Interactions between network operators, content providers and Internet intermediaries: Empirical implications of network neutrality

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Abstract
The aim of this paper is to explain the economic relationship between network operators, content producers and internet intermediaries such as search engines or e-commerce firms. Internet intermediaries benefit from net neutrality which refers to existing restriction, for Network owners, to engage in price discrimination amongst applications on the internet (such as search, e-commerce or content) to manage their traffic and to block access to their networks. Our analysis builds on econometric models and finds that broadband deployment and competition among network operators have increased internet intermediaries as well as content producers’ revenues. Our results suggest that synergies are at work among network operators and Internet intermediaries and among network operators and content providers. However, most of Internet intermediaries and content producers are American firms. Internet intermediaries’ growth is currently yielding an economic transfer from Europe and Asia to the United States. Therefore, it is likely that European industry will not benefit from network neutrality unless European firms invest internet intermediaries’ business.

Key words: Network neutrality, competition, innovation, infrastructures investments.
JEL codes: C51, L52, L82, L86, L96, O3
1. Introduction

The issue of network neutrality is starting to gain audience in Europe while it has been a contentious issue for several years in the United States. Such discrepancy is mainly due to their specific regulatory policies and market features. Net neutrality refers to the restriction for Network owners to price discriminate amongst Internet applications (such as search, e-commerce or content) to manage their traffic and to block access to networks.

A significant issue lies in the strong complementarities that exist between broadband roll out, contents that are available to customers and the emergence of Internet intermediaries. In Europe, this trend has produced a wide gap between the process of value creation and its distribution among the different layers of the ICT sector. To understand this easily, it may be convenient to analyse the ICT sector as an ecosystem.

Content providers and Internet intermediaries as search engines or e-commerce firms make use of telecommunications and cable networks to provide their services online. All these players belong to the ICT sector which can be considered as an ecosystem where different firms interact within a common environment. The layer model developed by Lombard (2008) can be here applied to analyse the main dynamics and major past and upcoming evolutions of this ecosystem. The layer model is also used by Fransman (2007) to describe the relationships at work within the frame of ICT industries. Firms are classified on the basis of their core business and main activity. Four groups of players are identified: technologies providers (Layer 1), network operators (Layer 2), Internet intermediaries (Layer 3) and content providers (Layer 4).

The networked elements are produced in the first Layer of activity. These include telecommunications switches and transmission systems manufactured by firms like Alcatel Lucent or Cisco; fixed and mobile phones produced by firms such as Apple, LG, Nokia, or Motorola and electronic devices connected to networks such as PCs produced by Acer, Apple, Dell, Sonny or Toshiba.

Some of these elements are strung together in the second Layer by network operators. Network operators include telecommunications operators such as AT&T, BT Group,
Deutsche Telecom, France Telecom, Telecom Italia, Telefonica, Verizon, cable TV operators such as Cox Communications, Ono, Time Warner Cable or Virgin Media and satellite operators such as BSkyB or DirecTV.

The third Layer features Intermediation platforms, such as search engines as Google and Yahoo or electronic commerce firms as Amazon and eBay, and firms developing social networks as Facebook and Twitter. These firms are based on two-sided business models and make use of access networks developed by network operators to provide their online services. Search engines enable interactions between consumers and advertisers and derive their revenues from advertisers only, while electronic commerce firms cater both the sellers and the buyers.

Contents production industry is embodied in the fourth layer. Content relates to the material downloaded or viewed by end users, such as textual information, music and movies. Content can be produced either by national broadcast channels like Antena 3, Canal+, CBS, TF1, or by media and entertainment conglomerates like Time Warner or Walt Disney.

The ICT sector analysis, as a set of crossed-relationships between various layers and the specific business models applied by firms and operators along the vertical chain, allows understanding the disconnection between creation and distribution of value. While broadband operators do invest to attract customers, Internet intermediaries, using a two-sided business model, do benefit from rent-extraction by taking advantage of network neutrality.

To our knowledge, there have been few net neutrality law cases. In the United States, in most cases, where a network operator attempted to block consumers from accessing a service through the Internet, the Federal Communications Commission (FCC) acted to compel the carrier to put an end to that practice. In 2005, Vonage stated that Madison River Telephone Co., a small American telephone company, was preventing its DSL customers from accessing Vonage’s VoIP service, to protect Madison River’s conventional telephone service from competing. The FCC reacted to stop Madison River from blocking access to Vonage1. In 2007, several Comcast’s customers noticed that the company had slowed their access to peer-to-peer sites, which allows internet users to share files directly with each other, in violation of

1 Source: Atckinson (2008).
the net neutrality principle. Several advocacy groups complained to the FCC, and Comcast stopped the practice. The FCC then ordered Comcast to disclose details of its change of heart. Comcast complied but then challenged the commission’s authority to issue the order at all. The case went to court. Finally, on April 2010, the District of Columbia court of appeals ruled that the FCC had no authority to regulate how network operators manage traffic to their customers.2

The tricky point is that welfare depends on how social surplus is distributed amongst the different layers involved, according to their geographical location. Considering Internet intermediaries are overwhelmingly Americans, European broadband operators do not completely derive benefits from their investments because of network neutrality and this can have a negative impact on welfare of European countries.

Our study aims to analyse the relationship between broadband penetration, network operators’ investments, competition between network operators and layers revenues, mainly those of content providers and Internet intermediaries. Our econometric estimations suggest Internet penetration rate is positively associated with content producers’ revenues and with Internet intermediaries’ revenues. We also find a positive relationship between network operators’ investments and content producers’ revenues. Furthermore, our analysis suggests that increased competition between network operators had a positive impact on Internet intermediaries’ revenues.

The paper is organized as follows: Section 2 provides a short overview of the recent literature on economics of network neutrality. Section 3 provides an econometric analysis and discusses the regression model for estimation and the most relevant results. Section 4 provides some concluding remarks and some policy implications for European industry.

2. Related literature

A large strand of literature has recently developed on network neutrality. Most of papers were discussing legal issues of network neutrality and the expected consequences of its abolition.

2 Source: the Economist.
Economic analysis in this field is less developed although some recent theoretical research has been made in the field of two-sided market models.

Economides and Tag (2007) model the Internet Broadband market as a two-sided platform in which broadband consumers stand on one side and content providers on the other side. In their framework, they discuss the benefits of net neutrality regulation both under monopolistic access and competitive setting. Their results show that when access is monopolized, network neutrality regulation (that imposes zero fees “on the opposite side” of the market) generally increases industry surplus compared to the fully private optimum at which the monopoly platform imposes positive fees on content and applications providers. In the same manner, Economides and Tag find that imposing network neutrality in a duopoly setting increases total surplus compared to a situation where competitive platforms charge a positive fee on content providers. Without network neutrality regulation, as platforms have incentives to attract more consumers to generate revenue from charging content provider, they set a lower subscription fee, hence consumers’ surplus increases. This positive impact is offset by the negative effect on content provision. Finally, the welfare increases with network neutrality and it does not depend on platform competition anyway.

While Economides and Tag (2007) model network neutrality assuming a zero fees for content providers, Hermalin and Katz (2007) consider network neutrality as a situation in which the broadband platform produces a single access quality (non-discriminatory access quality). They assume both traditional markets and two-sided markets where platform providers offer services making a connection between consumers and Internet applicant providers. Consumers are heterogeneous in the quality of contents and Internet application providers purchase network services of varying qualities from the broadband platform. Network neutrality plays as a product-line restriction and as a direct effect low valuation applicant providers get ruled out of the market. Their results show that network neutrality regulation by product restriction may hinder both consumers’ surplus and social welfare. They also examine a duopoly model and find that welfare is likely to fall under net neutrality.

Choi and Kim (2008) analyse precisely the effects of network neutrality regulation on investments incentives for network providers and content providers, and their implications for social welfare. They define network neutrality as non-discriminatory in the delivery of content through networks. The model developed is based on the queuing theory developed in
operational research to take clearly account of bandwidth scarcity and the need for rationing as the main causes of the network neutrality regulation debate. In this setting, they show that the network providers’ decision on the discrimination across content depends on a potential trade-off between access fee and the revenue from the trade of the first priority. Concerning the network providers’ investment incentives, their results show that the growth in capacity affects the sale price of the priority right under the discriminatory regime. They conclude that as the relative merit of the first priority becomes relatively small for higher level capacity, under discrimination the network’s incentives to invest may be smaller than that under network neutrality regulation where such rent extraction effects does not exist. Finally, the welfare effects of network neutrality regulation is ambiguous and depends largely on how capacity expansion affects the need to acquire the priority right and thus the ability to extract rent from content providers.

Close to Choi and Kim (2008), Cheng et al. (2009) develop a game theoretic model to highlight gainers and losers of abolishing network neutrality and to analyse the broadband providers’ incentives to expand capacity. In a duopoly setting on content provision, they assume that content providers can avoid congestion by paying network providers for preferential access. They find that content providers are left worse off when network neutrality is abolished and consumer surplus either does not change or is higher in the short run. In the short run, social welfare increases whether one content provider pays for preferential treatment but remains unchanged whether both contents providers pay. Finally, they find that incentive to invest in capacity for broadband provider is generally higher under the neutrality regulation because the network owner incurs a lost from the content provider’s side without net neutrality.

There are few empirical works that tests the effects of network neutrality on welfare and its impacts on network’s incentives to invest and this is particularly true for European countries. A recent contribution from Hausladen and Wallsten (2009) addresses this lack of empirical analysis about the effect of neutrality regulation in Europe and other countries than United States. In particular, they explore net neutrality in the UK, 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 in Europe, they use a dataset to test empirically the effect of unbundling on investment in fiber to the home. They find a significant negative correlation between the number of unbundled DSL connections per
capita and the number of fiber connexions. Therefore, countries that rely more on unbundled lines to provide broadband access exhibit less investment by incumbents in fiber than countries that rely less on unbundled lines and more on facility based entry.

The current study will provide an empirical analysis of network neutrality regulation taking into account how value is created in ICT sector and how it is distributed among operators and firms and among different geographical location. Our results contributed to emphasizing the fierce importance of the Internet as a main driver of economic growth and the issue of the network neutrality debate on innovation and investment incentives for various layers, especially in a European perspective. The following section will outline the data used and secondly the econometric analysis.

3. Data Analysis and econometric analysis

This section empirically investigates the relationship between network operators and content providers and then the relationship between network operators and Internet intermediaries. Four equations are estimated. The first equation models the impact of Internet penetration rate, competition among network operators and real GDP per capita on content providers’ revenues. The second equation captures the effect of network operators’ investments, competition between network operators and GDP per capita on content providers’ revenues. The third economic relation examines the impact of Internet penetration rate, competition among network operators and GDP per capita on Internet intermediaries’ revenues. Finally, the last equation analyses the impact of network operators’ investments, competition among network operators and GDP per capita on Internet intermediaries’ revenues.

3.1 Data

To address the economic relationship between content providers and network operators we consider a panel of 7 countries: Japan, United-States, United-Kingdom, Italy, France, Spain and Germany. We then consider a panel of 5 countries (Japan, United-Kingdom, Italy, France and United-States) to analyse the relationship between Internet intermediaries and network operators.\(^3\)

\(^3\) Because there are few Internet intermediaries, we can gather data only in five countries in the second panel. Thus there are more countries in the first panel than in the second.
We gathered data related to general and sectoral economic variables from different sources. We compute real content providers’ revenues and real Internet intermediaries’ revenues in each country. Content providers’ revenues and Internet intermediaries’ revenues are obtained from Thomson Financial database. Content producers and Internet intermediaries’ revenues are given by the sum of firms’ revenues in Layers 3 and 4 of the Layer Model. Indexes prices used to deflate revenues are from OECD database. We also compute the Herfindahl-Hirschmann indexes, or HHI, which measures the competition degree among network operators for Internet access market. Operators’ market shares used to calculate Herfindahl-Hirschmann indexes come from Informa and Telecom Media database, as well as Internet penetration rates. We then calculate real network operator’s capital expenditures for fixed networks, which represent network operator’s investments in fixed networks. Capital expenditures for fixed network are obtained from the IDATE database. Then, real GDP per capita are from OECD database. All data gathered concern the 2001-2008 period, except real network operators’ capital expenditures that concern the 2003-2008 period. Table 1 defines the variables used in this study and presents some summary statistics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHI_int</td>
<td>Herfindahl-Hirschmann for Internet access market</td>
<td>3571.1</td>
<td>1605.7</td>
<td>1493.5</td>
<td>10000</td>
</tr>
<tr>
<td>PENint</td>
<td>Internet access penetration rate</td>
<td>29.7%</td>
<td>20.6%</td>
<td>4%</td>
<td>65.9%</td>
</tr>
<tr>
<td>GDP</td>
<td>Real GDP per capita</td>
<td>29001.4</td>
<td>4254.063</td>
<td>25485.5</td>
<td>38788.1</td>
</tr>
<tr>
<td>CAPEX</td>
<td>Total fixed capital expenditures of network operators</td>
<td>3.14E+15</td>
<td>6.35E+15</td>
<td>2.10E+09</td>
<td>1.75E+16</td>
</tr>
<tr>
<td>REVtv</td>
<td>Real total revenues of content producers</td>
<td>1.64E+10</td>
<td>1.95E+10</td>
<td>2.95E+09</td>
<td>6.76E+10</td>
</tr>
<tr>
<td>REVinter</td>
<td>Real total revenues of Internet intermediaries</td>
<td>6.49E+09</td>
<td>1.31E+10</td>
<td>491340.1</td>
<td>5.80E+10</td>
</tr>
</tbody>
</table>

Table 1: Variable description and summary statistics

Before turning to our econometric models we present the evolution of different dependant and explanatory variables.

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4 Given Internet market structure in United States where there is mostly a duopolistic competition between cable and telecom operators, we have performed special calculations for Herfindahl-Hirschmann index. Internet HHI in the US is equal to the sum of cable market share plus the sum of telecom market share.
Graph 1: Real content providers’ revenues in 2000 billion Euros

Graph 1 features real content producer’s revenues evolution and shows that these revenues have increased slowly between 2001 and 2008. During this period, content providers’ revenues have increased by 1.4 percent, on average, each year. Content producers’ revenues increased from 145 432 billion Euros in the first quarter 2001 to reach 160 303 billion Euros in the fourth quarter 2008. In the fourth quarter 2008, content producer’s revenues of american companies were worth 86 291 billions Euros which represents 53.8 percent of the total revenues of content producers gathered in our panel. Indeed, many content providers and entertainment conglomerates are American companies.

Graph 2: Real Internet intermediaries’ revenue in 2000 billion Euros
Graph 2 shows that the real revenues of Internet intermediaries increased by 53.76 percent, on average, each year between 2001 and 2008. Internet intermediaries revenues increased from 2 412 billion Euros in the first quarter 2001 to 49 016 billion Euros in the fourth quarter 2008. In the first quarter 2008, Internet intermediaries revenues of American firms were equal to 43 300 billions Euros which represents 83.3 percent of the total revenues of Internet intermediaries gathered in our panel. Indeed, the biggest internet intermediaries like Google, Yahoo, Amazon or e-Bay are all American companies.

Graph 3 : Internet Herfindahl-Hirschmann indexes evolution

The evolution of Internet HHI exhibits a general decreasing trend showing that Internet access market has become more competitive (graph 3). Competition intensity in the Internet access market has increased in all countries (i.e. Internet HHI has decreased in all countries). Therefore, between 2001 and 2008, Internet HHI has decreased by 2.69 percent, on average, each year in France, Internet HHI decreased at an annual rate of 22.98 percent in Japan, and Internet HHI decreased by 0.12 percent, on average, in the United-States.
Graph 4 presents real capital expenditures for fixed networks and shows that capital expenditures are quite volatile. Real fixed capital expenditures increased by 5.94 percent each year, on average, in France. Conversely, real capital expenditures decreased at an annual rate of 5.19 percent in Italy.

Finally, Internet penetration rate has increased in all countries of our panel. United States has had an increase in the penetration rate from 17.55 percent in the first quarter of 2001 from 65.12 percent in the fourth quarter of 2008.

3.2 Econometric analysis

We now turn to econometric analysis and consider four panel models. We first consider the relationship between network operators and content providers. Random effects model used to estimate economic relationship between real content providers’ revenues in each country, Internet penetration rate, Internet HHI and real GDP per capita is given by:

\[
LREV_{it} = \mu + \beta_1 \text{PEN}_{it} + \beta_2 LHHI_{it} + \beta_3 \text{LGDP}_{it} + \epsilon_{it}
\]

With

\[
\epsilon_{it} = \alpha_i + u_{it}
\]
In our application, $i$ stands for countries and $t$ for time quarters. Also, $\alpha_i$ captures individual effects, $LREV_{it}$ is the logarithm of real content producers’ revenues in each country, $PEN_i$ stands for broadband penetration rate, $LHHI \text{ int}_i$ stands for logarithm of Herfindahl-Hirschmann index for Internet access market in each country and $LGDP_i$ measures the real GDP per capita in each country. Hausman statistic is equal to 90.37. Therefore we have to reject the hypothesis of absence of correlation between individual specific effects and explanatory variables and to consider the fixed effects specification. Fixed-effects model is given by:

$$LREV_{it} = \alpha_0 + \delta_j + \beta_1 LREV_{it-1} + \beta_2 LREV_{it-2} + \beta_3 PEN_{it} + \beta_4 LHHI \text{ int}_i + \beta_5 LGDP_i + u_{jt}$$  \hspace{1cm} (1)

Lagged variables are introduced to get rid of remaining autocorrelation of the residuals. Fixed effects model used to estimate economic relationship between real content providers’ revenues, fixed capital expenditures, Internet HHI and GDP per capita is given by:

$$LREV_{it} = \alpha_0 + \delta_j + \beta_1 LREV_{it-1} + \beta_2 LREV_{it-2} + \beta_3 LCAPEX_{it} + \beta_4 LHHI \text{ int}_i + \beta_5 LGDP_i + u_{jt}$$  \hspace{1cm} (2)

The variable $LCAPEX_{it}$ is the logarithm of network operators’ real capital expenditures in each country. As Hausman statistic is equal to 62.82, we do reject hypothesis of absence of correlation between individual specific effects and explanatory variables. Table 2 reports equation (1) and (2) estimation results.
The results of equation (1) estimation, reported in table 1, point out a negative relationship between the logarithm of Herfindahl-Hirschmann index for Internet access market and content producers’ revenues. However, logarithm of Herfindahl-Hirschmann index is not statically significant. Furthermore, results show a positive relationship between Internet penetration rate and content producers’ revenues. The rise in Internet penetration has in turn increased content producers’ revenues. The point estimate of the elasticity equals 0.11, which implies that a 1 percent increase in Internet penetration rate increases content producers’ revenues by, on average, 0.11 percent. We do not consider reverse causality between content producers’ revenues and Internet penetration rate. We consider that content producers’ revenues increase because Internet penetration growth and innovation are setting new ways to reach consumers rather than consumer purchase Internet access to consume TV contents. Finally, table 1 exhibits a positive relationship between GDP per capita and content producers’ revenues. The elasticity for real GDP per capita is 0.76. Thus a 1 percent increase in real GDP per capita increases content producers’ revenues by, on average, 0.76 percent.

The estimation of model (2), reported in table 1, exhibits a negative relationship between the logarithm of Internet HHI and the logarithm of content producers’ revenues. However, the logarithm of Internet HHI is not statically significant. The estimation of model (2) indicates, in addition, that network operators’ fixed capital investments are positively and significantly associated with content producers’ revenues. The elasticity for network operators’ fixed
capital investments equals 0.06. We also find that real GDP per capita is positively associated with real content producers’ revenues. The elasticity for real GDP per capita is 0.75.

We now turn to the relationship between network operators and Internet intermediaries. Random effects model used to estimate economic relationship between real Internet intermediaries’ revenues at the country level, penetration rate, Internet HHI and real GDP per capita is given by:

\[
LREV_{it} = \mu + \beta_1 \text{PEN}_{it} + \beta_2 \text{LHHI}_{it} + \beta_3 \text{LPIBHAB}_{it} + \epsilon_{jt} \tag{3}
\]

With

\[
\epsilon_{it} = \alpha_i + u_{it}
\]

\(LREV_{it}\) is the logarithm of Internet intermediaries’ revenues in each country. Hausman statistic is equal to 11.87. Therefore we do accept the hypothesis of absence of correlation between fixed effects and explanatory variables and to consider random effects specification.

Fixed effects model used to estimate economic relationship between real Internet intermediaries’ revenues in each country, real fixed capital expenditures, Internet HHI and real GDP per capita is given by:

\[
LREV_{it} = \alpha_0 + \delta_j + \beta_1 LREV_{it-1} + \beta_2 LREV_{it-2} + \beta_3 \text{LCAPEX}_{it} + \beta_4 \text{LHHI}_{it} + \beta_5 \text{LGDPP}_{it} + u_{jt} \tag{4}
\]

As Hausman statistic is equal to 82.06, we reject hypothesis of absence correlation between individual specific effects and explanatory variables and to consider the fixed effects specification. Table 3 reports equation (3) and (4) estimation results.
Dependant variable : LREVinter

<table>
<thead>
<tr>
<th>Between-groups estimator (3)</th>
<th>Within groups estimator (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coef.</td>
<td>t-stat</td>
</tr>
<tr>
<td>μ</td>
<td>-31.54</td>
</tr>
<tr>
<td>A</td>
<td>1.63</td>
</tr>
<tr>
<td>LREVinter (-1)</td>
<td>-0.64</td>
</tr>
<tr>
<td>LREVinter (-2)</td>
<td>-1.94</td>
</tr>
<tr>
<td>LHHIint</td>
<td>-1.94</td>
</tr>
<tr>
<td>PENint</td>
<td>2.59</td>
</tr>
<tr>
<td>LCAPEX</td>
<td>0.02</td>
</tr>
<tr>
<td>LGDP</td>
<td>6.56</td>
</tr>
<tr>
<td>R2</td>
<td>0.43</td>
</tr>
</tbody>
</table>

Table 3: equation (3) and (4) estimation results

***, **, *: statistically significant at 1, 5, and 10% level

The estimation of equation (3) points out a negative relationship between the logarithm of HHI for Internet access market and Internet intermediaries’ revenues. Therefore, competition growth has increased Internet intermediaries’ revenues. The elasticity for Internet HHI equals -1.94. Furthermore, there is a positive relationship between broadband penetration rate and Internet intermediaries’ revenues. The rise in Broadband penetration has increased Internet intermediaries’ revenues. The elasticity is 2.59, which implies that an increase in 1 percent in broadband penetration rate increases Internet intermediaries’ revenues, on average by 2.59 percent. Note that the elasticity for broadband penetration rate is higher than the elasticity for broadband penetration rate estimated in equation (1). Finally, estimation of equation (3) exhibits a positive relationship between GDP per capita and Internet intermediaries’ revenues. The elasticity for GDP per capita equals 6.56.

The estimation of equation (4) indicates that the logarithm of HHI for Internet access market is negative but not significantly associated with real Internet intermediaries’ revenues. Then, the logarithm of fixed capital expenditures is also negative but not significantly associated with Internet intermediaries’ revenues. The estimation finally exhibits a positive relationship
between real GDP per capita and Internet intermediaries’ revenues. The elasticity for GDP per capita equals 1.57.\footnote{The elasticity for GDP per capita estimated in equation (4) is lower than the elasticity for GDP per capita estimated in equation (3) because equation (3) concerns the 2001-2008 period whereas equation (4) concerns the 2003-2008 period.}

4 Concluding remarks

This paper examines two economic relationships: the one between network operators and content providers and then one between network operators and internet intermediaries.

Results of the literature on net neutrality depend on how authors have defined net neutrality. While Economides and Tag (2007) point out synergies between network owner and content providers, Hermalin and Katz (2007) find that network neutrality, i.e. non discrimination in network access quality, can exclude application providers from the market and reduce welfare. Most contribution in the literature finds that network neutrality increases total industry surplus. This is mainly the result of the two-sided nature of Internet intermediaries and content producers business models. Network neutrality regulation impact on network operators’ investment incentives is ambiguous according to the literature.

By contrast to the literature on net neutrality based on industrial organization, our econometric analysis takes account of the geographical dimension and draws a distinction between content providers and Internet intermediaries. Our econometric analysis suggests that Internet penetration rate is positively associated with content producers’ revenues and with Internet intermediaries’ revenues. We also find a positive relationship between network operators’ investments and content producers’ revenues. Therefore, these results suggest that synergies are at work amongst network operators and Internet intermediaries and amongst network operators and content providers.

European policies focus on promoting competition. Our econometric analysis suggests that increased competition has a positive impact on Internet intermediaries’ revenues. Indeed competition among network operators has promoted innovation and increased Internet intermediaries’ revenues. These results suggest the existence of spillovers created by network
operators. However, most of the Internet intermediaries are American firms. The biggest internet intermediaries like Google, Yahoo, Amazon or e-Bay are all American companies. Internet intermediaries are expecting fast growth in revenues. Therefore, value creation is spilling out from European industry. Internet intermediaries’ expansion yields an economic transfer from Europe and Asia to the United States. Therefore, it is likely that European industries will not benefit from network neutrality unless European firms enter Internet intermediaries’ business. European policy should focus on inducing firms innovating and investing internet intermediaries’ layer. This can help partly network owners financing NGN investments.

References