-83.

lucrative for producers, because it allows them to increase revenue by charging higher prices to those who place a higher value on the product.

The practice has more ambiguous effects on customers and total welfare, though antitrust scholar Herbert Hovenkamp notes that "most price discrimination is socially beneficial."[88] Hovenkamp explains that the practice often "produces higher output and thus yields greater consumer benefits than forced nondiscriminatory pricing."[89] One oft-cited example is the airline industry, which exhibits a cost structure similar to broadband providers and where price discrimination occurs regularly.[90] Assume, for example, that an airline's average cost to transport a passenger on a full flight is $700. This amount would be sufficient to cover the passenger's small marginal costs (primarily the in-flight meal) and a pro rata portion of the flight's fixed costs (such as fuel, employee salaries, and the installment payment for the plane). The business traveler, racing to town for a meeting, may pay $1000 for her ticket, while the college student who is heading home may pay only $500 for the next seat over.[91] The businessperson likely has a higher reservation price than the college student, because of the greater demands on her time. By charging the businessperson a higher price, the airline can secure from her a greater contribution to the airline's fixed costs. This contribution allows the airline to offer a discounted ticket to the student.

In this hypothetical, the ability to price discriminate allows the airline to serve more customers than under a flat-rate system. If the airline were instead forced to charge a single uniform rate of $700, the student and others with lower reservation prices would not be able to

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[88] Herbert Hovenkamp, ANTITRUST LAW, P 2340c, at 139, quoted in Edwards, *supra* note 60, at 588.
[89] *Id.*; see also Babette E.L. Boliek, *FCC Regulation vs. Antitrust: How Net Neutrality Is Defining the Boundaries*, 52 B.C. L. REV. 1627, 1678 (2011). ("Although 'discrimination' has a negative popular association, in economic theory, price discrimination may actually serve to increase consumer welfare.")
[90] Wallsten, *supra* note 62; Philip J. Weiser, *The Next Frontier for Net Neutrality*, 60 ADMIN. L. REV. 273, 282 (2008).
[91] Wallsten, *supra* note 62.

fly. Moreover, the airline might not be able to sell enough $700 tickets to fill the airplane, which would mean the uniform rate would have to be greater than $700 to cover the flight's fixed costs.[92] Of course, the airline could sell more tickets at a $500 rate, but this rate would fail to cover the airline's fixed costs. If airlines were forbidden from engaging in price discrimination, many customers who currently receive discounted fares would have to pay more for airline tickets, and many would instead choose not to fly at all.[93] Price discrimination allows the airline to capture more revenue from those willing to pay more, while expanding service to customers with lower reservation prices.

Of course, price discrimination works only if the company can successfully separate customers by reservation price. Ideally, a company would like to charge each customer exactly the maximum that the customer is willing to pay for the good—a scenario known as "first-degree price discrimination."[94] In reality, first-degree price discrimination is virtually impossible to achieve, so companies must devise strategies to segment the customer base. One way airlines distinguish business executives from students is by offering separate first-class and coach tickets. First-class fares include additional perks designed to appeal to executives, perks for which they are willing to pay extra but which do not add measurably to the marginal cost of service. Another way is to put restrictions on discount tickets that would discourage executives from buying. For example, requiring a twenty-one-day advance purchase to receive the discounted rate drives executives toward a higher fare, since business trips are often scheduled at the last minute and cannot be predicted three weeks in advance.[95] Similarly, offering the discount only in

[92] In this hypothetical, one can assume that the airline cannot sell all its seats at a $700 rate. Otherwise, it would not have sold a $500 ticket to the student.
[93] Weiser, *supra* note 90, at 283.
[94] Edwards, *supra* note 60, at 566.
[95] *Id.*

conjunction with a Saturday stay is an inconvenience for business executives who would rather spend their weekends at home with their families.[96]

3. Ramsey Pricing and Price Discrimination in the Broadband Industry

In the broadband industry, as with many industries marked by high fixed costs, price discrimination based on customers' willingness to pay is an efficient way to recover costs with minimal distortion to overall social welfare.[97] This practice, familiar to many regulated industries, is known as Ramsey pricing. Ideally, a firm maximizes overall social welfare by pricing its goods at marginal cost: this ensures that the company serves every customer who values the good more than the cost of producing it.[98] But as noted above, broadband providers cannot use marginal cost pricing because they need to recover fixed costs and make future network investments.[99] With Ramsey pricing, firms recover these fixed costs by raising prices more on those who are most willing to pay for the service, and less on those who would buy less (or not at all) if the price rose.[100] Or in economic terms, the firm should set prices in inverse proportion to customers' price elasticity of demand.[101] In an ideal world, where the firm can perfectly separate each customer by his or her elasticity, Ramsey pricing would allow the firm to recover all of its costs while ensuring that few if any consumers who value the service at marginal cost will ever be priced out of the market.[102]

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[96] Of course, firms can price discriminate for reasons other than finding customer reservation prices. For example, many airlines offer bereavement fares for families traveling to funerals, despite the fact that a funeral is an important event and the customer may have a high reservation price to get to the event on time. This form of humane price discrimination would also be impossible if airlines were required to charge a uniform flat rate per seat.
[97] Sidak, *supra* note 63, at 368.
[98] Michael E. Levine, *Price Discrimination without Market Power*, 19 YALE J. REG. 1, 9 (2002).
[99] See text accompanying notes 62-80.
[100] Levine, *supra* note 98, at 9.
[101] See, e.g., Daniel F. Spulber and Christopher S. Yoo, *Toward a Unified Theory of Access to Local Telephone Networks*, 61 FED. COMM. L.J. 43, 85 & n.205 (2008); see generally Baumol and Bradford, *supra* note 69, and Ramsey, *supra* note 69.
[102] Levine, *supra* note 98, at 9.

Usage-based pricing strategies can approximate Ramsey efficiency. By paying for consumption, consumers reveal how much they value broadband access. This form of price discrimination allows providers to put more network costs onto those whose consumption is least sensitive to changes in price. The extent to which the pricing strategy approximates Ramsey efficiency depends on the ability of the pricing structure to separate customers by willingness to pay. Simple metered pricing segments customers substantially, correlating prices charged with the value each consumer receives from network usage. If heavy users are highly price inelastic, a higher per-unit charge for consumption above a certain threshold may get even closer to Ramsey efficiency. By comparison, data caps divide the customer base into only two groups (typical users, who do not exceed the cap, and heavy users, who do), but allow further segmentation of the heavy user group through the overage charge. Tiered pricing lies somewhere between these two poles. By allowing customers to choose from an array of possible caps, the provider can segment its customer base more finely than with a simple cap. The provider can experiment with different tiers and different rates per tier until it finds the pricing structure that best covers its fixed costs.

Some courts have viewed price discrimination skeptically, assuming that the practice indicates that the firm has market power.[103] But as a unanimous Supreme Court recently recognized, "while price discrimination may provide evidence of market power . . . it is generally recognized that it also occurs in fully competitive markets."[104] The Court's holding is consistent with more recent scholarship suggesting that price discrimination is often a byproduct of healthy

[103] See, e.g., Gloria J. Hurdle and Henry B. McFarland, *Criteria for Identifying Market Power: A Comment on Baumol and Swanson*, 70 ANTITRUST L.J. 687, 688 (2003); Jonathan B. Baker, *Competitive Price Discrimination: The Exercise of Market Power without Anticompetitive Effects (Comment on Klein and Wiley)*, 70 ANTITRUST L.J. 643, 644 (2003), ("Price discrimination is properly understood as providing evidence of market power, as antitrust law has long recognized").
[104] Illinois Tool Works, Inc. v. Independent Ink, Inc., 547 U.S. 28, 44-45 (2006).

competition among firms. William Baumol and Daniel Swanson have explained that competition compels firms to charge lower prices to price sensitive consumers when possible.[105] When companies have significant fixed costs, new firms can enter the market, and customers can be segmented by demand, companies must resort to price discrimination or else they will fail to cover their costs.[106] Michael Levine similarly argues that in firms with high fixed costs, price discrimination will often be the dominant pricing strategy even in the absence of market power.[107] Under these conditions, Baumol and Swanson argue, price discrimination may be inevitable and "firms may be able to indulge persistently in uniform pricing only if they possess the sort of monopoly power that forecloses such competition and enables them to obtain abundant earnings."[108]

4. Price Discrimination and Increasing Broadband Penetration Rates

Usage-based pricing may also make entry-level broadband access more affordable.[109] The Federal Communications Commission has stated that increasing broadband adoption is one of its biggest public policy challenges.[110] While 65 percent of Americans have broadband access, those without access are generally "older, poorer, less educated, more likely to be a racial or ethnic minority, and more likely to have a disability" than those with broadband in the home.[111] According to the Commission's survey, those without broadband access cited cost as the primary

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[105] William J. Baumol and Daniel G. Swanson, *The New Economy and Ubiquitous Competitive Price Discrimination: Identifying Defensible Criteria of Market Power*, 70 ANTITRUST L.J. 661 (2003); see also Sidak, *supra* note 63, at 367-68; see generally Joshua D. Wright, *Missed Opportunities in Independent Ink*, 2006 CATO SUP. CT. REV. 333.
[106] Baumol and Swanson, *supra* note 105, at 662.
[107] See generally Levine, *supra* note 98.
[108] Baumol and Swanson, *supra* note 105, at 662.
[109] Cf. Sidak, *supra* note 63, at 367-68.
[110] Federal Communications Commission, *Connecting America: The National Broadband Plan*, at 167 (2010).
[111] *Id.* at 168. According to the Commission's report, those over age 65 have a 35 percent adoption rate. The rate for low-income consumers (defined as having household income below $20,000 per year) is 40 percent. For those without a high school diploma, the rate is 24 percent. Among African-Americans, the adoption rate is 59 percent, while among Hispanic Americans the rate is 49 percent. Only 42 percent of the disabled have broadband. *Id.*

barrier to adoption.[112] A 2009 report by Kevin Hassett and Robert Shapiro similarly concludes based upon several studies that "price is the strongest determinant of broadband subscription."[113] After projecting broadband adoption rates under different pricing models, Hassett and Shapiro conclude that "spreading [broadband] costs equally among all consumers—the minority who use large amounts of bandwidth and the majority who use very little—will significantly slow the rate of adoption at the lower end of the income scale."[114] If broadband providers can shift more network costs onto heavier users, they can offer lower rates for light users. This practice benefits firms and consumers alike: it allows firms to capture more of the demand curve, offering service to more people who value the service above marginal cost, while at the same time it narrows the "digital divide" between those who can afford broadband access and those who cannot.[115]

Of course, price discrimination only leads to higher adoption rates if broadband providers in fact lower prices for lighter users. This appears to be the case. A 2010 study by Scott Wallsten and James Riso surveyed nearly 25,000 broadband plans across several OECD countries.[116] They found that residential broadband plans with data caps were, on average, about $164 less per year than similar but unlimited plans, while residential triple play plans (which combine broadband, voice, and video) were $152 less per year if they contain a data cap.[117] As a result, Wallsten and

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[112] *Id.* at 168, 170. 36 percent of respondents cited cost as the primary reason they do not have broadband access, followed by lack of digital literacy (22 percent) and relevance (19 percent).

[113] *Id.* at 4-5, citing, among other sources, Paul Rappoport, Lestor D. Taylor and Donald J. Kridel, *Willingness to Pay and the Demand for Broadband Service* (2003), available at http://www.economics.smu.edu.sg/events/Paper/Rappoport_3.pdf; Austan Goolsbee, *The Value of Broadband and the Deadweight Loss of Taxing New Technology* (2006), available at http://faculty.chicagobooth.edu/austan.goolsbee/research/broadb.pdf; and John Horrigan, *Home Broadband Adoption 2009*, Pew Internet & American Life Project (2009), available at http://www.pewInternet.org/~/media//Files/Reports/2009/Home-Broadband-Adoption-2009.pdf.

[114] *Id.* at 12.

[115] *Id.*

[116] Scott Wallsten and James Riso, *Residential and Business Broadband Prices Part 1: An Empirical Analysis of Metering and Other Price Determinants*, Technology Policy Institute. 2010, available at http://techpolicyinstitute.org/files/residential%20and%20business%20broadband%20prices%20pt1.pdf (last visited August 26, 2012).

[117] *Id.* at 16.

Riso conclude that "many consumers, particularly the low-volume users, are likely to pay less for broadband with data caps than they would for plans offering unlimited data transfer."[118]

One also sees some evidence of this effect in the wireless broadband industry, though the record is mixed. In June 2010, AT&T eliminated its $30/month unlimited data plan for smartphone users. Instead, customers could choose a 200-megabyte plan for $15 per month, or 2 gigabytes for $25 per month.[119] If a customer exceeded his or her data cap, the company charged $15 for each additional 200 megabytes on the smaller plan or $10 for each additional gigabyte under the larger plan.[120] At the time of the change, 65 percent of AT&T customers used less than 200 megabytes of data each month, while 98 percent used less than 2 gigabytes.[121] This meant that the move from unlimited to tiered service was less expensive for most AT&T customers and made wireless broadband a more affordable option for consumers who found the $30 flat rate unacceptable.[122] But there was no comparable savings when Verizon Wireless phased out its $30/month unlimited data plan in June 2011, shortly after introducing the iPhone to its network. Henceforth, new Verizon customers could choose from three different tiers of service, the cheapest of which was 2 gigabytes per month at the same $30 rate as the old unlimited plan.[123]

III. Usage-Based Pricing as a Congestion Management Tool

Usage-based pricing can also be a tool to compel more efficient network operation. If the price a customer pays for use reflects the cost that use imposes on the network, the customer is

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[118] *Id.* at 3.
[119] See Press Release, AT&T Announces New Lower-Priced Wireless Data Plans to Make Mobile Internet More Affordable to More People, June 2, 2010, available at http://www.att.com/gen/press-room?pid=17991&cdvn=news&newsarticleid=30854&mapcode=financial|mk-att-blackberry-torch (last visited August 28, 2012).
[120] *Id.*
[121] *Id.*
[122] In January 2012, the company raised its rates to $20/month for 300 megabytes, $30/month for 3 gigabytes, or $50/month for 5 gigabytes. See Press Release, AT&T Launches New Data Plans, January 18, 2012. This means that the 2012 entry-level price remains below the 2010 flat rate.
[123] See Cecilia Kang, Verizon Phasing Out Unlimited Mobile Data Plans, *Washington Post*, June 23, 2011, at A15.

less likely to overuse the network. Usage-based pricing may also incentivize Internet content and application providers and broadband providers themselves to adopt more efficient data-management practices. The extent to which usage-based pricing can help manage network congestion depends on the nature of congestion and the feasibility of structuring a pricing strategy that would correlate prices with congestion costs.

A. Broadband Service and the Possibility of Congestion Costs

As Christopher Yoo and others have noted, unlimited flat-rate pricing plans "tend to induce excessive levels of consumption."[124] This is because broadband service constitutes what economists call a "club good."[125] A club good is one that exhibits some characteristics of a private good and some of a public good. Like a private good, a club good is excludable, meaning the owner can prevent consumers who have not paid from accessing the service.[126] This distinguishes club goods from purely public goods (such as broadcast television) and common pool resources (like fish in a public lake). But club goods are also non-rivalrous, meaning that they can be shared by more than one person at the same time.[127] This distinguishes them from typical private goods such as food or clothing. James Buchanan, the Nobel-prize-winning economist who devised the term, cited the swimming pool as his primary example.[128] Other economists have listed the cinema, cable television, and many social organizations.[129] Broadband

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[124] Yoo, *supra* note 37, at 204.
[125] See Yoo, *supra* note 46, at 1863-64 (describing broadband as a club good); William D. Rahm, *Watching Over the Web: A Substantive Equality Regime for Broadband Applications*, 24 YALE J. REG. 1, 18 (2007) (same).
[126] See Yoo, *supra* note 46, at 1863, citing James Buchanan, *An Economic Theory of Clubs*, 32 ECONOMICA 1 (1965) and Richard Cornes and Todd Sandler, *The Theory of Externalities, Public Goods, and Club Goods* 351-53 (2d ed. 1996).
[127] *Id.* at 1863-64.
[128] *Id.*; see also Patrick McNutt, *Public Goods and Club Goods* (1999), available at http://encyclo.findlaw.com/0750book.pdf (last visited May 31, 2012).
[129] J. Andrew Hansz, *Club Good Influence on Residential Transaction Prices* (2011), available at http://aux.zicklin.baruch.cuny.edu/jrer/papers/pdf/forth/accepted/Club%20Good%20Influence%20on%20Residential%20Transaction%20Prices.pdf (last visited May 31, 2012).

networks also fit the definition: the broadband provider may exclude consumers who have not paid for the service, but multiple consumers can use the network simultaneously.[130]

Because of these characteristics, club goods are affected by congestion costs, the marginal cost of additional network use. As implied by their name, congestion costs are the costs that one consumer's use imposes on other consumers, which can take the form of packet delays or packet loss.[131] When the network is lightly loaded, congestion costs are "essentially zero."[132] But when the network is running near full capacity, the congestion costs created by an additional user can be substantial.[133]

As Yoo has shown, unlimited flat-rate pricing can lead to overconsumption because consumers do not directly pay the congestion costs that they impose on the network.[134] Ideally, a network provider would want to encourage each consumer to use the network as long as the benefit he or she gets from network use exceeds the cost of that use. But under a flat-rate system, the consumer pays no additional cost for additional use, even when this consumption imposes congestion costs on society as a whole.[135] For example, a consumer may choose to watch a bandwidth-intensive movie or play interactive video games during peak times, even though this adversely affects the network's overall operations. The consumer suffers some congestion cost

[130] See *supra* note 125.
[131] When a broadband consumer requests Internet content from a server, the server breaks the content into a series of small packets, each of which travels across the Internet to the consumer. Once it arrives, the consumer's computer reassembles the packets into a message. Congestion occurs when more packets seek to pass through a particular bottleneck than that bottleneck can handle. This surge in demand forces the network to queue the packets, which can cause packet delay. If the queue gets too long, the network may simply delete some packets entirely, which creates packet loss. Generally speaking, packet delay and packet loss are more perceptible for consumers using real-time applications such as streaming video and video conferencing, because the consumer experience depends upon a continuous flow of packets at a relatively steady rate.
[132] Andrea Graber, *Internet Pricing: Economic Approaches to Transport Services and Infrastructure* 33 (2005).
[133] See *id.* As noted above, congestion thus increases the marginal cost of serving a broadband consumer. See *supra* text accompanying note 62.
[134] Yoo, *supra* note 37, at 204.
[135] It is worth noting, however, that providers of some club goods can rely on flat-rate pricing because many customers choose to consume only small amounts of club resources despite the fact that additional consumption is costless. Gym memberships are one notorious example.

(because the movie or game may suffer some congestion-related packet delays), but this cost is less than the congestion costs that the consumer's decision imposes on all other network users.[136]

A broadband provider can alleviate congestion in two ways: it can add network capacity or it can ration access.[137] If congestion occurs regularly, the provider should invest capital to expand the network and provide more bandwidth to all users. But if congestion occurs only infrequently, expansion may be an inefficient solution, because it leads to significant expenditures for additional capacity that lies dormant most of the time. In this situation, rationing may be a better solution because it encourages consumers and network owners to manage existing capacity more efficiently.

If done correctly, usage-based pricing can alleviate congestion by discouraging bandwidth overconsumption. A per-unit pricing strategy forces each consumer to internalize the congestion costs that marginal consumption imposes on others. Ideally, the per-unit price would fluctuate to reflect the precise congestion cost of additional use at that time, though transaction costs may prohibit pricing at that level of precision.[138] By bringing a consumer's private costs into line with the overall social costs of additional use, usage-based pricing encourages a consumer to consume additional resources only if his or her benefit exceeds the total cost. Usage-based pricing thus can temper the activities of "bandwidth hogs" whose heavy consumption could impose substantial congestion costs on their neighbors.

Usage-based pricing also forces Internet content and application providers to be more efficient when sending content to consumers. Because consumers pay based upon bandwidth consumed, they demand that content and application providers deliver their services using as

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[136] Graber, *supra* note 130, at 2-3, 34; Yoo, *supra* note 46, at 1864.
[137] Graber, *supra* note 130, at 1-2.
[138] See, e.g., Odlyzko et al., *supra* note 10, at 55. ("Data sent or received during peak hours could be charged at rates that reasonably reflected their impact on network congestion. This practice could encourage users to manage their network usage more efficiently and reduce congestion generally.")

little bandwidth as possible. These consumer demands can encourage greater use of zipped files and other forms of compression, for example, which leads to greater overall efficiency in network use. Odlyzko notes that when Canada adopted usage-based pricing in 2011, Netflix responded by offering two tiers of service: a high-quality, heavy-bandwidth streaming service, or a low-quality alternative that consumes two-thirds less bandwidth.[139]

Finally, usage-based pricing can force broadband providers to operate more efficient networks. If a broadband company is paid by volume of traffic that passes through its system, it will manage traffic where possible to maximize that volume. As volume rises, the increased congestion signals to the broadband provider the need for additional capacity. But importantly, under usage-based pricing, the increased volume that generates the congestion also helps fund the network expansion.

Odlyzko argues that usage-based pricing may encourage broadband providers to restrict capacity, thus creating artificial scarcity that allows the company to raise rates without investing in network expansion.[140] But this critique seems misplaced. A provider could create artificial scarcity only if it has market power, meaning it is insulated from competition. Otherwise, when a provider subjects customers to artificially high levels of congestion or exorbitant rates, consumers will flee to another provider that is investing in its network to better meet demand.

But if a firm has market power, it may avoid additional capital investment whether it uses flat rates or usage-based rates. A monopolist charging usage-based rates may lower its data cap and use overage charges to pad its bottom line. But a monopolist offering flat rates may exploit this power by increasing the rate for unlimited service and pocketing, rather than reinvesting, the added revenue. The difference is that under usage-based rates, consumers make efficient use of

[139] Odlyzko et al., *supra* note 10, at 14, citing Netflix Lowers Data Usage By 2/3 for Members in Canada, Netflix Blog, March 28, 2011, available at http://blog.netflix.com/2011/03/netflix-lowers-data-usage-by-23-for.html.
[140] Odlyzko et al., *supra* note 10, at 56.

the limited capacity available. In a capacity-constricted flat rate system, congestion rises until the only people using the network are those who can best tolerate lengthy service delays. This is what Jeffrey MacKie-Mason and Hal Varian call the "Yogi Berra equilibrium": the point where the network is "so crowded that no one goes there anymore."[141] Thus while firms may have incentives to pad profits by restricting capacity, their ability to do so depends much more on their market power than their choice of pricing strategy.

Whether usage-based pricing can be a useful tool to manage broadband congestion turns on two subsidiary inquiries. First, how congested are broadband networks? And second, how easily can usage-based pricing target and alleviate that congestion?

B. Measuring Broadband Congestion

Although congestion is difficult to measure with certainty, and performance varies by network provider, many analysts have concluded that congestion is not presently a significant problem for fixed broadband networks.[142] The Federal Communications Commission's most recent survey of fixed broadband performance, released in July 2012, shows that the average fixed broadband provider delivered 96 percent of its advertised speeds during peak usage periods.[143] This was up from 87 percent in 2011.[144] The Commission attributes this improvement to "improvements in network performance" rather than downward adjustment on advertised speeds, noting that there was a 38 percent increase in average speeds delivered to customers.[145] Peak-time performance varies somewhat based upon technology. During peak periods fiber-based networks such as FiOS delivered 117 percent of advertised download speeds, while cable-

[141] Jeffrey K. MacKie-Mason and Hal R. Varian, *Pricing Congestible Network Resources*, 13 IEEE J. OF SELECTED AREAS OF COMM. 1141, 1146 (1995), quoted in Graber, *supra* note 130, at 137.
[142] See Letter of Free Press et al., *supra* note 10, at 1.
[143] Federal Communications Commission, 2012 Measuring Broadband America July Report: A Report on Consumer Wireline Broadband Performance in the U.S., at 5. Peak time is defined as weeknights from 7:00pm to 11:00pm local time, when aggregate network demand is typically highest. *Id.* at 8.
[144] *Id.*
[145] *Id*. at 5-6.

based services delivered 99 percent of advertised speeds and DSL-based services lagged behind, at just 84 percent of advertised speeds.[146]

Of course, this does not suggest that congestion is never a problem for fixed broadband networks. In 2008, the Federal Communications Commission sanctioned Comcast Corporation for throttling traffic between users operating peer-to-peer networks.[147] Comcast claimed throttling was necessary because these networks created an unexpected spike in demand for upload bandwidth, which imposed congestion costs on other consumers who shared upload bandwidth with someone operating a peer-to-peer network.[148] One can also infer some level of network congestion from the rise of the Content Delivery Network (CDN) industry. Significant content providers such as Netflix rely on third-party CDNs such as Akamai and Level 3 Technologies to deliver their services.[149] CDNs store multiple copies of a content provider's data in locations across the country, and carry that data over their privately owned networks rather than the public Internet to a location on the broadband provider's network closest to the consumer. Netflix and other content providers would not pay CDNs to carry their data unless congestion on the public Internet made this an undesirable alternative. More generally, Say's Law suggests that any installed capacity will eventually become saturated: greater network capacity drives greater demand for bandwidth-intensive applications that the additional capacity makes possible.[150] This suggests that congestion may be managed or brought into equilibrium for

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[146] *Id.* at 10. Peak-time upload speeds were 106 percent of advertised for fiber, 110 percent for cable, and 103 percent for DSL.

[147] See Formal Compl. of Free Press & Public Knowledge against Comcast Corp. for Secretly Degrading Peer-to-Peer Applications, 23 FCC Rcd. 13028 (2008), vacated, Comcast Corp. v. FCC, 600 F.3d 642 (D.C. Cir. 2010).

[148] *Id.* at 13031-32.The Commission assumed without deciding that Comcast's factual claims were true, and found targeted throttling of peer-to-peer traffic was an unreasonable method of alleviating network congestion. *Id.* at 13056.

[149] See Odlyzko et al., *supra* note 10, at 23-24.

[150] See Graber, *supra* note 130, at 4-5.

a time, but supports the idea that congestion can be a legitimate factor in pricing determinations for broadband providers.

Congestion is a much more significant issue for wireless providers.[151] As Commission Chairman Genachowski and many commentators note, the smartphone revolution has unleashed tremendous demand for wireless applications and services. While wireless providers are investing billions of dollars to upgrade and expand network capacity, neither these efforts nor spectrum policy has been able to match that demand.[152] Industry analyst Peter Rysavy notes that the bandwidth-intensive mobile applications such as streaming video are "growing tremendously, and it's unclear how long operators will be able to keep up. In the absence of new spectrum, which does not seem to be materializing fast enough . . . the result will be networks running at capacity."[153] Given these dynamics, Rysavy concludes that "congestion is inevitable."[154]

C. Usage-Based Pricing as a Congestion Management Tool

Although usage-based pricing encourages more efficient network consumption generally, many question its usefulness for alleviating congestion specifically. While data caps and tiered pricing have become the dominant usage-based pricing strategies in the marketplace thus far,[155] they are rather crude tools for addressing network congestion.[156] Data caps limit the amount of bandwidth that a customer uses each month. While this limit reduces overall traffic on the

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[151] See Odlyzko et al., *supra* note 10, at 21.
[152] See, e.g., NCTA Interview with Julius Genachowski, 2012, available at http://www.ncta.com/Resource/Resource/NCTA-Video.aspx; Joe Zeto, Addressing Mobile Data Growth & Impending Network Congestion, WirelessWeek, February 7, 2012, available at http://www.wirelessweek.com/articles/2012/02/technology-addressing-mobile-data-growth-impending-network-congestion-wireless-networks/.
[153] Peter Rysavy, LTE: Huge Technology, Huge Challenges, InformationWeek Reports, March 2012, at 8, available at http://www.rysavy.com/Articles/2012_03_LTE.pdf.
[154] Peter Rysavy, Mobile Broadband Capacity Constraints and the Need for Optimization, Rysavy Research 2010; see Rysavy, *supra* note 153, at 8.
[155] See *supra* text accompanying notes 17-35.
[156] Odlyzko et al., *supra* note 10, at 28; Wallsten, *supra* note 62.

network, it does not directly target traffic during congestion periods. This is the equivalent of trying to solve rush-hour highway congestion by placing a limit on the number of miles each driver can drive each month. The cap may have some indirect effect on congestion, if heavy users choose to reduce consumption by reducing peak-time use. But the cap also targets heavy users who generate huge volumes of traffic during off-peak periods (for example, by backing up systems at 2:00 a.m.), whose uses generate virtually no congestion costs.[157] For this reason, Sandvine estimates that "monthly usage quotas have only a limited impact, if any at all, on peak network demand."[158]

If feasible, peak-time pricing could be a more effective usage-based strategy to alleviate congestion.[159] When facing rush-hour traffic congestion, London famously began charging commuters a fee to drive in the busiest part of town during peak times, which has reduced congestion by 30 percent.[160] For many years, peak pricing was a staple of long-distance and wireless telephone service, to drive traffic toward nights and weekends when networks were less congested.[161] In broadband, a metered rate that charges customers more for peak-time use might similarly encourage customers to shift peak-time activities to less expensive off-peak hours.[162]

But it may be difficult to identify predictable periods of congestion and communicate that clearly to consumers. This may be possible for fixed broadband. Although the consensus is not universal, most analysts generally agree with the Federal Communications Commission that fixed broadband networks experience consistent peaks on weekdays between 7:00 p.m. and

[157] Graber, *supra* note 132, at 84.
[158] Sandvine, *supra* note 3, at 5.
[159] Graber, *supra* note 132, at 86-100; Wallsten, *supra* note 16, at 2.
[160] See Sam Schwartz et al., *A Comprehensive Transportation Policy for the 21st Century: A Case Study of Congestion Pricing in New York City*, 17 N.Y.U. ENV. L.J. 580, 596-97 (discussing London and Stockholm examples); but see Michael H. Schuitema, Comment, *Road Pricing as a Solution to the Harms of Traffic Congestion*, 34 TRANS. L.J. 81, 92-112 (noting distributional and other problems with congestion-based pricing of traffic).
[161] See text accompanying note 16.
[162] Sandvine, *supra* note 3, at 5.

11:00 p.m., which coincides with the time that consumers return home from work and consume bandwidth-heavy applications such as streaming video.[163] As a result, a primetime premium may be a feasible solution to alleviate future fixed broadband congestion, assuming traffic patterns do not change as network use rises. But there is much less consensus regarding wireless congestion periods. Wireless customers vary widely in their data consumption habits. With the rise of wireless video, network optimization Bytemobile notes that "mobile networks are under constant strain for the majority of the day."[164] Systems can monitor network load and automatically raise prices when they detect congestion, but unless these periods are easily understood and predicted by consumers, they are unlikely to affect consumer behavior.[165]

IV. Potential Anticompetitive Effects of Usage-Based Pricing

While there are many potential benefits that flow from usage-based pricing, some critics do not trust the practice because of a fear of anticompetitive harm. These commentators fear that broadband providers may adopt data caps to achieve an unfair economic advantage in the video market. They note that "in the United States Internet service providers are almost always also in the pay-television business," which competes against Internet-based video providers such as Netflix and Hulu.[166] Comcast estimates that the amount of data required to replace its cable service with an Internet-based competitor would be 288 gigabytes each month—a figure suspiciously close to Comcast's proposed 300-gigabyte monthly cap. Given the incentive to discriminate, critics allege that data caps serve primarily "to protect [broadband providers'] legacy, linear video distribution models from emerging online video competition."[167]

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[163] See *supra* note 143.
[164] Bytemobile, Mobile Analytics Report, June 2011, at 3.
[165] Odlyzko notes that even simple, relatively clear time-of-day pricing in other industries often fails to measurably change consumer behavior. Odlyzko et al., *supra* note 10, at 28-29.
[166] Odlyzko et al., *supra* note 10, at 48.
[167] Letter from Free Press et al., *supra* note 10, at 2.

A. Data Caps as a Vertical Restraint on Trade

These are valid concerns, although they come with some caveats. For many consumers, over-the-top video providers like Netflix are complements rather than substitutes to traditional cable: they offer an alternative slate of entertainment choices but do not replicate the specific channels and programs that cable offers. Cable industry analyst James Ratcliffe explains that subscription rates remain high because "pay TV continues to provide customers with the content they want, a lot of which isn't available outside the traditional pay environment," such as live sporting events.[168] Moreover, many broadband providers (particularly DSL and wireless providers) do not deliver cable service, and not all who do (like Verizon) have adopted data caps. Nonetheless, the Commission has correctly found that vertically integrated broadband providers "have incentives to interfere with the operation of" Internet-based competitors.[169] These integrated companies wish to keep as many customers as possible enrolled in the "triple-play" bundle of voice, video, and data service, because it increases overall revenues, spreads the common costs of the network more widely, and can thus minimize the cost of each network service.

But regulatory intervention requires more than a showing that a vertically integrated firm has incentives to take actions that might harm competitors. The firm must also have the ability to do so. Antitrust law subjects almost all vertical restraints to the rule of reason, which makes these

[168] James Ratcliffe, Why Cable Is Winning the Cord-Cutting War, Hollywood Reporter, August 24, 2012, available at http://www.hollywoodreporter.com/news/cable-TV-netflix-hulu-youtube-hbo-time-warner-362784. Of course, some of the content Ratcliffe touts can be downloaded illegally online. See, e.g., Susan P. Crawford, Team USA Deserves No Gold Medals for Internet Access, Bloomberg View, August 5, 2012, available at http://www.bloomberg.com/news/2012-08-05/team-usa-deserves-no-gold-medals-for-internet-access.html (discussing file-sharing site Pirate Bay's circumvention of NBC's time-shifted Olympics coverage by hosting user-uploaded video of Olympic events).

[169] In re Preserving the Open Internet: Broadband Industry Practices, 25 FCC Rcd. 17905, 17916 ¶ 22 (2010).

restraints actionable only if the firm has market power.[170] Without market power, a firm cannot maintain anticompetitive conduct, because customers will defect. If consumers in a competitive market wish to use Netflix and find that one company's data caps prevent them from doing so, those consumers will move to another broadband provider.[171] If no provider offers uncapped service, over time one provider is likely to change its policies to meet this pent-up demand.

Although analysts dispute the precise level of competition in fixed broadband markets,[172] Gregory Sidak and David Teece are probably correct that "the market for broadband access is both highly rivalrous and workably (even if not perfectly) competitive."[173] The Commission notes that 82 percent of American census tracts have at least two competitive options for fixed broadband service.[174] Of course, in most places this means two options: the telephone company and the cable company. Susan Crawford notes that because of cable's recent upgrade to DOCSIS 3.0, a new standard that boosts performance of cable-based data transmission, cable companies offer speeds far greater than copper-based DSL service.[175] Alfred Kahn, the late dean of

[170] Leegin Creative Leather Products, Inc. v. PSKS, Inc., 551 U.S. 877 (2007). Technically, tying (which is a form of vertical inter-brand restraint) remains a per se offense, meaning a defendant can be held liable even without a finding of market power. But as Hanno Kaiser notes, this is somewhat of a distinction without a difference, as one element of a tying claim is that the defendant have market power in the tying market. See Hanno F. Kaiser, *Are "Closed Systems" an Antitrust Problem?* 7 COMP. POL'Y INT'L 91, 99-101 (2011).

[171] See Einer Elhauge, *Tying, Bundled Discounts, and the Death of the Single Monopoly Profit Theory*, 123 HARV. L. REV. 397, 401 (2009) (emphasizing the appropriateness of a market power requirement in analyzing vertical restraints); cf. Jeffrey Jarosch, *Novel "Neutrality" Claims against Internet Platforms: A Reasonable Framework for Initial Scrutiny*, 59 CLEV. ST. L. REV. 537, 543 (2011) (discussing role of market power in claims against closed Internet platforms such as Apple's App Store).

[172] See, e.g., Odlyzko et al., *supra* note 10, at 32-33 (noting estimates about fixed broadband concentration and difficulty of entry).

[173] J. Gregory Sidak and David J. Teece, *Innovation Spillovers and the "Dirt Road" Fallacy: The Intellectual Bankruptcy of Banning Optimal Transactions for Enhanced Delivery over the Internet*, 6 J. COMP. L. & ECON. 521, 526 (2010). Sidak and Teece cite several studies filed before the Federal Communications Commission in the net neutrality proceeding, including filings from Michael and one from Gary Becker and Dennis Carlton. See *id.* at 526 n.33.

[174] Federal Communications Commission, *Connecting America: The National Broadband Plan*, at 37 (2010). The Commission notes that it lacks the granularity of price and performance data needed to determine if two providers compete head-to-head throughout each census tract. *Id.*

[175] Susan P. Crawford, *The Looming Cable Monopoly*, 29 YALE L. & POL. REV. INTER ALIA 34, 36 (2010). Crawford notes that competition remains more robust where cable companies compete with fiber-based telephone networks such as Verizon's FiOS service. But Verizon has no immediate plans to expand the present FiOS service footprint.

regulated utilities law, has explained that "there is no consensus among economists about the likely sufficiency of competition under duopoly."[176] But Sidak and Teece cite data suggesting annualized churn rates between 29 and 36 percent, which suggests that a sizeable number of customers do change broadband providers each year.[177] AT&T adopted a no-term service contract option in 2008, advertising it as service "without the hassle of a term commitment like those of cable companies."[178] Most of the industry quickly followed suit, which tends to show both that the firms compete and that switching costs are falling. The cable industry's deployment of DOCSIS 3.0 also evinces a desire to gain a competitive edge over Verizon and AT&T, which might not have happened if the companies had market power and thus felt no need to respond to telephone-based competition.

Competition will increase if wireless broadband matures into a legitimate third alternative to fixed broadband providers, just as satellite rose as an intermodal competitor to traditional cable service. Many services available over fixed broadband networks are also available over wireless broadband; the gating factor is the capacity of wireless networks to offer these services at the same scale and speed as today's cable and telephone companies.

Opponents must also show that data caps harm consumers. Netflix can argue, and has argued, that data caps are a threat to its existing business model.[179] But the Supreme Court has repeatedly reminded litigants that the antitrust laws were passed for "the protection of

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[176] Alfred E. Kahn, Comments on FTC Workshop on Broadband Connectivity Competition Policy, February 13, 2007, available at http://www.ftc.gov/opp/workshops/broadband/presentations/kahn.pdf.
[177] Sidak and Teece, *supra* note 173, at 564-65.
[178] AT&T Press Release, Two Years, One Price, No Term Contract: AT&T Introduces New Broadband Plans with Guaranteed Monthly Rate, Press Release, Aug. 20, 2008, available at http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26024; see text accompanying note **Error! Bookmark not defined.**.
[179] See, e.g., David Hyman, Why Bandwidth Pricing Is Anti-Competitive, *Wall Street Journal,* July 11, 2011. Hyman is general counsel for Netflix.

competition, not *competitors*."[180] Like price discrimination, vertical restraints have ambiguous effects on consumer welfare.[181] Some vertical restraints "give rise to competitive foreclosure concerns," but most are procompetitive because they "generate significant efficiencies and enhance consumer welfare."[182] For example, when AT&T entered into an exclusive vertical agreement with Apple to distribute the iPhone, the wireless provider received a significant competitive advantage over Verizon and other competitors.[183] But this was undeniably good for consumers: it woke up a sleepy smartphone market, as AT&T advertised the product for which it paid so dearly, and Verizon began working with Google to develop the rival Android platform as a competitive alternative.

As discussed above, broadband operators can offer several procompetitive justifications for data caps. Caps allow firms to shift more network costs onto heavier users, which can expand service to light users who cannot afford the higher uniform flat rate.[184] And they encourage consumers, content providers, and broadband providers themselves to use network resources more efficiently.[185] As critics point out, caps could also deter customers from canceling cable service in favor of Internet-based video options. This is harmful to that subset of consumers who subscribe to both broadband and cable and would cancel cable but for the data cap. But it could benefit those customers who subscribe only to broadband service: because cable and broadband service share common network costs, a shrinking base of cable subscribers would force the

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[180] Brooke Group Ltd. v. Brown & Williamson Tobacco Corp., 509 U.S. 209, 224 (1993), quoting Brown Shoe Co. v. United States, 370 U.S. 294, 320 (1962).
[181] Thomas W. Hazlett and Joshua D. Wright, *The Law and Economics of Net Neutrality*, 45 IND. L. REV. 767, 798 (2012).
[182] *Id.* at 797.
[183] See *supra* text accompanying notes 29-30.
[184] See *supra* Section II.
[185] See *supra* Section III.

company to recover those costs by raising broadband rates.[186] The net effect of the practice is difficult to determine with certainty, meaning that the anticompetitive case is not as simple or obvious as some critics assert.

Perhaps for this reason, several antitrust scholars have surmised that the Department of Justice is unlikely to find that data caps are anticompetitive. Harry First notes that "all these cable companies are really facing big competition from the telcos" and "if the consumer can just switch, then it's not exclusionary and bad business."[187] Similarly, Herbert Hovenkamp notes that "if it's simply data caps . . . that's a tougher antitrust case to make because public utilities have a legitimate interest in preventing overuse of their assets, particularly if other people's access is being limited as a result . . . There's a legitimate claim on the part of the Internet providers that staged pricing or caps are reasonable."[188] First further explained that the agency's case likely depends on whether it can find evidence of collusion among broadband providers: "if they make these decisions unilaterally about how they're going to price downloading from the Internet individually, that's not going to exclude these Internet rivals."[189] These comments echo the conclusions of a 2007 Federal Trade Commission study, which found that it is "difficult to find evidence that vertical controls reduce welfare" and that "optimal policy places a heavy burden on plaintiffs to show that a restraint is anticompetitive."[190]

This analysis highlights the importance of case-by-case adjudication of allegedly anticompetitive conduct. One cannot say as a general matter that data caps and other forms of

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[186] See George S. Ford, *A Most Egregious Act? The Impact on Consumers of Usage-Based Pricing*, PHOENIX CENTER PERSPECTIVES 12-02 (May 23, 2012). Ford argues that the net effect of charging consumers a fee who switch from cable to Internet-based video services is positive.
[187] Melissa Lipman, DOJ Needs Collusion, Dominance to Make Antitrust Case, *Law360*, June 13, 2012.
[188] *Id.*
[189] *Id.*
[190] See Hazlett and Wright, *supra* note 181, at 815-16; quoting Luke Froeb, Director, Bureau of Econ., Federal Trade Commission, *Economics and Antitrust: Enforcement R&D*, at 23 (Sept. 2, 2005), available at http://www.ftc.gov/speeches/froeb/earie.pdf, and James C. Cooper et al., *Vertical Antitrust Policy as a Problem of Inference*, 23 INT'L J. INDUS. ORG. 639 (2005).

usage-based pricing are inherently anticompetitive. The effect they have on competition turns upon a fact-sensitive inquiry into the broadband provider's market power, and quantification of the impact that the pricing strategy has on different segments of the provider's customer base.

B. The Xfinity-Xbox Dispute

First and Hovenkamp suggested that the Justice Department may have an easier time challenging Comcast's specific practice of exempting Xfinity app use from its data cap when watched through the Xbox video game console, while subjecting Netflix and other like services to the normally applied data cap.[191] Their conclusions stem from Attorney General Eric Holder's congressional testimony suggesting that this practice may violate a condition that the Justice Department placed upon Comcast's 2011 merger with NBC Universal.[192] First wondered if the general investigation "was generated out of a concern that Comcast is violating the decree they entered into."[193]

But setting aside any special provisions attached to the Comcast merger, it is unlikely that the Xbox issue actually violates general antitrust principles. Comcast offers a service known as Xfinity On Demand, which is available for Xfinity cable subscribers to watch on television using a traditional cable box.[194] Customers who subscribe to both Xfinity cable service and Comcast broadband service may also access Xfinity On Demand using the Xfinity App on Microsoft's Xbox 360 video game console, which is connected to the television and the Internet. When a customer chooses to access Xfinity On Demand via the Xfinity App, the data used to view the service is exempt from the customer's monthly cap—even though other content viewed through the Xbox, such as Netflix, continues to count against the cap.

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191 Lipman, *supra* note 187.
192 *Id.*
193 *Id.*
194 See Tony Werner, The Facts about Xfinity TV and Xbox 360: Comcast Is Not Prioritizing, available at http://blog.comcast.com/2012/05/the-facts-about-xfinity-tv-and-xbox-360-comcast-is-not-prioritizing.html.

Although at first blush this arrangement appears discriminatory, it is hard to show any consumer harm because of the way the offer is structured. The exemption flows from Microsoft's ongoing efforts to market the Xbox as an alternative to a traditional cable set-top box. The Xfinity App is only available to customers who subscribe to Comcast's cable service, and the exemption only applies when the customer views Xfinity On Demand content on the customer's television through the Xbox. Accessing the Xfinity App on a computer or tablet would incur data use subject to the cap. Ultimately, this means only that existing Xfinity cable customers are free to use an Xbox in lieu of a traditional cable box to view On Demand content. Netflix may complain that the exemption leads Comcast customers to watch Xfinity rather than Netflix content using the Xbox, because Xfinity content does not incur data charges. But importantly, a customer may already do this regardless of the exemption, simply by tuning in to traditional cable.

From the consumer's standpoint, therefore, the exemption is merely a matter of convenience. Traditional cable consumption on television does not count toward monthly data limits, and no one seems to be suggesting that it should. The Xbox exemption merely allows customers to watch traditional cable consumption on television using the Xbox rather than a traditional set-top box as the conduit. This innovation is proconsumer, in that it gives consumers a choice of receivers for their television and perhaps allows some consumers to avoid Comcast's monthly set-top box rental fees. But it should have little effect on a consumer's marginal choice to watch Xfinity or Netflix content, because the consumer already gets cap-exempt Xfinity programming through the cable system. Thus, while at first blush this dispute looks like an example of the potential ills of data caps, ultimately the issue does little to undermine the potential benefits of experimenting with various forms of usage-based pricing.

C. Data Caps and Market Power

The antitrust analysis of data caps in Section IV.A suggests that critics' opposition to data caps is somewhat misplaced. The real threat to consumer welfare is not usage-based pricing, but market power. After all, a firm with market power can exploit consumers whether it relies on usage-based pricing or flat-rate pricing. A broadband provider with market power that wishes to offset lost cable revenue through additional broadband revenue need not use data caps to deter or punish video cord-cutters. It could simply raise standalone flat-rate broadband prices to punish those who do not also purchase cable service. And any broadband provider lacking market power could not gouge customers under either scenario, because affected consumers would simply take their business elsewhere.

As the Commission noted, vertically integrated firms often have incentives to leverage power in one market to improve their position in another market. The Madison River investigation is a testament to this possibility. Madison River Communications paid a $15,000 fine to the Commission in 2005 to settle allegations that it blocked third-party Voice-over-Internet-Protocol (VoIP) services from operating on its network, because these VoIP services competed against Madison River's traditional telephone network.[195] Regulators should remain vigilant with regard to potentially anticompetitive conduct, but they should also heed antitrust law's lesson that many vertical restraints are procompetitive, and absent market power, consumers can punish those that are not without help from the Justice Department.

Therefore, while there are risks that usage-based pricing can become a tool for anticompetitive conduct, this does not undermine the potential benefits of allowing firms to experiment with the practice. There may be significant consumer benefits that flow from data caps and other forms of usage-based pricing. And when a pricing change adversely affects

[195] *Madison River Communications, LLC and Affiliated Companies*, Consent Decree, 20 FCC Rcd. 4295 (EB 2005).

consumers, usually they can punish this behavior by switching providers. Regulatory enforcement should usually step in only if a company has wielded market power in a way that causes actual harm to consumers. As a result, any enforcement should take the form of ex post adjudication of specific harmful conduct, rather than ex ante prohibitions on pricing tools that help broadband providers improve the efficiency of the network.

V. The Importance of Transparency

To temper the concerns addressed above, and alleviate the concerns of both critics and consumers about the introduction and use of data caps, providers should clearly communicate to the public any changes in practices. On a basic level, this transparency is mandated by the Federal Communications Commission's Open Internet Order. The order requires that

> a person engaged in the provision of broadband Internet access service shall publicly disclose accurate information regarding the network management practices, performance, and commercial terms of its broadband Internet access services sufficient for consumers to make informed choices regarding use of such services and for content, application, service, and device providers to develop, market, and maintain Internet offerings.[196]

Clear disclosure of a firm's network management practices, including its billing practices, is an integral component of robust competition.[197] Customers can compare different broadband providers only if they have an accurate description of each firm's value proposition. Clear disclosure also puts content and application providers on notice of potential ways that these practices affect their customers' behavior, so they can adjust their business models accordingly.[198]

But disclosure of billing terms is not the only way the firm should communicate its plans to consumers. As Odlyzko notes, consumers prefer flat rates to metered rates, in part because

[196] In re Preserving the Open Internet: Broadband Industry Practices, 25 FCC Rcd. 17905, 17937 ¶ 54 (2010).
[197] *Id.* at 17936.
[198] *Id.*

they tend to overestimate their monthly data consumption and because of the mental transaction costs of making decisions under a metered regime.[199] Unlike minutes on a long-distance plan, megabytes are difficult units for consumers to conceptualize. But to achieve efficiency gains from usage-based pricing, a network provider must assure that its users generally understand how much data each online transaction consumes. To migrate successfully to usage-based prices without adversely affecting its reputation with customers, the provider should take steps to correct this overestimation and convince users that they are better off with usage-based pricing.

Graber suggests sending customers a bill comparing their flat-rate pricing with a hypothetical usage-based bill that shows both total use and potential savings under the new plan.[200] Providers might also circulate fliers on a regular basis noting the average amount of data consumed by popular activities, like Comcast did when it first adopted a data cap in 2008. As data consumption enters the zeitgeist, Internet content and application providers may also meet consumer demand by providing estimates of how much data individual actions might consume. Application developers in Apple's App Store and the Google Play Store routinely say how large each application is, so the consumer understands how much storage space the program will consume on the consumer's device. The market for Internet content and applications may ultimately evolve to provide similar information about consumption when possible.

Finally, providers need to make it easy for consumers to check their monthly data use. Most providers that have adopted usage-based pricing already make this information readily available to consumers through an application on the consumer's device or a web-based interface. Many also provide emails or text messages warning customers when monthly use begins to approach certain limits (such as a data cap). The prevalence of these tools shows that

[199] Odlyzko et al., *supra* note 10, at 44; see also Graber, *supra* note 132, at 41.
[200] Graber, *supra* note 132, at 41.

they are both feasible to provide and popular with consumers. Any firm considering usage-based pricing should make them available to consumers once the transition is complete.

VI. Conclusion

Ultimately, data caps and other pricing strategies are ways that broadband companies can distinguish themselves from one another to achieve a competitive advantage in the marketplace. When firms experiment with different business models, they can tailor services to niche audiences whose interests are inadequately satisfied by a one-size-fits-all flat-rate plan. Absent anticompetitive concerns, public policy should encourage companies to experiment with different pricing models as a way to compete against one another.

As Christopher Yoo has noted, the trend toward more experimentation with different pricing and business models in telecommunications mirrors a greater trend toward experimentation and ex post oversight in antitrust law generally. Usage-based pricing can be a useful tool for broadband providers to create differentiation in the marketplace by spreading network costs in new ways and can promote greater efficiency by consumers, content providers, and the network operator itself. Only through experimentation and empirical measurement will providers find the optimal pricing solution—which may vary dramatically by network. Regulators have correctly rejected the call to interfere with this pricing flexibility absent a showing of market failure and consumer harm. The newest move to data caps should not provide the impetus to deviate from that reasoned stance.