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Competition policy questions in mobile network sharing

Zoltán Pápai,¹ Gergely Csorba,² Péter Nagy³ and Aliz McLean⁴

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. 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. 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.

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

1. Introduction

Mobile network sharing is a type of cooperation between mobile network operators to jointly use, maintain, and sometimes 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.⁵ 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 carries the potential for restricting competition. A network sharing agreement therefore both carries great potential for efficiencies and may raise competition concerns.

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⁵ Mölleryd et al. (2014)

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

The paper presents a general framework for the competition policy assessment of active mobile network sharing agreements, mainly using the approach laid out in the European Commission's 2010 Guidelines on Horizontal Agreements. Chapter 2 provides a general introduction to network sharing: its history, its main types, and the motivations behind it. 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.

2. Network sharing agreements: an introduction

Network sharing is a means of economising 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, 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.

While the sharing of the passive network – namely sites, masts and even antennae – has been present since the beginning of the deployment of mobile telecommunication networks, active sharing, that is, the sharing of at least the radio access network, is becoming more frequent but not a universal phenomenon.

2.2 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 raise any competition concerns.

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 many times pushed by regulators; it was used in many 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 promised 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 forbidden 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 2002,⁶ 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.

2.3 Ways of network sharing

As previously discussed, passive network sharing involves the common use of sites, masts, and antennae. Active network sharing implies that (beside the passive infrastructure) 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

⁶ Mölleryd et al. (2014)

operator sends the traffic from its respective customers onto its own core for processing by its own core network elements and infrastructure.⁷ 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.

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:

- 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.

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.⁸ A much deeper level of sharing is when (at least some of) the core activities are also shared; this is the case of the GWCN (Gateway Core Network) sharing architecture, a definition used by 3GPP.⁹ The three kinds of active infrastructure sharing are depicted on the following graph, created by Analysys Mason in 2014.¹⁰

⁷ See GSMA (2012).

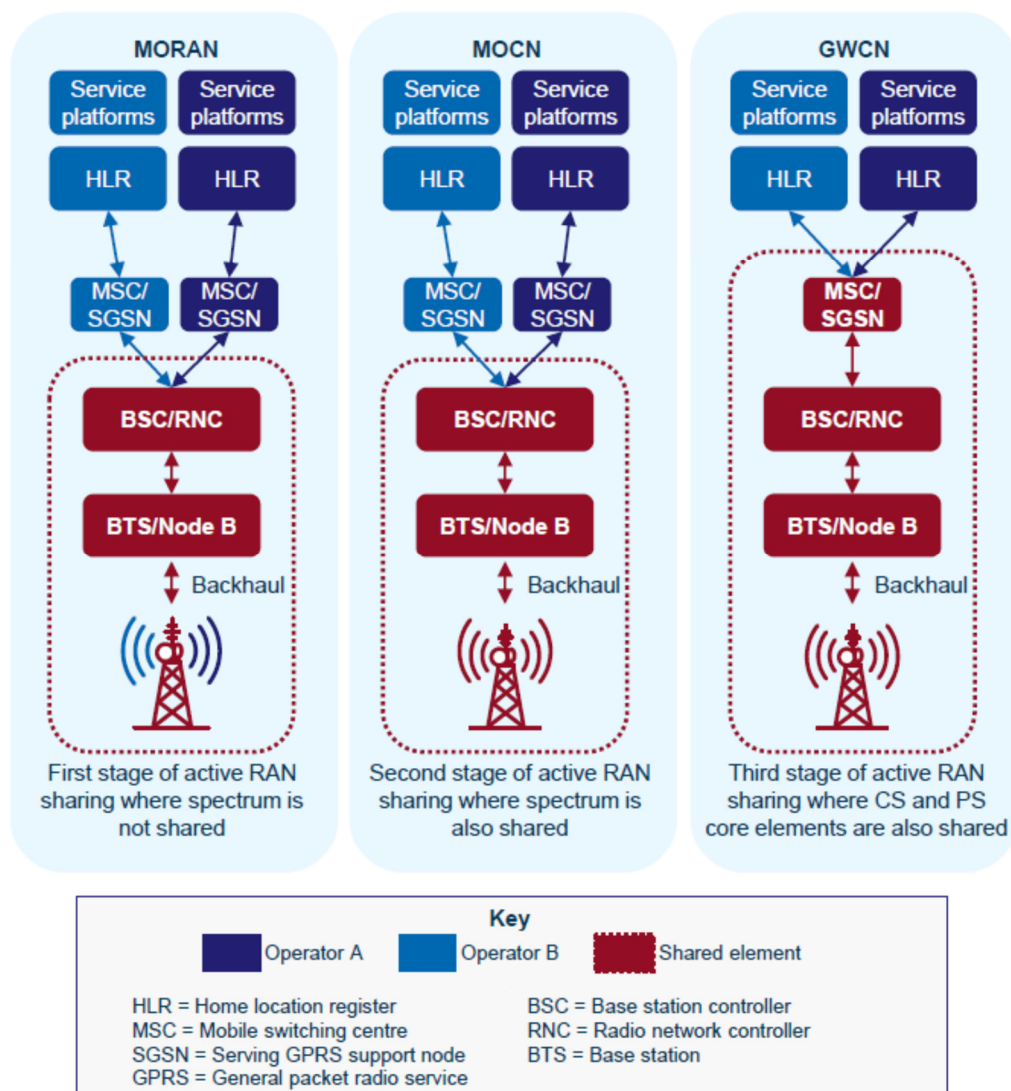
⁸ See GSMA (2012).

⁹ 3GPP (2015).

¹⁰ Pearson and Osmotherly (2014).

Figure 1: Different kinds of active infrastructure sharing

Figure 1: Different kinds of active infrastructure sharing [Source: Analysys Mason, 2014]



Source: Analysis Mason (2014)

The level of sharing becomes deeper from left to right. 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 GWCN, service differentiation still remains mostly under the control of the respective operators.¹¹ As far as practical relevance is concerned, the NSAs in Europe are predominantly MORAN, while some are MOCN. No GWCN has emerged so far, and going forward, our analysis will deal only with MORAN and MOCN agreements.

¹¹ We discuss the issue of differentiation in detail in Chapter 4.1.1.

2.4 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.¹² 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. 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. This type of NSA works best in cases where that parties' position is to some extent symmetric, and the gains from cost savings are 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, between T-Mobile and Hutchison in the UK, and between Magyar Telekom and Telenor in Hungary. Such cooperation may only be approved on a temporary basis by the sectoral regulatory body or the competition agency, for example in the case of densely populated areas, in order to speed up network deployment; but cooperation may be required to end when demand picks up and the partners become able to build separate networks economically.¹³

2. Gaining access to spectrum

Another type of NSA is one 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 due to 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.¹⁴ Another example is the later prohibited agreement between Yoigo and Telefónica in Spain.¹⁵

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, now 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

¹² See GSMA (2012), Mölleryd et al (2014), OECD (2014), Neumann and Plückebaum (2017).

¹³ In France, both the competition authority and the sectoral regulator prefer agreements to be temporary in urban areas. See ARCEP (2016) and L'Autorité de la Concurrence (2013)

¹⁴ Mölleryd et al. (2014)

¹⁵ See Comisión Nacional de los Mercados y la Competencia (2015).

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, 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 2: NSAs in Europe

Geographic Scope

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 *

How many RAN
technology generations
are involved?

1

2

3

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

Source: Authors' own work

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 time (the year the sharing began),

the generations of mobile technology involved, market structure (the number of players on the market), and the rank of the NSA participants by size.¹⁶

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, but many do not. With one exception (France), agreements were reached between two parties; typically, on 4-player markets. Their relative ranks differ, all combinations are present. Most of the existing agreements are MORAN and there are only some which are 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.

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 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 retail product 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:

¹⁶ 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.

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.

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.
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 narrow band 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 RAM 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 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, potentially imposing 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.

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.

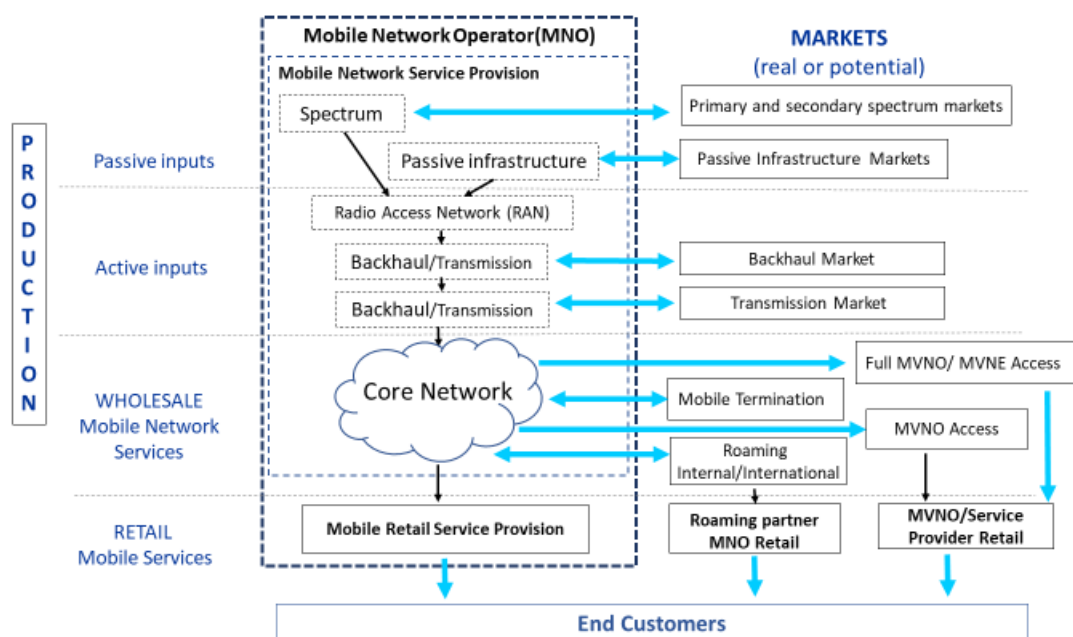
Therefore, in the following discussion we work with the loose definition of a market for mobile services at the retail level, without specifying whether it is sub-segmented into smaller relevant markets.

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 technologies and markets build upon each other. Note that this framework was developed to facilitate the competition policy and/or regulatory assessment of NSAs and does not necessarily correspond to the standard description of vertical relationships in mobile market analyses.

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 blue arrows show transactions with external operators; these connections mark the affected markets that are analysed later in our study.

Figure 3: Mobile telecommunication markets



Source: Authors' own work

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, during which 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 and customer relations.

As you can see 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 radio 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 tenders. However, in several countries and 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.

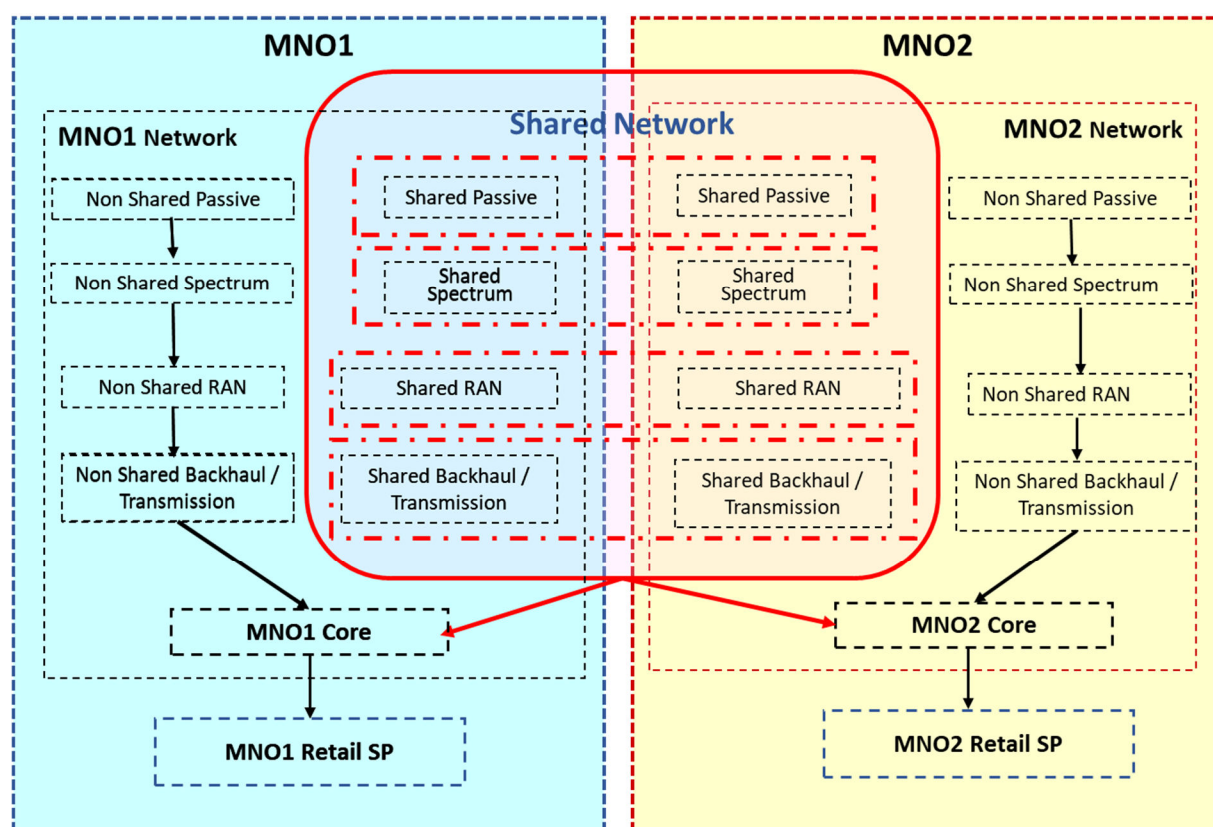
4. Transmission network: this provides the connection between various elements of the active network. There is a usual separation between two depths of transmission (backhaul and backbone), although the boundaries between the two are not unambiguous.
5. Core network: this is the intelligent part of the 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 MSP 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. In this case the wholesale service used is one level up, at RAN access.

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.

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

Figure 4: An example of network sharing



Source: Authors' own work

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 of sorts 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 a 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 differentiation of services offered to consumers takes place.

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). The burden of proof for establishing negative effects lies with the competition authority. This is the step we discuss in this chapter.
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 next chapter.

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 3-4) 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:

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

²⁰ Horizontal Guidelines (2011).

²¹ Horizontal Guidelines, paragraph 20.

²² Horizontal Guidelines, paragraph 157.

- The agreement could lead to a qualitative change on the market (especially because of an increased commonality of costs or information exchange), such that tacit collusion between all market players (not just the parties in the NSA) becomes easier, more stable or more effective.²³ Again, following merger terminology, we refer to these concerns as *coordinative horizontal effects*.
- 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 impossible or more expensive for competitors, which could indirectly have a harmful effect on the retail market.²⁴ These exclusionary concerns will be referred to as *vertical effects*.

Table 4.1 shows a list of competition concern that we will discuss one by one in the rest of this chapter, including one that cannot be easily fit into the classic framework: the potential exclusion of operators not party to the NSA.

Table 5: 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>	<i>Excessive concentration of spectrum</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>	
Uncategorised		
<i>Potential exclusion of operators not party to the NSA</i>		

Source: Authors' own work

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.

4.1 Unilateral horizontal effects

²³ Horizontal Guidelines, paragraph 158.

²⁴ Horizontal Guidelines, paragraph 159.

The term “unilateral effects” is borrowed from the terminology of merger assessment: it refers to the case when the parties' individual incentives to compete change due to the agreement, which might also impact their competitors' incentives.

We discuss three concerns which can be categorised as unilateral horizontal effects: the decrease in differentiation, the decrease in incentives to compete due to fix costs becoming variable, and the concentration of spectrum.

4.1.1 The decrease in differentiation

The argument that competition authorities and/or regulators usually make in this case 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.²⁵ The loss of differentiation implies a loss of competition. This is a rather general statement, and we need to specify what aspects of the services could be affected, and to what degree. Operators' services differ from each other in several 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. We make five general points concerning 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. 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.²⁶ 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.²⁷

²⁵ See L'Autorité de la Concurrence (2013).

²⁶ 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.

²⁷ 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

3. Some competition authorities²⁸ presume that RAN sharing also constrains the operators in their choice of technology, capacity enhancement and innovation. While future investments must indeed be coordinated, and there is less freedom in introducing any innovation unilaterally, it does not follow that overall innovation-related activity concerning the RAN will diminish.
4. 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 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, neither from a technical nor from a commercial perspective.
5. Even if some loss of differentiation between the parties in the RAN-related features occurs, it is a partial effect. Resources saved here can be diverted to differentiate more in other features of the services. Only an investigation comparing the full result to the counterfactual can be decisive on the overall effect on competition and consumer welfare.

The differentiation-related concern will always be investigated in connection to NSAs, even though there are strong arguments against it. The burden of proof for substantiating that there is a large enough decrease in differentiation to harm consumers is on the authority, and it is not at all easy. However, if the authority does convincingly show harm, there is probably no simple fix, no easy modification of terms that could alleviate the concern. This means that the assessment of the differentiation issue could seriously impact the fate of an NSA.

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.²⁹ This is because costs that were previously fixed may become variable (i.e. dependent on usage), which could change the pricing incentives of the operators, and therefore their incentives to compete.

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.

²⁸ See L'Autorité de la Concurrence (2013), paragraphs 92-96 (France) and Konkurrence- og Forbrugerstyrelsen (2012) (Denmark).

²⁹ The increase in cost commonality can also lead to possible coordinative concerns that we will deal with in the assigned section.

When a network is already built and has large enough capacities, network costs are largely fixed,³⁰ 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 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 pay 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.

In theory, 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. The challenge is reconciling this requirement with the diverse realities of the markets NSAs exist in: parties and their activities may be asymmetric, market positions may evolve, and the original cost sharing agreement may seem less than equitable.

4.1.3 The concentration of spectrum

A network sharing agreement, in the case of MOCN or any deeper level of agreement, like GWCN, 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. But spectrum sharing may appear similar to spectrum concentration: a not especially well-founded argument is based on this notion. The argument is 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 their disposal than their competitors, the competitors may be unable to offer services of comparable quality. We believe this argument to be faulty for several reasons; however, it needs to be mentioned as it has come up in real-world cases.³¹ Here are a couple of counter-arguments with respect to this concern:

- If the agreement is in the form of a MORAN, this concern can be automatically discarded.
- The concern stems from a fundamental misunderstanding of what spectrum sharing entails. 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.³² It would only

³⁰ This is evident for CAPEX, but also true for most of the OPEX.

³¹ NSA between Telia and Telenor in Denmark (the Danish case, see Konkurrence- og Forbrugerstyrelsen (2012)). This NSA was an MOCN where beside the RAN the spectrum was pooled and handed over to the established TT Network joint venture.

³² See for example BIPT (2012) on the advantages and the differentiation under spectrum pooling.

be a competition concern if it changed the ability and incentives of the parties to compete on the retail (or wholesale) markets.

- While the combined spectrum of the parties is larger, it must serve at least the existing customer base of the parties: the larger spectrum will be handling larger usage. Further in this vein: the useful metric of network speed is average speed, not the (theoretical) maximum speed. While a pooling of the spectrum enables larger maximum speed, it doesn't guarantee larger average speed, which depends on the number of users and usage.
- 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 – there is no discernible consumer harm. Harm would only manifest if competitors were forced to leave the market due to the effects of the NSA; this seems very unlikely and would be difficult to prove.

If this concern arises, one possible remedy would be to require the parties to the NSA to participate on the affected spectrum auctions together, as one entity.³³ While this would mitigate the concern, it would also further increase the proportion of costs that become common, increasing the likelihood of coordinative concerns. It would also disadvantage the parties as they may not be able to acquire enough capacity to properly serve their respective customer bases due to caps on the amount of spectrum one entity can purchase. Overall, we believe that this concern should not arise, but if it does, it can be remedied – albeit with caveats.

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, as with unilateral effects). If parties become more similar to each other in certain key aspects of competition, if their incentives align, this could possibly lead to *tacit cooperation* between them to the detriment of consumers – for example, through increasing prices.

Coordinative effects are assessed using the so-called Airtours criteria, originally developed for mergers, but now also referenced in the case of horizontal agreements.³⁴ For coordination to be sustainable, the following must apply:

³³ In the Danish case (see Konkurrence- og Forbrugerstyrelsen (2012)), a commitment required the NSA parties to participate together in the relevant spectrum auctions, since they could not be considered independent bidders. 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.

³⁴ Horizontal Guidelines, paragraphs 66-68. and Horizontal Merger Guidelines (2004), paragraph 41.

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 deterrent mechanism that can be activated if deviation is detected.
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.

The criteria apply to varying degrees to different markets – what needs to be assessed is whether the NSA itself *changes* the existing situation enough to enable coordination or make it more efficient.

It is worth considering whether the retail market for mobile telecommunications is especially prone to coordination in general. Here are a few general factors to take into account:

1. Ability to coordinate: mobile telecommunications form a dynamic and fast-changing market; and mobile services are highly differentiated products – these considerations 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. There may or may not be a regulator or similar body on the market, however, that collects and (albeit in some aggregate form) publishes data on the market, increasing transparency.
3. Deterrence: product differentiation and a possible lack of transparency makes any deterrence mechanism difficult to design and implement, although the possibility cannot be discounted.
4. No “maverick”: the presence of a possible maverick must be assessed in the market in question; possible candidates include other MNOs, MVNOs or aspiring entrants.

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. We now look at the two specific coordinative concerns that NSAs may give rise to.

4.2.1 The increase in cost commonality

The Horizontal Guidelines specifically mention this possible concern with production agreements:³⁵ 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.

³⁵ Horizontal Guidelines, paragraphs 176-180.

The 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. A significant mark-up covering fixed costs is a necessary element of pricing. If these short run quasi-fixed costs are also taken into account, this concern becomes more serious.³⁶

The effects must be assessed at the retail level, while the commonality of costs increases only at the network level.³⁷ This means that several costly processes of providing retail mobile services (marketing, sales, invoicing 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 cost is affected, our experience suggests that even full network consolidation would result in less than half of total mobile service production and provision costs becoming common. There is no safe harbour, however: neither the guidelines, nor established caselaw give any threshold below which anticompetitive concerns cannot be raised.

We should note that some degree of increase in cost commonality is inevitable in all NSAs. The challenge to the competition authority is quantifying it (by correctly identifying the costs that are relevant), and to the parties, minimising 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 can (to some extent, at least) in an MOCN setting 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.

³⁶ The Danish case (see Konkurrence- og Forbrugerstyrelsen (2012)) took fixed costs into account.

³⁷ Again, the Horizontal Guidelines specifically prescribe evaluating the retail market, but in the Danish case (see Konkurrence- og Forbrugerstyrelsen (2012)) the competition authority also looked at the upstream level, where shared costs constitute a much greater proportion of overall costs.

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 taken into account.

4.2.2 Information exchange

An NSA necessitates some degree of information exchange, both when designing the agreement, and later when operating it and making decisions regarding expansion and developments. Sharing information between competitors can, however, facilitate reaching a collusive outcome, or make it more stable, especially by increasing market transparency.³⁸ 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.

A key principle is that the amount and scope of information exchange should be as small as possible. Further, the nature of the information shared matters greatly. It is better if the information in question is not strategic (that is, the competitors' strategies cannot be deduced from it), if it concerns a smaller part of the market (for example, only the NSA parties), if it is rather aggregated than individualised, if it refers to the past, and not the present or the future, if it is shared rarely, and if it is publicly available (even if accessing it would not be trivial).

There are two areas where information between parties must be exchanged in an NSA: firstly, the shared network must be planned, developed and then maintained; and secondly, the parties must have a system in place to settle accounts with each other; the metrics on which 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;³⁹ no such data is needed to operate a shared network. This only means, however, that the need for information sharing does not prohibit the existence of NSAs completely; the issue must be given serious attention in the agreement. 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 discussed are to do with access. 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 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, wholesale getaway access to MVNEs or full

³⁸ Horizontal Guidelines, Chapter 2.

³⁹ Horizontal Guidelines, paragraphs 73-74.

MVNOs with their own core network, and wholesale access to the core to less than full MVNOs. Access is granted (or denied) at the relevant *upstream level*, to competitors *downstream*.

Vertical effects are analysed in the framework of ability, incentive and effect to foreclose, developed originally in the framework for assessing non-horizontal mergers.⁴⁰

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

4.3.1 Access to passive infrastructure

As NSA parties consolidate their networks, they may sell, demolish or abandon facilities (towers, antenna locations and other elements of passive infrastructure) that their competitors also use. 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 more serious if the NSA results in greater change (and especially, a reduction) in the number and location of facilities. This, in turn, depends on a number of factors. The concern is greater if, for example:

- the parties shared a larger proportion of their infrastructure with competitors before the NSA (so the possible instances of an adverse effect on competitors is greater),
- the parties own a larger proportion of the shared infrastructure as opposed to renting it (so they may demolish sites rather than simply not renting them any more),
- the parties, conversely, use fewer facilities owned by their competitors (therefore reducing interdependency or increasing competitors' maintenance costs),
- the facilities that the parties wish to leave have no alternative use to the owner, or are costly to maintain (so they are more likely to be demolished), etc.

If this concern appears substantial in the specific NSA under investigation, the parties may offer commitments: they could commit, for example, to offering abandoned facilities to competitors to buy or rent; or to seeking approval to demolish facilities.⁴¹ These remedies

⁴⁰ See Non-Horizontal Merger Guidelines (2008).

⁴¹ Such commitments were made in the Danish case (see Konkurrence- og Forbrugerstyrelsen (2012)) as a remedy to the concerns raised by the competition authority.

are not especially onerous from the NSA parties' point of view and may even coincide with their business interests.

4.3.2 Wholesale getaway access and access to wholesale mobile services to MVNOs

The concern related to access is more complex (but also often less realistic) in the case of MVNOs than with the passive infrastructure. We differentiate between three concerns that may arise:

1. Classic foreclosure: the NSA may lead to the parties' increasing market power on the relevant upstream level, increasing their ability and incentive to foreclose MVNOs: limit or overprice their access to wholesale services.
2. Less choice: MVNOs may have fewer distinct networks to choose from, as NSA parties consolidate theirs.
3. Less free capacity: NSA parties may optimise their shared network in a way that there remains less free capacity to offer to MVNOs than there would have been with separate networks.

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 are perhaps more crucial than access to passive infrastructure. In general, the concerns are greater if, for example:

- the parties to the NSA have previously provided wholesale services or getaway core access to (some or many) MVNOs, who may therefore suffer adverse consequences,
- the parties have no (strong, viable) competitors with significant free capacities who can cater to MVNOs, that is, the parties have strong market power on the relevant upstream market(s),
- the parties' free capacities are projected to decrease due to the NSA, etc.

The list above influences both ability and incentive; in the case of incentive, one must compare the profit loss upstream due to a loss of economies of scale (providing access to MVNOs means that they can contribute to the large fixed costs of maintaining a network) to the gain downstream on the retail market, where the parties would face less competition in the absence of MVNOs.

It is important to note here that we mention the *fixed* costs of network maintenance. Depending on the cost sharing system in place, the NSA may lead to these (more or less) fixed costs becoming variable, if they are shared between the parties based on usage. This could dissuade parties from supplying MVNOs: the gain in economies of scale from doing so would disappear. This means that the bad design of the cost sharing system can lead to all three types of concerns: unilateral, coordinative and vertical.

Overall, it is possible that serious concerns may arise regarding MVNOs, but not in all (or even most) cases. If they do come up, they can be handled through commitments: these

would typically involve a pledge to grant access to MVNOs with reasonable prespecified conditions.⁴²

4.4 Potential exclusion of operators not party to the NSA

A non-standard type of concern emerged in cases based on the potential exclusionary effect of an NSA⁴³. As the parties to the NSA might gain a non-replicable cost advantage and other quality improvements, this may create a competitive advantage. The concern is more likely to arise if the parties possess very large market power, for example, if they are the first and second largest players in a three-player market. According to the concern, the decreased relative competitiveness of other operators could lead to the competitors' elimination from the market, thereby decreasing competition, and allowing the remaining players to abuse their increased market power.

This concern is similar to the 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. But stating that it results in the elimination 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 (like forming an alternative NSA) on the market. The complete elimination scenario – especially taking into account the market structure of most mobile telecommunications markets, with few, large, integrated players – is dubious, and even if it happened, the threat of new entry would be very real. But the main effect of this concern, the abuse of market power, is conditional on this elimination actually happening.

This theory of harm is often raised by operators who have been “left out” of the planned NSA in question. 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 discussed above, this seems highly unlikely and would be almost impossible to prove.

Taking into account the extremely high burden of proof, it is not very likely that the competition authority could substantiate such a concern.⁴⁴ If it did arise, a commitment could conceivably be designed to handle the specific root of the problem: in some way requiring more openness to passive sharing, or even some active sharing (in rural areas, for old network technology etc.) with the disadvantaged competitor.

4.5 Summary

⁴² A commitment was offered in the Danish case (see Konkurrence- og Forbrugerstyrelsen (2012)), it contained no specifics regarding the conditions of access, however, and therefore may not be easily actionable.

⁴³ It is mentioned in OECD (2014), p. 68.

⁴⁴ The Czech telecom regulator prepared an assessment of the network sharing on the Czech market and investigated this concern on the three-player Czech mobile market but came to the conclusion that no exclusionary risk could be substantiated. See Český telekomunikační úřad (2015).

We summarise our findings in Table 4.2. It is important to note that NSAs, national markets, and competition authorities are each diverse – certain NSAs in certain markets, investigated by certain authorities will face a much greater risk of scrutiny than others. The overall picture that the table represents, however, can be a useful starting point for all stakeholders in this area. In this section we go through the concerns and discuss the effects of the depth of sharing on the seriousness of the concerns. We also emphasise the contextual elements and the combinations that together may enhance the validity of these concerns.

Table 6: Evaluation of competition concerns

Competition policy concern	Seriousness of the competition policy concern and main factors influencing it	Possible mitigation of the harm by the parties
Horizontal unilateral effects		
<i>Decrease in incentives to compete due to the decreased differentiation of services between parties</i>	<p>The concern is more serious:</p> <ul style="list-style-type: none"> the more of the network is shared (from MORAN through MOCN to GWCN) the larger the geographic scope (from local/rural to the total territory) the more technologies are involved the more of the operators' spectrum bands are included <p>However, most differentiation takes place in the (usually unaffected) core. Difficult to substantiate.</p>	If it is substantiated, it is hard to offer a good remedy.
<i>Decrease in incentives to compete due to fixed costs becoming variable</i>	<p>The concern is more serious:</p> <ul style="list-style-type: none"> the more costs are shared based on usage, with increasing depth in any dimension (technologies, geographical area etc.), the more information needs to be exchanged. 	<p>Can be avoided/mitigated by designing a cost sharing system with good competition incentives:</p> <ul style="list-style-type: none"> not to turn fixed costs into variable costs; to share costs based on capacity rather than usage.
<i>Excessive concentration of spectrum</i>	<ul style="list-style-type: none"> With no common use of spectrum (like in case of MORAN) no such concern can exist. May arise when spectrum is pooled but can only be substantiated in the context of future spectrum allocation procedures. 	Can be avoided/mitigated by joint participation at future auctions for the spectrum bands which were pooled, but this carries its own potential for adverse effects on competition.
Horizontal coordinative effects		

<i>Increased commonality of costs</i>	<ul style="list-style-type: none"> • The deeper the sharing in any dimension the higher the cost commonality. • The maximum is reached when the full network is shared. <p>No benchmark threshold of too much commonality exists, but even when the full network is shared, the level is expected to be less than half of total cost. Difficult to substantiate.</p>	<p>The commonality can only be substantially reduced by changing the level of depth and the scope of the agreement – often not a realistic option.</p>
<i>Information exchange</i>	<p>The deeper the sharing in any dimension, the more information is expected to be shared concerning network strategy, development needs, costs, network characteristics, usage, etc.</p>	<p>Can be mitigated by designing an appropriate information sharing system in advance:</p> <ul style="list-style-type: none"> • minimise information shared; • only share information which is critical and necessary to the functioning of the NSA; • use a clean team, or establish a joint venture, etc.

Vertical effects

<i>Access to MNOS to passive infrastructure</i>	<p>Dependent on the depth of sharing as far as how many locations, sites, masts will be demolished.</p>	<p>Can be mitigated by offering commitments if needed, concerning</p> <ul style="list-style-type: none"> • sale of sites to competitors, • commitment to granting access.
<i>Wholesale access to MVNOs to the operators' network</i>	<ul style="list-style-type: none"> • Not dependent on the depth of sharing. • Seriousness depends on the remaining number and free capacity of independent networks and the number of MVNOs served by the parties. 	<p>Can be remedied, if needed:</p> <ul style="list-style-type: none"> • commitment to granting access to MVNOs on specified terms; • different levels of access for different MVNO types (MVNE/full MVNO/service provider MVNO).

Uncategorised

<i>Potential exclusion of operators not party to the NSA</i>	<p>May depend on:</p> <ul style="list-style-type: none"> • the depth of sharing, • the market structure (three-player markets may be more prone to it), • market power of the parties (risk may be higher if the parties are the two largest operators). 	<p>Extremely high burden of proof on the authority, very hard to substantiate.</p> <p>Can be mitigated by offering a commitment, if needed:</p> <ul style="list-style-type: none"> • more openness to passive sharing, • or even active sharing (in rural areas or for old technologies, for example).
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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.⁴⁵ 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 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 NSA option and argue that the second form 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.

⁴⁵ There is also a detailed guideline available on the assessment of efficiencies (Guidelines on the application of Article 81(3), 2004).

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.

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 improvement in quality, leading to the enhancement or increased value of the service. 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. In order for them to be given more weight in the competition authority's final assessment, it is worth attempting to quantify them 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.⁴⁶

6. Conclusion

⁴⁶ This is mentioned explicitly in the Horizontal Guidelines, paragraph 69.

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. 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. In this paper, we presented 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. As mobile technologies and services continue to develop, understanding this complex issue will be a key to supporting market development while promoting vigorous competition.

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