Appendix 1

Spectrum in Competition Policy

We are often asked about the optimal number of mobile network operators in one country, but there is no 'magic number'. In particular, it is not a foregone conclusion that four mobile network operators should exist in a market. Indeed, in some analysis it is suggested not only that there should be four operators, but also that one of them at least should be a 'disruptive force' or a 'maverick'. Regardless, each case must be considered on its own merit. Regulators and governments considering licensing a new mobile network operator must carry out a proper market assessment.

The case studies in this booklet bring into focus the relationship between spectrum assignment and competition law. Spectrum allocation determines market structures in the mobile sector and is therefore one of the main determinants of competition policy. Every time spectrum is set aside for a new entrant, the structure of the marketplace changes. Equally, if a merger of mobile network operators goes ahead, there will be fewer operators in that marketplace, with a change to the pre-existing allocation of spectrum. At the institutional level, nothing shows the fault lines between the competition authority and the national regulator, and, in the case of supra-national enforcement of the competition rules, the national and the supra-national authorities, as allocation of spectrum.[304]

When a market has reached what a government or a regulator (the authority with the ability to assign spectrum) considers a satisfactory balance of spectrum between the existing mobile network operators, changing this balance (by a merger, or by secondary trading) may give rise to difficulties. Operators may well seek to merge to counter a fragmented spectrum assignment, especially in the absence of secondary trading. Indeed, two of the case studies discussed (Indonesia, Case 33, and Côte d'Ivoire, Case 51) show how, after the spectrum allocation process led to too many operators (seven in the case of Indonesia), the government itself sought to engender mergers between mobile operators. Fewer operators in a country may generate greater scale, prompt fiercer competition, and ensure investment and innovation.

In this appendix, the following will be discussed. First, can there can be said to be a 'magic number' of mobile network operators for thriving competition in any one country? Second, quite apart from the number of mobile operators, should one of them also be a 'maverick'? Third, it follows that there is a need, when deciding on spectrum assignment and specifically whether to set aside spectrum or to grant special regulatory treatment to a new entrant, to ensure that this decision is backed by a market analysis, to ensure that the marketplace will support that number of operators.

304. For example, the failed attempt by Hutchison in the UK to merge with O2 Telefonica, ultimately blocked by the competition authority with jurisdiction, the European Commission, was accompanied by public statements by the CEO of the national regulator, Ofcom, who took to the popular press to voice her opinion that the merger would lead to a substantial lessening of competition (see the interview with the Daily Mail: http://www.dailymail.co.uk/news/article-3381629/Older-mobile-phone-users-face-bills-hike-telecoms-firms-allowed-merge-watchdog-boss-warns.html. See also the article in the Financial Times: http://www.ft.com/intl/cms/s/0/be8d03c8-c67b-11e5-808f-8231cd71622e.html#axzz3yq6DXw6p). Ofcom specifically reserved spectrum for a 4th operator in the 2013 4G auction: http://media.ofcom.org.uk/news/2012/ofcom-unveils-plans-for-4g-auction-of-the-airwaves/

There is no 'magic number'

The European Commissioner Margrethe Vestager has been quoted as saying that no, the competition law authority within the European Commission, DG COMP, does not consider that four is the 'magic number' of mobile operators per country.[305] Indeed, she is right.

The magic number that everybody is concerned about is 'four'. Does every country require four mobile operators? Specifically, can 4-to-3 mergers be allowed? There is no simple answer. Every country is different and every case needs to be considered on its own merits. Within the EU, 19 countries have three mobile operators that account for more than 95 per cent of connections[306], while the remaining 9 countries are four-player markets.

It is possible that in a country with four mobile operators, one or two would find it difficult to compete, for example. In this situation, a merger between the two smaller operators could lead to fiercer competition between three operators, possibly leading to more vibrant competition than a status quo of two strong competitors and two struggling operators. Much has been discussed and many papers have been written to try and determine whether, post-merger, a country with three

Figure 52: Recent research on the effects of mergers and market concentration

Research paper	Investment effects	Price effects
CERRE (2015)	Yes	Yes
Csorba & Pápai (2013)	No	Yes
DG Comp (2015)	No	Yes
Frontier (2015)	Yes	Yes
Houngbonon (2015)	No	Yes
Houngbonon & Jeanjean (2016a)	Yes	No
Houngbonon & Jeanjean (2016b)	Yes	No
HSBC (2015)	Yes	Yes
Jeanjean (2015)	No	Yes

305. Margrethe Vestager, *Competition in telecoms markets*, speech at 42nd Fordham University conference, at: https://ec.europa.eu/commission/2014-2019/vestager/announcements/competition-telecom-markets_en
306. Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Finland, Germany, Greece, Hungary, Ireland, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia,
307. CERRE, 2015. *Evaluating market consolidation in mobile communications*; authored by Genakos C., Valletti T. & Verboven F., at http://cerre.eu/sites/cerre/files/150915_CERRE_Mobile_Consolidation_Report_Final.pdf; Csorba, G. & Pápai Z., 2013, *Does one more or less mobile operator affect prices? A comprehensive ex-post evaluation of entries and mergers in European mobile telecommunications markets*. 24th European Regional Conference of the International Telecommunications Society, at: http://hdl.handle.net/10419/88503; DG Comp, 2015, *Ex-post analysis of two mergers: T-Mobile/tele.ring in Austria and T-Mobile/Orange in the Netherlands*, by Aguzzoni L., et al., http://ec.europa.eu/competition/publications/reports/kd0215836enn.pdf; Frontier, 2015, *Assessing the case for in-country mobile consolidation,* for GSMA, at http://www.gsma.com/publicpolicy/wp-content/uploads/2015/02/Assessing-the-case-for-in-country-mobile-consolidation-report.pdf; Hogunbonon, G.V., 2015. *The impact of competition on the price of wireless communications services*; at http://ssrn.com/abstract=2600476; Houngbonon, G.V. & Jeanjean, F., 2016 a, *What level of competition intensity maximises investment in the wireless industry?*. Telecommunications Policy, vol. 40, issue 8, athttp://www.sciencedirect.com/science/article/pii/S0308596116300271;; Houngbonon G.V. & Jeanjean, F., 2016, *Optimal market structure in the wireless industry,* at http://ssrn.com/abstract=2668649; HSBC, 2015, *Supersonic: European telecoms mergers will boost capex, driving prices lower and speeds higher,* at http://www.orange.com/fr/content/download/33263/1086075/version/2/file/Supersonic+13.04.15.pdf; Jeanjean, F., 2015, *What causes the megabyte price drop in the mobile industry?* Journal of Industrial and Business Economics, vol. 42, issue 3, at http://link.springer.com/article/10.1007%2Fs40812-015-0013-6.

remaining mobile operators experiences more, or less intense competition. The main papers are listed in the footnote[307] and the readers can make up their mind. The following table (Figure 52) provides an overview of the papers and the two main matrices considered, namely the effects on investment, and the effects on price.

In the EU, three 4-to-3 mergers have been cleared with commitments in recent times, in Austria, Germany and Ireland. As more data become available as to the implications of those European mergers on pricing, and on quality of network coverage and speed of download, it should be possible to reach firmer conclusions but, for the present we can say the following.

When considering the impact of mergers or market structure on prices, the measurement chosen to assess prices will determine the conclusions reached on whether the mergers have led to price increases. There are broadly three ways in which prices can be measured:

- Revenue per unit (e.g., ARPU or ARPM): this tends to be easier to calculate but it is affected by both prices and usage. It also does not measure prices that are actually paid by consumers.
- Basket approach: this involves defining baskets that are representative of consumer usage and calculating the cost of consumption. This can give a better indication of what consumers actually pay but the prices that are estimated are sensitive to basket composition. In some studies, baskets have overestimated price by over-representing voice and SMS and underrepresenting data usage.
- Unit price: this involves estimating the unit price for voice, SMS and data that is paid by the consumer. Due to the manner in which mobile services are bundled together, this approach is difficult to implement analytically.

It is important that any analysis of pricing carefully consider the method of measurement and that any conclusions take into account potential limitations.

It is also necessary to take into account any improvements to quality of service (e.g., network coverage, download speeds etc.). On this aspect, it is instructive to consider the two reports issued in 2016 by the Austrian regulator and the Austrian competition authority, to see how the same facts can lead to different conclusions, and to see how still, regulators and competition authority seem to maintain a very narrow focus on the price of services after the merger (see Case 53 below).

In conclusion, there is therefore no magic number and no shortcut to a proper market analysis. For the purposes of this Appendix, it suffices to note that three of the most competitive markets in the world, namely South Korea, Japan and Australia, only have three mobile operators.

Figure 53: Recent research on the effects of mergers and market concentration

Austria: what happened there?
Year: 2016, 14 March
Authority: Austrian regulator: RTR (2016); Austrian Competition Authority: BWB (2016)

Documents:

- Ex post analysis of the merger between H3G Austria and Orange Austria; report by the regulator, RTR.
- The Austrian Market for Mobile Telecommunications Services to Private Customers, report by the competition authority, BWB, following a sectoral inquiry.

Chronology:

- November 2012 - H3G sold Orange's brand 'Yesss!' to the incumbent operator A1 Telekom Austria (TA); the transaction was cleared by the Austrian Cartel Court without commitments.
- December 2012 - the European Commission clears the acquisition of Orange Austria (Orange) by Hutchinson 3G Austria (H3G), subject to commitments.
- 14 March 2016 - the competition authority, BWB and the NRA, RTR, publish a report on the merger effects of the merger on the same day.

Background:

The merger between H3G Austria and Orange Austria and the related merger between Telekom Austria and Yesss! drew criticisms by both the RTR and the BWB. Both authorities expressed concerns about the effects of the merger on prices of mobile communications, going forward.

Both authorities concluded that the prices of consumption baskets across different market segments have increased following consolidation.

- RTR (2016) finds price increases from 22% to 90% for traditional and smartphone users, respectively;
- BWB (2016) finds increases of 14 to 30% depending on the type of tariff (pre- and post-paid; SIM or contract-only).

Figure 53: Recent research on the effects of mergers and market concentration

Analysis:

- Price Metrics
  - › The service mix in each basket considered in the RTR report is based on consumption patterns before 2013;
  - › The proportion SMS:voice:data per basket is kept constant over time: it is likely to underestimates the weight of data consumption; and
  - › RTR considers a single price measure for each country, using a single basket, averaged across operators. This approach is likely to understate consumer choice of tariffs and will not reflect the actual prices paid by a large number of consumers, which will vary considerably depending on preferences.
- Effectiveness of remedies not taken into account

Both studies analyse pricing until the end of 2014, which is before the MVNO remedy became effective. BWB refers to the fact that prices as measured are in fact decreasing following the implementation of the remedies, and in particular the introduction of MVNOs. "*In 2015 (not pictured) several mobile virtual network operators (MVNOs) entered the market, and according to the price index by the telecoms regulator RTR, prices started to decrease again.*"

Areas for consideration:

- The choice of metrics and baskets is key to this type of analysis. Houngbonon (2015) and HSBC (2015) find that the price per bundled megabyte in Austria has fallen as a consequence of H3G/Orange, whereas the price per minute of voice has increased (Houngbonon: 19% price decrease in the unit of bundled data; HSBC: estimates -0.83 USD cents per megabyte).
- If a merger is cleared subject to commitments, the authorities have considered that the commitments can address the issues identified. It is important therefore to take into account the impact of the remedies imposed when assessing the effects of a merger in a country.
- What happened to investment and quality of service in Austria? Since the merger took place, the merged entity has rolled out an LTE network which Hutchison predicted would be one of the by-products of this merger. Again, neither the competition authority, BWB, nor the regulator, RTR, have considered this aspect in their reports.

The role of the 'maverick'

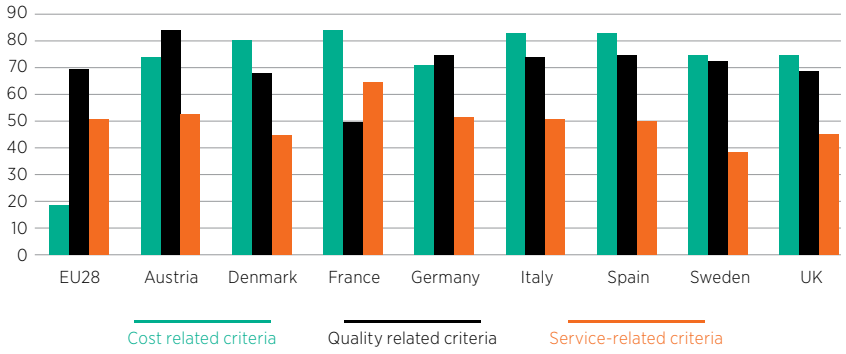
It is sometimes said that it is not only the number of operators that is relevant but also the fact that at least one of them should be a disruptive force,[308] usually have lower prices for mobile telephony services than countries where this is not the case. This is an uncontroversial finding: if the intended result is to achieve lower prices, it is not just the number of operators that matters, but also the fact that one of them at least should be a maverick, or a disruptive force. There are a number of points to make concerning these conclusions.

First, it appears the regulators and competition authorities continue to focus almost exclusively on *the price* of mobile services. Indeed, Ofcom states: "*we do not test for the impact of disruptive firms (or the number of firms) on investment incentives but we do appreciate that the sustainability of disruptive strategies must also be considered*".[309] At the GSMA, we believe that a narrow focus on price, without a proper assessment of sustainability, potentially leads to the wrong regulatory results.

Second, although price is a very important consideration, consumers need value for money. Research by the GSMA shows that quality, in the form of speed of downloads and roll out coverage, are also important factor for consumers. If the disruptive strategy leads to lower prices and lower investment, or is not otherwise '*sustainable*', this could be an issue.

Survey evidence produced by the European Commission illustrates the importance of quality to consumers. Figure 54 below shows that for Austrian and German consumers, quality-related factors are already more important than price-related factors. Furthermore, network quality will become even more important in the future.[310]

Figure 54: Consumer outcomes — what do consumers care about?



Source: E-Communications and the Digital Single Market (May 2016).
Consumers were asked "When subscribing to an internet connection what are the main factors you consider? Firstly? And then? (Maximum 4 answers)". Numbers represent the % of respondents that mentioned criteria related to cost, quality and service

308. At the height of the debate in the UK concerning the intended merger between Hutchison and Telefonica O2, Ofcom published a paper in which the UK regulator considered this point and reached this conclusion. In competition law parlance, Ofcom's disruptive force is often referred to as a "maverick", i.e., usually a smaller operator that enters the market and seeks to increase its market share by offering very competitive deals http://stakeholders.ofcom.org.uk/binaries/research/cross-media/disruptive-firms-econometrics/research_document.pdf
309. Ibid, page 2
310. European Commission, 'Full synopsis report of the public consultation on the needs for internet speed and quality beyond 2020'. https://ec.europa.eu/digital-single-market/en/news/full-synopsis-report-public-consultation-needs-internet-speed-and-quality-beyond-2020

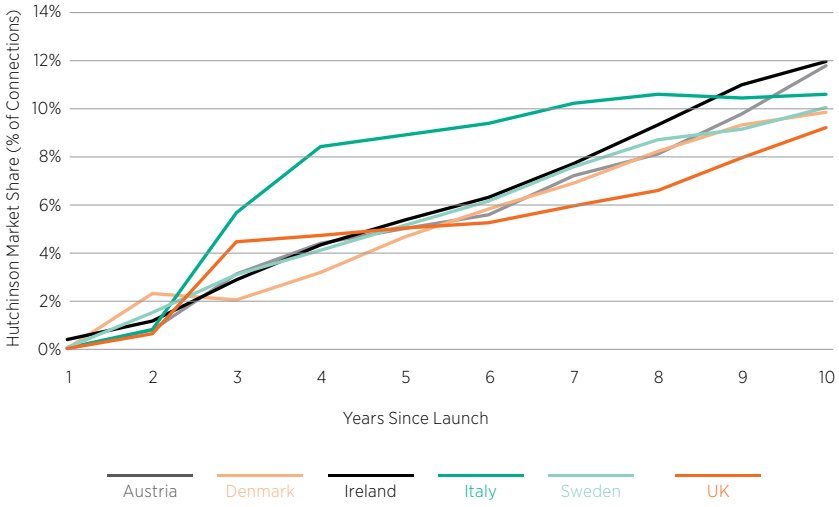
Third, if the analysis of disruptive pricing should take into account sustainability, it should perhaps consider whether prices may increase relative to a low, perhaps *unsustainable* starting point. This may have been the case in Austria (see Figure 53). Furthermore, price increases may be necessary to enhance investment and innovation. Regulators and competition authorities generally stress the importance of a framework that promotes investment, which is welcome, but this means that non-price factors also need to be given equal weighting and considering when assessing competition in the market. Furthermore, when a competition authority looks at mergers, an increase in price is often presumed whereas the merging operators are required to prove that the savings and revenue increase that they hope from the merger will materialise and be reinvested within a short time scale and to prove that there are no less disruptive means to achieve the intended result. This means that, in practice, price ends up being the main focus. This is explained in the Competition Policy Handbook.[311]

Fourth, as Ofcom acknowledges,[312] the conclusions hold if the maverick can continue to be a maverick indefinitely. In fact, this cannot be. The reason why the new entrant or the smaller operator offers very competitive deals is because it seeks to scale up, in order to be able to compete. If this does not happen, then the maverick at some point will have either to exit the market, or to seek to scale up by merging with a competitor. Although regulators, "*are keen to protect disruption to retain the consumer benefits associated with [market disruption]*",[313] no amount of regulatory intervention can achieve this. After a regulators or a competition authority have blocked a merger, that does not of course guarantee that this regulatory intervention will in any way "*protect disruption*".

Finally, research by the GSMA (Figure 55) shows that after 10 years since entry, Hutchison had achieved on average a 10% market share in the countries listed. Seen in this light, it may not be a coincidence if Hutchison is seeking to scale up by merging, in Europe. In other words, at some point the fundamental scale economies dominate, making the maverick strategy unsustainable. Then regulatory intervention to block efforts by the maverick to scale up can be counterproductive.

311. Quoted. See the contribution from Telecoms Italia, *Mobile to Mobile Mergers in the EU – Analysis.*
312. "disruption is generally motivated by a drive to increase market share to compete more effectively in a market," *ibid*, page 4
313. Ibid, page 3

Figure 55: The maverick will not be a maverick forever



More operators does not mean more competition

How did Indonesia end up with seven (nine including the BWA licensees) mobile operators? (see Case study in Figure 33). What happened in Côte d'Ivoire? (see Case study in Figure 51). History does not record but there are many reasons why governments or regulators may seek to license increasing numbers of mobile operators. Seeking to maximise revenue from auction is an obvious reason to increase the number of licences granted but in a number of cases the reasons are more nuanced. Spectrum allocation is often seen by regulators as a way to facilitate the entry of new players in a market, with a view to stimulate competition. However, GSMA research demonstrates that the majority of new entrants that launched services since early 2010 did not impact the competitive structure of their respective markets, in turn showing that the success and lifespan of new entrants depends on a number of factors that are not always properly considered in the regulatory process, and should be.

The need for a market assessment before spectrum allocation

The Competition Policy Handbook includes details of the way in which a proper exercise in market definition and market assessment should be carried out for the purposes of competition law and SMP regulation. In this Case Study booklet, more details are provided about the practical application of a proper SMP analysis, and in Appendix 2 below there are flowcharts illustrating the process in diagrammatical form.

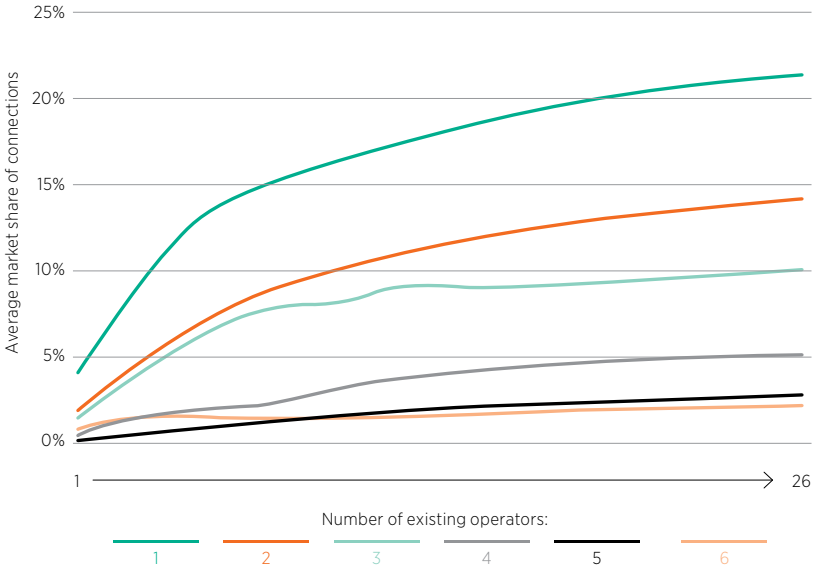
A similar process should be undertaken when considering whether to go to special lengths to facilitate entry by a new mobile operator. The regulator or the government should be clear about the reasons to license a new licensee. This is similar to identifying the market failure or consumer harm that regulatory remedies are designed to address, in regulation.

First, there should be a market and competition assessment. How many competitors are already in that market? Is the market working well for consumers? How is the market expected to develop?[314] What is the market failure that the introduction of a new operator will address? It is also important to consider the potential trade-offs between different types of economic efficiency. Due to the substantial amount of fixed costs involved in building and maintaining radio access networks (RANs), overall costs will be lower with a smaller number of RANs. On the other hand, if fewer operators result in a reduction in end-to-end network competition then this is less likely to be efficient in allocative and dynamic terms. Regulators should therefore assess the impact on each of these when considering the merits of promoting the entry of an additional operator and engage the stakeholders in a dialogue before acting. As this is a complex task that involves judgment calls, best practice is to engage with stakeholders as part of a transparent public consultation.

Second, if the market failure identified is for example failure to roll out a network in rural areas, it would be important to understand the reasons why this is so. There are many factors that contribute to the successful roll out of a network. As shown in Figure 56, the number of existing players in the marketplace at the time of launch of a greenfield operator is a significant indicator of its ability to grow market share.

314. Compared to a typical market review, a competition assessment for spectrum allocation may need to consider a longer time period because the award is will shape the competitive structure of the mobile sector for many years.

Figure 56: Number of existing operators at the time of launch is a determinant of success



Source: GSMA Intelligence

Further, the GSMA has identified the following important factors,[315] alongside availability of spectrum:

- the ability to invest in network deployments in order to rapidly reach nationwide network coverage;
- the facilitation of access to public building and the removal of other obstacles to support network deployments;
- incentives for infrastructure sharing; and
- the financial backing to sustain marketing campaigns.

Infrastructure costs and the legal regime are critically important to network deployment.

In light of the infrastructure costs, would a new entrant have access to investors' money? Would investors consider the specific market? The legal regime must be conducive to competition among the intended number of operators. This includes not only a predictable and sound regulatory regime, but also a system allowing for access to sites for network deployment, for example.

If the competition assessment suggests that the mobile market is currently not working well for consumers, for example if prices are too high and/or if quality of service is poor, then once again the regulator should assess the evidence to understand why this is the case and consider the merits of each policy option

315. Ibid., page 3

that could remedy the problem identified. Setting aside spectrum for an operator could be one option but there are also likely to be others, for example around network access (for MVNOs) or quality of service obligations. If high prices are primarily driven by consumer inertia and a lack of engagement when choosing a mobile service (which may result in consumers not choosing optimal tariffs) then a more targeted and proportionate remedy could involve improving consumers' access to information and making it easier to switch operator.

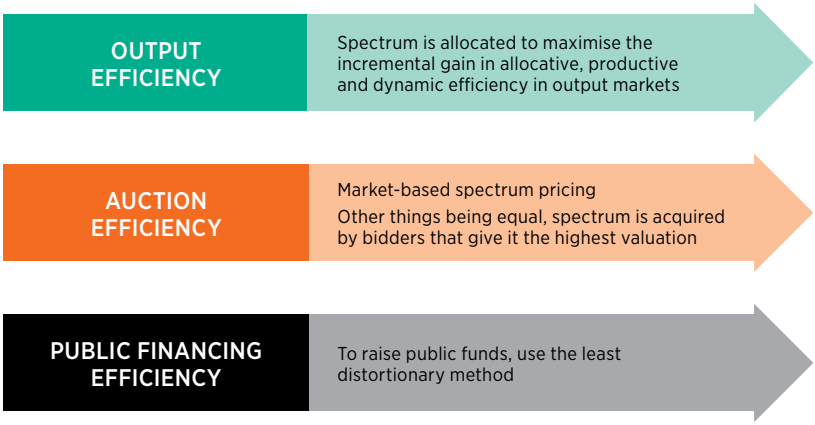
If availability of spectrum is a crucial factor, it is important to consider whether the spectrum to be made available will be (i) sufficient; and (ii) the 'right spectrum', achieving the right balance between lower and higher bands. Each new technology generation uses wider channel bandwidth, as well as improved spectrum efficiency to drive faster connection speeds. This means that they use increasing amounts of spectrum, making the need for new mobile frequency bands essential. For example, a 2G channel is 0.2 MHz wide, a 3G channel is 5 MHz wide and a 4G-LTE channel can range from 1.4 MHz to 20 MHz wide — the fastest 4G-LTE services are only possible with the wider channel sizes. The most recent types of 3G and 4G-LTE networks are capable of providing users with especially fast speeds by combining several channels together, making them even more reliant on large amounts of spectrum. It is also important to take into account that mobile operators in a given market will often focus on a particular set of services or customer segment - for example focusing on the delivery of a very high-quality service (e.g., high download speeds and latencies) at higher prices in more urban areas. Another operator may target consumers that prioritise budget over quality. Such differentiation is a common feature of competitive markets and should not be discouraged, either deliberately or unknowingly (for example by trying to ensure that operators have similar amounts of spectrum overall or that each operator should have spectrum in every band).

Third, having identified the market and the issue (the 'market failure') if a government or regulator decides to encourage a new entrant into the market, there needs to be a decision about how this is to be achieved, about the remedy to be imposed.

Auction design

An efficient way to ensure that spectrum is assigned with proper consideration of the implications for competition is through careful design of auction rules. In some countries, it is as if the term 'auction' has become confused with a method of assignment that implies granting spectrum to the highest bidder, without proper consideration of the other goals of spectrum assignment. Our analysis shows that this may be the case especially in countries across Africa. This is not the case. Figure 57 highlights three main types of efficiency that should be sought through the design of the assignment mechanism. The most important from an economics perspective is output efficiency: spectrum is assigned to maximise the intended output. This can range from roll out to rural areas; to ensuring that the operator is best placed to make use of the scarce resource. However, auction efficiency is an important consideration to ensure that the cost of spectrum reflects a fair market price, and there is an aspect of public financing efficiency that should not be ignored (but controlled). Auctions do raise public funds but it is important that this aspects does not become the driver in the auction design. Public financing efficiency should be carefully considered to ensure that the least distortionary method is used for raising funds.

Figure 57: Efficiency in auctions



Different models are employed to ensure both access to spectrum as well as facilitation of entry conditions, but each have trade-offs. Examples include:

- the use of spectrum caps
- set-asides of spectrum for the new entrant
- different network deployment and coverage requirements for the new entrant
- obligations imposed on incumbents or established operators to provide facilities sharing (such as access to infrastructure) and national roaming at regulated prices
- facilitation to access public buildings for site and cell towers allocation.

In Figure 58 below, an example is given of two mirror image potential market failures that can occur at the time of a spectrum auction (the larger operators obtain too much spectrum/ the smaller operators do not have enough spectrum) with the possible remedies and the regulatory risks associated with these.

Figure 58: Possible remedies and regulatory risks associated with them

Market failure	Possible remedy	Regulatory risk
Significant market power - larger operators may obtain the majority of spectrum.	Spectrum caps.	Setting appropriately sized caps is difficult. Setting caps too low could distort the market. The larger operators may be both the highest-value users and the users with the best incentive to maximise use.
	Obligations relating to coverage or network sharing.	If obligations have a material impact on operators' returns, this could affect incentives to invest.
Smaller operators do not have enough spectrum to be credible.	Spectrum set-aside. Spectrum floors.	Setting spectrum reserves is difficult. Reserving too much spectrum could distort the market. The smaller operators may not be the highest value bidders and may be unable to maximise spectrum use. Could choose the wrong spectrum to reserve. Set aside could be restrictive if different types of smaller operators have different spectrum requirements.
	Bidder credits	Setting the credit at the correct amount requires detailed data. If it's too low, smaller operators or new entrants may not obtain any spectrum. If it's too high, then the outcome is effectively pre-determined.

Only after the analysis, and only if the market failure to be addressed is capable of being dealt with by spectrum allocation, having considered all factors, should special measures be employed to license a new operator. Failure to do so can have negative consequences for the market, for the new entrants in question and for the regulator itself, leading to waste of time and resources, and possibly also reputational damage.