Effects of Network Neutrality Regulation and Competition Policy on the Evolution of the Internet

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Abstract

The network neutrality debate addresses issues that are fundamental to the governance of the Internet. Of the nearly 50 countries that have adopted explicit network neutrality policies, most rely on regulation to implement them. In these countries, competition policy is typically seen as complementary to regulation. The United States and other countries that currently do not have explicit network neutrality regulation rely mainly on competition policy and consumer protection laws to deal with potential abuses of market power by players in the Internet. The paper provides a high-level discussion of the roles and limitations of regulation and antitrust in safeguarding different notions of network neutrality. It reveals that in the deeply interconnected and interrelated Internet both sets of policies are construed and implemented in ways that limit their ability to effectively achieve stated goals of network neutrality. Using a conceptual framework rooted in the theory of dynamic adaptive systems and their governance, the paper also shows that the relations between network neutrality policies and instruments are more multifaceted and weaker than commonly realized. Consequently, efforts to protect network neutrality seem too limited, even misdirected, if an open Internet shall be safeguarded. A broader discussion on the constitution of digital markets and the rights and obligations of players, is needed. First efforts in this direction are visible in ongoing efforts to address unfair competition raised by digital platforms and related efforts to develop data policies.

1. Introduction

The network neutrality debate addresses issues that are fundamental to the governance of the Internet. As more voices and stakeholders joined the discussions, the scope of the issues broadened from a specific concern in the United States about the legal model governing the entry of cable operators into the provision of broadband access services to viewing an open Internet as a basic human right. In the process, network neutrality transformed from being an instrument to achieve certain goals, such as a free flow of information on the Internet or end-to-end connectivity to support edge innovation, to a goal in and of itself and somewhat of a panacea to address numerous issues in the digital economy.

Network neutrality policy pursues political and economic objectives that are often challenging to reconcile. Debates are further complicated by different notions among stakeholders of what constitutes "network neutrality". These are related to varying views of what the key attributes of the socio-technical system Internet are and how network neutrality could support them. For example, the political goal to keep the Internet free of state or corporate gatekeepers is broadly shared but the specific forms such protections should take and how they can best be implemented remain controversial. Similarly, while there is widespread acknowledgement that competition in the Internet ecosystem is an important tool to mitigate dominance and facilitate innovation, there continues to be a wide range of views as to what constitutes workable competition and how its conditions should be enforced. Finally, while there is a long track record of "permission free" innovation on the edges of the Internet, recent developments in digital innovation challenge whether this is a good blueprint for harnessing the benefits of future innovations.

During the past decade, nearly 50 countries have adopted policies to safeguard a neutral Internet. The two main sets of instruments used to implement network neutrality are regulation and competition law (referred to as antitrust in the United States). In most countries, regulatory safeguards were established,

with competition policy relegated to an ancillary role. However, recent developments related to digital platforms suggest a possible rethinking of these models and a rejuvenation of the complementary role of competition policy Crémer, de Montjoye, and Schweitzer (2019). Countries also differ regarding whether they adopted a "strict" or a "weak" notion of neutrality. Strict neutrality means that each datagram should be treated in exactly in the same way to assure an Internet that is agnostic to content, speakers, and devices. Weak neutrality allows some level of differentiation of service quality and prices as long they pass various forms of non-discrimination tests. In some cases, differentiation may be limited to classes of applications, in others it may be subject to a common carrier-like non-discrimination provision. Most countries that have gone the regulatory route are inspired by a strict notion of neutrality even though there are variations in the specific implementations and in most cases exceptions to this general rule are allowed, often subject to regulatory scrutiny and approval.

One major exception is the United States, where since the elimination of specific network neutrality regulations in 2018 competition policy and consumer protection are the primary instruments to safeguard an open Internet. In contrast to other countries that have adopted regulatory protections, regulation currently only plays a secondary role.[1] Other countries that have not adopted specific network neutrality regulations rely tacitly on existing tools of competition policy and consumer protections to address issues related to information flows on the Internet. Models that primarily rely on competition policy implicitly embrace the concept of weak neutrality. Supporters of "weak" neutrality argue that differentiation of quality of service will be necessary to accommodate increasingly heterogeneous applications and services but that safeguards against undesirable discrimination are

[1] The United States went through a rollercoaster of policies that saw the repeated introduction and withdrawal of network neutrality regulation between 2010 and 2018 after the Federal Communications Commission (FCC) had promulgated legally non-binding Open Internet Principles in 2004. Measures to reinstate legislation to protect a neutral Internet continue but have not been successful. A lawsuit against the FCC by 22 U.S. States that seek the reinstatement of the 2015 network neutrality rules is pending.

needed. This is in line with a basic tenet of competition policy, which has long recognized the importance of price and service differentiation as an inherent attribute of workable competition.

Neither regulation nor competition policy have developed robust practices to deal with platform markets as are typical for the Internet ecosystem. Of the two, competition policy offers a broader framework within which the dynamics of rivalry in such markets can be assessed. There is considerable theoretical and growing empirical evidence that the best policy approach would combine insights from both policy domains by allowing differentiation (e.g., of service quality) and multi-sided pricing (e.g., contributions from players other than consumers) while establishing safeguards against anti-competitive discrimination. The currently implemented models achieve this balance differently with interesting implications for the further evolution of the Internet. Since policy, technology, and business models co-evolve dynamically, it is likely that the Internet will evolve in different directions depending on the specific policies adopted for network neutrality.

This paper seeks to provide a fresh take on the discussion by embedding the challenges of and approaches to network neutrality in a dynamic systems framework of the Internet. From that vantage point, the paper focuses on three specific questions. It first reexamines critically the various notions and goals of network neutrality. From there, the paper moves on to explore the advantages and limits of regulation and competition policy to implementing network neutrality. Finally, the paper discusses their consequences of different approaches for the evolution of the Internet and the achievability of the political and economic goals that are at the heart of the network neutrality debate.

2. The Internet as a dynamic socio-technical system

Theorizing the roles of network neutrality requires a clear understanding of the system it seeks to influence. The ongoing discussions sometimes do not clearly specify which vision of the Internet is being used. Consequently, different diagnoses of problems and proposals to remedy them sometimes are

rooted in divergent views of the working of the Internet. In contrast to the highly centralized and hierarchical telecommunication networks, the Internet was designed as a decentralized network in which the intelligence resided on the edges of the network. Similarly, its governance, even though long under the supervision and control of the United States, was organized around interdependent multi-stakeholder networks. This governance model evolved in parallel to the growth and complexity of the Internet from a small group of computer scientists and network engineers to a global, differentiated network of actors including businesses, government, and civil society (Brousseau, Marzouki, & Méadel, 2012; DeNardis, 2009; Frau-Meigs, Nicey, Tupper, Palmer, & Pohle, 2012; Mueller, 2010; WSIS, 2003).

Norms and principles governing traffic flows, protocols, standards, rights, and obligations in this network or networks emerged largely in a bottom up process. During its early development phase, the openness and neutrality of the Internet was safeguarded by the norms of the engineers developing the protocols and business practices needed to achieve the goal of interconnecting heterogeneous information technology resources via a multitude of fixed and wireless communication networks. This was facilitated and enabled by the non-profit nature of the project, its public funding, and the relatively small number of individuals and organizations involved in making pragmatic and workable design decisions. Consequently, the norms and practices of the initial community of engineers were embedded in the technology of the Internet and, as the network expanded, shaped and centered the norms of subsequent participants. Design choices such as the end-to-end principle, the hierarchical layering in which the TCP/IP protocol layer serves as a portability layer, separating the upper and lower layers in a transparent and unifying way, were an outcome of these conditions (Clark, 2018; van Schewick, 2010).

The Internet has evolved considerably from the early days of a publicly funded and operated network intended to connect heterogeneous computers and other devices via a multitude of networking technologies. Its privatization, expansion to reach more than half of the global population, and the

increased reliance on Internet Protocol (IP) networking principles across private and public networks has led to a more differentiated and heterogeneous system. It would be more accurate to speak of an Internet of Internets. Its more than 60,000 Autonomous Systems (AS) work under varying economic, political and institutional conditions and are operated by for-profit and non-profit entities. The original structure in access, middle mile, and several tiers of backbone networks that were integrated by a system based on voluntary peering, has gradually been superseded. In a simplified view, backbone, access, and edge networks are visible but their relations and boundaries have muddied considerable (Nuechterlein, 2009).

New players, such as Content Delivery Networks (CDNs), technically edge networks, have built global overlay infrastructures. Peering has diversified to include a range of asymmetric paid peering arrangements and have been augmented by Internet Exchange Points (IXS) that have become important nodes integrating regional and global networks. Some of these networks are interconnected in the public networks but others, using IP technology, have developed into largely separate private IP networks that allow configuring services for their users somewhat free from the design and operational conventions of the public Internet (claffy & Clark, 2016; Clark & claffy, 2016). An increasing number of end-users rely on apps that are built on such private IP platforms to access content and services. The increasing heterogeneity of services configured for cyber-physical systems including the Internet of Things (IoT) and the differentiation of services needed to support next-generation digital innovations, software defined virtual networking will further differentiate network infrastructure and services.

This requires an overarching theory that allows positioning how network neutrality provisions affect this system and, more specifically, how neutrality policies implemented using competition policy and regulation affect outcomes. The framework adopted here borrows from several interrelated areas, including work on dynamic adaptive systems (Colander & Kupers, 2014; Room, 2011), the literature on

socio-technical systems (Geels, 2002, 2004; Sawyer & Jarrahi, 2014), and the work on the governance of large socio-technical systems (Bauer, Lang, & Schneider, 2012; Dutton, 1992; Mayntz & Hughes, 1988; Scharpf, 1997; Schneider & Bauer, 2007). These approaches have in common that they examine decisions and strategies of individual and groups of actors in a framework defined by formal and non-formal institutions that is, in turn, influenced by these actors. Individual actors make their decisions based on factors they deem relevant, which may include anticipated strategies of competitors, consumer behavior, and regulatory and competition law provisions. Stakeholders will seek to influence law and policy in their own interest, whereas political entrepreneurs will seek to adapt these rules in response to outcomes. Thus, technology, business models, policy, and governance co-evolve in nested games at multiple levels of the social system (individual, organization, sector, society).

The performance of this system, such as the level, quality and prices of connectivity, the information flows enabled (or prohibited) by the socio-technical system, and the rate and direction of innovation, are an emergent outcome from this co-evolution. Policies requiring certain players to obey network neutrality rules influence not only the strategies of individual players but the translate into the performance of the system. Network neutrality policies may pursue goals at the level of individual actors (e.g., Internet access providers) or at the system level (e.g., freedom of expression, civic participation, and public interest innovation). Whether network neutrality policy can achieve these goals depends on whether there is a stable relation between the implementation of network neutrality and these outcomes. This relationship is potentially influenced by many other independent factors as well as mediating and moderating factors. It cannot be assumed without further examination that a stable relation between network neutrality rules and desirable outcomes exists.

Such a highly interconnected, technologically dynamic system has many degrees of freedom. Given the number of potential interdependencies and interactions, a range of outcomes is theoretically possible.

Not surprisingly, a growing list of theoretical papers examining these issues finds that the outcomes are contingent on the system features captures in the specific modeling assumptions, the specific network neutrality rules, and the strategies of the actors affected by the rules (Choi, Jeon, & Kim, 2015, 2018; Choi & Kim, 2010; Krämer, Wiewiorra, & Weinhardt, 2013; Reggiani & Valletti, 2016). The sparse and rather preliminary empirical research examining the effects of network neutrality thus far has not generated robust evidence that network neutrality has affected the rate of innovation or the level of investment in network infrastructure (Layton, 2017). Consequently, neither theoretical nor empirical analysis provide strong support that network neutrality alone is sufficiently powerful to achieve such economic outcomes. However, more research on how network neutrality interacts with other factors is needed to develop a fuller picture.

3. Goals and notions of network neutrality

Broadly construed, network neutrality refers to the normative principle stating that datagrams on the Internet should be treated alike, regardless of the information content, the origin or destination of the content, and the devices involved in communicating the content. While initially the goal of safeguarding a neutral Internet was a response to the potential elimination of common carrier protections in cable broadband access networks in the United States, stakeholders quickly realized the broader importance of the principle as the Internet became increasingly embedded in the fabric of individual lives and society while being predominantly provided by for-profit commercial network operators and content providers. Researchers and advocates emphasized the importance of network neutrality for a broad range of goals such as safeguarding access to information, supporting digital innovation, preserving free speech, and civic political participation (Early & Bustillos, 2018; Lee & Wu, 2009; Novak & Haijbayova, 2019; Nunziato, 2009). Given the importance of some of these goals, and even though the role of network neutrality in achieving them is in need of additional work, within a decade preserving an open

and neutral Internet was elevated to a critical aspect of human rights (Bauer, Obar, & Koh, 2011; Belli & De Filippi, 2016).

The vibrant policy discussion and research on network neutrality, including contributions from social science disciplines, applied law and jurisprudence, information science, and philosophy, conceptualize the term in a variety of meanings. Similarly, the term is used and translated into practice in diverse ways, depending on the specific historical, political and institutional context. As will be discussed in more detail, the specific operationalization of rules influences the working of the Internet and its future evolution. For the purposes of this paper, it is not necessary to review all nuances, but it will be helpful to briefly discuss and clarify the recurring concepts of "strict" and "weak" network neutrality, as well as the emerging, but less used, concepts of "non-discriminating" Internet service provision, and "information utility". We will also briefly comment on, and position in this typology, the related notions of "strong" and "market-driven" network neutrality.

There are also differences in the scope to which these neutrality conditions are applied. Some proponents of network neutrality see it as a broad design principle that should apply to the entire Internet, including physical network layers, logical development platforms, and possibly access to data and content. Most researchers and proponents of network neutrality apply it more narrowly to the physical layers of the Internet but even there are differences in scope. Some discuss network neutrality as a design principle that should apply to all operations of Internet Service Providers (ISPs) and others more narrowly to traffic flows on last mile services provided by Internet Access Providers (IAPs) (Marsden, 2017). We will focus our discussion mainly on the physical layer and use to the term global network neutrality to refer to a standard covering all ISPs and the term access network neutrality to refer to access services provision.

Historically, the network neutrality debate started with a focus on access networks in the United States. In the American legal system, cable systems were subject to some public access and carriage requirements, but they were not generally treated as common carriers like other telecommunications service providers. By historical luck, cable operators had invested for decades in broadband network infrastructure used to distribute entertainment. Subject to growing competitive pressure by direct satellite television and saturating markets, cable companies were looking for new revenue opportunities and broadband Internet access was a logical form of diversification. Many cable providers had already introduced digital cable television and the one-way distribution networks could be upgraded to two-way capability with lower incremental costs than DSL access networks. As cable television networks vigorously expanded to provide broadband access concerns emerged that, given the legal status of cable operators, consumers and providers of content were not protected by the provisions of common carrier regulations that prohibited unreasonable discrimination and required offering service to all who had a reasonable demand for it (Cherry, 2006). Without going into historical detail, it will suffice here to simply recall that the American courts affirmed the ability of the FCC to determine the status of services as common carriage but that the agency repeatedly changed its approach (largely based on whether Democrats or Republicans held the majority in Congress).

The narrow focus on Internet access networks broadened in the subsequent discussions in the United States and as the notion of network neutrality was adopted by an increasing number of countries and organizations worldwide. In the current discussion, strict network neutrality is typically defined as requiring that each datagram is treated in the same way. This implies that the network is completely agnostic as to types of content, origins and destination of content, devices, etc. There are gradations within this general conceptualization. One extreme would be a radical stance in favor of neutrality, at least at the network layer, requiring the absence of all limitations. A somewhat less radical, more widely endorsed view would apply strict neutrality to all *legal* content. This clarifies that network neutrality is

contingent on the existing legal framework within which the Internet operates, but it also opens the door to different interpretations of the scope of strict neutrality. Because most national approaches allow exceptions, some authors further confine strict network neutrality to the best-effort Internet (Choi et al., 2018). Strict neutrality implies that the network operator may not charge content providers for prioritized access to the network.

In contrast, weak network neutrality puts less stringent boundaries on how datagrams may be treated. Differentiation of service quality and potentially charges from market participants (e.g., users or content providers) are permitted if done in a non-discriminatory fashion. This approach recognizes that in a network with heterogeneous consumers and services that require different qualities of network support, such differentiation will likely increase the efficiency of network design and user well-being (Krämer et al., 2013). For example, micro grids, tele-surgery, and online video gaming require higher quality network support than email or search. Weak neutrality typically implies that services are made available upon reasonable request and based on demand by users rather than imposed by the ISP or IAP. In this framework, network service providers may charge prices from one or more market participant. For example, zero-rating of content may be permissible as long as the conditions of weak neutrality are met (Fetzer, 2017).

Other design proposals balance the need to allow for quality of service differentiation while safeguarding against potential abuses of their position by IAPs differently. Van Schewick (2015) develops detailed principles of how a non-discriminatory Internet that allows quality of service differentiation and pricing might look like. A key suggestion among many other nuances in her proposal is that quality of service differentiation should remain agnostic to the type of application that is supported. Knieps and Stocker (2016) assert that in a competitive market network operators will have incentives to differentiate service quality and prices in response to conditions on the supply and demand side. In this

model of market-based network neutrality no explicit policy intervention is required. Gans (2015) and Gans and Katz (2016) distinguish between strong network neutrality and weak network neutrality but attribute different meanings. In their analysis, strong neutrality implies that network operators may not charge any market side for prioritized access nor may content providers charge for access. Weak neutrality is a framework in which charges between content providers and end-users are permissible.

The relationship between these concepts of network neutrality and the goals of network neutrality are rarely examined in detail and we will get back to that matter in section four. For the remainder of the paper, we will distinguish between the simpler and more generic approaches of strict and weak network neutrality. Where appropriate, we will also distinguish between imposing these rules on ISPs in general or only on the access portion of their services (the IAP part of their operations). We will next explore the role of regulation and competition policy in implementing network neutrality and its key goals before we can assess the effects of alternative approaches to network neutrality on the evolution of the Internet.

4. Roles and limitations of regulation and competition policy

Regulation and competition policy (usually referred to as "antitrust" in the United States) are two sets of public policy instruments that have historically been used to implement communication policy goals although their relative importance has varied over time. Although they are not the only tools that are available, they are increasingly seen as important tools to safeguard network neutrality. In the United States, antitrust policy has played an important role in telecommunications and media regulation since the late nineteenth century. In Europe, where much of the sector was organized as state-owned companies, neither regulation by independent agencies nor competition policy gained relevance until after privatization and market liberalization. The Internet emerged in this legacy environment and was

deliberately designed as an alternative to the existing hierarchically organized networks and governing institutions, dominated by intergovernmental agencies.

With the transfer of ownership and operation of the network infrastructure to the private sector, starting in the mid-1990s, and the increasing importance of content and applications as a source of value generation, these engineering principles and norms persisted but became gradually overlaid by the commercial and for-profit dictates of the telecommunications operators and technology companies that entered the space. In the United States, the early Internet had benefitted from common carrier rules that governed the operations of telecommunication service providers. U.S. communications law and regulation had introduced the notion of "enhanced services" (later renamed "information services") beginning in the 1960s as a new class of services with a high share of computing content that were not subject to common carrier regulation. However, until the migration to broadband in the 1990s, Internet access was based on dial-up services, which were provided under common carrier rules. Among other things, these rules obliged telecommunication service providers to allow attachment of modems to the telephone network (subject to certification requirements) and to provide non-discriminatory services to the emerging industry of Internet Service providers (Greenstein, 2015). All this changed with the migration to broadband access and the FCC's successive declaratory rulings that reclassified fixed and mobile broadband access as information service, no longer subject to the non-discrimination safeguards of common carrier regulation.

In other parts of the world the historical evolution of telecommunications differed significantly from North America. Most importantly, until the 1980s telecommunication services had largely been provided by state-owner enterprises. Regulation by independent agencies was gradually introduced starting in the 1970s in some countries and more widely in the 1980s and 1990s. Often, the former telecommunication monopolies remained part state-owned, creating the somewhat odd governance

structure of (partially) state-owned organizations regulated by state agencies (Bauer, 2005). Despite difference between statutory and common law systems, these entities had historically also operated under public interest or public service mandates. Initially, regulatory oversight was pragmatic but as information and communication markets grew it became increasingly detailed and sophisticated. Like the U.S. approach, Internet Service Providers benefitted from regulation that allowed them to lease local access loops or broadband wholesale services ("bitstream access") at incremental cost prices. This boosted market entry, price competition, and the adoption of first-generation broadband. By the time the Internet developed its more mature, horizontally layered value system, many countries, in contrast to the United States, therefore had developed stronger trust in regulation and its ability to successfully govern. Approaches to competition policy also differ significantly, with the United States focusing narrowly on consumer welfare whereas the European Union was open to a broader approach that also considered effects of sector reorganization on the competitive process.

The specific instruments and processes available to regulation and competition policy require appropriate legislative foundations. Consequently, the specific details and intervention scenarios for regulation and competition policy vary between countries and regions. However, there are also considerable similarities across countries. At some level, regulation and competition policy are complementary tools through which public policy can influence outcomes. However, within each group there are also approaches in which these sets of tools overlap, causing concerns that relying on both might lead to overregulation. As currently implemented, the core of regulation comprises as set of tools that allow ex ante intervention in decisions of the regulated entities. For example, regulation may prohibit network operators from blocking access to content or from charging content providers for access to their network. Much of regulation is rooted in economic analysis of the conditions of effective competition and of the workability of markets. Consequently, regulation seeks to correct for forms of market failure, such as the existence of natural monopoly or bottlenecks in the value chain, as well as

positive and negative externalities. In principle the lens of regulation allows the consideration of broader public interest goals in addition to these more narrowly construed efficiency goals when designing interventions. Because regulatory agencies can compel information from the regulated entities, decisions can, in principle, be based on a strong information basis.

In contrast to regulation, competition policy is more narrowly construed. It aims primarily at assuring that the process of competition remains effective. Unlike regulation it does not seek to achieve any public interest beyond safeguarding the process of competition (with the implicit assumption that workable competition will foster efficiency and welfare and thus the public interest). Competition policy principles may be invoked in two sets of circumstances: during the review of merger and acquisition proposals and in cases where one or more firms are accused of abusing their market power or manipulating the process of competition (DOJ, 1992/97; Haucap & Stühmeier, 2016; Just, 2015). In the case of merger reviews, an assessment of the potential harms and benefits of a merger is undertaken before a merger can obtain approval. The second scenario, abuses of single or joint market power (dominance) can relate to strategies aimed at monopolization of markets, possibly using predatory pricing or other forms of digital manipulation of the market process, tying and bundling of services, or sabotage in vertically related markets by refusing to provide bottleneck services to competitors. Cases of abuses of market power are typically ex post and the competition authority must discover whether a violation took place. This is often time consuming and no conclusive evidence may be generated.

Historically, merger and competition reviews examined structural and behavioral dimensions, such as post-merger market concentration and barriers to entry, and the consequences of a merger for the ability of other firms to compete in the market as well as effects on consumers, such as prices and quality of services. The emergence of multi-sided and platform markets has raised new challenges as it is increasingly difficult to determine the geographic and product boundaries of markets (Evans, 2003; Just,

2018). Moreover, platforms often optimize prices charged across several market participants. At least in the United States, since the 1970s, merger reviews have placed stronger emphasis on the effects of mergers on consumers and on prices. In the digital economy, where prices are often declining and platform markets are pervasive, in which revenue streams are generated from third parties such as advertisers, this has rendered such reviews largely ineffective (Ezrachi & Stucke, 2016; Khan, 2016; Stucke & Grunes, 2016).

In response to the limitations that regulation and competition policy face, they have evolved new approaches. As a result, the clear separation and complementarity of the two sets of tools has been blurred. At the same time, a richer set of instruments is available to govern dynamic systems. A new model of ex post regulation seeks to overcome the problem that ex ante regulation is not only a response to market failure, but it may not correctly anticipate future market developments and hence lock-in regulation where it is not warranted. This problem can be somewhat reduced if the regulatory model is periodically subjected to a broad review, as is the case in the European Union (and to a lesser degree in other countries). To reduce this risk, ex post regulation (also referred to as "forbearance" in the United States) establishes a set of regulatory goals and initially trusts that market players will work out issues. Only if there is compelling evidence that the outcomes to not meet the goals will regulation intervene. On the other hand, there are scenarios when competition policy might want to intervene before harm is done. In contrast to the typical rule of reason approach used in the review of potential violations of competition law, competition authorities can use a *per se* rule to prohibit a behavior looking forward. Competition law can also invoke interim measures to prohibit behavior seen as potentially harmful while an investigation is pending. Both scenarios require clear evidence that such behaviors violate competition law. When applying ex post regulation, per se rules, and interim measures, regulatory and competition policy overlap, even though some of the other specific features

are retained, such as the ability to consider broader interest goals versus a narrow focus on the competitive process.

As the number of stakeholders with opposing interests has increased in the Internet ecosystem, regulation and competition policy have increasingly become time consuming, contested, and slow moving. An increasing number of potential veto players may lock, challenge, and delay decisions (Tsebelis, 2002). Moreover, the specific role and power of regulation and competition policy to intervene in the Internet is influenced by the historical, political and legal context as well as the level of trust in regulation, all factors that vary across countries. At a high level, it is fair to say that at the time of writing trust in regulatory agencies in the United States is relatively low and lower than in other countries, not least because technology companies were successful in introducing a deregulatory framework into the policy discussions. In general, it is somewhat higher in countries that have introduced regulation late in the twentieth century. The fact that leading technology companies in the digital economy are American (or Chinese) probably contributes to an increased willingness outside of the United States to consider regulatory interventions. Competition policy is often seen as a more robust but slow-moving instrument.

5. Ability to of regulation and competition policy to achieve goals of network neutrality

This then raises the question of whether regulation and competition policy are principally capable to address network neutrality issues. As these policy interventions are conditioned by the enabling legal frameworks and past case law, the question also arises whether they are in practice capable of safeguarding network neutrality. Table 1 provides a high-level overview of these questions, distinguishing the two key notions of strict and weak network neutrality discussed in section 2. In a nutshell, the analysis suggests that with presently available tools strict neutrality can principally only be achieved in access networks and that it can practically only be accomplished by regulatory intervention

but not by competition policy. Even regulation may have practical limits, as current network neutrality rules typically grant exceptions for legitimate network management practices and specialized services.

Table 1: Regulation, competition policy and network neutrality

Neither regulation nor competition policy have the reach and remit to achieve strict general network neutrality. More importantly, they are not designed to achieve strict global network neutrality. Many players in the Internet ecosystem whose decisions affect the extent of neutrality on the Internet are beyond the reach of regulators and there is currently no enabling legislation in sight that would change that. Abuses of market power are principally within the scope of competition policy. However, not all forms of differentiation or price discrimination used by players in the Internet ecosystem can be considered abuses of market power. In fact, differentiation is one important dimension of competition, leaving the notion of strict neutrality at odds with the fundamental logic of competition policy. Thus, strict network neutrality is not within the scope of competition policy as currently construed. Similarly, strict general network neutrality is beyond the reaches of regulatory policy as currently construed. Many of the players who could affect strictly equal treatment of packets are not subject to regulation. It is currently unlikely that the scope of regulatory powers will be extended in such significant ways.

Similar arguments hold for the ability of antitrust policy to enforce strict neutrality in access networks. If regulatory agencies are empowered by the legislature to enforce strict neutrality in access networks they can principally implement, monitor, and enforce it. However, current regulatory rules allow exceptions so that in practice strict neutrality would likely be limited to a subset of the public Internet. Typical scenarios that qualify for exceptions include network management practices required to secure

the Internet against cyberattacks, practices required to manage network capacity constraints, and certain types of prioritization that may be in the public interest (e.g., emergency communications). As digital platforms such as Facebook and Google enter network access markets, the increasing number of requests to remove content from their servers may lead to conflicts with the notion of strict access neutrality. Moreover, certain types of specialized services may pass regulatory muster. For example, zero-rated content may be permissible if all content providers are eligible to benefit from it and if end-users have full choice privileges (Fetzer, 2017).

Regulation and antitrust are more powerful when it comes to weak forms of network neutrality but even there are limits. Weak neutrality could be achieved by regulatory means, but it would require significantly broadened enabling legislation to include entities currently not subject to regulation. Even then, players would have numerous options to bypass regulation. Therefore, in practice, weak global network neutrality is beyond the reach of regulatory instruments. It is, however, achievable in local access networks if the regulatory agency is authorized to implement network neutrality. Weak global and weak local access neutrality are principally within the scope of competition policy as it covers regulated and unregulated entities in the Internet economy. The test will be whether price and quality differentiation harm competition and/or user welfare. In practice, weak network neutrality is only partially achievable. Some forms of discrimination can be screened out. At the same time, some forms of discrimination that violate weak network neutrality principles, for example differentiation of prices within a class of applications or for specific users, may be acceptable to competition law unless they also harm competition.

In addition to these principal limitations of regulation and competition policy, differences and nuances in national legislation and policy implementation create constraints that influence the effectiveness of these instruments to safeguard network neutrality. For example, European regulation is in many ways

limited by competition policy. Regulation is typically contingent on a finding that significant market power (SMP) exists, a test that uses competition policy standards to assess single and joint dominance. Thus, as currently construed, European regulation in practice operates in tandem with competition policy and is, in that sense, more limited than regulation in the United States, which is often seen as a substitute instrument in cases where antitrust cannot address the matters. Regulated companies are often deemed as exempted from antitrust enforcement. More extensive discussions of these issues can be found in (Haucap & Stühmeier, 2016; Nuechterlein, 2009). The main implication is that the practical ability of regulation and antitrust to implement and enforce global network neutrality as well as strict access neutrality are rather limited.

6. Alternative approaches to network neutrality and the evolution of the Internet

It is now time to return to the issues raised earlier on whether different forms of network neutrality policy are capable to secure outcomes that align with the stated policy goals. The research linking network neutrality and other goals rarely provides empirical evidence. It often focuses on single cases without careful examination of whether the insights can be generalized. One way to make a step toward overcoming this shortcoming is to examine the logic relations between network neutrality and envisioned outcomes. This would allow differentiating whether network neutrality rules are sufficient conditions (i.e., whenever network neutrality is present, the desired outcome is present), necessary conditions (i.e., whenever the outcome is observed, network neutrality is present but there could be other outcomes in the presence of network neutrality) (Ragin, 2000, 2008), necessary and sufficient (which would indicate a strong association or even causal relation), or neither necessary nor sufficient. In the latter case, even if there is no evidence of strong causality, it is possible that a stable correspondence exists between network neutrality policy and the emergent system outcomes. In the

language of dynamic adaptive systems theory network neutrality "tunes" interactions of the actors in a way that nudges the system to a dynamically relatively stable state (an "attractor").

Table 2: Plausible relations between network neutrality models and goals

Building on Bauer and Obar (2014), Table 2 maps plausible relations between network neutrality models and overarching goals of network neutrality. The term plausible is used deliberately to indicate that these relations are not derived from a formal model of the system nor detailed empirical data. Rather, they are, based on what we know about the effects of establishing specific instances of network neutrality rules, reasonably believable linkages. This high-level analysis suggests that network neutrality is not sufficient to achieve any of the stated goals. For some goals, such as freedom of expression and civic participation, weak access neutrality is likely a necessary condition. In other cases, it supports the overarching goal but is neither necessary nor sufficient to achieve it. The main reason is that there are other conditions besides network neutrality that affect the goals. Network neutrality at best interacts with these conditions.

For example, freedom of speech and expression is supported by broadly construed strict network neutrality, but its realization requires additional conditions, such as education, time to engage, and so forth. When these conditions are in place, free speech could be achieved even if the Internet were not strictly neutral. Similarly, neutralizing ISPs across the entire value system reduces their ability to exert market power but it does not address the influence of large content providers and technology companies, which are often much more powerful players. To address them, other forms of neutrality would have to be considered, such as search neutrality or data neutrality more generally.

Of the four goals, innovation is the most complicated one. Much of the discussion of Internet innovation has focused on the importance of allowing edge-innovation to flourish (Lee & Wu, 2009). The innovation ecosystem of the Internet, however, also includes architectural innovations that require deviations from a strictly neutral network. There is considerable evidence that architectural innovations will be increasingly important in next-generation digital innovation, such as autonomous vehicles, some Internet of Things (IoT) applications, advanced forms of health care, and industrial applications. It is possible that after the initial experimentation and market introduction phase the emerging architectures become standardized and dominant designs. In this case, processes might again be modularized, and a more neutral network environment might be more conducive to further innovation. A policy of strict network neutrality therefore supports some types of innovations but potentially hampers others. The relative magnitude of these effects is not fully known ex ante. However, models of weak neutrality are an institutional design that supports both modular edge innovations and architectural innovations (if they are compatible with non-discrimination) (Bauer, 2018).

Table 3: Plausible relations between specific network neutrality instruments and goals

Similar overall conclusions emerge if specific instruments are analyzed that are widely used to implement network neutrality principles. Several of the specific instruments are necessary to achieve goals and others support them but none suffice to achieve the desired outcomes. Again, because of the diversity of innovation processes, there are scenarios in which an instrument will facilitate innovation and others when it will hamper innovation. All this suggests that network neutrality is no panacea to achieve legitimate and important goals of Internet policy. As an overarching model, weak forms of network neutrality are better aligned with important goals than strict forms of network neutrality. Weak

neutrality requires strong protections against discrimination. Blocking and throttling would violate these protections per se whereas paid prioritization might or might not violate them, dependent on how it is structured. Because of the challenges to implement general network neutrality, a broader discussion is needs as to how rights and regulations in the digital economy ought to be structured (Sandvig, 2007).

This discussion essentially assumes relatively stable relations between the policy choice and the system outcomes. As mentioned earlier, however, it is likely that different actors, their strategies, technology, and outcomes co-evolve. This would imply that the adopted network neutrality framework will shape the performance trajectory of the system. A system with strict network neutrality will create strong incentives for services that require architectural innovation to be migrated to private networks. In that sense, the policy of securing open networks may have the unintended consequences that it weakens the public, open Internet in the medium and long run. At the same time, a system with stricter network neutrality protection will better support permission-free edge innovation. One would anticipate a more vibrant modular innovation activity in such a system. With the proliferation and diversification of network neutrality regimes researchers will be able to study real-world experiments that will eventually help shed light on these dynamic relations.

7. Conclusion

The paper provides a high-level discussion of the roles and limitations of regulation and competition policy in safeguarding different notions of network neutrality. Using a conceptual framework rooted in the theory of dynamic adaptive systems and their governance, it reveals that in the deeply interconnected and interrelated Internet both sets of policies are construed and implemented in ways that limit their ability to effectively achieve stated goals of network neutrality. The analysis also shows that the relations between network neutrality policies and instruments are more multifaceted and weaker than commonly realized.

The development of the Internet from an early best-effort network to a communications infrastructure supporting many heterogenous services raises additional challenges and trade-offs. An increasing number of players have entered the Internet system, many beyond the reach of regulation. Competition policy could, in principle, affect them, but its goals of protecting the competitive process, which is inherently tied to differentiation, creates challenges when applied the network neutrality problems. However, both sets of tools can contribute to achieve some of the stated goals and they also provide frameworks for the debate and negotiation that might clarify whether there is a need for further-reaching policies.

The analysis in this paper suggests that safeguarding the fundamental goals of an open Internet requires efforts that go beyond the network neutrality debate. What is increasingly needed is a broader discussion on the constitution of digital markets. First efforts in this direction are visible in ongoing efforts to address unfair competition challenges raised by digital platforms, such as Facebook, Amazon, and Google, by related efforts to develop data policies, and by discussions of the governance of algorithms and artificial intelligence.

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Table 1: Regulation, competition policy and network neutrality

		Regulation		Competition policy	
		In principle	In practice	In principle	In practice
Strict network neutrality (every datagram is treated the same)	Strict global (ISP) neutrality	Could be achieved but would require significant broadening of enabling legislation of regulatory agencies to include currently non-regulated entities. Even then, players have options to bypass regulations	Not achievable, as many segments of Internet ecosystem that affect network neutrality are not subject to regulation and it is highly unlikely that regulation will be expanded in the foreseeable future	Abuses of market power are principally within the scope of competition policy. However, not all forms of differentiation or price discrimination can be considered abuses of market power. Moreover, differentiation is inherent to competition, leaving the notion of strict neutrality at odds with the fundamental logic of competition policy. This, strict network neutrality is not within the scope of competition policy as currently construed.	Not achievable. Workable competition requires differentiation. Therefore, the notion of strict neutrality is incompatible with the fundamental logic of competition policy
	Strict access (IAP) neutrality	In principle within the scope of regulation if regulatory agencies are empowered to enforce strict neutrality in access networks	Achievable. Current regulatory rules allow exceptions so that in practice strict neutrality would likely be limited to public parts of the Internet		
Weak network neutrality (differentiation allowed but subject to non-discrimination requirements)	Weak global (ISP) neutrality	Could be achieved but would require broadening of enabling legislation of regulatory agencies to include currently non-regulated entities. Even then,	Not achievable, as many segments of Internet ecosystem that affect network neutrality are not subject to regulation	Is within the scope of competition policy as it covers regulated and unregulated entities in the Internet economy. The test will be whether price and quality differentiation	Partially achievable. Some forms of discrimination can be screened out, but some forms of discrimination that would violate weak network neutrality

		players have numerous options to bypass regulation		harm competition and/or user welfare	principles may be acceptable to competition law
	Weak access (IAP) neutrality	Achievable	Achievable		

Notes: ISP … Internet Service Provider. IAP … Internet Access Provider.

Table 2: Plausible relations between network neutrality model and goals

	Strict network neutrality		Weak network neutrality	
	Strict global (ISP) neutrality	Strict access (IAP) neutrality	Weak global (ISP) neutrality	Weak access (IAP) neutrality
Freedom of expression and speech	Supports, not necessary, not sufficient	Supports, not necessary, not sufficient	Supports, not necessary, not sufficient	Necessary but not sufficient
Civic participation and democracy	Supports, not necessary, not sufficient	Supports, not necessary, not sufficient	Supports, not necessary, not sufficient	Necessary but not sufficient
Control of market power	May support, not necessary, not sufficient	May support, not necessary, not sufficient	May support, not necessary, not sufficient	Supports, not necessary, not sufficient
Innovation	Supports permission-free edge innovation, may hamper architectural innovation	Weakly supports permission-free edge innovation, may hamper architectural innovation	Supports permission-free edge innovation and other forms of innovation	Weakly supports permission-free edge innovation and other forms of innovation

Table 3: Plausible relations between specific network neutrality instruments and goals

	No blocking	No throttling	No paid prioritization
Freedom of expression and speech	Necessary, not sufficient	Necessary, not sufficient	Supports, but neither necessary nor sufficient
Civic participation and democracy	Necessary, not sufficient	Necessary, not sufficient	Neither necessary nor sufficient
Control of market power	May support, not necessary, not sufficient	May support, not necessary, not sufficient	May support, not necessary, not sufficient
Innovation	May support or hinder	May support or hinder	May support or hinder