

Pápai, Zoltán; Csorba, Gergely; Nagy, Peter; McLean, Aliz

Working Paper

Competition policy issues in mobile network sharing: A European perspective

IEHAS Discussion Papers, No. MT-DP - 2018/28

Provided in Cooperation with:

Institute of Economics, Centre for Economic and Regional Studies, Hungarian Academy of Sciences

Suggested Citation: Pápai, Zoltán; Csorba, Gergely; Nagy, Peter; McLean, Aliz (2018) : Competition policy issues in mobile network sharing: A European perspective, IEHAS Discussion Papers, No. MT-DP - 2018/28, Hungarian Academy of Sciences, Institute of Economics, Budapest

This Version is available at:

<https://hdl.handle.net/10419/222041>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

MŰHELYTANULMÁNYOK

DISCUSSION PAPERS

MT-DP – 2018/28

**Competition policy issues in mobile network
sharing: a European perspective**

ZOLTÁN PÁPAI - GERGELY CSORBA

PÉTER NAGY - ALIZ MCLEAN

Discussion papers
MT-DP – 2018/28

Institute of Economics, Centre for Economic and Regional Studies,
Hungarian Academy of Sciences

KTI/IE Discussion Papers are circulated to promote discussion and provoke
comments.

Any references to discussion papers should clearly state that the paper is preliminary.
Materials published in this series may subject to further publication.

Competition policy issues in mobile network sharing: a European perspective

Authors:

Zoltán Pápai
Infrapont Economic Consulting
email: zoltan.papai@infrapont.hu

Gergely Csorba
senior research fellow
Center of Economics and Regional Sciences – Institute of Economics
Hungarian Academy of Sciences
and Infrapont Economic Consulting
email: csorba.gergely@krtk.mta.hu

Péter Nagy
Infrapont Economic Consulting
email: peter.nagy@infrapont.hu

Aliz McLean
Infrapont Economic Consulting
email: aliz.mclean@infrapont.hu

October 2018

Competition policy issues in mobile network sharing: a European perspective

Zoltán Pápai - Gergely Csorba - Péter Nagy - Aliz McLean

Abstract

Network sharing agreements have become increasingly widespread in mobile telecommunications markets. They carry undeniable advantages to operators and consumers alike, but also the potential for consumer harm. We emphasize that not all NSAs are created equal: the assessment of harms and counterweighing benefits to customers due to an NSA is a complex endeavour. In this paper, we present a framework for the competitive assessment of NSAs, detailing the possible concerns that may arise, the main factors that influence their seriousness, ways to mitigate the concerns and the principles of assessing efficiency benefits.

JEL: K21, L13, L41

Keywords: mobile markets, network sharing, competition, competition assessment

Acknowledgement: the authors would like to thank the participants of the International Telecommunications Society 2018 Conference for their comments.

A mobil hálózatmegosztás versenypolitikai kérdéseiről: európai körkép

Pápai Zoltán, Csorba Gergely, Nagy Péter és McLean Aliz

Összefoglaló

A mobilpiacokon egyre elterjedtebbé válnak a hálózatmegosztási megállapodások. Ezek a megállapodások érdemi előnyökkel járnak a szolgáltatók és a fogyasztók számára, ugyanakkor felvethetnek versenypolitikai aggályokat is. Minden hálózatmegosztás különböző, és ezért az előnyök és hátrányok elemzése és összemérése komplex feladat. Ebben a tanulmányban egy elemzési keretet adunk a hálózatmegosztási megállapodások versenypolitikai értékelésére, sorba vesszük azokat a mérlegelésnél fontos tényezőket, az aggályok kezelésének lehetséges módjait, illetve a hatékonysági előnyök számbavételének alapelveit.

JEL: K21, L13, L41

Tárgyszavak: mobilpiacok, hálózatmegosztás, verseny, versenyelemzés

1. INTRODUCTION

Mobile network sharing is a type of cooperation between mobile network operators to jointly use, maintain, and build some of the network inputs required for their operations. Since the parties are direct competitors, the concern emerges that these agreements could potentially lead to a restriction of competition. However, the European Commission and various national competition authorities have previously regarded such agreements as favourable alternatives to mergers. This was not the case from the very beginning. In the early years of 3G network development, only passive sharing was accepted (and encouraged) between mobile operators, with the notable exception of Sweden.¹ By the time 4G arrived on the market, active network sharing agreements (NSAs) emerged in many EU countries as a way of reducing the costs of building and operating new (as well as older) generation networks, enhancing coverage, and speeding up the rollout of networks.

Nowadays network sharing is a widespread phenomenon, though it still has not become mainstream. Its cost and efficiency advantages are clear, but these agreements are encumbered by the required serious and long-term engagement between parties with potentially divergent strategies and interests. Competition authorities and industry regulators may also scrutinise this kind of cooperation between rivals, as it may restrict competition. A network sharing agreement therefore both carries great potential for efficiencies and may raise competition concerns.

Network sharing can be a viable strategy in closing the gap between high and increasing network building and operating costs and stagnating or only slowly growing revenues. Mobile networks providing voice, data and IoT services have become more complex than ever before. Sharing therefore provides a great potential for cost efficiency but also poses a serious assessment challenge, especially for the coming 5G era.

This paper presents a general framework for the competition policy assessment of active mobile network sharing agreements, building on the approach laid out in guidelines by the European Commission and European regulators, as well as competition cases in European jurisdictions. Chapter 2 provides a general introduction to network sharing: its history, its main types, the motivations behind it, and a brief literature review. We also give an overview of all current network sharing agreements in Europe, and group them according to various dimensions. Chapter 3 defines the relevant markets affected by network sharing and introduces our analytical framework. Chapter 4 details the possible anticompetitive concerns regarding NSAs, while Chapter 5 briefly discusses the efficiencies that they may result in. Chapter 6 concludes.

¹ Mölleryd et al. (2014)

2. NETWORK SHARING AGREEMENTS: AN INTRODUCTION

Network sharing is a means of cooperation to economise on the cost of providing better networks. Although the aim is simple, the implementation can take many forms. The differences between the real-world cases stem mostly from different answers to three basic questions: where, what, and with whom.

- “Where” refers to the geographic dimension of the coverage, which can be the whole country, or a larger or smaller part of it.
- “What” is more complex, because it refers to the depth of the agreement: the network elements, the technology and sometimes the spectrum involved in the network sharing. It may involve the passive infrastructure (sites or masts), the radio access network (RAN) or, theoretically at least, some part of the core network. It may concern one of the currently active generations of mobile technology like 2G, 3G, or 4G, or any combination of these. And the agreements can cover specific bands of spectrum, or the entirety of the operators’ spectrum endowments.
- The third question, “with whom” to share with, is also key, as not all players provide a good “fit”: motives, inclinations and incentives can vary significantly.

2.1 THE DEVELOPMENT OF NETWORK SHARING

In order to understand the differences between and the motives behind existing agreements, it is useful to look at the short history of network sharing.

The sharing of sites and masts (the passive network) was present on mobile markets from the very beginning, i.e. from the 2G era. It was either commercially motivated or induced by regulations. It occurred mostly on a site-by-site basis, at high-cost and/or low-traffic sites where it was uneconomical or impossible to duplicate the passive infrastructure. These agreements had more of a supplementary nature, and, but helped provide larger and more consistent coverage in a cost-efficient way and did not really raise competition concerns.²

Another early type of network sharing was national roaming: one operator would provide mobile services to the other operator’s customers under a wholesale agreement. The roaming provider shared its resources between its own customers and the other’s. The relationship was generally asymmetric: the network did not become common, and the buyer had no control over the parameters of the service. National roaming was also partly commercial motivated, but also often encouraged or even mandated by regulators; it was used in many

² See for example cases investigated by the European Commission: COMP/38.370 O2 UK Limited/T-Mobile UK Limited and COMP/38.369 T-Mobile Deutschland/O2 Germany. These agreements also concerned national roaming, discussed in the next paragraph.

countries to support new entrants by providing them with network services (2G, 3G) till they rolled out their own network.

When operators paid huge amounts for 3G spectrum licenses and were obliged to provide the fast deployment and high coverage detailed in the license terms, sharing the deployment and operational costs with another network operator suddenly seemed very attractive. In the first half of the 2000s, 3G appeared to be an expensive, risky investment: there were neither adequate devices for consumers, nor any lucrative new services to offer them, and the technology was still premature. Moreover, providing coverage on the 2100 MHz spectrum required more base stations than the 2G did on the 900 or even the 1800 MHz band. At the same time, active network sharing was explicitly or implicitly proscribed in the license terms in most European countries. Where it was not explicitly banned, however, economic necessity and the shared interests of the MNOs triggered the first active network sharing agreements, a deeper form of cooperation than what had occurred before.

This so-called active radio network (RAN) sharing first appeared in Sweden, approved by the regulator in 2002,³ and became ever more widely used. It was evident by the end of the first decade of the 21st century that rural coverage was too costly to provide and faster network deployment and especially close to 100% coverage could be better and more efficiently provided by using a common active network, and not just common sites, at least in the highest costing areas.

2.2 WAYS OF NETWORK SHARING

While passive network sharing involved the common use of sites and masts, active network sharing implies that in addition, the radio access network is also shared in some way, resulting in the RAN being operated as a common element of the operators' networks. In this case the parties share all the access network elements to the point of connection with the core network. At this point, each operator sends the traffic from its respective customers onto its own core for processing by its own core network elements and infrastructure.⁴ RAN sharing usually and rationally implies the sharing of backhaul and transport to the interconnection point of operators' separate core networks. In addition to the above, spectrum or even some core network activities can be shared between the parties. These different options of active network sharing imply different depths of technical and business cooperation.

³ See Mölleryd et al. (2014). The incumbent failed to secure any 3G spectrum itself, and this placed pressure on the regulator to approve RAN sharing.

⁴ See GSMA (2012a).

It is important to note that although active sharing implies the common use and operation of the radio equipment, as a default it does not involve spectrum sharing. Based on this distinction, we differentiate between three distinct types of active sharing.⁵

- MORAN (Multi-Operator Radio Access Network) is the case where each operator uses its own spectrum with a common RAN.
- MOCN (Multi-Operator Core Network) denotes the case when beside the RAN a specific spectrum band is shared and used together. Even in this latter case the core network is still separate.
- RAN sharing and partial sharing of the core.⁶

The core network, which is the very essence of service provision and differentiation, consists of the core transmission ring, and the core functionalities providing user authentication, switching, logical service assignments, billing, etc. to all of the operator's own retail or wholesale customers.⁷ Sharing resources induces similarity in these features of the operators' services. While MORAN does not affect service parameters except for those related to coverage, in the MOCN case the two operators' customers are served by the common radio carrier, so their experience concerning the radio quality parameters is more similar. But even with the partial sharing of the core, service differentiation still remains mostly under the control of the respective operators.⁸ As far as practical relevance is concerned, the NSAs in Europe are predominantly MORAN. To our knowledge, no sharing deeper than MOCN has emerged so far, so our analysis will deal only with MORAN and MOCN agreements.

2.3 MOTIVATIONS BEHIND NETWORK SHARING

We have already briefly touched on the subject of why network sharing makes business sense. While the motives and incentives are manifold, some typical scenarios can be identified.⁹ We list four of these here.

1. *The fast and efficient roll-out of a new network and its cost-efficient operation*

This was the main motive of cooperation in the shared deployment of new 3G, and later 4G networks, and will most probably arise in 5G networks as well. Building a new network together facilitates deployment and may result in somewhat better (in terms of signal quality) and larger coverage; both capital and operating cost savings may be significant. Such an NSA is easier to implement for the parties in cases where their position is to some extent symmetric, and the gains from cost savings are

⁵ The categorisation is based on the standards laid down by 3GPP. See BIPT (2012) for a good discussion.

⁶ This is technically feasible using the GWCN (Gateway Core Network) sharing architecture.

⁷ See GSMA (2012a).

⁸ We discuss the issue of differentiation in detail in Chapter 4.1.1.

⁹ See GSMA (2012a), Mölleryd et al (2014), OECD (2014), Neumann and Plückebaum (2017).

similar. Some examples of such agreements are those between all four mobile operators in France (and especially between SFR and Bouygues), between Telenor and Hutchison in Sweden, and between T-Mobile and Hutchison in the UK.

2. Gaining access to spectrum

Another motivation behind an NSA is where one party does not have the spectrum it desperately needs to remain competitive. The other party has enough spectrum but may be seeking to save on costs through the shared deployment and operation of a network. Such deals are usually reached between asymmetric parties, and as such, they are less widespread and not necessarily stable. However, the first 3G network sharing in Sweden fits into this category, where the incumbent Telia did not win any 3G spectrum, but had the resources to build the new network, while Tele2 was presumably happy to share in the financial risk and the cost of the new network. Another example is the later prohibited agreement between Yoigo and Telefónica in Spain.

3. Reducing the operating costs of old networks

Already built old (2G, and later 3G) networks can be more efficiently operated as a common network. If two players cooperate in rolling-out a new network (earlier 3G, then 4G), it is only logical to consider the joint operation of the old ones. An additional gain from the cooperation is that coverage and other qualities of old networks can be improved on the margin, with a much lower burden on the individual parties than in the standalone case. Agreements between Telia and Telenor in Denmark, Orange and T-Mobile in Poland, and O2 and T-Mobile in the Czech Republic are examples of this rationale.

4. Fulfilling license commitments

Network sharing agreements are sometimes established in order to cover the high cost of reaching sparsely populated and/or remote areas, whose coverage formed part of parties' license commitments. These agreements cover only rural areas, such as the Vodafone/Orange NSA in Spain, the Vodafone/Wind Hellas cooperation in Greece, or the agreement between Teliasonera and DNA in Finland.

2.4 NSAS IN EUROPE

Looking at the European countries where mobile network sharing agreements are in place at the time of writing (mid-2018), we find that these agreements differ widely with respect to their geographic coverage, the spectrum and technologies involved, the depth of the network activities shared and also the economic organisational forms of the sharing. As each dimension can affect the possible competition concerns we discuss them all briefly. Figure 2.1

presents a non-exhaustive typology of currently functioning mobile network sharing agreements.

Figure 1

NSAs in the European Union

Geographic Scope			
	How many RAN technology generations are involved?		
	1	2	3
Whole country	SE 2002 3G 4 1+2 * RO 2016 4G 4 1+3	UK 2007 4G/3G 5 4+5 SE 2011 4G/2G 4 2+3 * CY 2016 4G/3G 3 2+3	PL 2011 4G/3G/2G 4 1+3 * DK 2012 4G/3G/2G 4 2+3 * UK 2012 4G/3G/2G 4 2+3 IT 2017 4G/3G/2G 4 1+4
Large part of the country, except some densely populated areas	SE 2002 3G 4 3+4 HU 2015 4G (800) 3 1+2 *		CZ 2011 4G/3G/2G 3 1+2
Only rural	FR 2015 3G 4 1+2+3+4	ES 2009 3G/2G 4 2+3 GR 2013 3G/2G 3 2+3	FR 2014 4G/3G/2G 4 2+3 FI 2014 4G/3G/2G 3 2+3 *

key: **Country** #Start date #Technology generation | #No of MNOs | #Rank of the parties |*MOCN or both

The vertical dimension of the figure refers to the geographic scope and the horizontal to the number of technologies involved. Further information is provided about each agreement in the boxes, to provide insight into other factors, such as the year the sharing began, the generations of mobile technology involved, the number of commercially active, independent mobile operators on the market, and the rank of the NSA participants by size.¹⁰

The figure shows that many agreements cover all three currently active generations of network technology, or at least two of them. As far as geographic coverage is concerned, a majority of agreements cover the whole country. With one exception (France), agreements were reached between two parties. Most of the existing agreements are MORAN, a few MOCN or MORAN for some bands and MOCN for others. Overall, it seems network sharing is not a “one size fits all” type of cooperation.

2.5 LITERATURE REVIEW

Network sharing is widely discussed in industry forums as a viable form of consolidation besides mergers, see for example Mölleryd et al (2014) and Neumann and Plückebaum

¹⁰ Rankings are usually based on the number of subscribers on the retail market, as these are more easily and widely available than the alternative metric, annual mobile revenue.

(2017) for nice summaries. Surprisingly, however, there are very few academic articles explicitly exploring the incentives and competitive impact of network sharing.

The only theoretical article we know of is Motta and Tarantino (2017), where the starting point is the detailed theoretical modelling of horizontal mergers in environments where the operators compete both in price and investment. Their main finding is that without substantial efficiency gains, these mergers will reduce aggregate investment and harm consumers, if one compares the merger to the benchmark of no merger happening. Then they study network sharing as an alternative to a full-scale merger, where they model the NSA like the classical models of R&D cooperation: firms first decide on investments to maximise joint profit but then individually set their prices. With this comparison, they show that these types of NSAs perform better from a consumer welfare point of view than mergers.

We are aware of one article that aimed to quantitatively evaluate the economic effects of network sharing. Song et al (2012) provide estimates on cost savings and price developments for various network sharing alternatives in South Korea, and calculate changes in consumer and producer surpluses under some simplifying assumptions. However, they concentrate only on the changes in the resulting welfare measures without explicitly studying the changes in incentives and the impact on competition.

In the last decade, several regulatory authorities have also published summaries or guidelines on network sharing. The Body of European Regulators for Electronic Communications (BEREC) discussed network sharing in two documents. The first one, published together with Radio Spectrum Policy Group (RSPG) in 2011 summarises the answers European national regulatory authorities (NRAs) gave concerning some important issues such as of the scope and scale and cost reduction potential of the sharing agreements, their innovative forms, competition issues and governance models.¹¹ The document also presents a non-exhaustive list of points might be considered when assessing the potential distortion or restriction of competition due to a sharing agreement.

After 7 years, in 2018 BEREC consulted again with the NRAs and published a report on infrastructure sharing, in which it describes the various existing sharing models by classifying them according to how deeply the network is shared (passive and/or active infrastructure and spectrum).¹² It briefly discusses the legal framework and the regulations in place relating to agreements on infrastructure sharing, their geographic scope, time frame, the included technologies (2G, 3G, 4G), the type of the agreement (such as joint ventures or leases), its commercial and regulatory drivers, and also their benefits and potential challenges. The report also provides information on the formal or informal assessment of some cases.

¹¹ BEREC (2011).

¹² BEREC (2018).

A report by the OECD (2014) examines many advantages and disadvantages to network sharing both from the operators' and the consumers' perspective. The report makes use of competition policy categorisations of potential competition concerns such as unilateral effects, potential coordination and information sharing.

Among the national regulators' publications, the Belgian regulator's and two French authorities' guidelines provide useful summaries and information.

The document on network sharing published by the Belgian regulator in 2012 discusses the main concepts, the types of sharing architectures and the pros and cons of sharing, and provides a guideline to infrastructure sharing for MNOs.¹³ One of the main messages found therein is that a sharing which gives an operator independence in controlling all important elements of the service provision is acceptable from a competition point of view. Therefore, a MORAN-type agreement where the operator can fully control the radio access network is preferred to an MOCN.

L'Autorité de la Concurrence, the French competition authority published an opinion in 2013 on network sharing and internal roaming.¹⁴ According to the authority's opinion, sharing is more beneficial in sparsely populated high-cost areas, but even in these places it has to be justified because of its potential to diminish competition. In the most densely populated areas, the potential restrictive effects of RAN sharing may be too large because of the need for more information exchange between the partners, while the cost savings are lower. In these areas, an efficiency justification is needed, and maintaining the ability to differentiate is especially important.

ARCEP, the French telecommunications and postal regulator published its guideline on network sharing in 2016, and also took a fairly tough stance on the matter.¹⁵ The document discusses the pros and cons of the geographic dimensions of network sharing. It concludes that network sharing is welfare enhancing and beneficial in sparsely populated and high-cost areas, potentially harmful to investment and innovation in densely populated areas, and somewhere in between otherwise. According to the guideline, passive infrastructure sharing should be encouraged throughout entire territories; active sharing may be relevant in certain areas, provided that the negative impact on regulatory objectives can be offset by the positive impact, particularly sufficient benefits to users; and the pooling of frequencies (i.e. MOCN) should be limited to sparsely populated areas.¹⁶

¹³ BIPT (2012).

¹⁴ L'Autorité de la Concurrence (2013).

¹⁵ ARCEP (2016).

¹⁶ ARCEP (2016)

While these policy documents are informative, they only discuss competition issues very generally, and do not focus on providing guidance on the competition assessment of the theories of harm in real-life cases, which we develop in this paper.

3. AFFECTED MARKETS AND OUR ANALYTICAL FRAMEWORK

In any competition policy assessment, it is one of the first steps to define the relevant markets that might be affected by the business conduct in question. In this chapter, we outline the main questions to consider when forming the conceptual framework to analyse NSAs.

The principal question of the competitive assessment is how the different aspects of the agreement will impact competition from the perspective of the MNOs' final customers, that is, at the retail level of mobile telecommunication services.

3.1 THE PRODUCT AND GEOGRAPHIC MARKET DIMENSIONS OF MOBILE TELECOMMUNICATION SERVICES

First, we need to consider the boundaries of the relevant markets. To our knowledge, all previous competition policy and regulatory analyses in mobile telecommunications markets have considered the geographical scope of the markets to be national, and this was not contested by any interested parties. We agree with this assessment and shall not discuss the geographic dimension any further. The product market dimension of retail mobile telecommunication services is more ambiguous. The most important question is whether certain segments of the mobile telecommunication services form distinct relevant product markets or not. These questions have been raised during the assessment of several recent merger cases, but a final conclusion was always that the relevant market was the retail market for mobile telecommunications services.¹⁷

An obvious separation exists between mobile voice and data (also called mobile internet). However, there may be a need for further differentiation, based on the services typically offered to different customer groups. These are the following:

1. Voice service: standalone mobile voice service (including, of course, text messages) for customers (typically non-smartphone users) who require this service only.
2. Large-screen (LS) service: standalone mobile data service for customers (typically laptop and tablet users) who require this service only.

¹⁷ See M.5650 – T-Mobile/Orange; M.6497 – Hutchison 3G Austria/Orange Austria; M.6992 – Hutchison 3G UK/Telefónica Ireland; M.7018 – Telefónica Deutschland/E-Plus; M.7499 – Altice/PT Portugal; M.7612 – Hutchison 3G UK/Telefónica UK; M.7637 – Liberty Global/BASE Belgium; M.7758 – Hutchison 3G Italy/Wind/JV; M.7978 – Vodafone/Liberty Global/Dutch JV; M.8131 – Tele2 Sverige/TDC Sverige.

3. Small-screen (SS) service: mobile voice and mobile data service offered in a package to smartphone users.
4. Machine to machine (M2M) service: data communication between machines. This mostly narrowband communication can take place in the form of SMS or mobile data services.

For both the voice and data segment (separately or taken together), there is a possible sub-segmentation in services offered to residential or business customers and/or for the prepaid or postpaid customers. Furthermore, data services can be also sub-segmented based on their speed.

It is important that the technological scope of the NSA can also influence the market definition process. For example, if an active NSA covers only the spectrum and corresponding RAN used mostly for data services, then the market that needs to be assessed might be restricted to mobile data services, at least as a starting point. At the other extreme, if the NSA concerns full grid consolidation, then all product segments need to be considered (separately or together).

Finally, there is the question of whether there is viable competitive pressure from fixed telecommunication services towards mobile telecommunication services, that is, whether the relevant market should be defined more broadly. Although in some segments (especially in data services) it is technically possible for fixed services to offer an alternative to the respective mobile service, there does not seem to be a serious enough indication for competitive pressure coming from this direction.¹⁸ Therefore, this possibility has not been seriously discussed in previous cases, and we do not expect that to change in the next few years.

The discussion above highlights that quite a few market definition issues may arise in actual cases, posing a significant analytical burden. Fortunately, however, in most cases it is not necessary to arrive at a definite conclusion regarding the boundaries of the relevant markets, as the competitive assessment would likely be similar given any reasonable market definition. This is because most MNOs offer a full range of mobile services, and it is quite rare that one MNO has a much stronger market presence in one segment than in another.

Therefore, in the following discussion we work with the loose definition of a market for mobile services at the retail level, without specifying whether it is sub-segmented into smaller relevant markets.

¹⁸ Furthermore, even if the market were larger, the parties engaged in the NSA would likely still be closer competitors to each other; therefore, the competitive assessment would not change dramatically.

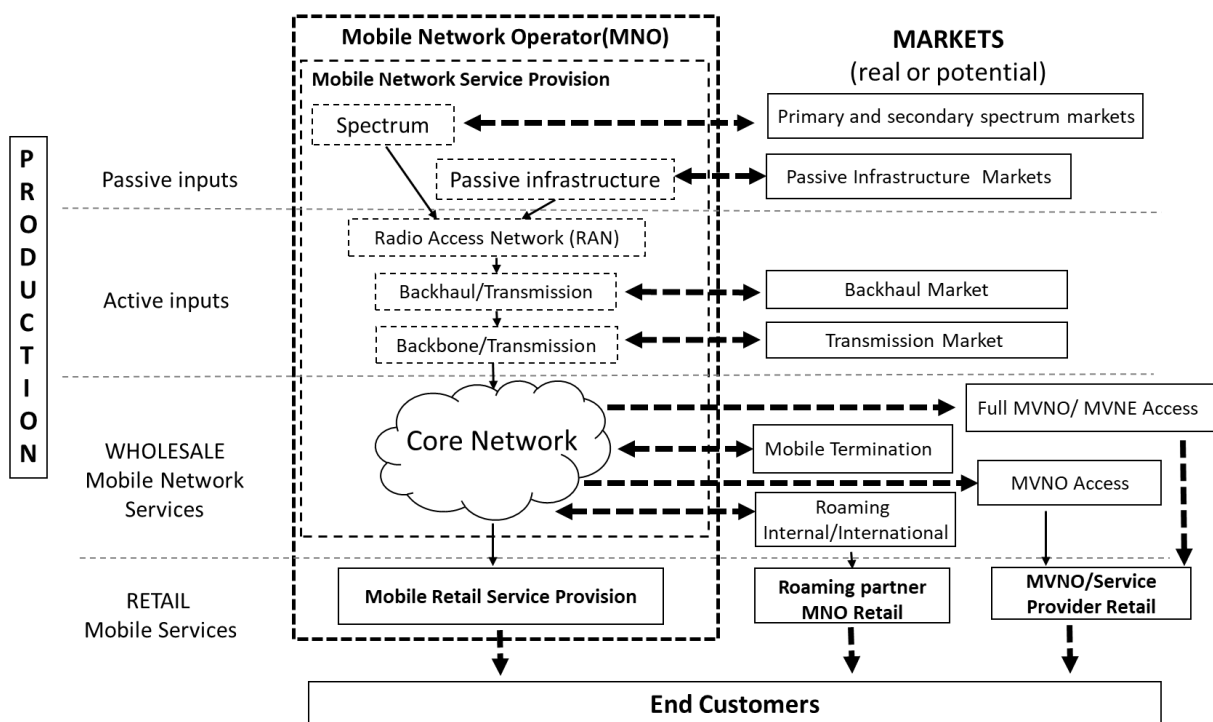
3.2 THE VERTICAL DIMENSIONS OF MOBILE TELECOMMUNICATION MARKETS

NSAs may concern many different elements of the mobile infrastructure and the relationship of the various infrastructures and markets is much more complex than in typical competition policy cases. It is therefore important to put together an analytical framework for the illustration of how network elements and services and markets build upon each other.

The following figure presents the relevant vertical levels and their connections in a general manner. The black arrows show connections within the company that can be interpreted as internal services. The dashed arrows show transactions with external operators; these connections mark the affected markets that are analysed later in our study.

Figure 2

Mobile telecommunication markets



We divide the vertical chain of mobile telecommunication services into three (not entirely distinct) levels. A classical integrated Mobile Network Operator (MNO) is active at all three levels.

1. ("Production level") The production of wholesale mobile services using various network inputs, equipment and services.
2. ("Wholesale level") The sale of the wholesale mobile services produced by the MNO to Mobile Service Providers (MSPs). These MSPs can be other integrated

MNOs (for example in the case of roaming services) or Virtual Mobile Network Operators (MVNOs).

3. ("Retail level") The provision of retail mobile services, where the Mobile Retail Service Provider develops the retail service packages by potentially adding quality features to the wholesale mobile service purchased from the MNO, then sells to the final customers and takes care of marketing, billing and customer relations.

As it can be seen on the graph, the "Production level" and the "Wholesale level" overlap to some extent: the core network may form part of either or rather both, as we discuss below. We can further divide the production level of mobile services into several levels, corresponding to different network elements (inputs). In this case, also, the boundaries between these elements are not always straightforward, but they are usually mentioned separately. Additionally, there is not always a strict one-way vertical relationship between the levels, but as we go down the "production line" dictated by technological sequencing, additional complementary network inputs and services are used. In the case of an integrated MNO, these complementary inputs / services typically arrive from within the firm, but at some levels the inputs can be procured from external sources and also provided to other network operators. These latter transactions will define additional markets we might look at in our competitive assessment.

1. Passive radio infrastructure network: these are sites, towers and antenna support structures on the roofs of buildings, including their maintenance and operation. In addition to the service provided within the integrated MNO, external transactions also take place at this level. According to current market practice, mobile operators frequently give each other access to their own passive infrastructure; in several countries existing regulations even require them to do so under certain conditions.
2. Radio spectrum: this input, or more correctly its usage rights are typically acquired by the MNO at spectrum awarding procedures. However, in Europe and in several other regulatory environments it has also become possible to trade spectrum between MNOs on the secondary market.
3. Radio access network (RAN): providing the radio access service requires various network elements (antennae, radio and other instruments) for the productive use of the previous two inputs (passive infrastructure and spectrum). This is the level where the so-called active network begins. In most countries, RAN services are typically supplied only internally, so there is no connecting market.
4. Transmission network: this provides the connection between various elements of the active network. There is a usual separation between two depths of transmission

(backhaul and backbone), although the boundaries between the two are not unambiguous.

5. **Core network:** this is the intelligent part of the mobile network where the production of the (wholesale) mobile service is completed by using the above inputs, and where the differentiating features of the service are added to satisfy the needs of the various retail entities (the integrated MNO's own Mobile Retail Service Provider, MVNOs, or the MRSP of another integrated MNO) that are in direct connection with the end consumers by producing mobile services for users.¹⁹ If we consider the core network provider as a separate entity, we get the central actor of the wholesale level. Note that in some countries there exists a type of MVNO (the so-called full MVNO) that has its own core network as well as connecting to the MNO's core.

3.3 SCOPE AND IMPACT OF NSAS IN THIS FRAMEWORK

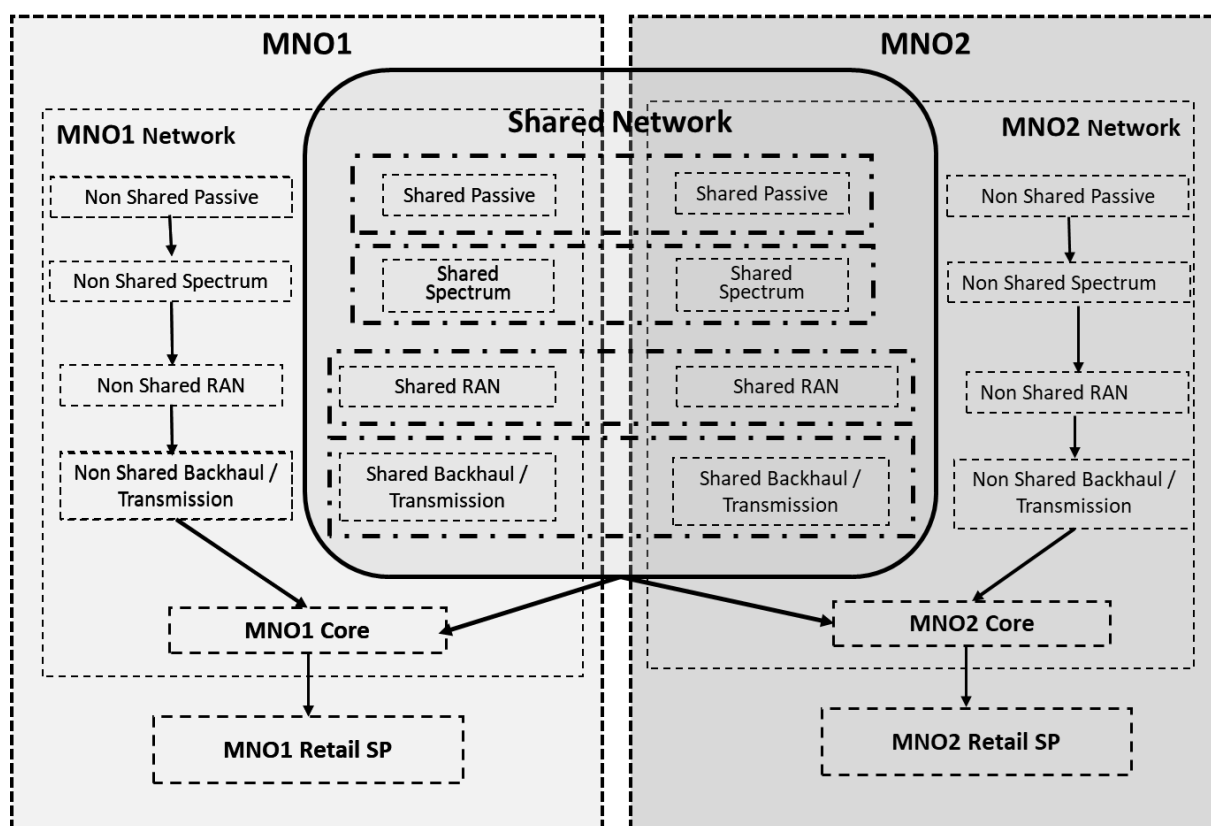
In this section, we provide an example of how the above framework can be used to illustrate an NSA and the depth of cooperation between the MNOs. The figure below shows an example of partial MOCN active sharing: the parties share parts of their passive infrastructure, their spectrum (e.g. the spectrum for the 4G network), and the corresponding RAN and transmission, but not their core. A similar graph can be drawn for cases where spectrum is not shared (like in case of MORAN), or when the sharing extends to all technologies and all spectra (full network consolidation). The sharing could either be partial in its geographical scope, e.g. pertaining only to rural areas, or national, covering the whole country, or somewhere in between.

In all forms of NSAs, it is important to note that the cooperation does not cover the mobile services offered at the retail or at the wholesale level; they only concern some aspects of the "production" of the mobile service. Therefore, we think it best to characterise NSAs as production agreements and provide their competitive assessment along these lines.

The second important feature worth remembering is that even the widest NSA (full network consolidation) does not result in full-scale cooperation at the production level. The core network of the production phase remains independent. This feature is crucial to consider, as the core network is the intelligent part of the production process, where the majority of the differentiation of services offered to consumers takes place.

¹⁹ The provision of interconnection services (IC) that establish connection with other networks also belongs to the provider of the core network.

An example of network sharing



4. POSSIBLE ANTICOMPETITIVE CONCERNS REGARDING NSAS

In this chapter, we discuss the potential competition policy concerns (so-called theories of harm) that may arise in connection to network sharing agreements and give a short summary of the arguments for and against them.

Since an NSA is an agreement between direct competitors, the natural starting point of any competition policy assessment is the framework established for horizontal agreements. The Horizontal Guidelines issued by the European Commission in 2010 presents the legal and economic arguments to be considered; we follow its structure.²⁰ The assessment consists of two successive steps:²¹

1. First, one must assess whether the agreement may have any restrictive effects and thus breach Article 101(1) of the European Treaty. The burden of proof for establishing negative effects lies with the competition authority. This is the step we discuss in this chapter.

²⁰ European Commission (2011).

²¹ European Commission (2011), paragraph 20.

2. Secondly, if competitive concerns are substantiated in the first step, then the assessment of the efficiency benefits of the agreement becomes relevant. Should these positive effects outweigh the negative effects, then the agreement may be exempt (Article 101(3)). The burden of proof connected to efficiency benefits lies with the parties to the agreement. We will discuss this part in the Chapter 5.

We make a few general observations regarding the process of evaluation:

- All concerns are assessed separately in all affected product and geographic markets. The methods used are very similar in each case, but the results could differ; it is therefore possible that a concern is substantiated only in one type of geographical area, or a specific segment of the product market.
- The market power of the parties to the NSA can substantially affect whether a concern arises, and thus their market power should be analysed thoroughly – above and beyond simply checking parties' market shares. Further, market power may differ at various vertical levels and must be evaluated at the level appropriate to the specific competition concern.
- Since all national mobile telecommunications markets feature oligopolistic structures with few (practically 3 or 4) integrated competitors at the retail level, seemingly small differences can be important in the assessment.
- A key expression in the case of all concerns is change: markets may be more or less competitive at the outset, but the assessment must concentrate on what the NSA itself directly changes, compared to the appropriate counterfactual: the expected (future) situation on the market without the NSA.

As the focus of an NSA is the sharing of production assets, it can be characterised as a production agreement. Chapter 4 of the Horizontal Guidelines deals specifically with these types of agreements, so we discuss the potential concerns raised therein. The theories of harm can be grouped into three main categories:

1. The agreement could decrease each involved party's individual incentive to compete, and therefore could result in a loss of rivalry between the parties.²² Following the classical terminology used in merger cases, we refer to these concerns as *unilateral (or non-coordinated) horizontal effects*.

Note that just because both parties' behaviour can change because of the agreement (and likely in the same direction), as long as the effect in question follows from changed individual incentives and not from any (tacit) collusion, it is a non-coordinated effect.

²² European Commission (2011), paragraph 157.

2. The agreement could lead to a qualitative change on the market such that tacit collusion becomes easier, more stable or more effective on the market.²³ Again, following merger terminology, we refer to these concerns as *coordinative horizontal effects*.

In our view, the Horizontal Guidelines uses slightly misleading language concerning the scope of collusion, as it usually refers only to collusion between the parties to the agreement. However, in other competition policy guidelines, especially concerning mergers where the theory of collusion is more firmly established, collusion is always discussed as taking place between all major market players in the relevant market.²⁴ The economic theory of Industrial Organization providing the conceptual framework of coordinated effects also deals predominantly with models of full collusion, as one major player not involved in the collusion would seriously jeopardise its effectivity.²⁵

Therefore, we think that the correct assessment of the coordinated effects of an NSA should analyse its impact on tacit collusion between all major operators, not just between the parties to the NSA.

3. The agreement could change the ability and / or the incentive of any party involved in the NSA to make access to an element of its mobile network infrastructure or service impossible or more expensive for competitors, which could indirectly have a harmful effect on the retail market.²⁶ These exclusionary concerns will be referred to as *vertical effects*.

These vertical effects could arise due to the changed individual incentives of the parties regarding access.²⁷

Table 1 shows a list of competition concerns that we will discuss one by one in the rest of this chapter, including one type that cannot be easily fit into the classic framework: the unfair competitive advantage.

The crucial question to evaluate for each theory of harm is how competition and consumers will be impacted at the lowest vertical level where the parties are still active, that is, on the retail market for mobile services.

²³ European Commission (2011), paragraph 158.

²⁴ See European Commission (2004, 2008).

²⁵ See Motta (2004), especially Chapter 4.

²⁶ European Commission (2011), paragraph 159.

²⁷ To our knowledge, there is neither a theoretical model nor a real competition policy case in which an agreement made collusion on jointly refusing access possible or more effective, so we do not deal with potential coordinated vertical effects; we therefore simply omit the unilateral label here.

List of competition concerns

Horizontal unilateral effects	<i>Decrease in incentives to compete due to the decreased differentiation of services between parties</i>
	<i>Decrease in incentives to compete due to fixed costs becoming variable</i>
Horizontal coordinative effects	<i>Increased commonality of costs</i>
	<i>Information exchange</i>
Vertical effects	<i>Access to MNOs to passive infrastructure</i>
	<i>Wholesale access to MVNOs to the operators' network</i>
Unfair competitive advantage	<i>Potential exclusion of operators not party to the NSA</i>
	<i>Excessive concentration of spectrum</i>

4.1 UNILATERAL HORIZONTAL EFFECTS

4.1.1 *The decrease in differentiation*

One of the first potential concerns that can occur to competition authorities and/or regulators is that due to the NSA, certain aspects of the operators' services will become more similar to each other, their technical autonomy will decrease and the possibility (and/or incentive) to differentiate will also decrease.²⁸ The loss of differentiation might imply a loss of competition.

This statement in itself is too general, and we need to specify what aspects of the services could be affected, and to what degree. Operators' services differ from each other in many ways; here is a tentative list: price, marketing strategies, range of services, data allowance, speed, quality, coverage. Some of these differences are related to the radio network, like coverage, some are dependent on the quality and quantity of spectrum used, and others are the result of the capabilities of and the settings in the core.

²⁸ See L'Autorité de la Concurrence (2013) as an example of this concern being raised.

We emphasise four general points that need to be considered when evaluating the potential change in differentiation:

1. All active network sharing proposals we have seen so far (be they of the MORAN or MOCN type) involve the RAN (and the corresponding backhaul and transmission) only and leave the core network unaffected and therefore independent. This is important as the main differentiation of mobile services happens in the core network.
2. It is worth distinguishing between technical and commercial differentiation. Technical differentiation consists of setting and managing service parameters, service access and usage rights, authentication, and network resource allocation to the individual customers. Technical differentiation occurs mostly in the core, and many aspects of it are not visible to customers. Commercial differentiation is often – but not always – based on technical differentiation. However, many of the most important aspects of product differentiation are non-technical: they involve pricing, creating appealing bundles of products, and other elements of marketing strategies. An NSA does not change the possibility and/or incentive of the operators to differentiate from a commercial perspective, nor a core-related technical perspective. Non-core technical differentiation is the only area where the NSA may have an impact.
3. RAN sharing typically affects coverage and other technical quality parameters attached to it in a positive way. A difference in coverage, for example, means a difference in the availability and quality of signals at different locations. However, there is a maximum level of coverage for a given technical threshold of quality, above which no differentiation can exist in this parameter. The closer an operator is to this maximum the better for its customers: improving coverage increases the value of the service to all of them. An NSA will result in greater similarity in coverage between the participating operators, but at a higher level than in the standalone scenario. Therefore, coverage is an important differentiator only if there is a shortage of it, not when it is abundant.²⁹ This argument can be made for other technical parameters, too, like capacity, although not identically: as opposed to coverage, capacity is less dependent on the NSA.³⁰
4. Some competition authorities have investigated the possibility that RAN sharing also constrains the operators in their choice of technology, capacity enhancement and the

²⁹ Even under an NSA, the options and incentives to differentiate in coverage and capacity remain, especially to business customers with special coverage and capacity needs.

³⁰ For capacity, there is a loss of differentiation as a result of the common antennae technology. But capacity also depends on the type of active sharing and whether spectrum is shared or not. In the case of MORAN each party uses its own spectrum with all the possibilities for differentiation it allows, and even with MOCN, when the similarity is higher, the capacity can be scheduled based on predefined principles in case of congestion, which means that ways to differentiate still remain.

introduction of technical innovations.³¹ This rests on the argument that in an NSA, future investments must be coordinated, and there is less freedom in introducing any innovation unilaterally.

However, in the assessment of this issue the depth of the agreement is a crucial factor. In the case of MORAN, spectrum use, carrier aggregation, and the introduction of new technologies and switching off old ones can all be implemented unilaterally and therefore any loss in differentiation is considerably smaller.

Furthermore, technical innovation itself is not predominantly driven by operators, but by equipment manufacturers, who then sell the more advanced equipment to operators when they next need or wish to replace theirs. Active equipment has a lifespan of a few years, and therefore innovations will be introduced within a relatively short time span irrespective of the NSA. Initially, the NSA may even speed up the adoption of new technologies as operators consolidate their network.³²

In our view, the issue of lost differentiation will always be one of the main topics investigated in connection to NSAs. The burden of proof for substantiating whether there is a substantial decrease in differentiation compared to the counterfactual and that it is large enough to harm consumers is on the authority, and this task it is not at all easy from an analytical point of view.

4.1.2 The decrease in incentives to compete due to fixed costs becoming variable

One of the effects of a network sharing agreement is that some parts of the network costs that individual operators bear become shared costs that need to be split between the operators in a way that they deem fair. The design of the system for sharing these costs may give rise to possible unilateral concerns, if the nature of costs changes.³³ Depending on the specifics of the NSA, costs that were previously fixed may sometimes become variable (i.e. dependent on usage), which could change the pricing incentives of the operators, and therefore their incentives to compete.

When a network is already built and has large enough capacities, network costs are largely fixed,³⁴ therefore the operator's incentive is to attract as many consumers, as much usage as possible, to exploit the economies of scale. However, if the network is shared, these

³¹ See BIPT (2012), L'Autorité de la Concurrence (2013) and the Danish case 4/0120-0402-0057 between Telia/Telenor (decision taken in 2012). The latter can be downloaded: <https://www.kfst.dk/media/13407/20120229-afgoerelse-anmeldelse-af-netdelingssamarbejde-mellem-telia-og-telenor.pdf>

³² If not all operators are involved in the NSA (as is almost all known cases), the competitive pressure coming from alternative operators to modernise the network would ensure that it is done in a timely manner. Keeping equipment beyond its lifespan also generates extra costs in itself.

³³ The increase in cost commonality can also lead to possible coordinative concerns that we will deal with in the assigned section.

³⁴ This is evident for CAPEX, but also true for most of the OPEX.

fixed costs must be split between the operators based on some metric. One intuitive metric is usage: it appears to make sense that an operator pays a larger proportion of the shared network costs if its consumers use it more. However, this sharing rule also means that (at least part of) the network costs become variable. As a consequence, operators are now less incentivised towards increasing usage (and therefore the network cost they have to pay), next to their original, scale-based incentive to increase it. Since attracting consumers is a key parameter of competition, the operators' incentives to compete decrease.

This is a concern with an easy fix from a competition point of view: fixed costs must remain fixed, and shared according to some pre-agreed, non-variable system, instead of becoming usage-based; this way, the incentive to compete is preserved.³⁵

4.2 COORDINATIVE HORIZONTAL EFFECTS

Before going into the two, specific coordinative-type concerns that may arise when evaluating NSAs, we look at how coordinative effects are investigated in general. The central question when analysing coordinative effects is whether the parties and their competitors' ability and incentive to tacitly collude changes due to the agreement (in contrast to their *individual* ability and incentive to compete, as with unilateral effects). The usual argument would be that if parties become more similar to each other in certain key aspects of competition, then this could possibly lead to *tacit cooperation* between all market players to the detriment of consumers – for example, through increasing prices, delaying innovations, decreasing quality, etc.

As a first, but not conclusive step, coordinative effects are usually assessed based on the so-called Airtours criteria, originally developed for mergers, but now also referenced in the case of horizontal agreements.³⁶ For coordination to be sustainable, the following conditions must apply.

1. Ability to coordinate: it must be relatively simple for parties to reach a common understanding of the terms of coordination.
2. Transparency: the coordinating firms must be able to monitor to a sufficient degree whether the terms of coordination are being adhered to.
3. Deterrence: discipline requires that there be some form of credible mechanism for punishment that can be activated if deviation is detected.

³⁵ In practice there may be some cases (typically in an MOCN setting), when parties and their activities are asymmetric, market positions evolve differently, and the fixed cost sharing agreement seems less equitable especially as time advances; but even in such a case, there are many ways to incorporate these changes into the agreement without resorting to a usage-based system (such as using a fair scheduler in congested periods, or paying lump-sum transfers for the larger capacity share).

³⁶ European Commission (2011), paragraphs 66-68. and European Commission (2004b), paragraph 41. The actual Airtours criteria are points 2-4; the first point is often implicitly assumed.

4. No “maverick”: the reactions of outsiders, such as current and future competitors not participating in the coordination, as well as customers, should not be able to jeopardise the results expected from the coordination.

In light of these criteria, it is worth considering whether the retail market for mobile telecommunications is especially prone to coordination in general. For each condition listed above, we list a few general factors to take into account.

1. Ability to coordinate: mobile telecommunication markets are dynamic and fast-changing; and mobile services are highly differentiated products – these properties can heavily undermine the ability to coordinate. On the other hand, mobile markets usually have few, large operators who pay close attention to each other’s actions – these factors increase the ability to coordinate.
2. Transparency: the very wide and varied product portfolios of MNOs make it difficult to determine an operator’s strategy, which goes against transparency. However, there may be a regulator or a similar body on the market that collects and publishes data on the market (albeit usually only in some aggregate form), increasing transparency.
3. Deterrence: product differentiation and a possible lack of transparency makes any punishment mechanism difficult to design and implement, although the possibility cannot be discounted.
4. No “maverick”: on many national markets, certain operators follow a very different market strategy from the others and therefore might be considered a factor destabilising any potential collusion. The best candidates can be recent or aspiring entrants or stronger MVNOs.

Overall, the mobile telecommunications market does not appear especially prone to coordination, but the specifics of both the market in question and the design of the NSA under investigation do matter.

Second, it needs to be assessed whether the NSA itself *changes* the existing situation enough to enable coordination or make it more efficient.

We now look at the two specific coordinative concerns that NSAs may give rise to. These are mentioned as two general mechanisms in the Horizontal Guidelines where coordinated effects might arise, and both of these issues have actually appeared in the assessment of NSAs.

4.2.1 The increase in cost commonality

The Horizontal Guidelines specifically mention this possible concern with production agreements: if parties have market power, the parties’ commonality of costs, that is, the

proportion to variable costs which the parties have in common, may increase to a level which enables them to collude.³⁷

The Horizontal Guidelines refer specifically to variable costs, as opposed to fixed costs, when discussing cost commonality. To put it simply, this is because economic theory shows that fixed costs do not influence pricing. It is important to discuss, however, what fixed and variable costs really mean in this sector. The difference between the two concepts is a question of the relevant time frame: many fixed costs are variable if the horizon is long enough. The majority of network costs that telecommunications operators face would normally be considered fixed; in reality, they are variable in the long run. In a dynamic context, an industry has to recover fixed costs (and a return on them) in order to be sustainable and attract capital for financing the necessary future developments. It is evident that in industries with high fixed and low marginal costs, marginal cost pricing is not realistic. If these short run quasi-fixed costs are also considered, this concern appears more serious.³⁸

The effects of this potential theory of harm must be assessed at the retail level, while the commonality of costs increases only at the network level.³⁹ This means that several costly processes of providing retail mobile services (marketing, sales, billing etc) are unaffected. Examples of costs that may become common include: costs relating to the passive infrastructure behind the parties' networks, costs relating to maintaining the parties' networks, costs relating to spectrum. As only network costs are affected, even full network consolidation would result in less than half of total mobile service production and provision costs becoming common.⁴⁰ Unfortunately, no safe harbour is given: neither the guidelines, nor established case law give any threshold on cost commonality below which this specific coordinative concern cannot be raised.

We should note that some degree of increase in cost commonality is inevitable in all NSAs. The challenge to the parties of the NSA is to minimise it, while maintaining the economic rationale of the agreement. The degree to which cost commonality increases essentially depends on two factors.

1. The scope of the agreement: as an example, spectrum costs do not become common in a MORAN setting, but may become so (to some extent, at least) in an MOCN setting

³⁷ European Commission (2011), paragraphs 176-180.

³⁸ The Danish case 4/0120-0402-0057 between Telia/Telenor took fixed costs into account when calculating common costs.

³⁹ Again, the Horizontal Guidelines (European Commission 2011) specifically prescribe evaluating the retail market, but in the Danish case 4/0120-0402-0057 between Telia/Telenor the competition authority also looked at the upstream level, where shared costs constitute a much greater proportion of overall costs.

⁴⁰ A study prepared by the GSMA on comparing the cost structures of mobile and fixed telecommunications services states that network cost is around 30% of an MNO's total cost. See GSMA (2012b).

or any deeper level of agreement. Similarly, the scope of the NSA with regard to technologies (2G, 3G, 4G) also influences cost commonality.

2. The cost sharing system: as discussed in 4.1.2, parties must decide how to share costs among each other; how much each should pay for shared items. The metric they use to determine this can also be important in this case: if previously (debatably) fixed costs are shared based on usage, they become undeniably variable, and increase variable cost commonality.

Overall, the severity of this concern depends foremost on the scope of the NSA: while the careful design of the parties' cost sharing system may mitigate it if the analysis focuses strictly on variable costs, it is quite possible that fixed costs will also be considered.

4.2.2 Information exchange

An NSA necessitates some degree of information exchange, both during its initial design and also later in its operation and decision-making regarding expansion and further developments. However, there is a potential competitive concern that sharing information between competitors can facilitate a collusive outcome, or make it more stable, especially by increasing market transparency.⁴¹ When evaluating the possible effects of information exchange in a production agreement such as an NSA, one must weigh this concern against the need for information sharing to make the NSA work efficiently.

Overall, the assessment of information exchange agreements is still a developing and much-debated area in competition policy. In the Horizontal Guidelines a "more economic approach" is outlined in general, but these assessment criteria have not yet been applied and discussed in a publicly available decision, so it is very hard to make accurate statements about where the border between procompetitive and anticompetitive information exchange may lie.

A key principle in competition policy is that the amount and scope of information exchange should be kept at the lowest level necessary to the functioning of the agreement. Further, the nature of the information shared matters greatly, and the Horizontal Guidelines lay down a few rules of thumb regarding the assessment. For example, the information exchange has less chance to be considered harmful if the information in question is in more aggregated form, if it refers to older data (and certainly not to the future) and if it is shared more rarely.

There are two areas where information between parties must be exchanged in an NSA. Firstly, the shared network must be planned, developed and then operated. Secondly, the parties must have a system in place to settle accounts with each other; the metrics on which

⁴¹ European Commission (2011), Chapter 2.

these accounts are based must be shared. It is only information exchanges between competitors of individualised data regarding intended future prices or quantities that is considered a restriction of competition by object;⁴² no such data is needed to operate a shared network.

This means that the need for information sharing might be a legitimate concern, but it does not prohibit the existence of NSAs completely. But to handle this issue, the scope of the information exchanged must be minimised, and the type of information shared must be restricted as well as the group of people with access to it (the parties may establish a “clean team”, for example, or form a joint venture to manage, operate and develop the joint network).

4.3 VERTICAL EFFECTS

All vertical effects emerging in connection to NSAs are connected to access. Competitors usually seek access to the relevant upstream *level* in order to be able to provide their downstream services. The question is whether the NSA would have the effect of changing the ability and/or the incentive of any party involved in the NSA to make access to an element of its mobile network infrastructure or services impossible or more expensive for its competitors at the given vertical level (this is called foreclosure or raising rivals’ costs). The levels in question define the concerns discussed; we will look at, in turn, access to passive infrastructure to competitors, and access to active infrastructure or services (like wholesale gateway access to MVNEs or full MVNOs with their own core network, and wholesale access to the core to less than full MVNOs).

Vertical effects should be analysed in the framework of ability, incentive and effect to foreclose, developed originally in the framework for assessing non-horizontal mergers.⁴³ We first list some arguments that need to be considered in general.

1. Ability: in order for the parties to have the ability to foreclose, the upstream service must be an important input to the competitors seeking access, and the parties must have significant market power on the upstream market – implying that competitors have no (economically rational) alternative to dealing with the parties.

In the context of NSAs, even if some decrease in the capacity offered to access seekers by any of the parties could occur as a result, for all services in question, there still remain some bypass opportunities. Moreover, as the variable cost of providing access is negligible, if there are no capacity constraints, they are rightly assumed to be incentivised to do so.

⁴² European Commission (2011), paragraphs 73-74.

⁴³ See European Commission (2008).

2. Incentive: foreclosure or raising rivals' costs entails some loss of profit for the parties to the NSA at the upstream level; the incentive to foreclose exists if this profit loss is more than compensated for in the downstream market, where competition is harmed.

Because of the available alternative opportunities, NSA parties would have a hard time gaining downstream customers via foreclosing strategies, and therefore the profit loss upstream would likely disincentivise them from doing so.

3. Effect: the foreclosure must have a demonstrable and substantive negative effect on final consumers.

Concerning NSAs, the cost of using a particular input on the respective upstream market is usually low compared to the total cost of providing the mobile service to customers on the downstream market. Therefore, in order to trigger a significant downstream price increase, rivals' access costs should increase (not just through the parties' behaviour, but also through alternative means) substantially. One should carefully evaluate, especially in the light of a given regulatory environment, whether such a substantial change of access costs would be likely – usually it would not.

Any of the conditions is hard to satisfy, and even more so cumulatively. In some specific cases, as we discuss below, these concerns may be valid. However, even if a competition authority can really substantiate a vertical theory of harm, usually the parties can easily offer commitments to alleviate these concerns.

4.3.1 Access to passive infrastructure

As NSA parties consolidate their networks, they may leave or demolish facilities (towers, antenna locations and other elements of passive infrastructure) that their competitors also use. The theoretical concern is that this could negatively affect competitors as they must seek, build, raise new facilities; and through a possible (if temporary) adverse effect on coverage, also final consumers. The concern is potentially more relevant if the NSA results in a greater change (reduction) in the number and location of facilities.⁴⁴

On top of the general arguments raised on the ability-incentive-effect triad of foreclosure, some additional elements need to be considered. First, in terms of passive infrastructure still there remain alternative ways to get this type access from players other than the MNOs, as substitute antenna locations could be available from entities not even present on the telecommunications markets (for example high rooftops, electric towers, etc.), which would make the ability to foreclose less likely to prevail. Second, the cost of site rental alone is quite

⁴⁴ For example, if one of the parties shared a very large proportion of its own infrastructure with competitors before the NSA, and after the NSA many of these facilities will be demolished.

small compared to the whole cost of providing downstream service, which makes significant downstream effects unlikely.

This concern was investigated in the Danish case, but was settled by the parties offering commitments, specifically to offer abandoned facilities to competitors to buy or rent; and seeking approval to demolish facilities.⁴⁵ Although these types of remedies may not be necessary, they cannot be especially onerous from the NSA parties' point of view and may even coincide with their business interests.

4.3.2 Access to wholesale mobile services to MVNOs

The classic foreclosure argument is that the NSA may lead to the parties' increasing market power on the relevant upstream level, increasing their ability and incentive to foreclose MVNOs: refuse, limit or overprice their access to wholesale services.⁴⁶

Network access is of course a key input for all types of MVNOs, and the supply of possible providers is limited even without NSAs. This means that these concerns may seem more crucial than access to passive infrastructure. However, only the number of truly independent networks decreases as a result of the NSA, not the number of independent MNO access providers. Therefore, the bargaining position of an MVNO is not necessarily expected to change. This concern may arise more acutely if the parties to the NSA have previously provided access to MVNOs, and their free capacities are projected to decrease significantly under the NSA, compared to the standalone option. However, even if this were the case the concern would be weak at best if the parties had strong, viable competitors with significant free capacities who could cater to MVNOs.

On top of the general arguments on ability, incentive and effect listed before, what is really important to consider is whether the incentives to provide MVNO access will be impacted by the NSA. Usually, in the case of abundant capacity, providing access will still remain a straightforward way for MNOs to economise on their large, quasi-fixed network costs.

4.4 UNFAIR COMPETITIVE ADVANTAGE

Finally, we mention a type of concern that we believe is not a standard one in modern competition policy, based on the potential exclusionary effect of an NSA, either at the retail level or in connection to spectrum allocation.⁴⁷

The issue raised is that the parties to the NSA might gain a non-replicable cost and /or quality advantage, which may create a competitive advantage. According to the concern, the

⁴⁵ See case 4/0120-0402-0057 between Telia/Telenor.

⁴⁶ Other, closely related concerns may be that MVNOs have less choice (fewer distinct networks to choose from), or that there will be less free capacity on the market for MVNOs (as NSA parties optimise their shared network).

⁴⁷ It is mentioned in OECD (2014), p. 68. as well as in BEREC (2018).

decreased relative competitiveness of other operators could lead to the competitors' exit or serious weakening, thereby decreasing competition, and allowing the remaining players to abuse their increased market power.

4.4.1 Potential exclusion of operators not party to the NSA

This theory of harm is often raised by operators who have been “left out” of the planned NSA in question: they posit that their competitiveness on the retail market will suffer due to the NSA. This points to its essential weakness: since a competition authority should protect competition, not competitors, the fact that competitors may not be able to keep up with the NSA parties in some way is not in itself an argument against the NSA, as there is no consumer harm. If a competitor left the market, it may lead to consumer harm; but, as we briefly discuss below, this seems highly unlikely and would be almost impossible to prove.

The concern is similar to that of predatory pricing and shares the same problem of credibility. The potential cost advantage of the parties to the NSA is real, though it might be replicable by others (especially if they could also become part of an alternative NSA). But stating that it results in the elimination or substantial weakening of the competitors and after that, the abuse of market power is extreme. Even significant cost and quality advantages can be offset with differentiation or other strategic moves on the market. The complete elimination scenario is dubious, especially considering the market structure of most mobile telecommunications markets, with few, large, integrated players, but the main effect of this concern, the abuse of market power, is conditional on this elimination actually happening.

Considering the extremely high burden of proof, it is not very likely that a competition authority could substantiate such a concern. We only know of one instance when it was investigated: the Czech telecommunications regulator prepared an assessment of the network sharing on the Czech market and evaluated this concern on the three-player Czech mobile market but concluded that no exclusionary risk could be substantiated.⁴⁸

4.4.2 The excessive concentration of spectrum

A network sharing agreement, in the case of MOCN or any deeper level of agreement, affects the utilisation of spectrum by operators on the market – specifically, the parties to the NSA can use their spectrum more efficiently by sharing it. Depending on the way spectrum is allocated, the parties may pool a significant amount of spectrum, which may lead to a competitive advantage. But this spectrum pooling may appear similar to spectrum concentration and a not especially well-founded concern can be based on this notion.

The argument can be that the amount of available spectrum affects network capacity and speed, therefore if the parties to the NSA have a significantly larger amount of spectrum at

⁴⁸ See Český telekomunikační úřad (2015).

their joint disposal than their competitors, the competitors may be unable to offer services of comparable quality. We believe this argument to be problematic for several reasons; however, it has come up in real-world cases.⁴⁹ Here are a couple of counter-arguments with respect to this concern, which mostly run parallel with those presented in the previous section, in relation to possible exclusionary effects on the retail market.

- If the agreement is in the form of a MORAN, no spectrum pooling occurs, therefore this concern can be automatically discarded.
- Spectrum endowments are usually asymmetric due to the endogenous allocation of spectrum rights. These asymmetries result in capacity and quality differences between operators and their service capabilities. Network sharing with spectrum pooling can enable the more efficient use of the spectrum.⁵⁰ Provided that the parties remain independent actors on the market in the relevant features of their services, apart from RAN- and spectrum-related ones, it could only raise a potential competition concern if it changed the ability and incentives of the parties to compete on the retail (or wholesale) markets.
- The fact that competitors may not be able to keep up with the NSA parties' superior offers due to the use of pooled spectrum is not in itself an argument against the NSA – consumer harm cannot be automatically assumed. Harm would only manifest if competitors were forced to leave the market or their ability to compete were significantly reduced due to the NSA.

While the spectrum concern shares many features with the previously discussed exclusionary concern, the affected markets differ. Spectrum is allocated, and after a given number of years, re-allocated through various award mechanisms, such as auctions. The positions of the MNOs can therefore be much less stable in the long run with regard to spectrum endowment than on the retail market. If previous spectrum awarding processes have resulted in a very asymmetric situation (to the advantage of NSA members), and the next award opportunity is further away in time, or if the allocation mechanism is designed poorly, this concern may carry some water. The message is, however, that the root of the problem – and thus also its solution, lies in the design of the spectrum awarding procedures, and not the NSAs.

In the Danish case where this concern was seriously considered, the competition authority found that a commitment requiring the NSA parties to participate together in the

⁴⁹ In the Danish case 4/0120-0402-0057, Telia and Telenor established a joint venture for their MOCN network sharing agreement. The spectrum was pooled and handed over to the jointly owned TT Network.

⁵⁰ See for example BIPT (2012) on the advantages and the differentiation under spectrum pooling.

relevant spectrum awarding procedures would be necessary to alleviate this concern.⁵¹ While the remedy directly mitigates the concern in hand, it would also increase the proportion of costs that become common, increasing the likelihood of coordinative concerns. Furthermore, it could also disadvantage the parties and indirectly the customers as the operators may not be able to acquire enough capacity to properly serve their respective customer bases due to caps on the amount of spectrum they can jointly purchase.

5. EVALUATING NSAS' EFFICIENCY BENEFITS

If competitive concerns are substantiated in the case of an NSA, the next step is to assess the possible benefits, efficiencies resulting from it: the negative effects must be weighed against the positive ones. In this chapter, we discuss the framework in which efficiencies are analysed in a competitive assessment and list some examples of the specific types of efficiencies that may arise in connection to NSAs. Although the efficiencies are crucial to the assessment of any NSA, they depend very much on the specific form of it takes. Therefore, this discussion of efficiencies is shorter and more general than the previous chapter on possible theories of harm.

The issue of countervailing efficiencies is dealt with in the third paragraph of Article 101. The paragraph lays out the conditions under which the agreement may be exempt from the prohibitions in Article 101(1), which we discussed in the previous chapter.⁵² These are the following:

1. The agreement must contribute to improving the production or distribution of goods or to promoting technical or economic progress.
2. Consumers must be allowed a fair share of the resulting benefit.
3. The agreement must be indispensable to achieve these efficiencies.
4. The agreement must not result in the possibility of eliminating competition in respect of a substantial part of the products (services) in question.

The first condition essentially states that efficiencies must result from the agreement, while the second stipulates that the efficiencies must not only benefit the NSA parties, but must be passed on to consumers. The third, indispensability condition implies that the agreement cannot be exempt if there is another, less restrictive way to achieve the efficiencies

⁵¹ See case 4/0120-0402-0057 (Telia/Telenor). The parties did state that their agreement relied on a presumption of mutual bidding, ruling out the alternative of bidding individually and then combining the relevant spectrum for joint use (a basis for the concern), but the Danish authority still found commitments more reassuring and thus necessary.

⁵² There is also a detailed guideline available on the assessment of efficiencies (European Commission 2004a).

in question. The fourth condition means that no efficiencies are desirable enough to outweigh the total elimination of competition.

The burden of proof for showing that all four, cumulative conditions are met is on the NSA parties; while the competition authority must show harm, it is the parties who must demonstrate efficiencies.

It might seem that the central question, is whether the first two, interconnected conditions are met (efficiencies and resulting consumer benefits). However, the evaluation of the third condition can be tricky as well, since in order to show indispensability one needs to compare it with another rationally available option and argue that the second one does not produce a comparable level of efficiencies with less harm – this question can be crucial when designing the NSA. The fourth condition is usually simple to see: competition is not eliminated.

Two main types of efficiencies may arise in NSAs:

1. Cost efficiencies: cost savings resulting from the agreement which translate into lower prices (or similar benefits) to consumers. These can and should be quantified.
2. Qualitative efficiencies: the quality of services (such as coverage, speed or reliability) may improve for some or all consumers, or certain improvements (such as new technologies) may reach consumers sooner than they would have absent the agreement. These efficiencies are often not quantifiable, or their quantitative assessment is not trivial.⁵³

Let us first discuss cost efficiencies. The main advantages of an NSA, to the parties at least, are the CAPEX and OPEX savings it results in. These can be calculated from comparing so-called business cases, as a difference of net cost in standalone scenario (the counterfactual) and the net cost with the agreement. But only part of these savings need to be considered: the part that is passed on to customers in the form of a general price decrease, a device subsidy, a subsidised additional service, etc. In order to judge the case, we need to know the pass-through rate, and a plausible mechanism for transferring the savings to the customers. This complex setting means that even for these more quantifiable efficiencies, the calculation is less than trivial.

The positive effects of the agreement on consumers may arise in many forms apart from the simple monetary advantage. Most of these can be classified as improvements in quality, leading to the enhancement or increased value of the service, or the earlier availability of

⁵³ Pedrós et al (2017), a paper published by GSMA, provides an interesting new approach in the assesment of qualitative efficiencies in the Austrian Hutchison/Orange merger.

these improvements than in the counterfactual scenario. These are qualitative efficiencies, the most common of which are the following:

- better indoor or outdoor network coverage (due to more sites, or a larger covered territory),
- better network and signal quality (due to denser networks, better locations, an enhanced and more efficient RAN, etc.),
- higher up- and download speed and higher throughput (in the case of an MOCN agreement),
- faster network rollout,
- earlier availability of coverage and services than absent the agreement,
- earlier fulfilment of coverage and quality commitments than otherwise.

Some advantages are temporary, others are permanent by nature. These qualitative efficiencies also have to be assessed compared to the counterfactual: the (future) situation without the agreement, and should be quantified as much as possible. This is especially important as these efficiencies taken together may be larger and more important than those passed through in the form of price decreases.⁵⁴

6. CONCLUSION

Network sharing agreements have become increasingly widespread in mobile telecommunications markets, creating an assessment challenge for regulatory agencies and competition authorities. Our paper presents a framework for the competitive assessment of NSAs, detailing the principles of evaluating possible concerns and counterbalancing efficiency benefits.

While NSAs sometimes bring considerable change on the market, their impact is significantly smaller on the final consumer than that of a merger, as many of the benefits are delivered with less potential for harm. Our approach emphasises that not all NSAs are created equal: the assessment of the balance of harm and benefits to customers due to an NSA is a complex endeavour, and a lot depends on the specifics of the agreement. We also find that for most theories of harm, the likelihood of an adverse effect on the consumers increases (but not always significantly) with the depth of the agreement, from MORAN to MOCN and onwards.

As mobile technologies and services continue to develop and new technologies requiring high investment emerge the mobile telecommunications industry is in desperate need of cost reductions. As consolidation is mostly discouraged by competition authorities, network

⁵⁴ This is mentioned explicitly in the Horizontal Guidelines (European Commission 2011), paragraph 69.

sharing can be a path towards eliminating the possibly unnecessary duplication of networks, or towards decreasing cost whenever possible. Understanding the complex issue of NSAs will be a key to supporting further market progress while preserving effective and sustainable competition.

REFERENCES

- ARCEP (2016): Autorité de régulation des communications électroniques et des postes: Lignes directrices sur le partage de réseaux mobiles, Mai 2016, URL: https://www.arcep.fr/uploads/tx_gspublication/2016-05-25-partage-reseaux-mobiles-lignes-directrices.pdf
- BEREC (2011): BEREC-RSPG report on infrastructure and spectrum sharing in mobile/wireless networks, June 2011, URL: https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/224-berec-rspg-report-on-infrastructure-and-spectrum-sharing-in-mobilewireless-networks
- BEREC (2018): BEREC Report on Infrastructure Sharing, 14 June 2018, URL: https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8164-berec-report-on-infrastructure-sharing
- BIPT (2012): Belgian Institute for Postal Services and Telecommunications: Communication of the BIPT of 17 January 2012, containing guidelines for infrastructure sharing
- Český telekomunikační úřad (2015): Stanovisko Českého telekomunikačního úřadu ke sdílení sítí 2G, 3G a 4G, URL: https://www.ctu.cz/cs/download/aktualni_informace/stanovisko_ctu_sdileni-siti_2g-3g-4g_04_09_2015.docx
- European Commission (2004a) Guidelines on the application of Article 81(3) of the Treaty: Official Journal 101, 27.4.2004, p. 97–118, URL: [https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52004XC0427\(07\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52004XC0427(07)&from=EN)
- European Commission (2004b): Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings, URL: [https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52004XC0205\(02\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52004XC0205(02)&from=EN)
- European Commission (2008): Guidelines on the assessment of non-horizontal mergers under the Council Regulation on the control of concentrations between undertakings (2008/C 265/07), URL: [https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52008XC1018\(03\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52008XC1018(03)&from=EN)
- European Commission (2011): Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements, 2011/C 11/01., URL: [https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52011XC0114\(04\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52011XC0114(04)&from=EN)
- GSMA (2012a): Mobile Infrastructure Sharing, URL: <https://www.gsma.com/publicpolicy/wp-content/uploads/2012/09/Mobile-Infrastructure-sharing.pdf>
- GSMA (2012b): Comparison of fixed and mobile cost structures, URL: <https://www.gsma.com/publicpolicy/wp-content/uploads/2012/09/Tax-Comparison-of-fixed-and-mobile-cost-structures.pdf>
- L'Autorité de la Concurrence (2013): Avis n° 13-A-08 du 11 mars 2013 relatif aux conditions de mutualisation et d'itinérance sur les réseaux mobiles, URL: <https://www.arcep.fr/fileadmin/reprise/textes/juris/2013/13-a-08.pdf>

- Mölleryd, B.G. – Markendahl, J. – Sundquist, M. (2014): Is network sharing changing the role of mobile network operators?, 25th European Regional Conference of the International Telecommunications Society (ITS), Brussels, Belgium, 22-25 June 2014, URL: <https://www.econstor.eu/bitstream/10419/101392/1/795277237.pdf>
- Motta, M. (2004): Competition Policy: Theory and Practice, Cambridge: Cambridge University Press
- Motta, M. – Tarantino, E. (2017): The effect of horizontal mergers, when firms compete in prices and investments, Economics Working Papers 1579, Department of Economics and Business, Universitat Pompeu Fabra.
- Neumann, K-H. – Plückebaum, T. (2017): Mobile Network Sharing. 14th International Telecommunications Society (ITS) Asia-Pacific Regional Conference, Kyoto, Japan, 24-27 June, 2017
- OECD (2014): Wireless Market Structures and Network Sharing, OECD Digital Economy Papers 243, URL: [https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP/CISP\(2014\)2/FINAL&docLanguage=En](https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP/CISP(2014)2/FINAL&docLanguage=En)
- Pedrós, X. – Bahia, K. – Castells, P. – Abate, S. (2017): Assessing the impact of mobile consolidation on innovation and quality: An evaluation of the Hutchison/Orange merger in Austria, GSMA
- Song, Y. – Zo, H. – Lee, S. (2012): Analyzing the Economic Effect of Mobile Network Sharing in Korea, ETRI Journal, Volume 34, Issue 3 (June 2012), pp. 308-318.