



ELSEVIER

Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Information Economics and Policy

journal homepage: www.elsevier.com/locate/ieop

The interplay between network investment and content quality: Implications to net neutrality on the Internet



Edmond Baranes

Lameta and University of Montpellier 1, France

ARTICLE INFO

Article history:

Received 15 March 2013

Received in revised form 5 May 2014

Accepted 3 July 2014

Available online 17 July 2014

JEL classifications:

L13

L51

L96

Keywords:

Next generation network

Investment

Content quality

Net neutrality regime

Discriminatory regime

ABSTRACT

This paper studies the interplay between network investment and content quality on the Internet, and investigates the implications to the net neutrality regime. We assume a model in which a network operator provides access to consumers and content providers. The network operator offers two access technologies: an old technology (copper) and a new technology (fiber). Content providers sell both a basic content and a premium content depending on the network technology to which consumers subscribe. We consider two market segments: one in which the network operator only offers the old technology (copper), and the other in which both technologies are offered. The network operator can invest in the new technology to increase its market coverage. We show that a marginal network investment can be beneficial for content providers and increase the consumer surplus, and examine the impacts of the discriminatory regime. We also state that content quality produces contrasted effects in the investment from the network operator depending on how high the consumer valuation for premium content is compared to basic content and the substitutability between both technologies. Finally, high content quality can give incentives to the network operator to invest more in the new technology, and then create a greater positive effect of the discriminatory regime.

© 2014 Elsevier B.V. All rights reserved.

1. Introduction

The development of the Internet network gave rise to a huge regulatory debate over the past few years. The most important issue is certainly on the neutrality of the Internet and its impacts on the incentives for network operators and content providers to invest both in network infrastructures and quality of services. The debate over net neutrality raises many questions about how relationships between network operators and content providers should be organized, mainly in terms of pricing and quality of access to broadband transmission services. Recently, [Schuett \(2010\)](#) and [Krämer et al. \(2013\)](#) give a overview of these issues. One of the main questions is the condition under

which regulators should allow network operators to adopt traffic management practices to avoid congestion and ensure sufficient quality of service to content providers for offering their services. In September 2011, the FCC released the final net neutrality rules for preserving an open Internet and stressed the need for transparency in network management practices and reasonable discrimination in transmitting network traffic. In Europe in September 2013, the Commission adopted a legislative package that aims to build a telecoms single market ensuring an open Internet.

In Europe, and related to the debate on net neutrality, the regulatory debate focuses on the investment in Next Generation Networks (NGNs), i.e. fiber. The question is how to give incentive to the network operators to invest in new communication infrastructures and then migrate

E-mail address: edmond.baranes@univ-montp1.fr

from the copper network (the old technology) to the fiber network (the new technology). Broadband coverage is an essential part of the Digital Agenda for Europe that aims to foster investments in next generation access networks and to ensure everyone has sufficiently good Internet access by 2020. Broadband investment is then clearly at the top agenda of policymakers in Europe. In a speech in January 2013, Neelie Kroes, the Vice-President of the European Commission responsible for the Digital Agenda, said: "I'm in a fighting mood, and Europe can't wait. If the last three years have shown me anything, it's that broadband is essential to our future. That's not something I can let go of. We must deliver that investment".

This paper focuses on the interplay between next-generation network infrastructure investment by network operators and the quality of content, and how that interplay is affected by a potential non-network-neutrality regime. Usually, Internet broadband is viewed as a two-sided market consisting of consumers on one side and content providers on the other. The interplay between both sides includes the way prices are set. However, consumers' willingness to pay to access the network depends not only on the number of content providers, but also on the quality of content offered. On the other hand, network operators' investment crucially depends upon how they can price the access to the new technology on both sides of the platform. As consumer willingness to pay is usually an increasing function of the quality of content, the network operator's incentive to invest should be potentially even stronger when the quality of content is high. At the same time, content providers' incentive to upgrade the quality of content should also increase with the quality of the network infrastructure.

To study the interplay between network investment and content quality, we build a model in which two content providers buy access to the network operator to reach consumers that access the content via the Internet. The network operator provides two access technologies, copper and fiber, and the market is split in two areas, rural and urban. In the rural area, the network operator offers access only to the copper technology, whereas it offers both technologies in the urban area. Thus, the network operator has to operate a trade-off to limit competition between both technologies in urban areas when it sets access prices to copper and fiber for consumers. The operator should also set a not-too-high access price for the copper; otherwise it cannot attract enough consumers in the rural area. This constraint is, however, relaxed when market coverage with fiber increases. As we will show, a complementarity between investment incentives of the network operator and the quality of content offered by content providers exists, and a departure from network neutrality can strengthen this complementarity. Access to fiber allows consumers to benefit from more functionality for content and application services, and increases their perception of content quality. That is, access to the fiber increases the consumer's willingness to pay for content. Then, when the network operator increases its market coverage with fiber, more consumers can benefit from a higher content quality and the operator is able to get more surplus. As the market coverage with fiber is increased, access pricing

for consumers in rural areas is no longer an issue and the network operator can more easily extract consumer surplus. This is the main intuition that explains how content quality increases the profitability of investment for the operator and, thus, the investment incentive. Finally, a departure from network neutrality, i.e. discrimination, can reinforce the complementarity as it benefits consumers in urban areas by lowering the price they pay to access fiber. These results contribute both to the complex relationship between network investment and content quality and to the debate about network neutrality. From a policy perspective, results are interesting for at least two reasons: they first show how incentives to invest in fiber can be highly impacted by the nature of competition and the relative quality levels of copper and, secondly, they highlight the potential impacts of a departure from network neutrality.

Economic literature focused on the investment in the NGNs has mainly analyzed the impact of the access pricing rules on the incentives of operators to rollout new infrastructures. How to manage the coexistence of the old and the new technologies is certainly the main issue for National Regulatory Authorities (NRAs). The interplay between investment and access price has already been studied in the economics literature – for instance, by Brito et al. (2012), Vareda and Hoernig (2010), and more recently, by Bourreau et al. (2012) in models that introduced directly the issue of the technological migration and the balancing effects of the network access price on the incentives to invest in the new technology.

Contributions closest to ours have been those that have modelled the key impact of network neutrality on the investment of the network operators. The first rigorous theoretical analysis of net neutrality can be found in Economides and Tag (2012).¹ Using a two-sided framework, this paper analyzes a model where network operators can charge content providers for traffic termination to consumers. They show that net neutrality, viewed as a no-access-fees regime, can greatly increase consumer surplus but they do not consider investment by network operators nor innovation by content providers. Economides and Hermalin (2012) assume a limited bandwidth allocated between content providers and look at the ISP's incentive to invest in more bandwidth. Cheng et al. (2011), Choi and Kim (2010), and Krämer and Wiewiorra (2012) study a model of queuing theory to model congestion on the Internet. They show that a complex trade-off appears both in the short-run and in the long-run when priority pricing is applied. More precisely, Cheng et al. (2011) is the first attempt to analyze the effect of a network neutrality regime using queuing theory. They show that priority access can result in a prisoners' dilemma for the content provider in the short-run. Choi and Kim (2010) show that the discriminatory regime may not yield higher investment incentives in the long-run because less congestion may lead content providers to have lower willingness to pay for the prioritized delivery service. Complementary results are obtained by Krämer and Wiewiorra

¹ Hermalin and Katz (2007) analysed net neutrality as a restriction on the product line from the network operator but not consider the Internet traffic.

Download English Version:

<https://daneshyari.com/en/article/5075776>

Download Persian Version:

<https://daneshyari.com/article/5075776>

[Daneshyari.com](https://daneshyari.com)