6-2017

Net Neutrality: Policy and Stock Market Implications

Ian Bennett
Union College - Schenectady, NY

Net Neutrality: Policy and Stock Market Implications

By

Ian Bennett

* * * * * * * * *

Submitted in partial
fulfillment of the
requirements for
Honors in the Department of Economics

UNION COLLEGE
March, 2017

ABSTRACT

BENNETT, IAN An event study of policies: Net Neutrality's impact on stock prices. Department of Economics, June 2017.

ADVISOR: Professor Lewis Davis

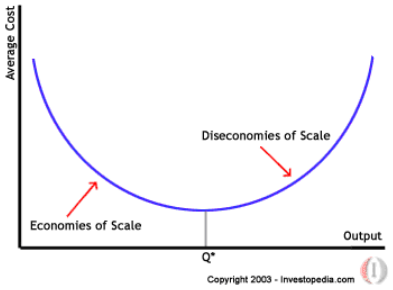
From 2011 to 2015, the Telecommunications Industry faced changing FCC regulations that impacted daily business operations and stock price changes due to Net Neutrality. These changing regulations stemmed from rapidly morphing technology. The three types of firms in this study are Internet Service Providers (ISP's), Content Providers (CP's) who provide video streaming services and those who do not (ISP's, CP's streaming and CP's not streaming). During this era, the FCC went through two different regulation regimes of the Preserving the Open Internet order and the Open Internet – Bright Line Rules with two key court hearings in between. These key events were analyzed based off how the announcement of the news impacted stock prices for the thirty-nine firms in the study. The Preserving the Open Internet order impacted the firms across our study with the most relevance. Date 1 resulted in a 0.836% excess returns for the stock prices while all other variables were held constant for our firms. Date 2 resulted in a 1.6% excess returns for the stock price while all other variables were held constant for our firms. Date 3 did not result in any significant results for our firms daily. Date 4, while impacting the firms at different sample levels, did not result in any significant results for our firms daily at an entire sample level. With consumer preferences changing and firms changing business operations regularly, it is important to understand how policies, whether economically efficient or not, impact the stock market.

Contents

Lit Review

The Telecommunications Industry is one of the oldest industries with some of the most profitable firms in the world. Varying business strategies are paramount to the decisions these firms make with the most detailed research going into them.

Bryne aims to study the post-deregulation dynamics of the Canadian Cable Television Industry. Bryne uses data from 1990-1996 on national regulator's license ownership decision files (showing acquisition decisions, subscribership and subscription profits). The estimation is done twofold, the first being an estimation of the firms' profit functions based on their licenses' and then the estimation for the parameters of fixed, merger and entry cost functions by Simulated Maximum Likelihood (Byrne, 2010). Byrne focuses on two economic principles in the Telecommunications Industry: economies of scale (this graph can be found at: http://www.investopedia.com/terms/e/economiesofscale.asp) and economies of density (this graph can be found at: http://www.unige.ch/cyberdocuments/theses2001/HuberH/these_body.html) with profit for these firms in mind.



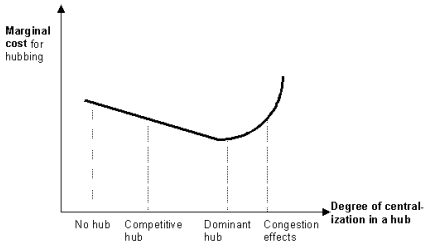


Fig. 1 – Economies of Scale Fig. 2 – Economies of Density

The acquisition and entry model is based on an economic game written by Farrell and Scotchmer in 1988. (Farrell, J., and S. Scotchmer (1988): "Partnerships," Quarterly Journal of

Economics, 103, 279–297.) The licenses are bought and sold this period, based off the acquisition behavior of the firms last period. The surplus created by the firm is based off three main things, the size of the buying and selling firms, an acquisition effect that impacts fixed costs per license and firm heterogeneity.

Bryne uses two data sets. The first deals with number of subscribers, revenue, channel counts and affiliation payments while the other deals with new license applications, license renewals and license buyouts.

The licensing method by the Canadian Government allows for revenue and decisions to be tracked year by year with data on the firm's decisions each year. Byrne finds that large cable companies earn more profits per subscriber than small ones and that this scale effect drives mergers and acquisitions (Byrner, 2010). Economies of density seems not to influence a firm's merger activity. The 1994 deregulation of the Cable Industry increases the economies scale effect on firms profits which creates a pattern of large firms buying out smaller firms. This points to deregulation being an effect in an increase in merging and acquiring business strategy. With the research that has been done on decisions and regulation regimes, the market also needs to be analyzed.

The Telecommunications has been impacted by several key news announcements including the ones in this study and the events included in the study done by Cundith. Cundith aims to look at the impact of two events in 2014 and 2015 respectively.

The first event takes place in June 2014, when John Oliver from *Last Week Tonight* gave his opinion on Net Neutrality and the Open Internet – Bright Line Rules, although not specifically stated (Cundith, 2016). In his event study, Cundith takes seven firms from the

Telecommunications Industry to study with varying time lengths from ten days, two months and six months.

Cundith uses three different estimation methods in his study: Means Adjusted Returns, Market Adjusted Returns and a OLS Market Model (Cundith, 2016). The formulas for his three models are stated below. $A_{i,t}$ denotes abnormal return of the event period, $R_{i,t}$ denotes return at day t, R_{iavg} denotes a simple average of daily returns in the event period, $R_{m,t}$ denotes return on the S&P500 at day t and α_i denotes the excess returns a stock has to the market. With these different models, Cundith discusses the faults of each model focusing around the stock's simple average not expressing the previous returns of the stock, length of the estimation period not capturing the full impact of the event and the stocks not being impact by the market by the same amount (Cundith, 2016).

1) $A_{i,t} = R_{i,t} - R_{iavg}$
2) $A_{i,t} = R_{i,t} - R_{m,t}$
3) $A_{i,t} = R_{i,t} - \alpha_i - B^* R_{m,t}$

Cundith takes the results of the firms he used to create a ten-day picture if he were to have invested $100 on the day of the event. With this, he breaks up the firms into CP's, ISP's and the S&P500. Cundith found no significant results of the events and the abnormal returns of the CP's and ISP's (Cundith, 2016).

Cundith's approach to an event study is valid in many ways, but the sample size used in his study is too small to capture the full effect of the Net Neutrality news. Similarly, his first event is a talk show opinion which does not directly impact the regulation of Net Neutrality, but

informs people of the debate; it is more impactful to use regulation regime changes to capture the full impact of Net Neutrality news.

Timeline

Net Neutrality burst onto the scene in the early 2010's. A few companies took note to Net Neutrality and took advantage of it. Before we can tell the story of Net Neutrality, we must understand the roots of the issue. The Telecommunications Act of 1996 changed the structure of the Telecommunication Industry. The act removed barriers to entry and allotted certain regulations from preventing any one company to have sole market power in a single area. This allowed local providers an opportunity to enter the market and compete (Telecommunications Act of 1996, 1996). The Telecommunications Act of 1996 created an opportunity for the market to be perfectly competitive. The market will never be perfectly competitive, but it will also never be monopolistic or oligopolistic.

In the late 2000's and early 2010's, consumers' preferences for goods have demanded increasing speed and quality; video has been the good with the most attention. From 2012 to 2016 there was an increase of 24.24% video viewers in the United States, these video viewership statistics can be found at: https://www.statista.com/statistics/271611/digital-video-viewers-in-the-united-states/. These videos require bandwidth to stream which is provided though an Internet Service Providers' (ISP) lines to the consumer. Imagine the line being a tunnel in which the video is sent through and the early 2010's being 5 o'clock traffic. The tunnel will be too flooded with traffic. The appropriate response to this dilemma would be to allow people who do not want to sit in traffic to pay a fee to ride along a less congested highway in the tunnel. In the consumer entertainment industry, this would be to allow certain players to pay for faster

connection and preferential treatment in their ISP lines. This is where we pick up on Netflix and Comcast.

Netflix had blown up with their subscriptions. To show this and the change in consumer preferences, 2010 became the first year that Netflix had more users watch their content online via streaming than receive a DVD in the mail (Federal Communications Commission, 2015). With more people were watching their content on the Internet with no slowdown in sight. The competition for bandwidth on the Internet was increasing. With more people using the Internet, any ISP line's connection would be slowed due to an increasing number of users using the Internet. Netflix experienced the problem of a public good being in the middle of their private good. Consumers needed the ISP line (that was already paid for in your Internet subscription) to not only access Netflix, but you needed the line to have a fast connection for a quality video. During this time, Netflix experimented by with paying small ISP's a fee for their video content to have preferential treatment in their lines (Ramachandran, 2014). They wanted the bandwidth of streaming Netflix to be available at all times and the quality in the line to be fast and speedy for their payment to them. Instead of attempting to find a solution to lower the bandwidth needed to stream Netflix, they went to the market to classify their content as a higher priority in some ISP lines than other content such as email or web searching.

While Netflix attempted to "pay for better play", ISP's were feeling the burden of their lines becoming public goods once a subscription was bought. Their lines became clogged. While using ISP lines, some of the sites on the Internet had become lagged because video services had become such a large part of content watched online. The more they had people stream video while using their lines, the more other sites became lagged. A lag in time to open a website, that was not video streaming, would not be burdensome to the user because the content will load and

then all the content will be there. However, a lag in time to stream a video would be burdensome because the video will stream then stop to load and repeat. This is leaving the market in a place where it had not been before.

In the realm of communication and bandwidth industry, voice and text are not bandwidth intensive to provide, but video is dense and uses much more bandwidth. With the change of preferences, Internet Service Providers (ISP's) have become highly profitable, due to an increase in users. Net Neutrality became an issue for them. Should ISP's allow access to all content available on the Internet, no matter the Content Provider (CP)? Can a single ISP provide preferential treatment of content over others or block access to content? The Internet Service Provider (ISP) lines had become full of traffic causing this problem. Comcast took this to court in what is known as Comcast v. FCC (Reicher, 2011). The decision came down to the economics of what was economically efficient for the market. The court found that ISP's could slow access to specific sites or charge access for faster service of their content (Kang, 2010). This was announced April 6, 2010.

On September 23, 2011, the FCC released Preserving the Open Internet to tackle this issue. The three points stemming from this document are that all communication businesses had to be transparent in performance characteristics and terms and conditions of broadband services. They may not block lawful content, applications, services or non-harmful devices. They also may not block lawful websites or applications that compete with their voice or video communication services. They may not unreasonable discriminate in providing lawful network traffic (Preserving the Open Internet, 2011).

Verizon took on the FCC in what is known as Verizon v. FCC on July 2, 2012. Verizon argued that the FCC regulations were unconstitutional by stripping the providers of control over

the transmission of speech on their networks and takes network owners property without compensation. Verizon argued that FCC was arbitrary because they enacted Preserving the Open Internet without any evidence of a systematic problem in need of a solution, recognizing that the Internet was already open and working well for consumers (Wilhem, 2012). Verizon argued the FCC was arbitrary in how they singled out broadband providers for burdensome new regulation even though other key providers in the internet economy have the same theoretical incentive and ability to engage in the conduct that concerned the FCC. Lastly, Verizon argued the FCC was outside of its authority because rather than proceeding with caution (Wilhem, 2012).

On May 9, 2012, the FCC released the Small Entity Compliance Guide: Preserving the Open Internet; Broadband Industry Practices. The FCC discussed Transparency as: Network Practices, Performance Characteristics and Commercial Terms. With the Network Practices the broadband providers must provide links or display congestion management, application-specific behavior, device attachment rules and security. With Performance Characteristics, the broadband providers must provide links or display service description and impact of specialized services as discussed in the document. With Commercial Terms the broadband providers must provide links or display pricing, privacy policies and redress options (Small Entity Compliance Guide Preserving the Open Internet; Broadband Industry Practices, 2012). The FCC continued to discuss No Blocking as defined that does not allow broadband providers from impairing or degrading content, applications, services or non-harmful devices to make them effectively unusable. The FCC discussed that there is not a distinction between blocking and degrading, i.e. traffic is not different. They continued to discuss that any service provider could not require content providers to pay a fee to avoid being blocked (Small Entity Compliance Guide Preserving the Open Internet; Broadband Industry Practices, 2012). The FCC

discussed Unreasonable Discrimination as prioritizing traffic. The users must be allowed to choose their own bandwidth rates and reliability on their own connections for traffic. The key part of this document discussed paying for prioritization of traffic (Small Entity Compliance Guide Preserving the Open Internet; Broadband Industry Practices, 2012).

The US Court of Appeals in DC ruled that the FCC's Preserving the Open Internet rules on anti-blocking and nondiscrimination of content were overreaching on January 14, 2014 (Verizon v. Federal Communications Commission, 2014). This would ISP's to give video priority in their lines.

Comcast officially bought Time Warner Cable on February 13, 2014. Time Warner Cable would still provide their services, but under the ownership of Comcast (Stelter, 2014).
On February 23, 2014, the Wall Street Journal reported that Netflix had paid Comcast to provide faster service and prioritization of their content traffic over others (Ramachandran, 2014). This move gained much attention.

The FCC's responded with the Open Internet – Bright Line Rules which was adopted on February 26, 2015. These regulations stipulated that broadband Internet access providers could not block content, they could not throttle the content (impair or degrade the service) and they could not be paid for prioritization of content over others (Protecting and Promoting the Open Internet, 2015).

Debate over Net Neutrality

The performance of the Telecommunications Industry was impacted by Net Neutrality during the early 2010's. Net Neutrality has changed business strategies of ISP's and CP's. ISP's are required to treat all content on the internet the same despite the bandwidth requirement. ISP's

now offer different bandwidth levels for a consumer to choose from. ISP's cannot block content and must allow access to any application available. CP's, from social media sites to video streaming sites, cannot pay to receive faster speeds for their site. Consumers reaped the benefits of this. They can pay for the level of bandwidth speed they prefer and their CP's price would not increase. This brings the argument to competition and the many ways Michael Ciarlo, who is pro NN, sees the debate.

Ciarlo takes a free market stance on the debate over NN. He believes the internet cannot be under the control by corporations and that a free and open internet stimulates ISP competition, prevents unfair pricing practices, promotes innovation, the spread of idea, drives entrepreneurship and protects the freedom of speech (Ciarlo, 2016). The FCC has similar ideas to Ciarlo's on defending their regulations in the Bright Line Rules. The FCC cites the fact that in the three years after the Open Internet – Bright Line Rules were enacted to protect and promote innovation and investment, broadband providers invested $212 billion to enhance innovation in the Telecommunications Industry. This is more in any three-year time frame since 2002 (Federal Communications Commission, 2015). They cite the fact that in 2010 there were 70,000 devices in the U.S. connect to LTE and in 2015 there was over 127 million (Federal Communications Commission, 2015).

The argument is different from the Telecommunications firms' point of view which can be seen in Verizon v. FCC. As talked about earlier, Verizon argued that the FCC was overreaching in the fact that the market was already in an open state for users and that broadband providers were being singled out amongst other key players in the Internet business (Wilhem, 2012).

It is difficult to say that these regulations caused this growth, but these regulations were in place during the growth. The Telecommunications Industry could have performed even better without these regulations in place, but we cannot rewrite history to see what would have happened.

Theory

There is an inefficiency in the United States Government policy towards the Telecommunications Industry and the idea of how it should be regulated. The Telecommunications Act of 1996 removed barriers to entry and allotted certain regulations from preventing any one company to have sole market power in a single area (Telecommunications Act of 1996, 1996). The local providers could provide their own cables and services to the area without the need to expand. This would lead to vast competition in local markets for the power of the fastest services.

The dynamics of streaming video on the Internet is complex. To access the internet, consumers need an Internet Service Provider (ISP) line. These are your basic companies such as: Comcast, Verizon FiOS, Time Warner Cable and Xfinity. After you have bought access into the line it becomes a congestible public good because how often you use the line does not correlate to the price. A congestible public good is a public good which is typically non-rival, but as it becomes heavily used, becomes rival

Continuing the discussion of the Economics of Net Neutrality, let us look at price discrimination. Price discrimination is when a firm sells the same product at different prices to different people so they can maximize profits. In the realm of the Internet, price discrimination would be directly charging CP's for higher quality access to an ISP's lines. This was not illegal

at one point in the early 2010's, but currently is illegal. This does not prevent the ISP's from preforming secondary price discrimination. This form of price discrimination is being forced upon consumers. There are 286,942,362 internet users as of 2016, these internet statistics can be found at: http://www.internetlivestats.com/internet-users/us/. These users are facing different prices for the bandwidth speed they want. Users can sign a contract with an ISP for a different speeds and different prices. The ISP market is condensed with few ISP's controlling most of the market as shown by Fig. 3 (Leichtman Research Group, 2017).

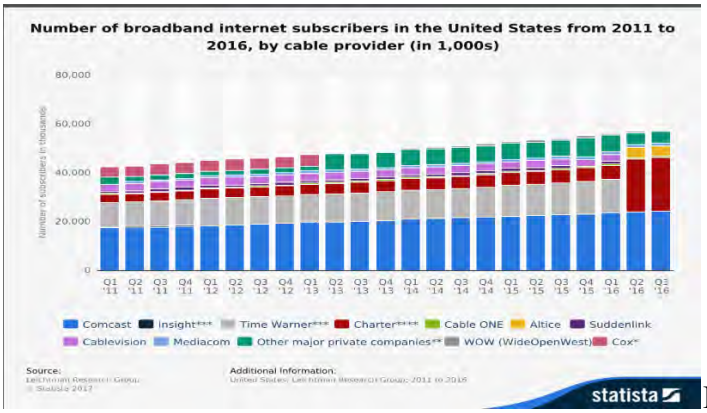


Fig. 3

When demand increases in this model, prices become higher for the users who see bandwidth as inelastic. These firms are segmenting users into different ranges. The users who view bandwidth as inelastic are sold bandwidth at a higher cost and those who view bandwidth as elastic are sold bandwidth at a lower cost. In Fig. 4, which can be found at: http://www.economicsonline.co.uk/Business_economics/Price_discrimination.html, different elasticities are combine to show how a firm can use the fact that their users treat their good differently with respect to price.

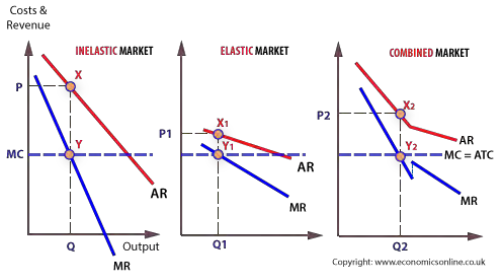


Fig. 4

The firms do not know who is in what segment, but it knows by providing different prices, they will sell more. The change in profit from secondary price discrimination is shown below in the Fig. 5 with the loss of consumer and producer surplus when the market is not perfectly competitive in Fig. 6. The ISP's offer different levels of contracts that allow you to opt into services with higher bandwidth. There are basic plans and premium plans, with a multitude of plans in between.

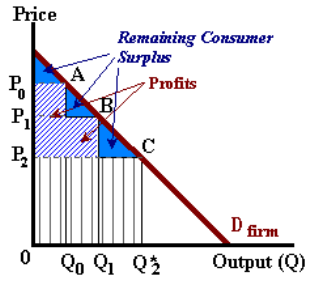


Fig. 5

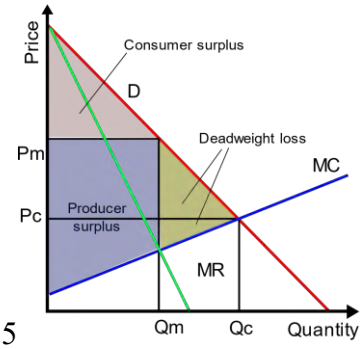


Fig. 6

The regulations during this time caused many issues for CP's and ISPs. The Bright Line Rules state that the ISP's could not block any access to content (an ISP could not deny access to any particular CP), they could not throttle the content (ISP's could not slow access or degrade the quality of content) and that the ISP's could not receive payment for prioritization of content over others. From this, CP's cannot gain faster access for their content, even if they wanted to. Their content is treated the same as any other video on the market, no matter how much it is watched. ISP's can now price discriminate to users which causes surplus problems in the market.

Consumers are now put into tiers based off of how much bandwidth they want with no ability to increase their bandwidth speed without increasing their costs.

These regulations caused wins and losses for many players. The ISP's finally received policy aid in their practices. ISP's went from making a choice on what content to lag, to not being able to lag anything, to being paid for better quality to not being able to be paid for better quality to the Bright Line Rules. The content providers had a bit of different story, they were growing and saw an opportunity to prevent any reductions in the growth by paying ISP's. They then paid the ISP' and now cannot be paid for prioritization. Their content is now under the Bright Line Rules which safely guards the quality. Where does this leave the market and the consumers in it?

Content Providers and ISP's cannot pay for better play, but consumers have to pay for better quality. If the consumer's care enough about the quality of their video or if their video is being lagged that much, they can upgrade their services with the ISP's by opting into a more expensive, better quality internet connection. This will not be the last place the market stops since technology is growing too fast and companies are becoming hungrier to provide content you have access to "anytime, anywhere, any device".

The main battle today is bandwidth. In 2010 in the United States there were 222,150,226 internet users and in 2016 there are 286,942,362 internet users; that is a growth of nearly 29.2% which can be found at: http://www.internetlivestats.com/internet-users/us/. From 2012 to 2016 in the United States, the number of video viewers has grown from 171.6 million to 213.2 million; that is a growth of 24.24% which can be found at: https://www.statista.com/statistics/271611/digital-video-viewers-in-the-united-states/.

The main good of consumption outside of text is video. Consumers want to watch the content they have paid for on any device. This requires data. Cisco Visual Network Index has tracked and predicted IP traffic globally and found that we will be using nearly 200 Exabytes by 2020, which can be found at: http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/vni-hyperconnectivity-wp.html. Figure 7 below tracks and predicts usage. Data is becoming more expensive and video is data dense. With more and more content providers becoming mobile friendly, we are witnessing a change in the goals of ISP's and CP's. This brings our discussion to surplus.

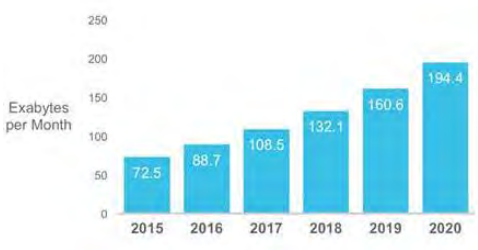


Fig. 7

The surplus gained and lost during the early 2010's changed quite frequently due to different regulation regimes. Due to NN, consumers faced a time where prices often changed and the surplus they gained changed with it. Before NN, consumers faced a time where they could use the Internet as much as they wanted with slowing speeds when faced with traffic. Consumers were gaining surplus from Internet usage up to the point where the speeds were not slowed. Currently, the surplus is split based off price discrimination. Each consumer is facing a choice to how much bandwidth they are using. They aim themselves to the level of bandwidth they require and the usage of the bandwidth is matched with the surplus you aim to gain. This is different from the division of surplus of ISP's and CP's.

In the beginning, ISP lines were abused. They gained surplus from their consumers and CP's for their payments. However, the usage was unlimited once the consumers gained access to

the lines and the CP's paid for their content being streamed. Currently, the ISPs are gaining surplus from aligning the different consumers who want different levels of bandwidth correctly. The ISP's could require CP's to pay them for better access to bandwidth and form this the ISP's were gaining surplus from every payment.

The CP's are different. They experienced surplus gains from their content being allowed to be streamed endlessly originally, but before the Bright Line Rules and after Preserving the Open Internet, they were losing surplus every day. Their payments for better access was a loss of surplus that they could have had, but they needed to prioritize their content within ISP lines. Currently, the CP's are gaining from the secondary price discrimination. They are not required to make payments to ISP. They do lose out on consumers who do not have access to enough bandwidth to stream their content under the secondary price discrimination, but this is minimal because those consumers were not originally opting into their service. They are gaining every day from more consumers being able to stream their content at a high quality.

Today, the focus is being able to consolidate all telecommunications services into one company. Is it beneficial for wireless phone, data and video streaming capabilities to be under the same roof? These internal economies of scale will allow an overarching company to cut costs on all their services making the consumption of the good relatively cheaper and pushing technological innovation forward. The table below depicts the predicted impact of each event studied from 2010 to 2015 with the key dates in bold.

Telecommunications Act of 1996	1996-Present	Effect on ISP Profit	Effect on CPstreaming Profit	Effect on CPnon Profit
Comcast v. FCC	April 6, 2010	+	-	-
Preserving the Open Internet	September 23, 2011 – July 2, 2012	-	+	+
Small Entity Compliance Guide: Preserving the Open Internet; Broadband Industry Practices	May 9, 2012	+	-	-
Verizon v. FCC	July 2, 2012	+	+	+
Netflix beings Pay for Play	2013	+	+	-
US Court of Appeals in DC – Preserving the Open Internet Revoked	January 14, 2014	+	+	+
Comcast buys Time Warner Cable	February 13, 2014	+	+	-
Netflix pays Comcast	February 23, 2014	+	+	-
The Open Internet – Bright Line Rules	February 26, 2015	+	+	+

With this table, goes the hypothesis testing of how an increase or decrease in Net Neutrality and Transparency will impact future profits for each type of firm. This table depicts how each type of firm is expected to be impacted due to the strengthen or weakening of Net Neutrality and Transparency.

Impact on Future Profits				
Day 1 – Preserving the Open Internet	Increased or Decreased	ISP	CP's Streaming	CP's Non
	Net Neutrality Increased	+	+	+
	Transparency Increased	-	+	+
	Net Impact	?	+	+
Day 2 – Verizon v. FCC	Net Neutrality Decreased	+	+	-
	Transparency Decreased	+	+	-
	Net Impact	+	+	-
Day 3 – US Court of Appeals in DC – Preserving the Open Internet Revoked	Net Neutrality Decreased	+	+	-
	Transparency Decreased	+	+	-

	Net Impact	+	+	-
Day 4 – Open Internet – Bright Line Rules	Net Neutrality Increased	+	+	+
	Transparency Increased	+	+	+
	Net Impact	+	+	+

Data

In this section, the data is discussed based off each key date and the variable associated with the study. Information on the data such as sources and descriptions of the variables used can be found in Appendix A.

Following event study structure, four key dates are studied to understand their impact on the market and firms in the Telecommunications Industry. Thirty-nine firms in the Telecom Industry along with the S&P500 and the NASDAQTELE Index were included in this study for 100 business days before and after the key date in question (for a complete list of firms and indices see Appendix B). The categories divide our observations into either an Internet Service Provider, a Video Streaming Content Provider, a Content Provider who does not stream videos.

The stock price event study methodology requires a control to compare the firms used in the Telecom Industry to the rest of the market. In this analysis, the S&P500 and NASDAQ Telecommunications Index were used. The S&P500 was used in the regression analysis to allow the firms of the Telecommunication Industry to be impacted by the announcement of each regime to be compared to how the rest of the market performed. The NASDAQ Telecommunications Index was used to allow the firms used in this analysis in the Telecom Industry to be compared against how the rest of the Telecom Industry performed.

These firms were chosen at regional and nationwide level to help capture the geographical effect of Net Neutrality. Along with this, different types of firms in the Telecommunications Industry were chosen, such as: ISP types for business and residential, CP's that provide streaming and those who do not. Each firm has 100 business days plus or minus for stock prices for each key date. The key dates for this event study are September 23, 2011, July 2, 2012, January 14, 2014 and February 26, 2015. These dates coincide with the FCC Regulatory regimes and changes of Preserving the Open Internet, Verizon v. FCC, US Court of Appeals in DC – Preserving the Open Internet revoked and The Open Internet – Bright Line Rules respectively. These dates are studied to understand the effect on that day of the announcement of the news. The key dates are broken into dummy variables for each firm.

These firms range from historic companies such as Walt Disney and AT&T to relatively new firms such as Etsy and Twitter. Because of this, a few of the firms do not have values for the key dates due to the firm not being on the stock market. The stock prices for each firms are normalized by using the natural log function for each stock price; this allows the data to fit our model and for the data to be normally distributed. The key variables for the regressions stem from this calculation as the daily and weekly return for each stock can be calculated for each firm.

The daily return & weekly return for each stock is measured by the below equations:

1) $dlnP_1 = lnP_1 - lnP_{1,t-1}$
2) $dlnP_{1,week} = lnP_{1,t-1} - lnP_{1,t+6}$

using the day's end natural log of the stock price and t_{-1} natural log of the stock price. The weekly return is measured by using the difference between the day before the news came out on and six days after that. To help with this calculation, a day of the week dummy variable was

created to help depict this. For example, the Preserving the Open Internet order was released on a Friday so for that date, the week is from that Thursday to the next Thursday to capture the impact of the news. These calculations were also performed for the S&P500 and the NASDAQ Telecommunications Index.

Table 1 in Appendix 1 presents the summary statistics for the thirty-nine firms and two indices used. The dates range from May, 2011 to July 2015 with gaps in between the 100 days plus or minus around each date. The stock prices range from a low of $1.22 to $1220.17. The stock price difference ranges from a low of -1.96849 to a high of 2.70158. This helps show us that the stocks had many different prices from day to day; bouncing from positive returns to negative returns. The mean for this change is positive at 0.00097, showing us these firms had an average of positive returns over these periods.

Econometric Model

The four keys dates regarding Net Neutrality will be used along with indices. We expect to find that the S&P500 will not be greatly impacted by Net Neutrality regulations, but the NASDAQ Telecommunications Index to be impacted due to the volume of the firms in this study being in the index itself.

The firms will be analyzed in two ways. The first will be an analysis of the magnitude of the impact on the firm and the second will be a derivative function to allow us to see direction the stock price is going after Net Neutrality has been announced. With the functions, we will use the natural log of each stock price to normalize the prices to each other. The first and second equations are represented below:

1) $lnP_{firm,t} = \alpha_t + \beta_{t,1} lnS\&P50 + \gamma_t NN + \varepsilon.$
2) $\delta lnP_{firm,t} = \alpha_t + \beta_{t,1} \delta lnS\&P500 + \gamma_t \delta NN + \varepsilon$

The first form of our model uses the natural log of the firm's stock price as the dependent variable and the natural log of the S&P500 and other indices as the independent variables. This will show us the movement of the firm's stock prices relative to the S&P500 and other indices due to Net Neutrality. To capture a broader sense of the market with a control, the S&P500 will be replaced at times with the NASDAQTELE index. The second form of our model, the key function, uses the natural log of the firm's stock price as the dependent variable and the natural log of the S&P500 and other indices as the independent variables, but we are focusing on the change in the stock price for the firms. Using derivatives of both the firm's stock price and the S&P500 and other indices will allow us to help explain the change in the stock price of firms to capture excess returns due to Net Neutrality.

We expect to find abnormal returns from Net Neutrality announcements. The abnormal returns are calculated as the realized (actual) returns minus the expected returns. The realized return is the return from the impact of the event and the expected returns is the return on the price if the event had not happened. The expected return is conditional on the fact that the event in question (Net Neutrality) did not occur. The simple form of the equation is:

1) $AR_{t,i} = R_{t,i} - E(R_{i,t})$.

To take a view at what the stock price would look like before and after Net Neutrality happens, see the graph below. The announcement date that impacts firms stock prices in the graph below is date 28. The graph is an illustration of what we expect to see.

Fig. 8

Results

To begin the testing on the impact of the FCC regulatory regimes of Net Neutrality on the stock market, a set of different tests were looked at for each date. To begin the testing, each date received the same treatment of changing the sample used for the regression to 1) the entire sample; 2) if CPstream equals 1, 3) if CPnon equals 1, 4) if ISP equals 1, 5) the robustness test using the weekly return if the day of the week dummy variable equals 1, 6) the robustness test using the weekly return with the NASDAQ Telecommunications Index and if the day of the week dummy variable equals 1. This testing allows us to control the sample size and to capture the full effect the announcement of a new FCC regulatory regime on the market. This will show the effect of news on the market and the market belief on how each regime will impact the market and the firms in it.

These variations are necessary for the analysis of each of the four key dates due to the announcements impacting some firms and not others. The entire sample is run to capture the impact of the news at a baseline level. This gives us a general impact of each key date. Limiting the sample to if CPstream equals 1 allows us to capture the impact of each key date on this type of firm. Changing the sample to if CPnon equals 1 shows the impact on the firms who are text rich sites and do not require a lot of bandwidth to access them. Limiting the sample to if ISP

equals 1 shows the impact on companies who provide the bandwidth to access any CP site. Regulations during this time shaped the horizon for how these firms could operate and had direct impact on their decision making. There are many pitfalls when using the baseline regression due to the varying types of firms in the Telecommunications Industry. The variance allows us to see how different types of firms were impacted due to a certain news announcement; for example, ISP's were certainly not in favor of the Open Internet – Bright Line Rules due to fact that paying for prioritization of content by CP's is illegal.

In Table 2, Date 1 (located in Appendix D) – Preserving the Open Internet (September 23, 2011), is tested to see how the announcement of the new FCC regulatory regime impacted the market and the firms tested in it. The data collected is from May 6, 2011 to February 22, 2012 for the thirty-nine firms and two indices. Columns 1) - 6) are the different sample variations for each test. The different variations in the sample allow for the regressions to tell different stories on how Preserving the Open Internet impacted the firms. In columns 2) – 4), the sample is modified for the regressions to only regress the firms that are Content Providers that stream video, firms that are Content Providers and do not stream video and firms that are Internet Service Providers. Columns 5) and 6) show us the Robustness Tests on the sample to see a larger picture of what is going on.

The results are mixed with the predictions on how firms would be impacted by Preserving the Open Internet. For Date 1, ISP's were predicted to take a negative impact on their profit due to the nature of the order and both CP groups were predicted to experience a positive impact on profit due to the order. This document was the first order to attempt to make the Economics of Internet efficient. It aimed to make all business transparent, unlawful for the firms to block any content and unable to discriminate in network traffic. In columns 1), 2) and 4), Date

1 is positively and significantly related at the 1% significance level excess returns of the stock price. This reveals that the Preserving the Open Internet order impacted the firms at an entire sample level, but when the sample was restricted based on Content Providers that do not provide video streaming, our dependent variable was not significant. It is noteworthy to say that this sample for Date 1 yields a negative impact on non-video streaming Content Providers. From this it can be said that Date 1 results in a 0.836% change in the difference in the excess returns of the stock prices while all other variables were held constant. Continuing with columns 1) – 4), the independent variable of the daily difference of the S&P500 is positively and significantly related at the 1% significance level to our dependent variable. These regressions yield extremely high t-statistics leading to the belief that the Preserving the Open Internet order led the market to believe that this order would be beneficial for the market or from simple growth of the market. From this, using column 1, it can be said that a one percent change in the excess returns of the S&P500 results in a 1.063% change in the expected value of excess returns of the stock prices while all other variables were held constant.

For the discussion of Date 1, columns 5) and 6) are not significant for Date 1. Conversely, columns 5) and 6) show a different story of how the Preserving the Open Internet order impacted the indices. These columns show a positive and significant at the 1% significant level relationship between the weekly return of the S&P500 and the NASDAQ Telecom Index to the firms' weekly returns.

In Table 3, Date 2 (located in Appendix D) – Verizon v. FCC (July 2, 2012) is tested to see how the announcement of the overreaching authority of the Preserving the Open Internet impacted the market and the firms tested in it. The data collected is from February 13, 2012 to November 29, 2012 for the thirty-nine firms and two indices.

The predictions were correct on how firms would be impacted by Verizon v. FCC. For Date 2, ISP's and both CP groups were predicted to experience a positive impact on future profit. This ruling stated that Verizon was correct in their statement that the FCC was out of their authority. In columns 1) and 4), Date 2 is positively and significantly related at the 1% significance level to the excess returns of the stock price. This reveals that Verizon v. FCC impacted the firms at an entire sample level, but when the sample was restricted to either type of CP, our dependent variable was not significant. It is noteworthy to state that the sample restriction to only ISP's is positively significant at the 1% significant level. From the entire sample, it can be said that Date 2 results in a 1.6% change in the excess returns of the stock prices while all other variables were held constant. At the ISP level, it can be said that Date 2 results in a 2.39% change in the excess returns of the stock prices while all other variables were held constant. In columns 1) – 4), the independent variable of the difference between days of the S&P500 is positively and significantly related at the 1% significance level to our dependent variable. These regressions also yield extremely high t-statistics leading to the belief that Verizon v. FCC led to the market belief that this would be beneficial for the market or the market experienced simple growth. From column 1, it can be said that a one percent change in the difference in the natural log of the S&P500 results in a 1.63% change in the expected value of the excess returns of the stock prices while all other variables were held constant.[1]

For Date 2, the key regression is in column 6), the Robustness Test with the Monday dummy variable & using the NASDAQ Telecommunications index. This regression is positive and significant at the 5% significance level. This reveals that the test captured Verizon v. FCC as a positive impact on the market at a weekly basis. From this it can be said that Date 2 results in a

[1] These figures are roughly the same throughout each Date and will not be mentioned again.

1.43% change in the weekly difference in the excess returns on the stock prices while all other variables were held constant. Columns 5) and 6) confirm the results about the positive impact of Verizon v. FCC on the market. These columns show a positive and significant at the 1% significance level relationship between the weekly return of the S&P500 and the NASDAQ Telecom Index to the firms' weekly returns. These high t-statistics show a strong relationship between how the stock market was performing and the weekly return of the firms during these dates.[2]

In Table 4, Date 3 (located in Appendix D) - US Court of Appeals in DC – Preserving the Open Internet Revoked (January 14, 2014), is tested to see how the announcement of an FCC regulatory regime being revoked impacts the market and the firms tested in it. The data is collected from August 8, 2013 to June 13, 2014 for the thirty-nine firms and the two indices.

Our predictions were mixed on how firms would be impacted by the Preserving the Open Internet being revoked by the US Court of Appeals in DC, but these results are not significant. For Date 3, ISP's were predicted to experience a positive impact on their profits due to an order that limited their practices being revoked, both CP groups were also predicted to experience a positive impact on profit due to an opening up of more practices they can perform in their business. The predictions for ISP and CP's who do not provide video streaming were both correct, but CP's who provide video streaming experienced a negative impact on their profits[3]. This can be explained by the fact that the market was in a state of question; since the order was revoked, the market belief must have been unclear on how the market would react to this news. Columns 1) – 4), the difference between days of the S&P500 is positively and significantly related at the 1% level to our dependent variable.

[2] These figures are roughly the same throughout each Date and will be mentioned as concept points.
[3] These results are depicted the sign of the coefficient and are not significant.

The Robustness Test for Date 3 contain significant answers with column 5) and 6) significant at the 1% significance level to the weekly excess returns of the stock price. It is noteworthy that the signs on our coefficients in columns 5) and 6) are negative which is opposite of columns 1), 3) and 4) and what was predicted for this date. This could possibly be explained in the same fashion as above: the market was in a state of question and was unsure how the order being revoked would impact the Telecommunications Industry or the market experienced simple contraction. With the US Court of Appeals in DC revoking the Preserving the Open Internet order, the next regime of the FCC over the Telecommunications Industry is the Open Internet – Bright Line Rules.

In Table 5, Date 4 (located in Appendix D) - The Open Internet – Bright Line Rules (February 26, 2015) is tested to see how the announcement of a new FCC regulatory regime impacted the market and the firms tested in it. The data is collected from October 9, 2014 to July 28, 2015 for the thirty-nine firms and the two indices.

The predictions were partially correct on how firms would be impacted by the new regime of the Open Internet – Bright Line Rules, with two significant results. For Date 4, ISP's and both CP groups were predicted to experience positive impacts to their profits. This was not the case; both CP groups experienced positive returns (video streaming CP's was not significant), but ISP's experienced a negative impact on profit. The two significant regressions are columns 3) and 4); these regressions contain the samples for CP's who do not provide video streaming and ISP's respectively. This document aimed to fix the inefficiencies that CP's and ISP's had fought over in court. Stemming from this document the new regulations stated ISP's could not block content, degrade their service or be paid for prioritization of content over others. In column 3), Date 4 is positively and significantly related at the 1% significance level

respectively to excess returns of the stock price. In column 4), Date 4 is negatively and significantly related at the 10% significance level respectively to the excess returns of the stock price. From this it can be said that Date 4 results in a 1.18% change in excess returns of the stock prices while all other variables were held constant. Also, it can be said that Date 4 results in a -0.734% change in the excess returns of the stock prices were held constant. Column 3) tells an interesting story that CP's who do not provide video streaming services benefited from these rules. This can be from the fact that their sites cannot be impaired, blocked or put lower in a priority level in bandwidth traffic for other sites that are CP's who provide video streaming services. Column 4) also tells an interesting story that was not expected: ISP's were hurt from these new regulations. ISP's could no longer receive payments for prioritization of content over others, they could not impact the Internet in a way that was most profitable for them. The Robustness Test for Date 4, the Open Internet – Bright Line Rules revealed significant results in column 5). This regression is negative and significant at the 1% significance level. This reveals that the test captured the Open Internet – Bright Line Rules as a negative impact on the market at a weekly basis. From this it can be said that Date 4 results in a -1.10% change in the weekly difference in the excess returns on the stock prices while all other variables were held constant. The Robustness Test also confirmed our results from the previous 3 dates about index level data that the weekly returns for the index level showed either simple growth/contraction over time or that there was a market belief that these regulations would be good or bad for the market.

Conclusion

The Telecommunications Industry has been rapidly changing since the early 2010's. This has allowed for consumer preferences to change with it. Net Neutrality has been on the forefront

of debate since. Different firms have different views on Net Neutrality depending on the type of firm you are. ISP's are against strong Net Neutrality due to the belief that it will slow their technological progress on their networks. CP's who stream videos on their site believe that without strong Net Neutrality, they will be put under monopolistic circumstances. CP's who do not stream videos on their site believe that they will be marginalized due to the lack of bandwidth needed to load their site.

While few studies have been done on Net Neutrality, Cundith aims to study specific impacts of key dates on stock prices of firms in the Telecommunications Industry from 2011 to 2015. Cundith aims to use three different estimation methods: Means Adjusted Returns, Market Adjusted Returns and a OLS Market Model. These methods allow him to control for the weight that the market has on a stock to capture the excess returns (Cundith, 2016). While Cundith explored the impact of news announcements on stock prices, Bryne aimed to look at the post-deregulation dynamics of the Canadian Cable Television Industry from 1990 to 1996. Bryne looked at the firms' profit functions based on the licenses they hold while using Simulated Maximum Likelihood estimation on fixed, merger and entry cost functions (Bryne, 2010). Bryne's research looked at economies of scale and economies of density and how that impacted firms merging with other firms.

The FCC came out with two different regulation regimes for Net Neutrality. The Preserving the Open Internet order stated all businesses must be transparent and ISP's cannot unlawfully block or impair network traffic at their will. ISP's took this matter to court with the result that the FCC was out of their authority with their regulations. In 2014, the US Court of Appeals in DC ruled that the FCC's Preserving the Open Internet order were overreaching when discussing anti-blocking and nondiscrimination of content. The Open Internet – Bright Line

Rules were released in 2015 with the main points stemming from ISP's could not block or impair content and ISP's could not be paid for prioritization. These regulations helped keep the Telecommunications Industry away from any monopolistic circumstances.

Under the Bright Line Rules, ISP's can now second degree price discriminate against consumers. Consumers can choose and pay for bandwidth they plan on using per month allowing for firms to segment consumers into categories of bandwidth. This strategy allows for surplus to be gained by consumers because they can choose exactly how much bandwidth they require. ISP's lose out on surplus due to this because they can no longer charge a single price across segments, but they do gain surplus from second degree price discriminating.

After collecting data from 2011 to 2015 on thirty-nine firms in the Telecommunications Industry based, the firms were split into three categories of ISP's, CP's who stream video and CP's who do not. The daily and weekly returns were calculated for these firms to allow for testing on excess daily and weekly returns. The event study model allowed the tests to capture the impact of news of Net Neutrality while controlling for the S&P500 and the NASDAQ Telecommunications index.

The first date, Preserving the Open Internet, confirms our hypothesis on how the firms would be impacted and reveals how ISP's would be impacted. This date results in a 1.05% change in the excess returns for the stock prices for ISP's while all other variables were held constant. This reveals that the impact of regulation on ISP's was beneficial for them at the time; ISP's now understood what regulation to abide by and could operate business per that. This date also resulted in a 0.95% change in the excess returns for stock prices for CP's who provide video streaming services while all other variables were held constant. Content Providers who provide video streaming services were helped by these regulations because ISP's had to abide by them.

The second date, Verizon v. FCC, confirmed our hypothesis on how the firms would be impacted. This date resulted in a 2.39% change in the excess returns for the stock prices for ISP's while all other variables were held constant. This date was predicted to cause a positive impact to ISP's since the FCC was ruled to be out of their authority with their regulations. This led to more freedom for the ISP's to operate. The third date, US Court of Appeals in DC – Preserving the Open Internet Revoked, did not provide any significant results. This could be from a lack of knowledge of how the Telecommunications Industry was going to shape after deregulation. The fourth date, the Open Internet – Bright Line Rules, depicted conflicting results to our hypothesis on how firms would be impacted. This date resulted in a -1.10% change in the excess returns for the stock prices for ISP's while all other variables were held constant. This date was predicted to cause a positive impact to ISP's, but provided a negative impact since the strong Net Neutrality regulations caused more difficulties for ISP's to operate. Date 4 confirmed our predictions on how these regulations would impact CP's who do not provide video streaming services. This date resulted in a 1.18% change in the excess returns for the stock prices for ISP's while all other variables were held constant. These firms' content would no longer be put on a lower prioritization by ISP's.

Furthermore, research on the entirety of the market should be done. Market structure is one component that should be included in further research. During the early 2010's several firms began to align themselves horizontally with firms to provide specific services to each other, but this has changed as of late. With new regulations in place, firms are beginning to vertically align themselves in the Telecommunications Industry to cost effectively provide their product. Firms such as Comcast have been vertically merging with NBC to provide their content seamlessly.

Comcast is an ISP who provides the internet, so you can watch any show that NBC produces on their channel. This is one case of vertical alignment and it may not be the last.

Research on market structure is not the way to understand Net Neutrality; growth of technology is a key factor that will shape how the Telecommunications Industry looks in years to come. With the change of consumer preference to "anywhere, anytime" media, there will need to be an increase in the technology supporting that. Download speed of content and advertising over the Internet is bound to increase due to Moore's Law. This competition for the best supporting technology to changing consumer preferences will help propel the Telecommunications Industry in the future.

Bibliography

Boik, Andre. "Intermediaries in Two-Sided Markets: An Empirical Analysis of the US Cable Television Industry." *American Economic Journal: Microeconomics* 8, no. 1 (2016): 256-82. doi:10.1257/mic.20140167.

Bring, D., W. Leighton, K. Lopiccalo, C. Matraves, J. Schwarz, and D. Waterman. "The Year in Economics at the FCC, 2014–2015." *Review of Industrial Organization Rev Ind Organ* 47, no. 4 (2015): 437-62. doi:10.1007/s11151-015-9491-y.

Bryne, David P. "Acquisitions as a Response to Deregulation: Evidence from the Cable Television Industry." *Queen's Economics Department Working Paper*, March 1, 2010. https://www.econstor.eu/bitstream/10419/67862/1/636311627.pdf.

Byrne, David P. "Testing Models Of Differentiated Products Markets: Consolidation In The Cable Tv Industry." *International Economic Review* 56, no. 3 (2015): 805-50. doi:10.1111/iere.12123.

Ciarlo, Michael. "A Guide to the Open Internet." *The Open Internet: A Case for Net Neutrality.* N.p., n.d. Web. 16 Jan. 2017.

Choi, Jay Pil, Doh-Shin Jeon, and Byung-Cheol Kim. "Net Neutrality, Business Models, and Internet Interconnection." *American Economic Journal: Microeconomics* 7, no. 3 (2015): 104-41. doi:10.1257/mic.20130162.

Cundith, Brandon. "Net Neutrality: The Potential Winners and Losers in the Digital Media Space through an Event Study." PhD diss., Texas Christian University, 2016. 2016. Accessed March 7, 2017. https://repository.tcu.edu/bitstream/handle/116099117/11371/Cundith__Brandon-Honors_Project.pdf?sequence=1.

Gans, Joshua S., and Michael L. Katz. "Weak versus Strong Net Neutrality: Correction and Clarification." *J Regul Econ Journal of Regulatory Economics* 50, no. 1 (2016): 99-110. doi:10.1007/s11149-016-9305-7.

Greenstein, Shane, Martin Peitz, and Tommaso Valletti. "Net Neutrality: A Fast Lane to Understanding the Trade-offs." *Journal of Economic Perspectives* 30, no. 2 (2016): 127-50. doi:10.1257/jep.30.2.127.

Gu, Chengyan. "Three Essays in Empirical Industrial Organization and Merger Policy." PhD diss., Northeastern University, 2015. Abstract in March 2015.

Guo, Hong, Subhajyoti Bandyopadhyay, Hsing Kenneth Cheng, and Yu-Chen Yang. "Net Neutrality and Vertical Integration of Content and Broadband Services." *Journal of Management Information Systems* 27, no. 2 (2010): 243-76. doi:10.2753/mis0742-1222270208.

Hogendorn, Christiaan. "Broadband Internet: Net Neutrality versus Open Access." *International Economics and Economic Policy* 4, no. 2 (2007): 185-208. doi:10.1007/s10368-007-0084-6.

Kang, Cecilia. "U.S. Court Curbs F.C.C. Authority on Web Traffic." The New York Times. 2010. Accessed December 08, 2016. http://www.nytimes.com/2010/04/07/technology/07net.html.

Leichtman Research Group. "Number of Broadband Internet Subscribers in The United States from 2011 to 2016, by Cable Provider (in 1,000s)." Statista - The Statistics Portal. Statista. November 2016. Web. 16 Jan 2017. <https://www.statista.com/statistics/217348/us-broadband-internet-susbcribers-by-cable-provider/>

Ramachandran, Shalini. "Netflix to Pay Comcast for Smoother Streaming." The Wall Street Journal. February 23, 2014. Accessed December 08, 2016. http://www.wsj.com/articles/SB10001424052702304834704579401071892041790.

Reicher, Alexander. "REDEFINING NET NEUTRALITY AFTER COMCAST V. FCC." *Berkeley Technology Law Journal* 26, no. 1 (2011): 733-63. http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?sid=b9882e33-50f2-4536-b997-65a54fd27471@sessionmgr4010&vid=1&hid=4114.

Rousseau, Peter L., and Caleb Stroup. "Director Histories and the Pattern of Acquisitions." *Journal of Financial and Quantitative Analysis J. Financ. Quant. Anal.* 50, no. 04 (2015): 671-98. doi:10.1017/s0022109015000289.

Stelter, Brian. "Comcast Agrees to Buy Time Warner Cable for $45 Billion." CNNMoney. Accessed December 08, 2016. http://money.cnn.com/2014/02/13/technology/comcast-time-warner-cable-deal/.

United States. Federal Communications Commission. *Applications of AT&T Inc. and DIRECTV For Consent to Assign or Transfer Control of Licenses and Authorizations*. Washington DC, 2015.

United States. FEDERAL COMMUNICATIONS COMMISSION. Federal Register. *Preserving the Open Internet*. 185th ed. Vol. 76. 2011.

United States. Federal Communications Commission. *Protecting and Promoting the Open Internet*. Washington DC, 2015.

United States. FEDERAL COMMUNICATIONS COMMISSION. *Small Entity Compliance Guide Preserving the Open Internet; Broadband Industry Practices*. Washington DC, 2012.

United States,. *Telecommunications Act of 1996*.

United States. United States Court of Appeals FOR THE DISTRICT OF COLUMBIA CIRCUIT. *Verizon v. Federal Communications Commission*. Washington DC, 2014.

Wilhem, Alex. "Verizon Slams the FCC's Net Neutrality Rules as Unconstitutional." The Next Web. July 2, 2012. Accessed December 8, 2016. http://thenextweb.com/insider/2012/07/03/verizon-slams-the-fccs-net-neutrality-rules-as-unconstitutional/#gref.

"Yahoo Finance - Business Finance, Stock Market, Quotes, News." Yahoo! Accessed March 08, 2017. https://finance.yahoo.com/.

Appendix

A – Data description

Dependent Variable	Description	Source
price	Stock price of a firm.	Yahoo Finance
lnprice	Natural log of the stock price of a firm.	Yahoo Finance
dlnprice	Daily difference in the natural log of the stock price of a firm.	Yahoo Finance
rtn7	The weekly return of the natural log of the firms stock price from a given day.	Yahoo Finance
Independent Variables		
date	The date starting from May 6, 2011 to July 28, 2015.	Authors Calculation
days	The number of days since May 6, 2011.	Authors Calculation
fridaydum	A dummy variable Given to a day of the week if it is a Friday; coded 0 or 1.	Authors Calculation
thursdaydum	A dummy variable given to a day of the week if it is a Thursday; coded 0 or 1.	Authors Calculation
tuesdaydum	A dummy variable given to a day of the week if it is a Tuesday; coded 0 or 1.	Authors Calculation
mondaydum	A dummy variable given to a day of the week if it is Monday; coded 0 or 1.	Authors Calculation
firm	The name of the firms involved in the study.	Yahoo Finance
firmnum	The number given to each firm ranging from one to thirty-nine.	Authors Calculation
date1poi	A dummy variable given to the date in which the Preserving the Open Internet Order was released on; coded 0 or 1.	Authors Calculation

date2vvfcc	A dummy variable given to the date in which Verizon v. FCC was released on; coded 0 or 1.	Authors Calculation
date3poir	A dummy variable given to the date in which the Preserving the Open Internet Order was revoked on; coded 0 or 1.	Authors Calculation
date4blr	A dummy variable given to the date in which the Open Internet - Bright Line Rules was released on; coded 0 or 1.	Authors Calculation
isp	A dummy variable for the type service provided by a Telecommunications Firm; coded 0 or 1.	Authors Calculation
cpstream	A dummy variable for the type service provided by a Telecommunications Firm; coded 0 or 1.	Authors Calculation
cpnon	A dummy variable for the type service provided by a Telecommunications Firm; coded 0 or 1.	Authors Calculation
sp500	The S&P500 Index price.	Yahoo Finance
lnsp500	The natural log of the S&P500 Index price.	Yahoo Finance
dlnsp500	Daily difference in the natural log of the S&P500 Index price.	Yahoo Finance
nasdaqtele	The NASDAQ Telecommunications Index price.	Yahoo Finance
lnnasdaqtele	The natural log of the NASDAQ Telecommunications Index price.	Yahoo Finance
dlnnasdaqtele	Daily difference in the natural log of the S&P500 Index price.	Yahoo Finance
rtn7_sp	The weekly return of the natural log of the S&P500 Index price from a given day.	Yahoo Finance
rtn7_nastele	The weekly return of the natural log of the NASDAQ Telecommunications Index price from a given day.	Yahoo Finance

B – Firm description

Firm	ISP	CPSTREAM	CPNON
AMC Networks	0	1	0
ATT	1	0	0
Alaska Communications System Group	1	0	0
CBS	0	1	0
Century Link	1	0	0
Charter Communications	1	0	0
Cincinnati Bell	1	0	0
Comcast	1	0	0
Discovery Communications	0	1	0
Dish	1	0	0
Ebay	0	0	1
Etsy	0	0	1
Fox	0	1	0
Fronteir Commununications Corp	1	0	0
General Communication	1	0	0
Google	0	0	1
IDT	1	0	0
IMAX	0	1	0
Level 3 Communications	1	0	0
Linkdin	0	0	1
Lions Gate Entertainment	0	1	0
MSG Networks	0	1	0
Microsoft	0	0	1
NY Times	0	0	1
Netflix	0	1	0
Pandora	0	1	0
Scripps Network Interactive	0	1	0
Sony	0	1	0
Starz	0	1	0
Telephone and Data Systems	1	0	0
Time Warner Cable	1	0	0
Tmobile	1	0	0
Twitter	0	0	1
United States Cellular Corporation	1	0	0
Verizon	1	0	0
Viacom	1	0	0
WWE	0	1	0
Walt Disney	0	1	0
Windstream Communications	1	0	0

C – Table 1 Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
date	0				
days	31,083	743.8758	494.2163	0	1544
friday	31,083	.5151461	.2958587	0	.8571429
fridaydum	31,083	.2032622	.4024325	0	1
thursday	31,083	.4572504	.3326719	0	.8571429
thursdaydum	31,083	.2007528	.40057	0	1
tuesday	31,083	.3326761	.2891874	0	.8571429
tuesdaydum	31,083	.2070263	.4051811	0	1
monday	31,083	.2898369	.2001451	0	.5714286
mondaydum	31,083	.1856964	.3888677	0	1
lnprice	29,848	3.423352	1.104732	.198851	7.10675
firm	0				
firmnum	31,083	20	11.25481	1	39
price	29,848	61.46545	119.8572	1.22	1220.17
dlnprice	29,734	.000097	.0312651	-1.96849	2.70158
date1poi	31,083	.0012547	.0354002	0	1
date2vvfcc	31,083	.0012547	.0354002	0	1
date3poir	31,083	.0012547	.0354002	0	1
date4blr	31,083	.0012547	.0354002	0	1
isp	31,083	.4615385	.4985265	0	1
cpstream	31,083	.3589744	.4797074	0	1
cpnon	31,083	.1794872	.3837659	0	1
sp500	31,083	1631.33	329.8737	1099.23	2130.82
lnsp500	31,083	7.376507	.203642	7.00237	7.66426
dlnsp500	30,966	.0003891	.01037	-.068958	.046317
nasdaqtele	31,083	228.5574	33.14281	170.15	289.45
lnnasdaqtele	31,083	5.421154	.1462899	5.13668	5.66798
dlnnasdaqt~e	30,966	.0000512	.0131329	-.078689	.078227
rtn7	28,266	.0003512	.0686461	-1.89766	2.812895
rtn7_sp	29,445	.0018002	.0218591	-.13942	.0834403
rtn7_nastele	29,445	.0001526	.0284973	-.1496501	.1122799

D – Regression Results

Table 2: Date 1
Preserving the Open Internet

	(1)	(2)	(3)	(4)	(5)	(6)
SAMPLE	ALL	CP=1	CPNON=1	ISP=1	ROBUST TEST, TUESDAY=1	ROBUST TEST, TUESDAY=1 & NASDAQTELE
VARIABLES	dlnprice	dlnprice	dlnprice	dlnprice	rtn7	rtn7
dlnprice						
date1poi	0.00836***	0.00965**	-0.00278	0.0105***		
	(3.109)	(1.995)	(-0.806)	(2.871)		
dlnsp500	1.063***	1.040***	1.168***	1.051***		
	(66.48)	(40.99)	(30.05)	(43.87)		
rtn7						
F3.date1poi[4]					-0.0230	0.00512
					(-1.543)	(0.343)
rtn7_sp					1.087***	
					(34.74)	
rtn7_nastele						0.736***
						(27.44)
Constant	-0.000332*	-0.000292	-0.000631	-0.000273	-0.00109	0.000535
	(-1.957)	(-1.056)	(-1.505)	(-1.091)	(-1.300)	(0.623)
Observations	29,734	11,061	4,381	14,292	5,800	5,800
R-squared	0.124	0.122	0.154	0.117	0.119	0.095

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Notes: Robust t-statistics are in parentheses. Asterisks indicate statistical significance

[4] F3 was used in Stata to help the day dummy variable control for start of the weekly return.

Table 3: Date 2
Verizon v. FCC

	(1)	(2)	(3)	(4)	(5)	(6)
SAMPLE	ALL	CP=1	CPNON=1	ISP=1	ROBUST TEST, THURSDAY=1	ROBUST TEST, THURSDAY=1 & NASDAQTELE
VARIABLES	dlnprice	dlnprice	dlnprice	dlnprice	rtn7	rtn7
dlnprice						
date2vvfcc	0.0160***	0.0115	0.000516	0.0239***		
	(3.246)	(1.587)	(0.0858)	(3.068)		
dlnsp500	1.063***	1.040***	1.167***	1.051***		
	(66.52)	(41.02)	(30.05)	(43.90)		
rtn7						
F4.date2vvfcc[5]					0.00616	0.0143**
					(1.068)	(2.465)
rtn7_sp					1.090***	
					(20.43)	
rtn7_nastele						0.678***
						(17.34)
Constant	-0.000342**	-0.000295	-0.000634	-0.000289	-0.00217**	-0.000402
	(-2.015)	(-1.065)	(-1.514)	(-1.159)	(-2.394)	(-0.432)
Observations	29,734	11,061	4,381	14,292	5,057	5,057
R-squared	0.124	0.122	0.154	0.118	0.099	0.067

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Notes: Robust t-statistics are in parentheses. Asterisks indicate statistical significance

[5] F4 was used in Stata to help the day dummy variable control for start of the weekly return.

Table 4: Date 3
US Court of Appeals in DC – Preserving the Open Internet Revoked

	(1)	(2)	(3)	(4)	(5)	(6)
SAMPLE	ALL	CP=1	CPNON=1	ISP=1	ROBUST TEST, FRIDAY=1	ROBUST TEST, FRIDAY=1 & NASDAQTELE
VARIABLES	dlnprice	dlnprice	dlnprice	dlnprice	rtn7	rtn7
dlnprice						
date3poir	0.000211	-0.000859	0.00260	0.000209		
	(0.102)	(-0.192)	(0.963)	(0.0866)		
dlnsp500	1.064***	1.041***	1.167***	1.051***		
	(66.46)	(41.00)	(30.00)	(43.86)		
rtn7						
F4.date3poir[6]					-0.00866	-0.00835
					(-0.951)	(-0.918)
rtn7_sp					1.052***	
					(27.85)	
rtn7_nastele						0.691***
						(21.14)
Constant	-0.000323*	-0.000279	-0.000637	-0.000260	-0.00116	0.000372
	(-1.898)	(-1.009)	(-1.520)	(-1.040)	(-1.390)	(0.427)
Observations	29,734	11,061	4,381	14,292	5,724	5,724
R-squared	0.124	0.122	0.154	0.117	0.112	0.076

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Notes: Robust t-statistics are in parentheses. Asterisks indicate statistical significance

[6] F4 was used in Stata to help the day dummy variable control for start of the weekly return.

Table 5: Date 4
The Open Internet – Bright Line Rules

	(1)	(2)	(3)	(4)	(5)	(6)
SAMPLE	ALL	CP=1	CPNON=1	ISP=1	ROBUST TEST, THURSDAY=1	ROBUST TEST, THURSDAY=1 & NASDAQTELE
VARIABLES	dlnprice	dlnprice	dlnprice	dlnprice	rtn7	rtn7
dlnprice						
date4blr	-0.000662	0.00261	0.0118***	-0.00734*		
	(-0.222)	(0.539)	(3.908)	(-1.692)		
dlnsp500	1.064***	1.040***	1.168***	1.051***		
	(66.54)	(41.03)	(30.06)	(43.91)		
rtn7						
F6.date4blr[7]					-0.0110***	-0.00804
					(-3.263)	(-0.751)
rtn7_sp					1.045***	
					(25.98)	
rtn7_nastele						0.678***
						(20.28)
Constant	-0.000321*	-0.000284	-0.000650	-0.000250	-0.000799	0.00126
	(-1.892)	(-1.025)	(-1.551)	(-1.002)	(-0.917)	(1.390)
Observations	29,734	11,061	4,381	14,292	5,308	5,308
R-squared	0.124	0.122	0.154	0.117	0.105	0.072

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Notes: Robust t-statistics are in parentheses. Asterisks indicate statistical significance

[7] F6 was used in Stata to help the day dummy variable control for start of the weekly return.