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Technological change and the provision, consumption and regulation of services: Papers from a European ITS regional conference

The papers in this special issue are drawn from the 25th European regional conference of the International Telecommunications Society that was held in Brussels, Belgium and hosted by iMinds-SMIT/VUB. The theme of the conference, which was held between the 22nd and 25th June 2014, was ‘Disruptive innovation in the ICT industries: Challenges for European policy and business’. The theme reflected the disruptive impact, being felt within Europe as well as globally, that successive waves of digital innovation have had on the converged telecommunications, media, consumer electronics, IT and web application domains. Due to these waves of innovations, legacy players are struggling to adapt their business models or have, in some cases, been replaced altogether by new entrants. Within the rapidly changing industries that have emerged, consumers have been confronted with fast-evolving usage contexts where social networks, recommendation services and search technologies capture their personal data and influence consumption of an increasingly diverse array of services on devices anywhere, anytime and anyplace. And the resulting impact of disruptive innovation on companies and consumption is forcing policy makers and regulators to, once more, rethink their frameworks and policies as a new ICT ecology revolving around platform firms emerges.

The conference attracted participants from more than 25 countries, with academia, industry, policy makers and regulators all being represented. As befits a conference with more than 30 parallel sessions, the scope of the papers presented was diverse – papers were presented on topics ranging from spectrum policy within the European Union to consumer behaviour in Spain, big data analytics, ICT based innovation in Asia and the strategy of OTT players. While the subjects addressed were diverse, a common theme of the papers was the desire to explore and understand the interplay between technological change and how services are provided, consumed and regulated. The papers in this special issue, which were submitted in response to a call for papers, reflect to varying degrees this interplay. The first three papers in this special issue are united by their focus on broadband, and explore in various ways the interplay between technological change and service provision and consumption. These papers are then followed by two that investigate competition, albeit in different contexts. In the penultimate paper attention is directed towards understanding consumer behaviour, while in the final paper the focus is on the development of (spectrum) policy.

The first three papers of this special issue investigate issues related to broadband. In the first of these, ‘Facility- and service-based competition and investment in fixed broadband networks: Lessons from a decade of access regulations in the European Union member states’, by Wolfgang Briglauer, Klaus Gugler and Adhurim Haxhimusa, the focus is placed on competition and its impact on fixed broadband investment. The authors employ firm-level panel data to examine the impact of service- and facility-based competition on firm-level investment as well as the strategic effects underlying those investment decisions.

The paper finds that facility-based competition exerts significant positive impact on both incumbents’ and entrants’ investments, implying that those investment decisions are strategic complements, which in turn may therefore re-inforce the effects of regulatory decisions. The paper also finds that intermodal competition in terms of a fixed-mobile substitution exerts different effects at the firm level. Service competition, on the other hand, has no significant impact on the investment decisions. In fact, with respect to the later phase

of market liberalization, service-based competition has a negative impact on entrants' investments. This, the authors argue, casts doubt on future regulatory access policies which continue to foresee multi-layer access obligations and service-based competition as a guiding principle for emerging fibre-based access.

The second paper on broadband, 'The impact of tariff diversity on broadband penetration – An empirical analysis' by Justus Haucap, Ulrich Heimeshoff and Mirjam R.J. Lange, examines factors affecting broadband penetration. While a growing body of empirical literature has stressed the importance of (low) prices for broadband adoption, it has largely neglected the role of price variety (within a country). Also from a theoretical perspective, it is not clear how price diversity would affect broadband uptake. Therefore, the authors provide a quite unique empirical analysis of how tariff diversity affects fixed broadband penetration.

To measure tariff diversity on a country-level, the paper used a dataset of over 1000 fixed-line broadband tariffs and applied an instrumental variable approach to estimate demand, controlling for various industry and socio-economic factors. The results indicate that price, service-related factors (QoS) and socio-economic factors (income, education) affect broadband demand the most. However, tariff diversity also significantly enhances demand, and these results could suggest that policy makers should be lenient towards price discrimination in broadband markets.

The final paper on broadband, 'A cost study of fixed broadband access networks for rural areas' by Juan Rendon Schneir and Yupeng Xiong, investigates the cost side of broadband networks. Focus is on rural areas, where the deployment of high-capacity broadband access networks lags behind that of urban and suburban areas. The paper assesses the costs for the rollout of fixed access networks capable of providing citizens with downstream broadband capacities of 30Mbps or 100Mbps (since these speeds are related to the broadband targets of the European Digital Agenda). A cost model is employed to determine the cost of a home passed and the cost of a home connected for various fibre- and copper-based network architectures in rural areas.

The paper finds that the cost of deploying a network outside a town or village in a rural area is on average 80% higher than the cost of deploying the network in the town or village and this could in turn lead to a digital divide within the same rural area. The following order of costs (in descending order) is identified: FTTH, FTTdp-Building, FTTdp-Street, FTTRN, FTTC and CO-VDSL. Some network architectures (FTTC and CO-VDSL) will not be able to provide all households in some areas with 30Mbps. It is therefore possible that operators will need to create a combination of various broadband access networks. The authors also highlight several topics that policymakers should address: how the digital divide within a rural area can be avoided; a National Broadband Plan that clearly addresses the provisioning of broadband in rural areas; elaboration of studies on broadband demand in rural areas; and the assessment of costs and technical capacity of wireless networks in rural areas.

The next two papers in this special issue address, broadly speaking, the issue of competition. In their paper, 'What level of competition intensity maximises investment in the wireless industry?', Georges Vivien Hounbouon and François Jeanjean investigate the relationship between competition and investment in the wireless industry from a dynamic perspective. Their research refers to the long standing debate on whether investment benefits most from having large firms in concentrated markets or from increasing competition, which stimulates investment to escape competition. The policy debate about the relationship

between competition and investment in the wireless industry arises in the context of merger and entry waves worldwide and particularly in the European Union. While some national regulators have granted additional spectrum licenses to new entrants or have opposed mergers, others have cleared a range of proposed mergers between mobile operators.

Using firm level data and instrumental variable estimation strategy, the authors find that the relationship between competition and investment in the wireless industry is inverted U shaped. The investment maximising intensity of competition is reached when operators' gross profits represent 37 or 40 per cent of their revenues. This finding implies that investment increases with competition as long as operators' profits are above the thresholds of 37 or 40 per cent of their revenues. Under these thresholds there is a trade-off between competition and investment. The paper also finds a significant long run effect of competition on investment.

It appears that in the case of the wireless industry, the escape-competition effect is weaker with intense competition because innovation in wireless infrastructure is mainly designed by equipment manufacturers that provide their facilities to all rival operators at the same time. Opportunities to escape competition by investment are, therefore, temporary, in particular when competition is intense. The authors' findings suggest that policymakers should consider wireless operators' profit margins before allowing a new market entrant or merger in the industry. Since investment in wireless technologies is decisive for traffic growth and dropping megabyte prices for consumers, it appears that policy makers should aim for a competition intensity that is close to the level which maximises investment.

The next paper in this special issue, 'Competing against yourself: State duopoly in the Luxembourg telecommunications industry' by Nico Binsfeld, Jason Whalley and Lee Pugalis also addresses the issue of competition, albeit within the confines of Luxembourg, a geographically small but prosperous member state of the European Union. The authors begin by highlighting the liberalisation of telecommunication markets that has occurred within the European Union before arguing that the approach adopted in Luxembourg is different compared to that of other member states.

The authors identify three different dimensions of the role played by the Luxembourg state with respect to its telecommunications industry. The state is a policy maker, a regulator and an operator. With regards to the former two roles of the state, the paper illustrates the scope of the activities undertaken by the state as the sector has been liberalised and Luxembourg has sought to adjust to the new, information-based, economy that is emerging.

It is with regards to the third role of the state, namely, as an operator, that the paper vividly illustrates the unique approach adopted in Luxembourg. While the telecommunications market in Luxembourg has been liberalised, the state has retained full ownership of POST Group, the incumbent operator. Not only is POST Group a diversified provider of telecommunication services, but it also provides financial and postal services. Given the size and scope of the company, it is perhaps unsurprising that the state has retained outright ownership of it. What is surprising, however, is that the state has established a second wholly-owned operator, Luxconnect, to provide national and international connectivity as well as operate data centres. The Luxembourg state, in other words, wholly owns two companies that compete against one another in the telecommunications market. The paper charts how this situation arose, and then explores the challenges and tensions that result from the presence of the two companies in the market.

Teresa Garín-Muñoz, Teodosio Pérez-Amaral, Covadonga Gijón and Rafael López analyse in their contribution, ‘Consumer complaint behaviour in telecommunications: The case of mobile phone users in Spain’, the post-purchase behaviour of mobile phone users once they have experienced a service failure. Since customer retention in competitive service industries such as the wireless industry is strongly dependent on whether consumers have the opportunity to voice any dissatisfaction and how this is subsequently handled, consumer complaint behaviour is an important issue.

For this study, a survey for 4249 individuals in Spain was used for specifying econometric equations that explain the determinants of the complaining decision and the impact that a proper complaint management may have on overall satisfaction. One finding is that a proper handling of complaints by the company may constitute a source of improvement in the overall user satisfaction and profitability of the firm. Accordingly, it seems reasonable to use complaint management as a tool to retain customers, and to maximize the capture of all possible consumer complaints before they are manifested in badmouthing, complaints to third-parties, boycotts or exits.

However, the results suggest that dissatisfaction is not a necessary condition for complaining and that the propensity to complain is different depending on the type of problem experienced by the customer. Ordering the types of problems according to their impact on the likelihood of complaining, they are (from highest to lowest): (1) difficulty in cancelling the service; (2) incorrect billing; (3) delay in establishing the service; (4) incorrect billing for services not used; (5) breach of contract or commercial offer; (6) difficulty in obtaining the required information and (7) coverage problems. Also, the probability of reporting an unpleasant experience with the service is higher for younger, male and more highly educated people.

Spectrum is, of course, a key component of today’s telecommunications industry. In this final paper of the special issue – ‘Wireless access policy for electronic communication services’ – Mohamed El-Moghazi, Jason Whalley and James Irvine explore a European approach to spectrum property rights. This approach, which goes by the abbreviation WAPECS, sought to introduce greater flexibility into spectrum management by allowing for technology and service neutrality. The paper begins by placing WAPECS in context, both in terms of previous approaches to spectrum management and the motivations for it in the first place. The rest of the paper then explores the attractiveness and practicalities of WAPECS, drawing on data from more than 30 interviews from across the telecommunications industry. This enables the authors to explore WAPECS from the perspective of different stakeholders.

The authors find that the perception of WAPECS by industry stakeholders varies, with some of the views expressed being highly critical of the concept. Those interviewees from industry also revealed their preference for harmonisation and not greater spectrum flexibility as this comes with a cost. The paper also highlights the challenges and difficulties associated with amending the spectrum management regime. While WAPECS was a European initiative, spectrum management occurs within a broader international context shaped by the ITU-R radio regulations and World Radiocommunication Conferences. The paper draws attention to the conflicts that occurred between WAPECS and the ITU-R radio regulations, and vividly illustrates the protracted nature of discussions that occurred over several successive World Radiocommunication Conferences regarding flexibility, a key, perhaps defining, characteristic of WAPECS. Not only do these conflicts and discussions reveal the different and often

contradictory opinions and views of stakeholders – European countries, operators, regulators, broadcasters and non-European countries – but they also remind us of the geopolitical nature of spectrum management as well.

The papers presented in this special issue highlight the diversity of research that is being undertaken to explore the dynamic interaction between technological change and how services are provided, consumed and regulated. Not only do the papers illustrate the diversity of specific issues that are being tackled, but also the different methodologies that are being adopted to explore the topics. Across the special issue a range of quantitative and qualitative methodologies are used, with data coming from a variety of sources such as the ITU and World Bank as well as from surveys and interviews. The different approaches adopted highlight the need to draw on methodological developments in other research domains, to improve the robustness and perhaps generalizability of telecommunications orientated research. Not only can the methodologies adopted in telecommunications orientated research be improved by drawing on developments elsewhere, but ideas for innovative data collection techniques can also be gained and implemented. There is, in other words, a need for further research to improve the methodologies and data sources used in telecommunications orientated research.

The papers also suggest that further research is required that explores how successive waves of technological change are changing, sometimes quite dramatically, business models, consumer behaviour and regulatory regimes. One area for further research is how consumers react to changing business models, especially those that are rapidly evolving and which provide services across multiple devices. Integral to this is the provision of data by consumers to companies that then use it to innovate and customise the services that they provide. The complexity and dynamism of this relationship necessitate continued research in this area. But so too do the implications of the ease at which a seemingly ever greater proportion of consumers are willing, and able, to combine services from different companies to fulfil their communication needs. This challenges those companies that seek to lock-in their customers to whatever service or product they provide. Another possible area relates to how the choices being made today will shape tomorrow's converged ICT landscape. How will, for example, the regulatory and commercial decisions taken today, shape the services that are available tomorrow, how they are delivered and the benefits that consumers receive from them?

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