

Net Neutrality, Unbundling, and their Effects on International Investment in Next-Generation Networks

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Abstract

This paper examines the net neutrality debate in countries outside the U.S., particularly in the EU. Most appear to have endorsed the idea of net neutrality and believe that policies promoting unbundling – mandatory network sharing – will ensure neutral networks. We argue that unbundling may not necessarily affect incumbent incentives to prioritize certain traffic. Because unbundling can affect investment incentives, we use a new dataset to examine empirically the effects of unbundling on investment in new fiber networks in Europe. We find a significant negative correlation between the number of unbundled DSL connections per capita and the number of fiber connections.

1 Introduction

Network neutrality has been a contentious issue in the United States for several years, but is increasingly debated elsewhere, with the EU, several European countries, and the Japanese government all examining the issue.¹

Net neutrality does not have a single, unanimously accepted definition even within, let alone across, countries. Nevertheless, proponents of net neutrality generally believe that a structure in which the Internet's intelligence lies primarily at the edges of the network, with the edges connected by relatively "dumb pipes" is responsible for the Internet's diversity and innovation. They fear that without some regulation broadband providers may discriminate in favor of their

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¹ The Chair's Summary of the OECD Ministerial on the Future of the Internet Economy in June 2008 noted that many Internet and broadband issues, including net neutrality, could best be resolved in international discussions (OECD 2008). WIK, a German consultancy, held an international conference specifically on "Network Neutrality: Implications for Europe" in December 2007, and the Japanese Ministry for Internal Affairs and Communications released a detailed report on network neutrality in mid 2007.

own or sponsored applications, or might degrade traffic to sites that do not pay for better quality of service tiers.²

Opponents of net neutrality contend that network neutrality rules are unnecessary, likely to reduce investment in the network, and lead to inefficient use of existing infrastructure (see, for example, Hahn and Wallsten, 2006). Network neutrality regulations could also reduce innovation by diminishing the utility of certain applications, such as those that require real-time connections and therefore may not work properly without packet prioritization, like VoIP or potential telemedicine applications.

In principle, an infrastructure provider may have an incentive to engage in anti-competitive behavior against a content provider that competes to provide similar services.³ So, for example, a broadband provider selling its own video on demand may have an incentive to degrade service quality of a company trying to sell a similar service online. While such behavior would most likely violate antitrust laws in most industrialized countries, proponents of net neutrality argue that antitrust proceedings are generally too slow to adequately police against such self-dealing.

Net neutrality debates in the U.S. have focused primarily on regulations regarding how broadband providers could price and manage traffic on their networks. The debate in Europe, and the EU in particular, has generally focused instead on the role unbundling – mandatory network sharing – can play in keeping networks neutral. Unbundling proponents argue that if the infrastructure provider does not offer retail services or is only one of many retailers offering service over its infrastructure it will have less incentive to discriminate in favor of or against particular content. Unbundling opponents typically do not discuss it in the context of net neutrality, but note that it can reduce incentives to invest in the underlying infrastructure.

This paper first examines the net neutrality debate in countries other than United States. In particular, it explores net neutrality in the U.K., France, Denmark, the Netherlands, Germany, Sweden, South Korea, and Japan. Because net neutrality is another type of mandatory network sharing and because unbundling is a key component of the EU's general response to net neutrality, the second part of the paper uses a new dataset to test empirically the effects of unbundling on investment in fiber-to-the-home.

2 The role of competition and unbundling

Proponents and opponents of net neutrality generally agree that competition can mitigate net neutrality concerns because users could simply switch providers if they do not like the way a certain provider manages network traffic. But policymakers and scholars differ in their judgments of what types of competition to emphasize and how much competition is sufficient.

European countries, and the EU in particular, tend to focus on competition between Internet Service Providers (ISPs) providing DSL service over an infrastructure operator's (generally the incumbent's) wires – or *intra-platform* competition. Consistent with this view, the E.U. has promoted various types of unbundling policies, in which the infrastructure owner must allow competing ISPs to offer services over its lines.

² Google, for example, argues that broadband providers should not be allowed “to determine what content gets to you first and fastest” <http://www.google.com/help/netneutrality.html>.

³ An infrastructure provider will not necessarily face such an incentive. Blocking or degrading a competing service will reduce demand for the broadband service itself. The provider will face an incentive to discriminate in this way if its expected profits from extra sales of the competing service exceed the loss of denying access to certain sites.

By contrast, the U.S. now generally emphasizes competition as between several facilities-based platforms providing broadband service, such as DSL, cable, and wireless—or *inter-platform* competition. In this case, providers compete with each other to build the best networks. Consistent with this view, the U.S. has largely ended mandatory unbundling by telephone companies by not requiring them to unbundle new infrastructure. Cable networks were never subject to unbundling in the U.S.

Broadband markets in the EU and the U.S. have developed in ways consistent with these differing approaches to competition. Figure 1 shows the extent of DSL retail competition across countries. The figure shows that European countries tend to have more retail DSL competition than does the U.S., which has very little. Figure 2 shows the extent of platform competition. In contrast to Figure 1, this figure demonstrates the greater extent of platform competition in the U.S. than in Europe, where it is nearly nonexistent in some countries.

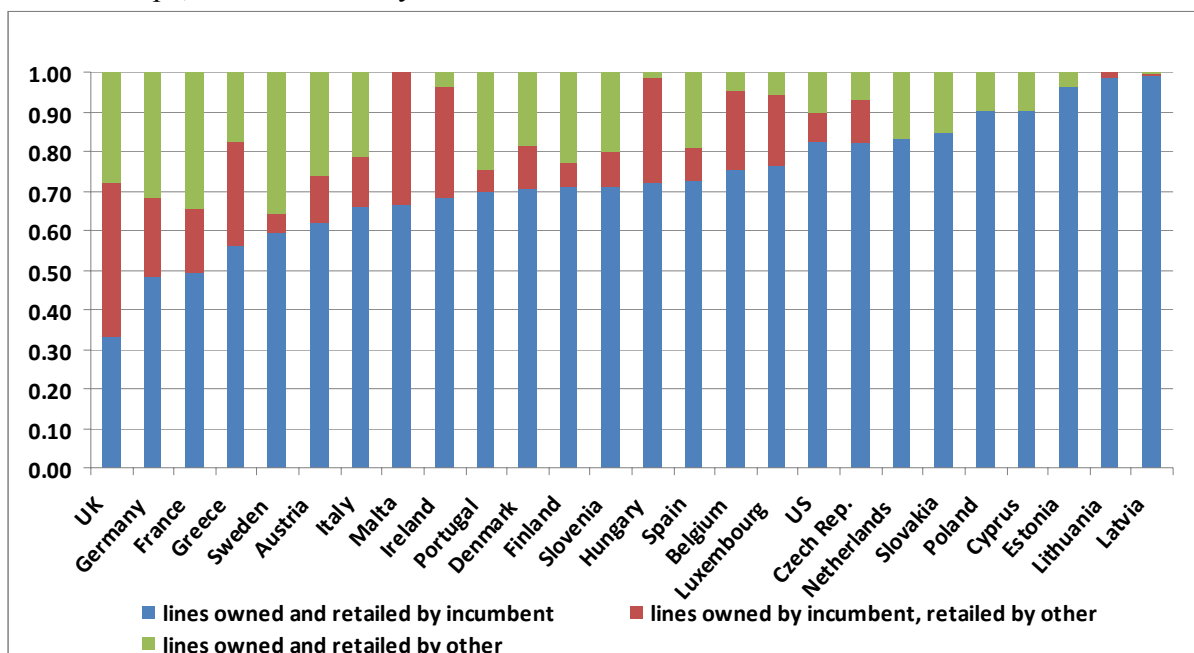


Figure 1: Incumbents’ proportion of DSL lines (September 2007*)

Note: *US data from June 2007. Source: ECTA Broadband Scorecard, FCC.

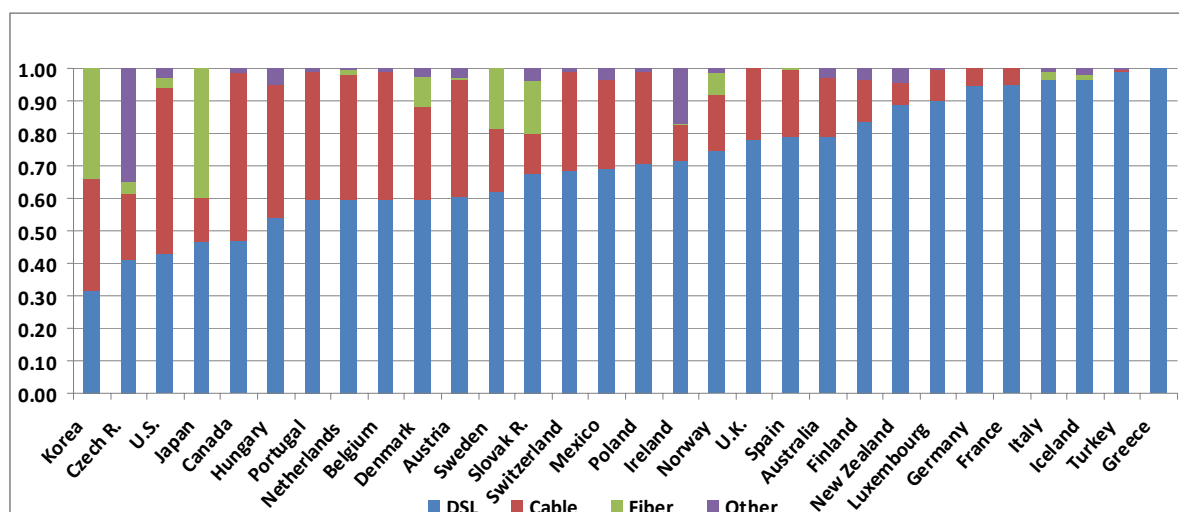


Figure 2: Proportion of broadband connections by type (Dec. 2007)

Note: Data for the Czech Republic are not directly comparable to data for other countries because the OECD counts wireless connections in that country but not in others. Source: OECD.

The traditional debate over unbundling is whether the benefits of promoting intra-platform competition outweigh the possibility of reducing infrastructure investment through decreasing the private returns to incumbents' investments by requiring them to share their infrastructure. However, in Europe, proponents also argue that unbundling can create incentives for an operator to maintain a neutral network. In particular, they argue, an infrastructure operator has less incentive to favor one type of content over another if it does not sell retail services to end users or is just one of many service providers.⁴ As a result, the EU and several European countries have embraced unbundling as an alternative to imposing specific net neutrality rules.

Setting aside the question of whether net neutrality is good policy, it does not necessarily follow that unbundling increases the incentive for an infrastructure provider to behave in a neutral manner. As Marsden (2007) notes, the incumbent retains control of the underlying infrastructure and may face similar incentives regardless of whether it is a retailer.

Under some circumstances unbundling may prevent an incumbent from having the incentive or ability to discriminate. For example, if an ISP operates its own DSLAM and does not rely on the incumbent for backhaul then the incumbent may not be able to involve itself in network

⁴ Cave and Crocioni (2007), for example, note that "the net neutrality debate originated in the U.S. and is at least partly conditioned by the U.S. specific regulatory and market features". See p.670: Retail competition can mitigate the need for network neutrality rules because "It is most importantly the retail ISPs, operating at the IP layer of the network, making prioritization decisions. In the U.S. it is much more likely that the ISP is affiliated to the network access provider than in Europe. This is because the degree of access regulation for Internet broadband in the U.S. is currently considerably lower than in Europe where often because of access obligations, the retail ISP is not the wholesale network provider." Retail competition, combined with rules governing behavior of firms with "significant market power," they argue, should be sufficient to maintain a neutral network and make regulations unnecessary. Chirico *et al* (2007) also argue that intra-platform competition is more effective for maintaining a neutral network than is inter-platform competition but are unsure whether rules regarding tiered access are necessary.

management decisions relevant to the ISP’s customers. Such a scenario requires fully unbundled loops so the competitors can operate their own DSLAMs as well as a competitive backhaul market.

ISPs that rely more heavily on the incumbent’s infrastructure, through bitstream or resale, for example, will still be subject to network management by the incumbent. Even ISPs that operate their own DSLAMs can be subject to the infrastructure operator’s network management decisions without competitive backhaul choices.

Figure 3 shows that far more broadband connections are provided by bitstream access, shared lines, and resale, where the incumbent maintains control over the incoming and outgoing data streams, than by full unbundling. In those cases, an incumbent could still, in principle, ask for payments from content providers under the threat of slowing or otherwise degrading their traffic using the infrastructure under its control.

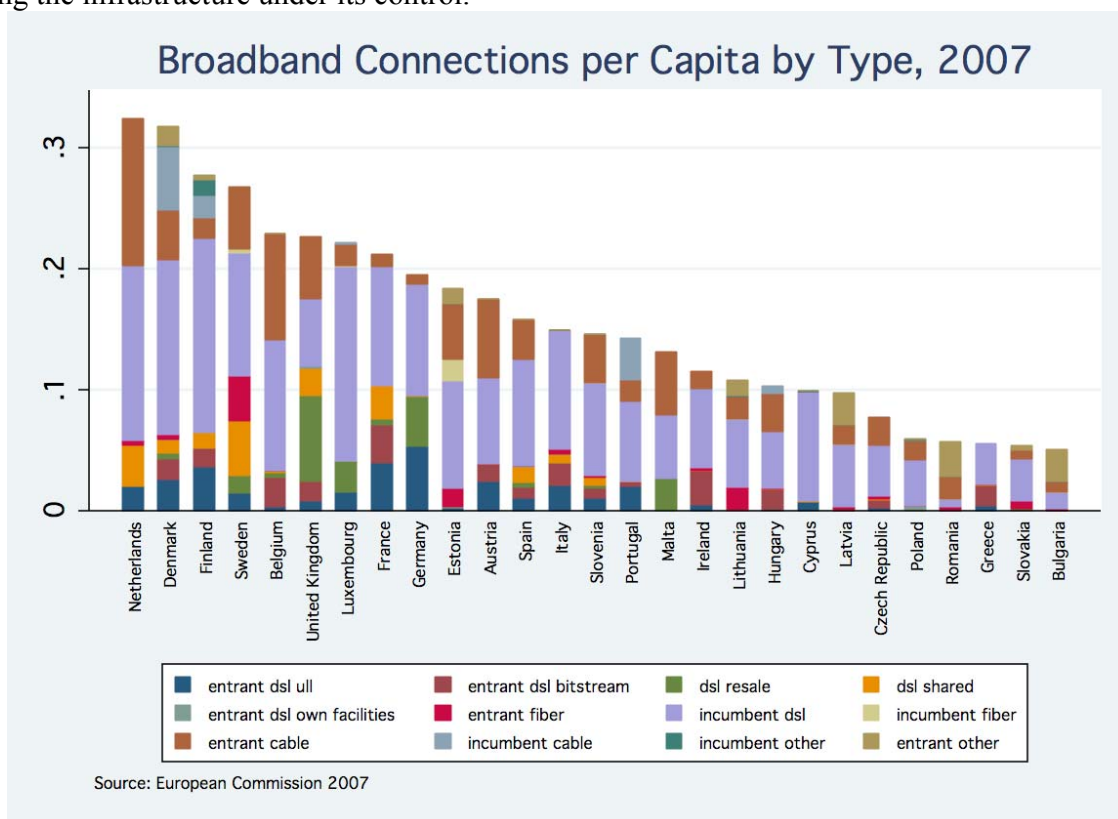


Figure 3: Broadband connections per capita by type, 2007

The point here is not to say that an incumbent will engage in such behavior, since infrastructure providers do not necessarily have an incentive to do so even if they could.⁵ Instead, the point is

⁵ When evaluating incentives and types of competition in the broadband market, it is important to understand that broadband providers are platforms in a multi-sided market that exhibits indirect network effects. The platforms are valuable only to the extent that they deliver content to consumers and consumers to content. More available content increases consumer demand (willingness to pay) for access, while more consumers online increases the potential market and thus investment in content. This market structure makes it difficult to determine incentives facing each set of participants and to determine which, if any, firms have market power. Thus, policies adopted to promote competition may have varying effects on competition among actors on different sides of the market.

simply to point out that the incentives facing an incumbent regarding discrimination with respect to content providers do not necessarily change simply because it is required to unbundle its lines.

The real issue with unbundling is whether the benefits of encouraging retail competition outweigh the reduced investment incentives the incumbent faces as a result. In the final section of this paper, we empirically investigate the investment effects of unbundling and of platform competition.

3 International approaches to net neutrality

The net neutrality debate began in other countries much later than it began in the U.S. Most European countries embrace the general idea of net neutrality. While they address the issue differently, most have so far stated that unbundling combined with rules governing firms with significant market power, rather than specific net neutrality regulations, are sufficient.⁶ Table 1 highlights some key information about the net neutrality debate in Europe, while the rest of this section discusses the EU, member countries, and Japan and South Korea in more detail.

3.1 European Union

The European Union Commissioner for Information Society and Media, Viviane Reding, stated in October 2007, “I firmly believe in net neutrality. I firmly believe in the principle of access for all. The Commission does not want to see a two-speed internet where the rich benefit and the poor suffer.”⁷

The EU has called for additional legislation. In the *Impact Assessment* for various Commission proposals in 2007, the EC decided to “update and strengthen the current provisions”. Two proposed articles for the Universal Service Directive include specific requirements for transparency by providers on contract terms and “minimum quality of service requirements”.⁸

While network operators are required to provide unbundling and bitstream access to competitors under EU law, not all European countries agree with the extent of this legislation. In mid 2007, the EC took Germany to the European Court of Justice over a German law that granted Deutsche Telekom a “regulatory holiday” to encourage it to invest in a fiber network. Under the regulatory holiday DT was not obligated to allow competitors to offer services over the new network.⁹ Although Reding remains opposed to any type of “regulatory holiday”, she said “that the companies must have a financial incentive to make the necessary investment, so they should be allowed to charge a premium of around 15 percent on the price it charges other operators for access to the improved networks”,¹⁰ implicitly recognizing the trade-off between mandating access to lines and investment incentives.

⁶ For example, in 2007, Richard Cawley from the European Commission noted that Europe seems to largely have the necessary legal measures to address problems raised by net neutrality (<http://www.wik.org/content/nnc/Cawley.pdf>).

⁷ <http://adslgr.com/forum/showthread.php?t=137431> However, Hermalin and Katz (2007) demonstrate that in most cases restricting the number of tiers of service available has negative welfare effects, and is particularly detrimental to “application providers at the bottom of the market”, although it is these providers that network neutrality professes to protect.

⁸ http://ec.europa.eu/information_society/policy/ecomms/doc/library/proposals/ia_en.pdf

⁹ <http://www.forbes.com/markets/feeds/afx/2007/06/26/afx3856465.html>

¹⁰ http://www.pcworld.com/businesscenter/article/147541/proposed_eu_law_aims_at_nextgeneration_infrastructure.html

Country/ Region	Important Points
E.U.	<ul style="list-style-type: none"> •Emphasis on unbundling combined with existing E.U. competition and interconnection regulations, antitrust law, and rules for firms with SMP (Significant Market Power). •Call for additional regulation to require transparency by providers on contract terms and “minimum quality of service.”
U.K.	<ul style="list-style-type: none"> •Net neutrality began to gain prominence in regulatory debate in early 2007 •Only European country considered where the incumbent retailed less than half its own lines. •“Functional separation” of the network and operator functions of BT's network: Openreach created to manage BT's infrastructure and provide non-discriminatory access to all competitors. •The BBC iPlayer, a service for watching BBC shows online, raised the question of who should pay for infrastructure upgrades. Network providers have borne most of the costs, but the BBC has installed some servers to store popular shows closer to users.
France	<ul style="list-style-type: none"> •Most broadband provided on incumbent's DSL lines-ARCEP focus is on intra-platform competition rather than creating platform competitors to France Telecom. •Some legislation on neutrality of transmissions but no judicial determination of extent. •In late 2007 Dailymotion, a video provider, accused Neuf Cegetel of restricting access, generating debate on whether Neuf was permitted to restrict high bandwidth services. The incident was resolved as resulting from technical errors.
Denmark	<ul style="list-style-type: none"> •High cable broadband penetration for Europe: 28.4% of broadband connections. •In January 2008 Tele2, a major ISP, was ordered to prevent its subscribers from accessing The Pirate Bay, a filesharing site, demonstrating that Danish courts were holding ISPs accountable for content in their pipes.
Netherlands	<ul style="list-style-type: none"> •High quality existing cable broadband network: 38.6% of broadband connections. •Parliament decided in 2006 to require cable companies to open networks to competitors, although it is not clear if this resolution was passed into law.
Germany	<ul style="list-style-type: none"> •More skeptical of unbundling: Bundesnetzagentur focuses on “intermodal” as well as “intramodal” competition. •Taken to European Court of Justice over a 2007 law to provide a “regulatory holiday” from access regulation to promote platform competition. This holiday was meant to justify investment by Deutsche Telekom in a new fiber network. •Broadband dominated by DSL despite high cable TV penetration. •Vice President of Bundesnetzagentur calls for some additional regulation: “interoperability and minimal quality of service.”
Sweden	<ul style="list-style-type: none"> •Fiber comprises a significant proportion (18%) of broadband connections. •Subsidizes municipalities to build their own network if only one provider available in the area. •Many municipal and other non-ISP-owned fiber networks exist. •PTS, the telecommunications regulator, states that promoting competition is appropriate to deal with net neutrality-related concerns.
continued	

Country/ Region	Important Points
South Korea	<ul style="list-style-type: none"> • Well-developed infrastructure competition. • Coordinated national broadband strategy, including the Korea Information Infrastructure Plan, which invested over \$800 million in an optical transmission network. • Initially did not allow cable television providers to offer broadband services. Instead other companies leased space on their networks to provide broadband. • In 2007 forced American military to use licensed Korean VoIP providers, along with all other people in Korea. As of August 2008 12 were licensed. • In 2006, many network operators slowed or blocked access to HanaTV, an IPTV service offered by Hanaro Telecom, saying it was too bandwidth intensive. The service could also have competed with these providers' cable TV offerings, and eventually the Korea Communications Commission found fault with the parties on both sides of the issue.
Japan	<ul style="list-style-type: none"> • High-capacity broadband connections, but MIC still concerned about increasing network congestion. • 2007 MIC "Report on Network Neutrality" called for "packet-shaping guidelines" and prevention of "bit discrimination." • May 2008 "packet-shaping guidelines" produced, allowed for some restriction of traffic in the case of excessive bandwidth demand, but no blocking of high-bandwidth applications or users. • Has introduced regulations to restrict unacceptable online content based on categorization through existing media laws.

Table 1: Summary of relevant events in Europe's net neutrality debate

3.2 U.K.

Ofcom, consistent with the EU position, emphasizes unbundling and the ability of consumers to choose among retail ISPs as an important way of dealing with issues raised by net neutrality. Unbundling has played a critical role in shaping the DSL market in the U.K., as it was the only European Union country as of the third quarter of 2007 in which the incumbent retailed less than half of its own DSL lines.

Ofcom has been perhaps the most active regulator in driving unbundled access by creating Openreach to manage BT's infrastructure.¹¹ Openreach is part of BT, but as a functionally separate entity it is legally obligated to provide access to the network on an equal basis for all competitors.¹²

Network neutrality became more concrete in Britain when the BBC introduced its iPlayer service in December 2007. This service allows users to watch BBC shows up to a week old online. It generated an outcry among network operators who feared the impact of the iPlayer's high-bandwidth requirements on their networks. This issue cut to the core of the net neutrality debate: who should pay for the costs imposed on the network by the service or for the infrastructure upgrades necessary to alleviate the congestion?¹³

¹¹ See Marcus and Elixmann (2008).

¹² See Rochet and Tirole (2006 p.26). For more about Openreach see

http://www.openreach.co.uk/orpg/aboutus/Downloads/web_corp_brochure.pdf#page=2

¹³ Garside (2007) "ISPs could refuse to transmit good quality, uninterrupted images unless customers pay a higher monthly broadband subscription. This would put the BBC in a difficult position, with some licence-fee payers having to make do with an inferior or non-existent iPlayer. As an alternative to renting bandwidth, the BBC is in effect building its own transmitters, an internet equivalent of the giant TV masts that relay pictures

Six months after the iPlayer's launch *The Guardian* reported that the same issues remain critical, with concerns over who pays for bandwidth affecting content providers, regulators, and network operators (Wray, 2008). So far, little has been done to resolve the issue in the U.K. Yet by agreeing to install additional server capacity in various parts of the U.K. Internet infrastructure the BBC appeared to recognize that it should bear at least some of the costs imposed by the iPlayer.¹⁴

3.3 France

In France, nearly all broadband is provided using DSL technologies over the incumbent's lines. This is largely because cable television networks are not extensive in France, and only slightly over a third of homes were passed by cable when broadband initially started becoming popular (Table 2).

Country	Homes passed by cable in 2001 (%)
Denmark	71
France	34.5
Germany	82.6
Japan	27.2
Korea	71
Netherlands	94
Sweden	65
U.K.	50
USA	97.1

Table 2: Cable penetration in selected countries

Source: "Working Party on Telecommunication and Information Services Policies: Broadband and Telephony Services over Cable Television Networks." OECD Nov. 2003.

ARCEP, the French regulatory authority for postal and electronic communications, emphasizes fostering intra-platform competition through unbundling, rather than creating platform competitors to France Telecom.¹⁵ ARCEP Commissioner Gabrielle Gauthey argued in November 2007 that "In France, unbundling has stimulated competition on access and created incentives to innovate" (Gauthey 2007). She suggests that unbundling, by stimulating competition for customers, may have reduced the relevance of net neutrality in France in the past, but that the increasing popularity of high-bandwidth applications may increase the relevance of the issue.

While infrastructure-sharing rules are standard practice in the EU, the Postal and Electronic Communications Code, the primary French legislation regarding electronic communications, is unusual in that it legislates some degree of neutrality. However, the

around the country. Working with a company called Cachelogic, it hopes to install servers at various points in the UK's internet pipes. These servers, or caches, will store the most popular iPlayer programmes in a place physically close to the viewers." The article also notes, however, that the project is probably not large enough to affect total costs, which would remain largely on ISPs.

¹⁴ See footnote 13.

¹⁵ ARCEP (2006, p.285).

extent of the obligation is difficult to interpret and the judicial system has not yet defined it.¹⁶ ARCEP does not appear so far to have interpreted the rule aggressively in favor of network neutrality.¹⁷

Network management practices have become controversial in France. In November 2007, a video service provider, Dailymotion, accused Neuf Cegetel, one of the largest French broadband ISPs, of restricting traffic to Dailymotion's site to increase its bargaining position over bandwidth charges. After generating debate about whether Neuf should be allowed to restrict access to high bandwidth applications, the issue was resolved after a few days when Dailymotion accepted Neuf's explanation that technical errors had caused the access difficulties.¹⁸ However, the incident illustrated the problems caused by mounting bandwidth demand by increasingly popular video services.

3.4 Denmark and the Netherlands

Denmark and the Netherlands have both high broadband penetration and a relatively high proportion of cable broadband connections: 38.6% in the Netherlands and 28.4% in Denmark (Figure 2), and therefore more infrastructure competition than most European countries. The extent of existing cable TV networks when broadband was first becoming popular is at least partially responsible. Also, in the Netherlands, the cable network, which reached 94% of homes in 2001 (Table 2) was already of high quality. An ITU case study states "As of January 1999, 43 per cent of the main cable networks consisted of optic fiber cables, thus enabling cable companies to prepare their networks for two-way broadband traffic."¹⁹ In other countries, (such as Germany, discussed below) the existing cable network was of lower quality and so would require much larger investments to be capable of handling broadband traffic.

The Netherlands recently adopted a clear pro net neutrality stance. Despite its success with inter-platform competition, the Dutch Parliament decided in 2006 to require cable companies to open their networks to competitors, under the apparent belief that vertical integration of content and distribution could harm consumers.²⁰ While this decision mainly concerned separating the content-providing areas of the cable companies from the network operators for cable television, it also affects cable broadband in a similar manner.²¹

¹⁶ <http://isoc.fr/spip/spip.php?article59>. For the exact wording, see p.122.

<http://www.arcep.fr/fileadmin/reprise/textes/lois/cpce-decrets.pdf>

¹⁷ Paul Champsaur, the president of ARCEP, stated that, "On Net Neutrality, in Europe, we are very prudent. Anyway, it's only a sub-issue of the more general problem of the relationship between content and the tubes. We can't imagine that we can finance networks if those who run them can't get revenue from the content that will go through them." (Rough translation of, "Sur la Net Neutrality, en Europe, on est très prudent. Ce n'est d'ailleurs qu'un sous-aspect du problème générique de la relation entre les tuyaux et les contenus. On ne peut pas imaginer qu'on pourra financer les réseaux sans que les gestionnaires ne tirent plus de revenus des contenus qui vont y être véhiculés.")

http://www.arcep.fr/index.php?id=2124&tx_gsactualite_pi1%5Buid%5D=978&tx_gsactualite_pi1%5Bannee%5D=&tx_gsactualite_pi1%5Btheme%5D=&tx_gsactualite_pi1%5Bmotscle%5D=&tx_gsactualite_pi1%5BbackID%5D=24&cHash=eaddc71e68

¹⁸ http://french-law.net/index.php?option=com_content&task=view&id=49&Itemid=262

¹⁹ <http://www.itu.int/osg/spu/ni/security/docs/cni.08.pdf>

²⁰ http://www.iht.com/articles/ap/2006/10/24/business/EU_FIN_Netherlands_Cable_Television.php

²¹ Free Press, an outspoken proponent of net neutrality in the US, cites an article by Paul Budde that lauds this decision: "The Netherlands in the first country to attack the network neutrality issue at its heart ... By deciding to abolish vertically integrated telecom networks, the Dutch have again given the rest of Europe a worthwhile example to follow." (<http://www.freepress.net/news/19151>). Similarly OPTA (Onafhankelijke Post en

Denmark, in contrast to the Netherlands, seems to be less favorable to network neutrality, at least in terms of preventing discrimination based on the type of application. In January 2008, a Danish court ruled in favor of the International Federation of the Phonographic Industry and ordered Tele2, a major ISP in Denmark, to prevent its subscribers from accessing The Pirate Bay, a filesharing site that was accused of facilitating illegal downloads.²² By this action, the Danish courts judged that ISPs could be held accountable for the content flowing through their pipes, and should be expected to take an active role in monitoring it. Previously in 2007, the Danish government had also asked ISPs to block AllofMP3.com,²³ and a government proposal could establish a tribunal to make these blocking orders easier to obtain.²⁴ These regulatory requests contradict the network neutrality idea of “dumb pipes”, and set a precedent for more active engagement by ISPs in the type of traffic on their networks.

3.5 Germany

In contrast to the regulators in the EU, the U.K., and France, the German regulator seems to have a more limited view of the benefits of unbundling, as shown by its decision to suspend access rules for DT’s investment in next generation infrastructure. The Bundesnetzagentur also explicitly states that it wants to promote both “intermodal” and “intramodal” competition.²⁵ Because of this different regulatory approach, the EC has taken Germany to court over its “regulatory holiday” from unbundling constraints for Deutsche Telekom.

In Germany, the broadband market is dominated by DSL (Figure 2). Despite high cable TV penetration of 82.6% (preceding table), cable provides only 5% of broadband connections. The lack of cable broadband in Germany has several explanations. First, Deutsche Telekom controlled both the cable and telephone networks until the early 2000s, meaning it had little incentive to upgrade its cable network as it would be competing primarily with its own copper telephone network. Second, it would have been costly to adequately upgrade the cable network. Heng (2003) argues that since the cable network was built in the 1980s, “it would cost at least EUR 9 billion to equip the German cable network for bi-directional data transfer”. Finally, Heng (2003) also explains that the retail cable market is highly fragmented, with over 5,000 local providers comprising approximately two-thirds of the cable network operator market and larger operators making up the remaining third. He argues that this fragmentation has hindered investment not just because of the large sums necessary to upgrade the network, but also because it prevented an effective marketing campaign to promote cable broadband as an alternative to DSL.

The decision to now focus on intermodal as well as intramodal competition parallels the decision to make an exception for Deutsche Telekom to unbundling regulations to encourage it to build out a new fiber network. The Vice President of the Bundesnetzagentur, Dr. Iris Henseler-Unger (2007) has called for some type of network neutrality, but stressed

Telecommunicatie Autoriteit), the Dutch telecommunications regulator, published a draft decision in July 2008 to force cable companies to provide a wholesale offer to competitors to provide television service. This would potentially intensify competition between cable and DSL by enabling the same types of service bundling on both platforms. Discussion available at

<http://www.reuters.com/article/technologyNews/idUSL1544415320080715>

²²

http://www.infoworld.com/article/08/02/06/Danish-ISP-may-fight-order-to-fence-in-The-Pirate-Bay_1.html

²³ http://www.pcworld.com/article/142223/danish_isp_may_fight_order_to_fence_in_the_pirate_bay.html

²⁴ <http://torrentfreak.com/danish-copyright-censorship-proposal-080517/>

²⁵ <http://www.wik.org/content/nnc/Henseler-Unger.pdf>

that it should be minimal, involving interoperability and quality of service regulations and reflect the need to maintain incentives to invest in the network.²⁶

3.6 Sweden

Unlike most European countries, fiber is a significant component of total broadband connections in Sweden (Figure 2, see Appendix A for discussion), and the government is committed to promoting broadband growth.

Sweden holds a similar view to many in Europe on the importance of competition. PTS (Post- och telestyrelsen), the Swedish telecommunications regulator, in April 2008 claimed that the potential problems of a non-neutral network in Europe are somewhat mitigated by the presence of more ISP competition than in the United States, as well as the existence of regulation on the behavior of the dominant actor. The degree of competition allows consumers to switch operators more easily if they disagree with any prioritization that occurs.²⁷ As discussed earlier, it is not necessarily the case that ISP competition can help ensure a neutral network, depending on the extent to which the incumbent handles the ISP's data traffic.

PTS also argues that prioritization of traffic is not necessarily bad, although the potential for abuse exists and therefore the most important solution is to ensure that there is adequate competition in the market.²⁸ This is consistent with the PTS "Proposal for Swedish broadband strategy" outlined in February 2007.²⁹

While PTS allows that some issues specifically related to net neutrality may arise in the future, it argues that currently the focus on promoting competition to decrease the likelihood of serious problems developing is appropriate.

3.7 South Korea and Japan

South Korea and Japan both have broadband networks that offer consumers very fast speeds, and South Korea has an especially high penetration rate. These countries have also started to become more concerned with issues of network neutrality, particularly in how they relate to network management. Japan has produced various reports on the issue and in May 2008 four associations of telecommunications providers came out with a specific "Guideline for Packet Shaping".

Japan is a particularly useful example of how even a country with high broadband capacity, with widely marketed 100 Mbps connections, still has concerns with congestion and has adopted multiple strategies to cope with problems related to network neutrality. This

²⁶ <http://www.wik.org/content/nnc/Henseler-Unger.pdf>

²⁷ <http://www.pts.se/upload/Rapporter/Tele/2008/Konvergens-nasta-generations-nat-080425.pdf>

²⁸ <http://www.pts.se/upload/Rapporter/Tele/2008/Konvergens-nasta-generations-nat-080425.pdf>

Google translator: "For certain categories of users, it may however, be interesting to pay for increased availability and quality to increase the reliability of essential services. Such conduct is not required to be ineffective as long as the socio-economic it happens in a market with competition, but rather can often contribute to konsumentnyttan. Get paid for better performance or access to desirable applications are fully natural for a konkurrentutsatt [competitive] market. With effective competition is limited scope for abuse because it would lead to other competitors attracts over customers with more attractive offers. On the other side, there are good motives and opportunities for an operator to abuse its position on this has sufficient market power (that the market is not competitive). The decisive factor is to ensure competition in accessmarknaden [access market] for broadband, as is the case in extra numbers as operators in increasingly becoming vertically integrated (such as incentives to protect their traditional sources of revenue from voice, TV, etc.)."

²⁹ http://www.pts.se/upload/Documents/EN/Proposed_broadband_strategy_eng.pdf

indicates that, contrary to the views of some proponents of national broadband policies, greater investment in broadband infrastructure alone is unlikely to eliminate the role of traffic management by network operators.

Asian countries in general have shown themselves more willing to regulate online content than European and American regulators. Korea has restricted access to VoIP service providers and Japan has proposed restricting unacceptable content. (See Appendix B for a more detailed discussion of these two countries).

3.8 Summary

Outside the U.S., policymakers have largely endorsed some version of net neutrality. Especially in Europe, ensuring net neutrality therefore becomes another reason these policymakers support network unbundling, under the idea that unbundling reduces incentives to operate a non-neutral network. Unbundling, however, can affect network investment, as discussed next.

4 The effects of unbundling on investment in next-generation infrastructure in Europe

In this section of the paper, we use a new dataset to explore the effects of unbundling on investment in next-generation infrastructure. In particular, we look at the correlation between the use of unbundled loops and bitstream unbundling and the rollout of fiber to the home, broadband over wireless local loops, cable broadband, and facilities-based DSL. We find that controlling for income, country fixed effects, and time fixed effects, countries with more broadband connections per capita provided through local loop or bitstream unbundling have fewer fiber connections and WLL per capita provided by the incumbent and entrants. Conversely, in countries where entrants provide broadband over their own DSL or cable infrastructure, incumbents provide more fiber. In other words, countries that rely more on unbundled lines to provide broadband see less investment by incumbents in fiber than countries that rely less on unbundled lines and more on facilities-based entry.

Mandatory line sharing, or unbundling, for the most part is no longer a factor in the U.S. In 2003, the FCC ended the line sharing obligations for incumbent telephone companies, and further Court decisions, such as *Verizon v Trinko*, have made it less likely that broadband providers will be forced to share new investments with competitors. Some work concludes that these decisions have encouraged broadband investment. Hazlett (2005) notes that once the line sharing regulations were lifted, the number of DSL subscribers began to grow more quickly. In addition, after these decisions the incumbent telecommunications companies such as AT&T and Verizon increased their investment in fiber.

The cross-country literature on the effects of unbundling largely concludes that inter-platform competition is more effective in stimulating new investment than is intra-platform competition. In a report commissioned by the Brussels Round Table, a consortium of European operators and telecom manufacturers, Maldoom *et al* (2003) observe that facilities-based competition yields positive results, while access-based competition, via unbundling regulations, does not. They conclude that “Competition based on bitstream access and/or resale cannot bring about all these benefits, and risks crowding out facilities-based benefits.” Yet their conclusions are based on case-studies, not empirical

analysis. Garcia-Murillo and Gabel (2003) find in a 2001 cross-section of countries no effect of unbundling but positive effects of facilities-based competition.

Case-study approaches generally reach similar conclusions regarding unbundling regulations and broadband. Crandall (2005), for example, contends that the primary difference between the U.S. and Canada is that Canada had less extensive unbundling regulations and notes that Korea did not require unbundling until 2001.

Not everyone agrees that unbundling always has negative effects, however.³⁰ Ford and Spiwak (2004) examine the correlation between the regulated rates for unbundled loops and the share of zip codes in a state with certain numbers of broadband providers. They find that states with lower regulated prices for local loop access have higher shares of zip codes with more providers.

To our knowledge, however, no study has yet examined the effects of unbundling on investments in so-called “next-generation” infrastructure. In the following subsection, we describe the data, method, and results of our analysis in detail.

4.1 Data

The dataset includes information on 27 European countries from July 2002 through July 2007, with data from January and July in 2003, 2004, 2005, and 2006. The data come from reports and data produced by the European Commission.

Most of the data we extracted come from a Communications Committee Working Document on “Broadband access in the EU: situation at 1 July 2007”. The dataset includes the number of broadband connections by incumbents and entrants offering DSL, cable, fiber, WLL, as well as the number of lines provided through full unbundling, shared access, bitstream, or resale. The Committee defines incumbents as “the organisations enjoying special and exclusive rights or *de facto* monopoly for provision of voice telephony services before liberalisation, regardless of the role played in the provision of access by means of technologies alternative to the PSTN.” New entrants, by comparison, are “alternative telecommunications operators, as well as internet service providers (ISPs).” The data were collected from national governments and regulators. Downstream capacity of over 144kbps is considered broadband.

Figure 4 shows the breakdown of how consumers subscribe to broadband in different countries in 2007. DSL is the dominant technology in all these countries, though the extent to which it is offered through unbundled lines or by incumbents differs substantially.

Figure 4 aggregates this information to show the extent of broadband offered over unbundled DSL lines and over different platforms. The figure reflects the greater extent of platform competition in some countries, like the Netherlands, which have a fair amount of platform competition than others, like France, which have very little.

³⁰ Frieden (2004) argues in a case study that the failure of U.S. regulators to fully open the RBOC’s lines to competitors was detrimental to broadband development. His paper, however, comparing Canada, Japan, Korea, and the U.S., focuses more broadly on the role of government in ICT development than on unbundling, per se.

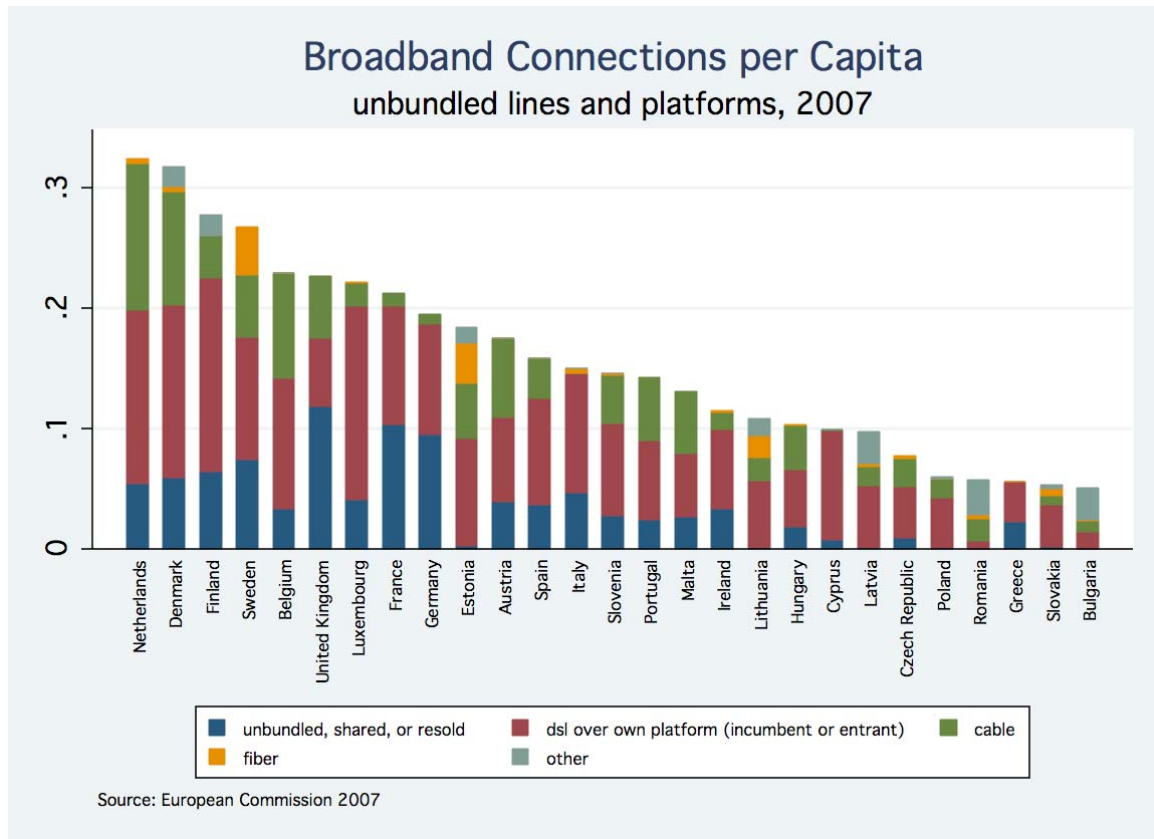


Figure 4: Broadband connections per capita

4.2 Empirical method and results

We investigate the effects of unbundling on the deployment of next-generation infrastructure by estimating several forms of equation (1) below.

$$(1) \text{ } ngn_{it} = \beta_0 + \beta_1(\text{unbundled lines per capita}_{it}) + \beta_3(\text{GDP per capita}_{it}) + \alpha_i + \gamma_t + \varepsilon_{it}$$

where ngn_{it} is the number of fiber broadband connections (estimated separately for incumbents and entrants); *unbundled lines per capita* is either number of per capita DSL connections offered over unbundled loops or through bitstream unbundling, depending on the specification; α_i are country fixed effects and γ_t are time fixed effects. The data are reported in January and July of each year, so the time fixed effects include two constants for each year.³¹

Tables 3a and 3b show the results of estimating equation (1). The table shows that the number of DSL connections provided over unbundled lines – both unbundled loops and bitstream – are associated with fewer fiber connections per capita provided by the incumbent

³¹ Wireline connections are more accurately compared across countries on a per household basis rather than per capita since any given household will generally have only one connection regardless of household size (see Wallsten 2008). However, per capita estimates are acceptable in a regression as long as the regression controls for country fixed effects since it is differences in household sizes across countries that makes the per household comparison more accurate. Nevertheless, I also estimated the regression using per household figures and the results were unchanged.

and entrants. In other words, more unbundled lines are associated with fewer fiber broadband connections.

	fiber per capita			
	entrants		incumbents	
unbundled lines per capita	-0.103 (3.06)* *		-0.041 (2.26) *	
bitstream lines per capita		-0.219 (4.77)* *		-0.064 (2.51)*
GDP per capita	-0.048 (0.35)	-0.100 (0.74)	0.034 (0.46)	0.021 (0.28)
Constant	0.000 (0.05)	0.002 (0.48)	-0.001 (0.42)	-0.000 (0.23)
Observations	244	233	244	233
R-squared	0.84	0.85	0.49	0.49

Absolute value of t statistics in parentheses

+ significant at 10%; * significant at 5%; ** significant at 1%

Table 3a: Unbundling and fiber

Note: Date and country fixed effects included in all regressions, but not shown in the table.

	cable		wireless local loop		DSL over entrants' own facilities	
	unbundled lines per capita	-0.318 (3.40)**		-0.085 (3.72)**		-0.014 (3.20)**
bitstream lines per capita		0.087 (0.79)		-0.020 (0.62)		-0.008 (1.27)
GDP per capita	-0.040 (0.11)	0.188 (0.58)	0.058 (0.64)	0.063 (0.67)	-0.017 (1.00)	-0.016 (0.89)
Constant	0.037 (3.47)**	0.031 (3.39)**	-0.001 (0.39)	-0.001 (0.51)	0.000 (0.98)	0.000 (0.84)
Observations	244	233	238	231	244	233
R-squared	0.92	0.91	0.67	0.65	0.47	0.45

Absolute value of t statistics in parentheses

+ significant at 10%; * significant at 5%; ** significant at 1%

Table 3b: Unbundling and cable, wireless local loop, and facilities-based DSL

Note: Date and country fixed effects included in all regressions, but not shown in the table.

The result is consistent across other platforms as well. The number of broadband lines per capita provided over unbundled local loops is negatively correlated with broadband connections over cable, wireless local loops, and also with DSL provided over entrants' own

facilities. The number of connections provided by bitstream unbundling is not statistically significantly correlated with cable, WLL, or entrants' own facilities.

The differing results for unbundled loops and bitstream unbundling demonstrate that unbundling comes in several forms, and that different types of unbundling may have different effects. With local loop unbundling an entrant must install its own equipment (DSLAM). A competitor that relies on bitstream unbundling may not own much equipment and is unlikely to have much control over the data flowing to and from end-users.

One possible explanation for the negative results of local loop unbundling on investment in other platforms is that firms with the ability to invest in equipment are more likely to choose to use local loops instead of building new platforms if the option is available to them. Under that scenario, we would observe use of local loops and less investment in alternative platforms. Similarly, it is possible that bitstream unbundling is uncorrelated with investment in other platforms because firms that use bitstream to offer service are unlikely to ever be in the position of building new platforms themselves, given that they may not even invest in a DSLAM. Under that scenario, bitstream unbundling could make incumbents less likely to invest since they would have to share their returns with competitors, but could be unlikely to directly affect other platforms.

Table 4 shows the results of estimating the corollary of equation (1), which examines the effect of platform competition on investment. In particular, it explores the correlation between the presence of entrants' facilities and fiber connections.

	fiber per capita			
	entrants		incumbents	
	entrant cable connections per capita	0.02 (1.53)		0.054 (2.16)*
DSL over entrants' own facilities		1.106 (3.87)**		0.352 (0.64)
GDP per capita	0.045 (0.61)	0.061 (0.85)	-0.019 (0.14)	-0.011 (0.08)
Constant	-.002 (0.94)	-0.002 (0.83)	-0.003 (0.70)	-0.0011 (0.28)
Observations	244	244	244	244
R-squared	0.48	0.51	.84	.83
Absolute value of t statistics in parentheses				
+ significant at 10%; * significant at 5%; ** significant at 1%				

Table 4: Platform competition and fiber adoption

Note: Date and country fixed effects included in all regressions, but not shown in table.

The table reveals that the number of DSL connections provided over entrants' own facilities is positively correlated with the number of fiber connections per capita provided by entrants. That is, when entrants provide DSL over their own facilities – rather than over unbundled lines – they are more likely to build their own fiber facilities.

Incumbents, meanwhile, appear to respond to competition from cable. The number of cable connections per capita provided by entrants is positively correlated with the number of fiber connections per capita provided by incumbents. That is, incumbents have rolled out

more fiber when entrants provide broadband over cable networks. The correlation between entrant cable broadband and entrant's fiber is positive, but not statistically significant, as is the correlation between entrants providing DSL over their own facilities and incumbents' rollout of fiber.

5 Conclusion

Net neutrality has been debated in the U.S. for a number of years, but recently the debate has expanded to other countries. In many ways, net neutrality is a new version of the old question regarding how incumbent network operators should grant access to and manage their infrastructure. The debate in the U.S. has focused largely on possible net neutrality regulations. Many other countries, in Europe in particular, seem to have endorsed the idea of net neutrality but believe it can be enforced largely by a policy of mandatory network unbundling. That is, proponents of the unbundling approach argue that requiring the incumbent to allow competitors to offer retail services on its network increases ISP competition, which reduces incentives to behave in an anticompetitive fashion.

This argument has two potential flaws. First, unbundling does not necessarily change the incentives facing the incumbent if the incumbent still controls the underlying data traffic. So it is not obvious that unbundling is relevant whether one believes net neutrality is a good idea or not. Second, mandatory unbundling can affect incentives to invest in the network by reducing the potential returns to that investment.

To test the effects of Europe's unbundling policies on investment, we use a new dataset compiled largely from information provided by the EC to examine the effects of unbundling and platform competition on investment in fiber networks. We find that the more a country relies on unbundled local loops or bitstream unbundling to provide DSL service, the less incumbents and entrants invest in fiber. Similarly, the more platform competition in a country the more investment there is in fiber. In particular, when entrants provide DSL service over their own facilities they also invest more in fiber, and when faced with competition from cable incumbent telcos invest more in fiber.

In sum, it is not clear that Europe's approach to net neutrality – encouraging unbundled networks – will do much to facilitate neutral networks. Moreover, the cost of that neutrality appears to be significantly less investment in next-generation networks.

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7 Appendix A: Fiber networks in Sweden

In 1994, Stokab was founded in Stockholm to build and run a city-wide fiber network.³² The company is owned by Stockholms Stadshus AB, owned by the City of Stockholm, and local governments invested over \$100 million in the enterprise.³³ According to Stokab, the company’s “network comprises 5,600 kilometres of cable and in total 1,200,000 kilometres of fibre. From this infrastructure, connections are leased to customers. The customers thereby get the exclusive right to use a line or an entire network structure, where they decide how they wish to use the fibre.”³⁴ In addition to Stokab, many other networks throughout the country are owned by non-ISPs: “A unique feature that separates the Swedish market from others was the early adoption of many operator neutral networks throughout the country that were built by municipalities and utilities. These allow ISPs and other service providers to offer their services without any investment in expensive infrastructure.”³⁵

Shim *et al* (2006) discuss some additional qualities of the Swedish market. Ethernet LAN quickly became a popular mode of access for Swedes. Since ISPs often did not own the fiber network, it was easier for many smaller competitors to emerge and for customers to switch providers, creating greater competition in the Swedish market. Specifically,

³² <http://www.stokab.se/templates/StandardPage.aspx?id=306>

³³ http://lw.pennnet.com/articles/article_display.cfm?article_id=66598

³⁴ <http://www.stokab.se/templates/StandardPage.aspx?id=775>

³⁵ <http://www.bbwo.org.uk/broadband-3045>

customers have more freedom to choose their own provider because “the unique aspect of the Stockholm approach is that all operators ... as well as end-users can have their private fibres out of the Stokab fibre cables.”³⁶ Shim *et al* stress the role of the government:

There are direct subsidies to local councils to build local broadband grids. The Swedish government has committed funds to build an alternative broadband network (Flynn, 2002) and €950 million has been earmarked for investment to ensure that 98% of all households have a broadband connection by 2005 (EC, 2001).

They also cite a competition policy that requires local governments to provide an alternative connection method if only one provider is available, and the resulting municipal networks, as factors contributing to the expansion of broadband.³⁷

8 Appendix B: South Korea and Japan

8.1 South Korea

South Korea is the largest country with very high broadband penetration. Its population in 2007 was approximately 49 million, as compared to around 16.6 million in the Netherlands and only 5.5 million in Denmark.³⁸ Even more so than these countries, South Korea has well developed infrastructure competition, with broadband connections approximately evenly divided between cable, fiber, and DSL. Wu (2004) explains that the development of a strong cable broadband service was largely due to the fact that “In Korea, cable television began recently in 1995, therefore, over half the network is fiber optic and ready to provide advanced services.” Thus it was able to avoid many of the problems Germany faced in financing network upgrades. Also, like Sweden, the government provided active funding to broadband rollout. Specifically, this occurred largely through the Korea Information Infrastructure plan, completed in 2005. According to the National Computerization Agency, “with government investment of over 800 million USD, this project established an optical transmission network linking 144 cities and an ATM network consisting of ATM switches.”³⁹

South Korea at least initially did not allow the cable providers – Korea Telecom and Powercomm – to provide broadband services. Instead, Thrunet and Hanaro leased space on those networks to provide broadband (Wu, 2004). While that separation between ownership and operation appears on its face to favor neutral networks, Korea has demonstrated a willingness to manage its network in ways that most Western countries would consider violations of net neutrality.

For example, South Korea allows only authorized companies to provide VoIP service under the Korean Telecommunications Business Act. In mid 2007, South Korea forced the American military to switch to approved South Korean VoIP service providers. This decision effectively blocked the US military from using Vonage, which had been the most popular VoIP service.⁴⁰ According to voipproviderslist.com,⁴¹ 12 VoIP companies are now

³⁶ Shim, *et al* (2006).

³⁷ Shim, *et al* (2006).

³⁸ <https://www.cia.gov/library/publications/the-world-factbook/geos/ks.html>

³⁹ www.ipc.go.kr/servlet/download?pt=ipceng/public&fn=Vol6_No3.pdf

⁴⁰ American VoIP Dishonorably Discharged in South Korea. Telecomweb news break. May 30, 2007.

⁴¹ Last accessed 8/5/2008.

authorized to operate in South Korea, but Vonage and Skype are still not included, and the Act could be seen as a method to promote South Korean national companies above competitors through a non-neutral network.

Another South Korean case regarding blocking certain sites resulted in a more ambiguous outcome. In 2006, Hanaro Telecom came out with a new IPTV service, HanaTV, but many network operators, including cable providers Curix, C&M, and HCN, and telephone company LG Powercomm, Korea's third largest network operator in mid 2006,⁴² slowed traffic to or blocked it altogether. The cable operators claimed HanaTV used too much bandwidth, while HanaTV countered that the cable providers restricting access had their own television services that would have faced direct competition from HanaTV.⁴³ The issue was not resolved until the Korea Communications Commission found fault with both Hanaro Telecom and LG Powercomm and ordered them to renegotiate connection charges, which they did in January 2007.⁴⁴ However, the decision's ambiguity means that overall responsibility for satisfying increased bandwidth demand remains undetermined.

8.2 Japan

In Japan, regulators emphasize the need to relieve network congestion without promoting anticompetitive behavior that some traffic shaping methods could facilitate. However, they appear less concerned with general access-to-content arguments, and have begun to regulate online content.

Japan is notable because of the high capacity of household connections, with 100 Mbps connections widely marketed. Despite high capacity, Japanese network operators and regulators remain concerned about increasing network traffic and congestion. The Japanese Ministry of Internal Affairs and Communications (MIC) declared "From the viewpoint of ensuring QoS on the Internet as a whole, bandwidth control is recognized as an appropriate method. However, there is an undeniable possibility of using these methods as impediments to competition."⁴⁵ Therefore, MIC concluded that there should be "packet-shaping guidelines" but not "bit discrimination". Also, consumers need to be more educated about the effects of different network management and security procedures so that they can make better decisions in choosing service providers. The MIC's general approach to network neutrality is based on achieving the twin goals of "equitable cost allocation of networks" and "equal access to networks". To do so, they propose a variety of measures, including evaluating current regulations and potentially proposing new ones, developing interconnection rules, diversifying the access network, looking into new methods for delivering content and verifying quality of service, and better conflict resolution mechanisms.

While the MIC claims that "in general, it is acceptable to collect an additional charge from heavy users", in practice questions of the desirability of a tiered Internet structure and potential pricing issues lead to its conclusion that "in the meantime, a case-by-case approach

⁴² <http://www.globalinsight.com/SDA/SDADetail7411.htm>

⁴³ <http://www.asiamedia.ucla.edu/article.asp?parentid=55961>

⁴⁴ Ministry of Internal Affairs and Communications, Japan. *Report on Network Neutrality*. Working Group on Network Neutrality, September 2007, 13-14. See also ARCEP, *ARCEP Mission in South Korea: Report*, September 2007, 10-11.

http://www.arcep.fr/fileadmin/uploads/tx_gspublication/rapport-coreedusud-juil07-eng.pdf

⁴⁵ Ministry of Internal Affairs and Communications, Japan. *Report on Network Neutrality*. Working Group on Network Neutrality, September 2007.

should be taken”.⁴⁶ Because of uncertainty surrounding the possible dangers of network management and congestion, the Japanese government has chosen to attempt more modest regulatory changes to address many of the issues raised in the network neutrality debate.

In May 2008 four associations of telecommunications providers in Japan published “Guideline for Packet Shaping”, which emphasizes that network expansion should be the main response to higher bandwidth demand, while “packet shaping should be implemented only in exceptional circumstances” (Japan Internet Providers Association, Telecommunications Carriers Association, Telecom Services Association, and Japan Cable and Telecommunications Association 2008). The Guideline clarifies, however, that while traffic shaping would normally violate the Secrecy of Communications law because it involves identifying packets by a specific user or application, it is acceptable if “performed in the pursuit of lawful business”. In particular, the Guideline notes that if a specific P2P software or heavy user “is degrading or has a high probability of degrading the quality of service of other applications, by excessively occupying network bandwidth ... traffic based on such applications [or users] is to be identified and *restricted* by employing packet-shaping equipment.” However, completely blocking such traffic would most likely not be allowed without consent of the affected parties. The Guideline also says that in order to comply with the Fairness in Use rule in the Business Law “implementing packet shaping to some heavy users but not to others who generate similar volumes of traffic or increasing the fees only for specific users would correspond to unjust, discriminatory treatment, unless there are valid reasons for such differences in treatment.” Finally, companies should provide information on traffic shaping policies to the customer at the time of contract and post this information on the website for others who may be affected.⁴⁷

Unlike the U.S. and Europe, Japan has recently proposed policies to regulate online content, which many would argue violates net neutrality principles. A report in December 2007 by the MIC developed a plan to categorize online content according to existing media laws, and would restrict content deemed unacceptable.⁴⁸ *The Japan Times* considers the potential negative impacts of this regulation:

Where the report classifies the content of Web services, however, serious concerns arise. Under the title of “kozensei” (“content that has openness”), for example, a wide range of currently unregulated services become eligible for forced content correction or removal. Blogs, Web pages, and bulletin-board services such as popular Japanese forum 2-Channel all appear to fall in this group.

And yet the limits of the regulation are unclear, as the proposed categories, which borrow primarily from broadcast and telecommunications law, have little basis in the language of Web technology.

Nico Nico Douga, for example, is a video-sharing Web site, but it also acts as a kind of messaging service. Twitter is a messaging service, but is also a kind of blog; Mogo Mogo combines messaging and social-networking functions. Boundaries on the Web are constantly being redefined, blurring the line between “broadcast” and “communication”.⁴⁹

⁴⁶ <http://www.wik.org/content/nnc/Taniwaki.pdf>

⁴⁷ Japan Internet Providers Association, Telecommunications Carriers Association, Telecom Services Association, Japan Cable and Telecommunications Association. *Guideline for Packet Shaping*. May 2008.

⁴⁸ <http://gyaku.jp/en/index.php?cmd=contentview&pid=000320>

⁴⁹ <http://search.japantimes.co.jp/cgi-bin/nc20080116a1.html>