



## OPEN ACCESS

EDITED AND REVIEWED BY  
Habib Mostafaei,  
Eindhoven University of Technology,  
Netherlands

\*CORRESPONDENCE  
Pantelis Koutroumpis  
✉ pantelis.koutroumpis@oxfordmartin.ox.ac.uk

RECEIVED 24 October 2023  
ACCEPTED 06 November 2023  
PUBLISHED 23 November 2023

CITATION  
Koutroumpis P, Masselos K and Varoutas D  
(2023) Editorial: Infrastructure sharing in  
broadband networks: impact on  
telecommunications operators and consumers.  
*Front. Comput. Sci.* 5:1327140.  
doi: 10.3389/fcomp.2023.1327140

COPYRIGHT  
© 2023 Koutroumpis, Masselos and Varoutas.  
This is an open-access article distributed under  
the terms of the [Creative Commons Attribution  
License \(CC BY\)](#). The use, distribution or  
reproduction in other forums is permitted,  
provided the original author(s) and the  
copyright owner(s) are credited and that the  
original publication in this journal is cited, in  
accordance with accepted academic practice.  
No use, distribution or reproduction is  
permitted which does not comply with these  
terms.

# Editorial: Infrastructure sharing in broadband networks: impact on telecommunications operators and consumers

Pantelis Koutroumpis<sup>1\*</sup>, Konstantinos Masselos<sup>2,3</sup> and  
Dimitris Varoutas<sup>2,4</sup>

<sup>1</sup>Oxford Martin School, University of Oxford, Oxford, United Kingdom, <sup>2</sup>Hellenic Telecommunications and Post Commission (EETT), Athens, Greece, <sup>3</sup>Department of Informatics and Telecommunications, University of Peloponnese, Tripolis, Greece, <sup>4</sup>Department of Informatics and Telecommunications, University of Athens, Athens, Greece

## KEYWORDS

mobile sharing, digital economy, network sharing, communications networks, infrastructure

## Editorial on the Research Topic

[Infrastructure sharing in broadband networks: impact on telecommunications operators and consumers](#)

Communication networks have evolved significantly over the past decades. Through a range of technological improvements, market interventions and a plethora of services for their subscribers, fixed and mobile networks have changed the ways we live, work and communicate with each other. The current landscape in communication networks poses some new challenges as demand for access is largely saturated across several markets in terms of adoption and the need to improve the infrastructure (including 5G) to support the other technologies than build on it remains strong.

The economic intuition for Network Sharing Agreements (NSAs) rests on the idea that investment in network deduplication can reduce downstream prices and increase investments if these effects pass-through to consumers, leaving product market competition intact, in contrast to a fully-fledged vertical merger. This idea dates back to the economic literature documenting the positive effects of coordinated R&D efforts (d'Aspremont and Jacquemin, 1988) where firms participating in these agreements decide investments to maximize joint profits, but they behave non-cooperatively when setting prices.

Taking these considerations in the mobile telecommunications sector, Motta and Tarantino (2021) find that under standard assumptions the first order conditions that maximize profits for mobile operators imply that the network sharing scenario will (weakly) dominate the benchmark case of no sharing in terms of consumer welfare, which is in turn a function of prices and investment. The intuition behind this result comes from the fact that the network sharing deal is assumed not to distort price choices while at the same time allowing its members to benefit from cost savings in the investment function. In a separate theoretical contribution, Foros et al. (2023) follow a similar approach to Motta and Tarantino (2021) but focus on two important parameters: customer “loyalty” as a measure of price elasticity of demand for existing subscribers and synchronization of investment decisions. They find that in a setting of “semi-collusion” (when firms jointly decide on investment levels and degree of network sharing), “investment increases when networks are

shared and firms optimally prefer to fully share their networks.” Instead, when firms make separate decisions and maximize individual profit functions, quality is a decreasing function of network sharing. This result originates from the tendency of providers to free-ride on each other’s investments when these investments are shared. Additionally, they show that when subscriber “loyalty” dwindles, it may be preferable for both consumers and economic welfare to ban any cooperation, i.e., network sharing should be prohibited altogether.

In two separate empirical papers [Oughton et al. \(2022\)](#) and [Koutroumpis et al. \(2023\)](#) find convincing evidence that NSAs benefit consumers and producers, but these agreements need to account for the technological and market specificities of each region as it can significantly affect its outcomes. For example in the case of 5G six main models of network sharing have been identified. (1) The joint deployment in white areas supported by public funding (UK, Germany), (2) the joint development in low density areas (France, Italy, Germany, Spain, Finland, Sweden), (3) the national roaming agreement between incumbent and new entrant (China, France, Spain, Denmark), (4) the national joint deployment (China, Italy, Belgium, Sweden, Denmark), (5) small cells/indoor sharing (China, South Korea), and (6) state-owned network (Malaysia).

The variation in the type of agreement aligns with the generally favorable regulatory stance vis-à-vis NSAs around the world but also underpins the scrutiny and additional requirements added by regulators in cases of competitive concerns, like the NSA in the Czech Republic ([European Commission, 2022](#)). In this particular case, executive Vice-President Margherite Vestanger added that the Commission made binding commitments “that will keep the benefits of network sharing whilst removing technical and financial disincentives to unilateral deployments and limiting information exchange, all to the benefit of Czech mobile users.”

Outlining the key messages from the contributions in this Research Topic, we start with [Koratagere Anantha Kumar and Oughton](#) who attempt to tackle the cost effectiveness of infrastructure sharing in 5G networks. They find that a rural 5G neutral host network (NHN) strategy helps reduce the total network cost significantly compared with other sharing strategies achieving higher profits too. They further highlight that 5G upgrade strategies are sensitive to the average revenue per user, the adoption rate, and the amount of existing site infrastructure.

We also host a conceptual paper by [Lehr and Stocker](#) who attempt to expand the concept of network sharing beyond the more traditional top-down NSA approach. The authors argue that new and evolved forms of edge sharing have become a necessity for 5G coverage and that one of the solutions lies with increased and more dynamic options for sharing, including end-user owned network infrastructure, which should be embraced for the future of NSAs. Lehr and Stocker conclude that these novel sharing paradigms must be embraced by appropriate regulatory policies to succeed.

Departing from the everyday uses of mobile networks, [Sümer et al.](#) delve into the importance of sharing agreements among operators in Public Safety Network (PSN) applications which are often the focus of Public protection and disaster relief (PPDR)

agencies. The authors note that these services tend to rely on bandwidth-heavy information such as videos leading many countries to integrate their public safety networks with 4G and 5G networks. Comparing various infrastructure sharing mechanisms across countries the authors highlight the pros and cons of each solution.

Last, [Popovicu](#) argues that measurement issues are always crucial in terms of understanding the quality of broadband services highlighting that data collection efforts are still lagging in terms of the user experience by focusing exclusively on a simple metric, namely the bandwidth availability. Moreover the author introduces composite metrics that capture a broader angle of the quality of service and emphasizes the feasibility of measuring and monitoring these metrics over time.

We hope that our readers will find these works interesting as they help push the research agenda in terms of network sharing agreements further.

## Author’s note

The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the Hellenic Telecommunications and Post Commission (EETT).

## Author contributions

PK: Writing—original draft, Writing—review & editing. KM: Writing—review & editing. DV: Writing—review & editing.

## Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher’s note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

## References

- d'Aspremont, C., and Jacquemin, A. (1988). Cooperative and noncooperative R&D in duopoly with spillovers. *Am. Econ. Rev.* 78, 1133–1137.
- European Commission (2022). *Antitrust: Commission Accepts Commitments from T-Mobile CZ, CETIN and O2 CZ on Czech Network Sharing, Press Release*. Technical report. Brussels: European Commission.
- Foros, Ø., Hansen, B., and Vergé, T. (2023). Co-operative investment by downstream rivals: network sharing in telecom markets. *J. Regul. Econ.* 64, 34–47. doi: 10.1007/s11149-023-09462-1
- Koutroumpis, P., Castells, P., and Bahia, K. (2023). To share or not to share? The impact of mobile network sharing for consumers and operators. *Inf. Econ. Policy* 101061. doi: 10.1016/j.infoecopol.2023.101061
- Motta, M., and Tarantino, E. (2021). The effect of horizontal mergers, when firms compete in prices and investments. *Int. J. Ind. Organ.* 78, 102774. doi: 10.1016/j.ijindorg.2021.102774
- Oughton, E. J., Comini, N., Foster, V., and Hall, J. W. (2022). Policy choices can help keep 4G and 5G universal broadband affordable. *Technol. Forecast. Soc. Change* 176, 121409. doi: 10.1016/j.techfore.2021.121409