



Does Net Neutrality Spur Internet Innovation?

By Roslyn Layton

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Key Points

- The 2015 Federal Communications Commission (FCC) declared that its Open Internet Order was necessary to support innovation, but it never conducted an empirical assessment or reviewed the experience of other countries with net neutrality rules. It is in the public interest that the FCC examine this policy empirically, as it directly affects consumers and innovators.
- Evidence from some 50 countries with net neutrality rules made over the past decade suggests that the FCC's approach will not create more innovation at the edge of the network, at least as measured by new mobile applications.
- Denmark and the Netherlands, two similar socioeconomic countries with multiple advanced mobile networks, employed two different regimes for net neutrality over five years. During this period, Denmark, which employed voluntary self-regulation, experienced an increase in the number, rank, and performance of locally made mobile applications, whereas the Netherlands, which legislated the world's toughest rules, experienced a decline for the same indicators. Results were statistically significant.

This document summarizes the author's doctoral research project at the Center for Communication, Media, and Information Technologies at Aalborg University in Copenhagen, Denmark, conducted from 2012 to 2016 to investigate the outcome of net neutrality policy around the world.¹ A podcast discussion on the research is available at High Tech Forum.²

The 2015 Federal Communications Commission's (FCC) Open Internet Order concluded that hard net neutrality rules are necessary to "protect free expression and innovation on the Internet and promote investment in the nation's broadband networks."³ The order's strongly worded emphasis on protecting innovation and promoting investment implied that the agency had performed a robust analysis, in particular an empirically based assessment of the regulation's likely impact. But the 400-page order contains no such analysis.

In the vast literature that has developed on net neutrality, almost no one has tested it empirically by

comparing the efforts of different national policies and, more importantly, whether the policies delivered the promised results. The net neutrality concept developed by Tim Wu,⁴ Mark Lemley and Lawrence Lessig,⁵ and Barbara van Schewick⁶ suggests there is an inherent problem with private ownership of broadband networks and that only government provision of broadband, or at least heavy regulation of broadband networks, can ensure a "neutral platform" for third-party innovation.⁷ As such, Open Internet policy implements a set of price and traffic controls on broadband internet access service (BIAS) providers

to give “edge providers,” or third-party application developers, an advantage.

The goal of net neutrality is to protect a low-cost and unconstrained environment for application and service innovation at the edge, which takes precedence over innovation by BIAS providers and even consumer preferences.⁸ Following the 2015 FCC’s logic, the next app at the edge, whether “Angry Birds” or Instagram, is more important than innovation within the network—for example, the development of the 5G mobile wireless standard. This view conflicts with established academic theories of innovation, such as complementary assets, the idea that apps and networks evolve together symbiotically,⁹ and two-sided markets, the idea that forces of supply and demand allow different parties to maximize their particular preferences and utilities.¹⁰

Because FCC policies can affect America’s digital industries, some one-sixth of the US economy, it is paramount that regulation is based on a solid foundation of empirical research.

The 2015 order failed to explain why innovation at the edge should be the priority or why such an extreme regulatory change was immediately required to preserve it. Indeed, the order failed to distinguish between incremental improvements to existing internet products and services and truly groundbreaking invention, or what is referred to in management literature as “disruptive innovation.”¹¹

Because FCC policies can affect America’s digital industries, some one-sixth of the US economy, it is paramount that regulation is based on a solid foundation of empirical research. Too frequently there is a gap between policy research and policy. Consider health care: More than \$30 billion annually is spent in the US on research, but the enacted policy rarely resembles the research’s recommendations.¹² A review by Hartsfield et al. identified 107 model public health laws covering 16 topics, but only seven laws were based on scientific information (i.e., research-based guidelines).¹³

My research undertaken at Aalborg University represents a preliminary step to address the gap between research and policy. I investigated the results of net neutrality before and after rules were imposed to see whether the policy delivers the promised innovation at the edge. The investigation was confined to mobile apps on mobile networks. The specific research questions were: To what degree does introducing net neutrality in a given country stimulate edge providers’ innovation on mobile networks? In other words, how many more mobile apps does a country make once it establishes net neutrality rules? How do the different frameworks affect edge innovation?

The investigation found significant statistical support for “soft” voluntary net neutrality rules and increased mobile app innovation, but not for “hard” net neutrality. Countries that adopted net neutrality through legislation and regulation did not display an increase in mobile app development. The results suggest that hard net neutrality policy, such as the FCC’s Open Internet Order with Title II, may not be as necessary and effective as purported.

Net Neutrality Around the World

US policymakers could learn a lot from studying the experience of net neutrality around the world. Over the past decade there have been a series of natural experiments on net neutrality at the nation-state level, providing an opportunity to study the policy instruments and their effects.

Net neutrality rules around the world can be characterized as either “soft” or “hard.” Soft, or voluntary, rules consist of principles, codes of conduct, multi-stakeholder dialogue, and self-regulation. In soft regimes, the telecom regulator plays the role of a facilitator, allowing experimentation and partnerships in the internet value chain but maintaining the ability to intervene if harm occurs.

Hard rules, on the other hand, are mandatory and punitive. Promulgated through legislation or regulation, these rules generally prohibit blocking, throttling, and prioritization and frequently, though unwittingly, turn the telecom regulator into a warden and judge.

Beginning in 2009, the Nordic countries implemented voluntary soft rules. For some five years these rules were largely successful: Mobile

application innovation continued, there were no significant violations, and there was no litigation against regulators.

However, in April 2016, the 28 nations of the European Union and subsequently Norway adopted hard rules through legislation. Significantly, the Netherlands and Slovenia were the first European movers to create a net neutrality law in 2012, following Chile, which in 2010 became the first nation to make such a law. Most nations in Latin America have adopted hard net neutrality rules. India imposed a two-year ban on zero rating in January 2016¹⁴ and is still in the process of making net neutrality rules.¹⁵ (See Table 1.) Unsurprisingly, the effort to make harder, bright-line rules has been coupled with litigation against regulators in a number of countries, as bright-line rules frequently conflict with competition principles and constitutional laws.¹⁶

A separate study on the mobile app economy notes that about 95 percent of the value of the mobile app economy is concentrated in just 10 markets.¹⁷ While this was not a study about net neutrality policy, the high-level results suggest that benefits from the policy do not necessarily flow to the countries that make rules. Countries in Latin America that have had hard net neutrality rules for years comprise a small fraction of the value of the mobile app economy, while China, which has no rules, continues to count for an increasing share of mobile app innovation. China became the world's largest app market by downloads in 2016, with more than 50 billion downloads and some USD \$10 billion in revenue.¹⁸

Save the Internet, a leading organization for net neutrality, claims, "Without Net Neutrality, the next Google would never get off the ground."¹⁹ To date, however, no such Google has emerged from countries with net neutrality rules. The only countries that claim to have a search engine on the order of Google are Russia with Yandex and China with Baidu.²⁰ While Russia and China have considered net neutrality, they have not made any rules.

An Empirical Investigation of the Rules

To address the gap in regulators' analysis, my research evaluated the impact of net neutrality rules across countries. The investigation tested the proposition that countries that adopt net neutrality rules should experience an increase in mobile app innovation,

Table 1. Countries with Soft vs. Hard Rules for Net Neutrality

Soft Rules		Hard Rules	
Sweden	2009	Chile	2010
Norway	2009	Canada	2010
Japan	2010	The Netherlands	2012
France	2010	Colombia	2011
Denmark	2011	Peru	2012
United Kingdom	2011	Slovenia	2012
South Korea	2011	Turkey	2012
Austria	2013	Argentina	2013
Switzerland	2014	Israel	2013
		Ecuador	2013
		Brazil	2014
		Mexico	2014
		Italy	2015

Source: Roslyn Layton, *Which Open Internet Framework Is Best for Mobile App Innovation?: An Empirical Inquiry of Net Neutrality Rules Around the World*, Aalborg University Copenhagen, 2017, http://vbn.aau.dk/files/255922611/PHD_Roslyn_Layton_E_pdf_rettet.pdf.

whether in the number or rank of apps produced in the national economy. I developed a statistical methodology that measured the number of locally developed mobile apps in the country for relevant periods before and after rules were imposed, as well as the corresponding levels of downloads and, where possible, revenue. I used two independent tool sets and adjusted the analysis for the sophistication and penetration of advanced mobile networks in the country.

To make more meaningful comparisons and avoid inevitable differences between countries, the investigation focused on two similar countries with different rules: Denmark with soft rules (self-regulation) and the Netherlands with hard rules (legislation). There was no weighting for the type of app or its publisher as that would violate the net neutrality precept that all data are equal. As such, a video game app was considered the same as an e-government app. The analysis consisted of counting all discrete apps that appeared in app stores in Denmark and the Netherlands and then identifying the country in which the app was made and its corresponding net neutrality regime.²¹

To test the assertions of net neutrality, I hypothesized that countries with hard net neutrality rules should exhibit a higher degree of locally made innovation. The research included the following steps:

1. I organized 53 countries based on their type of net neutrality rules, resulting in three categories: countries with soft rules, countries with hard rules, and countries with no rules.
2. As the 53 countries are heterogeneous, the research drilled down on two similar countries, Denmark and the Netherlands. Denmark opted for self-regulation in 2011, while the Netherlands imposed hard rules in 2012.
3. I took measurements across the countries using App Annie, the leading market research tool to measure downloads in mobile app stores. I measured activity in Google Play and the Apple App Store for 2011–12 and 2016 in both Denmark and the Netherlands. Tables were made of the top 250 apps in each country for the two periods, as measuring the top 200 apps in any country is statistically significant for the vast majority of activity in the app store for the given country.
4. I made similar measurements with a competing tool, Apptopia, to see how and whether results differed, bearing in mind that tools are not perfect substitutes.
5. I then reviewed the results in light of additional factors, such as the level and sophistication of mobile networks and the types of mobile broadband subscriptions in the market.

The results of the investigation did not support the hypothesis that hard rules promoted more innovation. From 2012 to 2016, Denmark *increased* its local mobile app development, while the Netherlands *decreased* its development, both to a statistically significant degree.²² Over the period, Denmark produced 115 of the top apps in the country, while the Netherlands produced 102 (Table 2). At the time of measurement, both Denmark and the Netherlands had four mobile network operators and multiple mobile virtual network operators.

As for the total apps used in Denmark and the Netherlands during the period, just 20 apps were produced in countries with hard net neutrality rules. Notably, a

significant number of apps (150) were produced in soft-rule countries. Countries with no rules produced a significant number of apps (130) that were subsequently consumed in Denmark and the Netherlands. The US accounted for 302 apps, but these apps were published before the 2015 Open Internet Order. Note that the Open Internet Order in the US only came into effect in April 2015, so there was not a full year to assess the effect.

Over the period, some apps were retired, some were merged into other platforms, and others continued in successive versions. The original research documents these evolutions.²³

Table 3 shows the statistical results of the rankings for apps from each type of net neutrality regime. For example, the average Danish app increased in rank in the app store from 42 to 26 over the period, but the average Dutch app fell in rank from 31 to 43. The changes in rank status are statistically significant. There were so few apps from countries with hard rules that the rank analysis could not be performed.

Table 2. Countries of Origin for Top Apps Used in Denmark and the Netherlands (2010–16)

Soft Rules	Apps	No Rules	Apps
Austria	6	Australia	22
France	21	Belgium	3
Japan	7	Belarus	2
Norway	11	Bulgaria	1
South Korea	5	China	21
Switzerland	11	Czech Republic	4
Sweden	37	Egypt	1
United Kingdom	52	Finland	21
Total	150	Germany	26
Average	18.75	Hong Kong	2
Denmark	115	India	3
		Ireland	2
		Croatia	2
Hard Rules	Apps	Lebanon	3
Argentina	4	Liberia	1
Brazil	1	Lithuania	2
Canada	7	New Zealand	4
Israel	6	Russia	5
Italy	1	South Africa	1
Turkey	1	Spain	1
Total	20	United Arab Emirates	1
Average	3.33	Vietnam	2
The Netherlands	102	Total	130
		United States	302

Source: Roslyn Layton, *Which Open Internet Framework Is Best for Mobile App Innovation?: An Empirical Inquiry of Net Neutrality Rules Around the World*, Aalborg University Copenhagen, 2017, http://vbn.aau.dk/files/255922611/PHD_Roslyn_Layton_E_pdf_rettet.pdf.

Table 3. App Store Rankings for Apps from Different Net Neutrality Regimes

		Denmark, 2012	Denmark, 2016	The Netherlands, 2011	The Netherlands, 2016
Mean	Locally Made	41.97	26.50	31.17	42.57
	USA	21.37	20.03	18.37	14.43
	Soft Rules	42.29	53.20	47.80	43.13
	Hard Rules	-	-	-	-
	No Rules	37.80	53.93	51.86	41.97

Median	Locally Made	43.5	27	34	46
	USA	23	21	16.5	13.5
	Soft Rules	40	59	48.5	38.5
	Hard Rules	-	-	-	-
	No Rules	42	51	49	45.5

Source: Roslyn Layton, *Which Open Internet Framework Is Best for Mobile App Innovation?: An Empirical Inquiry of Net Neutrality Rules Around the World*, Aalborg University Copenhagen, 2017, http://vbn.aau.dk/files/255922611/PHD_Roslyn_Layton_E_pdf_rettet.pdf.

Table 4. The Global Success of “Subway Surfers”

90 Days in 2016	Denmark		The Netherlands	
	Downloads	Revenue	Downloads	Revenue
“Subway Surfers”	4.5 Million	\$3.6 Million	-	-
Top 18 Apps	8.2 Million	\$5.5 Million	2.7 Million	\$3.6 Million

Source: Roslyn Layton, *Which Open Internet Framework Is Best for Mobile App Innovation?: An Empirical Inquiry of Net Neutrality Rules Around the World*, Aalborg University Copenhagen, 2017, http://vbn.aau.dk/files/255922611/PHD_Roslyn_Layton_E_pdf_rettet.pdf.

Over the period, Denmark succeeded in producing several “killer apps,” which were adopted globally, notably the game “Subway Surfers” by Kiloo. The amount of downloads and revenue of this single app over 90 days in 2016 exceeded the total downloads and revenue of the top 18 Dutch-made apps in the Netherlands for the same period (Table 4). Even with the world’s toughest net neutrality law, the Dutch did not succeed in producing a killer app for consumers during the period.

The net neutrality regime alone probably does not explain the differences between Denmark and the Netherlands regarding the success of their respective mobile apps, so I investigated the level and type of mobile broadband networks and subscriptions to see whether other factors came into play. Denmark enjoyed a significantly higher rate of adoption of next-generation (3G and 4G) network subscriptions for mobile broadband. Moreover, Denmark displayed a significantly higher rate of postpaid mobile subscription (Table 5). A country with a high rate of postpaid advanced mobile broadband subscriptions

offers critical mass for app developers to deploy their innovations.

In general, there was more economic freedom in Denmark during the period. Danish mobile operators were allowed permission-less innovation and, as a result, exhibited a significantly higher percentage of subscriptions for next-generation mobile networks and postpaid subscriptions for data. Moreover, Danish mobile operators enjoyed more freedom to experiment in ways to get users to adopt next-generation mobile networks. The country’s mobile operators have employed free data for more than a decade to incentivize users to try mobile broadband subscriptions. They are also aggressive to partner with local content companies to promote Danish content.

Such efforts, however, were discouraged in the Netherlands. Indeed, the net neutrality law prohibited offering zero rating or free data for stand-alone services. This was struck down in early 2017, as the court ruled that it violated the new EU net neutrality law.

My investigation found significant statistical support that soft net neutrality rules adopted voluntarily could promote edge innovation. However, hard rules adopted through legislation and regulation were not associated with greater mobile app development for the given country. Additionally, the explosion of mobile apps from countries with no net neutrality rules and the general lack of mobile apps from countries that have had hard rules for years run counter to net neutrality claims. This suggests that policymakers should revisit their assumptions and expectations for net neutrality policy.

Net Neutrality in the US

The FCC has attempted to establish net neutrality rules for more than a decade, with two prior attempts being struck down in court.²⁴ Its third attempt, the 2015 Open Internet Order, was challenged by nine lawsuits but upheld in district court.²⁵ A Supreme Court challenge is underway, which includes a petition by an edge provider, the cofounder of Voice over Internet Protocol, whose HelloDigital edge application was banned under the FCC's framework.²⁶ Even though the FCC's earlier rules were struck down, the agency still succeeded to impose net neutrality provisions on a number of wireline companies as part of the merger review process, including Comcast as part of its acquisition of NBC Universal and Charter, Time Warner Cable, and Bright House Networks as part of their merger.²⁷

From 1996 to 2015, during which time the internet became an unprecedented and unqualified success through bipartisan policy,²⁸ it was subject to antitrust enforcement by the Department of Justice, the Federal Trade Commission, state attorneys general, and state-level consumer-protection authorities. In its 2015 Open Internet Order, the FCC claimed that internet service providers have the "incentive and ability" to deter "openness,"²⁹ but if that is the case, it is odd that the FCC would remove the internet from the jurisdiction of federal and state competition authorities. Ironically, the FCC's imposition of Title II common carriage rules on the internet removes these applicable layers of law enforcement and consumer-protection standards.

Table 5. Mobile Broadband Subscriptions in Denmark and the Netherlands

Denmark	2013	2014	2015	2016
2G Percentage of Total Subscriptions	26.3	22.0	17.9	14.3
3G or 4G Percentage of Total Subscriptions	73.7	78	82.2	85.6
Prepaid Percentage of Subscriptions	17.2	17.7	17.6	17.1
Postpaid Percentage of Subscriptions	82.8	82.3	82.4	82.9

The Netherlands	2013	2014	2015	2016
2G Percentage of Total Subscriptions	41.4	32.8	23.8	16.8
3G or 4G Percentage of Total Subscriptions	58.7	67.2	76.3	83.2
Prepaid Percentage of Subscriptions	37.3	39.1	38.8	37.6
Postpaid Percentage of Subscriptions	62.7	60.9	61.2	62.4

Source: Ovum, "Mobile Subscription Revenue and Forecast 2016–21," August 2016.

In point of fact, the commercial internet has never been "unregulated" as such; at issue is whether broadband access providers can be policed through antitrust standards or whether they must comply with preemptive common carriage law. The current FCC's effort merely wishes to restore the internet to the competition law framework and layered enforcement that stewarded the internet's success through 2015.³⁰ Nevertheless, the door remains open to create legislation on the issue, as some 50 nations have done.³¹

Conclusion

This paper described my research on net neutrality policy around the world, which explored whether net neutrality rules in different countries created more innovation at the edge. Hard rules were not associated with edge innovation, but soft rules were. This does not explain the success of countries such as Russia and China, which have no rules at all but still produce significant innovation at the edge. My work represents a preliminary attempt to assess the policy and should encourage other researchers and regulators to undertake investigations.

While there may be tacit agreement to the value of evidenced-based policymaking, it is frequently difficult because of insufficient or nonconclusive

information. The scientific evidence may be lacking or changing over time, and there is a cost to collecting and analyzing information. All the same, the FCC works in the public interest, and it has a duty to undertake fact-based assessments to inform policy. The FCC should make a bona fide effort to include data and evidence into decision-making and, if not, disclose its policy's shortcomings. The 2015 FCC did not conduct an evidence-based assessment of net neutrality, and former FCC officials documented that technical expertise was not incorporated in the rulemaking process.³²

The ostensible premise of an expert, independent regulator such as the FCC is that the agency houses technical experts to provide relevant information and a fact-based process to create optimal policy. It appears that technical expertise at the FCC has declined from its heyday in the 1990s. The agency today has some scant 50 economists and a severely reduced workforce of engineers, but it has grown the ranks of lawyers to more than 600.³³ This is not to say that engineering and economics are the only concerns in policymaking, but it is wrong to purposely exclude them, as was the reported case with the 2015 order. The new FCC chairman proposes to address the situation by creating an Office of Economics and Data, which will attempt to inform policymaking with evidence.³⁴

In any case, a holistic assessment of the experience of net neutrality policy around the world and the relevant research suggests a nuanced picture.³⁵ The peer-reviewed literature shows that net neutrality is not unambiguously good; sometimes the policy could be helpful, but at other times not.³⁶ The internet has many multifaceted markets with plenty of opportunities for abusing market power by app stores, operating systems, device makers, and content providers; broadband providers are not the sole actors of concern.³⁷ Moreover, a holistic analysis would have described the benefits of competition,

partnerships, and differentiation that emerge when actors across the value chain depart from purely “neutral” or pro-edge arrangements. Most important would be the recognition that net neutrality policy is frequently detrimental to consumers,³⁸ particularly in prohibiting their ability to tailor their broadband experience across a range of parameters including price, quality, service, and security—not just speed, which the FCC misleadingly claims is the relevant metric.³⁹

As of this writing, public comment for the FCC's Restoring Internet Freedom numbers more than 20 million submissions.⁴⁰ Public comment, while important, needs to be incorporated with empirical investigations. Nevertheless, such a groundswell of support suggests that Congress should address the issue.

Historically, Congress has legislated little on the internet, other than a pronouncement in 1996 in Section 230 of the Telecommunications Act that it is the policy of the United States “to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation.”⁴¹ A review of net neutrality rules around the world shows that even legislative solutions can be problematic, but Congress would be more likely to include the needs of the poor, the elderly, and people of color who are not represented in the FCC's public comment box but who desire to get online with greater ease and less cost.⁴² Unfortunately, Title II, the FCC's preferred instrument, has been shown empirically to increase the digital divide.⁴³

There is broad bipartisan support to protect the internet as a free and open platform, but less to empower the FCC to regulate the internet's pricing and traffic.⁴⁴ If maximizing innovation is the goal, the experience from abroad does not support the FCC's approach in 2015, so US policymakers may want to reconsider this policy.

About the Author

Roslyn Layton is a visiting scholar at the American Enterprise Institute and a visiting researcher at Aalborg University in Denmark.

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Notes

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