

**THE ECONOMICS OF DATA CAPS AND FREE DATA SERVICES IN MOBILE
BROADBAND**

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by
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I. INTRODUCTION

This paper provides an analysis of the economic effects of two related pricing practices commonly employed by providers of mobile broadband services that are often referred to as data caps and free data services.¹ For reasons explained below, I believe that these practices largely represent efficient carrier responses to competitive pressures, technical realities, and consumer preferences, and should be trusted over the predictive judgements of regulators when it comes to maximizing consumer welfare. Proposals to ban or severely restrict the use of data caps or free data plans would essentially amount to the imposition of a form of price regulation on a well-functioning competitively vibrant industry, and would do more harm than good.

A pricing plan between a mobile broadband provider and a subscriber is said to employ a “data cap” if the subscriber pays a fixed monthly fee for the right to have the network transmit up to a fixed amount of data per month. Depending on the plan, users who want additional data above that fixed amount during the month have the option of either buying additional blocks of data and continuing to use the network as usual or, in some cases, being allowed to use the network without purchasing any additional blocks of data but being subject to reduced performance during periods of congestion.

A pricing plan is said to offer “free data services” if the data arriving from certain content providers is not counted against the data cap. If the content provider pays a fee to the mobile provider in return for having its data included as a free service to subscribers, this is typically referred to as a “sponsored free data service.” If no payment is made, this can similarly be referred to as a “non-sponsored free data service.” Even for the case of non-sponsored free data services, there is still typically a contractual arrangement between the mobile provider and content provider

¹Another term often used to refer to free data services is zero rating.

where the content provider agrees to satisfy certain technical conditions in return for having its data be provided as a free service to subscribers.

Government regulators, industry participants, consumer advocates, academics and the policy community have engaged in a vigorous debate over the impact these practices have on subscribers and whether or not it would be desirable for government to regulate or ban their use.² This paper provides an economic analysis of the issues that have been raised in this debate and draws two main conclusions.

First, the concerns of critics of these practices are largely misplaced and misdirected because they ignore the fact that the mobile broadband industry in the United States is highly competitive with four large national providers engaged in vigorous head-to-head competition with one another over price levels, pricing structures and the quality and variety of services they offer. Proposals to severely restrict or ban the use of data caps and/or free data service essentially amount to proposals to impose extensive and intrusive price regulation on a competitive market. In a competitive market, rate regulation is a poor substitute for open competition, as regulators have no advantage over competitors themselves in determining subscriber preferences; and while regulations tend to lock existing business practices into place for an extended period, unregulated competitors can respond quickly to each other's competitive forays with new offerings of the type that would be discouraged or banned under prescriptive regulation. Consistent with what would be expected in a competitive market, the four national wireless carriers have indeed taken different

²See, for example, Bergmayer (2015), Brake (2016), Eisenach (2015), GAO (2014), Hussain, Kehl, Lennett and Lucey (2012), Katz (2014), Kehl and Lucey (2015), Lerner (2014), Lerner and Ordovery (2015), Lyons (2013, 2015, 2016), Malcom, McSherry and Walsh (2016), Multicultural Media Telecom and Internet Council (MMTC) (2016), Odlyzko, St. Arnaud, Stallman and Weinberg (2012), Open Internet Advisory Committee (2013), Weinberg (2014), Wood (2016), van Schewick (2016), and Yoo (2006).

approaches, providing new options and choices for consumers.

Critics of data caps argue that these arrangements allow broadband providers to earn excessive profits by allowing them to create artificial scarcity where no real scarcity exists. Critics of free data services observe that these arrangements violate some expanded notions of net neutrality. As will be explained in detail below, the potential concerns that critics have raised with these practices are not significant in competitive markets, and the proposed regulation would risk a reduction in consumer welfare.

The chairman of the FCC has expressed a strong preference for relying on competition to protect consumers and make resource allocation decisions in markets where sufficient competition exists and I agree with this policy.³ The level of competition in wireless broadband, with four vigorous and robust competitors engaged in intense rivalry over both pricing and service plans, is as high or higher than the level of competition that exists in many other modern markets where prices are not regulated and we rely on competition to determine prices. For example, even though the FCC has the legal authority to regulate pay-TV pricing, it largely defers from doing so even though a typical consumer has three choices of pay-TV provider available, and in rarer circumstances perhaps four - the incumbent cable provider, the incumbent telco and the two DBS providers. Last year, the FCC found that cable operators are subject to “competing provider effective competition,” citing in part the fact that “[a]pproximately 99.7 percent of homes in the U.S. have access to at least three MVPDs, and nearly 35 percent have access to at least four

³See Wheeler (2013), page 4. “If the facts and data determine that a market is competitive, the need for FCC intervention decreases. I have zero interest in imposing new regulations on a competitive market just because we can. I have repeatedly advocated the ‘see-saw’ rule - that when competition is high, regulation can be low.”

MVPDs.”⁴

Historically, one could interpret the FCC as having recognized that there is no need for extensive price regulation in an industry as competitive as the mobile broadband industry, since it has largely refrained from exercising any regulatory control over retail prices in this industry. Taking steps to limit and control the type of pricing plans that mobile carriers are allowed to experiment with and offer to their retail subscribers would set a dangerous and unwise precedent in the other direction and be inconsistent with the FCC Chairman’s expressed preference for relying on competition to extent possible as well as with the FCC’s treatment of the pay-TV industry.

Second, data caps and free data plans help mobile broadband providers accomplish important economic functions that improve efficiency and benefit their subscribers. In particular, they help firms ration scarce capacity and manage congestion; they provide subscribers with incentives to use existing capacity efficiently; they provide content providers with an incentive to consider the impact on the underlying network of data-intensive services; and they allow mobile providers to expand the market they serve by offering consumers a range of plans at different prices. The fact that the marketplace is highly competitive guarantees that any efficiencies that are created will largely flow back to subscribers.

It bears noting in this regard that three of the nationwide carriers do offer some form of unlimited usage plans, complementing capped plans offered at lower prices.⁵ Were data caps eliminated, presumably only higher priced unlimited plans would remain, likely pricing some consumers out of the market, particularly low-income consumers who rely disproportionately on

⁴See FCC (2015b), at para. 4.

⁵See section II.A.

mobile services for their broadband needs.⁶

How to design the most efficient possible pricing structure, taking into account factors such as the transactions costs and technical feasibility of monitoring usage and congestion levels, the transactions costs and technical feasibility of transmitting real time information to subscribers and consumer preferences for simple pricing plans, is a complex problem best left to competing firms to experiment with in an industry as competitive as the mobile broadband industry. Again, government regulators have no comparative advantage in solving this problem and there is no good rationale for second-guessing pricing structure decisions that are the outcome of vigorous competition between multiple firms.

The paper is organized as follows. Section 2 begins with a short description of the manner in which mobile broadband providers currently employ data caps and free data services in their pricing structures. Section 3 provides a description of the competitive environment in mobile broadband. Then Sections 4 and 5 consider, respectively, data caps and free data services. These sections explain that the presence of significant levels of competition in wireless broadband markets greatly reduces the concerns of critics of these two practices, and also explain that both practices perform useful economic functions that benefit consumers. Section 6 draws a brief conclusion.

2. CURRENT USE OF DATA CAPS AND FREE DATA SERVICES

A. Data Caps

Prior to the introduction of smartphones, mobile broadband subscribers were relatively

⁶ See Horrigan and Duggan (2015) and McHenry (2016), which both report that African American and low income households rely on wireless broadband for their only broadband connection at much higher rates than the population as a whole.

light users of data, and most mobile broadband providers, including the top four national providers - Verizon, AT&T, T-Mobile and Sprint - offered primarily unlimited data plans where subscribers paid a fixed monthly fee for service and were not subject to data caps.

However, things changed with the advent of the smartphone. Dramatically increased demand for data by smartphone users began to result in severe congestion problems, especially in some major urban areas, and carriers responded by introducing plans with data caps. AT&T led the wave of adoption of smartphones by becoming the exclusive provider of the iPhone in 2007 and, after data traffic rose “nearly 5,000 percent” in three years,⁷ became the first provider to introduce data caps in December 2010. As of December 2010, AT&T ceased offering any unlimited data plan to new customers and instead offered a number of different plans with different data caps, although it allowed existing customers to continue with legacy unlimited plans.⁸ Verizon followed suit in July of 2011.⁹ Both AT&T and Verizon offered various incentives to their subscribers under existing legacy unlimited plans to switch to plans with caps.¹⁰ T-Mobile and Sprint also began offering plans with data caps 2011, but unlike AT&T and Verizon,

⁷See Paczkowski (2009).

⁸See CNN(2010). Also see Dano (2016) which states that AT&T “discontinued offering unlimited data plans to new customers in 2010. The move was largely seen as a reaction to the increasing demands for data among the carrier’s iPhone customer base – at that time, AT&T was still the exclusive provider of the iPhone in the United States, and the operator fell under withering criticism that its network was not able to support the growing demand for data among its customers. AT&T replaced its unlimited plans with tiered data usage options geared toward preventing customers from using large amounts of data.”

⁹See Sandborne (2011).

¹⁰See Pagliery (2015). Fierce Wireless (2015) reports that fewer than 1% of Verizon’s customers remain on legacy unlimited plans.

continued to offer and actively market unlimited plans to new subscribers as well.¹¹

Recently AT&T began offering unlimited plans to subscribers that purchase AT&T mobile service bundled with DirecTV service.¹² However, other than this minor exception, AT&T and Verizon never began offering unlimited data plans to customers once they were withdrawn in the 2010-11 time period. One recent study reports that in the sample it studied that 27% of subscribers subscribed to unlimited plans with the other 73% subscribing to limited plans.¹³ The subscribers to unlimited plans constitute a mixture of T-Mobile and Sprint customers as well as AT&T and Verizon customers that still subscribe to legacy unlimited plans from these carriers dating from the pre 2010-11 period when they offered these plans to new subscribers.

B. Free Data Services

T-Mobile has been an industry leader in introducing free data services into the U. S. mobile broadband market, introducing a free data service for steaming music in 2014 called Music Freedom and introducing a free service for streaming video in 2015 called Binge On. Both programs have a relatively similar structure in that they are non-sponsored¹⁴ and are generally open to all providers on the same terms and conditions.

Since Binge On is the most significant program of the two, it will be described in somewhat more detail.¹⁵ The Binge On service is made available to all T-Mobile subscribers

¹¹See Tsukayama (2011) and Sprint (2011).

¹²See Dano (2016).

¹³See Cisco (2016), page 31.

¹⁴T-Mobile does not charge content providers to have their content included in the free data service. Rather content providers simply must satisfy certain technical conditions such as, for example, delivering the content in such a way that T-Mobile can identify it

¹⁵See T-Mobile (2016a) for a more detailed description of the Binge On program rule for

that subscribe to plans providing 3 GB or more of data per month. At any instant in time, a subscriber can enable or disable the Binge On feature. When the feature is enabled, the video delivered by all content providers participating in the Binge On program does not count against the subscriber's data cap. T-Mobile also reduces the resolution of high definition video signals of participating content providers to reduce the data content that must be transmitted to about one-third of its original requirements. T-Mobile notes that mobile screens are small enough that the visual difference in resolution to mobile viewers is imperceptible, meaning the only difference to consumers is an increase in the number of hours of video that can be viewed at the same price as before.¹⁶ When the Binge On feature is not enabled, T-Mobile transmits all video at the resolution that it receives it at, but the data counts against the subscriber's data cap. T-Mobile reports that the service has been extremely successful both in attracting content providers to enroll in the program and in its popularity and use with subscribers. More than 100 content providers have enrolled in the program representing more than 70% of all video T-Mobile customers watch. Customers on qualified limited plans are reportedly watching twice as many video hours per day.¹⁷

Although T-Mobile's free data plan for video has been the most significant such plan introduced in the United States to date, AT&T was actually the first of the four major mobile broadband providers to introduce such a plan. Its plan, which it simply calls Sponsored Data, was introduced in January 2014. As its name suggests, it is a sponsored free data plan, i.e., content providers directly pay AT&T to have their content included as a free service. Thus far only a few

subscribers and T-Mobile (2016b) for a detailed description of the arrangements that T-Mobile makes with content providers that wish to join the Binge-On program.

¹⁶See Wagner (2016).

¹⁷See T-Mobile (2016c) and T-Mobile(2016d).

advertisers have participated in the plan, but it has been reported that AT&T is considering expanding the plan to include more video content, including possibly content from DirecTV.¹⁸

Verizon introduced its own sponsored free data plan called FreeBee Data in January 2016.¹⁹ As with AT&T, the service is a sponsored service (i.e., content providers are charged a fee to have their data included as a free service) and it is aimed towards advertisers as well as video providers. Although FreeBee's content is currently not as expansive as that offered under the BingeOn program, Verizon lists its own affiliate AOL as a participant in the program as well as its own streaming video service called go90.²⁰

Finally, Sprint offered free data streaming of the Copa America Centenario soccer tournament on a free 60-day trial basis to subscribers.²¹ Based on press reports, it is not clear if this arrangement was sponsored or non-sponsored.

In summary, although T-Mobile is the only major national mobile provider that currently offers a significant free data service that has already had a big impact on the market, all four providers have launched free data services and are clearly actively exploring further possibilities. Therefore it seems likely that significant new developments in free data services will occur over the next few years so long as the FCC does not take measures that restrict or prohibit such innovation from taking place.²²

¹⁸See Wood (2016).

¹⁹See Baumgartner (2016).

²⁰See Wood (2016) and Verizon(2016).

²¹See Brodtkin (2016) and Gibbs (2016).

²²A related innovation in this space is known as "earned data," a type of free data service that allows consumers to earn data for general use if they sign up for certain services, view certain advertisements or download particular apps.

3. THERE ARE HIGH LEVELS OF COMPETITION IN THE MOBILE BROADBAND INDUSTRY

A. Four Robust Competitive Alternatives Are Available to Most Consumers of Mobile Broadband Services

The United States is in the very fortunate position of having four robust mobile carriers - Verizon, AT&T, T-Mobile and Sprint - that can be described as being national in the sense that they each provide coverage over almost all of the United States. While Verizon and AT&T are larger than T-Mobile and Sprint,²³ T-Mobile and Sprint are both serious well-financed competitors with significant market shares. All four of these providers each provide coverage over most of the United States and further competition is provided by the dozens of other smaller facilities-based carriers who serve millions of additional customers in many regions of the country.²⁴ This means that most people in the United States live in areas served by at least four mobile providers. As of December 2014, the percentage of the U.S. population living in census blocks served by at least four (three, two) mobile providers of LTE mobile broadband service was 82.5%, (91.5%, 97.8%).²⁵ Furthermore, since the nationwide mobile carriers sell their services through nationally marketed plans available at the same price over the entire country, even areas with fewer than four providers will experience the same beneficial effects of competition as areas with all four competitors, because providers will be choosing prices to offer at the national level taking into account the fact that the vast majority of their customers have at least four alternatives.

²³Market shares at the end of 2Q 2015 based on revenues were: Verizon (38.1%), AT&T (32.6%), Sprint (14.1%) and T-Mobile (13.2%). See FCC(2015a), Table II.C.2, page 15.

²⁴See FCC(2015a), Table II.C.1 and Table II.C.2, page 15.

²⁵See FCC(2015a), Chart III.A.2, page 26 and Chart III.A.3, page 28.

B. There are High Levels of Price and Non-Price Rivalry in the Mobile Broadband Industry

It is widely recognized that the mobile broadband industry is characterized by a high level of rivalry between providers, where firms are continually introducing price reductions, changes in pricing plans, changes in other aspects of the contractual terms and new products and features in an attempt to lure customers away from one another. Advertising is intense and a wide variety of web sites and publications by third parties provide excellent information on prices and network quality and service quality.

A period of particularly intense rivalry has emerged beginning in 2013 when T-Mobile began introducing a series of innovations in contract structures and pricing schemes which it branded as its “Uncarrier” initiative. Besides introducing aggressive price cuts, family data plans, and free international roaming, it dropped the requirement that subscribers sign long term contracts and began offering to reimburse customers of other plans for their early termination fees (ETF) if they switched from some other carrier to T-Mobile. The other carriers responded with similar initiatives aimed not only at T-Mobile but at one another, that has led to a three year period of intense competition involving price cuts and innovations in service plans and pricing structures.²⁶

²⁶See, for example, Bank of America Merrill Lynch (2014), page 3, which states “U.S. wireless carriers have implemented more than 20 pricing and promotional changes since June, 2014. The moves reflect the intersection of T-Mobile and Sprint’s initiatives to gain or sustain subscriber momentum after years of losses, and AT&T and Verizon’s efforts to hold share and keep churn low.” See FCC (2015a), paras. 74-81 for a detailed description of rivalrous behavior during the 2014-2015 time-period. Also see Lerner (2014), pages 28-30 and Lerner and Ordovery (2015), pages 6-10 for further documentation of rivalrous behavior.

C. Competition Between Providers Has Resulted in the Elimination of Long Term Contracts Which Will Further Intensify Competition and Benefit Consumers in Other Ways

As mentioned above, one of the innovations introduced by T-Mobile was to depart from the wireless industry's traditional practice of bundling mobile phones with two-year service contracts with early termination fees. Consumer advocate groups and others have complained that this use of long term contracts decreased competition in the industry by increasing switching costs of subscribers and also by generally making pricing less transparent. T-Mobile also placed additional pressure on its rivals by offering to reimburse subscribers switching from other networks for their early termination fees. Other carriers were forced to follow suit to retain customers and by the end of 2015 none of the four major carriers any longer offered long term contracts and all four carriers were offering to pay the early termination fees of switching consumers. Although some legacy long term contracts are still in force, these will gradually expire over next year or so.²⁷ Carriers still offer installment plans for subscribers to purchase phones but the installment payment is a separate line item that ends when the phone is paid for. Subscribers also have the option of purchasing their phone outright from their mobile provider or providing their own phone from another source.

The main impact of this change has been and will continue to be to increase competition between providers by reducing switching costs. However it also benefits consumers by generally making pricing more transparent, making it more clear exactly what consumers are buying and what they are paying for, and increasing consumers' options to only buy exactly what they want. For example, under traditional arrangements where service prices were set higher to implicitly cover the cost the phone, most carriers did not lower the service price once the two-year period was

²⁷See Goldman(2015b, c), Chokkattu (2016) and Dellinger (2016).

up and the phone was paid for, although subscribers did have the option of upgrading to a new phone at that point. The Wall Street Journal reports that now that subscribers either purchase their phones outright or make installment payments that end once the phone is paid off, they are tending to hold their phones longer.²⁸ That is, when faced with the real price of purchasing a new phone, consumers have decided that it makes more sense to hold on to their existing phone for a longer period of time. This pro-consumer change was the result of allowing carriers to compete with one another by experimenting with different pricing structures. Besides being an example of the high level of pro-consumer rivalry and competition occurring in this industry, it provides an excellent example of the sort of pricing innovations that might be throttled if government regulators begin to more closely regulate the type of pricing structures that mobile carriers are and are not allowed to offer.

D. High Levels of Churn Are Consistent with High Levels of Rivalry and Low Switching Costs

Wireless customers are generally satisfied with their service. For example, one survey finds that more than nine in ten consumers report being satisfied or very satisfied with their wireless service.²⁹ Nonetheless rates of churn in the wireless industry are relatively high. Rather than indicating customer dissatisfaction, these high churn rates are best explained as being the natural outcome of the high level of ongoing rivalry and innovation occurring in this industry together with the fact that switching costs for consumers are fairly low. Low switching costs are one of the underlying structural conditions that support a high level of competitive rivalry between providers.

²⁸See Gryta (2016).

²⁹See ACTwireless (2014).

The average monthly industry churn rates from the first quarter of 2012 to the second quarter of 2015 have ranged between 1.44 percent and 1.85 percent.³⁰ This means that the average provider has lost between 17 percent and 22 percent of its customers each year over this time period. It should also be noted that, since all four national carriers serve almost all areas of the United States, customers generally do not have to change providers when they move. Therefore these churn numbers are not artificially inflated by customers that move and are forced to change their service because their old provider no longer serves their new location. Also it is important to note that these churn rates were generated over a period when most subscribers were still under long term contracts which created an extra switching cost. It is reasonable to expect that churn rates will rise even higher in the future now that long term contracts are being phased out. Finally, another development that promises to further reduce switching costs in the future is that, beginning with 4G LTE mobile technologies, the extent to which cell phones are incompatible across different providers' systems (because of the incompatibility of CDMA and GSM technologies employed to provide previous generations of service) will be reduced so that consumers will be less likely to have to purchase a new phone when they switch providers.³¹

³⁰See FCC (2015a), para. 20.

³¹See Reardon (2014),

4. DATA CAPS DO NOT RESULT IN EXCESS PROFITS AND CREATE BENEFITS FOR SUBSCRIBERS

A. Regulating Data Caps to Attempt to Indirectly Regulate Price and Profit Levels is Neither Necessary nor Appropriate in an Industry as Competitive as the Mobile Broadband Industry

Critics of data caps argue that they allow broadband providers to earn excessive profits.³²

They believe that restricting the use of data caps could therefore serve as a form of price regulation that would keep over-all price levels lower and reduce firms' profits.

This simplistic argument fails to take the effects of competition into account. While allowing an unregulated monopolist to price discriminate³³ will generally allow the monopolist to earn higher profits, this is not true in a competitive industry. In a competitive industry, if one firm identifies a pricing structure that allows it to earn excessive profits then it will find itself undercut by other firms. Thus, while allowing firms to use data caps or more generally to engage in any form of price discrimination will change the over-all structure of prices that different consumers face and will likely result in different consumption patterns among consumers, there is no reason to believe that it will result in over-all excessive profits. Furthermore, to the extent that price caps increase efficiency by allowing firms to manage congestion better, provide better incentives for content providers or subscribers to efficiently use existing capacity or allow firms to serve more customers, these efficiency gains will be largely passed through to subscribers.

From an economic point of view, all firms in a competitive market will have a short-run

³²See Kehl and Lucy (2015), page 3, Hussain, Kehl, Lennett and Lucey (2012), page 1, and Bergmayer (2015).

³³Economists use the term "price discrimination" very generally to describe any pricing structure where a firm offers a menu of different qualities or quantities of a product at different prices in an attempt to charge higher prices to consumers with higher willingnesses to pay, but still earn some profit from consumers with lower willingnesses to pay by selling them lower quantities or qualities of the product at a lower price. Under this definition, data caps are a type of price discrimination.

incentive to find more efficient pricing structures because in the short run this will allow them to earn extra profits. However, in the longer run profits will be competed back down and consumers will be the beneficiaries. Price discrimination of various forms is very common in many competitive markets and economists generally view this as a desirable practice that likely increases total consumer welfare.

B. Data Caps Help Manage Congestion and Ration Scarce Capacity and Provide Incentives for Content Providers and Subscribers to Use the Network Efficiently

Given current technology and given the limited amount of spectrum that is available, it is completely clear that demand for mobile data transmission would vastly exceed the available supply if all current subscribers to mobile broadband were enrolled in completely unlimited plans under which they paid a fixed fee for monthly service with no data cap or limits of any sort. Thus there is a sense in which some form of usage-based pricing that impacts a substantial share of customers is necessary to manage congestion in the mobile broadband industry.

Most current wireless subscribers subscribe to plans with data caps. Furthermore, even the unlimited plans currently offered by some mobile providers begin reducing the download speed of subscribers during periods of congestion once they reach a level of about 22- 23 GB of usage in any given month and also place limits on the extent to which subscribers can tether laptops to their mobile devices.³⁴ As a result mobile subscribers generally limit their use of

³⁴See Goldman (2015a). I do not mean to suggest or imply that there is any “problem” with the fact that carriers impose some restrictions on data use even on unlimited plans. Quite the reverse, as will be discussed below, I believe that demand would completely overwhelm available supply in the complete absence of any restrictions at all on data usage and that both the restrictions in place on unlimited plans and the presence of limited plans that place even more restrictive limits on data usage (in return for charging lower prices) play an essential role in managing congestion, rationing existing scarce capacity and providing incentives for subscribers and content providers to use the network efficiently.

mobile devices to some extent and also attempt to offload their usage to WiFi whenever possible. Notwithstanding constraints such as these, Americans' mobile wireless data usage in 2015 was double that of 2014, three times that of 2013, and 25 times that of 2010.³⁵ If all these constraints on mobile usage were removed and all subscribers had access to unlimited amounts 4G service at a fixed price, or even if all wireless broadband users were switched to the sorts of unlimited plans that are currently offered by carriers that place more modest restrictions on data usage, it seems clear that wireless usage would grow enormously.

The FCC reports that the amount of data generated by mobile devices that is offloaded to WiFi may be four times as large as the amount of data generated by mobile devices that stays on mobile networks.³⁶ This means that if subscribers no longer had any incentive to offload data to WiFi and instead placed all of this traffic directly on the mobile networks of their providers, mobile traffic would immediately grow to be five times as large. Even this may be a radical underestimate of the potential demand for data transmission if all current mobile subscribers were enrolled in unlimited data plans with no limits of any sort. Under this scenario, subscribers would be able to use wireless broadband service for any task they currently used wired service for at no additional cost. The FCC reports that typical wireless usage is 1.9 GB per month while typical fixed broadband usage is 57.4 GB per month.³⁷ If mobile subscribers transferred all of their current use of fixed broadband to mobile broadband this means that data usage would increase by approximately thirty times!

Notwithstanding wireless carriers' capital investments of \$177 billion over the last six

³⁵See CTIA(2016b).

³⁶See FCC (2016), note 117, page 17.

³⁷See FCC (2016), para. 37, page 17.

years,³⁸ a government policy that completely banned the use of data caps by wireless broadband providers could overwhelm wireless networks with vastly more traffic than they could handle and would, in any event, reduce utility for all users. If mobile providers kept prices low enough so that most current subscribers stayed connected to the network, there would very likely be massive amounts of congestion that would make the network essentially unusable for significant fractions of the day in significant fractions of the country. If mobile providers raised prices high enough to reduce congestion to more manageable levels, this would mean that a significant share of U. S. consumers that currently subscribe to mobile broadband service would be priced out of the market. These consumers would clearly be worse off. Low income consumers, who disproportionately rely on wireless service for their broadband needs,³⁹ could be especially hard hit.

Even many consumers that were not priced out of the market would also likely be worse off. Some consumers that formerly subscribed to low price limited plans but switched to higher price unlimited plans when the limited plans were no longer available would still prefer to subscribe to their original plans if these were available. Furthermore, and perhaps even more importantly, at the prices that mobile broadband providers would set under the new regime it is likely that there would be significantly more congestion than currently exists and this would make all subscribers worse off.⁴⁰

³⁸This figure is in constant 2016 dollars and excludes the cost of spectrum bought from the government. See CTIA (2016), at page 60.

³⁹See Horrigan and Duggan (2015) and McHenry (2016), which both report that African American and low income households rely on wireless broadband for their only broadband connection at much higher rates than the population as a whole.

⁴⁰By limiting mobile providers' ability to effectively ration by price, this would likely result in them relying more on rationing by congestion and less on rationing by price which would result in higher equilibrium levels of congestion.

In the current system prices ration usage on two different margins. First, prices prevent some people from subscribing to wireless service at all. However, second, because of usage-based pricing, prices also provide incentives for users that subscribe to the service to limit their usage. The result of this is an efficient pattern of usage where usage is rationed in two different ways. By banning price caps, government would essentially be telling mobile providers that they were no longer allowed to ration usage on the second margin. That is, government would telling mobile providers that they had to provide “all you can eat at a single price” service to all customers. This would result in inefficiencies in much the same way that inefficiencies would result if restaurants were told that they could only offer a single “all you can eat” menu to customers.

Critics of data caps also attempt to cast doubt on whether or not data caps are used to manage congestion by pointing out that data caps are not the theoretical fully efficient pricing system for managing congestion in simple theoretical economic models that ignore real-world factors such as the transactions costs of measuring congestion and usage, the transaction costs of transmitting real time information to subscribers, and subscriber distaste for complex pricing schemes.⁴¹ I certainly agree with the observation that simple theoretical models, which ignore the sorts of real-world factors listed above, predict that more complex pricing schemes could manage congestion more efficiently. Since congestion varies over time and location, it is correct that better incentives to manage congestion could be created if the price a subscriber faced for using the network at any particular time or location better reflected the actual level of congestion existing at that particular time and location, if there were no real-world costs and difficulties created by such

⁴¹See, for example, Hussain, Kehl, Lennt and Luce (2012) at page 3, Kehl and Lucey (2015) at page 1 and Rossini and Moore (2015) at page 6.

schemes. However, I disagree that these models necessarily shed any light on whether or not real-world broadband providers are in fact using the best pricing schemes to manage congestion taking all of these real-world factors into account. Transaction costs do exist and there are technical limitations on the extent to which firms can measure usage and congestion and transmit real time information to subscribers. Just as importantly, a long literature dating back to the cell-phone era reveals that many subscribers have an extremely high distaste for dealing with complexities of any sort in pricing plans and that consumers might ultimately prefer using simple flat rate plans even if more complex plans would allow them to save money or use more data in off-peak periods.⁴² Thus, firms face an extremely complex and challenging problem when they select pricing plans in competition with one another and it is by no means clear that they are not choosing the best pricing structure taking all relevant factors into account.

In addition there may be an element of consumer learning to the entire process which means that we may witness an evolution in pricing structures. For example, firms may have introduced simple “buckets of data” first because this was a very simple concept that was easy to understand that was very analogous to the “buckets of minutes” plans that many providers once offered for mobile telephony. Once consumers get comfortable with this, it may well be that one of the firms will decide to offer a slightly more complex plan that divides the day into peak and off-peak periods and offers unlimited data during off-peak periods with “buckets of data” only applying to peak periods. If this turns out to be successful, then we would expect other firms to adopt similar structures. Thus it may be that plans will grow more complex over time as consumers become more “expert” in understanding and working with such schemes.

⁴²See Yoo (2006), Section III, pages 1863-1873 for a very detailed and thorough review of this literature.

More generally, the fact that choosing pricing schedules to efficiently manage congestion is an extraordinarily complex and difficult problem involving complex technological, economic, and consumer psychology issues, argues even more forcefully for delegating this decision to the firms themselves, that have the information and expertise to make these decisions, and are highly incentivized to make the right decisions by virtue of being locked in head-to-head combat with one another for customers. Government regulators have no comparative advantage in solving this problem and there is no good rationale for second-guessing pricing structure decisions that are the outcome of vigorous competition between multiple firms.

In addition, it is important to note that the price signals sent by data caps do more than simply create incentives for subscribers to use their mobile devices less. As mentioned above, on the subscriber side, subscribers can decide to attempt to offload their traffic to WiFi networks. Consumer demand for WiFi networks in turn creates incentives for commercial firms to provide these networks in order to attract consumers to their locations. In addition, content providers have decisions under their control that can affect the amount of capacity a mobile provider needs to transmit their data, both by adjusting the resolution of their signals and other more complex technical choices. If customers of content providers are subject to data caps, this provides at least a second-hand incentive for content providers to attempt to make these sorts of decisions efficiently in order to keep their customers happy.⁴³ Furthermore, some content providers such as Netflix are apparently beginning to introduce systems that allow their subscribers to directly control the resolution at which video is transmitted, that thus allows them to directly adjust the

⁴³Of course directly charging content providers themselves for the data they generate would provide even stronger and more direct incentives for content providers to make such decisions efficiently. I will return to this point in the next section on free data services since this is precisely what is accomplished by sponsored free data services.

amount of network capacity that they are using in response to usage based pricing.⁴⁴

Finally, although there is very limited publicly available data on the effect of usage-based pricing on actual usage, the limited data that is available suggests that usage-based pricing may have an extremely large effect on the usage patterns of the highest usage subscribers and therefore may have a truly significant impact on congestion. The only such data that I am aware of has recently been reported by Cisco (2016) which reports usage data on a panel of mobile subscribers over the period 2010-2015.⁴⁵ Cisco reports that at the start of the study in January 2010, when essentially all subscribers had unlimited contracts, the top 1% of users accounted for 52% of total data usage while at the end of the study in November 2015, when most subscribers had limited contracts, the top 1% of user accounted for only 7% of total data usage. In November 2015 one would need to include somewhere between the top 10% and top 20% of all users to account for the same share of traffic that the top 1% accounted for in January 2010.⁴⁶ This is an extremely significant change in the pattern of usage and suggests that data caps may have had an extremely significant impact on the usage decisions of the heaviest users.

C. Data Caps Result in Expanded Access to Broadband, Especially for Lower Income Consumers, by Lowering Prices for the Most Price Sensitive Consumers

Mobile broadband is a classic example of an industry with high fixed costs and low marginal costs. This means that, although a for-profit firm needs to recover its fixed costs from

⁴⁴See Selleck (2016).

⁴⁵See Cisco (2016) 31-34.

⁴⁶See Cisco (2016), Figure 32, page 32 which reports that the top 10% of users accounted for 42% of data usage and the top 20% of users accounted for 59% of data usage. Linearly interpolating between these two points, one would need to include the top 16% of all users to account for 52% of all data usage.

subscribers in order to survive and continue in business, it potentially has some freedom in determining how to recover these costs from subscribers. At one extreme a mobile provider could simply sell unlimited access to the network at a fixed price independent of usage and thus recover the same amount of overhead from each subscriber. A fundamental insight from the economics literature is that this type of pricing will necessarily exclude subscribers from the market who value the service at more than the marginal cost of providing it to them and that more consumers could be served and more total social welfare could be generated if some way was found to recover more overhead from subscribers with higher willingness or ability to pay for the service and less overhead from subscribers with lower willingness or ability to pay for the service who would otherwise be excluded from the market. Furthermore, this desirable outcome can be achieved by allowing the firm to engage in usage-based pricing, since it can segment its market and earn higher markups on high-usage plans purchased by consumers with high willingness or ability to pay while earning lower (but still positive) markups on low-usage plans purchased by consumers with low willingness or ability to pay who would have otherwise been excluded from the market.

Thus, even in the absence of the level of competition evidenced in the mobile broadband market, economists believe that it generally may be desirable to allow even an unregulated monopoly provider of a good to engage in usage-based pricing (or that at least economics does not in general provide any support for prohibiting usage-based pricing by an unregulated monopolist). Although the firm would likely earn higher profits by engaging in usage-based pricing, it would also serve a greater fraction of market. Consumers that would otherwise not have been served are clearly better off and it may be that total consumer surplus will increase as well. It is certainly the case that over-all efficiency as measured by the sum of consumer surplus and industry profits will

increase. However, as mentioned above in Section 4.A, the situation of a single monopoly provider is not the situation we face in the case of mobile broadband provision. The mobile broadband industry is highly competitive. This means that a substantial share of any efficiency gains created by usage-based pricing will ultimately flow back to consumers in the form of lower prices.

The discounts that carriers currently offer for plans with lower levels of usage are very significant. For example, T-Mobile currently offers a plan with 2GB of data for \$50 per month while an unlimited plan (which, recall, provides 22-23 GB per month with a separate cap on tethering) costs \$95 per month.⁴⁷ Sprint offers a 3GB plan at a price of \$30 per month and an unlimited plan (which, once again, provides 22-23 GB per month with a separate cap on tethering) for \$75 per month.⁴⁸ AT&T offers a 2 GB per month plan at \$30 per month, while a 20 GB per month plan costs \$140.⁴⁹ Verizon offers a 2 GB per month plan at \$65 per month and a 24 GB per month plan for \$110 per month.⁵⁰ Thus a basic plan offered by each carrier with approximately 2-3 GB per month generally costs half or even less than half as much as a larger plan offering 18-23 GB per month. Both AT&T and Verizon offer plans with even larger data caps that cost considerably more. For example AT&T and Verizon offer a plans with 50 GB per month for,

⁴⁷See <http://www.t-mobile.com/cell-phone-plans.html> accessed August 16, 2016.

⁴⁸See https://www.sprint.com/shop/plan-wall/?ECID=SEM:Google:p:2016_Q3_INC:INC1_RLSA_Prospect_Brand_Plans_Core_BMM:Plan:_sprint_plans:Broad:tfn90009&gclid=Cj0KEQjw88q9BRDB5qLcwLXr7_sBEiQAZsGja038PJ_DLP-ZfDwbKAraOLbaZBHq2JQkrc6CDCKFTDwaAuYs8P8HAQ&gclsrc=aw.ds#!/?plan=individual, accessed August 16, 2016.

⁴⁹See <https://www.att.com/shop/wireless/data-plans.html>, accessed August 16, 2016.

⁵⁰See <http://www.verizonwireless.com/landingpages/verizon-plan/>, accessed August 16, 2016.

respectively, \$375 per month⁵¹ and \$225 per month.⁵² By any measure, basic plans with 2-3 GB per month are offered at truly significant discounts to these plans.

5. FREE DATA SERVICES CREATE NO SIGNIFICANT COMPETITIVE CONCERNS AND BENEFIT SUBSCRIBERS

A. Free Data Services Arrangements Create Powerful and Direct Incentives for Content Providers to Efficiently Use Mobile Capacity

As mentioned in the previous section, content providers have decisions under their control that can affect that amount of capacity a mobile provider needs to transmit their data both by adjusting the resolution of their signals and other more complex technical choices. If customers of content providers are subject to data caps this provides at least a second hand incentive for content providers to attempt to make these sorts of decisions efficiently in order to keep their customers happy. Of course, directly charging content providers themselves for the data they generate would provide even stronger and more direct incentives for content providers to make such decisions efficiently. This is precisely the outcome of sponsored free data services. Content providers directly negotiate payments for data transmission with broadband providers and presumably will be able to negotiate lower prices if their data uses less capacity. Thus the incentives for content providers to make efficient choices to minimize capacity usage will be more direct and powerful when they are directly paying for data transmission than when they are simply attempting to please their customers who in turn pay for data transmission.⁵³

⁵¹See <https://www.att.com/shop/wireless/data-plans.html>, accessed August 16, 2016.

⁵²See <http://www.verizonwireless.com/landingpages/verizon-plan/>, accessed August 16, 2016.

⁵³As mentioned above in Section 4B, content providers can directly delegate some of these decisions to their subscribers. For example, Netflix now allows its subscribers to directly control the resolution at which video is transmitted to their mobile devices. However, a range of more

B. Free Data Services Result in Expanded Access to Broadband, Particularly for Lower Income Consumers, by Making Internet Access More Affordable

It also seems clear that providing opportunities for content providers to directly pay for data transmission costs that their customers would otherwise pay for will reduce the costs of mobile service for these customers. The economics of this situation are simple. Some content providers may be in a position where they would find it profitable to encourage customers to view more of their content by subsidizing the customers' phone bills. However, it may be costly or even infeasible for a content provider to directly monitor a subscriber's viewing and to send a payment to the subscriber meant to reimburse the subscriber for payments the subscriber makes to the mobile provider. The institution of free data services essentially provides a very low transactions cost method of accomplishing precisely this result. Instead of monitoring each customer's viewing hours and attempting to send payments to every individual customer, the content provider simply negotiates a single deal with the mobile provider. Thus this institution essentially fills in what would otherwise be a missing market.⁵⁴

Very recently the Multicultural Media, Telecom and Internet Council has come out very strongly in favor free data service offerings by mobile broadband providers, noting that people of color and low-income consumers are particular beneficiaries of such programs that make internet access more affordable and also noting that access to wireless broadband is particularly important for such groups because they rely disproportionately on wireless broadband as their only

complex decisions that impact network usage will necessarily still be left in the hands of content providers.

⁵⁴See Jullien and Sand-Zantman (2016) for a formal economic model illustrating this idea.

connection to the internet.⁵⁵

C. Concern Over Net Neutrality Issues is Greatly Reduced in an Industry as Competitive as the Mobile Broadband Industry

Advocates of net neutrality suggest a potential concern with various possible combinations and permutations of two basic types of behavior that a broadband provider could engage in.

These are:

- (i) Directly charging content providers a fee for transmitting their content to subscribers.
- (ii) Providing different levels of service to different content providers

Furthermore their concern is magnified when both practices occur at the same time, i.e., when broadband providers can potentially offer different levels of service to content providers and are charging content providers for service.

Proponents of net neutrality regulations traditionally have characterized “levels of service” as corresponding primarily to variations in the quality of data transmission (such as variations in speed, latency, jitter, etc.). More recently, however, some have contended that it is also possible to interpret whether or not to include a service in a free data service as corresponding to another form of “level of service.” After all, just as consumers may value a service delivered at a higher speed or lower latency more highly than a service delivered with lower speed or lower latency, they will value a service delivered for free more highly than a service whose delivery must be paid for. This is why advocates of net neutrality believe that their concerns over net neutrality

⁵⁵See Multicultural Media, Telecom and Internet Council (2016). Also, see Horrigan and Duggan (2015) and McHenry (2016), which both report that African American and low income households rely on wireless broadband for their only broadband connection at much higher rates than the population as a whole.

are relevant to the provision of free data services. They interpret including or not including a content provider in a free service as providing a different level of service to the content provider.

The main point I wish to make in this section is very simple and has been made before by a number of economists and antitrust scholars.⁵⁶ This is that the leading economic theories of harm that explain why violations of net neutrality principles cause social harm all depend on the presence of market power in the broadband market. Many advocates of net neutrality attempt to argue that economic harm occurs from violations of net neutrality even if broadband markets are competitive and that while a lack of competition in the broadband market would exacerbate harms due to violations of net neutrality, it would still be appropriate to enforce full-blown net neutrality principles in situations where the broadband provider market is highly competitive. I disagree with this viewpoint.

In the specific case of free data plans, the nature of the supposed economic harm that occurs when broadband providers charge content providers for higher levels of service, regardless of whether or not the broadband market is competitive, is nicely summarized by one of the consumer groups opposed to free data services as follows.

“Such ‘pay for play’ arrangements favor big content providers who can afford to pay for access to users’ eyeballs, and marginalize those who can’t, such as nonprofits, startups and fellow users.”⁵⁷

The statement by this consumer group goes on to argue that even in cases where a broadband provider does not directly charge content providers, just the fact that the broadband provider is

⁵⁶See, for example, Katz (2014), paragraphs 45-49, Brake (2016), page 12, Nuechterlein (2009), Section I.C.3 and Lyons (2016), page 5.

⁵⁷See Malcolm, McSherry and Walsh (2016).

exempting some traffic from data caps is harmful because it allows the broadband provider to arbitrarily advantage some content providers over others.⁵⁸

The problem with this theory of harm is that it has no limits. It would seek to impose “neutrality” regulations on any input market that content providers purchase inputs in. That is, it would require firms operating in any input market that serves content providers to provide the same level of service to all content providers at the same price. For example a critical input that content providers need to either purchase or provide for themselves is the services of content delivery networks (CDNs) that enable content providers to avoid congestion on the internet by caching content very near interconnection points with broadband providers. While it is completely clear that larger better financed firms are able to afford to either purchase or self-provision better such services, there are no calls for “CDN services neutrality.” Furthermore, this principle could be applied to input markets serving almost any downstream industry. For example, in the on-line sales industry we could impose “delivery neutrality” to guarantee that large well-financed companies are not favored over small start-ups. A full blown set of regulations implementing delivery neutrality would at a minimum require delivery services to charge the same prices for all deliveries regardless of the identity of the on-line company selling the product and might also require delivery companies to only provide a single level of service to all companies or prohibit on-line firms from selling products at prices that include shipping.

It is clear that such a “populist” or “level the playing field” theory of neutrality – that is, a theory based on the idea that all downstream firms should be able to purchase all inputs at the same prices and that they should possibly also be required to all purchase the same quality of every input

⁵⁸See van Schewick (2016) and Weinberg (2014) for similar arguments regarding the harms of both sponsored and unsponsored free data plans.

– goes more than a step too far. When firms in a downstream industry have access to a relatively competitive market for some input, there is generally no economic justification for government to attempt to regulate the input market to “level the playing field” and attempt to guarantee that small firms are not disadvantaged relative to large firms. Firms compete and innovate by differentiating their products, and so long as the inputs are being purchased on relatively competitive markets there is no need for government to regulate input markets to level the playing field. Rather than encouraging competition, such a policy would directly impede competition by preventing firms from innovating and experimenting, thus freezing existing business models in place.

Based on the arguments above, I believe that provision of free data services by broadband providers is only likely to cause significant competitive harms in circumstances where broadband providers have reasonably significant levels of market power. Furthermore, in the particular case of the mobile broadband industry I believe that there is a sufficient level of competition in this industry that a complete prohibition on free data services would be undesirable. Of course the antitrust agencies would still have authority to intervene to address any competitive issues that arise.

6. CONCLUSION

The mobile broadband industry exhibits high levels of competition with four established and financially healthy firms locked in head-to-head competition with one another over price levels, pricing structure, and the quality and variety of services they offer. Regulating the use of data caps and free data services in this industry is form of price regulation that is simply not needed. Rather than protecting competition and innovation, such regulations would directly

impede competition and innovation by limiting firms' abilities and opportunities to compete with one another and innovate in terms of pricing structures and service offerings. Economic theory identifies a number of important economic functions that data caps and free data services help accomplish, and the high level of competition in this industry guarantees that most of these efficiency gains will ultimately flow back to consumers. The Chairman of the FCC has expressed a strong preference to let competition work wherever possible. I agree with this approach and believe that the mobile broadband industry is a clear and obvious industry to which this principle should be applied.

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