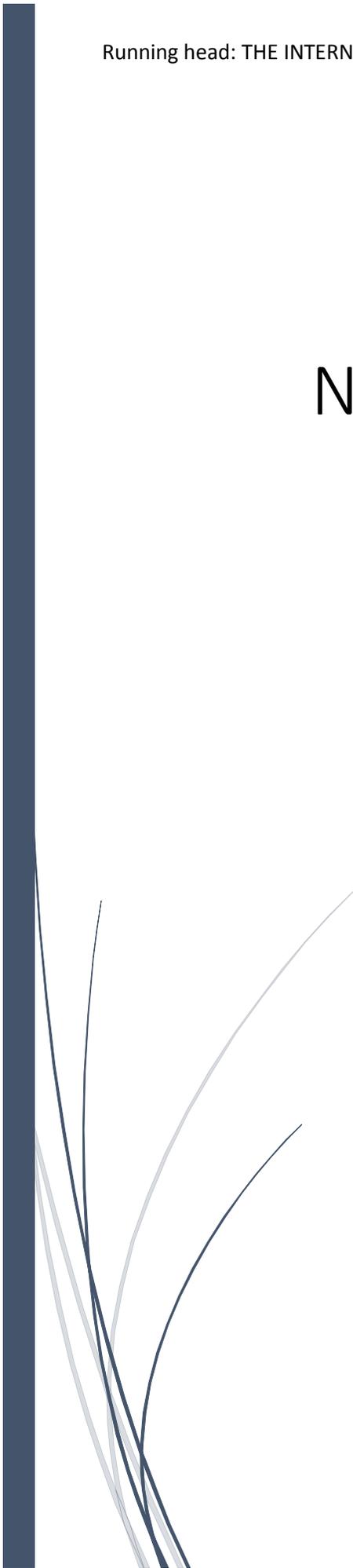


The Internet Neutrality Debate: Policy and Economic Perspective

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Introduction

The internet is a marvel of connectivity that drives innovation and allows information to be transmitted at incredible speed and capacity. In contrast to this magnificence, the internet as we know it is likely to change. Internet service providers wish to overthrow the status quo of internet neutrality and replace it with a discriminatory network. A discriminatory network in the hands of internet service providers raises anti-trust concerns due to the limited amount of alternative providers. In line with this threat Cheng, Bandyopadhyay, and Guo (2011) describes the limited competition amongst internet service providers in the United States. In some areas internet service providers operate as a de facto monopolist. There are three possible outcomes for this issue. The first is that the internet remains a neutral network, where all packets of information are treated equally. The second and more likely option, government regulatory agencies allow reasonable discrimination amongst packets with their oversight. The last and the most harmful possibility is that internet service providers will create a discriminatory network devoid of government regulation. The purpose of this paper is to illuminate the effect these three options will have on internet service providers, content producers, and consumers.

Technical Framework

Internet Infrastructure. In order to understand how internet service providers are able to establish monopolistic control, the infrastructure of the internet must be clearly understood. Tyson (2014) creates an excellent description of internet infrastructure. End-users, consumers who subscribe to the internet service provider, connect to the internet through a device called a modem. This modem allows access to the internet service provider's network. Information, which is separated into packets of information, may travel through a number of different networks belonging to numerous internet service providers until it reaches its destination. This destination could be a content provider, a company such as Google or Netflix, or another end-user.

The information originating from the content provider is the focus of a discriminatory network. Here the internet service provider can control the packets of information traveling to and from the content provider. This process is best detailed by Cheng et al. (2011), "...the hosting service provider is different from the local [internet service provider] at the consumers' end) but as that of a gatekeeper who determines how content from the content producers reaches the consumers, after it reaches the local switching office" (p. 5). Discrimination of packets occurs from the internet service provider that hosts the content provider, not from where the end-user is located. It is here, in local proximity to the content provider, that a discriminatory network is created.

Internet neutrality requires a best-effort-connection that treats packets equally and routes them in the order they were received. At switching offices the host internet service provider can manage packets of information through a number of different methods. The first is queuing, which typically involves routing packets in the order they were received, a characteristic of

neutral networking. However, in a discriminatory network packets of information are not routed in the order they were received, no longer making it a best-effort-connection. Packets that take priority over other packets will have greater bandwidth, a term for internet speed, than non-prioritized packets. Second, packets can be dropped from transportation. Packet dropping requires those packets to be sent again which decreases bandwidth. Because the content provider often exists within a de facto monopoly, content providers cannot switch internet service providers when their packet bandwidth is altered. The internet service provider can then exert its monopoly power and demand fees for different levels of manipulated bandwidth.

Arguments. Internet service providers are opposed to network neutrality and desire a discriminatory network. Under a discriminatory network internet service providers protest they would have more incentives to invest in internet infrastructure. Choi and Kim (2010) describe the argument against internet neutrality, “The logic is that they would have no incentive to invest in network capacity unless content providers supporting bandwidth-intensive multimedia applications pay a premium for heavy internet traffic” (p. 447). This quotation is the heart of the internet neutrality debate. The question that will be answered in the economic analysis section of this paper is, if more revenue generated through a discriminatory network results in a real incentive to improve internet infrastructure.

On the other side of the debate content providers claim that internet neutrality, the act of treating all packets of information equally, yields the most industry growth and innovation of content. The logic behind this argument is explained by Choi and Kim (2010). They detail how the internet has been operating on the principles of internet neutrality since its creation. The principle of internet neutrality fostered the conditions where creation and innovation does not require content providers to seek permission. Meaning that there are no fees for usage on the

content provider's end, just the end-user who requests the content. Competition, thus, is limited to whatever content provider makes the most desirable content. This framework greatly reduces the barriers to entry, and makes for a more competitive market amongst content providers.

Economic analysis

Equilibrium, Short-Run. The following models created by Choi and Kim (2010) details the conditions of internet neutrality and a discriminatory network that reaches equilibrium, in other words the demand for content and the supply of end-users reach a natural point. Under internet neutrality end-users choose the content provider with the best content. When two content providers produce homogenous content their demand is contingent on end-users and its capacity to supply them. The internet service provider's profit is the determined only by its ability to cover the end-user market, who pay a subscription fee to access the network.

In a discriminatory network internet service providers charge content providers a fee for a priority fast lane, which will move its packets of information faster than content providers without a priority fast lane. Consumers will face different waiting times to access content depending on the priority level of the content provider. Equilibrium for the internet service provider will be determined by a content provider's maximum disposition to pay and its ability to cover the end-user market. If one content provider has a higher market share of end-users it will be inclined to obtain a priority fast land over its rival. The following is a scenario with two content providers denoted as *A* and *B*. If content provider *A* obtains the priority first it will take the end-users away from content provider *B*, due to an appealing reduced waiting time. This situation can lead to all of the end-users switching to content producer *A*'s and abandoning content producer *B*.

Prisoner’s Dilemma. When content providers *A* and *B* have a homogeneous product they face a prisoner’s dilemma in a discriminatory network. Hourigan (2004) depicts the situation of two

Figure 1: Hourigan (2004)

content providers when choosing to pay the priority fast lane fees. A value of zero is the least profitable outcome and a value of five is the most profitable. When both content providers *A* and *B* choose not to pay they receive a mutual

		Player B	
		<i>Cooperate</i>	<i>Defect</i>
Player A	<i>Cooperate</i>	A → 3, B → 3 Reward for mutual cooperation	A → 0, B → 5 Sucker’s payoff and temptation to defect
	<i>Defect</i>	A → 5, B → 0 Temptation to defect and sucker’s payoff	A → 1, B → 1 Punishment for mutual defection

benefit. This is denoted by the value of three for both content providers. This means that the two content providers could share an equal portion of the end-user market without paying the internet service provider priority fees.

In the situation where both content providers decide to pay the priority fee they both incur the least profitable outcome. The value of one depicts the content providers sharing the end-user market equally while incurring the cost of priority fast lane fees. While not portrayed in this figure, the loss of the content provider’s profit becomes the internet service provider’s profit. Cheng et al. (2011) supports this outcome in his economic model, “Since the [internet service provider] is a monopolist gatekeeper between the content providers and the consumers, he can essentially “drive” the direction of the equilibrium...in such a way that it ensures the highest possible profits for him” (p. 18). The clear victor in this situation is the internet service provider and both content providers are worse off.

The last scenario for the content providers it when one chooses to pay the priority fee and the other does not. This action is depicted by the value of five, the profitable outcome for choosing the priority fast lane; and the value of zero, the content provider that did not choose the

priority fast lane. As mentioned previously in this paper the end-user market shifts equilibrium as end-users' demand for the content provider with the lowest waiting time increases. The end-users who previously preferred the content provider that is now non-prioritized leaves that content provider with no market share. Choi and Kim (2010) support this claim in their model, "The best-case scenario for the high-margin [content provider] is to capture the whole market and double the profit it would receive under net neutrality" (p. 456). By losing the entire end-user market the non-prioritized content provider is removed from the market and competition which drives innovation is reduced. Consumers are the victim in this scenario due to the loss of competition and innovation.

Investment incentives, Long Run. As stated previously the argument made by internet service providers for a discriminatory network is based on the belief that more revenue will incentivize the improvement of internet infrastructure. Contrary to the claims made by internet service providers Choi and Kim (2010) conclude that investment incentive are higher under internet neutrality rather than a discriminatory network. Internet service providers will invest in internet infrastructure when their marginal benefit of investing equals their marginal cost of that investment. These two variable are affected by the network access fee charged to end users and the priority fast lane fee charged to content providers, as well as the cost related to internet infrastructure. Charging end-users a higher network access fee for faster broadband is analogous in both internet neutrality and a discriminatory network. On the other hand charging content providers a priority fast lane fee exists only in the discriminatory network, thus is the deciding variable for the internet service provider's investment incentive.

When internet service providers improve their internet infrastructure they enable faster content downloads by end-users. They can, in turn, charge end-users a higher price for this

improvement. Improving internet infrastructure is a uniform change to the entire network, meaning that all content providers benefit. The content providers without a priority fast lane receives improved internet speeds under their best-effort-connection. The priority fast lane becomes marginally less superior to the non-prioritized best-efforts-connection. As a result, the demand for the prioritized fast lane is reduced and content providers will pay less for it. The internet service provider's argument that charging content providers will enable them to better improve their internet infrastructure is false. In order to maintain the need for priority fast lanes internet service providers will not improve their internet infrastructure.

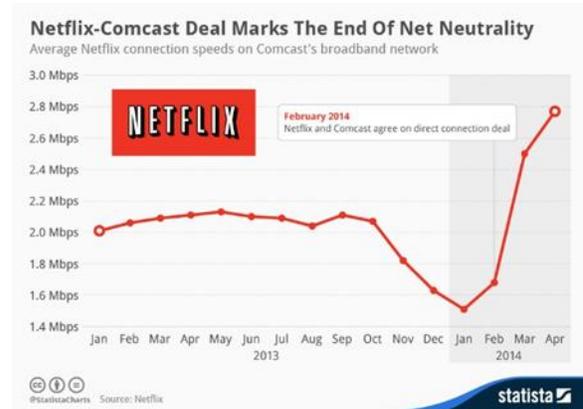
Content providers, as stated previously, argue for internet neutrality. They believe that innovation and investment incentives will be best stimulated under a best-effort-connection. The content provider will invest in innovation when their marginal benefit of investing equals their marginal cost of that investment. Under a neutral network the only variables are the cost of the investment and the revenue gained by superior content attracting more end-users. However, under a discriminatory network the variables become more complex. The priority fast lane fee can bring more end-users, as demonstrated by the prisoner's dilemma scenario that resulted in a value of five. On the other hand it could become a cost that does not generate revenue. This scenario was represented by a value of one. In short, the investment incentive is beneficial to the content provider that has the highest market share of end-users; conversely, it is most harmful to the content provider with the least market share of end-users. Investment incentives for innovation can still exist under a discriminatory network; however, it will increase barriers to entry causing reduces competition between content providers.

Policy Analysis

Laissez-Faire and Anti-Trust. It is in the best interest of policy makers to preserve and promote competition. In line with this philosophy Weiser (2008) portrays the relationship between Laissez-Faire and the internet. Commerce of the internet should be free of government interference to the extent that a free-enterprise economy is maintained. This paper's economic analysis explain the position content providers and internet service providers take, but it is the balance of Laissez-faire and anti-trust that makes a discriminatory network a concern to policy makers. In today's internet it is apparent that internet service providers operate with monopoly power and competition is not enough to promote a free-enterprise economy.

Internet service providers under a discriminatory network have too much power to extort priority fast lane fees from content providers. Internet service providers can even control the download rate of content providers on their network, essentially holding the content provider hostage until a priority fast lane fee is paid. The ability to hold a content provider's content hostage is depicted by Richter (2014). Richter's graph shows that in October 2013 Comcast, an internet service provider, began restricting the rate at which content was downloaded from Netflix. This restriction began increasing until January 2013 when Netflix finally agreed to pay Comcast a priority access fee for using their network. The degrading quality and download speeds were causing Netflix to lose customers. Netflix could not overcome this issue by switching internet service providers because in many locations Comcast was the only option. After Netflix made an agreement with Comcast in

Figure 2: Richter (2014)



February 2013 the download rate increases 80 percent by April 2013. This graph is an excellent depiction of the monopoly power internet service providers have over content providers.

Compromise. The reality is that a discriminatory network without regulation could result in more situations similar to Comcast and Netflix, but there are also real investment advantages for content providers in a discriminatory network. The compromise lies in the regulation of a discriminatory network to prevent anti-competitive conduct.

Weiser (2008) conveys this belief in the following quotation:

There is a real possibility that [internet service providers] and [content providers] will be able to agree on a framework for business relationships that both will deem satisfactory.

Given that possibility, policy makers will need to develop a strategy for preventing anticompetitive behavior. (p. 310)

This approach satisfies both Laissez-Faire principles and anti-trust laws. An example of an investment advantage is detailed by Choi and Kim (2010). They describe how a network that relies on a best-efforts-connection could become congested, and not deliver internet speed necessary to enable real-time information transmissions. Streaming video or audio over the internet can be adversely effected by any delay or congestion. A delay or congestion could result in a business executives receiving a distorted Skype conference, a technology that enables video conferencing over the internet. It is imperative that policy makers develop a compromise that enable a discriminatory network devoid of anti-competitive conduct.

Procompetitive Guidelines. The key to maintaining a compromise between Laissez-Faire and anti-trust laws is through the development of effective guidelines. Weiser (2008) has formulated an excellent proposal to encourage a free-enterprise economy and eliminate anti-trust concerns. The first step is to establish what information about internet service providers are critical for end-

users to understand. By giving end-users relevant information they can make effective consumer decisions. For example, relevant information would be the average internet speed end-users should expect under a best-effort-connection. Rather than theoretical internet speeds that do not accurately reflect what an end-user would typically experience. By having this information end-users can accurately purchase broadband best suited to their needs.

Second, a well-managed network would enable internet service providers to move information faster and more efficient. However, these management policies should be disclosed to protect the service end-users pay for. Weiser (2008) detailed an example where Comcast engaged in packet forgery, a method that disrupts internet traffic amongst end-users. The packet forgery was aimed at disabling content originating from BitTorrent, a program that enables end-users to share information over the internet. Their reasoning was that the internet traffic did not proportionally reflect the end-users subscribing to their service. This internet traffic congested Comcast's internet infrastructure and was eliminated as a result. This action was not disclosed by Comcast until internet neutrality advocates brought it to light, and outrage amongst Comcast's end-users ensued. In short, a well-managed network should be encouraged while making management practices transparent to end-users. After all, it's a service they are paying for and it should represent their needs.

The third guideline is that a level of best-efforts-connection should be maintained. This best-effort-connection is similar to the average internet speed discussed in the first example, except it applies more to content providers rather than consumers. The assurance of such a connection would enable content providers to better predict their return on investments and reduce the barriers to entry. The barriers to entry would be reduced because content providers could innovate without the fear of their content being held hostage and extorted for a priority fast

lane fee, as previous stated in this paper by the Netflix example. Content providers would be able to more accurately predict their return on investment by innovating content that would thrive under the internet speeds maintained by a best-efforts-connection. The company could further develop their content and incur any necessary priority fast lane fees after that company was established. This guideline preserves competition and enables innovation amongst content providers.

Government Agencies. The guidelines listed above need to be effectively enforce by the proper government agencies. Currently both the Federal Trade Commission (FTC) and the Federal Communication Commission (FCC) have partial and potential capacity to enforce procompetitive guidelines. Currently the FCC has classified internet service providers as a Title I Information Services and is regulated by its delegated jurisdictional authority. The FCC (2014) states that it regulates, “interstate and international communications by radio, television, wire, satellite, and cable in all fifty states...Promoting competition, innovation and investment in broadband services and facilities” (p. 1). This quotation clearly states that regulating the discriminatory network of internet service providers would be within the scope of the FCC’s responsibilities. While the FCC currently does not regulate internet service providers there is a pending proposal to enable regulation.

The current proposal is still pending as of June 5, 2014 and has yet to be finalized. FCC (2014) states that the proposal will prevent behavior considered detrimental to end-users or that inhibits competition. There are three principle rules in the proposal to ensure the latter. First, transparency will be required amongst internet service providers involving network management policies. Second, internet service providers may not block legal content. And lastly, internet

service providers are prohibited from reducing internet traffic in an anti-competitive manner. If this proposal is accepted it will greatly improve the overall health of the internet.

Fortunately the FCC's classification of internet service providers as Title I Information Services enables the FTC oversee the conduct of internet service providers. Originally internet service providers were excluded from the FTC's authority under Title II of the Communications Act of 1934. The FTC is now able to ensure procompetitive competition amongst internet service providers, therefore protecting consumers. While the FTC can regulate internet service providers its powers are more reactive and currently does not include regulatory guidelines. Barry Cutler reveals the extent of the FTC authority in Barbagallo and Baschuk (2013). "...the FTC's main role is and will be a law enforcement function to make sure that companies' practices are not unfair, deceptive, or misleading, and to ensure that they are not anticompetitive" (para. 44). In the future, the FTC and FCC will need to embrace cooperation to enforce regulatory guidelines and ensure a discriminatory network devoid of anti-trust concerns.

Conclusion

In conclusion, the winners and losers of internet neutrality are clear. Internet service providers will experience greater financial gain from a discriminatory network by charging content providers a priority fast lane fee. This charge is not guaranteed to encourage investments in internet infrastructure, a claim often made by internet service providers. Content providers, however, may gain from a discriminatory network if their market share of end-users is large. Conversely, content providers that have a low market share of end-users will suffer increased barriers to entry and could lose end-users to content providers with a higher market share. Knowing this information policy makers can move beyond the rhetoric and decide if a discriminatory network is Laissez-Faire manifest, or creating an incumbent internet service

provider with monopoly power. The answer for this dilemma is to create guidelines that the FCC and FTC can use to maintain a compromise between Laissez-Faire principles and monopoly power. The future of the internet neutrality is not set in stone, but from an economic and policy perspective a regulated discriminatory network is the most likely prospect. It is unlikely that the internet will remain a completely neutral network as priority fast lanes are already being implemented. Furthermore, it is imperative that discriminatory network will not allowed to exist unregulated. The internet we know today is changing and it is imperative that government agencies change with it.

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