Final report for Ofcom

Assessment of the UK mobile sector

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Contents

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1 Executive summary

1 Analysys Mason is pleased to present Ofcom with this final report, which forms part of Ofcom's Mobile Sector Assessment (MSA). Ofcom's MSA process will seek views on whether the current UK regulatory framework should be revised in the light of ongoing changes within the industry.

2 This report presents four possible scenarios for the evolution and development of the mobile industry over the next ten years, and highlights the possible implications of these scenarios for market players and for the UK regulatory framework. The scenarios have been developed based on an understanding of current industry trends and developments that appear likely to have a significant impact on the industry. This understanding has been built up on the basis of secondary data collection, wide-ranging discussions with major stakeholders within the industry, and on consultation between experts from Analysys Mason and Ofcom.

1.1 Status of the industry

3 The UK mobile industry continues to deliver considerable benefits to the UK economy[1]. Total UK service revenues for the four largest operators[2] have grown from GBP13.2 billion in 2002 to GBP18 billion in 2007. The total number of active subscriptions has risen at 9% per annum since 2001, to reach 73.2 million or 120% of the population in 2007. Traffic volumes are rising across voice, messaging and data services, as consumers increase their use of mobile telephone networks.

4 Despite ongoing revenue growth, average operator EBITDA has fallen from a peak of over 30% of revenue in 2004 to 25% in 2008, and there is little indication that this trend is likely to be reversed. While revenue per capita has risen over the last few years, ARPU (the average monthly revenue per SIM) has fallen. Operators have continued to invest significantly in distribution, subscriber acquisition and network development, contributing to higher costs. Stakeholders have claimed that operators in the UK mobile market have amongst the lowest EBITDA levels of any international market.

5 A number of other key trends characterise the market:

- Voice traffic continues to move from fixed to mobile networks. Over the last eight years the average number of (fixed plus mobile) call minutes per user has grown by 1.4% per annum. Over the same period, the average number of mobile call minutes has risen by 15% per annum while the average number of fixed call minutes has fallen by 3% per annum. Tariff and price basket analysis suggests that this trend has been driven by the perceived fall in the cost per minute of calls from mobile networks (in reality, more minutes for a given price). Research

[1] Ofcom report on the "Economic impact of the use of radio spectrum in the UK" by Economic Europe, November 2006

[2] Vodafone, T-Mobile, Orange and O2

conducted by Ofcom[3] suggests that utilising all of the available minutes in a call bundle is the primary reason for callers choosing to use mobile handsets.

- Mobile data services have seen dramatic growth in the last twelve months. Laptops that are equipped to use mobile broadband services (via HSPA and USB dongles) have driven data traffic volumes up markedly. H3G reports signing up 500 000 dongle customer in the ten months to July 2008. This has been accompanied by a 700% increase in data traffic throughput between September 2007 and March 2008. Industry sources suggest that at least two UK networks are now carrying more data traffic than voice traffic.

- Users of smartphones are exhibiting a strong propensity to access the Internet from mobile handsets. Research from M:Metrics suggests that in the USA 85% of iPhone users and 60% of all smartphone users access the Internet over their mobiles. The BBC reports that its mobile Website received 2.8 million unique monthly visitors (in comparison to 17 million visitors for its standard Internet site). Of those users accessing the mobile site, 40% were users only of the mobile site.

- The need to support growth in data traffic is now driving operators' strategies for network investment. Operators have been making investments in the air interface (specifically HSPA) to support high-speed data traffic. This investment is likely to continue as the planned re-farming of 2G spectrum and other spectrum awards (including the 2.6GHz expansion band and digital dividend spectrum) provide opportunities to increase the capacity of the air interface. At the same time, major investments are already being made to upgrade backhaul capacity between Node Bs and radio network controllers (RNCs), as it is currently this link in the network that represents the constraint on end-to-end bandwidth for consumers.

1.2 Current industry value chain

6 In our value chain analysis in Section 3.2, we have broken down the major functions that are provided by the vertically integrated mobile network operators (MNOs) and separate third parties. Specifically we consider the network operator function (i.e. the holder of the network licence and spectrum rights) separately from the functions of service provision and distribution. This reflects the presence of both mobile virtual network operators (MVNOs) and independent distributors in the market.

7 The key market trends identified above are having a significant impact on the industry value chain. Our findings suggest that the network operator function continues to maintain the strongest position in the value chain as it is able to exert considerable pressure on suppliers by virtue of its control of national network infrastructure assets and the spectrum which those assets use to

[3] Research conducted by Ofcom in February/March 2008, and published in its Mobile Sector Assessment consultation document in July 2008

provide connectivity services. Such assets present high economic barriers to entry for new players and limit the power of customers to select substitute products at a lower price.

8 It is also apparent that the power of independent distributors has increased. This is due to consolidation in the sector, continued high churn, and users' propensity to make use of retail distribution channels. However, mobile operators are seeking to balance this power by expanding their own direct sales channels including retail outlets and online presence.

9 As mobile broadband services proliferate, certain content players and application developers will be able to exert a degree of control over premium-price content delivered through the mobile channel. However, this control will be constrained by the abundance of entertainment content in particular, and restricted to a small number of leading players.

10 With continued innovation in device development, and users continuing to view handsets in part as fashion items, some device vendors are able to exert significant leverage in the value chain. However, MNOs' control over significant parts of the distribution channel will limit manufacturers' power to dictate the price and configuration of handsets.

1.3 Scenarios

11 Four distinct scenarios have been developed as part of this work:

- **Scenario 1: 'Steady as she goes'** represents a base case for market evolution constructed under the assumption that there are no major changes to market conditions or significant deviation from currently observed trends. In this scenario, the profitability of major players continues to decline as increasing investment is made in distribution to maintain market share. There are no new entrants in infrastructure and the value of the industry declines as a proportion of GDP.

- **Scenario 2: 'Mobile voice wins'** explores a world in which the substitution of voice traffic (and revenue) from the fixed network to mobile network accelerates. In the short term, industry revenue grows at the expense of the fixed network with a 'free home-call' proposition (delivered in part via femtocells) helping to secure additional traffic. However, this proposition simply delays (rather than reverses) the eventual decline in revenues. With high voice traffic and falling prices, this scenario results in the lowest MNO EBITDA margins of the four cases considered.

- **Scenario 3: 'Internet on your mobile'** considers the situation in which significant numbers of users start to consume large volumes of Internet-based content and services on mobile handsets, rather than on laptops (which are currently fuelling growth in broadband data traffic). This change in behaviour is assumed to occur under a market structure that is largely unchanged from today. The only significant variation is the assumption that MNOs will seek to support their deployment of this proposition by developing (either through partnership or strategic alliance) a presence in fixed broadband service provision. Under this scenario the

industry grows in nominal terms, and significant opportunities arise for content players, application developers, and equipment and handset vendors. Deployment of this new value proposition delays the decline in operator margins for significantly longer than the previous two scenarios.

- **Scenario 4: 'SIMs everywhere'** examines a world in which a wide range of new, connected devices and applications are developed and delivered to market by MNOs and a range of other parties. In this environment, the relationship between the use of mobile connectivity and the user changes significantly from today's norm. Third parties (including car manufacturers, insurance companies, media players, systems integrators, and healthcare organisations) offer 'connected' applications without the user entering into a direct relationship with the MNO that carries the traffic. This outcome requires significant evolution of the market as it is seen today, and is contingent upon a number of other developments in the market. The industry enjoys significant market growth under this scenario, with operators, traditional content players, and application developers all benefiting. Other industry sectors outside the telecoms industry also see significant benefits through the additional value and increased efficiencies that new, mobile, connected applications bring to their respective fields. Margins rise significantly for MNOs under this scenario on the assumption they participate to a limited degree in the additional value associated with the provision of connected services. This scenario is the only case where industry retains its value as a proportion of GDP (Figure 1.1).

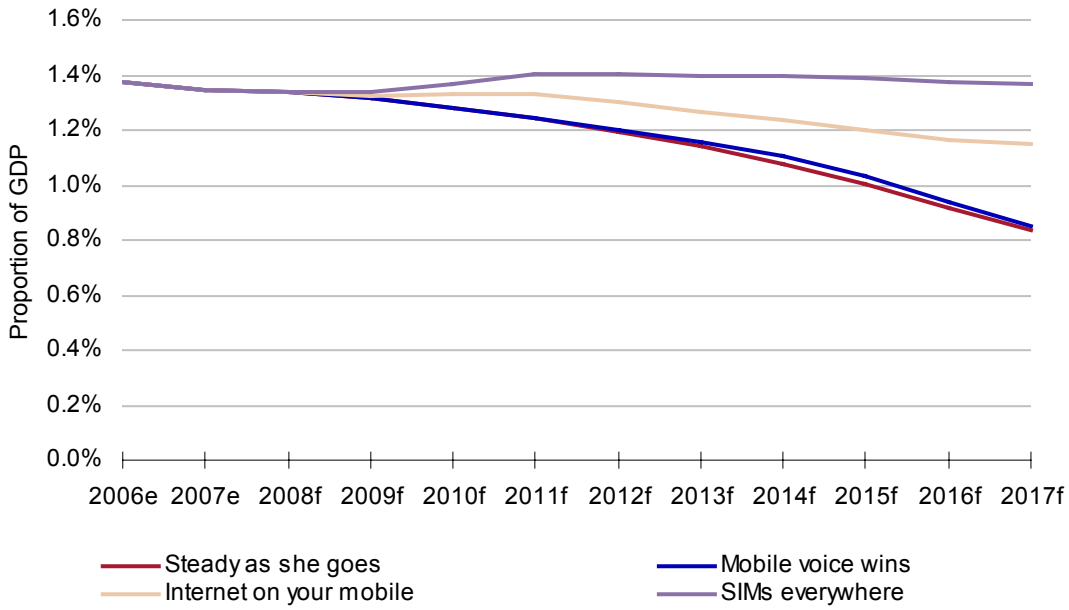

Figure 1.1: Revenues from mobile services as a proportion of GDP [Source: Analysys Mason]

12 Each of these scenarios is predicated on certain developments and trends in the market and in consumer behaviour.

- Termination rates are assumed to fall in all cases. Increases in data traffic as a proportion of total network traffic will drive down termination rates under the current rate-setting methodology. We have assumed different degrees of decline depending on the traffic volumes projected under each scenario.

- In the short term, investment in backhaul capacity will rise significantly as backhaul networks are upgraded to cope with the rise in traffic. Given the current economics of backhaul services, it is likely that operators will install (or have installed) capacity sufficient to match projected air interface developments.

- Femtocells are assumed to play a role in three out of the four scenarios. While not a prerequisite for these three scenarios, discussions with industry players suggest that there is significant potential for these devices to extend current mobile propositions in conjunction with fixed network operations and in so doing significantly reduce network costs. Nonetheless, the deployment of this technology is dependent on the resolution of technical and proposition development issues. Should femtocells prove not to be viable, the aggregate capacity of mobile networks will be lower and the costs of delivering capacity are likely to be higher than would be the case for a network that includes femtocells. As a result, we might anticipate a slowing of demand for new converged propositions as envisaged and reductions in MNOs' margins.

1.4 Conclusions

13 In creating and examining these four scenarios a number of issues have become apparent.

- **Consumers are putting increasing value on broader aspects of the mobile service experience beyond voice and text communications.** Use of mobile handsets for media services, and take-up of new connected applications for individuals is increasing. It is possible – but by no means certain – that significant numbers of consumers will start to access standard Internet content and applications via their mobile handsets. This trend provides an opportunity to forestall declines in industry value that are likely to occur without further development of the mobile proposition, and may open up significant growth opportunities for some market players.

- **The nature of the mobile network cost base is undergoing significant transformation** as a consequence of the increased migration of users and traffic to 3G networks, with the planned re-farming of spectrum used for 2G, and with an increasing focus on investment in distribution**.** Historically, operator costs have varied significantly with traffic as well as subscribers; increasingly, network operator costs are dictated by the number of subscribers signed up to a network rather than the traffic carried. This change is a key enabler for value-added opportunities to be realised, and steps should be taken by market players and the regulator to support and accelerate this transition.

- **Evolution in the structure of the mobile value chain is likely**. Revenues from mobile services are increasingly likely to be retained by content players, application development functions and distribution. The current squeeze on network equipment vendors is likely to accelerate, and changes in the relationship between MNOs and consumers may occur. Players from outside the industry may play an increasing role in the delivery of a wide range of mobile-enabled applications to consumers. In many respects, these changes represent a natural evolution for the market. Our analysis would indicate that the greatest value will be realised by all parties within the mobile 'ecosystem' and by the UK economy as a whole through embracing and, where possible, working to accelerate those changes.

- The current UK regulatory framework governing the delivery of mobile services was established to promote competition in infrastructure-based services that were delivered solely through mobile communications networks. With the increased focus on service and applications, and the move towards consumption of content and use of applications by consumers across multiple networks and devices, **adjustments to the UK regulatory framework are likely to be required** if the benefits of the emerging trends are to be fully realised**.**

1.5 Implications for the UK regulatory regime

14 From our analysis, a number of implications for the regulatory framework emerge as a result of changes within industry.

Termination rates

15 It is clear that there is a requirement for further work on termination rates. As discussed, the general direction of changes in termination rates is clear but the precise impact of the trends observed is poorly defined. We would suggest it is important to develop that understanding to inform further debate on how rates and the regime will evolve.

16 The current termination rate regime should be able to function in the data-centric worlds envisaged in this work. However, this study has also highlighted the sensitivity of the nature of the propositions offered, and the financial performance of the MNOs, to the level of voice termination rates. As the industry becomes increasingly focused on data, the question will arise as to whether a new regime is appropriate, particularly if the market moves to products offering all-inclusive voice and data bundles. We suggest that industry players – including Ofcom – look to prepare for this debate and be ready with views on how the system should evolve.

Regulation of the content market

17 The current content regulation regime is already highly complex and struggling to adapt to the current environment, and will be put under potentially untenable pressure by the data-centric scenarios. The complexities of jurisdiction and applicable code that arise from the distinctions currently made between broadcast, Internet, and mobile content, and between content that is paid for via a mobile bill rather than by other means are enormous.

18 Consumers will seek to consume the same content via multiple devices and different telecoms services provided by integrated players. They make simple choices to view content on a mobile handset versus a laptop, and whether to pay for services on a credit card or via their mobile bill. These apparently straightforward choices inevitably give rise to major inconsistencies in the legal treatment of a 'content consumption event'. Major barriers to market development may come about as a consequence of these inconsistencies, and how operators, independent service providers, and content players react to them (and indeed the costs that operators incur in understanding the different regimes and identifying those inconsistencies). Rationalisation of mobile content regulation in light of ongoing convergence is essential.

19 The treatment of personal data – particularly under the environment envisaged under the 'SIMs everywhere' scenario – raises a series of difficult questions. The sharing of authentication, location, and presence data between MNOs and third parties has the potential to deliver significant benefits to consumers via a wide range of applications. However, this also raises questions over the ownership of such data, the right to determine how this data is used, what the scope of those rights are and how ownership rights and privacy rights of the individual to whom the data relates should be protected. The stakeholders we have approached as part of this work appear to have no immediate answers to these important questions of personal data protection. On the contrary, there is a clear need for a debate on those issues to be addressed.

Impact on demand for spectrum

20 Developments in air interface technology, coupled with planned 2G spectrum re-farming and new spectrum awards (e.g. 2.6GHz and digital dividend spectrum) should increase significantly the air interface capacity of existing mobile networks over the next three to five years. Our analysis suggests that these additional spectrum allocations may well be able to support projected traffic demand for mobile voice and broadband services for the foreseeable future. Our discussions with industry players also suggest that the barriers to market entry for players offering two-way mobile broadband services are significant. Both infrastructure build-out costs and the need to establish national distribution channels to market present major obstacles in a maturing market. The strategies being followed by The Cloud, UK Broadband and Freedom4 demonstrate the challenges of delivering a national retail mobile broadband proposition in direct competition to the incumbent MNOs. As a result, we anticipate that the nature of demand for spectrum in the UK will change with greater emphasis being placed by new players bidding for spectrum on new uses, rather than on seeking to acquire spectrum to compete head-on with the existing MNOs.

21 We also note that in the short term, it is the Node B-to-RNC backhaul networks that are likely to represent the bandwidth bottleneck within mobile networks. As microwave is likely to form an important part of the solution to this bottleneck, demand for fixed link spectrum is likely to increase as MNOs seek to match backhaul capacity to installed air interface capacity.

22 It is also apparent from the flow of funds analysis that there is a general shift towards content becoming the source of added value for the consumer. This trend is encouraging competition between market players at that level at the expense of competition based on infrastructure (albeit one that occurs at varying rates in different scenarios). In this environment, we would observe that spectrum is a less significant consideration to operators than other issues, including proposition development, investment in retail distribution, and the development of appropriate and positive commercial relationships with content players and application developers.

Increasing regulatory focus on services and content

23 The UK mobile regulatory framework seeks to further the interests of consumers through establishing competitive and efficient markets in mobile communications services. Historically, regulatory measures used to achieve this goal have focused on infrastructure and infrastructure operators, as the services offered have been closely tied to the capabilities of that infrastructure.

24 The evidence of the last twelve months suggests that the industry has started a transition in which the nature of the services delivered over mobile is changing. Ubiquitous mobile broadband access is changing the nature of the mobile proposition. Development of new applications based around mobile IP connectivity, and widespread access to 'real' Internet-based services appear likely to offer considerable additional value to UK consumers and businesses. In taking up mobile broadband services, laptop users are starting to use mobile networks to consume the services and content they previously accessed over fixed networks. Research suggests that, with the proliferation of smartphones, the same thing may well happen with content consumed on mobile handsets.

25 In the event that this trend accelerates, our analysis suggests that the greatest benefits to consumers, market players, and the UK economy as whole is likely to arise through the development of applications and content that take full advantage of the evolving capabilities of mobile broadband networks. The same analysis suggests that the benefits of competition solely from the entry into the market of additional broadband infrastructure players per se is limited.

26 Given this finding and given issues raised over the complexity of content regulation and consumer protection in a converging world, a fundamental question arises as to whether the focus of UK regulation should now shift from infrastructure-based competition towards encouraging the development of non-voice converged services.

27 We do not in this work presume to suggest how such a shift might be appropriately enacted but we would recommend Ofcom raises this as a fundamental issue within its consultation and seek responses as to whether for example Ofcom should:

- play a more active role in working with other government bodies to set a consistent and coherent framework for content regulation and protection of consumer rights in this new mobile broadband world
- focus more on ensuring wholesale infrastructure markets open up more quickly to encourage application development
- take steps to proactively adjust mobile termination rates to respond to the rapid changes in network traffic that are now taking place
- seek new roles to encourage innovation and service development in this new environment.

28 The broader question is how best Ofcom can continue to fulfil its remit in a mobile environment that is changing fundamentally: data traffic now exceeds voice traffic on some networks. How the UK should respond to this change – which has occurred in the last nine months – and how it should establish an environment for future growth is a question that warrants serious consideration by all stakeholders within the industry.

2 Introduction

29 We are pleased to present to Ofcom this final report on our assessment of the mobile communications sector in the UK. This work has been completed as part of Ofcom's 2008 consultation process that seeks views on whether Ofcom should revise its approach to regulation of the mobile sector in the light of changes that are taking place within the industry.

30 Ofcom commissioned Analysys Mason to conduct a scenario development exercise to feed into a mobile sector assessment (MSA) consultation during 2008. In conducting this assessment, Ofcom hopes to:

- consider possible approaches to the future regulation of the mobile communications sector, including scope for the promotion of competition and reduction of regulation
- define principles informing its work for the next phase of market development.

31 The market developments under consideration include: convergence, spectrum release and liberalisation, infrastructure sharing, new entrants, disruptive technologies and consumer protection issues. This assessment will not revisit decisions Ofcom has already taken, but will look forwards to future developments.

32 Our work has been undertaken in four major parts:

- We have undertaken desk-based research into the current state of the industry reviewing publicly available documents from key industry players together with commentary and opinions expressed by industry observers.
- We have interviewed representatives from twenty major industry stakeholders including the five largest mobile network operators, MVNOs, new infrastructure players, equipment vendors, handset manufacturers and content players.
- We have consulted internal stakeholders within Ofcom to understand issues of particular concern to the regulator.
- Based on the outcomes of the above process, we have developed four scenarios that explore possible evolution paths for the mobile industry in the UK, highlighting key enablers and trends and exploring the outcomes and implications of those evolutionary paths.

33 The study covers the mobile telecoms market including any service delivered by radio-communications[4]. We have developed four scenarios, focusing on those trends that have the highest degree of uncertainty and the greatest potential impact on the development of the industry.

[4] This is in line with the definition set out in the Mobile Sector Assessment Project Guidelines published by Ofcom on 7 February 2008

34 These scenarios provide insight into the dynamics of the sector and how different players in the value chain may fare under different assumptions.

35 The remainder of this document is laid out as follows:

- Section 3 describes the current UK mobile market and identifies the key trends affecting its development.
- Section 4 provides an overview of the scenarios developed as well as their implications for the different actors in the value chain.
- Section 5 presents a summary of our key conclusions and implications for the mobile market.

36 The report includes a number of annexes containing supplementary material:

- Annex A provides details of the quantitative modelling approach and the assumptions used.
- Annex B includes an overview of the modelling approach for our analysis of the flow of funds.
- Annex C contains transcripts of interviews with stakeholders within the industry. This Annex is confidential to Ofcom.

3 The current UK mobile market

37 This section presents a review of the key historical trends and the current status of the UK mobile market. The review is divided into three parts:

- an overview of market
- an assessment of the current state of the value chain by which services are delivered
- a review of the shift in control of the funds generated between players in the market value chain over the last eight years.

38 We utilise the analysis presented in these sections to frame our scenarios for the evolution of the market in Section 4 and to provide a context for the implications that we have drawn from the scenario analysis.

3.1 Market overview

39 This section presents an overview of the UK mobile telecoms market. It begins by summarising the key developments and trends in the evolution of subscriber, revenue and EBITDA over the last ten years. It goes on to examine in greater detail a number of key sources of revenues, value and cost in the mobile market:

- voice services
- messaging services
- non-messaging data services
- mobile network costs
- distribution and MVNOs
- other mobile players.

3.1.1 Subscriber, revenue and EBITDA growth to date

40 Between 1993 and 2000, the UK mobile market as a whole grew rapidly, with the subscriber base increasing at an average CAGR of 56%. The launch of prepaid services in 1997 fuelled significant growth in the subscriber base, as highlighted in Figure 3.2.

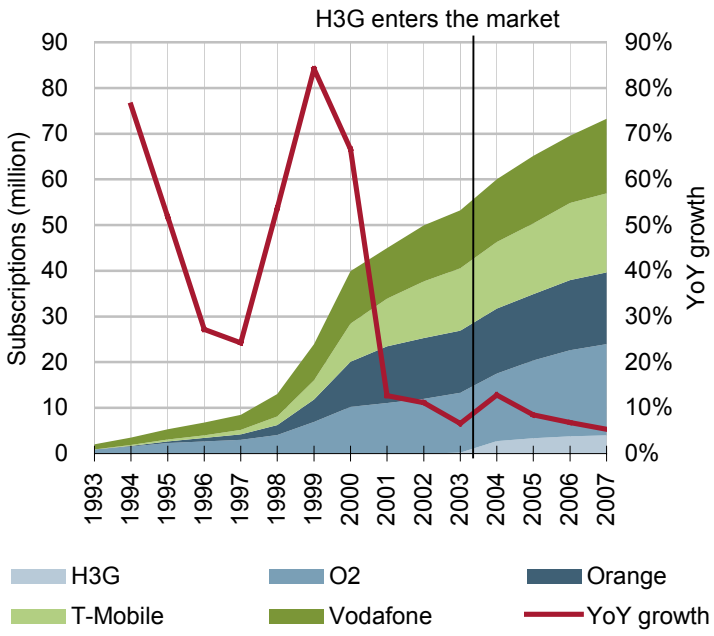

Figure 3.2: Mobile operators' subscriber numbers [Source: WCIS]

41 In the period from 2000 to 2007, growth in the subscriber base continued, albeit at a substantially reduced CAGR of 9.1%. Following this period of sustained growth, the market has now clearly reached saturation, as evidenced by the increasing proportion of subscribers holding multiple SIMs.

42 Despite the number of new subscribers entering the market over this period, the share of active SIMs held by each operator has remained relatively constant, as shown in Figure 3.3. New MVNO entrants such as Virgin Mobile at the end of 1999 and, more significantly, H3G in 2003, have also lead to upturns in subscriber growth, but with limited impact on overall respective market shares. There is no indication today that any operator (including MVNOs) is gaining or losing significant ground.

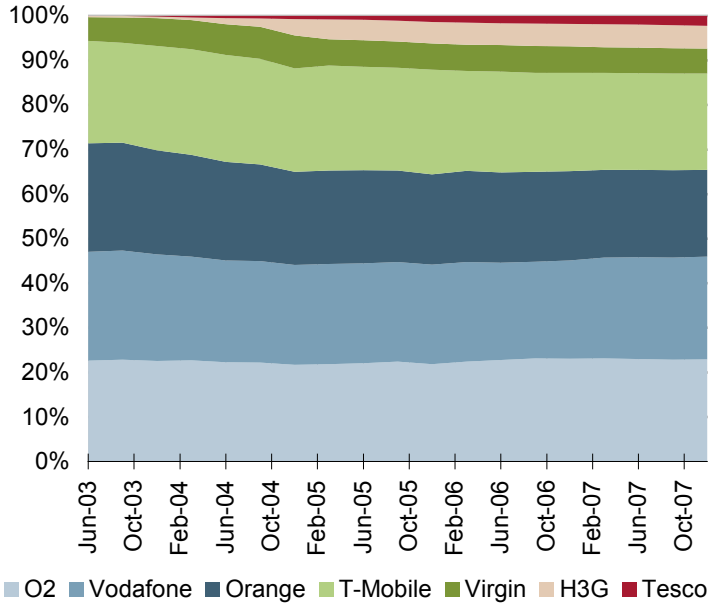

Figure 3.3: Evolution of respective market shares of UK mobile operators (including leading MVNOs) [Source: GlobalComms]

43 Figure 3.4 shows that the overall UK mobile subscriber base in 2007 stood at 73.2 million subscribers (120% of the population), representing an increase of 5.3% on the subscriber base in 2006. Of this total, prepaid subscriptions accounted for 66% of the overall UK mobile market.

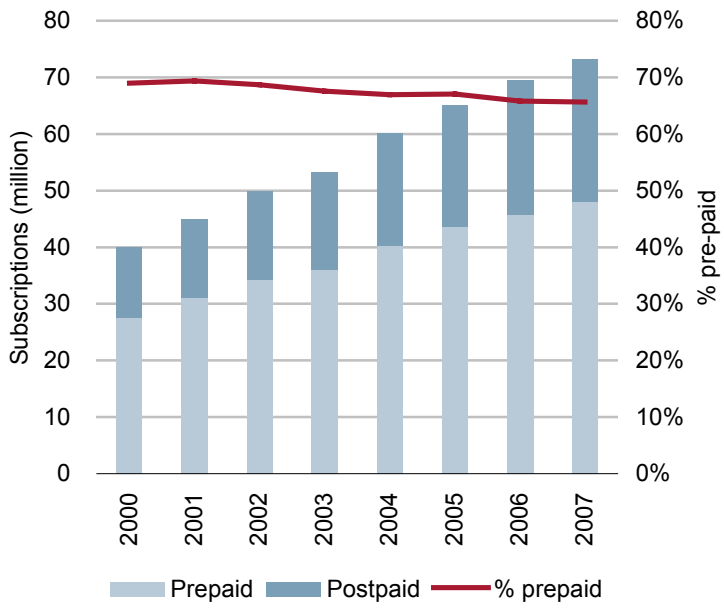

Figure 3.4: UK subscriber numbers and types [Source: WCIS]

44 Despite accounting for the majority of the subscriber base, prepaid subscriptions accounted for only 35.1% of total revenues in 2007. This reflects the fact that prepaid customers are typically younger, or less wealthy, leading to lower levels of expenditure. As growth in subscriber numbers

has slowed and the pricing of postpaid contracts has evolved, operators have had some success in converting prepaid consumers to postpaid contracts (as can be seen in the slowly declining proportion of prepaid subscriptions in Figure 3.4).

45 The combined revenues of the four largest mobile operators[5] reached GBP18 billion in 2007, having grown from GBP13.2 billion in 2002 at a CAGR of 6.3% in nominal terms (4.3% in real terms), as highlighted in Figure 3.5.

46 This rate of growth in revenue is noticeably slower than the rate of growth in subscriber numbers, partially as a consequence of some individuals taking up multiple SIM cards and therefore spreading their expenditure over multiple subscriptions, and also as a reflection of the fact that incremental subscribers are typically less affluent, lower-spending consumers.

47 The average EBITDA for the four largest operators rose from GBP3.9 billion in 2002 to GBP4.5 billion in 2007, (a nominal CAGR of 4.8%, 2.9% in real terms). Average EBITDA margins reached a peak of 32.2% in 2004, up from 26.9% in 2002 (and has since fallen to 25.0% in 2007). We note that peak EBITDA and the last peak in subscription growth occurred in the year following H3G's entry to the market. The recent pressure on EBITDA margins stems from increasing competition over retail tariffs for voice calls, which have partially offset the effect of higher average usage (as discussed in more detail in Section 3.2.2 below).

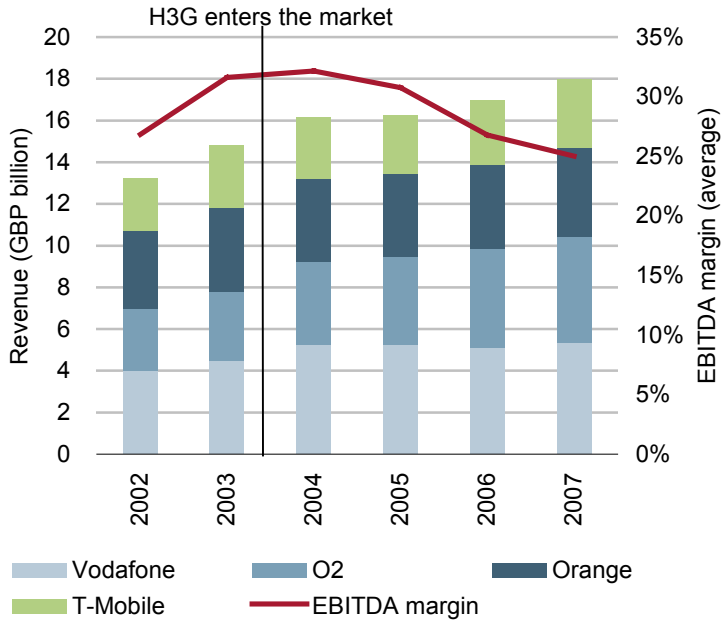

Figure 3.5: Operator revenues and EBITDA margin [Source: Merrill Lynch
(Note: revenue figures include interconnection revenue)]

48 The traditional benchmark measure of growth in the mobile telecoms industry has been the average revenue per user (ARPU). 'User' in this definition is used to refer to an active SIM. According to this measure, revenue per customer is flat. However, as evidenced by the penetration

[5] Vodafone, T-Mobile, Orange and O2

rates exceeding 100%, there are many examples of customers who hold more than one active SIM. Consequently, their expenditure is spread across several subscriptions, reducing the revenue generated from each subscription.

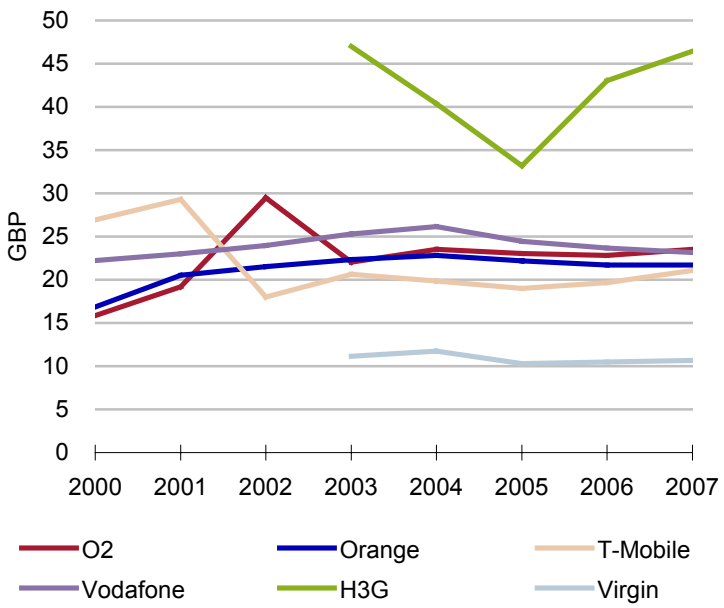

Figure 3.6: Evolution of ARPU for mobile operators [Source: WCIS]

49 Whereas Figure 3.6 shows how ARPUs for the various operators have remained flat in nominal terms (at GBP20-25 for the largest operators), Figure 3.7 contrasts these figures with equivalent results for the average revenue per capita of the addressable mobile market. For this analysis we consider the UK population as a whole with the exclusion of children of less than 8 years of age. This analysis shows that expenditure per capita aged 8+ has risen since 2000 from GBP15 to GBP31 at a CAGR of 10.9%. We have used this population-based analysis elsewhere to draw insights into user behaviour.

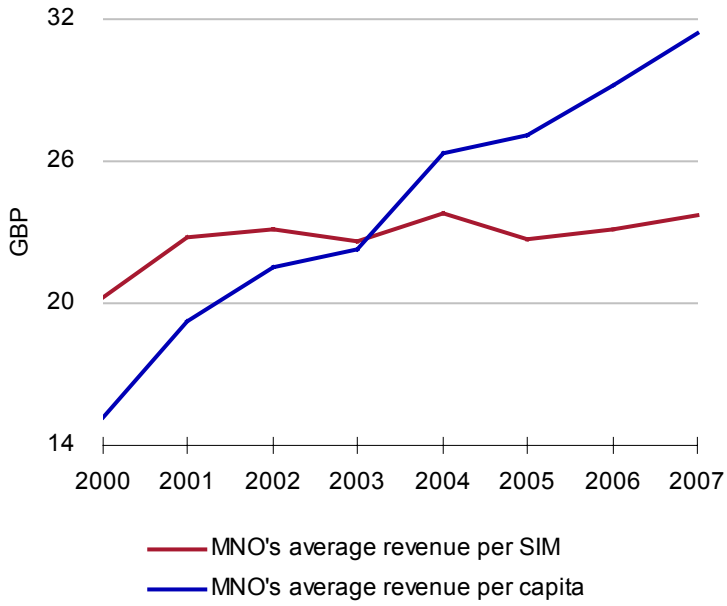

Figure 3.7: Mobile operators' revenue per user and per capita [Source: WCIS]

3.1.2 Voice services

50 Voice services remain the largest source of revenues for the industry, and contributed GBP10.8 billion in 2007. Despite ongoing growth in absolute terms (at a CAGR of 4.39%) voice revenues have been steadily declining in relative importance to the mobile market. As Figure 3.8 shows, between 2004 and 2007 voice revenues fell from 80% to 73% of overall revenues. This decline reflects the fact that growth in voice revenues has not kept pace with growth in other areas: over the last five years services such as SMS, multi-media messaging and data services have started to contribute more significantly to the growth of the industry.

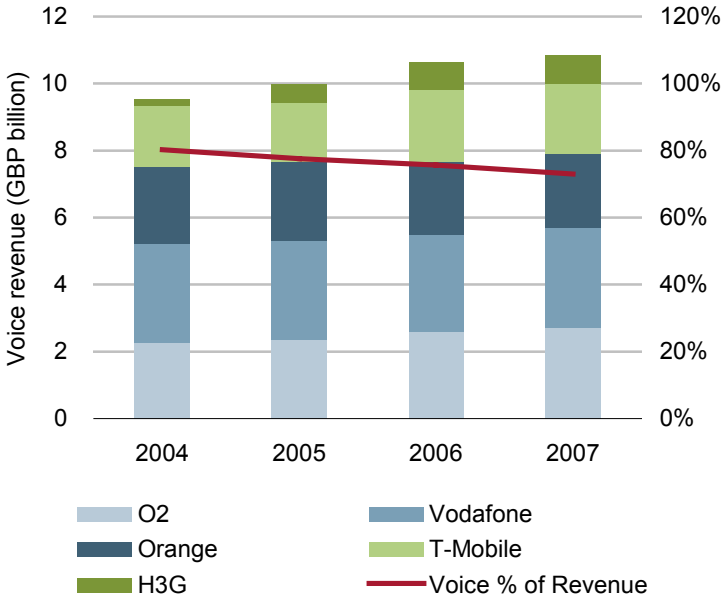

Figure 3.8: Voice revenues for UK mobile operators [Source: Analysys Mason]

51 Competition in the mobile market has caused downward pressure on voice prices, leading to a decline in voice ARPU from GBP13.5 in 2004 to GBP12.5 in 2007. However, looking at voice revenues on a per-capita basis, we see that expenditure on voice calls has increased (see Figure 3.9). Average revenue per capita (aged 8+) rose from GBP14.6 in 2004 to GBP16.3 in 2007.

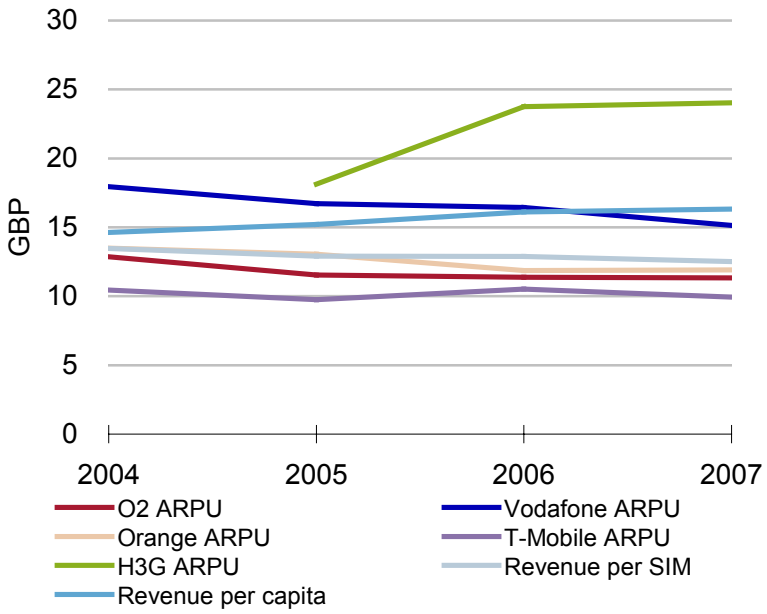

Figure 3.9: Average monthly voice revenue per SIM for the five largest operators, average revenue per SIM and per capita [Source: Analysys Mason]

52 The increasing tendency of users to use more than one SIM – and so spread their expenditure across multiple subscriptions - is likely to be due to users taking up advantageous prepaid offers, increasing numbers of users using additional devices such as BlackBerrys and an increasing

proportion of users using a handset for business use and one for personal use. Figure 3.10 shows the growth in the number of SIMs in use per capita.

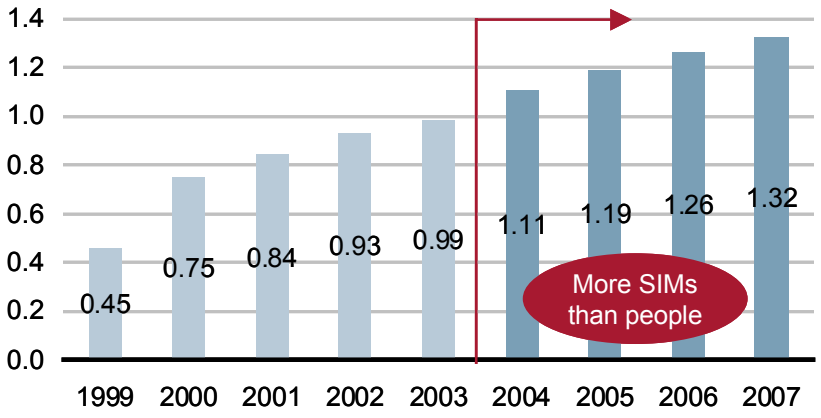

Figure 3.10: SIMs per capita aged 8+ [Source: Analysys Mason]

53 The average monthly mobile usage per capita aged 8+ has seen a steady increase, reflecting retail price declines, fixed-to-mobile substitution and an increase in mobile working. Figure 3.11 shows that, while total voice minutes (on both fixed and mobile networks) have grown, total voice minutes on the fixed network have fallen. Total outbound voice traffic generated from mobile devices rose from 52 billion minutes in 2002 to 82 billion minutes in 2006.

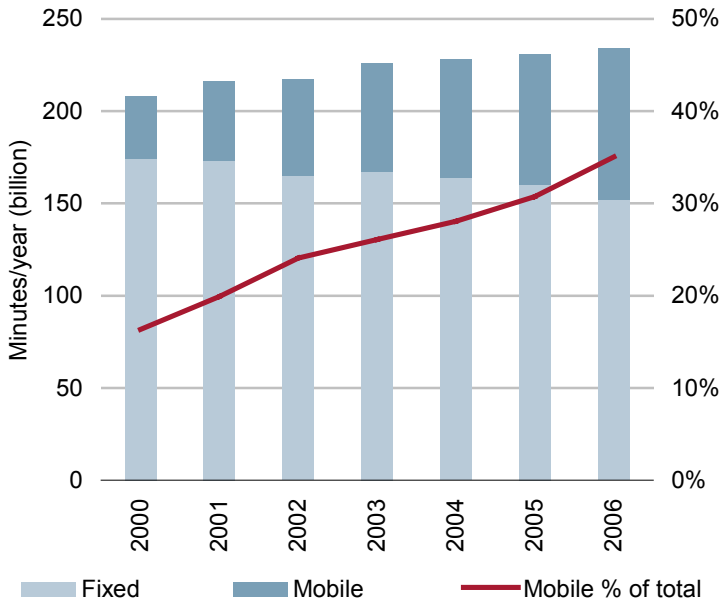

Figure 3.11: Total outbound call volumes [Source: Ofcom, Merrill Lynch, European Wireless Matrix Q1 2008]

54 As can be seen from Figure 3.12, total voice usage per capita (aged 8+) rose from 326 to 354 minutes per month between 2000 and 2006 (a CAGR of 1.4%). Monthly mobile usage per capita grew by 71 minutes during the period, whilst monthly fixed usage fell by 43 minutes.

	2000	2006	CAGR
Fixed minutes per month	273	230	-3%
Mobile minutes per month	53	124	15%
Total minutes per month	326	354	1.4%

Figure 3.12: Minutes per month per capita (aged 8+) [Source: Analysys Mason]

55 With the ongoing trend for fixed to mobile substitution, mobile users have an increasing tendency to use their mobile handsets to call other mobiles from their own homes. Data from Ofcom and BT (Figure 3.13) suggests that 75% of calls from mobile handsets are made to other mobile numbers, whilst 13% of calls from fixed lines are to mobile numbers. This implies that, as the total number of calls originated on mobile handsets grows, the traffic is increasingly terminated on mobile networks, primarily since bundled calls to mobile lines are perceived to be cheap from mobile networks.

	Billions of minutes	*% of all calls*	*% of calls*
Fixed to mobile	14.7	7.0%	13%
Fixed to fixed	98.7	46.5%	87%
Mobile to mobile	73.5	35.0%	75%
Mobile to fixed	24.7	11.5%	25%

Figure 3.13: Source and destination of call minutes in 2007 [Source: Ofcom, BT]

56 Figure 3.14 shows additional data supporting the supposition that a significant proportion of calls from mobile handsets are made from indoor locations, primarily a user's own home. Different data sources use varying and sometime ambiguous definitions of 'in the home' but in general it can be deduced that an average of around 40% of all calls are made in the user's own home, whereas 65% of fixed calls are made from the home[6]. Taking these two statistics together, we estimate that of the 354 total outgoing minutes per month per capita (aged 8+) in 2007, around 190 minutes, or over 50%, were generated in users' own homes. The data would also suggest that there is an opportunity for mobile operators to capture significantly larger volumes of fixed calls.

6 Source: BT

Mobile usage patterns		
	Strategy Analytics	Swisscom
Indoor	**59%**	**60%**
Home	40%	36%
Work	19%	24%
Outdoor	**41%**	**40%**
Travelling	24%	21%
Other	17%	19%

Figure 3.14: Mobile usage patterns [Source: Strategy Analytics 2005, Swisscom, Innovation paper, 2004]

57 Bundling has been a key part of operators' strategy to enhance the value they deliver to consumers. Prior to 2000, operators sought to attract subscribers and increase usage by reducing the headline price per minute. Since then, operators have tended to offer contract customers increasing numbers of minutes and SMS for the same fixed-price package. This has allowed them to maintain revenue streams while increasing the perceived value of the service to users. At the same time, some operators have increased other charges to mobile users (e.g. out-of-bundle minute charge) that may not be directly considered by users when choosing their service provider (sometimes known as 'invisible' charges).

58 A review of historical tariffing data shows that there is no clear trend. There are many tariffs in the market and the complexity of packages and offers that include add-ins (such as free weekend calls to fixed lines, or the ability to 'mix and match' SMS and voice traffic at will), is high. Overall there are over 400 tariff packages offered to consumers in the UK market by the five largest MNOs and two largest MVNOs.

59 We have analysed packages from the four largest mobile operators[7] at six price points over an eight-year period. To consider the value of text and voice bundles together we have translated texts into minute equivalents at a rate of 2 texts equal to 1 minute. Our findings (in Figure 3.15) suggest that in reality only users on the higher tariff packages (i.e. above GBP35) are receiving real reductions in the effective price of voice and text usage.

[7] Vodafone, T-Mobile, Orange and O2

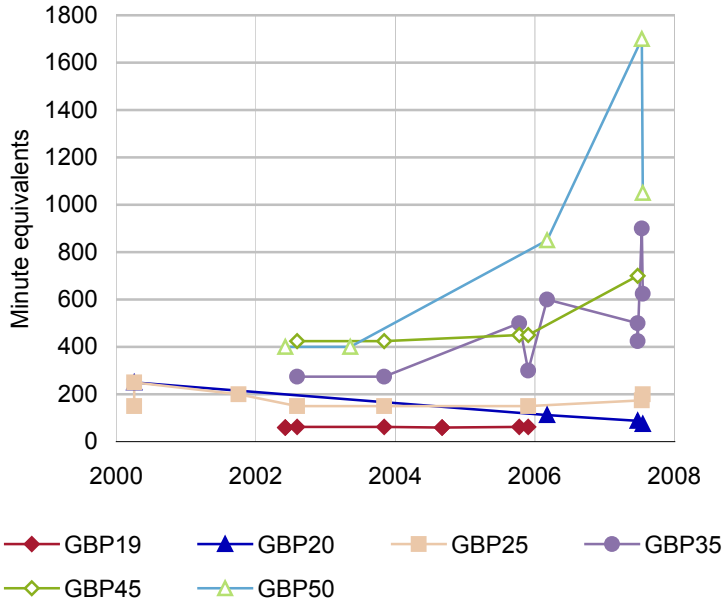

Figure 3.15: Minute equivalents in operator tariff bundles [Source: Tarifica 2008]

60 We compared this analysis with Analysys Mason's 'Cutting the Cost' service which provides a tariff basket analysis. 'Cutting the Cost' tracks the cost of mobile services using a common basket of usage for different customer segments in multiple markets. The methodology used is based on the approach taken to price comparison work undertaken for Ofcom in the 1990s.

61 This methodology confirms the findings of the tariff bundle analysis: since 2000 only those users in the highest pricing segments have experienced significant reductions in the effective cost of service. However, there have also been additional initiatives introduced by operators to add value in other ways that are not captured in these analyses, for example:

- expanding the scope of the bundle to include calls to all mobile networks as well as calls to fixed networks
- including fixed-rate data access within the bundle. Again this is typically available only to subscribers of GBP35+ bundles.

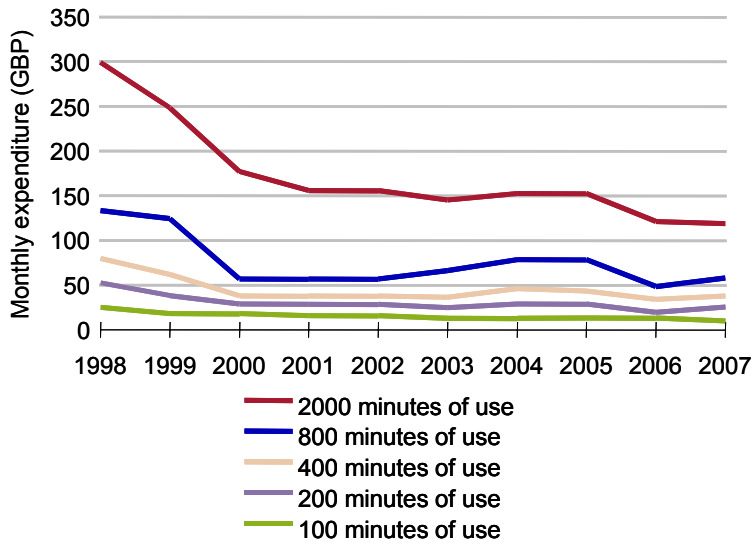

Figure 3.16: Decline in the costs of mobile services for business customers with varying usage [Source: Analysys Mason 'Cutting the Cost']

62 Operators' approaches to designing call bundles have been shaped by users' calling patterns and the termination rate regime. Asymmetries between fixed and mobile termination rates have led to differences in the types of calls that are included in the bundle. Specifically:

- Mobile to mobile: For the four largest mobile operators[8], the costs and revenues associated with mobile termination are broadly equal. This symmetry has allowed calls to any mobile network to be included in bundles.
- Mobile to fixed: The low proportion of calls from mobiles to fixed lines, and the very low termination rates for such calls, make bundles with large allowances of fixed calls viable.
- Fixed to fixed: The low fixed-line termination rates have enabled some fixed-line broadband suppliers to offer unlimited calls to UK fixed lines within many packages.
- Fixed to mobile: While mobile termination rates have fallen 40% since 2002 (see Figure 3.16 below), they are not yet sufficiently low for fixed operators to be able to include calls to mobile lines as part of service bundles.

[8] Vodafone, T-Mobile, Orange and O2

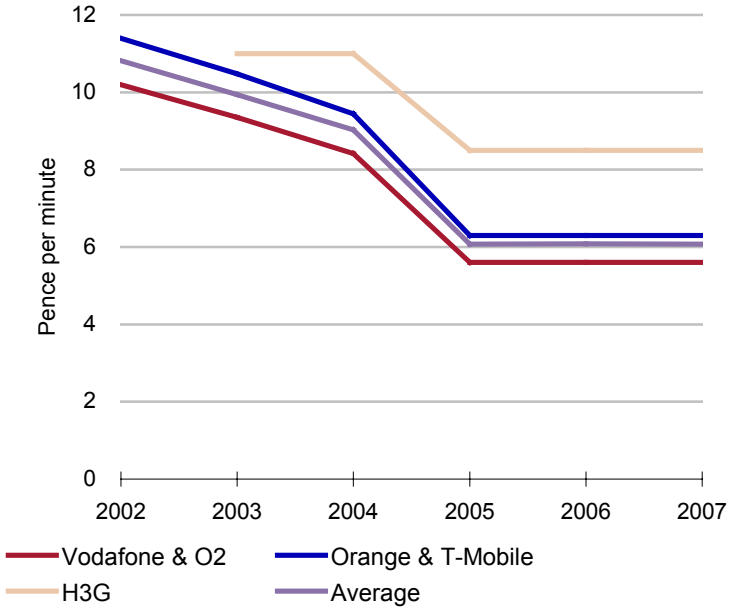

Figure 3.17: Reduction in mobile termination rate [Source: Oftel, Ofcom]

3.1.3 Messaging services

63 Messaging traffic has grown rapidly and consistently for over a decade. Ongoing growth continues to be solid, fuelled by the SMS phenomenon. The Mobile Data Association reports that UK mobile subscribers sent 56.9 billion SMS messages in 2007 up from 1 billion in 1999, as shown in Figure 3.18. This equates to 86 messages per capita aged 8+ per month in 2007. After a six-fold increase in total SMS volumes between 1999 and 2000, growth has slowed to a more modest pace more recently, as the growth in the last five years has averaged 28% per annum. However, 2007 still saw a 36% rise over 2006 in terms of total SMS traffic, suggesting that the boom in SMS use is far from over.

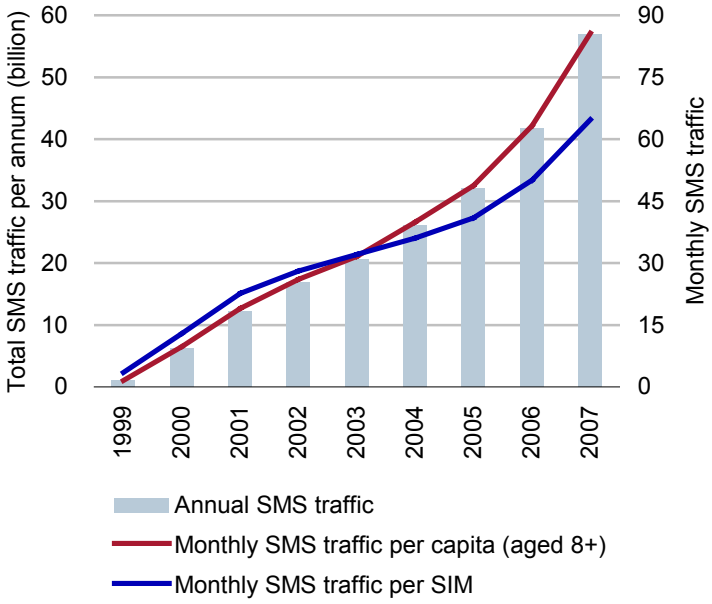

Figure 3.18: UK SMS traffic [Source: Mobile Data Association]

64 Messaging accounted for just 1% of operators' revenue in 1998, but rose to 16% by 2004, and remained largely unchanged thereafter. Overall, SMS accounted for GBP3.4 billion of revenue for UK operators in 2007 (16.2% of total operator revenues).

65 The revenue per SMS has declined from a peak of GBP0.102 in 2003, and by 2007 it had fallen back to its 1998 level of GBP0.059.

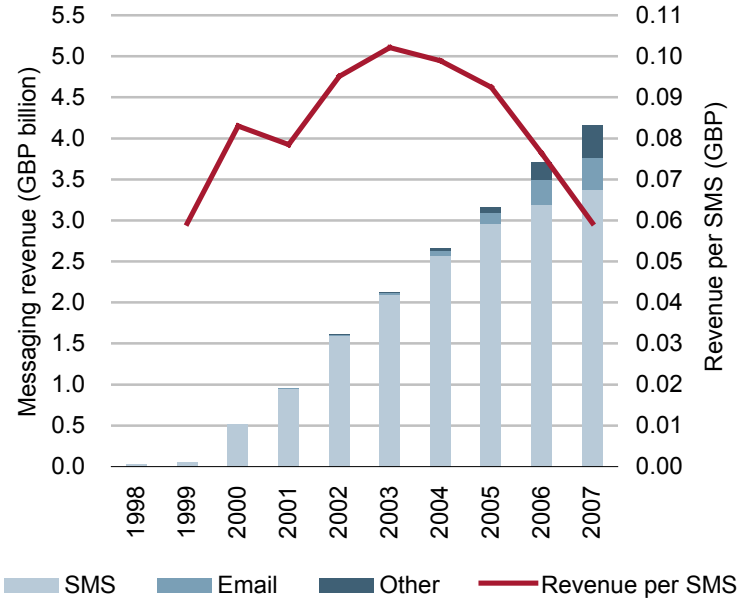

Figure 3.19: UK person-to-person messaging revenue 1998–2007[9] *[Source: Analysys Mason]*

66 Meanwhile, revenues from other person-to-person messaging services (such as MMS, email and instant messaging) rose from almost zero in 1998 to GBP781 million in 2007 and now account for 19% of messaging revenue and around 3% of overall revenues.

3.1.4 Non-messaging data services

Overview

67 Non-messaging data services constitute a small but increasingly important part of the UK mobile market, and generate revenues from three major sources:

- 'On-portal' services, generating revenues from content services (ringtones, games, music tracks) sold through operator portals such as Vodafone Live! or O2 Active. These arise from charges levied for downloading content as well as for 'mobile Internet' access.
- Broadband dongle services – giving laptop computers broadband access to the Internet over mobile networks.
- BlackBerry and other email access fees.

68 Operators also accrue revenues from fixed broadband connections, but (with the exception of Orange) this is not currently significant. The number of broadband subscriptions for the operators

[9] Note: Person-to-person messaging includes email, SMS, IM, unified messaging, enhanced messaging service (EMS) and MMS

is relatively low compared to mobile broadband subscriptions, despite having been on offer for considerably longer.

69 At the end of 2006 Orange UK reported annual growth in of 15% whilst total non-voice revenue rose by 5.9% over the same period. Whilst experiencing fast growth, non-messaging data revenues still accounted for less than 5% of total revenues. Vodafone UK reported a 20% increase in non-messaging data revenues from Q4 2006 to Q4 2007, accounting for 8% of total service revenue.

Distinction between on-portal and off-portal content revenues

70 A distinction can be drawn between on-portal and off-portal content revenues. Operator-branded content portals were established in the early 2000s, and have been one of the largest revenue sources for certain mobile content players (including music and games publishers). This is because operator portals have been strongly marketed to consumers as the place to access mobile content, and have been easier for consumers to find in comparison to third-party Websites and content portals.

71 Nonetheless, an off-portal content market has developed in parallel, driven by pan-European players such as Jamster (now part of News Corp), Buongiorno, and Zed. Off-portal content has historically been billed primarily through premium-rate SMS (PRSMS) billing, supported in some instances by credit-card billing directly to the consumer. PRSMS revenues accruing to operators from off-portal content transactions have therefore been accrued as part of messaging services. At the end of 2007, however, UK operators moved to migrate off-portal content providers to the 'Payforit' WAP billing platform.

72 Given the historical aggregation of content revenues into messaging, information on the total mobile content market is based on estimates rather than reliable data. Overall, Ofcom estimated annualised operator content revenues in Q3 2007 to be GBP460 million. Informa estimates that UK revenues for premium mobile content in 2007 totalled GBP464 million. This is broadly consistent with operators' figures but we consider this figure to be relatively uncertain. Figure 3.20 shows Informa's forecasts for UK mobile entertainment revenues to 2012.

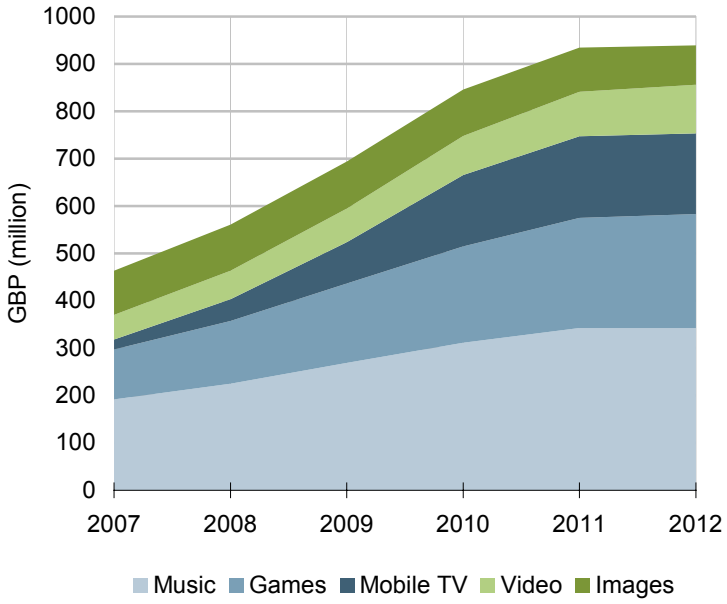

Figure 3.20: Estimated UK mobile entertainment revenues, 2007-2012 [Source: Informa, 2008]

Addressing barriers to the adoption of non-messaging data services

73 Operators are addressing a number of the barriers to the purchasing of content and Internet browsing on handsets. Browsing free mobile sites and the wider Internet from a handset has been held back due to a number of factors:

- high data-traffic tariffs
- poor usability of the service
- limited selection of mobile-rendered content.

Evolution of data-traffic charging

74 High per-MB traffic charges applied to content downloads have created concerns over the transparency and predictability of the cost to users of browsing on handsets. For example, users have often found the total cost of downloading content many times the headline price.

75 Operators responded to this by progressively moving subscribers to packages that involved no additional charge for the downloading of 'on-portal' content. However, this move did not address 'bill shock' associated with 'off-portal' browsing and purchases.

76 Since then, operators have moved to further simplify prices for content access. The launch of X-Series by H3G in December 2006 marked the first high-profile marketing of a flat-rate data package for all content downloads. Initially, these services offered 120MB-1GB per month for a monthly charge of GBP5-GBP7.50. During 2007, all major UK operators launched flat-rate data packages for handset data usage. All operators now offer Internet access as a 'bolt-on' to handset

tariffs at GBP7.50-GBP10 per month for a monthly allowance of 3GB to 5GB. On higher-priced postpaid packages this service is being included as part of the contract bundle.

77 This move to simplify prices for content access has significantly increased the attractiveness of mobile content and broadband to consumers. Operators have reported strong positive responses to these new tariffs and data traffic levels have risen steadily.

Evolution of mobile handsets

78 Subscribers' usage of non-messaging data services is contingent on the capabilities of the handset that they own, and more specifically on the type of browser installed. Historically, mobile handsets were equipped with only WML browsers, which were only capable of accessing WAP sites. With the deployment of 3G networks, handset manufacturers (supported by companies such as Opera and Openwave) started to include XHTML-compatible browsers in handsets. While not fully compliant with all the technologies used on standard Websites, these browsers are capable of reading a significant proportion of 'normal' Web content. The rate of adoption of this technology by handset manufacturers across both basic and smartphone handsets has been rapid: within a two-year period, the vast majority of handsets on sale were capable of reading XHTML sites. Figure 3.21 illustrates the growth in sales of UK handsets equipped with XHTML browsers from Q2 2005, in which 39% of handsets were equipped with an XHTML browser, through to Q2 2007, in which 82% of handsets were equipped with an XHTML browser.

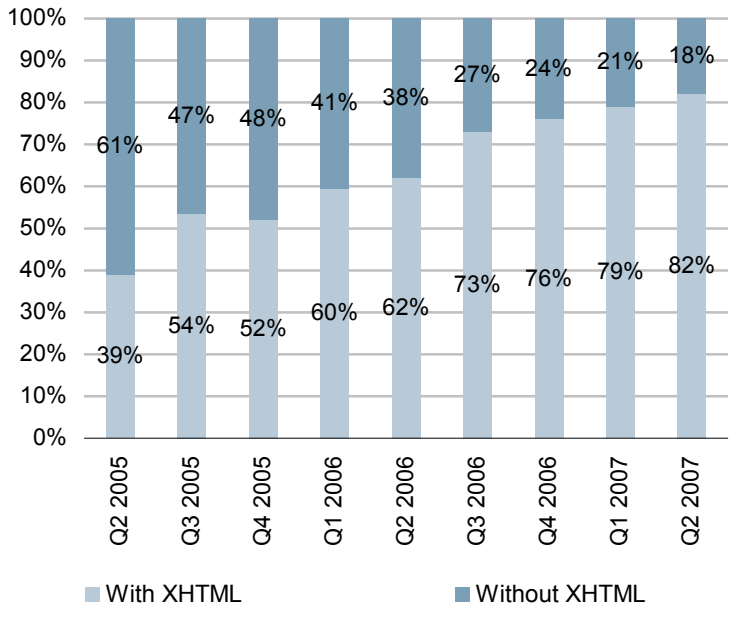

Figure 3.21: Sales of UK handsets equipped with and without XHTML browsers, Q2 2005-Q2 2007 [Source: Ofcom 2007]

79 Following the development of handsets that support XHTML Web browsing, manufacturers introduced a variety of high-specification smartphones. According to Gartner, worldwide shipments of smartphones increased from around 2% of total shipments in 2003 to 9% in 2006.

80 M:Metrics estimates that almost 5 million UK subscribers in 2007 had smartphones (a 60% increase on 2006). It also cites primary research that shows significant growth in application usage, particularly browsing, by smartphone users compared to non-smartphone users. This research is illustrated in Figure 3.22.

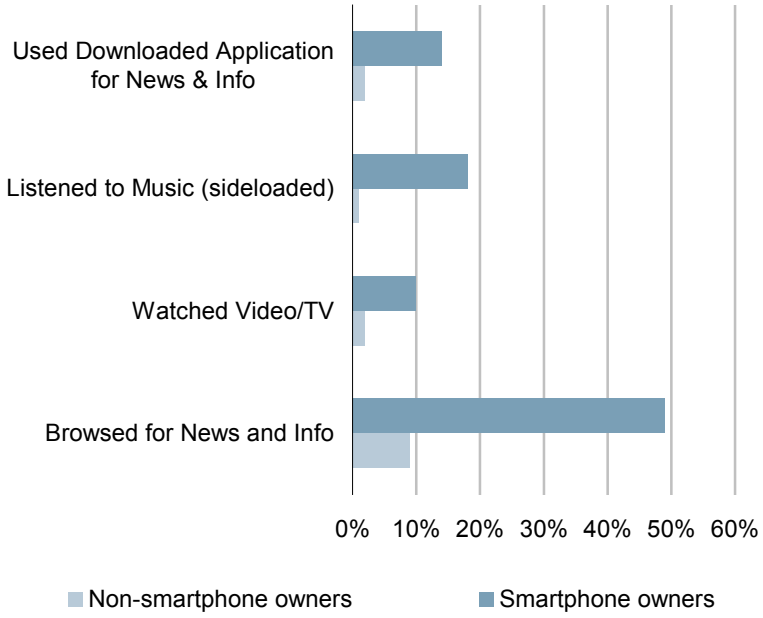

Figure 3.22: Impact of smartphones on application usage within the UK market [Source: M:Metrics]

81 Further, research undertaken by Nokia suggests that 8% of smartphone users' time using the device is spent browsing the Internet, which generates over 50% of the total data traffic from those devices (illustrated in Figure 3.25). This compares to 37% of time spent messaging, 19% consuming music/video and 12% making voice calls.

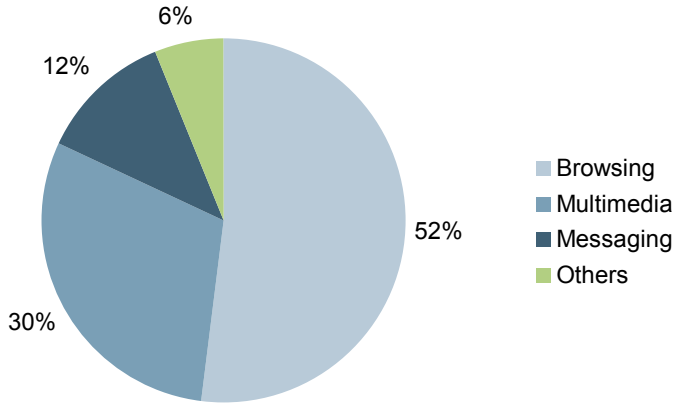

Figure 3.23: Data traffic per application [Source: Nokia]

82 The rising proportion of 3G- and 3.5G-enabled handsets is making the mobile content experience more user-friendly and the 3G subscriber base is increasing both in absolute terms and as a proportion of total subscriptions. This trend is shown in Figure 3.24, which shows our estimate that in 2007 there were 12.5 million 3G handsets in use within the market, compared to 60.7 million GSM handsets.

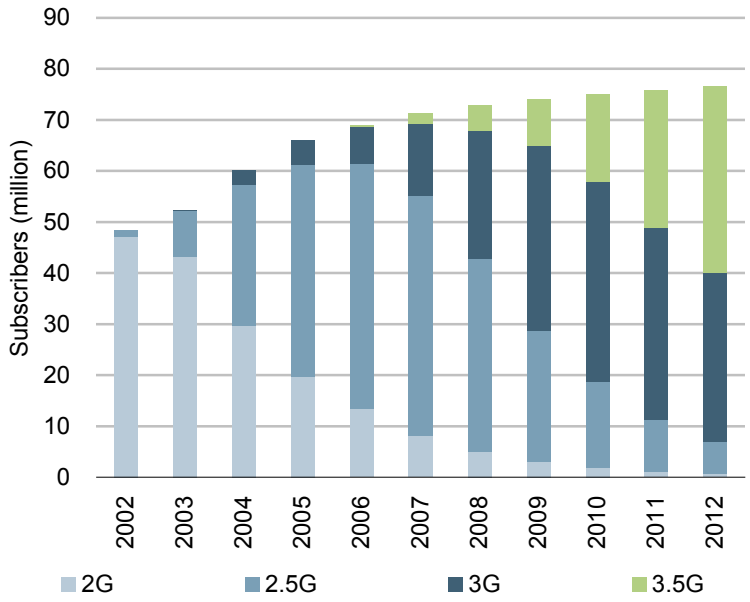

Figure 3.24: Breakdown of handset technology [Source: Analysys Mason]

83 Further evidence of the increasing take-up of 3G handsets is provided in primary research from M:Metrics, which indicates that 24% of UK subscribers aged 13+ have a 3G handset and that 23% of UK mobile subscribers use 3G data services (see Figure 3.25).

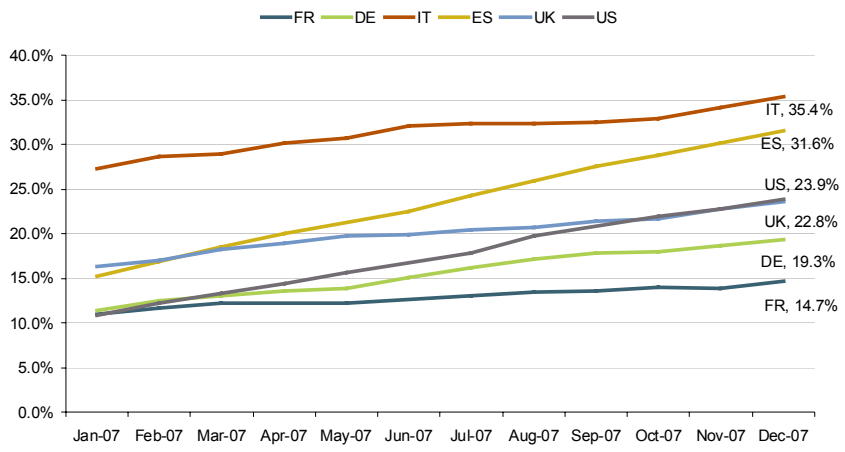

Figure 3.25: Percentage of mobile users on 3G data networks across selected countries, January, 2007-December, 2007 [Source: M:Metrics]

84 It is worth noting that whilst not all 3G handset users subscribe to data services, the number is significant and growing strongly. For example, Orange UK reported that 10.4% (or 1.6 million) of its subscribers use mobile data services. Also, a similar picture is emerging across Europe, with France Telecom reporting that the number of mobile broadband subscribers had more than tripled between June 2006 and June 2007.

85 Operators are increasingly moving towards bundling in data subscription with contracts, thereby lowering barriers to usage and increasing the proportion of the population equipped to use data services.

Consumer interest in Internet browsing via mobile handset

86 Whilst browsing the wider Internet on mobile handsets has only recently been feasible, there are indications that this is having a strong positive effect on consumer interest. This is backed up by research undertaken by M:Metrics as shown in Figure 3.26, which suggests that about 25% of UK subscriber base (per capita) is browsing and downloading content, which makes the UK one of the highest browsing communities in Europe.

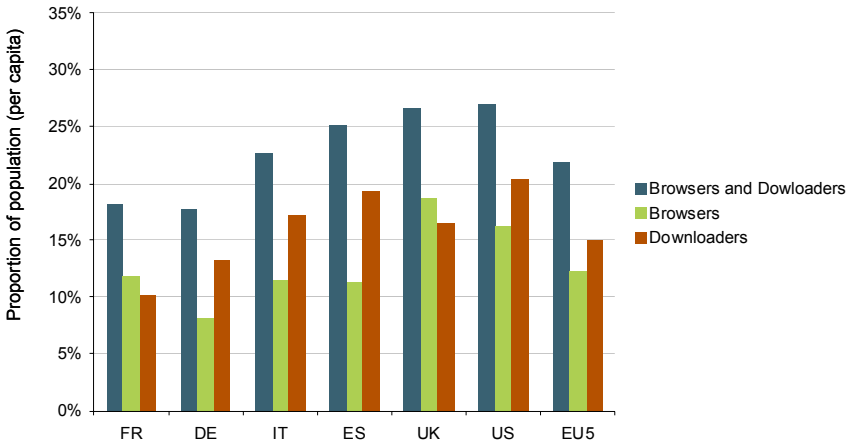

Figure 3.26: Audience for browsing and downloading across selected countries [Source: M:Metrics]

87 Also, according to the BBC, 2.8 million unique users access bbc.co.uk from their mobile handsets every month and 40% of those users access the BBC's Website only from their mobiles.

Growth in HSDPA and data dongles

88 In 2006, mobile broadband services based on HSPA technology were introduced and users began to use these services as a means of providing Internet connectivity to PCs and similar devices. HSDPA handsets and PCMCIA cards were introduced to the market, and saw steady take-up, supported primarily by Vodafone UK, which is illustrated in Figure 3.27.

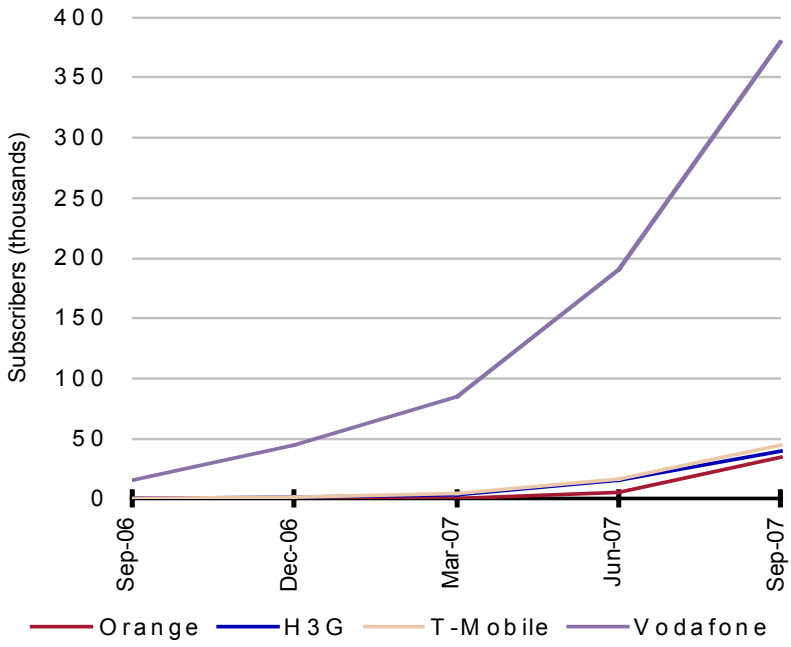

Figure 3.27: HSDPA subscriber growth, [Source: WCIS]

89 Following on from the introduction of HSDPA, the first dongle data service for laptops was launched by H3G in October 2007 with initial prices of around GBP15 per month for 500MB-1GB. In the ten months to the end of July 2008, H3G had attracted 500 000 dongle customers.

90 Heavy marketing by other operators in Q1 2008 in response to H3G's success is believed to have driven rapid market growth and users can now buy a monthly allowance of 1-3GB for GBP10-GB15 per month on an 18-month contract.

91 Broadband speeds of 3.6Mbit/s are currently available, and 7.2Mbit/s services are scheduled for launch on some networks later in 2008. It is worth noting that in certain European markets over 90% of non-messaging data revenues are derived from dongle access charges. However, we understand that no equivalent figures are available for the UK.

Impact of mobile broadband services on network traffic

92 Certain UK mobile networks have seen dramatic growth in data traffic from the use of broadband services via PCs. T-Mobile recently announced that data traffic exceeded voice traffic on its UK network[10]. Data traffic on H3G's network rose sevenfold in the six months to March 2008. (Figure 3.28).

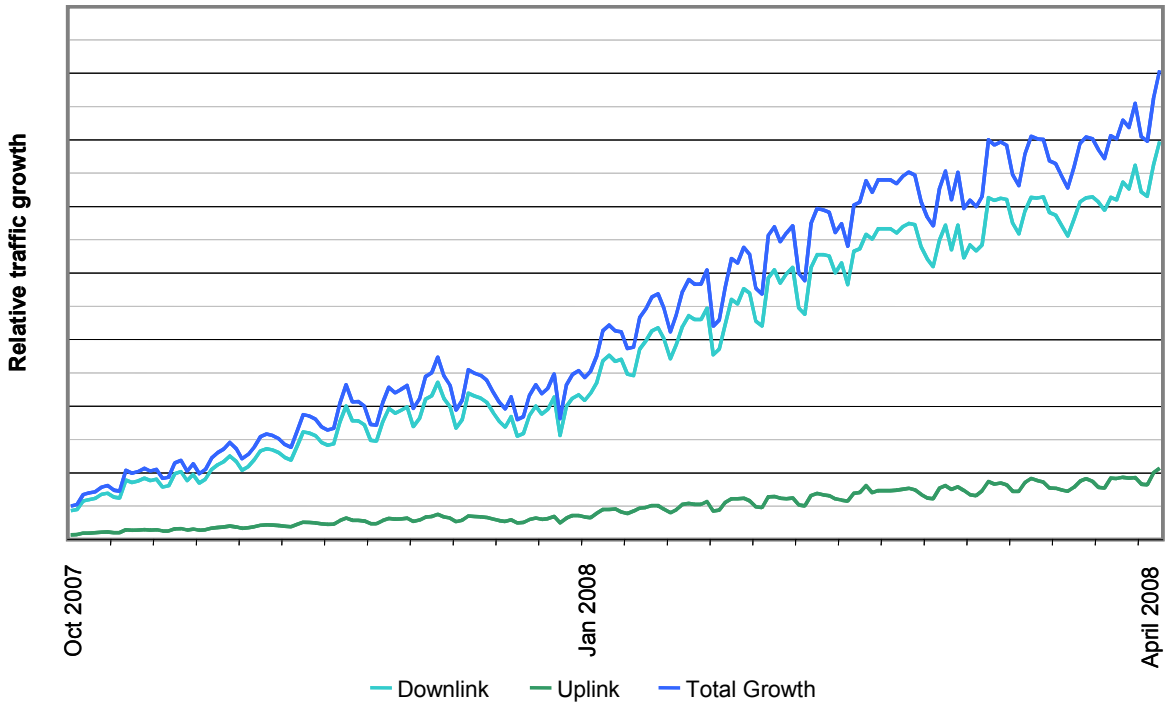

Figure 3.28: Growth in H3G data traffic [Source: H3G]

10 Source: Mobile Entertainment, April 2008

93 Vodafone Group's recent public report on data traffic flows on its networks suggests that they are experiencing similar growth to that seen on H3G's UK network. Complemented by growth in dongle sales in 2008, data traffic is now believed to have exceeded voice traffic on Vodafone's network.

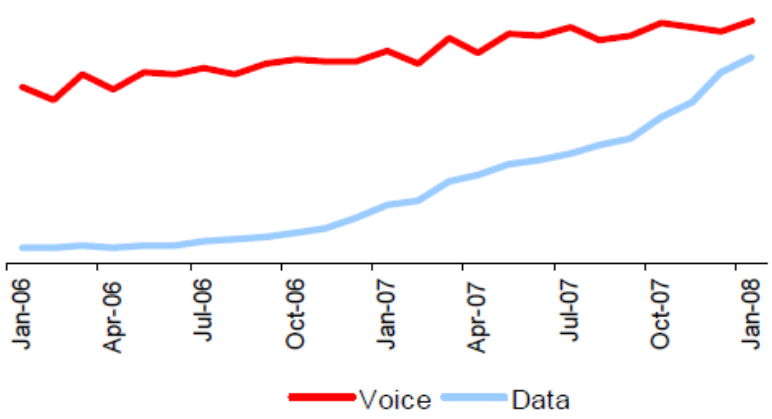

Figure 3.29: Growth in Vodafone's data traffic, [Source: Vodafone Group[11]]

94 This phenomenon has significant implications for mobile networks' use of spectrum. In the fixed Internet world, it is generally the case that traffic flows are largely loaded towards traffic flowing to the PC from content servers and sites. Whilst peer-to-peer traffic accounts for a significant proportion of network traffic, video downloads from cached Websites and streaming media is increasingly dominating traffic patterns.

95 There is no reason to expect the flow of data traffic to be fundamentally different for a mobile network. Indeed, data provided by H3G (Figure 3.26), suggests that in the mobile environment (where there is currently no peer-to-peer traffic), traffic flows are even more heavily loaded towards the downlink. Given that data traffic as a whole is on the rise, and already represents 50% of the traffic carried on two UK networks, uplink spectrum is expected to be increasingly under-utilised.

Exploring the perception of fixed and mobile broadband services as substitute products

96 The Austrian telecoms market provides a telling example of how ultra-competitive mobile broadband services are pricing fixed-line services out of the market. Details of the market are presented as a case study as a basis for drawing conclusions regarding the perception of fixed and mobile broadband services as substitute products.

97 In Austria, tariffs for mobile broadband access are significantly lower than for fixed-line DSL services at equivalent data speeds. The lowest tariff currently available in Austria is One's 'all you can eat' package (15GB for EUR10 per month), which is illustrated in Figure 3.30. This is just

11 Figures indicative only - Vodafone did not include a scale for this trend

over one third of the cost of the cheapest DSL broadband service in the market, which are illustrated in Figure 3.33.

Mobile broadband bundles (EUR)[12]	*500MB*	*3GB*	*5GB*	*6GB*	*10GB*	*15GB*
Telekom Austria	15.00	20.00	30.00	-	-	-
One	-	-	-	-	-	10.00
T-Mobile	10.00	10.00	-	-	10.00	-
Tele.ring	12.00	-	-	16.00	-	-

Figure 3.30: Mobile broadband bundle prices in Austria in May 2008 (EUR) [Source: Operator Websites]

Fixed broadband services	*Monthly price (EUR)*[13]
Telekom Austria	49.90
Tele2 Austria	39.90
Chello broadband	27.90
Inode	39.00

Figure 3.31: Fixed broadband prices in Austria in May 2008 (EUR) [Source: Company Websites]

98 During 2007, this price differential fuelled strong growth in mobile broadband services. At the same time, net additional subscriptions to fixed-line broadband services fell to zero. Figure 3.32 shows net additional subscriptions to mobile datacard services compared to fixed ADSL services.

12 Prices include current promotional offers

13 Fixed prices for services with equivalent speed to mobile (i.e. 3072/512 or 3MB) and unlimited data usage

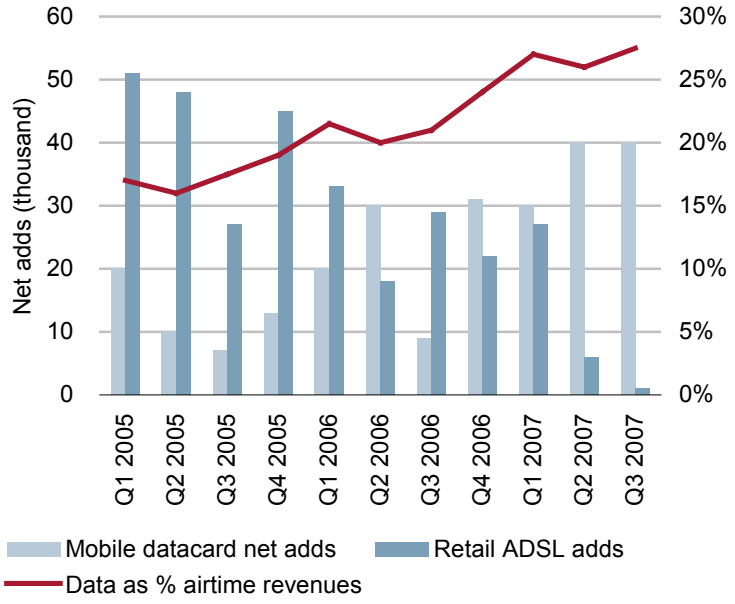

Figure 3.32: Take-up of Telekom Austria's broadband services [Source: Lehman Brothers]

99 In December 2007, Credit Suisse reported that mobile broadband subscriptions accounted for 75% of all new broadband connections in Austria in the preceding six months. This was corroborated in January 2008, by UBS, which announced that mobile subscriptions accounted for 27% of Austrian broadband connections. Whilst, there are questions surrounding the long-term sustainability of this position, it does clearly illustrate that users do perceive fixed and mobile broadband services to be substitute products.

100 There is some evidence that the first signs of similar developments may be emerging in the UK. At present in the UK, the price differential between mobile and fixed broadband offers is limited. For example, Orange's lowest-cost fixed broadband service offers 6GB per month at up to 2Mbit/s for GBP12 per month after the initial three-month offer period, compared to GBP15 per month for their equivalent mobile broadband offering. However, users of the fixed service also have to pay GBP11 for the rental of their fixed line on top of the GBP12 per month taking the total monthly payment to GBP22. Both tariffs are offered on 18-month contracts.

101 While fixed-line users are typically able to access higher data speeds and enjoy higher data caps than equivalent mobile services, the competitive offerings on offer from mobile players at the lower end of the market suggests that fixed/mobile substitution is likely to occur. Indeed, a statement to the market in June 2008, the Carphone Warehouse's Charles Dunstone cited connections to wireless broadband as one reason why subscriptions to its TalkTalk fixed broadband service were lower than expected.

3.1.5 Mobile network costs

Overview of the cost profile of mobile operators

102 As the data published by UK operators on their cost structures is limited, we have developed estimates[14] of operators' costs in different categories. The following costs and cashflow elements are illustrated as a proportion of revenues in Figure 3.33:

- free cashflow
- network-related opex
- customer management
- interconnection
- sales and marketing
- capex.

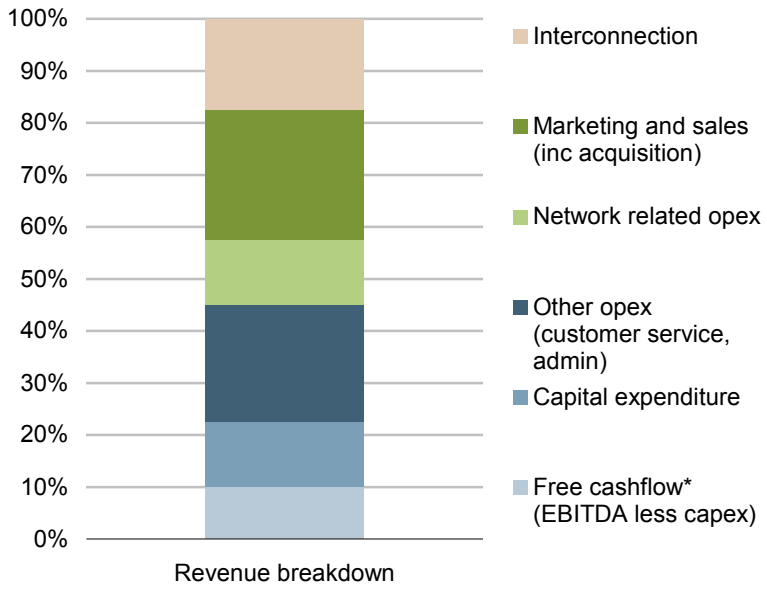

Figure 3.33: Estimated breakdown of operator costs and cashflow as a proportion of revenues [Source: Analysys Mason]
** We have not considered the effects of taxation in this analysis which would reduce free cashflow*

103 Figure 3.33 shows that the largest element of operator costs is sales and marketing, which includes handset subsidy and dealer commissions along with front-line customer management activities. Interconnection also forms a significant proportion of costs, however, this is largely offset for the four largest operators by revenue received for terminating incoming calls. It can be seen that network-related opex is a relatively small proportion of total revenues.

[14] Based on Analysys Mason business planning work for operators elsewhere, and on published accounts for international mobile operators

Methods to reduce mobile network backhaul costs

104 Mobile network backhaul costs are currently estimated to be around 4-5% of revenues for UK operators. The increase in data traffic has a corresponding effect of sharply increasing the cost of connecting Node Bs to RNCs. Further, multi-hop links (where cell sites are linked together in 'daisy chains') can significantly increase the capacity required in final drops to the main network switching points due to the effects of traffic aggregation.

105 Consequently, mobile operators are looking to mitigate this backhaul cost issue by migrating backhaul networks to IP technologies. This in turn will enable the operators to take advantage of statistical multiplexing and allow them to decouple backhaul costs from increasing capacity requirements.

106 Vodafone has publicly highlighted its plan to use Carrier Ethernet and MPLS Pseudo wire technologies within its backhaul network. Backhaul providers such as BT and Alcatel Lucent have also confirmed that mobile operators are engaged in the process of accommodating IP technologies within the backhaul network. Figure 3.34 illustrates the expected impact on backhaul costs of a move to full IP.

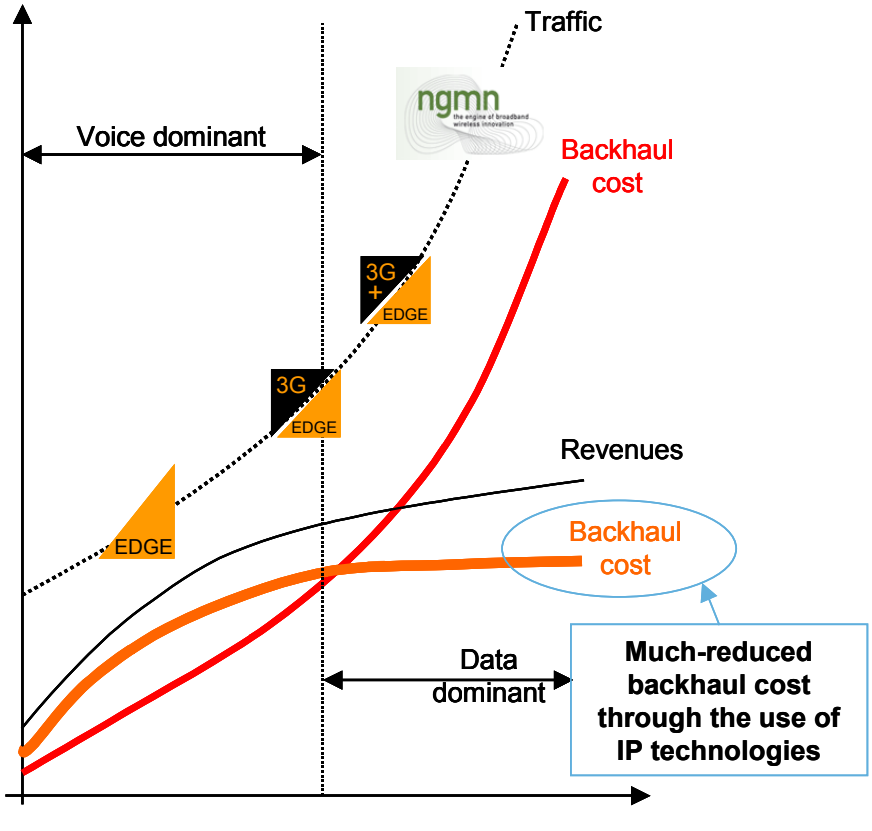

Figure 3.34: Expected impact of move to full IP on backhaul costs [Source: FT/Orange at mobile backhaul strategies conference, 9 April, 2008]

Trends in network equipment prices

107 Competition between manufacturers and global volumes of orders are driving down the prices of network equipment across the board. For example, the prices paid by Vodafone for macro-cell

equipment have halved in less than four years. This downward equipment price trend is illustrated in Figure 3.35.

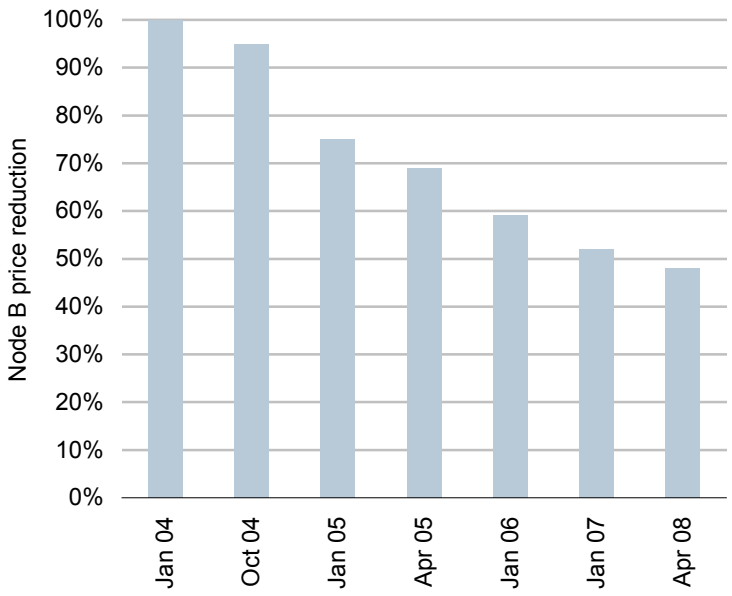

Figure 3.35: UMTS macro-cell equipment price decline, 2004-2008 [Source: Vodafone]

108 Furthermore, mobile operators are moving to single-supplier sourcing and are using this strategy to negotiate large discounts from vendors by virtue of the increased volume of orders. There is also evidence of this sourcing strategy proving successful as Vodafone Turkey's network deployment achieved a price reduction of 42% by moving to a single supplier solution[15]. It is worth noting that this single-supplier sourcing strategy is in contrast to previous network sourcing strategies, which saw UK mobile operators adopt two main network vendors in order to facilitate competition both in terms of price and network performance.

109 Global sourcing strategies from multinational groups like Orange and Vodafone are also having an impact: Vodafone Group reported in its March 2008 Technology Update that it had "overachieved on (its) target of 8% saving of GBP3.3 billion external network spend"[16].

Network outsourcing trends

110 A proportion of the reductions achieved in network opex have been realised through outsourcing elements of the network operation to third parties under fixed-price contracts. In fact, mobile operators are increasingly outsourcing network management to their equipment vendors and we

15 Source: Vodafone

16 Source: Vodafone

identified 15 such deals in Europe between 2005-2007. An overview of three of these deals is offered in Figure 3.36.

Deal	*Date*	*Example*
H3G + Ericsson	2005	Transfer of network management, deployment and field ops
E-Plus Germany + Alcatel-Lucent	Mar-07	Transfer of operation, maintenance and deployment
Vodafone Australia + Nokia	Nov-06	Managed operations and maintenance services for Vodafone's GSM, GPRS, 3G, HSDPA and core networks

Figure 3.36: Details of selected network management outsourcing deals [Source: Analysys, Informa Telecoms & Media]

111 Overall, the supply side of the market is gearing up to this outsourcing trend as mobile operators seek to outsource in order to reduce cost, increase organisational flexibility and gain access to additional skill sets, know-how and resources. For example, equipment vendors are vertically integrating into infrastructure and backhaul provisioning, whilst companies such as Blackdot Wireless and MD7 offer to reduce operators' network opex through lease optimisation. Further evidence of this shift to professional service provision within the outsource sector is illustrated in Figure 3.37, which shows an increasing proportion of Ericsson's business coming from professional services (i.e. outsourcing arrangements).

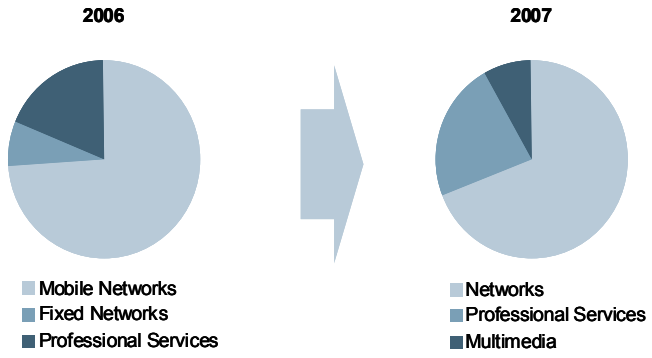

Figure 3.37: Ericsson's changing revenue mix between 2006 and 2007 [Source: Ericsson]

RAN sharing

112 Sharing radio access networks (RANs) represents an opportunity for significant cost reduction for mobile operators and a number of alternative RAN share scenarios have been considered by operators, offering different levels of benefits:

- sharing of power and site infrastructure only
- sharing of radio infrastructure
- sharing of only new-build 3G, or all 2G and 3G sites.

113 Deals announced by UK operators suggest that approximately 16% of UK sites could be decommissioned over the next few years (8000 out of approximately 50 000 sites).

114 The deal between T-Mobile and H3G is expected to achieve savings of GBP2 billion over ten years. Whilst, Vodafone states RAN sharing could save between 5% and 25% of relevant 'costs' depending on the RAN sharing scenario followed. Should the benefits from RAN share be taken to the bottom line, these savings could represent in the order of a 20% increase in free cashflow to mobile operators.

115 A summary of the RAN share deals within the UK is offered in Figure 3.38.

Deal	*Example*
H3G and T-Mobile	Plan to decommission 5000 duplicate existing 3G sites
Vodafone and Orange	Plan to decommission 3000 duplicate sites

Figure 3.38: Planned RAN-sharing deals in the UK [Source: Analysys Research]

116 While no figures for UK-specific on RAN share costs savings are publicly available, Analysys Mason has undertaken research to understand the scale of savings that can be realised by generic operators across Europe under different scenarios. Figure 3.39 illustrates that the potential cost savings from sharing 3G and 2G networks is almost ten-fold compared to sharing 3G new sites only.

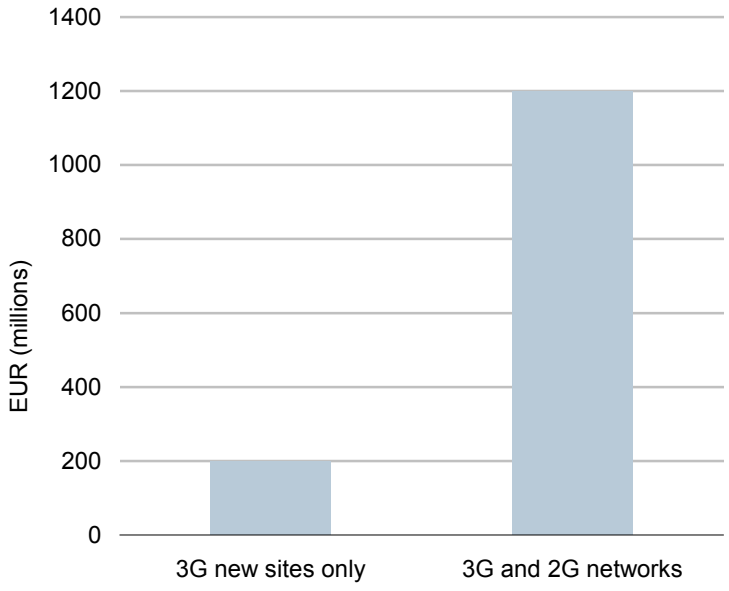

Figure 3.39: Opex/capex savings over a ten-year period from sharing 3G or 2G+3G networks[17] [Source: Analysys Mason]

117 An indicative breakdown of the constituent elements that comprise the cost saving is shown in Figure 3.40.

[17] Note: Sharing scenarios assume new 3G sites can be mainly co-sited with existing 2G sites – actual savings could therefore be higher for some operators

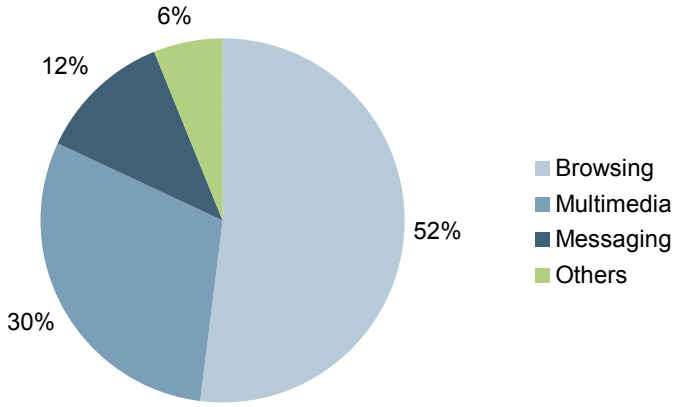

Figure 3.40: Illustrative breakdown of typical cost savings from network sharing (3G and 2G networks) [Source: Analysys Mason]

118 Critically, the cost savings in the network opex and capex elements that are achieved as a result of RAN sharing can translate into significant potential free cashflow for a mobile operator, as illustrated in Figure 3.41.

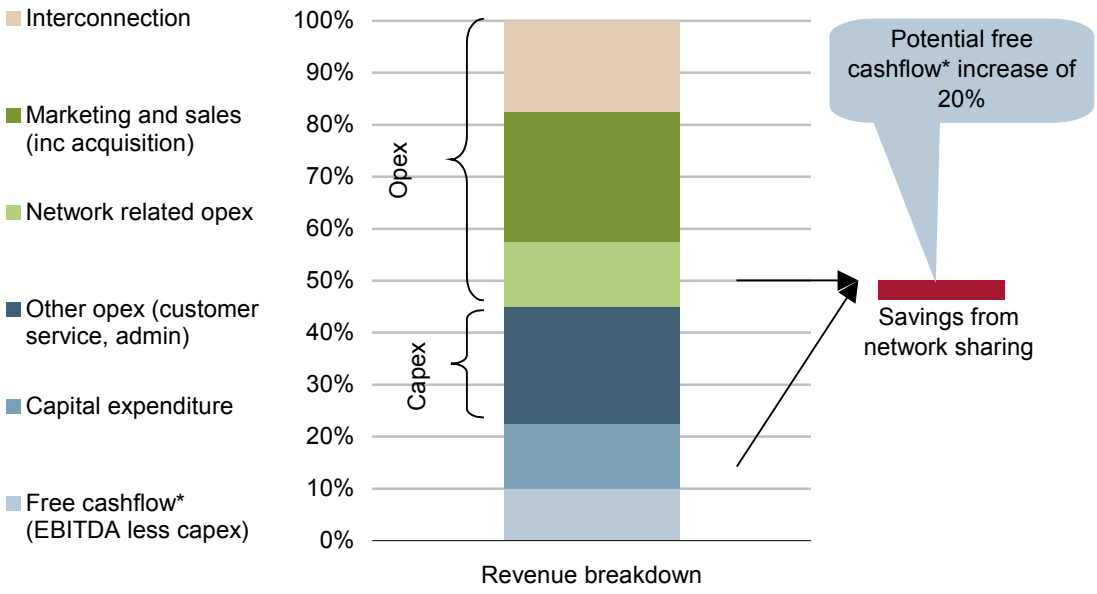

*Figure 3.41: Illustration of savings from 2G/3G network sharing over ten years based on typical European mobile operator financials [Source: Analysys Mason] *Excludes consideration of financing and corporate taxation*

3.1.6 Distribution and MVNOs

Distribution

119 Dealer commission costs have historically been a very significant element of overall subscriber acquisition costs. Recently however, mobile operators' strategies for reducing subscriber acquisition costs have led to a marked increase in direct (i.e. 'own-branded') distribution channels.

120 For example, T-Mobile is extending its direct channel strategy: "the number of stores will exceed 300 stores by the end of the year. This larger footprint will bring us closer to our customers and enhance the T-Mobile brand on the high street[18]."

121 The five mobile network operators in the UK have significantly increased their investment in own-branded outlets in recent years. Mobile operators are also augmenting their 'physical' direct channel strategy with increased Internet-based sales.

122 Nonetheless, indirect channels also remain a key element of the distribution network. Figure 3.42 presents the number of stores operated by a selected range of distributors in the UK.

Distributor	*Stores*
The Carphone Warehouse	783
Phones4U	400+
T-Mobile	275
Orange	300+
Vodafone	347
O2 ((01/07))	257

Figure 3.42: Direct and indirect channel strategies: Number of stores of key distributors (excluding H3G and MVNOs) [Source: Analysys Research, 2007; Analysys Mason 2008]

123 The exploitation of brands with substantial retail presence (such as Tesco, Asda and Sainsbury) to sell mobile services is also increasing, and is being realised through both reseller and MVNO agreements. The use of household names to target a new customer base and thus maximise the market share of the mobile network is being leveraged as part of sub-branding strategies. This in part appears to be a reflection of the success of sub-branding and MVNO distribution in markets such as Germany.

[18] Source: Gordon Ballantyne, UK sales and service director, T-Mobile

Overview of MVNO market

124 The UK has a total of approximately 25 MVNOs and service providers. This comprises a small number of mass-market players, such as Virgin Mobile and Tesco Mobile, and a limited number of niche-market new-entrants, such as Dot mobile (targeting the youth market) and Lebara (targeting international callers). Also, several service providers target the business market, such as Aerofone, Vodafone Business and Yes.

125 Compared to its European counterparts, the UK has a moderate number of MVNOs with a relatively high share of the market. By comparison, Germany has a total of 63 MVNOs/service providers, covering a wide range of household brands, although with a relatively low market share. The German market has illustrated the potential for specialist, niche-market MVNOs (based on characteristics such as ethnicity and language) to gain a foothold in the market. The most established of these is Ay Yildiz, an MVNO targeting the Turkish community. It is worth noting, however, that following this proliferation of MVNO propositions, the German market is now entering a period of consolidation.

126 MVNO market entry in Germany is being facilitated by so-called mobile virtual network enablers (MVNEs), such as Vistream, Moconta and Ensercom. However, despite the large number of providers, MVNOs still represent a relatively small proportion of the total mobile subscriber base across a range of European countries. It is an open question as to whether the UK market would benefit further from encouraging such small niche-market players. We note for example that Blyk (which is targeting the 16-24-year-old segment with an advertising-based proposition) is growing strongly, and announced on 24 April 2008 that it had exceeded its first-year target of acquiring 100 000 subscribers six months ahead of schedule.

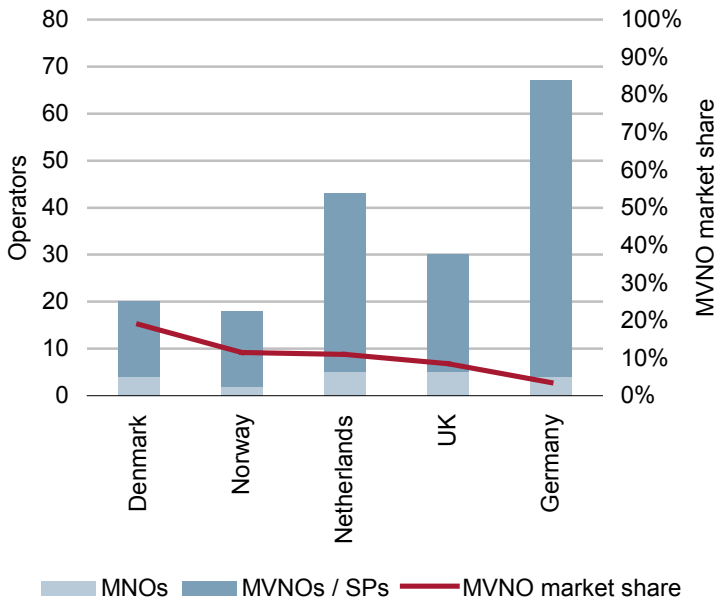

Figure 3.43: Number of MVNOs and market share across selected European countries [Source: WCIS]

127 Figure 3.44 offers a breakdown of the UK mobile subscriber base and shows that MVNOs constitute a total of 9% of total mobile subscriptions.

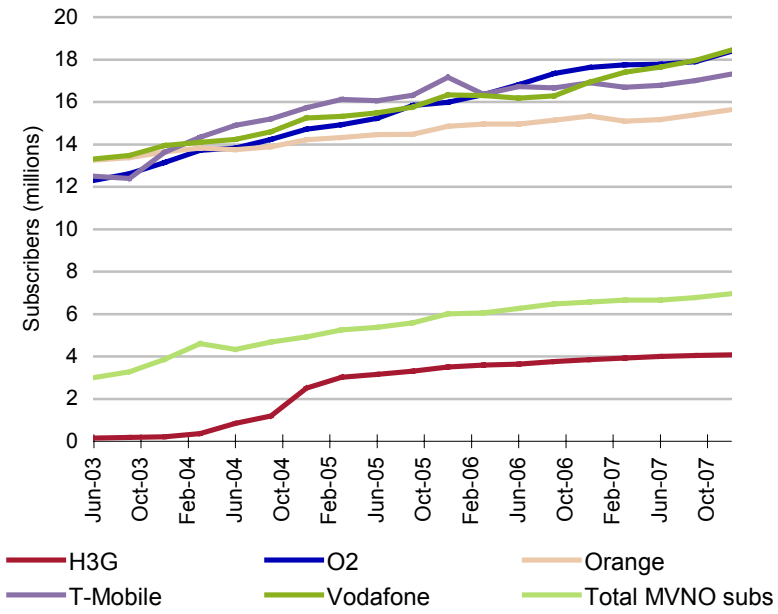

Figure 3.44: Breakdown of mobile subscribers between MNOs and MVNOs [Source: WCIS]

128 Of this 9% of overall subscribers, 63% subscribe to Virgin Mobile and 24% to Tesco Mobile (as shown in Figure 3.45). Tesco Mobile is the fastest growing prepaid operator in the UK, having captured 30% of new customers in 2006.

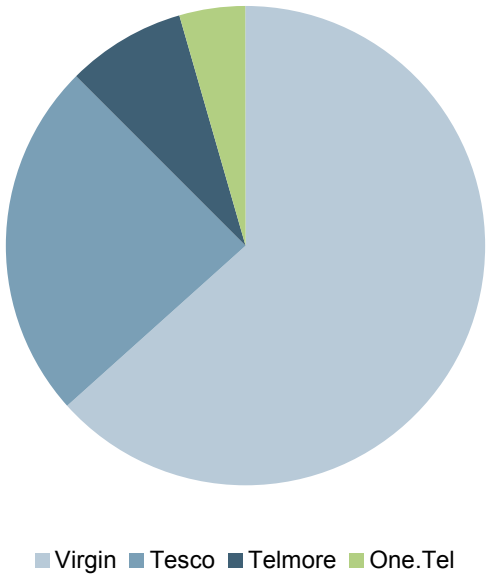

Figure 3.45: Breakdown of MVNO subscriber base

3.1.7 Other mobile players

129 In addition to the mobile network operators, and the MVNO operations that they support, industry players are exploring a range of possible alternative technologies. Specifically we have looked at the recent developments in the UK infrastructure and VoIP services in the UK market.

130 There are three other major infrastructure players worthy of note seeking to deliver mobile services to the UK retail market: the Cloud, UK Broadband (owned by PCCW) and Freedom4 (owned by Pipex and Intel Capital).

131 Following Qualcomm's acquisition of 40MHz of L-band spectrum in the UK, there is a possibility it may use this spectrum to deploy a MediaFLO broadcast mobile TV service in conjunction with partners. Qualcomm has made no public statement regarding the prospects for deploying MediaFLO in the UK and has indicated to the study team that it currently views this spectrum as a test bed for innovation and research.

132 Stakeholders in the UK mobile market believe VoIP players may play a disruptive role, although significant uncertainty remains. In particular, Vodafone has in the past cited Skype as a potentially disruptive player. VoIP could play an increasing role in the UK mobile market as it has the potential to deliver significant price benefits to consumers. The main VoIP operations currently available in the UK are as follows:

- Truphone offers a service that is well integrated into handsets and with refinement could become relatively easy to use.
- Skype is pre-installed on some mobile handsets, including the Nokia X-series handsets from H3G, and a stand-alone Skype-branded handset (again from H3G) offering free calls to other

Skype users. It should be noted, however, that both these products do not use VoIP over the air interface. Rather they operator over a normal voice channel on H3G's network before converting to IP and interfacing to Skype in the network.

133 The market potential for these players has yet to be proven. Skype has so far had limited impact on the market, and Truphone is still in commercial trials. Usability and integration with handset user interfaces would appear to be a significant barrier to use.

134 Truphone has made some significant advances in this area, but the Skype service from H3G is still awkward to initiate. As a result the service is likely to appeal to only the most price-sensitive users. We also note that VoIP services from Internet-based independent suppliers have not significantly displaced fixed voice services from traditional players. With likely reductions in termination rates, the window of opportunity for the current VoIP business model is likely to survive only a few years (a point acknowledged by Truphone). It should also be noted that VoIP makes relatively inefficient use of the spectrum in comparison to GSM or 3GPP channelised voice protocols.

3.2 Value chain assessment

135 In this section we present our assessment of the main sub-sectors in the mobile industry, based on an analysis of each individual sub-sector using Porter's Five Forces. We firstly present the overall value chain and then discuss each of the elements in turn.

3.2.1 Overview of mobile industry value chain

136 Figure 3.46 presents the value chain for the provision of mobile communications services that forms the basis of our assessment.

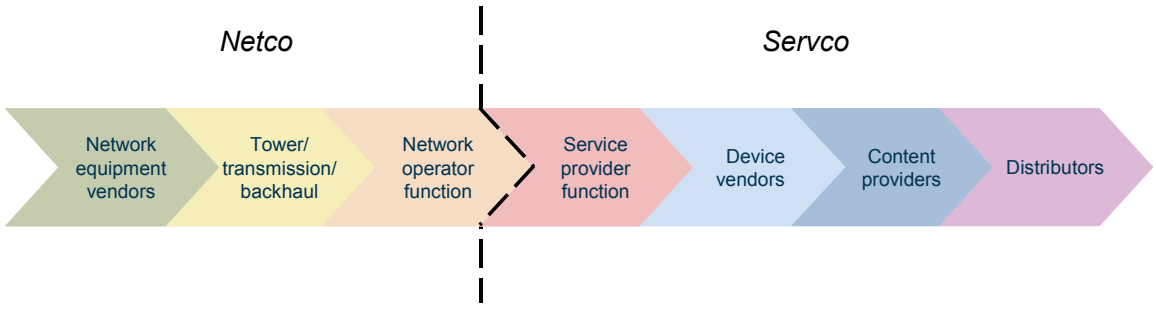

Figure 3.46: Mobile industry value chain [Source: Analysys Mason]

137 The value chain has been divided into the following sub-sectors:

- *Network equipment vendors* – this comprises the providers of network systems and sub-systems including radio and core access networks, IT (including value-added service) platforms. We also include developers of femtocell equipment in this sub-sector.
- *Tower/transmission and backhaul* – this comprises those organisations providing such services to network operators, including cell site providers (e.g. National Grid Wireless, Arqiva) and telecoms service providers (e.g. BT).
- *Network operator function* – this comprises the owners of mobile spectrum and operators of public wireless communications networks including the five MNOs and alternative mobile spectrum licence holders (e.g. UK Broadband).
- *Service provider function* – this comprises those organisations providing service provisioning and retailing communications services to end users. This includes the service provision function of the MNOs, MVNOs and resellers.
- *Device vendors* – this comprises the manufacturers of mobile handsets and other wireless devices and includes the major players (e.g. Nokia, Motorola, Samsung) as well as RIM and Apple.
- *Content providers* – this includes content owners, content aggregators and mobile experience developers.
- *Distributors* – this comprises the customer-facing retail function – including both distributors and third-party retailers as well as the direct sales and online sales functions within the mobile operators and MVNOs.

138 Figure 3.47 summarises how industry players fit into the above value chain classification.

	Network equipment vendors	Tower/ transmission/ backhaul	Network operator function	Service provider function	Device vendors	Content providers	Distributors
Voice over licensed spectrum	Alcatel Lucent Ericsson	Arqiva BT	5 mobile network operators	5 mobile network operators MVNOs	Nokia	n/a	The Carphone Warehouse 5 mobile network operators Tesco
VoIP/data over licensed spectrum	Nokia-Siemens ipaccess	BT Ericsson	5 mobile network operators	5 mobile network operators MVNOs	Dell (i.e. laptop with 3G dongle) Nokia (HSPA handset with femtocell connection)	BBC Jamster Sony Pictures EA	The Carphone Warehouse 5 mobile network operators Tesco
VoIP/data over unlicensed spectrum	Netgear Linksys	BT	BT T-Mobile The Cloud	Skype Truphone The Carphone Warehouse BT Openzone	Nokia (dual-mode/ VoIP handsets) Dell (i.e. laptop with Wi-Fi connection)	CNN Yahoo! Disney	Starbucks Costa BA

Figure 3.47: Mapping of industry players to value chain

139 In the following sub-sections, we describe our assessment of each industry sub-sector based on an analysis using Porter's Five Forces.

3.2.2 Network equipment vendors

140 Figure 3.48 summarises our Porter's Five Forces assessment of network equipment vendors. In summary, intense internal industry rivalry and price pressure from the network operators are increasing pressure on equipment vendors, leading to consolidation in the industry.

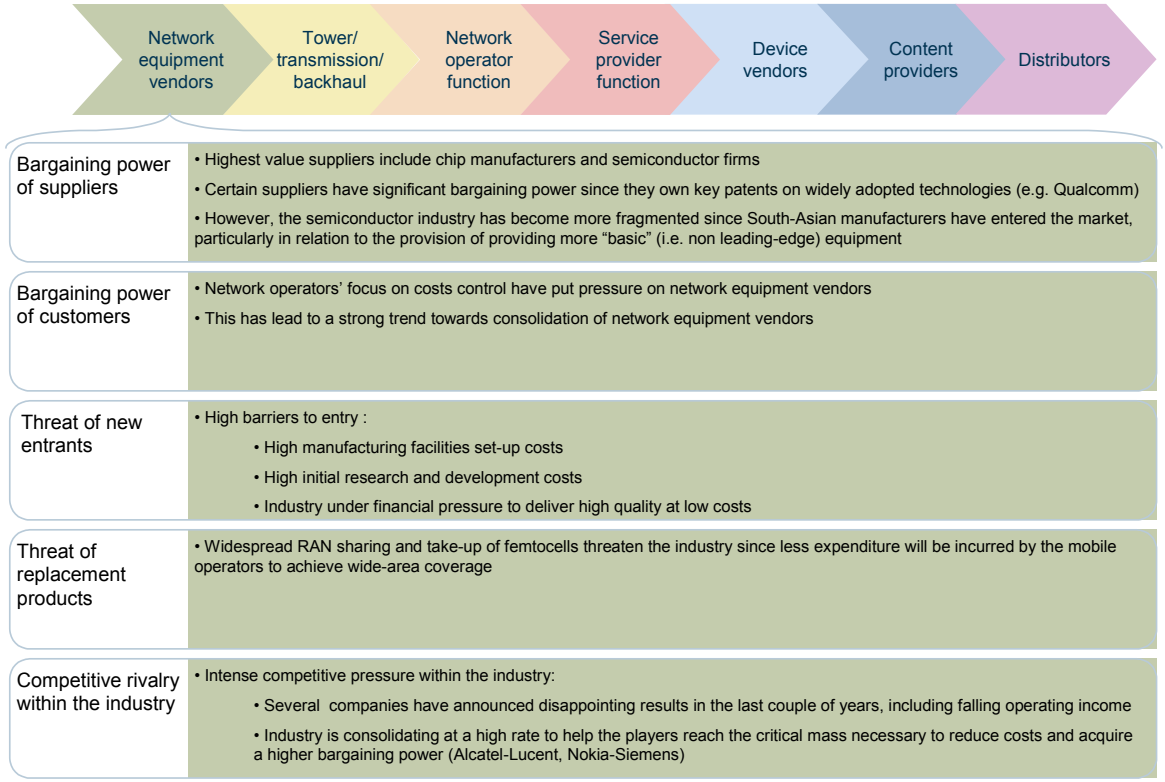

Figure 3.48: Analysis of network equipment vendors based on Porter's Five Forces

3.2.3 Tower/transmission/backhaul

141 Figure 3.49 summarises our Porter's Five Forces assessment of tower/transmission/backhaul providers. In summary, tower providers' relationships with the mobile network operators are governed by existing long-term contracts. At the time of renewal, the MNOs are unlikely to wish to move their network equipment to new sites, giving the providers a degree of negotiating power. Towers providers would also be able to wield considerable power over new entrants, as new site acquisition is becoming increasingly difficult due to environmental considerations.

142 Leased-line providers (for backhaul/transmission) are being squeezed as a consequence of industry rivalry as well as pressure from the mobile operators, who negotiate new commercial arrangements based on the threat of migrating their existing links to microwave links.

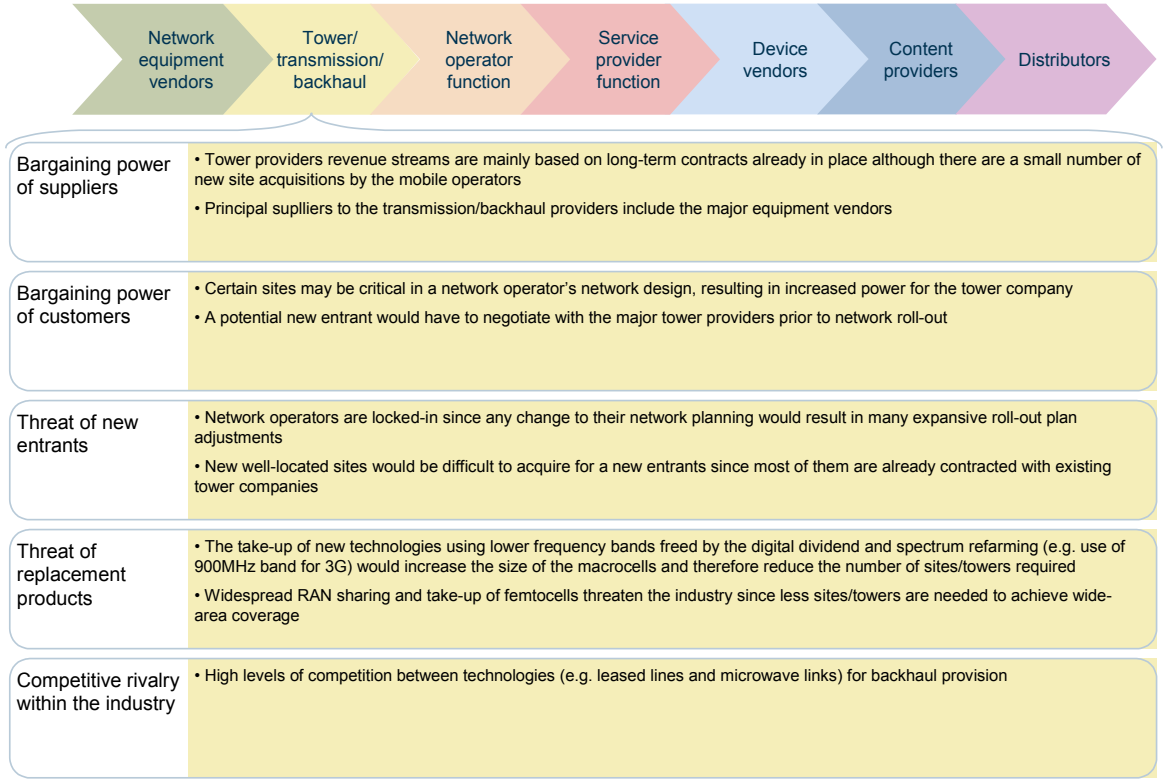

Figure 3.49: Analysis of tower/transmission/backhaul based on Porter's Five Forces

3.2.4 Network operator function

143 Figure 3.50 summarises our Porter's Five Forces assessment of the network operator function. In summary, the network operators hold considerable power relative to their suppliers and customers, and the threat of new market entry or use of substitute products is limited.

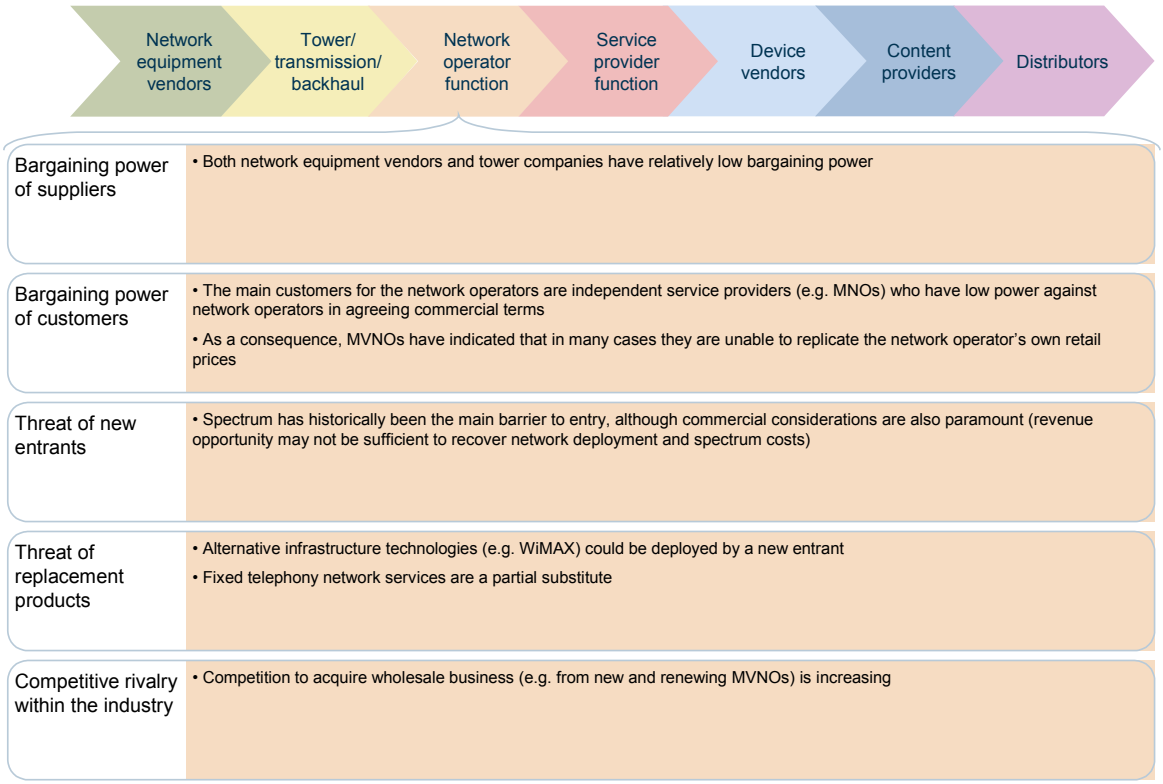

Figure 3.50: Analysis of network operator function based on Porter's Five Forces

3.2.5 Service provider function

144 Figure 3.51 summarises our Porter's Five Forces assessment of the service provider function. In summary, the ability of independent service providers to set prices in the market is relatively low as they face direct competition from the service provision arms of the network operators, who have no incentive to provide independent service providers with an attractive commercial arrangement.

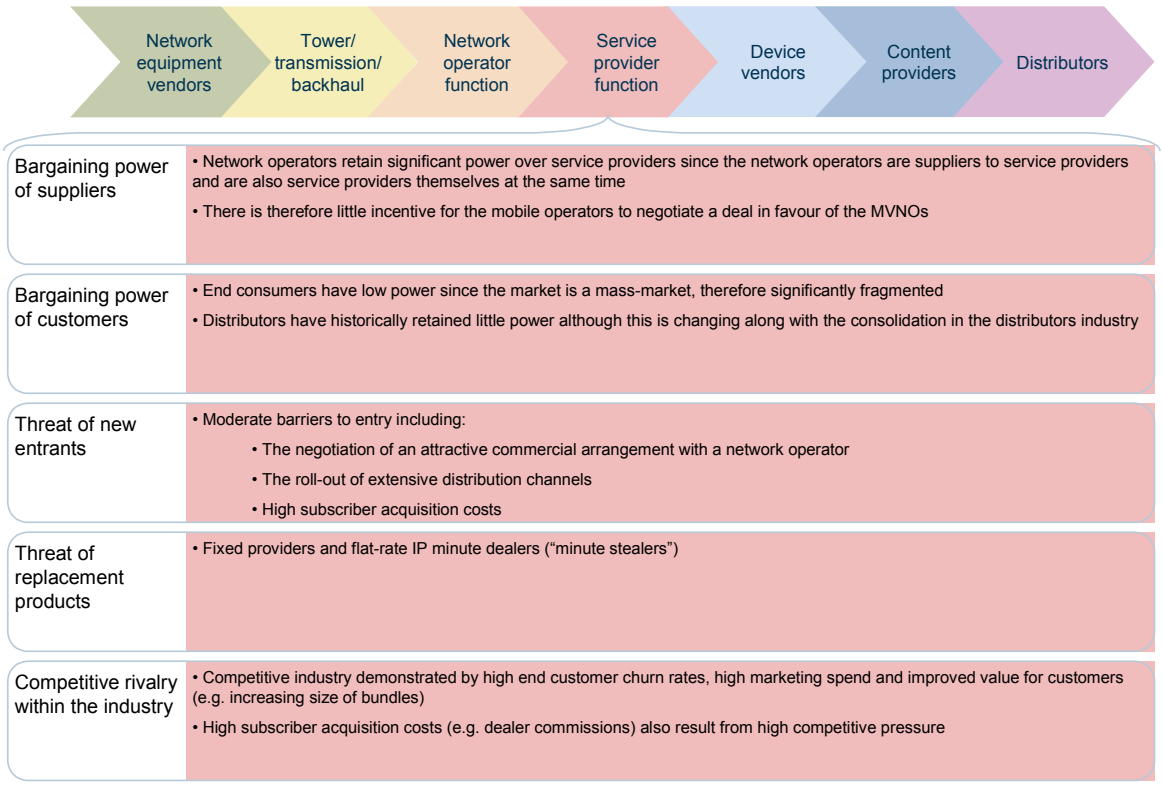

Figure 3.51: Analysis of service provider function based on Porter's Five Forces

3.2.6 Device vendors

145 Figure 3.52 summarises our Porter's Five Forces assessment of device vendors. In summary, the power of most device manufacturers is limited by competitive pressure. There are exceptions: Nokia's global market share (40%) gives it greater negotiating power with the mobile operators than its competitors, and Apple has exerted significant power over the mobile operators in relation to the sale of the iPhone.

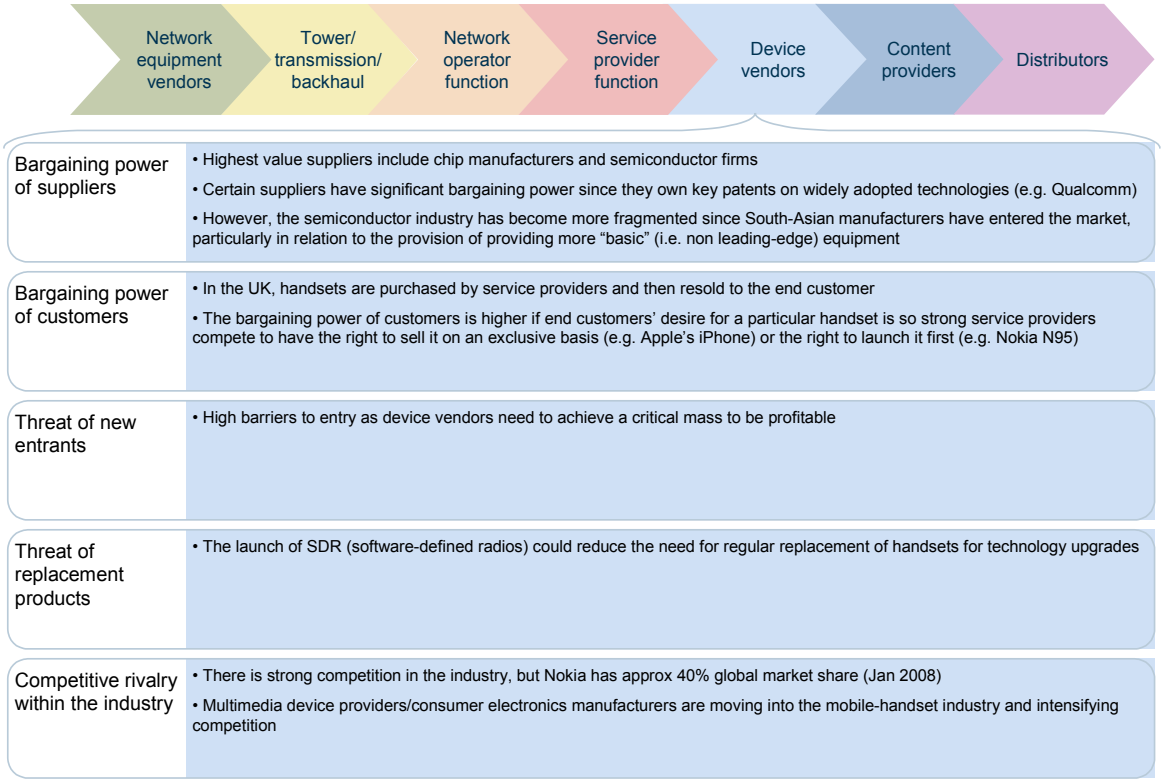

Figure 3.52: Analysis of device vendors based on Porter's Five Forces

3.2.7 Content providers

146 Figure 3.53 summarises our Porter's Five Forces assessment of content providers. In summary, content providers' power has generally been severely constrained by operators' control of the distribution channel and by the difficulty consumers have in browsing/finding content using current mobile handsets. The increasing shift towards take-up of smartphones and to handsets capable of browsing 'real' Internet sites over mobile networks will increase the power of content providers relative to mobile industry players. This will provide major opportunities for content players.

147 At the same time, the proliferation of content seen across the Internet is limiting the ability of any one player in the market to price their products at a significant premium. The abundance of content in today's market will (as is seen with fixed-line Internet access) place a cap on the power of content creators. A few, very powerful content players offering entertainment or applications that are difficult to replicate (e.g. Google, Disney, certain corporate application developers) will hold significant power in the chain and will benefit significantly as a result.

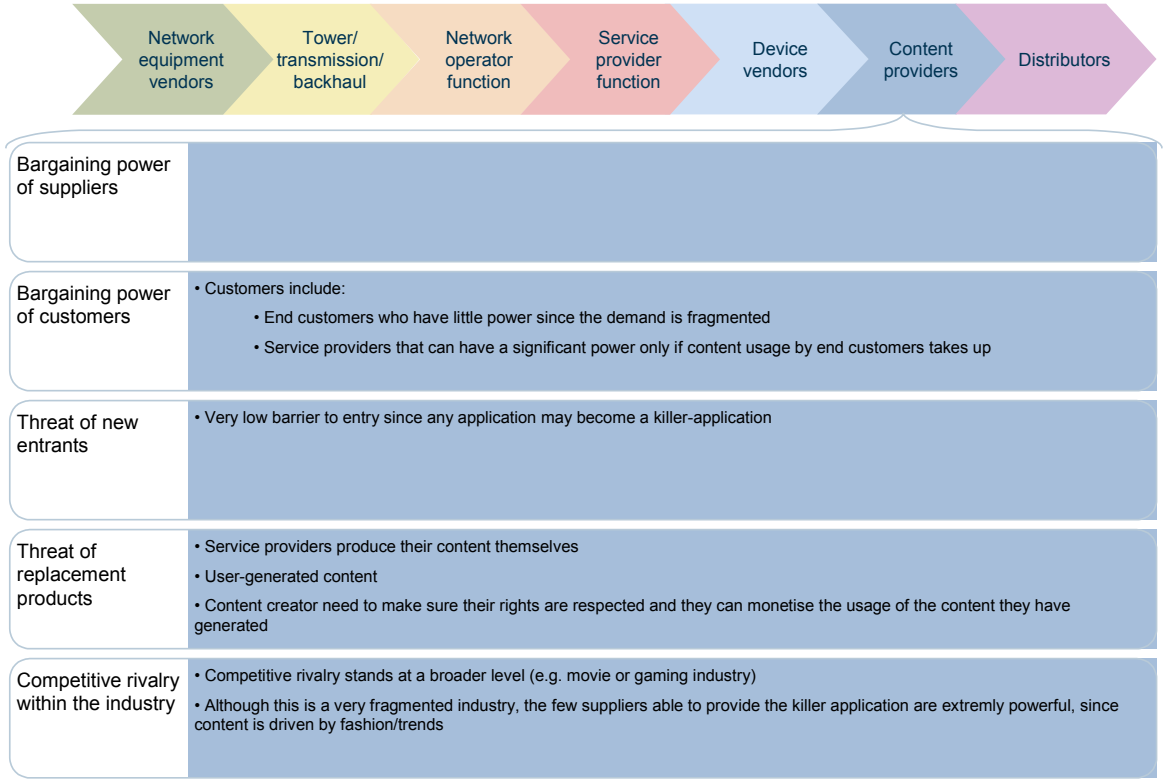

Figure 3.53: Analysis of content providers based on Porter's Five Forces

3.2.8 Distributors

148 Figure 3.54 summarises our Porter's Five Forces assessment of distributors. In summary, the power of independent distributors and retailers is moderate; their potentially increased power derived from competition for end users between service providers is balanced by operators' increased focus on their own direct sales channels (e.g. retail outlets, online presence). Consolidation has reduced the level of competition in the industry.

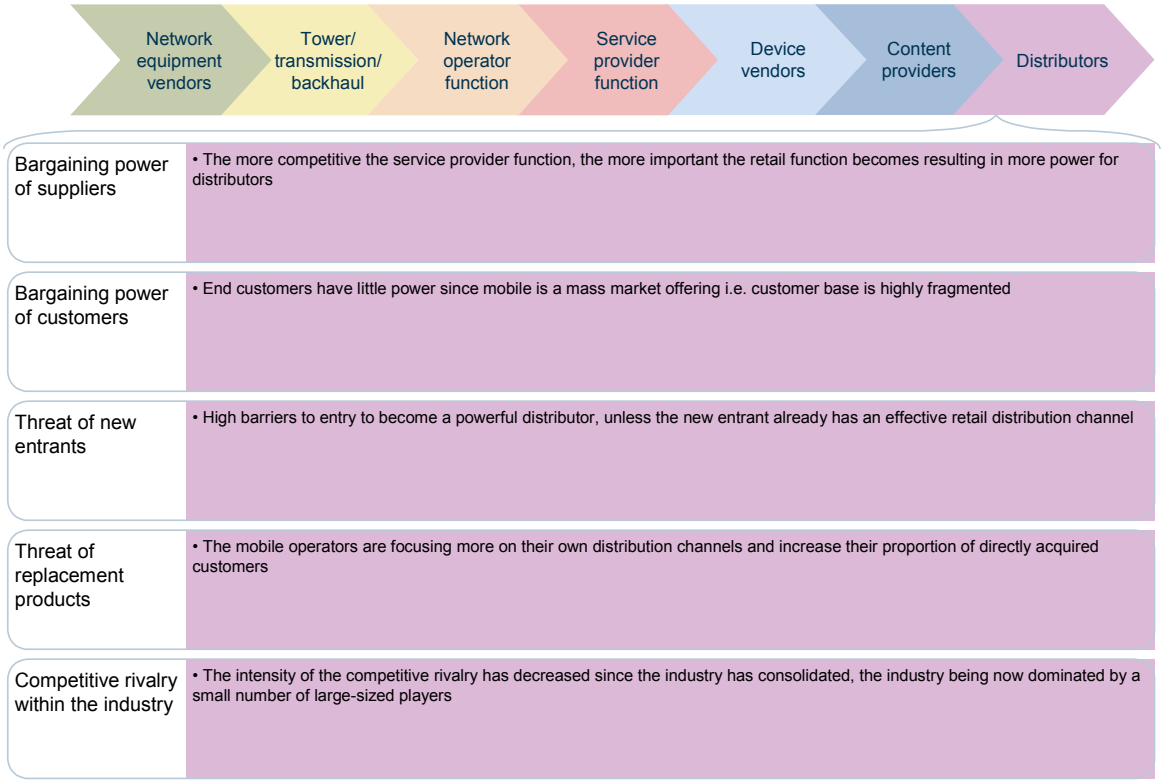

Figure 3.54: Analysis of distributors based on Porter's Five Forces

3.2.9 Summary of value chain assessment

149 In summary, it can be seen that the network operator function currently has the strongest position in the value chain as it is able to exert considerable pressure on suppliers.

150 The power of the network operator's customers remains relatively limited and there are high barriers to entry (economies of scale/commercial case for recovering spectrum and network deployment costs).

151 Some device vendors are also in a strong position in the value chain (e.g. Nokia and Apple in relation to the iPhone).

152 Distributors' power is also currently moderated by competition between service providers, however mobile operators are able to balance this power through expanding their own direct sales channels including retail outlets and on-line presence.

153 Content providers power is increasing as interest in and usage of non-mobile services increases.

3.3 Flow of funds

154 We have developed an approach to analysing the flow of revenues between the main participants in the UK mobile telecoms industry. This 'flow of funds' approach is a useful tool to compare how the various participants in the UK mobile value chain are able to appropriate the value generated by the industry.

155 It is important to note that the flow of funds approach does not attempt to assess the exact profitability of every single player in the value chain but rather calculates the 'retained value' for the main participants. This 'retained value' is the share of revenues retained by a market participant after paying or sharing revenues with the other main participants. For instance the amount paid by infrastructure owners to tower manufacturers is not subtracted from the tower companies' 'retained value' as the flow of funds analysis stops at the level of the infrastructure owner.

156 The list of the main participants being considered in that analysis include:

- HM Government[19]
- network equipment vendors
- infrastructure owners (also known as tower companies)
- backhaul providers
- network operators (i.e. the network management and wholesale function of a mobile operator)
- billing/CRM vendors
- mobile service providers (i.e. the retail function of a mobile operator, including MVNOs by definition)
- distributors
- device manufacturers
- content providers.

3.3.1 Modelling

157 The flow of funds model calculates the total revenues generated by the UK mobile industry and allocates them to the main participants as described above. The total revenues include revenues from sales of devices, content and services (voice and data). The allocation is based on the

[19] Excludes amount paid in 2001 auctions

supplier-buyer or revenue-sharing relationships between the participants; as such, network equipment vendors sell to network operators while service and content provider share content revenues between themselves. Our modelling approach and the assumptions used in the calculations are discussed in greater detail in Annex B.

158 The model was used to compare the change in the flow of funds between two recent periods of the UK mobile industry: 2000-2003 vs. 2005-2007. This reflects the need to have a reasonably long period – five years – between measurements (to allow changes to become apparent), and is averaged over several years (in order to smooth any year-to-year jumps in the flow of funds, e.g. the significant variations in network equipment vendors' revenues due to the cyclical nature of capex investments).

3.3.2 Results

159 The flow of funds during the 2000-2002 and 2005-2007 periods are quite different from one another as shown in the three figures below.

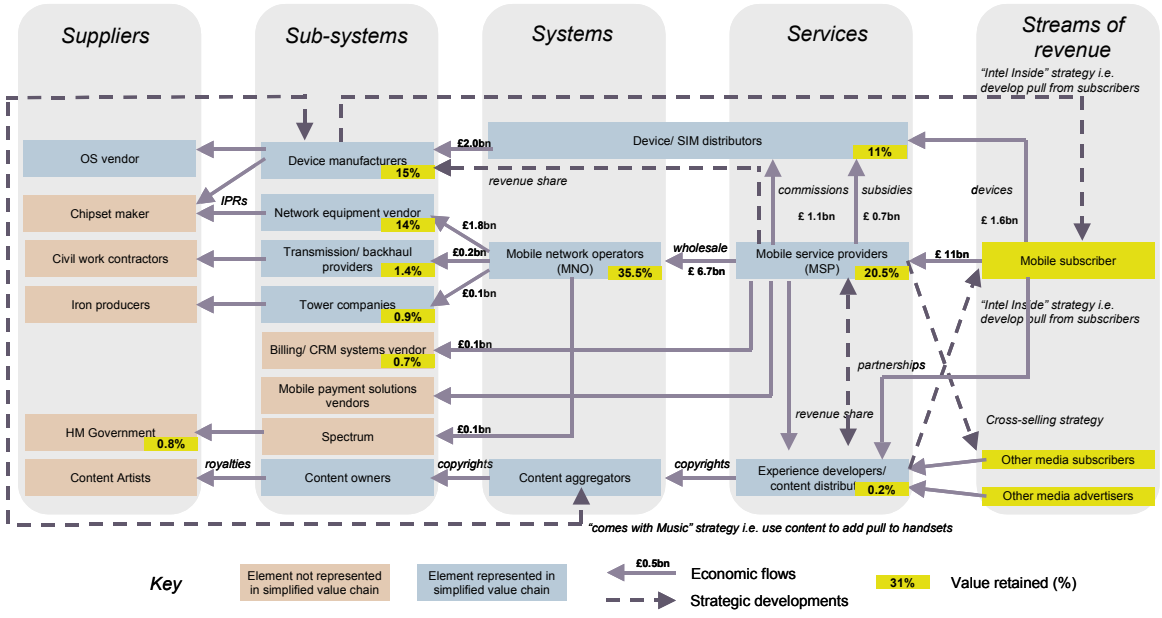

Figure 3.55: Flow of funds across UK mobile value chain, 2000-2003 [Source: Analysys Mason]

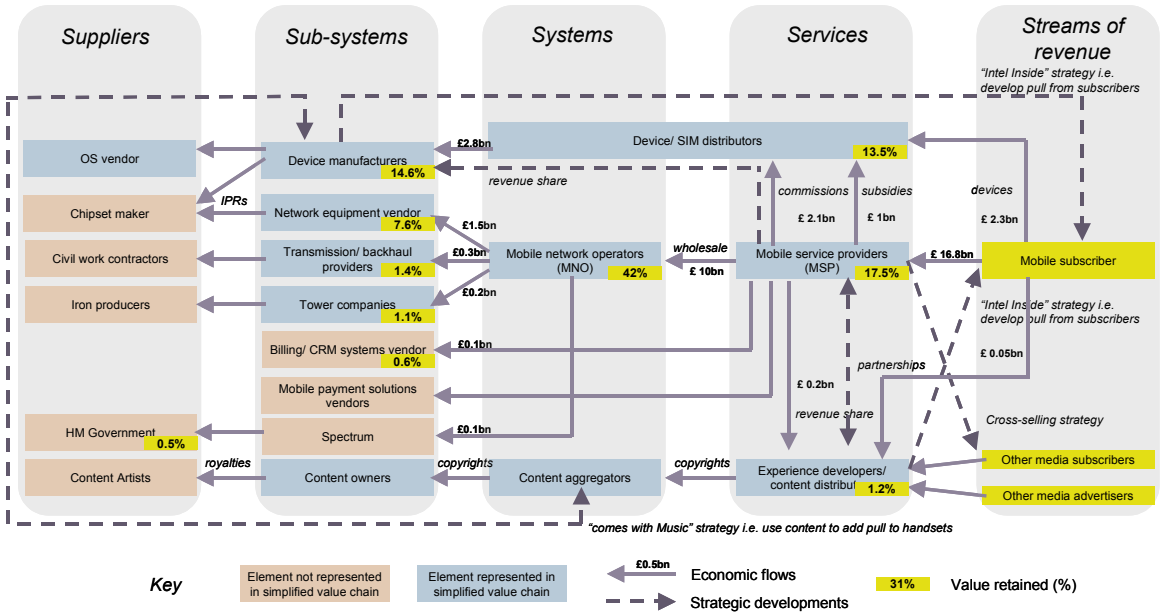

Figure 3.56: Flow of funds across UK mobile value chain, 2005-2007 [Source: Analysys Mason]

	Network equipment vendors	Tower/ transmission/ backhaul	Network operator function	Service provider function	Device vendors	Content providers	Distributors
2000-2002							
Value breakdown	GBP1.8bn	GBP0.3bn	GBP4.6bn	GBP2.6bn	GBP2bn	GBP0.03bn	GBP1.4bn
% of net value*	14%	2.3%	35.5%	20.5%	15%	0.2%	11%
2005-2007							End user revenue: GBP12.8bn
Value breakdown	GBP1.5bn	GBP0.5bn	GBP8.1bn	GBP3.4bn	GBP2.8bn	GBP0.2bn	GBP2.6bn
% of net value*	7.6%	2.5%	42%	17.5%	14.6%	1.2%	13.5%
							End user revenue: GBP19.2bn

**Figures rounded*

Figure 3.57: Revenue split across the mobile value chain [Source: Analysys Mason]

160 The most significant change between the two periods has been the drop in the market value retained by equipment vendors. Their share of retained market value has dropped from 14% in 2000-2002 to 7.6% in 2005-2007. This trend is consistent with declines seen in base station pricing and with aggressive moves by equipment vendors to diversify into other services. This trend is also consistent with reductions in termination rates observed in the UK, and indeed elsewhere.

161 There has also been a transfer of value from mobile service providers to distributors. Mobile service providers' share of retained values has dropped from 20.5% to 17.5% over the period while

distributors have seen their share increase from 11% to 13.5%. This trend is consistent with the move to counter increased churn coming from increased competition at the retail level.

162 A significant change has been seen in the value that service provider functions share with content providers. While the absolute numbers are still relatively modest, their share of retained value has increased from 0.2% to 1.2%. This represents a 42% CAGR in share of retained value and a 54% CAGR in absolute value.

163 The device industry would appear to have lost a marginal share of market value from 15% to 14.6% over the period, in spite of the observed increase in smartphone take-up. This is because the increase in devices sales is not as great as the increase observed in content and service revenues.

164 The net result of these trends is that the network operation function has increased its retained value significantly from 35.5% to 42%.

3.4 Trends

165 Our assessment of the evolution of the UK mobile market over that last ten years allows the key emerging trends to be identified. These are summarised as follows:

- an increase in per-capita expenditure on mobile telecoms
- a shift in traffic from fixed to mobile networks as the size of mobile tariff bundles increases and mobile prices fall
- dramatic recent growth in data traffic
- content usage driven by smartphone developments
- data growth driving operators' network investment strategy
- development of femtocells potentially changing the mobile proposition
- growth in data application innovation.

166 These key emerging trends form the basis for developing the market scenarios over the next five to ten years which we describe in Section 4.

3.4.1 An increase in per-capita expenditure on mobile telecoms

167 Analysis of ARPU data suggests that while headline ARPU (i.e. monthly revenue per SIM) is flat in nominal terms on average, revenue per capita of population (aged 8+) has been increasing at over 10% per annum since 2000. Growth in revenue can be seen across all services, although the greatest increase is seen in non-voice services including simple messaging, multimedia messaging, data access and content downloads such as music.

168 Although voice tariffs have declined over the past five years, this has been more than offset by an uplift in usage as described in Section 3.1.2, as well as growth in non-voice services.

3.4.2 A shift in traffic from fixed to mobile networks

169 Mobile customers are making an increasing proportion of voice calls from mobile handsets rather than from fixed lines.

170 Whilst unproven, it is likely that this trend is common to most segments of the market. In the consumer market, an increasing number of UK households appear to have given up their fixed line altogether and use mobile handsets as their sole communications device. In business markets, the increase in workforce mobility would indicate a parallel substitution effect.

171 As illustrated in Section 3.1.2. tariff and price basket analysis has demonstrated that the number of minutes on offer for a given price over the last few years has increased, particularly for those on the higher value packages. It suggests that those using over 200 minute equivalents per month are seeing the greatest reductions in cost of mobile service (or increase in service value). Hence, it would seem reasonable to expect those users to be most likely to substitute mobile for fixed minutes.

172 Although there has already been a significant shift in traffic from fixed to mobile networks, there is still great potential for further transfer. In 2007, monthly fixed-line traffic equated to an average of 230 minutes per capita (aged 8+) compared to 124 minutes for mobile traffic. It is generally accepted that the tendency towards increased mobile usage is based on several aspects of consumer behaviour:

- perceived price reductions (e.g. bundles with large numbers of 'free' minutes)
- the personal nature of the mobile handset
- the centralisation of telephone numbers of friends and contacts in one place
- the ease with which users can reach the people they wish to call.

3.4.3 Dramatic recent growth in data traffic

173 Until 2005, take-up of data services was limited. In recent years, and especially in the last twelve months, data services have seen dramatic growth, and this growth looks likely to continue. This has been supported by several factors including improved network speeds, broader 3G coverage and a larger number of data-capable 2.5G and 3G devices in circulation. Specifically ongoing growth in data traffic will be driven by:

- **Content downloads and messaging:** Growth in content downloads and messaging has stemmed from entertainment services such as music, multi-media messaging, and video clips.

- **Internet surfing via mobile handsets:** Recent research has shown a clear propensity for users to browse the Internet when the user experience is of a sufficiently high quality. A report from M:Metrics claims that 85% of iPhone users are using the device to browse the Internet. By including easy-to-browse functionality on the front screen of devices (such as Vodafone Live!), operators have made the user experience easier.

- **Mobile broadband access:** This involves accessing the Internet primarily via laptops or PCs using devices such as data cards, dongles and embedded SIMs. The marked growth in this area is highlighted by the sharp increase in the number of HSDPA-enabled PCs. H3G reported 500 000 new broadband dongle subscribers in the ten months to the end of July 2008. This was accompanied by a 700% increase in data traffic between September 2007 and March 2008. Further growth is likely to be driven both by continued enabling of PCs, and by the take-up of handsets capable of providing an acceptable broadband data experience.

174 The mobile industry appears to be poised on the edge of a new phase of development. New propositions will offer consumers a good Internet browsing experience on a new generation of smartphones together with a true broadband experience as offered by HSDPA. As Internet search functionality on the handset screen improves, the user experience will reach a level that could lead to a substitution in usage away from the PC.

175 In seeking to realise the opportunity presented by these development, the key challenge is for the industry to successfully price propositions in such a way as to maximise incremental revenues at the lowest marginal cost (as has been done with data dongles).

3.4.4 Content usage is driven by smartphone developments

176 One of the key drivers of content usage and Internet browsing is the usability of devices. The iPhone is seen as indicative of a revolution in the usability of mobile handsets for Internet browsing and content consumption. The successful launch of this product in 2007 has demonstrated the impact that usability and customer experience can have on usage levels.

177 Research undertaken by M:Metrics (see Figure 3.58) shows the improved mobile content experience supported by smartphones. Levels of content consumption across all content categories are dramatically higher for users of such devices than for the market as a whole. 58.2% of smartphone users (and 85% of iPhone users) access news or information via a browser, compared to 13.1% across the overall market. iPhone users are ten times more likely to undertake Web searches than standard device owners and fifteen times more likely to access video content.

Mobile Content Consumption: iPhone, Smartphone and Total Market: January 2008

Activity	iPhone	Smartphone*	Market
Any news or info via browser	84.8%	58.2%	13.1%
Accessed web search	58.6%	37.0%	6.1%
Watched mobile TV and/or video	30.9%	14.2%	4.6%
Watched on-demand video or TV programming	20.9%	7.0%	1.4%
Accessed Social Networking Site or Blog	49.7%	19.4%	4.2%
Listened to music on mobile phone	74.1%	27.9%	6.7%

Source: M:Metrics, Inc., Copyright © 2008. Survey of U.S. mobile subscribers. Data based on three-month moving average for period ending 31st January 2008, n = 31,389.

**Smartphones include devices running Windows, Symbian, RIM or Apple operating systems.*

Figure 3.58: Consumption of mobile content [Source: M:Metrics, 2008]

178 As smartphones and similar devices become more common, it is reasonable to expect that content consumption on mobile networks will increase significantly. Video streaming to the handset is also likely to become prevalent.

179 While still at an early stage, we believe the iPlayer experience on the iPhone is a compelling one; once similar experiences are available from other providers on other devices, we would expect video to be a major part of future growth in mobile broadband traffic. The development of new smartphones with increasing functionality is not only relevant to the consumer market, but is being targeted at business users demonstrating a significant opportunity to increase usage in that segment as well.

3.4.5 Data growth driving operators' network investment strategy

180 The experience over the last 12-18 months points to potentially huge future growth in data traffic. The need to support this growth is driving operators' current network investment strategy. Operators have been making investments in the air interface to provide the significant capacity needed to support high-speed data traffic and to provide emerging mobile broadband propositions for businesses.

181 Our modelling suggests that, with 2.6GHz extension bands and the simplifying assumption of an average of five carriers per operator, the macro-cellular air interface could reasonably support data traffic to a level of several GB per user per month. However, the step change in air interface capacity introduced with the roll-out of HSDPA has resulted in the bandwidth bottleneck shifting to the Node B-to-RNC backhaul link. Operators are now engaged in upgrading the backhaul network to IP technology to reduce link costs and take advantage of statistical multiplexing when backhauling from 'daisy-chained' sites. Vendors with a focus on backhaul supply are reporting significant growth in revenues, although this may be a short-term trend.

3.4.6 Development of femtocells potentially changing the mobile proposition

182 The deployment of femtocells has the potential to fundamentally change the mobile proposition.

183 A femtocell is a small-scale cellular base station, typically designed for use in residential or small business environments, and connects to the service provider's network via fixed-line broadband infrastructure (such as DSL or cable). Current designs of femtocells typically support two to five mobile handsets in a residential setting.

184 A femtocell allows service providers to extend service coverage indoors, especially where access would otherwise be limited or unavailable. The femtocell incorporates the functionality of a typical base station but extends it to allow a simpler, self-contained deployment; for example, a UMTS femtocell containing a Node B, RNC and GSN with Ethernet for backhaul. Although much attention is focussed on UMTS, the concept is applicable to all standards, including GSM, CDMA-2000, TD-SCDMA and WiMAX solutions.

185 Femtocells provide an alternative means of realising the benefits of fixed-mobile convergence (FMC). The distinction is that most FMC architectures require a new (dual-mode) handset that works with existing home/enterprise Wi-Fi access points, while a femtocell-based deployment will work with existing handsets but requires installation of a new access point.

186 As seen in Figure 3.14, users currently generate around 60% of traffic indoors. Femtocells therefore present an opportunity to take a significant amount of voice and data traffic off the macro cell network.

187 The costs of customer premises equipment (CPE) for a femtocell deployment are expected to be around USD100-150 (assuming large volumes). CPE is likely to be integrated into units with DSL/cable modems and Wi-Fi routers. It is assumed that these units will be self-installed, raising the prospect of manufacture by consumer electronic companies and sale through high-street outlets. It is not clear at this stage whether operators will choose to subsidise the cost of femtocells.

188 For a mobile operator, the attractions of a femtocell may lie in a number of areas. There are possibilities to improve both indoor coverage and network capacity at relatively low incremental cost. Given the propensity of users to make calls indoors and the apparent growth in traffic from users, these benefits could be significant. In addition, there may also be opportunities to extend contract durations and capture increasing numbers of subscribers from within one household, thus reducing subscriber acquisition costs.

189 Our analysis of costs and call patterns suggests that mobile operators could offer customers data access (capped as per current market practice) and unlimited calls at home from their mobiles and broadband-enabled devices for a relatively small fixed monthly fee. Under certain scenarios we estimate that a GBP5 per month price increment on top of existing mobile and fixed broadband revenues will deliver significant returns to operators on this proposition. The long-term value to operators of securing the customer attention and expenditure of entire households arguably warrants waiving this fee.

190 A number of technical and regulatory issues remain to be resolved. The degree to which interference between the femtocells and nearby handsets not registered on a cell may cause service degradation or outages have yet to be fully understood. To ensure successful deployment, operators will need to ensure the quality of service on the DSL backhaul link is controlled. This suggests either close partnership with ISPs or a triple-play offering by the operators themselves.

191 It should also be noted that, at the time of writing, there are regulatory issues that may hinder the deployment of femtocells. Current regulations require MNOs to notify Ofcom of all base station deployments, which would prohibit self-installation of femtocells.

192 The resolution of these issues is a pre-requisite for the success of this proposition. The majority of the stakeholders interviewed believed that it is possible – and indeed likely – that such issues will be resolved, and that the nature of the market proposition will become clear. If so, mass-market deployment in the UK is expected within two years.

3.4.7 Growth in data application innovation

193 The potential for innovation in new data applications is significant. There appears to be a consensus within the industry that new applications based on SIMs embedded within devices have an important role to play in the market A number of vendors and application providers have discussed concepts based on devices with embedded SIMs and low-cost access to the network.

194 Agreements between Dell and Vodafone, and between Apple and O2 have been the most highly visible manifestation of this trend to date.

195 In other markets, Japanese car manufacturers are discussing with operators the potential of bringing to market cars with built-in two-way data access. This connectivity would be used for delivering a range of new services to consumers as well as for vehicle monitoring and after-sales care.

196 Ofcom's own recent technology paper highlighted the potential for application development in healthcare and transport using low-cost embedded SIMs and cost-effective connectivity.

197 The ongoing innovation in this area is also evidenced by Polymer Vision's expected launch in late 2008 of a rollable screen reader with embedded mobile broadband connectivity.

198 Significant opportunities exist for content providers to improve the service offered to users by utilising features such as user identification, authentication, presence, behaviour and location information that mobile operators are uniquely placed to collate and federate to third parties (subject to the resolution of data protection issues).

4 Scenarios for the evolution of the UK mobile market

199 A scenario-based approach has been utilised to explore and assess the implications of different evolutionary paths that the UK mobile market might follow.

200 Scenario planning is a useful tool to capture and assess the diversity of potential developments in complex, dynamic markets. Appropriately constructed scenarios help market participants gain a fundamental understanding of the forces that are shaping the evolution of the market, aid identification of important uncertainties, and highlight the relationship between critical issues and outcomes. The main objective of the scenario development process is to create scenarios that are informative, diverse and instructive in exploring how an industry may evolve.

201 For these objectives to be achieved, it is important to ensure that the scenarios chosen are as informative and relevant as possible. To this end we have focused consideration on factors that are:

- likely to have a significant impact on the size and structure of the industry
- very difficult to predict in terms of outcome over the period being considered
- largely unrelated to each other. When a factor is assumed to lead to a particular outcome, there should be no obvious implication for, or dependency on, the other factors
- likely to result in diverse and clearly differentiated outcomes that are challenging and explore the extremities of the market while at the same time being credible outcomes

202 It is important to note that the scenarios are not intended to be exhaustive or comprehensive. Rather they are a tool through which the impact of certain changes in the market can be examined or alternative strategies can be tested

203 Four distinct scenarios have been developed as part of this work:

- **Scenario 1: 'Steady as she goes'** represents a base case for market evolution constructed under the assumption that there are no major changes to market conditions or significant deviation from currently observed trends.

- **Scenario 2: 'Mobile voice wins'** explores a world in which the substitution of voice traffic (and revenue) from the fixed network to mobile network accelerates.

- **Scenario 3: 'Internet on your mobile'** considers the situation in which significant numbers of users start to consume large volumes of Internet-based content and services on mobile handsets, rather than on laptops (which are currently fuelling growth in broadband data traffic). This change in behaviour is assumed to occur under a market structure that is largely unchanged from today.

- **Scenario 4: 'SIMs everywhere'** examines a world in which a wide range of new, connected devices and applications are developed and delivered to market by MNOs and a range of other parties. In this environment, the relationship between the use of mobile connectivity and the user changes significantly from today's norm. Third parties (including car manufacturers, insurance companies, media players, systems integrators, and healthcare organisations) offer 'connected' applications without the user entering into a direct relationship with the MNO that carries the traffic. This outcome requires significant evolution of the market as it is seen today, and is contingent upon a number of other developments in the market.

204 Each of these scenarios is predicated on certain developments and trends in the market and in consumer behaviour. In our discussion of each scenario we have identified these 'key enablers', and have assessed their implications for different players and organisations in the market.

4.1 Scenario modelling

205 We have quantified the impact of each of these scenarios in order to support our understanding of the market and regulatory implications of each scenario.

206 To develop the supporting arguments for each scenario we have therefore built a model of the UK mobile market calibrated to the aggregate results of the major players in the industry. The model includes service revenue assessments and breakdowns of capex and opex for a typical MNO together with an assessment of the flow of revenue between key players in the value chain. This is the flow of funds model discussed in Section 3.

207 We have then applied this baseline assessment to develop views of both overall market evolution and the likely fortunes of a hypothetical 'typical' UK operator under each of the different scenarios. Each assessment covers the time period from 2008 to 2017.

208 Our modelling approach is discussed in detail in Annex A.

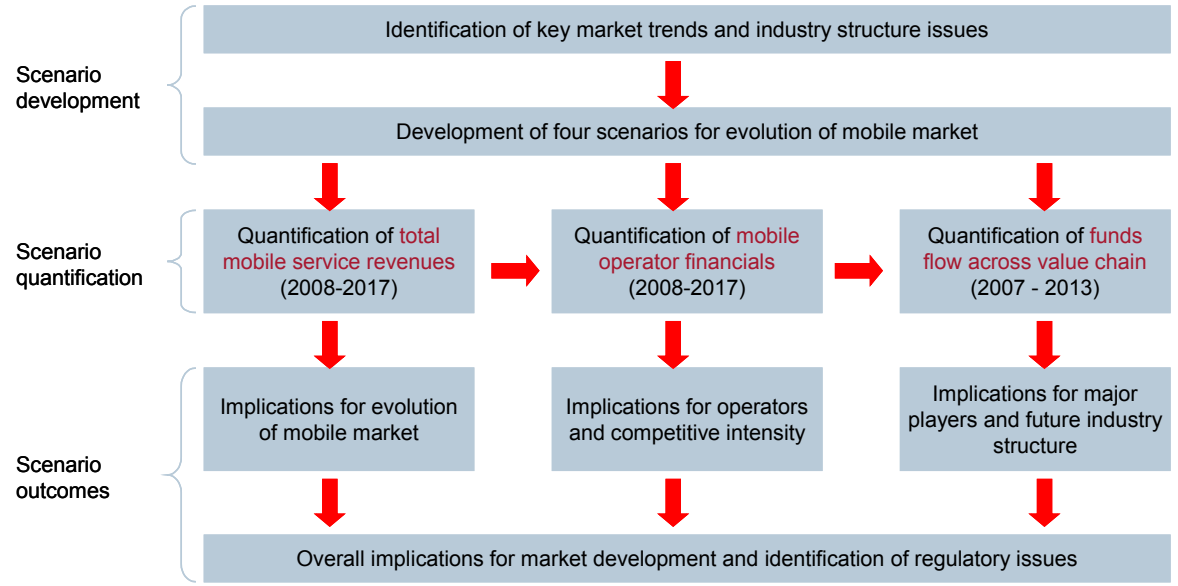

Figure 4.1: Methodology for development and utilisation of scenarios

4.2 Scenario 1: Steady as she goes

209 The 'Steady as she goes' scenario represents a continuation of the current market environment with little development in the propositions available to consumers.

210 As discussed in Section 3, mobile operators have in recent years achieved growth in revenue per capita largely by delivering better value to the consumer: subscribers to a given package are offered additional minutes and texts for the same headline price. At the same time, prices of less visible service elements (e.g. minutes that fall outside the bundle) have risen.

211 This strategy has succeeded in increasing the proportion of users on contracts, and has maintained the average monthly subscription of those on contracts. However, it is unlikely that the success of this strategy can be sustained indefinitely. As such, in the 'Steady as she goes' scenario, we have assumed that operators' success in continuing this approach gradually diminishes. The perceived added value of these offers is assumed to fall, precipitating an eventual decline in total revenue (in nominal terms). There is an intensification in competition for customers in what is a commoditising market, and the focus on cost reduction strategies becomes sharper.

212 A summary of the key enablers, outcomes and implications of this scenario is illustrated in Figure 4.2 and discussed further below.

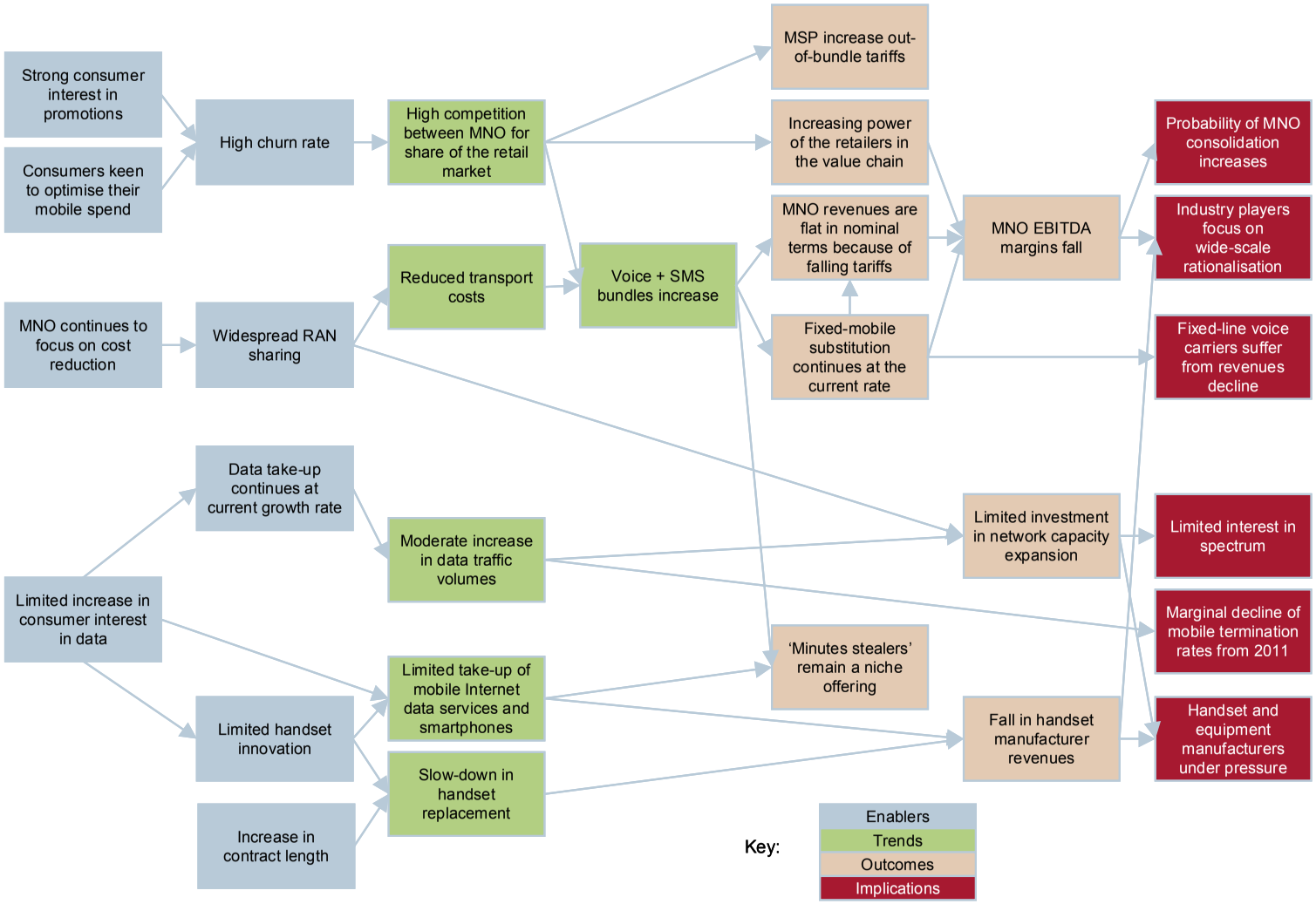

Figure 4.2: 'Steady as she goes': Summary of scenario

213 We have summarised the key trends and enablers underlying the 'Steady as she goes' scenario together with the key outcomes and their implications in Figure 4.3.

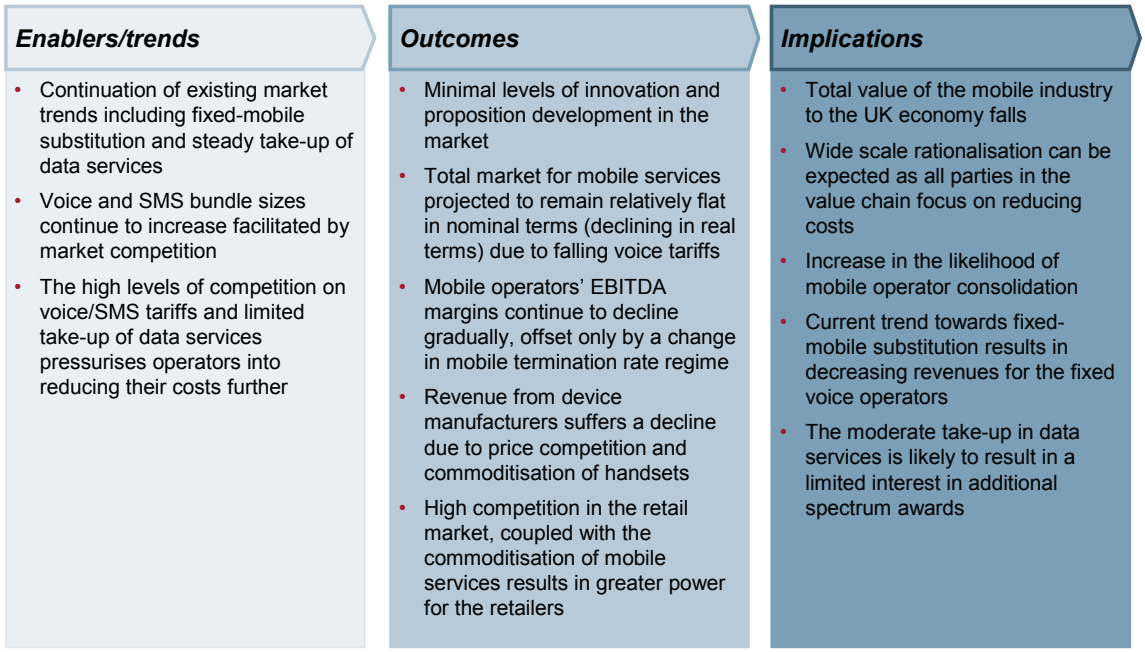

Figure 4.3: Summary of enablers/trends, outcomes and implications for the 'Steady as she goes' scenario

4.2.1 Developments in consumer propositions

214 In order for this scenario to come about, a number of key 'enablers' must come into place.

215 Users eventually conclude that there is limited additional value to be had from ever larger voice and text bundles. While fixed-mobile substitution continues at its present rate in the short term, price differences eventually cause substitution to slow and users find within the next few years that the number of minutes and texts they have in the average bundle is sufficient to meet their needs.

216 While the current phenomenon of mobile broadband on laptops continues (including both mobile professionals and 'nomadic'[20] individuals), there is limited interest in handset-based access to Internet content. This prevents operators from offering broadband access via handsets as a significant 'value add' element to existing bundles and packages. Lack of interest in this proposition may be due to several reasons:

- users may find Internet browsers on devices difficult to use
- device screens may be seen to be too small to be satisfactory

20 This refers to individuals who change their home address with relative frequency, and so includes students, seasonal workers etc.

- limited investment in networks given traffic loadings may keep data speeds too slow to be useful
- users may simply see Internet access from mobile handsets as a novelty with limited utility.

217 Take-up of this services is therefore assumed to be minimal, and as a result, growth in overall data traffic slows once the penetration of mobile broadband-enabled laptops peaks.

4.2.2 Operator response

218 In this environment, the number of subscription continues to grow, but there is an intensification in competition for customers in what is a commoditising market for voice and SMS services. Consequently, price pressure continues to lower ARPU.

219 In the short term, voice and SMS bundles are increased to maintain value to the consumer, and operators continue to focus on raising the prices of 'invisible' services, but these actions are sufficient to maintain revenue growth in nominal terms only for a limited period of time (see Figure 4.4).

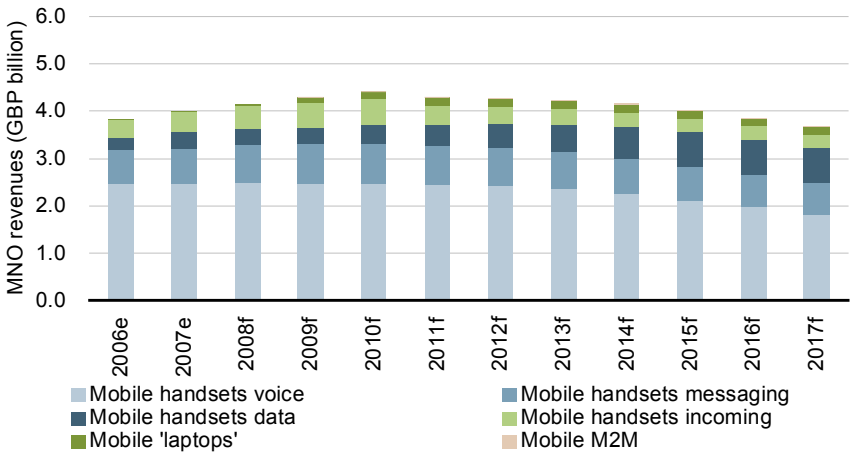

Figure 4.4: Assumed revenue mix for a 'generic' market operator under 'Steady as she goes'. [Source: Analysys Mason]

220 It is possible that operators may respond by offering femtocells to the market in an effort to capture additional traffic, but in this scenario take-up of femtocells is assumed to be minimal. It is possible that a lack of a clear, beneficial proposition for consumers limits take-up, or that technical issues remain insurmountable. Ultimately, the user response is poor and the technology falls by the wayside.

221 Overall, without the entry of other major players, revenues for individual MNOs and for the market as a whole follow a similar trajectory. What is apparent is that over the period of the study, the industry represents a significantly declining proportion of GDP (see Figure 4.5).

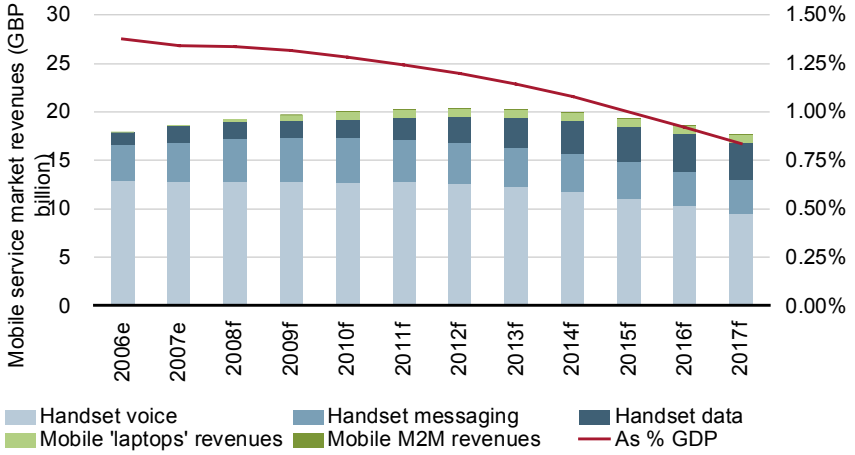

Figure 4.5: Impact of 'Steady as she goes' on overall mobile market revenues and revenues as a proportion of GDP [Source: Analysys Mason]

222 Against this backdrop, the focus of operators' attention is on strategies to retain customers and to reduce costs. In terms of the acquisition and retention of customers, operators' investment in retail space (particularly direct channels) continues to rise as a proportion of total costs, allowing a cap to be maintained on dealer commissions. Operators have some success in lengthening contracts, which reduces churn and subscriber acquisition costs in the short term. In the absence of a strong market for Internet-based content and applications,, feature development on handsets slows, and the main focus is on fashion and simplicity of devices. Further efforts are also made to broaden the proposition sold through direct channels (e.g. offering broadband-enabled laptops). Average handset costs fall enabling reductions in handset subsidies.

223 With regard to cost-reduction strategies, operators are able to derive some reductions in both network opex and capex through a continued focus on network sharing– both radio access network and backhaul infrastructure. The trend towards outsourcing certain network functions continues to deliver cost benefits to operators, as does provision of centrally negotiated, pan-European facilities contracts.

224 Network technology upgrades are limited to those required to handle laptop-generated data traffic. LTE deployment is limited to urban hot-spots.

225 The most significant change in operators' cost – and revenue – structure arises through the assumptions we have made in relation to reductions in mobile termination rates from 2011. These are driven down as a result of the increase in the proportion of data traffic on mobile networks, a trend that is already being seen today.

4.2.3 Market implications

226 The significant reduction in mobile termination rates in 2011 causes a one-off positive impact on operators' margins (Figure 4.6).

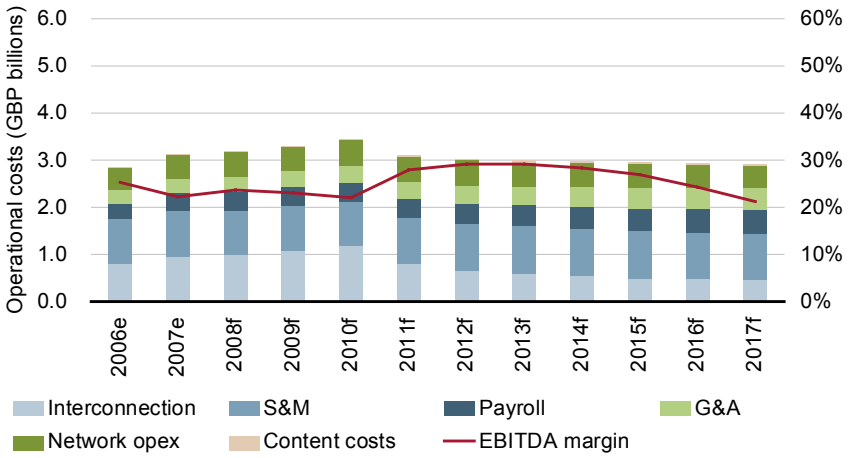

Figure 4.6: 'Generic' operator costs and EBITDA margins under the 'Steady as she goes' scenario [Source: Analysys Mason]

227 Despite this, operator margins overall are expected to be broadly flat over the period, and without the impact of termination rates, margins would fall (Figure 4.7).

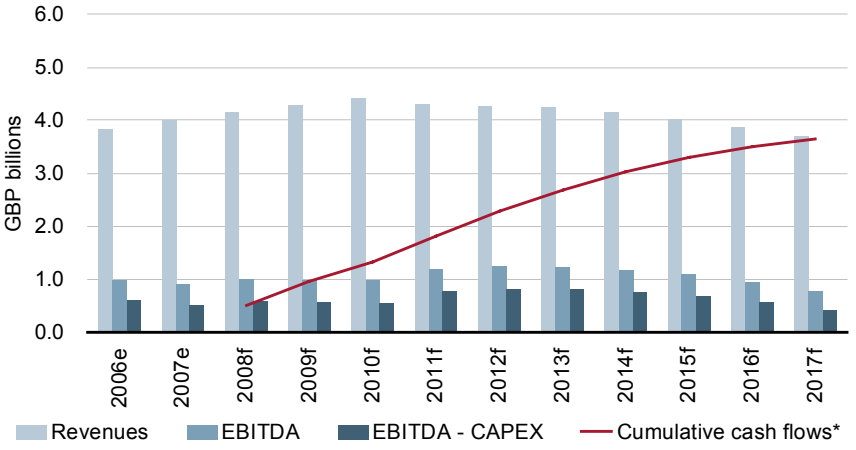

Figure 4.7: 'Generic operator financial performance under the 'Steady as she goes' scenario [Source: Analysys Mason]

228 A toughening market for operators and indeed all market players is envisaged in this scenario. With only limited take-up of new propositions by consumers and hence limited market growth, all industry players throughout the value chain are likely to focus on rationalisation as a way of minimising costs. This is likely to extend to all aspects of the business, including payroll.

229 MNOs' increased focus on direct retail channels will change the competitive dynamic between themselves and independent distributors and MVNOs. Any substantial change in the conditions offered by MNOs to independent distributors and MVNOs are likely to diminish the latter's margins and put them under greater financial pressure. This may not significantly affect those players with substantial other retail business (e.g. supermarkets), but it will affect specialist, communications-only players.

230 Fixed-line carriers are likely to suffer a revenue decline as traffic continues to move to mobile networks.

231 These conditions prove unfavourable for the entry of a new infrastructure provider. New players would require significant financial resources to develop the necessary infrastructure, devices,

propositions and (crucially) the channels to market (true for both wholesale or retail propositions). Financing for such a venture is therefore extremely difficult to obtain. Against a backdrop of limited market growth, the commoditisation of existing propositions and a squeeze on the margins of major players, the market environment for the entry of such a player is not favourable. Indeed, under this scenario it is more likely that consolidation between some of the existing mobile operators will occur.

232 The one group within the value chain with some potential for limited upside are content players, who are in a position to benefit from continued growth in content consumption in this market. Content in this case is likely to be mobile-specific, delivered through operator and device portals as well as dedicated mobile portals of players such as EA, rather than based on access to standard Internet content.

4.2.4 Flow of funds

233 We have considered how the 'Steady as she goes' scenario will affect the industry structure and flow of funds across the value chain.

234 Figure 4.8 summarises the changes to each of the industry players under this scenario.

	Steady as she goes
Network equipment vendors	• Network equipment vendors are squeezed further as network operators increasingly focus on cost-cutting
Tower/transmission /backhaul	• Network operators' focus on cost-cutting (RAN-sharing in particular) also reduces tower companies' revenues
Network operator function	• The lack of growth in the market puts the network operators under pressure, and leads them to focus on cost-cutting • Cost-cutting allows the network operators to stabilise their margins
Service provider function	• Competitive rivalry intensifies at the retail level since the market does not grow • The bargaining power of content providers increases and a portion of the service providers revenues are transferred to content providers
Device vendors	• The price pressure which damages service providers' revenues drives down device prices
Content providers	• The migration towards off-portal revenues results in moderate growth in content providers' revenues
Distributors	• The increased competitive rivalry at the service provider level drives up commissions

Figure 4.8: Impact of 'Steady as she goes' scenario on industry players

235 While total revenues for the market as a whole are broadly stable in nominal terms over the period, there will be a noticeable shift in the distribution of revenue across value chain functions under this scenario (Figure 4.9).

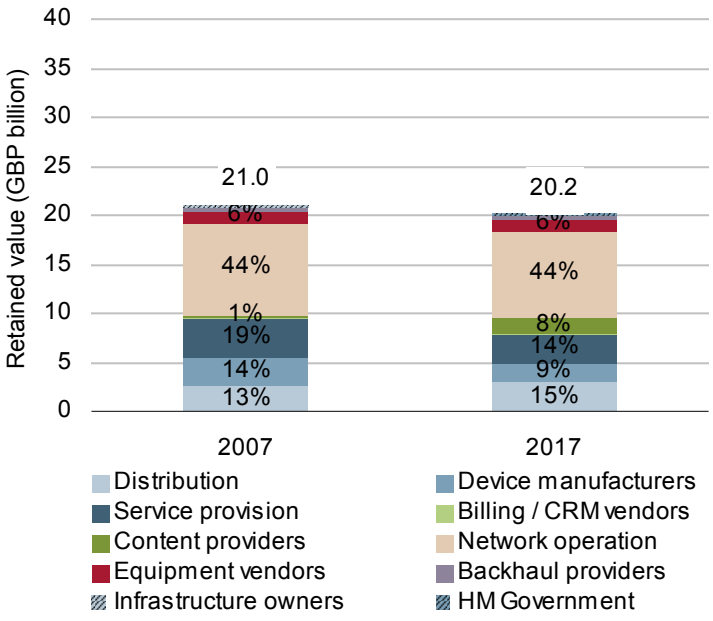

Figure 4.9: Shift in retained revenue by market players under 'Steady as she goes' [Source: Analysys Mason]

236 The distribution function (including direct retail) will derive a larger proportion of revenues at the expense of service providers as the importance of retail presence continues to increase. Revenues retained by the service provider function will fall as a result of continuing competition between existing players.

237 This is not likely to be true of the network operation function. With ownership of relevant spectrum rights and associated network assets remaining at the core of the value chain, continuing downward pressure on prices will affect the service provision function rather than the network operation function.

238 Handset vendors are also likely to see a significant fall in retained revenues both in absolute and relative terms. This is due to a steep reduction in the average prices of handsets driven by commoditisation of the handset market.

239 Continued growth in mobile content (as opposed to Internet browsing from mobile handsets) will allow content players to accrue new revenues. At the same time, changes in the content revenue share agreements between the service providers and content players will lead to more content revenues flowing to content players, hence a dramatic increase in their retained value share from 1% to 7%.

4.2.5 Regulatory implications

240 The most significant regulatory change that will occur under this scenario relate to the marked changes in mobile termination rates. As discussed, these rates will fall as a result of the ongoing rise in the data traffic carried by mobile networks. The expansion of 3G network operations

(potentially including the re-farming of 2G spectrum) to carry this traffic will significantly alter the nature and utilisation of assets used in the calculation of mobile termination rate.

241 While significant, the changes in termination rates envisages under the 'Steady as she goes' scenario are the least marked of the four scenarios considered in this study. Nonetheless, the impact of these changes are considerable. Ofcom will need to consider in more detail the nature of the changes that will result from the forecast evolution of the market, and indeed whether the current regime will continue to represent the most appropriate means of addressing the changes that are envisaged.

242 A second key implication of the 'Steady as she goes' scenario is the relatively low interest of MNOs in new spectrum under this scenario. We anticipate existing players will maintain an interest in the planned re-farming of 2G spectrum and award of 2.6 GHz expansion bands and digital dividend spectrum However, if the amount of data traffic being generated by new services is limited, the value operators will place on new allocations will be restricted. At the same time, limited scope for entry by new players offering services that compete directly with MNOs services will limit competition for new allocations and the value placed on that spectrum.

4.3 Scenario 2: Mobile voice wins

243 The 'Mobile voice wins' scenario represents a world where voice traffic switches rapidly from fixed to mobile networks. Mobile operators successfully capture significant proportions of the revenues currently controlled by fixed networks.

244 A summary of the key enablers, outcomes and implications of this scenario is illustrated in Figure 4.10 and discussed further below.

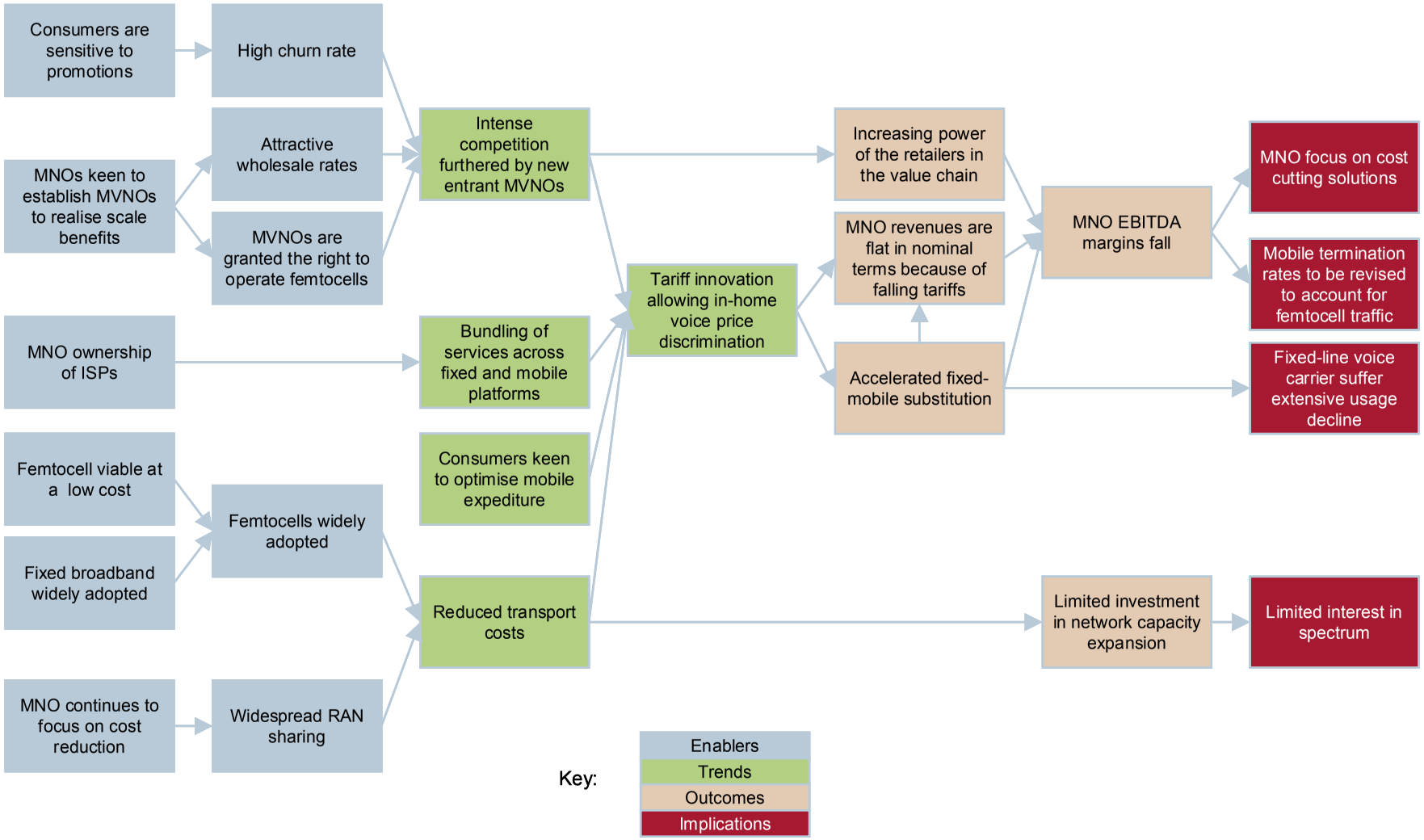

Figure 4.10: 'Mobile voice wins': Summary of scenario

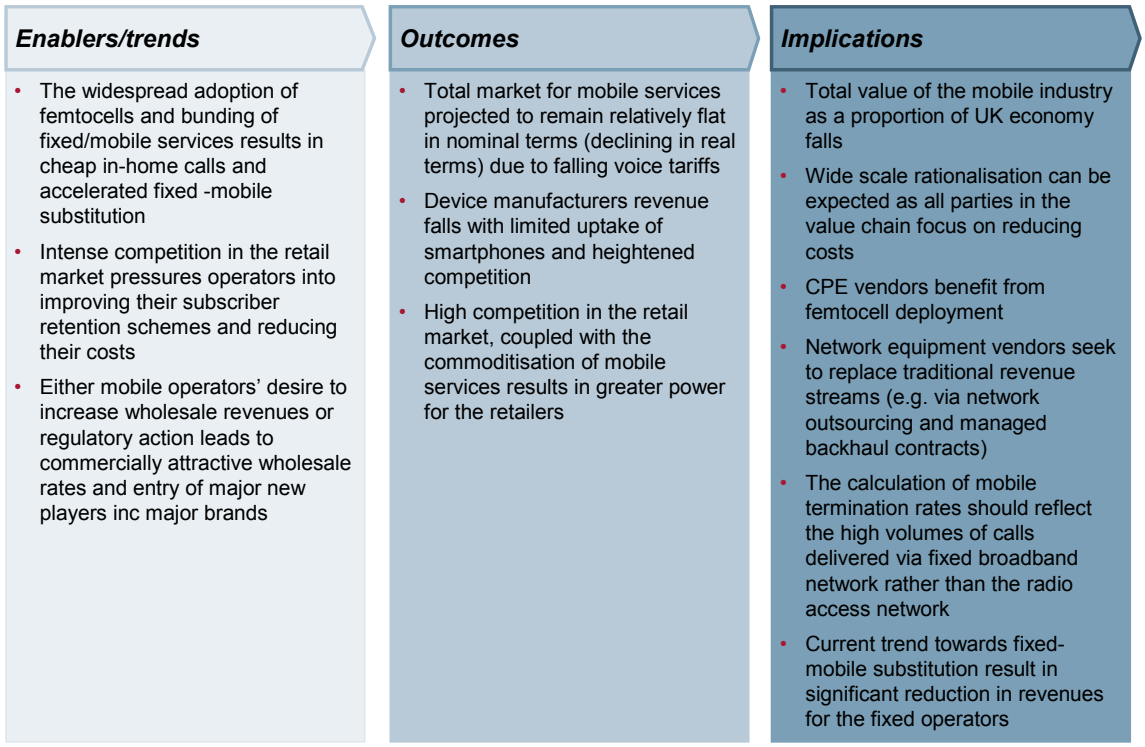

Figure 4.11: Summary of enablers/trends, outcomes and implications for the 'Mobile voice wins' scenario

4.3.1 Developments in consumer propositions

245 The central proposition offered by mobile network operators to bring about this scenario is the 'free home-call' proposition. This service allows a user to make unlimited voice calls from a mobile handset within the home.

246 Introduced in 2010, but only really pushed to the market in 2011, the 'home-call' product provides users with unlimited calls to national fixed and mobile numbers for a limited additional monthly charge – of the order of GBP5 per month – on top of their existing package. The only prerequisite is for the user to have a fixed-line broadband connection.

247 Delivery of that package is facilitated primarily by cheap, self-installed femtocells. These are made available as a self-install unit at no cost to the consumer. As a result of the success of this proposition, mobile subscriptions render fixed-line telephones almost obsolete for voice calls, as individuals make and receive the vast majority of their calls from mobile handsets.

248 Alongside this core product, MNOs seek to optimise wholesale revenues by increasing the attractiveness of commercial rates to existing and new-entrant service providers. A plethora of new MVNOs emerge focusing on brand extension and development in a retail environment.

249 A number of broadband ISPs form partnerships with operators to deliver services on their behalf. A range of other players establish their own MVNO operations in which the femtocell-delivered home-call service is a core part of the offering. Integration of Wi-Fi and DSL routers with the femtocell is a core part of this proposition.

250 MVNO participation in this proposition is aided by a desire on the part of the MNO to reduce the direct cost of distribution and to expand market reach. This results in MNOs increasing the proportion of retail revenue that the MVNO retains. At the same time, a fall in mobile termination rates reduces the commercial risks to smaller players of offering bundled mobile minutes to consumers.

251 As in the 'Steady as she goes' scenario, take-up of data services (interest in 3G laptop connectivity) continues to be modest. However, higher prices for wide-area access to this service coupled with integration of Wi-Fi into both laptops and femtocells ensures large numbers of consumers continue to use Wi-Fi for broadband PC access.

252 The browsing of the standard Internet via mobile handsets fails to take off, as users find browsing on mobile devices a broadly unsatisfactory experience. The compromises involved in combining Internet access and content consumption with a communications device prove unacceptable.

4.3.2 Operator response

253 The home-call proposition maintains the value of mobile subscriptions in the minds of the consumer for a period. Eventually, however, operators find that price pressure, coupled with the lack of an additional 'more for the same' offering, and slowing penetration, drives down ARPU and with it total revenue (Figure 4.12).

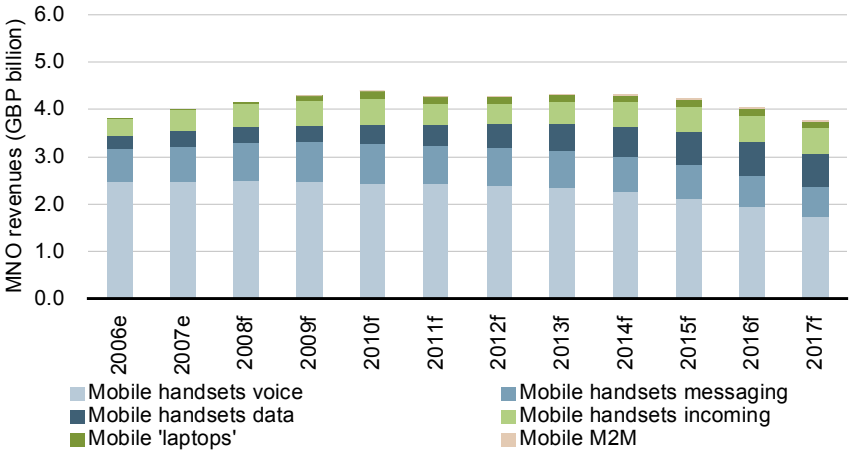

Figure 4.12: Assumed revenue mix for a 'generic' market operator under 'Mobile voice wins'. [Source: Analysys Mason]

254 As subscribers remain highly sensitive to promotions, operators continue to experience the current high rates of churn. The consequent importance of customer acquisition further enhances the role of an effective retail presence.

255 In addition, MNOs' increased focus on wholesale distribution will change the competitive dynamic between themselves and MVNOs. The changes required to ensure the commercial viability of niche MVNOs will provide MNOs with short-term advantages in terms of market reach and asset utilisation.

256 Overall mobile market revenues in the 'Mobile voice wins' scenario follow a broadly similar trajectory to those in the 'Steady as she goes' scenario: initial steady growth gives way to a slow decline. However, revenues in the 'Mobile voice wins' scenario are maintained at a higher level for longer than in the 'Steady as she goes' case, supported by the combination of the value added by home-call services and the success of MVNOs with new propositions.

257 This goes some way to stemming the decline in the value of mobile telecoms revenues as a proportion of GDP.

258 In parallel with these developments, however, fixed-line carriers are likely to suffer a revenue decline as traffic continues to move to mobile networks.

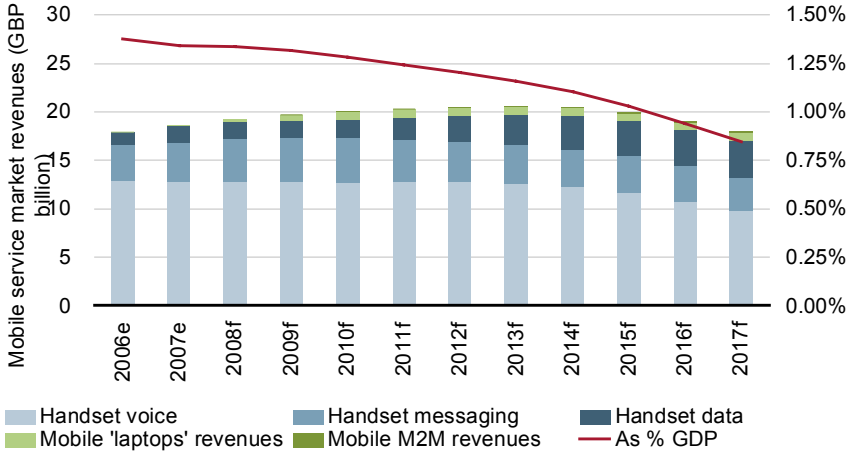

Figure 4.13: Impact of 'Mobile voice wins' on overall mobile market revenues and revenues as a proportion of GDP [Source: Analysys Mason]

259 As the number of retailers offering mobile services rises, increased investment in dealer commissions and handset subsidies (from an already high base) is found to be necessary to support continued acquisition of subscribers. However, in the absence of a strong market for Internet-based content and applications, feature development on handsets slows, and operators focus on fashion and simplicity of devices. Average handset costs fall mitigating the rise handset subsidies.

260 The cost per subscriber therefore increases, but MNOs find that overall distribution costs fall in absolute terms as an increasing proportion of subscribers are connected through MVNOs.

261 Despite the significant increase in the number of mobile voice minutes carried, operators are able to control network expenditure as the majority of incremental traffic gained is from in-home use, and is delivered via femtocells using fixed broadband networks.

262 Operators continue to control expenditure through a combination of cost-cutting initiatives and limited investment in new radio access technologies (such as LTE).

263 Again, reductions in termination rates occur from 2011 as the data traffic that is carried on the network feeds through into lower charges. This reduction significantly affects the costs of outgoing minutes and the interconnect revenue received for terminating traffic.

264 The most significant change in operators' cost – and revenue – structure arises through the assumptions made in relation to reductions in mobile termination rates from 2011. These are driven down as a result of the increase in the proportion of data traffic on mobile networks, a trend that is already being seen today.

4.3.3 Market implications

265 The significant reduction in mobile termination rates in 2011 causes a one-off positive impact on operators' margins (Figure 4.6).

266 Under this scenario, operator margins are seen to decline significantly towards the end of the period. The impact of the change in termination rates is to provide a one-off positive impact on

operator margins in 2011, but over the longer term, reductions in termination rates do not keep pace with the growth in traffic captured from the fixed network. (Figure 4.14).

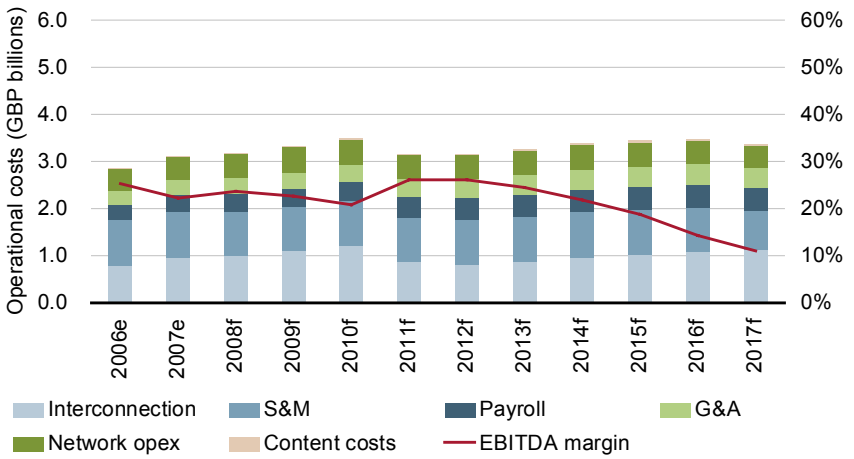

Figure 4.14: 'Generic' operator costs and EBITDA margins under the 'Mobile voice wins' scenario [Source: Analysys Mason]

267 However, in the longer term, operators' margins are likely to fall faster than under the 'Steady as she goes' scenario. As a result, operators' capacity to generate free cashflow falls dramatically by the end of the period (Figure 4.15). This raises questions over whether such a strategy is viable without additional changes in termination rates beyond those modelled here.

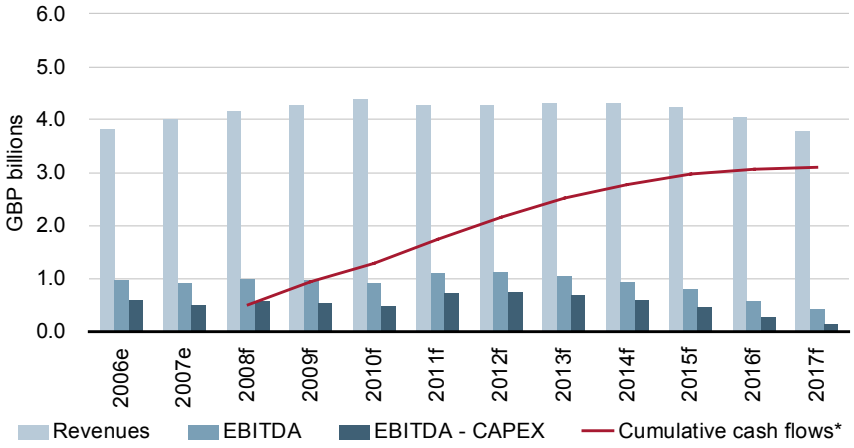

Figure 4.15: 'Generic operator financial performance under the 'Mobile voice wins' scenario [Source: Analysys Mason]

268 The one group within the value chain with some potential for limited upside are content players, who are in a position to benefit from continued growth in content consumption in this market. Content in this case is likely to be mobile-specific, delivered through operator and device portals as well as dedicated mobile portals of players such as EA, rather than based on access to standard Internet content.

4.3.4 Flow of funds

269 Figure 4.16 summarises the changes to each of the industry players under the 'Mobile voice wins' scenario.

	Mobile voice wins
Network equipment vendors	• Network equipment vendors are squeezed further as network operators increasingly focus on cost-cutting • Revenue growth opportunities for femtocell manufacturers
Tower/transmission /backhaul	• Network operators' focus on cost-cutting (RAN-sharing in particular) also damages tower companies' revenues • The take-up of femtocells reduces the number of sites required to achieve full-coverage and results in lower revenues for the tower companies
Network operator function	• The wholesale market becomes crucial for the network operators which have to compete at the wholesale level to attract MVNO traffic on their networks
Service provider function	• The industry competitive rivalry increases strongly due to new entrant service providers in a market with flat revenues
Device vendors	• The price pressure which damages service providers' revenues drives down device prices
Content providers	• The migration towards off-portal revenues results in moderate growth in content providers' revenues
Distributors	• The intense competitive rivalry at the service provider level strongly drives up commissions

Figure 4.16: Impact of 'Mobile voice wins' scenario on industry players

270 As in the 'Steady as she goes' scenario, total revenues for the market as a whole are broadly stable in nominal terms over the period, but there will be a noticeable shift in the distribution of revenue across value chain functions (Figure 4.17).

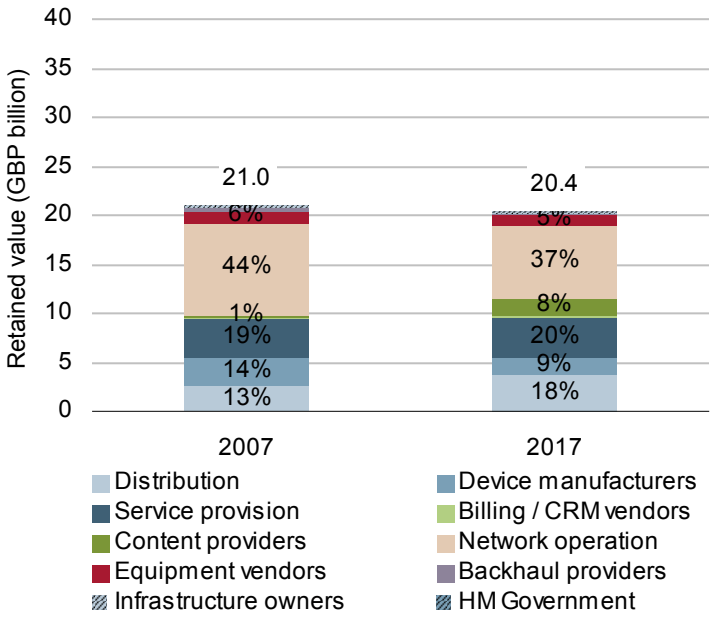

Figure 4.17: Shift in retained revenue by market players under 'Mobile voice wins' [Source: Analysys Mason]

271 The share of revenues that is retained by the network operator function will fall significantly as a result of the continuing competition between existing players. The key difference relative to the 'Steady as she goes' scenario is that service providers are able to benefit from the increased competition at the wholesale level to pass on to network operators the costs associated with increased competition at the retail level. In particular, changes in MVNO commercial arrangements will act to move value towards the service provider activity.

272 The distribution function is also likely to benefit from a higher proportion of revenues as a consequence of the intensification of competition for customers, greater use of promotions, and the increasing importance of attracting customers.

273 As in the 'Steady as she goes' scenario, customers will steadily increase consumption of mobile content, and the share of download revenues retained by operators is expected to shrink significantly for 'on portal' content. As such, there is a significant increase in the share of value retained by content players.

274 The revenues retained by device manufactures fall on account of the ongoing commoditisation of devices in a market in which additional take-up of smartphones is limited.

275 Significant growth in traffic volumes will have lower than expected impact on infrastructure: much of the voice traffic will be carried via fixed broadband, with the use of femtocells. In addition, faced with increased competition at the wholesale level, MNOs will intensify efforts to minimise network costs, leading to a significant reduction in revenues flowing to equipment vendors, backhaul providers and infrastructure owners.

4.3.5 Regulatory implications

276 As in the 'Steady as she goes' scenario, the most significant regulatory change that will need to occur under this scenario are changes to mobile termination rates. As discussed, these rates will fall as a result of the ongoing rise in the data traffic carried by mobile networks.

277 Similarly, the second key implication of this scenario is the limited interest in spectrum. Existing players will maintain an interest in the planned re-farming of 2G spectrum and award of 2.6 GHz expansion bands and digital dividend spectrum. However, if the amount of data traffic being generated by new services is limited, the value operators will place on new allocations will be restricted even with additional voice traffic attracted from the fixed network. Limited scope for entry by new players will limit competition for new allocations and the value placed on that spectrum.

278 It should be noted that, at the time of writing, there are regulatory issues that may hinder the deployment of femtocells. Current regulations require MNOs to notify Ofcom of all base station deployments, which would prohibit self-installation of femtocells. Resolving this issue – for example by exempting femtocells from this requirement – is a pre-requisite for the viability of this scenario and for the success of this proposition.

279 On a related note, it is unclear whether MVNOs would have access to femtocell technology to deploy as part of their proposition which is seen as an important aspect of capitalising fully on the potential of this scenario. Such access could occur either through commercial agreement with the parent MNO and/or through regulatory action.

4.4 Scenario 3: Internet on your mobile

280 The 'Internet on your mobile' scenario depicts an environment in which mainstream users start to consume 'real Internet' content on their handsets. This is a proposition that extends beyond today's adoption of mobile broadband for laptops towards a world where users find browsing standard Internet sites and utilising standard Internet applications an easy, usable and valuable experience. In this scenario, smartphones with standard Internet browsers proliferate, produced by multiple manufacturers. The broadband connectivity provided to those devices is more than acceptable for users to access a wide range of applications, including streaming video.

281 A summary of the key enablers, outcomes and implications of this scenario is illustrated in Figure 4.18 and discussed further below.

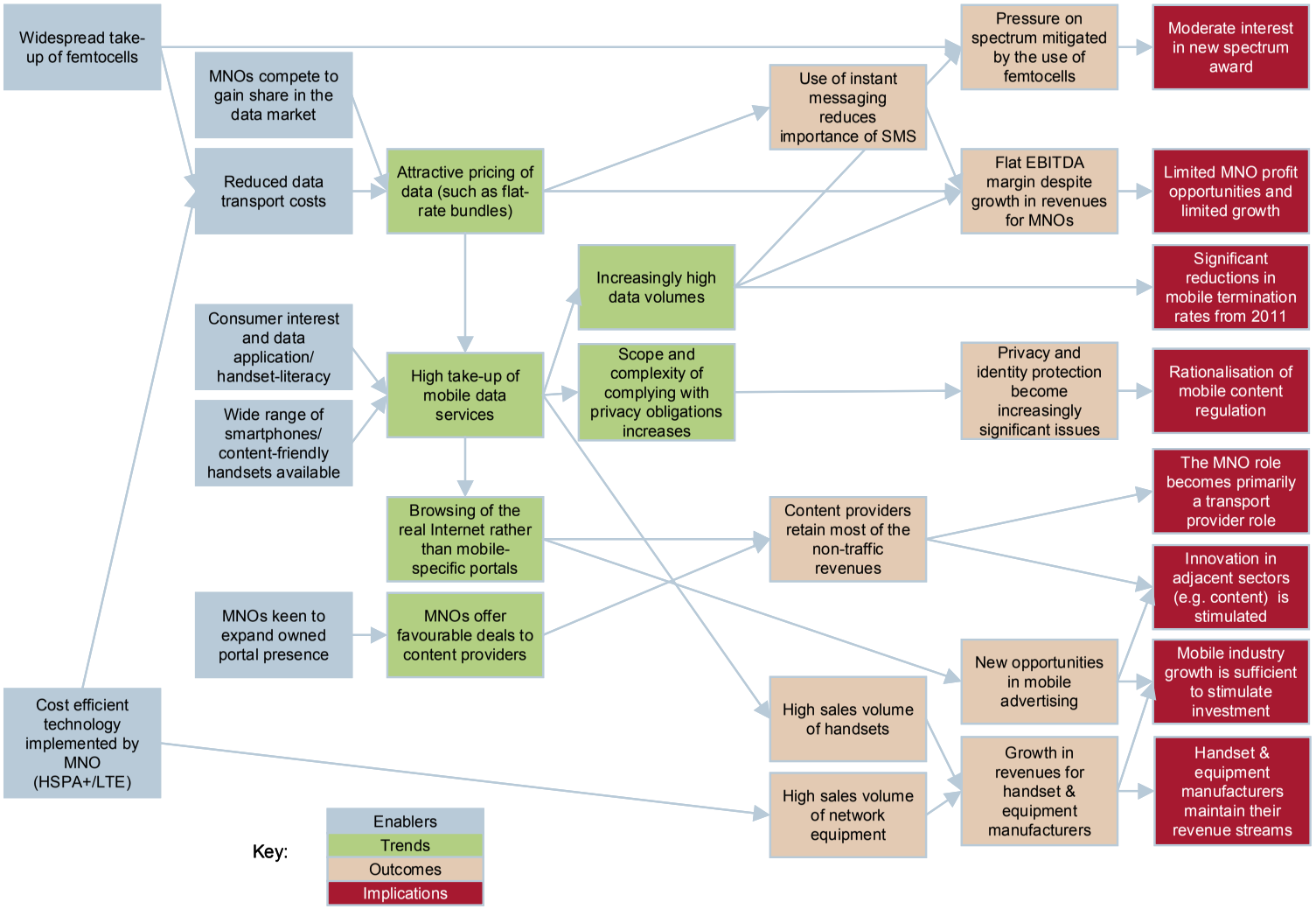

Figure 4.18: 'Internet on your mobile ': Summary of scenario .

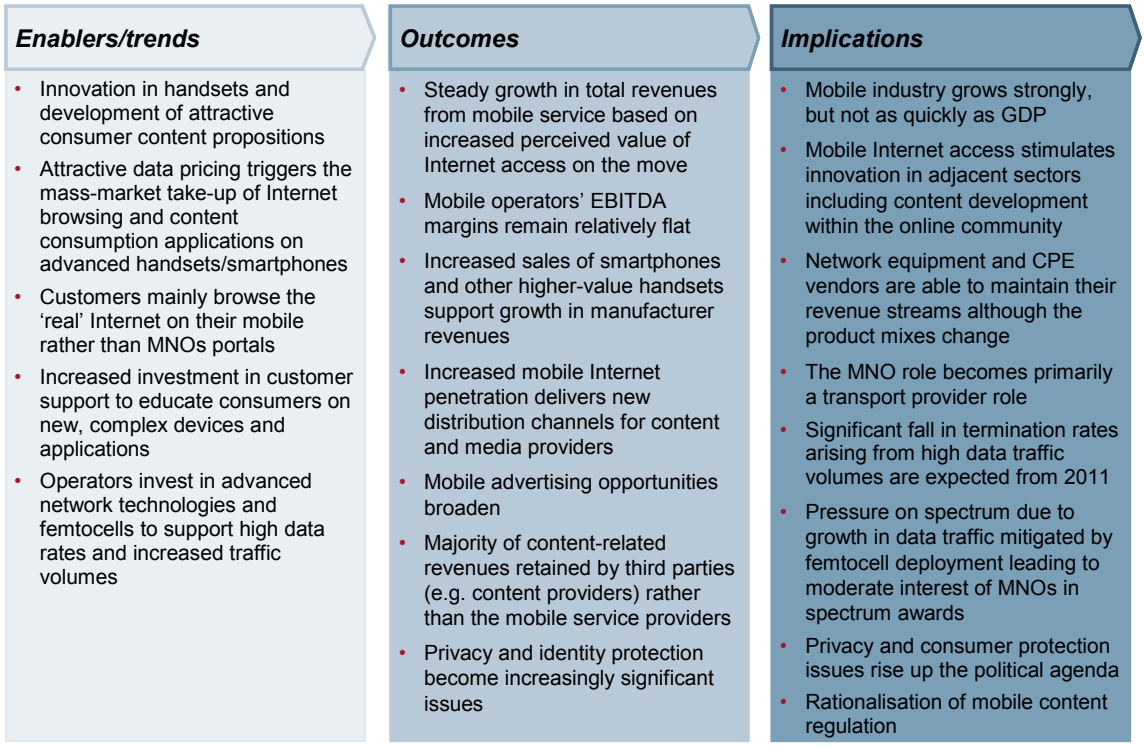

Figure 4.19: Summary of enablers/trends, outcomes and implications for the 'Mobile voice wins' scenario

4.4.1 Developments in consumer propositions

282 Innovative smartphones (incorporating touch-screen user interfaces, voice recognition input and intelligent Web 3.0 technology) prove to be highly usable and attractive devices for the majority of consumers. A significant proportion of the subscriber base purchases high-end handsets and uses them to browse the wider Internet.

283 Significant interest in and usage of new mobile data services on handsets results in widespread take-up of bundled data packages. In addition to Internet browsing, individuals can access email, social networking applications, music, time-shifted TV and a range of location- and presence-based services offered by third parties while on the move. Data connectivity propositions offered by operators to the market increase over time from a monthly allowance of 1GB at the start of the period to around 8GB per subscriber.

284 As the importance of data rises, operators increasingly bundle data services in with voice and SMS packages to maintain the value of the proposition to the consumer. The widespread availability of low-cost data access and incorporation of instant messaging clients on handsets with easy-to-use interfaces (including automatic log-in using MNO authentication services) supports a migration of SMS usage to IM. Given the legacy base of SMS usage, this migration occurs quickly in certain segments but only gradually in the market as a whole.

285 'Home connectivity' packages based around self-installed femtocells are offered to the market for a small incremental fee to a users existing package This in turn encourages family members – particularly the young – to make significant use of Internet-based services on mobile handsets from inside the home.

4.4.2 Operator response

286 With the evolution of data packages, voice services are no longer charged by the minute: unlimited usage of voice services forms part of an attractive flat-rate data bundle. This proposition becomes increasingly important in the market. Prior to 2011, total market revenues rise on the basis of stable ARPU built on continued bundling of value-added services into the core proposition, and ongoing growth in total subscriptions. The increased take-up of data services also generates opportunities in mobile advertising for operators and third parties, although investment in service enablers (data mining platforms, advertisement insertion platforms, and inventory control systems) is required to support this revenue stream.

287 Ongoing development of retail channels enables operators to deliver the new data proposition effectively to the market. Users receive clear communication of new add-ons to existing service propositions and are quickly convinced by self-installed femtocell-based solutions for home calls.

288 The widespread adoption of Internet browsing on handsets causes a dramatic rise in the data traffic carried over mobile networks, which in turn results in substantial falls in termination rates from 2011 onwards. This causes MNO revenues and costs to fall before continued growth in the take-up of data services supports a resumption in revenue growth later in the period (Figure 4.20).

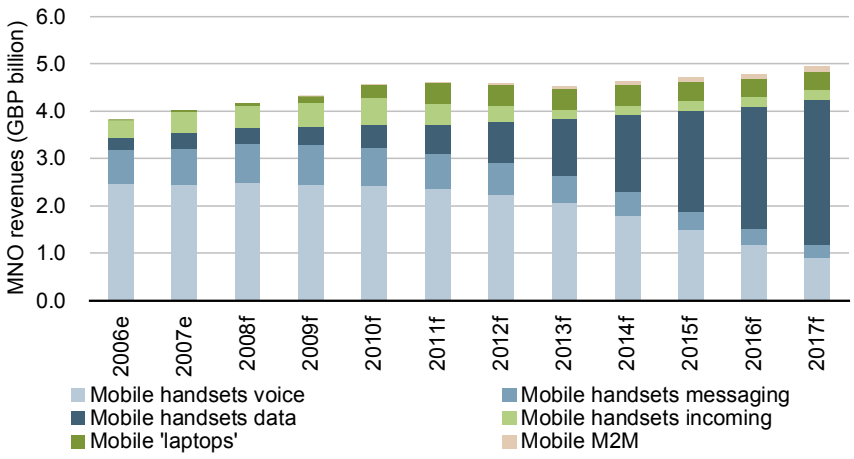

Figure 4.20: Assumed revenue mix for a 'generic' market operator under 'Internet on your mobile'. [Source: Analysys Mason]

289 MVNOs and third parties continue to play a role under this scenario, taking a proportion of total retail revenues and helping to fuel nominal growth in the overall market over the period. However, as can bee seen from Figure 4.21, the value of the industry as a proportion of GDP continues to fall.

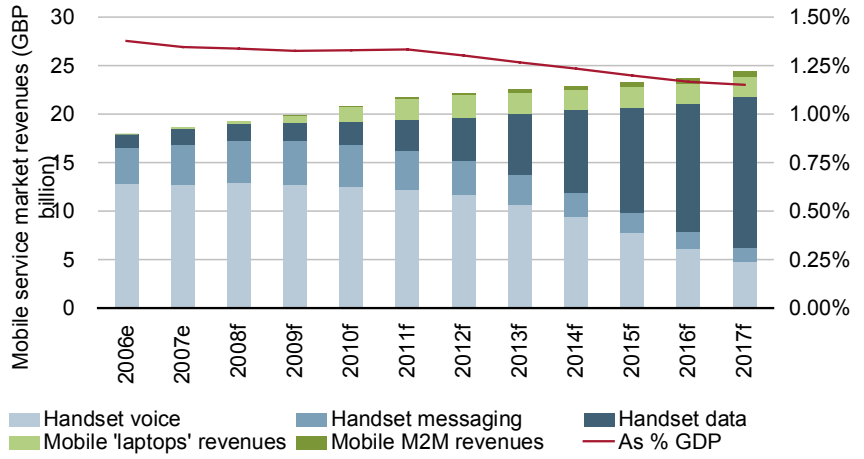

Figure 4.21: Impact of 'Internet on your mobile' scenario on overall mobile market revenues and revenues as a proportion of GDP [Source: Analysys Mason]

290 With regard to the costs of distribution, limited competition allows operators to maintain a cap on handset subsidies and dealer commissions. Operators succeed in lengthening contracts, which reduces churn and subscriber acquisition costs in the short term.

291 With regard to network costs, the growing volumes of data traffic continue to require significant ongoing increases in backhaul capacity, driving up network opex. At the same time, network sharing and outsourcing continue to develop as a means of managing costs, and pan-European deals by the large MNOs drive reductions in both network opex and capex.

292 As with the 'Mobile voice wins' scenario, the widespread deployment of low-cost, self-install femtocells also keeps capex under control, despite the significant increase in data traffic volumes and voice traffic volumes resulting from accelerated fixed-mobile substitution.

4.4.3 Market implications

293 In the 'Internet on your mobile' scenario, the greater volume of data traffic will result in significantly lower termination rates compared with Scenarios 1 and 2. We have assumed a substantial decline in the initial year of change, 2011, followed by a two-year glide path to a lower. This causes operator margins to rise substantially in the short term (as shown in Figure 4.22) as termination rate changes take effect. Subsequently investment in distribution and the network to support new consumer propositions and additional traffic cause margins to fall sharply.

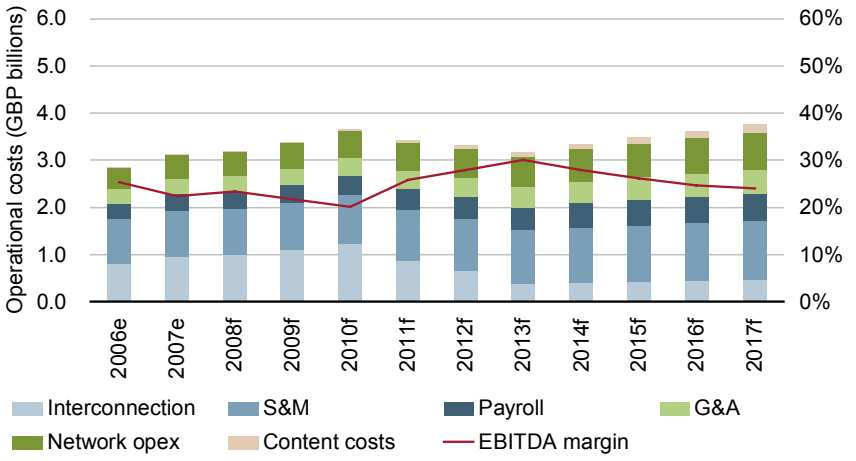

Figure 4.22: 'Generic' operator costs and EBITDA margins under the 'Internet on your mobile' scenario [Source: Analysys Mason]

294 As a result, operators' capacity to generate free cashflow declines towards the end of the period (Figure 4.23).

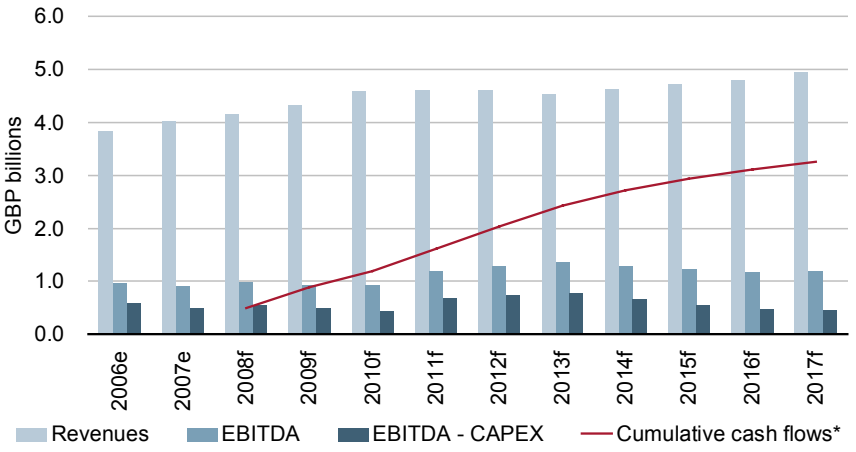

Figure 4.23: 'Generic operator financial performance under the 'Internet on your mobile' scenario [Source: Analysys Mason]

295 Content providers will benefit very significantly from this scenario. In effect, 'Internet on you mobile' opens up a new distribution channel for existing online content providers in addition to offering new opportunities for new players to develop new services. Given the number of new 'connections' that are envisaged under this scenario together with the additional time users are likely to spend accessing Internet content with this proposition, the 'Internet on your mobile' scenario will dramatically increase consumer reach and product purchasing opportunities.

296 As an obvious consequence of this new consumer behaviour, the opportunities to derive revenues from consumer traffic on sites will increase significantly. Mobile advertising can be expected to grow rapidly in a variety of forms. Sites will extend traditional banner advertisements and advertisement insertion inventory to include 'eyeballs' and clicks from mobile devices. In addition, new advertising formats and schemas utilising the unique characteristics of mobile networks – knowledge of the identity of the consumer, their location and presence information – will open up new, added-value advertising opportunities, subject to the resolution of data

protection issues. These opportunities are likely to be exploited by a mix of existing content players, network operators, and new third-party operators.

297 This scenario will be positive for handset manufacturers, backhaul companies, and equipment manufacturers. A plethora of new devices will emerge as an enabler to the 'Internet on your mobile' proposition. Traditional handsets offering 'real' Internet access (of which the iPhone is the notable leader) will be offered by many manufacturers, and innovative approaches will be used to resolve hindrances to the user experience. The number of smartphones sold as a proportion of total handset sales will rise significantly, increasing average revenue and margins per handset.

298 Backhaul companies will benefit significantly from the requirement for additional backhaul capacity to carry the additional traffic envisaged. Equipment manufacturers (particularly those involved in femtocell manufacture) will also see significant new orders as operators look to upgrade network capacity to deal with increased traffic.

4.4.4 Flow of funds

299 Figure 4.24 summarises the changes to each of the industry players under the 'Internet on your mobile' scenario.

	Internet on your mobile
Network equipment vendors	• Revenue growth opportunities for femtocell manufacturers • Less internal competitive rivalry since (i) market revenues increase slightly; and (ii) the network operators buy equipment to increase their capacity and also invest in new technology equipment to support higher data traffic
Tower/transmission /backhaul	• Higher traffic volumes lead to higher revenues for transmission and backhaul providers • Network operators running three networks (GSM, UMTS, LTE) simultaneously results in a higher demand in sites for tower companies
Network operator function	• The industry structure does not change significantly but network operators benefit from the increase in data traffic and associated revenues
Service provider function	• The industry structure does not change significantly but the increase in new data revenues reduces the pressure on service providers
Device vendors	• The importance given to the device by customers increases significantly, and technology-driven device replacements increase • Strong incentive for device vendors to develop innovative handsets to secure market share
Content providers	• Off-portal revenues become significant • Mobile advertising provides additional revenue streams
Distributors	• Small reduction in power of service providers due to competition for providing data services

Figure 4.24: Impact of 'Internet on your mobile scenario on industry players

300 The market dynamics in play in the 'Internet on your mobile' scenario will result in a more significant shift in the distribution of revenue between value chain functions than is seen in Scenarios 1 and 2 (Figure 4.25).

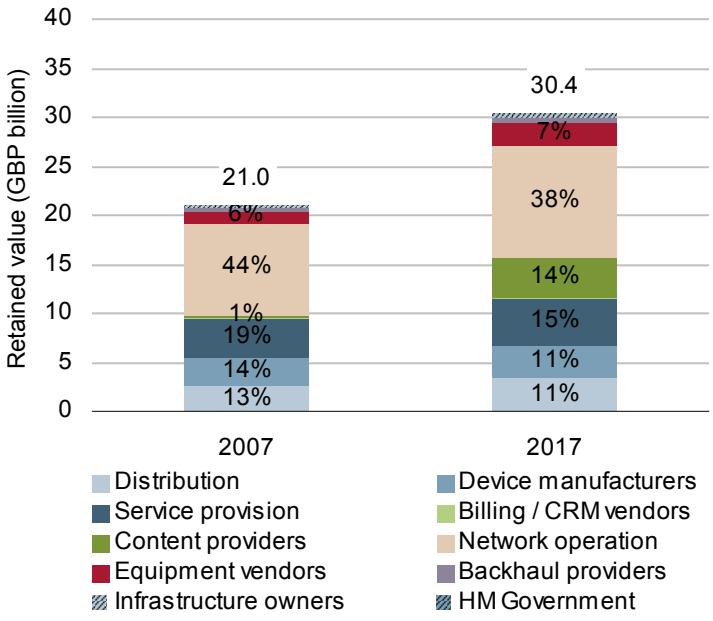

Figure 4.25: Shift in retained revenue by market players under 'Internet on your mobile' [Source: Analysys Mason]

301 As in other scenarios, the network operator function will see a fall in the proportion of total retained revenue as value shifts to other parts of the value chain, although the absolute value accruing to the function will increase. The service provider function will also see a decline in relative value although again this will grow in absolute terms as data propositions are developed.

302 Excluding the revenues of content players leads to a very different result. In that hypothesis, the share of all players stays roughly the same, with some increase for equipment vendors and backhaul providers. This shows that the main trend in this scenario is a dilution of the shares of existing players caused by the fact that the new source of revenues flow almost exclusively to the content players.

303 Content providers enjoy the largest increase in accrued revenue. It should be noted that the value estimated in Figure 4.25 refers only to content revenue retained by operators and content players providing mobile-specific content such as paid-for mobile email, social networking, music and location-based services. Most of this revenue will be retained by the providers of those mobile specific services rather than MNOs. What is not considered here are new revenue streams flowing directly to online, Internet content players through standard sites, nor do we attempt to estimate the value of incremental online advertising generated under this scenario.

304 Heavy investment in network infrastructure – including femtocells – to cope with the increase in data traffic is reflected in an increase in the percentage of revenues accruing to equipment vendors and backhaul providers.

4.4.5 Regulatory implications

305 As in Scenarios 1 and 2, the most significant regulatory changes that will occur under the 'Internet on your mobile' scenario are changes to mobile termination rates. With traffic rising more rapidly in this scenario than in Scenarios 1 or 2, rate declines will be more marked.

306 Pressure on spectrum resources will be greater under the 'Internet on your mobile' scenario than observed in Scenarios 1 and 2. While femtocells will carry a proportion of traffic, existing players will maintain an interest in the planned re-farming of 2G spectrum and award of 2.6 GHz expansion bands and digital dividend spectrum to meet escalating capacity demands. However, the limited scope for new entrants to capitalise on market opportunities created by this scenario will limit competition for new allocations and the value placed on that spectrum.

307 The current content regulation regime – already highly complex and struggling to adapt to the current environment – will be put under potentially untenable pressure under this scenario.

308 For example, the Department for Culture Media and Sport (DCMS) will shortly be consulting on the implementation of the EU Audiovisual Media Services Directive[21] in the UK. This directive, primarily aimed at the broadcast TV industry, also applies to the nascent mobile TV industry, including streamed TV. The directive sets out a series of obligations and rules with regard to mobile TV and 'TV-like' services, advertising, sponsorship and product placement. If inappropriately applied to mobile TV services, the obligations in the directive could smother the development of the market before it is able to establish itself. In addition, market players may be exposed to high levels of commercial risk as a consequence of the lack of clarity over whether or not the directive's provisions have precedence over certain established national regulations that may apply to mobile TV.

309 A second example of confusion over the regulation of content is the new blanket regulations to protect consumers from unfair, misleading and aggressive selling practices. These regulations came into force in the UK in May 2008 as a result of the EU Unfair Commercial Practices Directive[22]. These regulations replace or consolidate some of the UK's existing sector-specific and other consumer protection laws and mainly affect business-to-consumer transactions. The regulations contain a 'blacklist' of 31 practices that are always deemed unfair. During our stakeholder interview programme, industry players raised questions over the consistency of requirements under this European legislation and the PhonepayPlus Code of Practice, and have suggested there is uncertainty over how they can promote mobile content services in a compliant manner.

310 Thirdly, in the case where content is sponsored through advertising, the company that sources the content may determine whether the operator or service provider has obligations regarding the

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21 Directive 2007/65/EC

22 Directive 2005/29/EC

nature of the content delivered (for example access for minors to adult content). TV broadcasters offering content to consumers over mobile handsets may be directly responsible for the quality and suitability of the content under broadcast regulation. For content created and aggregated by other content players it is the service provider who may be held responsible for the suitability of the content. However, this is still unclear.

311 The complexities of jurisdiction and applicable code that arise from the distinctions made currently between broadcast content, Internet content, and mobile content, and between content that is billed to the mobile bill versus content that is paid for by other means are significant.

312 Consumers will seek to consume the same content via multiple devices and different telecoms services provided by integrated players. They make simple choices to view content on a mobile handset versus a laptop, and whether to pay for services on a credit card or via their mobile bill. These apparently straightforward choices are likely to give rise to major inconsistencies in the legal treatment of a 'content consumption event'. Major barriers to market development may come about as a consequence of these inconsistencies, and how operators, independent service providers, and content players react to them (and indeed the costs that operators incur in understanding the different regimes and identifying those inconsistencies). As a result, we can expect growing pressure for the rationalisation of regulation that affects content delivered via mobile networks. This pressure may potentially become critical as data content accounts for a growing proportion of total consumption.

4.5 Scenario 4: SIMs everywhere

313 In the 'SIMs everywhere' scenario we foresee an evolution of services to handsets as we know them today that is broadly consistent with the 'Internet on your mobile' scenario, coupled with significant developments in the scope and nature of connected applications to non-traditional mobility devices.

314 As in the 'Internet on your mobile' scenario, users find the Internet browsing capability of new generations of handsets highly attractive and start to make significant use of these devices for consuming Internet content. Mobile broadband-enabled laptops, high-service speeds and attractive pricing support widespread take-up and utilisation of cellular networks to provide connectivity for laptops; low-cost wide-scale femtocell deployment supports carriage of significant amounts of data and voice traffic over DSL broadband backbones, reducing investment requirements in the macrocell network.

315 Increased adoption of data bundles coupled with reductions in termination rates leads operators to bundle voice, data and home-call packages into flat-rate propositions, enabling operators to maintain ARPUs.

316 In addition, it is recognised that operators cannot themselves capitalise on the potential of the mobile broadband market, nor can they maximise return on network investment Hence, steps are

taken to encourage the development of a new 'ecosystem' of mobile broadband application developers. Those organisations bundle low-cost connectivity into a wide range of devices and deliver a series of new applications to consumers and businesses, where mobile broadband connectivity is bundled in as part of the service. This scenario is characterised by:

- the low ongoing cost of access to the network via data-enabled modules
- the wide range of new device modules that are deployed to support these new services
- the relationship between the provider and consumer of connectivity. No longer is a (business or residential) customer required to enter into a relationship with an MNO for a mobile broadband service. Rather the commercial conditions exist to enable a wide range of organisations to offer connectivity along a wide range of applications.

317 Steps to bring about this scenario may well be taken by the operators themselves as a natural evolution of the market. Commercial arrangements are already being entered into by certain operators that match these conditions, the most notable example being that in the USA of the Amazon Kindle. Alternatively, it might be conceivable that regulatory intervention brings about such a market structure.

318 A summary of the key enablers, outcomes and implications of this scenario is illustrated in Figure 4.26 and discussed further below.

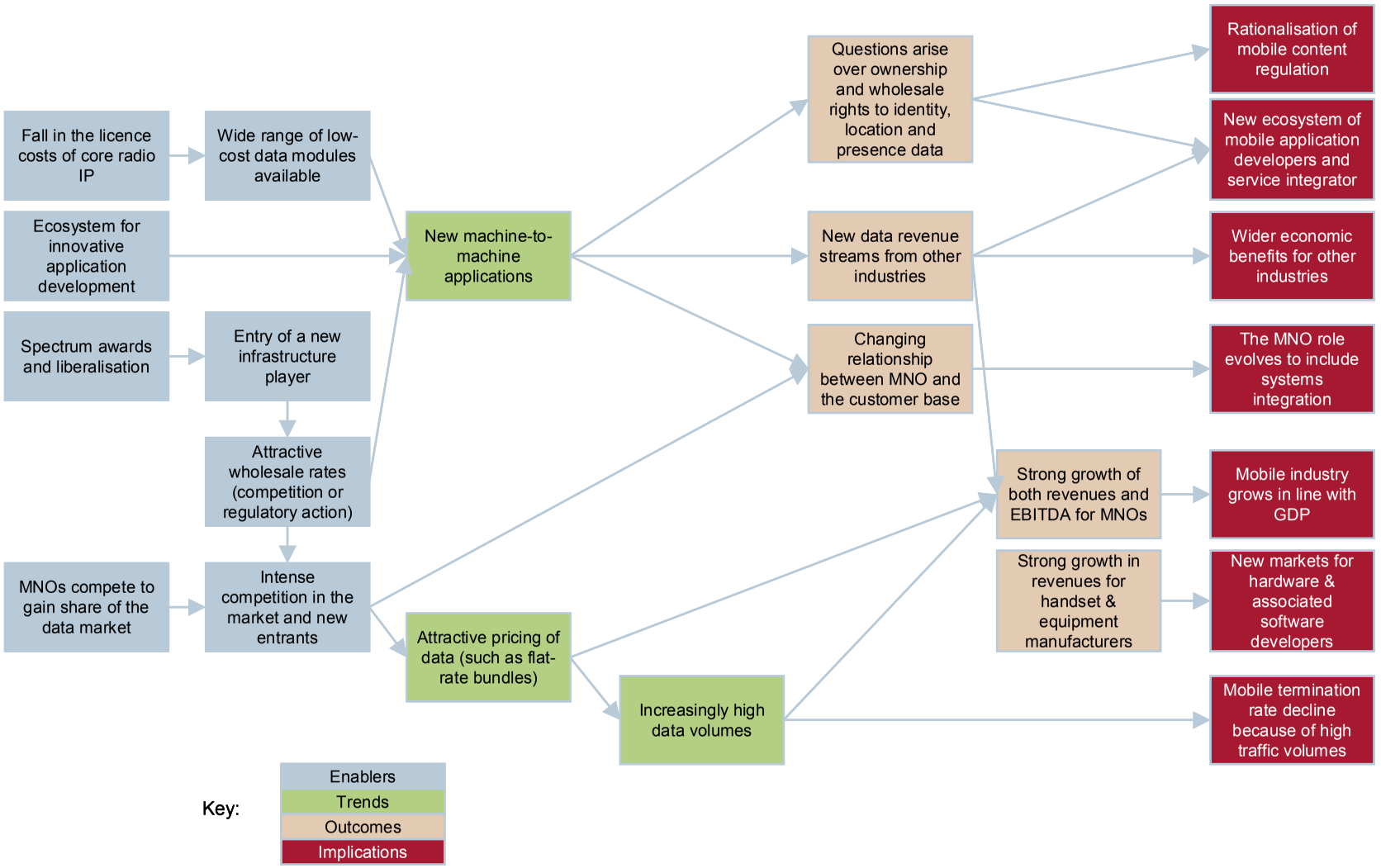

Figure 4.26: 'SIMs everywhere': Summary of scenario .

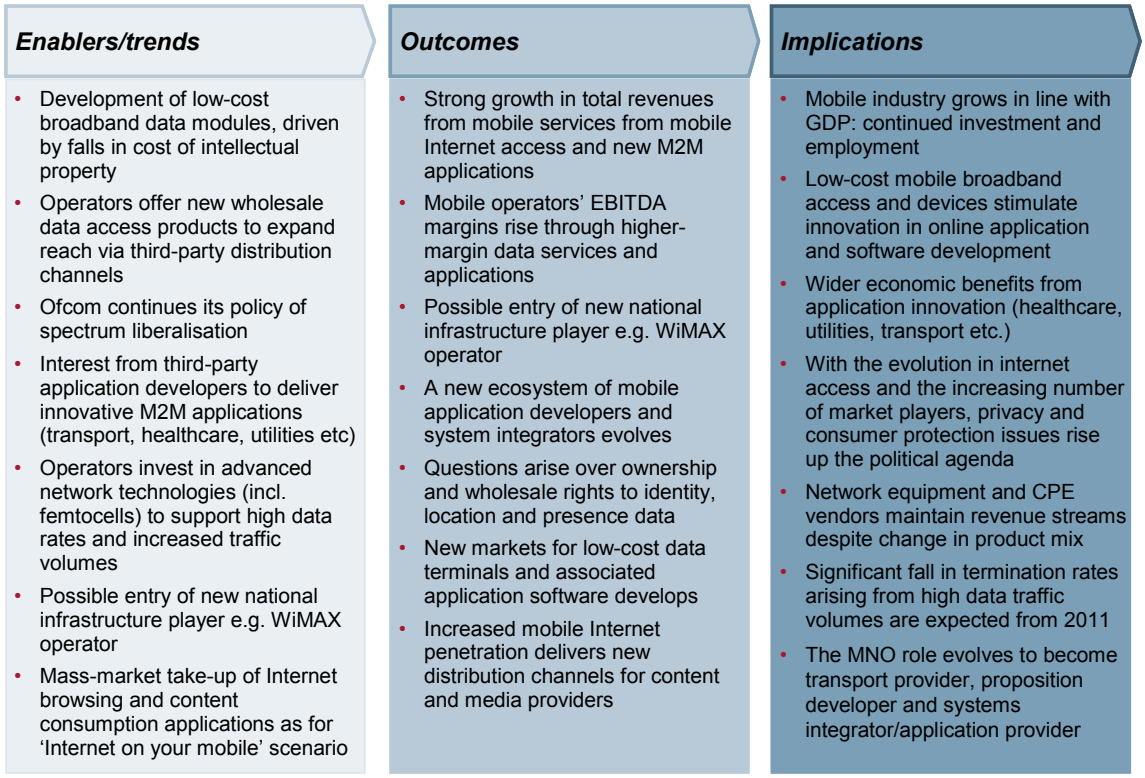

Figure 4.27: Summary of enablers/trends, outcomes and implications for the 'SIMs everywhere' scenario

4.5.1 Developments in consumer propositions

319 The key 'enablers' for this scenario cover a range of categories.

320 More competitive network access is offered to third parties allowing the development of MVNE platforms to support proposition developments by partners of all types. Services offered to third parties include user- and device-location information, presence information, access link conditions, federated user profile data, authentication services and billing services.

321 At the same time, low-cost (sub-GBP15) HSDPA-enabled access modules, made possible by reductions in the cost of core intellectual property used in 3G devices, are launched. This allows operators to provide ethernet interfaces to host devices and to offer low-cost broadband access to the network. A new category of network access is also created for SIM-enabled modules with monthly connectivity charges starting at GBP1 per month and scaled dependent on speed of access and the traffic generation profile of the application that uses those services.

322 Together, these developments in the nature of the mobile proposition and distribution structure lead to the entry of a range of new players into the market. New data application providers come into the market from a range of industries, including:

- laptop manufacturers
- car manufacturers
- transport network providers
- systems integrators
- healthcare service providers
- TV broadcasters
- handset manufacturers.

323 These players bundle mobile connectivity into a plethora of products to develop and deliver a range of innovative applications and application platforms to businesses and consumers.

Transport

324 In the transport sector, car manufacturers embed modules into new vehicles providing low-cost two-way connectivity to consumers. With these they are able to offer a range of after-sales services providing value to consumers and deepening the manufacturer/customer relationship. Applications include real-time car monitoring and servicing support, automatic crash monitoring and emergency-service call-out, automatic car-theft monitoring, interactive travel advice, enhanced navigation services and brand extension products.

325 The extension of manufacturer-delivered services supports monitoring and avoidance of traffic congestion.

326 Lower-cost and ubiquitous connectivity enables the extension of existing localised bus and train location systems. This in turn promotes the development of improved automated ticketing and travel information services to consumers, supporting greater roll-out of e-ticketing and providing real-time information to consumers.

327 Other potential users of vehicular SIMs include emergency service vehicles, taxis etc. To some degree this could reduce demand for the deployment of dedicated private mobile radio network which in turn would free up the spectrum used to support these networks.

Utilities

328 With low-cost modules, utility companies are able to connect utility meters throughout the country, improving the monitoring of energy and water usage, allowing better feedback on consumption and more accurate billing to consumers. Not only does this lower costs for the utilities, it also enables consumers to monitor usage online on a real-time basis, encouraging greater efficiency.

Healthcare

329 Using on-body monitors, medical professionals are able to provide low-cost and ubiquitous connected monitors to patients providing clinicians automated real-time monitoring of patient physiology such as blood flow, oxygenation levels, and blood pressure. This in turn leads to earlier intervention in high-risk groups, potentially saving lives and lowering secondary and tertiary healthcare costs.

330 This could even go as far as the dispensing of drugs, supported by 'intelligent' pill boxes that sense whether they have been opened each day at the appropriate time. Failure to take prescribed medication leads to a patient or clinician alarm. Two-way connectivity allows the clinician to reprogramme the dispensing device based on remotely collected diagnostic data.

Personalised content services

331 Location authentication and presence information enables online content houses to offer a range of enhanced services to consumers and business users. Content providers are able to automatically identify and authenticate users and tailor the experience presented to the user. Content players are able to automatically provide personalised input to consumers on their handsets (as some companies offer today on PCs). That experience can be tailored to the users' location, anticipating the needs of the user depending on whether they are at home, travelling in their own country or abroad, and in due course personalised according to the street they are in.

332 The option of paying for third-party purchases via mobile bills provides a simple means of executing a purchase.

Workforce management

333 Low-cost broadband connectivity enables dramatic developments in field workforce management applications. Retailers are able to manage suppliers and support organisations increasingly effectively through high-speed Web-based intranet and extranet applications. Hotel, restaurant and pub chains gain efficiencies in fault diagnosis, repair scheduling, and just-in-time product deliveries in outlets, taking significant costs out of the supply chains of those organisations.

Business models

334 These new applications are supported by a range of business models. Corporate data applications are likely to be delivered by the application/service provider on the basis of an ongoing service charge designed around the nature and content of the service. The majority of the value of this charge will be retained by the service provider/application creator with connectivity charges and device charges flowing through to the MNO.

335 Where MNOs or MVNOs are involved in federated information (i.e. the aggregation and anonymisation of customer data) provision or billing for services, a revenue share model is likely to be adopted.

336 MNOs themselves will look to provide mobility applications to businesses and the public sector where those applications have a high communications content/value add, and where the skill set of the current operator organisation is well matched to user needs. In this way, operators are likely to play a significant role as systems integrators and application providers alongside players from other sectors.

337 In addition to changes to direct to business and consumer charging models, a number of applications, particularly in the content provisioning space are likely to be supported by advertising. The majority of advertising revenue will flow through to the original owner of the inventory, in most cases the content provider.

338 As a result of these changes, the mobile value chain is likely to evolve along similar lines to the fixed network. However, the unique combination of attributes offered by a mobile cellular service – ubiquity of coverage, location knowledge, presence, billing and the inherent scarcity of nationwide mobile connectivity – will ensure that the commoditisation of the transport function is a relatively gradual process. Over the longer term, the retained value is higher than is seen in the fixed network.

Other distribution network changes

339 As wholesale charges fall for data access and new parties come into the value chain, new MVNOs are also likely to come into the market, offering extension propositions in traditional consumer voice and data services. Major consumer brands (Gucci and Quiksilver for example) may seize the opportunity to enhance the perceived value delivered by mobile to certain niche segments. In addition, converged entertainment companies may look to offer bundled entertainment and connectivity packages to consumers by establishing their own MVNO propositions (e.g. Sky, BBC, BT Vision). A number of operators are already looking closely at MVNE platforms that would support ‘thin’, economic access to propositions of this type.

New entrants

340 With an increasingly vibrant data network ecosystem supporting a range of new application developers and distributors, a regional WiMAX player (or consortium) is encouraged to develop a network on a national scale. WiMAX terminals are developed and deployed at costs comparable to the HSDPA/LTE cellular data connectivity units, providing a competitive alternative to mainstream cellular players. The strength of the distribution sector enables the new entrant to offer a competitive proposition for machine-to-machine applications, laptop connectivity and handset browsing. This in turn leads to increased intensity of competition between mobile infrastructure providers and re-enforces the focus on capturing wholesale revenues.

4.5.2 Operator response

341 In this environment, consumers are successfully migrated from voice bundles to bundles that are designed around data access, and which offer 'all-in-one' access – voice, SMS and data – for a single monthly fee. At the same time, operators focus on maximising the value through invisible charges. There is also growth in the number and nature of bundles offered by third parties to the market.

342 In many respects, this strategy represents a continuation of operators' current approach of enhancing the perceived value delivered to consumers through bundling, except that the user focus is on the value offered through Internet access (connectivity and device characteristics) rather than voice or text volumes. As a result of these developments, total consumer expenditure on core mobile services rises.

343 The value added through additional application development drives market growth to GBP29 billion in 2017 (Figure 4.28 below). As a result, the mobile industry as a whole maintains its value as a proportion of GDP.

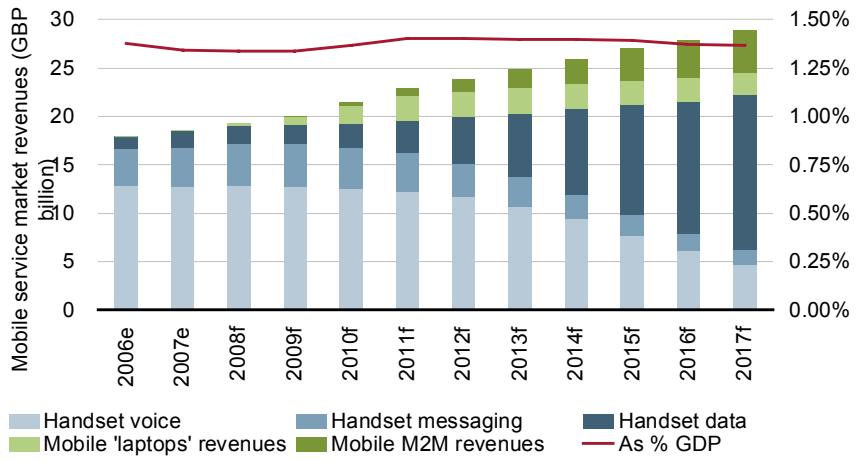

Figure 4.28: Impact of 'SIMs everywhere' scenario on overall mobile market revenues and revenues as a proportion of GDP [Source: Analysys Mason]

344 The MNOs continue to grow through the period driven by a combination of core product bundling (as in the 'Internet on your mobile' scenario), access revenues from new machine-to-machine devices, and a share of the market for machine-to-machine application development.

345 However, given the nature of the market structure and services delivered, much of the additional value generated is retained by parties other than the MNOs. A combination of application developers, system integrators and MVNOs incur the majority of the cost and realise the majority of the value from delivery of those applications. As a result, MNOs' revenues for core services are broadly flat over the period, and growth occurs solely as a result of participation in machine-to-machine application development and delivery (Figure 4.29 below)

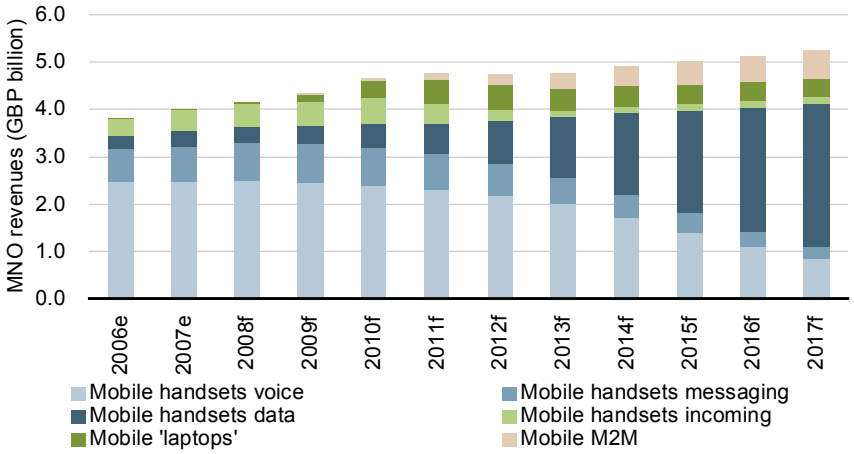

Figure 4.29: Assumed revenue mix for a 'generic' market operator under 'SIMs everywhere'. [Source: Analysys Mason]

346 In this environment with a large number of new retail players offering both basic services and connectivity applications, the effort involved in attracting the attention of individual users will rise. As a result, distribution costs in aggregate across the market are likely to increase. However, for the MNOs absolute increases in operator distribution costs are offset by the increased use of MVNO distribution channels to acquire customers.

347 MNO network opex and capex will rise to support substantial increases in data traffic on the network. Successful deployment of femtocells means a significant proportion of new traffic (up to 50%) will be carried over the femtocell network and existing fixed backhaul network at minimal incremental cost to the operator. Nonetheless, given the levels of traffic that will be generated, it will be important for MNOs to secure planned spectrum allocations for mobile services. Backhaul costs in particular will also rise. To support the increasing volumes of data traffic and service expectations, and to match the high-speed services offered by the new-entrant WiMAX player, the incumbent mobile operators accelerate deployment of LTE.

348 As in other scenarios, operators pursue network sharing/outsourcing deals and pan-European central facilities provision to mitigate cost the pressures driving up network opex and capex.

349 Again, the most significant change in operator cost – and revenue – structure arises through reductions in termination rates from 2011. These are driven down sharply as a result of the increase in the proportion of data traffic on networks already being seen today.

4.5.3 Market implications

350 As in previous scenarios, the significant reduction in mobile termination rates in 2011 causes a one-off positive impact on operators' margins (see Figure 4.30).

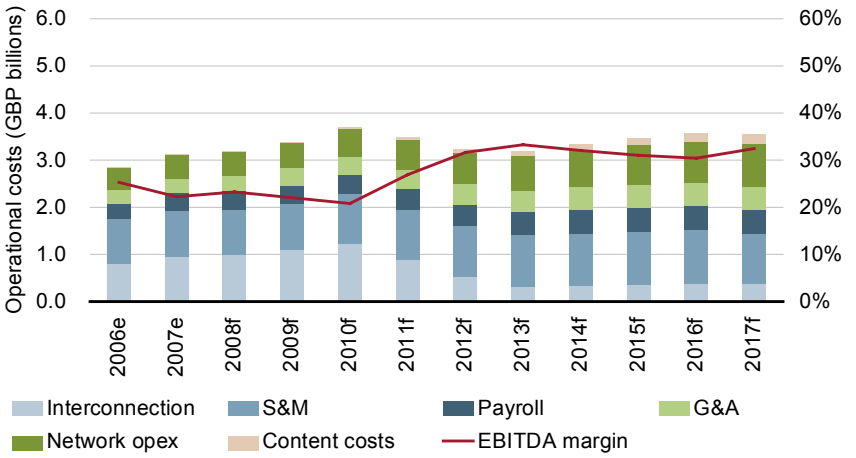

Figure 4.30: 'Generic' operator costs and EBITDA margins under the 'SIMs everywhere' scenario [Source: Analysys Mason]

351 The overall profitability of key market players improves significantly through a combination of absolute revenue growth (driven by new application development) and changes in cost structure and service mix (supporting significant falls in the marginal cost of delivering data traffic) as shown in Figure 4.31.

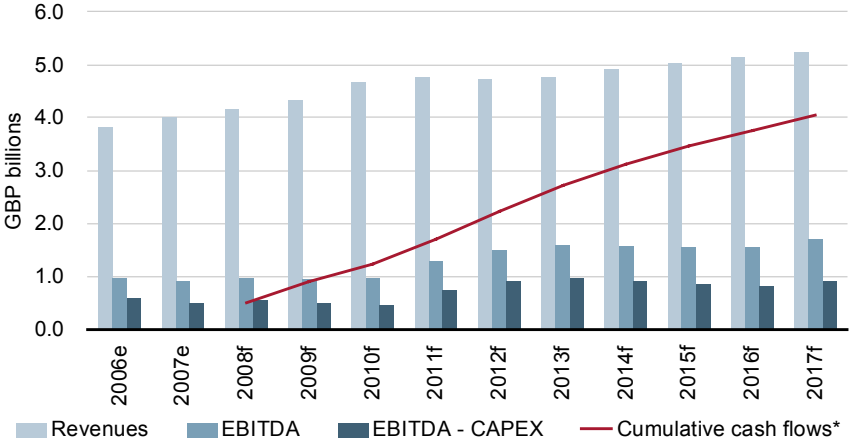

Figure 4.31: 'Generic operator financial performance under the 'SIMs everywhere' scenario [Source: Analysys Mason]

352 This scenario generates some of the most positive outcomes for the mobile communications industry and the UK economy as a whole.

353 The realisation of substantial wider economic benefits across many industrial sectors is supported by the new 'ecosystem' of application developers and system integrators, brought into existence by the development of low-cost mobile broadband access and devices. Healthcare, transport, the content industry and the utility sector all experience substantial levels of innovation and service development. A wide range of new propositions are delivered to market generating additional value for consumers, while at the same time significant efficiencies are realised across a broad range of economic activities. As a result of these stimuli, the mobile industry is likely to maintain its importance to the UK economy in terms of its value as a proportion of UK GDP.

354 Mobile operators will see two significant changes. First, there will be a widespread shift in their relationships with the end consumer. The industry will return in large part to the position it was in the late 1980s and early 1990s when the relationship between consumer and service provider was

an indirect one, with third parties acting as user-facing agents. In this case, however, consumers will be purchasing the communications service as part of a broader package – of another application or service, rather than a stand-alone service. This is likely to have a significant impact on the operator, placing distance between the operators and certain sections of its customer base, and potentially working to weaken its brand. This may be particularly true if another strong consumer brand offers both connected applications and traditional communications services. Under these circumstances, operators are likely to look to similar successful campaigns (such as that run by Intel) to identify how they can maintain brand strength and awareness in the face of this change.

355 Secondly, MNOs are likely to play a role in the systems integration business, working on the development and delivery of connected applications, particularly to business users. The motivation behind securing a proportion of the value add created in this developing market is clear. However, the degree to which this happens will depend of course on the commitment and investment operators make in the concept, people and processes associated with this business.

356 For equipment vendors and handset manufacturers, this scenario too offers new opportunities. Alongside the femtocell market and backhaul capacity opportunities, new markets will be created for a range of stand-alone and integrated modules used to provide connectivity in other products. These will range from chipsets and boards integrated into cars and healthcare products, to modules provided as after-sale add-ons to (for example) buses and taxis.

4.5.4 Flow of funds

357 Figure 4.32 summarises the changes to each of the industry players under the ‘SIMs everywhere’ scenario.

	SIMs everywhere
Network equipment vendors	• Revenue growth opportunities for femtocell manufacturers • Less internal competitive rivalry since (i) market revenues increase significantly; and (ii) the network operators buy equipment to increase their capacity and also invest in new technology equipment to support much higher data traffic levels
Tower/transmission /backhaul	• Very high traffic volumes lead to higher revenues for transmission and backhaul providers • Network operators running three networks (GSM, UMTS, LTE) simultaneously results in a higher demand in sites for tower companies
Network operator function	• The wholesale market becomes crucial for the network operators which have to compete at the wholesale level to attract MVNO traffic on their networks • This is partially offset by the increased take-up of data traffic and new systems integration revenue opportunities
Service provider function	• The industry competitive rivalry increases slightly because the effect of new entrant service providers is partially offset by the strong growth in market revenues
Device vendors	• The importance given to the device by customers increases significantly, and technology-driven device replacements increase • Strong incentive for device vendors to develop with innovative handsets to secure market share
Content providers	• Content providers' revenues increase due to strong growth in off-portal revenues • Mobile advertising provides additional revenues streams
Distributors	• The intense competitive rivalry at the service provider level drives up commissions • To balance this effect, service providers become more involved in direct sales for new products in particular (e.g. machine to machine and mobile 'laptop' services)

Figure 4.32: Impact of 'SIMs everywhere' scenario on industry players

358 In this scenario, total revenues grow strongly over the period benefiting all market players (see Figure 4.33).

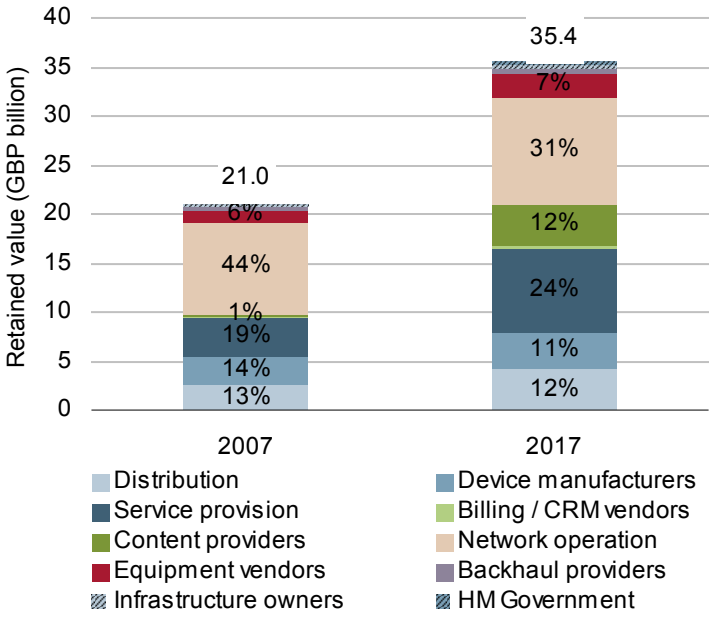

Figure 4.33: Shift in retained revenue by market players under 'SIMs everywhere' [Source: Analysys Mason]

359 The changing commercial terms for those delivering the service provider function result in a substantial shift in the proportion of retained value towards those players. Conversely, the operator function is expected to see a significant reduction in retained value. This trend is explained by the

increasing need for service providers to 'educate' subscribers to use the new services, a process that the network operator function is unable to provide.

360 As with the 'Internet on your mobile scenario', content providers see a significant increase in revenue in absolute as well as relative terms commensurate with an uplift in the consumption of content and other value-added services. The dilution effect described in the 'Internet on your mobile scenario' scenario is even more pronounced in the 'SIMs everywhere' scenario.

361 Distributors and device manufactures will benefit both in absolute value through take-up of new smartphones for personal Internet consumption and new devices to support the range of new networked applications. A significant proportion of this increase will come from higher commissions from the service provider function as a result of increased retail competition and the need to incentivise new service sales.

362 Heavy investment in network infrastructure to carry greater volumes of data traffic will increase the value retained by equipment vendors, backhaul providers and infrastructure owners, rising from GBP1.8 billion to GBP3.1 billion, an increase of 72%.

363 Whilst ownership of relevant spectrum rights and associated network assets remains at the core of the value chain, continuing downward pressure on prices and competition from the new infrastructure player demand a focus on reducing network costs (e.g. through RAN share). This in turn will lead to a relatively significant fall in the retained revenue for the network operation function.

4.5.5 Regulatory implications

364 As in previous scenarios, changes to mobile termination rates will represent the most significant regulatory implication from market developments variation under this scenario, and changes in mobile termination rates are as for those in Scenario 3. This reflects the fact that data traffic growth will be broadly consistent with the levels of growth seen in that scenario. Again, the impact of these changes and the implications for rates are significant, with a marked fall in the revenues and costs associated with interconnect traffic, and a consequent increase in margins at the point where rate changes are implemented.

365 As a result of the volume of data carried by the networks there will be significant pressure on spectrum, albeit mitigated by the widespread deployment of femtocells. This should ensure positive market conditions for upcoming auctions of spectrum planned by Ofcom. At the same time, market players envisage that many of the applications foreseen under this scenario will demand long-term commitments to the provision of connectivity under service agreements. Hence, the issue of certainty – and arguably longevity – in relation to the terms and conditions under which market participants are provided with access to that spectrum.

366 The proliferation of bodies gaining access to user identity, presence, and location information held and managed by operators will raise issues with regard to data security and privacy. An orderly

market in the transferring of information collected and held by one commercial party to another commercial party will be essential for the successful development of this scenario. Transacting parties must be able to trust counterparties to manage and utilise personal user information appropriately.

367 Management of that data, and the terms and conditions under which this data will be accessed by parties acting on behalf of consumers, will be the subject of much debate.

368 The current complexity of the regulatory regime governing mobile content services and applications is not in our view compatible with this scenario. Players will require greater certainty as to their obligations in delivering different services by different mechanisms to consumers, and clarity as to the organisation that holds jurisdiction over those services. A reduction in the current number of bodies overseeing delivery of services and seeking to protect the rights of consumers is essential; legislation will need to recognise and accommodate the variety of means by which consumers use content and the scope of information sharing that consumers will demand.

369 Inevitably, privacy and consumer protection issues will rise up the political agenda under this scenario.

5 Conclusions

370 In this study we have examined the current status of the mobile telecommunications industry in the UK. We have identified key trends that are shaping the industry, considered how the value chain is currently structured and reviewed the industry's evolving dynamics.

371 We have then gone on to consider how those trends and other key enablers may cause the industry to evolve in certain directions depending on a limited number of key factors. In creating and examining those scenarios a number of issues have become apparent.

- **Consumers are putting increasing value on broader aspects of the mobile service experience beyond voice and text communications.** Use of mobile handsets for media services, and take-up of new connected applications for individuals is increasing. It is possible – but by no means certain – that significant numbers of consumers will start to access standard Internet content and applications via their mobile handsets. This trend provides an opportunity to forestall declines in industry value that are likely to occur without further development of the mobile proposition, and may open up significant growth opportunities for some market players.

- **The nature of the mobile network cost base is undergoing significant transformation** as a consequence of the increased migration of users and traffic to 3G networks, with the planned re-farming of spectrum used for 2G, and with an increasing focus on investment in distribution**.** Historically, operator costs have varied significantly with traffic as well as subscribers; increasingly, network operator costs are dictated by the number of subscribers signed up to a network rather than the traffic carried. This change is a key enabler for value-added opportunities to be realised, and steps should be taken by market players and the regulator to support and accelerate this transition.

- **Evolution in the structure of the mobile value chain is likely**. Revenues from mobile services are increasingly likely to be retained by content players, application development functions and distribution. The current squeeze on network equipment vendors is likely to accelerate, and changes in the relationship between MNOs and consumers may occur. Players from outside the industry may play an increasing role in the delivery of a wide range of mobile-enabled applications to consumers. In many respects, these changes represent a natural evolution for the market. Our analysis would indicate that the greatest value will be realised by all parties within the mobile 'ecosystem' and by the UK economy as a whole through embracing and, where possible, working to accelerate those changes.

- The current UK regulatory framework governing the delivery of mobile services was established to promote competition in infrastructure-based services that were delivered solely through mobile communications networks. With the increased focus on service and applications, and the move towards consumption of content and use of applications by consumers across multiple networks and devices, **adjustments to the UK regulatory**

framework are likely to be required if the benefits of the emerging trends are to be fully realised**.**

372 We discuss each of these issues in more detail below.

5.1 Consumers are putting increasing value on broader service experiences

373 In recent years, growth in subscriber numbers has slowed, and the industry has maintained the perceived value of its propositions by increasing the volume of voice minutes and text messages available for a given price. This approach, supported by handset innovation (adding increased functionality to the device and focusing on developing handsets as fashion items) has produced an increase in expenditure per capita on core mobile services since 2000.

374 Despite this increase in per-capita expenditure, operator margins from 2004–7 have fallen. Subscriber numbers have continued to grow, and penetration is well in excess of 100% of the population. The cost of acquiring and retaining these subscribers is continuing to rise as operators invest in direct distribution channels and try to minimise high ongoing churn.

375 There is already significant evidence of consumers showing interest in new mobile propositions. While connectivity remains important, services other than voice calls and SMS are an increasingly important factor in consumers' perception of the value of mobile services.

Data propositions

376 New propositions offering high-speed broadband data access for laptops at low, fixed, monthly rates have dramatically reshaped the industry in less than a year.

377 HSDPA dongles and integrated modems have been taken up for laptop connectivity by a relatively small proportion of customers (of the order of 1.5 million in a total subscriber base of 70 million). Nonetheless, this relatively small number of subscribers has increased data traffic on some networks by 5–10 times over a period of just six months. Already some mobile networks are carrying more data traffic than voice traffic. At the same time, the additional subscription revenue associated with such services has been secured at low incremental cost, with device subsidies much lower than for high-end handsets.

Mobile content

378 There is an inexorable general shift of value away from network operators in favour of content providers. Although robust data is difficult to obtain, there is clear evidence of growth in both on-portal and off-portal mobile content since 2000.

379 Research into smartphone usage shows a major differences in behaviour on the part of users of more complex devices versus more basic handsets. Not only do smartphone users tend to spend

significant amounts of time accessing more advanced applications, they also make substantially more use of core mobility services than non-smartphone users. Furthermore, the penetration of these devices (and hence this behaviour) amongst the subscriber base is increasing rapid. Judging by the behaviour of the early adopters that use these devices, it appears that a significant change in consumers' use of mobile devices may be taking place. However, questions remain as to how far this behaviour is likely to be reflected in the wider population as these propositions are taken up across the market.

380 Traditional online channels could benefit significantly from the increased opportunities consumers will have to consume content, access services, and purchase products in a broader range of environments outside the home or office. Music, video and TV, social networking and online shopping are all likely to see significant growth on the back of these changes.

The evolution of mobile application markets

381 The successful opening up of the mobile distribution channel to other industries to allow development of mobile machine-to-machine applications also represents a major possible opportunity for the wider UK economy. Appropriately harnessed, the opportunities for connected mobile applications in sectors such as healthcare, transport, utilities and logistics could provide benefits to those within the mobile industry as well as application developers and the players in those respective sectors.

5.2 Industry cost structures are changing

382 There are major changes taking place to the cost structure of the mobile network operators.

Network investment strategy

383 In the 2G world, increases in traffic required operators to deploy significant additional physical assets – in-fill base stations, and additional radios – to cope with the incremental traffic. With the deployment of 3G networks and in particular HSPA technology, costs are increasingly dictated by subscriber numbers rather than traffic. Fewer radio carriers are deployed per base station, as CDMA channel rates are much higher than for GSM networks. Base station deployments are set to support a high level of traffic loading and ensure network cell 'breathing' is set to a minimum. Air interface capacity upgrades are increasingly based on software rather than hardware. As a result, as subscribers and traffic increasingly move onto 3G networks, less capital needs to be invested in network elements to support incremental traffic growth.

384 This characteristics of 3G networks, along with the rise in data traffic, has major implications for operators' investment strategies and for their suppliers. Base station suppliers are seeing a drop in revenues now that 3G network coverage is moving towards maturity. Backhaul costs from base

station to Node Bs are reported to be the main capacity bottleneck in the network and costs in this area are rising sharply.

385 The data proposition will evolve to become the dominant elements of the business. With this evolution, 3G mobile networks will take on a cost structure that more closely matches that of fixed-line networks, in which a far higher proportion of costs are fixed. That in turn will alter how propositions are marketed and delivered to market.

Mobile termination rates

386 There will be a significant change in mobile termination rates as a result of the migration of consumers onto 3G networks and the growth in data traffic carried by those networks. Judging by the changes in the nature and volume of traffic seen today, if the current termination rate regime is applied in the next rate setting cycle for introduction in 2011, there will be significant changes in termination rates for calls to mobile networks. These changes will have a major impact on the revenues, costs and margins of the MNOs. They will also significantly improve the ability of other parties to offer competitive voice bundles that include minutes to mobile networks.

387 As mobile data volumes increase, so the termination rates will fall. It appears likely that previous estimates of the impact of increased data traffic developed for Ofcom may have underestimated the consequent fall in termination rates. We have therefore reflected alternative views of how fast rates will decline in our scenarios. However it should be noted that these estimates have not been based on a detailed cost analysis, as this falls outside the scope for this study.

388 The key points of debate under the current regime will be firstly to reach agreement on forecast data volumes, a process that is part of the rate setting process. Secondly, there will be debate around the shape of the glide path that will be applied as rates move from their 2010 level to the new agreed rate over a period of years. There may also be a case to question whether the current rate-setting regime is appropriate if the industry is increasingly dominated by data traffic rather that voice calls.

Financial performance of MNOs

389 With slowing growth in subscriber numbers and rising costs (and in particular SAC), MNO EBITDA margins have fallen in recent years. Operators argue that the current average EBITDA for UK MNOs of 25% represents one of the lowest margins in the industry.

390 Operators' future financial results vary significantly under the different scenarios. Comparing the EBITDA of our 'generic operator' across the four scenarios, the analysis suggests that if the consumer interest continues to be focused primarily on voice propositions, this will lead to a path of slow decline, in both revenue and profitability, for key market players (Figure 5.1). Changes resulting from termination rate adjustments aside, margin growth is only likely to come if the mass

market embraces data propositions and operators seek ways to deliver additional value to consumers.

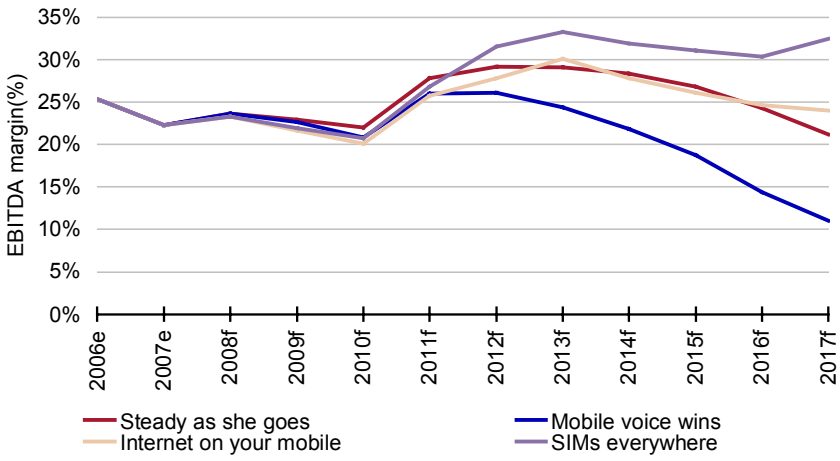

Figure 5.1: A comparison of the financial performance of a 'generic' operator under each scenario [Source: Analysys Mason]

5.3 Some changes in overall market structure are likely

391 Under higher-growth scenarios, handsets and network connectivity will be increasingly perceived as simply parts of a wider industry of value-added functions and applications. New players will inevitably be involved in the creation and delivery of services, with the consequence that the relationship between consumers and the current market players is likely to change.

392 As discussed above, the role of content players in this market is likely to become more important. To varying degrees we expect users to download greater amounts of content and engage with content brands. This will inevitably lead to a strengthening of the relationship between some user segments and those brands with a corresponding weakening of the major communications brands in the market today. The degree to which this occurs and the impact this trend will have varies from scenario to scenario, but to a greater or lesser degree, current market players will need to accept some level of brand re-definition as the industry evolves.

393 In the 'SIMs everywhere' scenario, mobile operators will see two significant changes. First, there will be a widespread shift in their relationships with the end consumer. The industry will return in large part to the position it was in the late 1980s and early 1990s where the relationship between consumer and service provider was an indirect one, with third parties acting as user-facing agents. In this case, however, consumers will be purchasing the communications service as part of a broader package – of another application or service, rather than a stand-alone service. This is likely to have a significant impact on the operator, placing distance between the operators and certain sections of its customer base, and potentially working to weaken its brand. This may be particularly acute if other strong consumer brands offer both connected applications and traditional communications services. Under these circumstances, operators will need to maintain brand strength and awareness in the face of this change.

394 Secondly, MNOs are likely to play a role in the systems integration business, working on the development and delivery of connected applications, particularly to business users. The motivation behind securing a proportion of the added value created in this developing market is clear. However, the degree to which this happens will depend of course on the commitment and investment operators make in the concept, people and processes associated with this business.

395 While all of the above changes are likely to be most significant in the 'SIMs everywhere' case, some movement in these directions are likely under other scenarios.

5.4 Implications for the UK regulatory framework

396 As a result of the changes outlined above, a number of implications for the regulatory framework arise.

Termination rates

397 It is clear that there is a requirement for further work on termination rates. As discussed, the general direction of changes in termination rates is clear but the precise impact of the trends observed is poorly defined. We would suggest it is important to develop that understanding to inform further debate on how rates and the regime will evolve.

398 The current termination rate regime should be able to function in the data-centric worlds envisaged in this work. However, this study has also highlighted the sensitivity of the nature of the propositions offered, and the financial performance of the MNOs, to the level of voice termination rates. As the industry becomes increasingly focused on data, the question will arise as to whether a new regime is appropriate, particularly if the market moves to products offering all-inclusive voice and data bundles. We suggest that industry players – including Ofcom – look to prepare for this debate and be ready with views on how the system should evolve.

Regulation of the content market

399 The current content regulation regime is already highly complex and struggling to adapt to the current environment, and will be put under potentially untenable pressure by the data-centric scenarios. The complexities of jurisdiction and applicable code that arise from the distinctions currently made between broadcast, Internet, and mobile content, and between content that is paid for via a mobile bill rather than by other means are enormous.

400 Consumers will seek to consume the same content via multiple devices and different telecoms services provided by integrated players. They make simple choices to view content on a mobile handset versus a laptop, and whether to pay for services on a credit card or via their mobile bill. These apparently straightforward choices are likely to give rise to major inconsistencies in the legal treatment of a 'content consumption event'. Major barriers to market development may come

about as a consequence of these inconsistencies, and how operators, independent service providers, and content players react to them (and indeed the costs that operators incur in understanding the different regimes and identifying those inconsistencies). As a result, we can expect growing pressure for the rationalisation of regulation that affects content delivered via mobile networks. This pressure may potentially become critical as data content accounts for a growing proportion of total consumption.

401 The treatment of personal data – particularly under the environment envisaged under the 'SIMs everywhere' scenario – raises a series of difficult questions. The sharing of authentication, location, and presence data between MNOs and third parties has the potential to deliver significant benefits to consumers via a wide range of applications. However, this also raises questions over the ownership of such data, the right to determine how this data is used, what the scope of those rights are and how ownership rights and privacy rights of the individual to whom the data relates should be protected. The stakeholders we have approached as part of this work appear to have no immediate answers to these important questions of personal data protection. On the contrary, there is a clear need for a debate on those issues to be addressed.

Impact on demand for spectrum

402 Developments in air interface technology, coupled with planned 2G spectrum re-farming and new spectrum awards (e.g. 2.6GHz and digital dividend spectrum) should increase significantly the air interface capacity of existing mobile networks over the next three to five years. Our analysis suggests that these additional spectrum allocations may well be able to support projected traffic demand for mobile voice and broadband services for the foreseeable future. Our discussions with industry players also suggest that the barriers to market entry for players offering two-way mobile broadband services are significant. Both infrastructure build-out costs and the need to establish national distribution channels to market present major obstacles in a maturing market. The strategies being followed by The Cloud, UK Broadband and Freedom4 demonstrate the challenges of delivering a national retail mobile broadband proposition in direct competition to the incumbent MNOs. As a result, we anticipate that the nature of demand for spectrum in the UK will change with greater emphasis being placed by new players bidding for spectrum on new uses, rather than on seeking to acquire spectrum to compete head-on with the existing MNOs.

403 We also note that in the short term, it is the Node B-to-RNC backhaul networks that are likely to represent the bandwidth bottleneck within mobile networks. As microwave is likely to form an important part of the solution to this bottleneck, demand for fixed link spectrum is likely to increase as MNOs seek to match backhaul capacity to installed air interface capacity.

404 It is also apparent from the flow of funds analysis that there is a general shift towards content becoming the source of added value for the consumer. This trend is encouraging competition between market players at that level at the expense of competition based on infrastructure (albeit one that occurs at varying rates in different scenarios). In this environment, we would observe that spectrum is a less significant consideration to operators than other issues, including proposition

development, investment in retail distribution, and the development of appropriate and positive commercial relationships with content players and application developers.

Increasing regulatory focus on services and content

405 The UK mobile regulatory framework seeks to further the interests of consumers through establishing competitive and efficient markets in mobile communications services. Historically, regulatory measures used to achieve this goal have focused on infrastructure and infrastructure operators, as the services offered have been closely tied to the capabilities of that infrastructure.

406 The evidence of the last twelve months suggests that the industry has started a transition in which the nature of the services delivered over mobile is changing. Ubiquitous mobile broadband access is changing the nature of the mobile proposition. Development of new applications based around mobile IP connectivity, and widespread access to 'real' Internet-based services appear likely to offer considerable additional value to UK consumers and businesses. In taking up mobile broadband services, laptop users are starting to use mobile networks to consume the services and content they previously accessed over fixed networks. Research suggests that, with the proliferation of smartphones, the same thing may well happen with content consumed on mobile handsets.

407 In the event that this trend accelerates, our analysis suggests that the greatest benefits to consumers, market players, and the UK economy as whole is likely to arise through the development of applications and content that take full advantage of the evolving capabilities of mobile broadband networks. The same analysis suggests that the benefits of competition solely from the entry into the market of additional broadband infrastructure players per se is limited.

408 Given this finding and given issues raised over the complexity of content regulation and consumer protection in a converging world, a fundamental question arises as to whether the focus of UK regulation should now shift from infrastructure-based competition towards encouraging the development of non-voice converged services.

409 We do not in this work presume to suggest how such a shift might be appropriately enacted but we would recommend Ofcom raises this as a fundamental issue within its consultation and seek responses as to whether for example Ofcom should:

- play a more active role in working with other government bodies to set a consistent and coherent framework for content regulation and protection of consumer rights in this new mobile broadband world
- focus more on ensuring wholesale infrastructure markets open up more quickly to encourage application development
- take steps to proactively adjust mobile termination rates to respond to the rapid changes in network traffic that are now taking place
- seek new roles to encourage innovation and service development in this new environment.

410 The broader question is how best Ofcom can continue to fulfil its remit in a mobile environment that is changing fundamentally: data traffic now exceeds voice traffic on some networks. How the UK should respond to this change – which has occurred in the last nine months – and how it should establish an environment for future growth is a question that warrants serious consideration by all stakeholders within the industry.

Annex A: Quantitative modelling approach and assumptions

A.1 Overview of approach to modelling

A.1.1 Modelling of mobile market services revenues

411 The following flowchart gives an overview of the way mobile market services revenues are modelled:

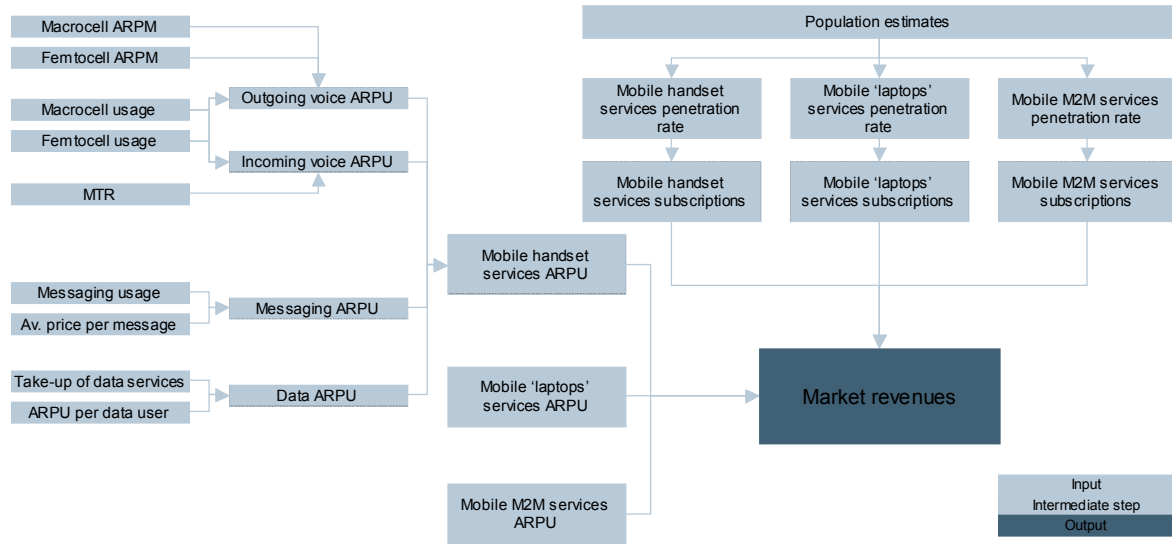

Figure A.1: Overview of the mobile market services revenues modelling

A.1.2 Modelling of mobile operators revenues and costs

412 The following flowchart gives an overview of the way mobile operators revenues and costs are modelled:

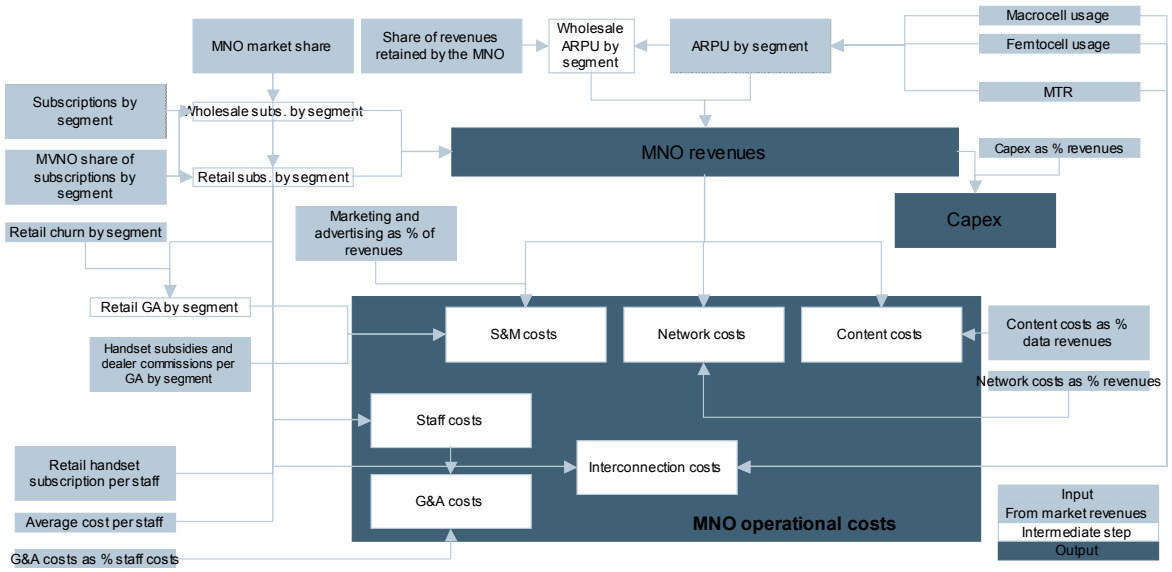

Figure A.2: Overview of the mobile operators revenues and costs modelling

A.1.3 Modelling of mobile operators financial data[23]

413 The following flowchart gives an overview of the way mobile operators' financial data are modelled:

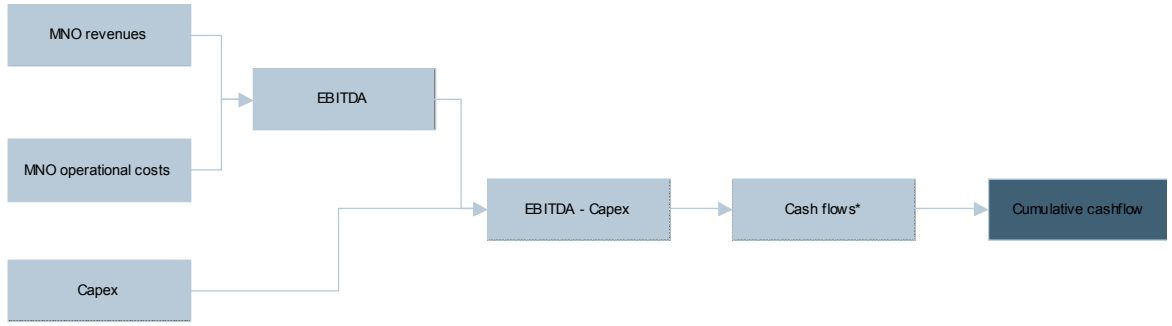

Figure A.3: Overview of the mobile operators financials modelling

23 Cashflow is calculated from free cashflow defined as EBITDA – Capex, i.e. including the effect of taxation

A.2 Structure and assumptions used in the revenues model

A.2.1 Macroeconomic assumptions

414 The model uses economic and demographic input including population, inflation and GDP projections between 2007 and 2017.

415 The population figures used in the model originate from the Office of National Statistics. The UK population is expected to grow from 61.0 million in 2007, at a CAGR of 0.7% over the period. The number of subscribers is derived from the population figures and is therefore a key assumption driving the model.

416 Inflation projections are based on the EIU forecast, and assumes a 2% inflation per annum until 2017.

417 Nominal GDP is expected to increase by an average of 4.3% per annum over the next ten years, growing from GBP1.4 trillion in 2007 to GBP2.1 trillion in 2017. This forecast is based on Euromonitor and EIU estimates.

418 The UK mobile market is expected to benefit from sustained economic and demographic growth, as shown in the figure below.

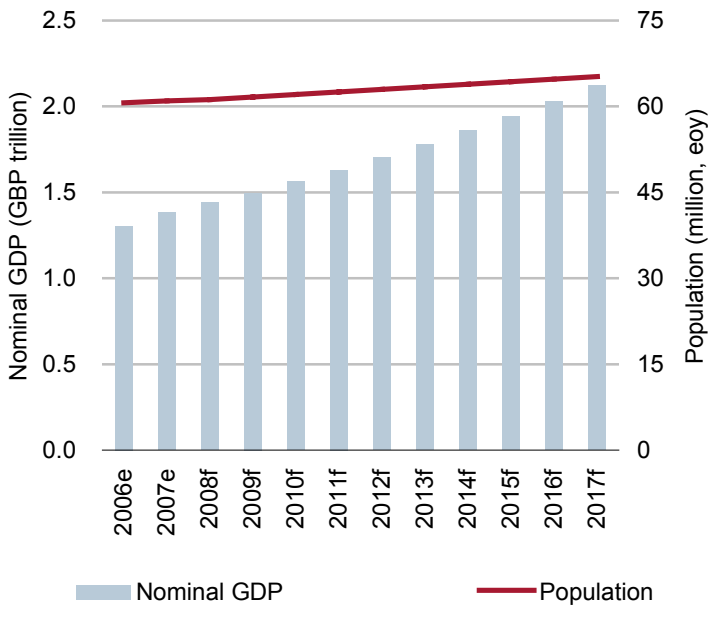

Figure A.4: Demographic and macroeconomic indicators used in the model [Source: Office of National Statistics Euromonitor, EIU]

A.2.2 Penetration assumptions and share of the retail market by scenario

419 Penetration of mobile services in the UK is estimated to be around 120% at the end of 2007. In the model, mobile subscriptions are split into three categories:

- Mobile handset subscriptions include all the SIMs used in handsets, including BlackBerry subscriptions.
- Mobile 'laptops' subscriptions include all the SIMs used in laptops, including datacards and dongles.
- Machine-to-machine subscriptions include all SIMs embedded in machines e.g. telemetry systems.

420 Penetration of mobile handset services does not vary across the scenarios and is forecast to increase gradually and reach 140% by 2017, equating to 91.3 million subscriptions.

421 Penetration of mobile 'laptops' is forecast to be higher in the data-centric scenarios. Their number is expected to reach 22.8 million in the 'SIMs everywhere' scenario (35% of the population), against only 6.5 million (10% penetration) in the 'Steady as she goes' and 'Mobile voice wins' scenarios.

422 Data take-up also drives the number of machine-to-machine subscriptions. Their number is forecast to reach 130.4 million in the 'SIMs everywhere' scenario (two for every person) against only 4.9 million (7.5% penetration) in both voice-centric scenarios.

423 The number of subscriptions considered in the model by 2017 is presented by scenario and by type in the figure below.

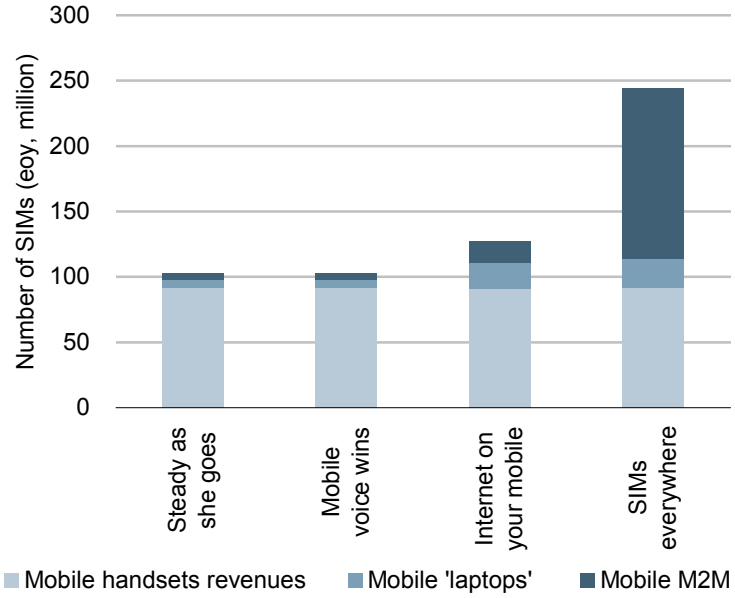

Figure A.5: Subscription by scenario in 2017

424 The model assumes a typical operator in order to produce meaningful financial indicators. The operator's market share is assumed to be 20% across the period for all scenarios, representing an equal share of a five-player market.

425 The typical operator's subscriptions by segment are then split between retail and wholesale subscriptions according to the level of MVNO competitive pressure. In the most competitive scenarios ('Mobile voice wins' and 'SIMs everywhere'), the combined share of MVNOs and service providers is expected to reach 25% in mobile handset services by 2017. In the other scenarios, the operator's wholesale subscriptions amount to about 10% of the total subscription base by 2017.

426 The combined market share of MVNOs and service providers assumed in the model is shown is the figure below:

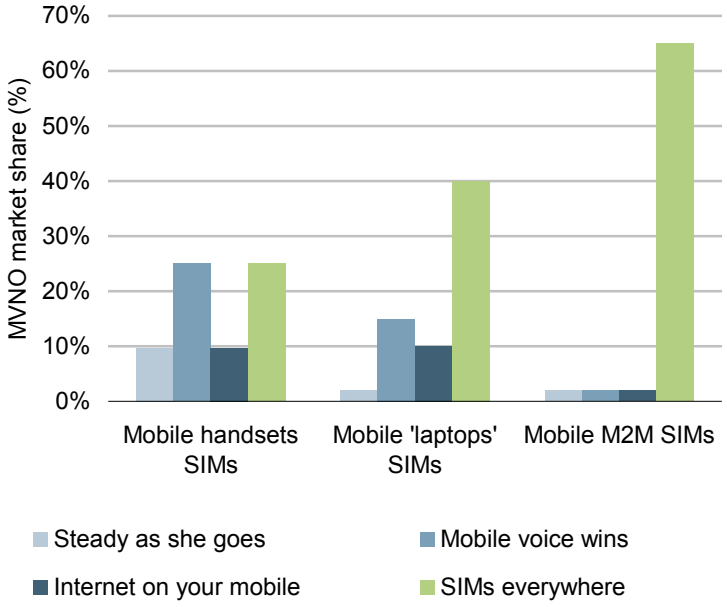

Figure A.6: Combined MVNOs and service providers market share assumed in the model by 2017

427 Gross additional subscriber numbers are calculated based on churn rate assumptions, which are different from one segment to another:

- Mobile handset churn rate is forecast to decrease and stabilise around 28% with the move to longer contracts.
- Mobile 'laptops' churn rate projections are slightly lower, around 21% except from the 'SIMs everywhere scenario', in which it remains around 28%.
- Mobile machine-to-machine churn rate is forecast to be very low, around 5% as this is an enterprise application with devices which have a long replacement cycle.

A.2.3 Revenues assumptions by segment

428 ARPU from mobile handset services includes outgoing voice ARPU, incoming voice ARPU, messaging ARPU and data ARPU.

429 Outgoing voice ARPU is calculated from an average usage per SIM and an average price per minute. Scenarios featuring femtocells (i.e. all but 'Steady as she goes') assume a significant growth in usage, with the mobile network capturing most of the current fixed traffic by 2017. Femtocell-based services are assumed to be launched in 2009, although their impact only becomes consequential in 2013. However, voice average revenue per minute (ARPM) is forecast to decrease dramatically, driving the handset ARPU down. Resulting outgoing voice ARPUs are around GBP8.7 and GBP8.9 per month for voice-centric scenarios and GBP4.3 for data-centric scenarios.

430 Incoming voice ARPU is driven by the total traffic and the mobile termination rate. Scenarios featuring femtocells result in higher incoming traffic, and the mobile termination rate is a key driver of incoming revenues.

431 Messaging ARPU is calculated from an average usage per SIM and an average revenue per message. The monthly usage is expected to fall and to stabilise at around 100 message per SIM per month, whilst the decline in revenue is forecast to slow in voice-centric scenarios (as messages are expected to be increasingly included in bundles) and to intensify in data-centric scenarios (as messages are expected to be increasingly replaced by instant messaging). By 2017, messaging ARPU projections become stable around GBP3.2 in both voice-centric scenarios and around GBP3.1 in both data-centric scenarios.

432 Data ARPU is based on a take-up of data services amongst the handset customer base which is lower in the voice-centric scenarios. Hence, in these scenarios, data ARPU is expected to remain low and grow from an estimated GBP2.2 in 2007 to GBP3.7 in 2017, whereas data ARPU is forecast to become the larger contributor to the total handset ARPU in data-centric scenarios, and reach GBP15.0 and GBP15.7 by 2017 as most of the customer base subscribes to data bundles. These data bundles help operators in maintaining the handset ARPU in data-centric scenarios.

433 Mobile handset services ARPUs by scenario are shown in the figures below.

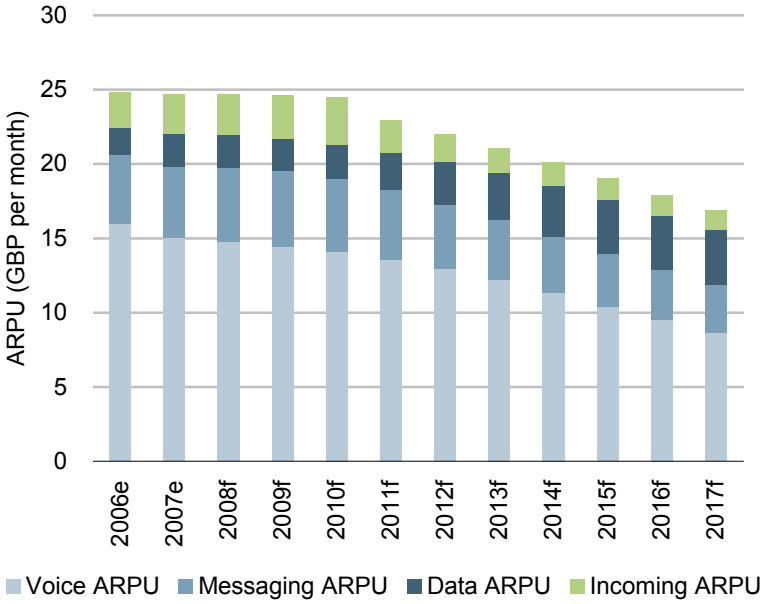

Figure A.7: Mobile handset ARPU per month – 'Steady as she goes'

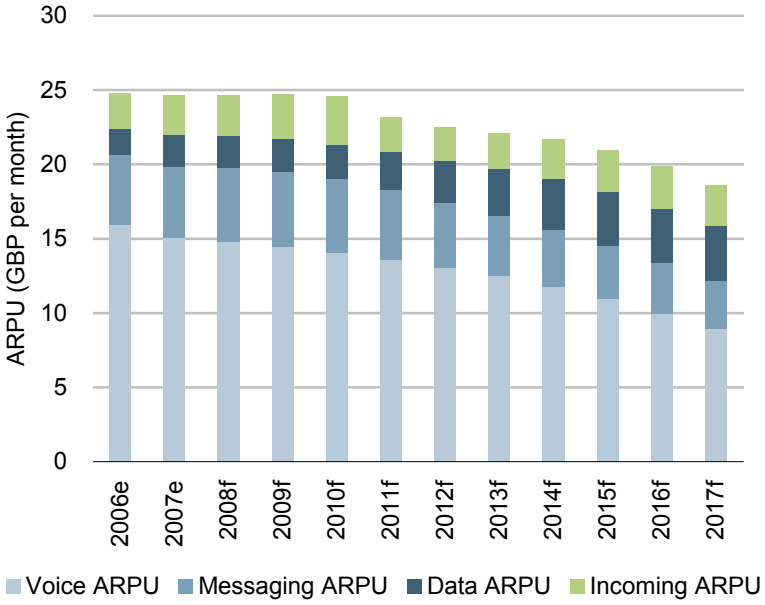

Figure A.8: Mobile handset ARPU per month – 'Mobile voice wins'

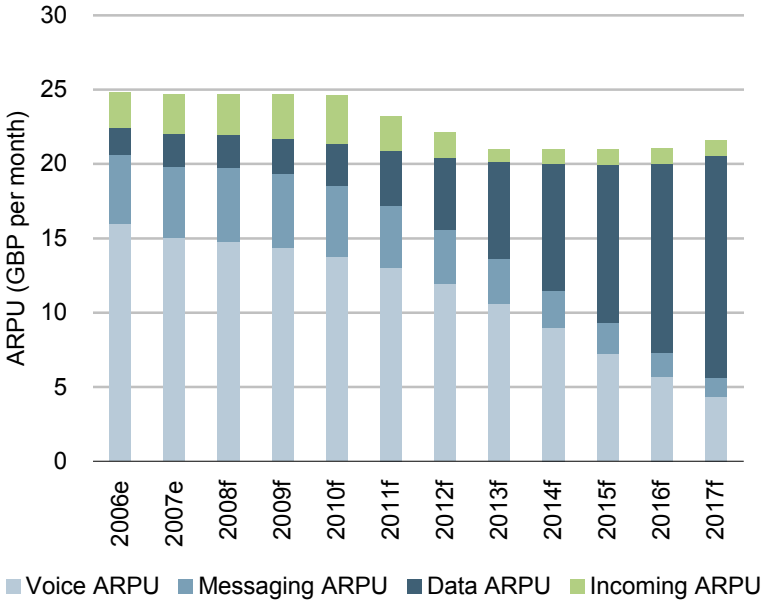

Figure A.9: Mobile handset ARPU per month – 'Internet on your mobile'

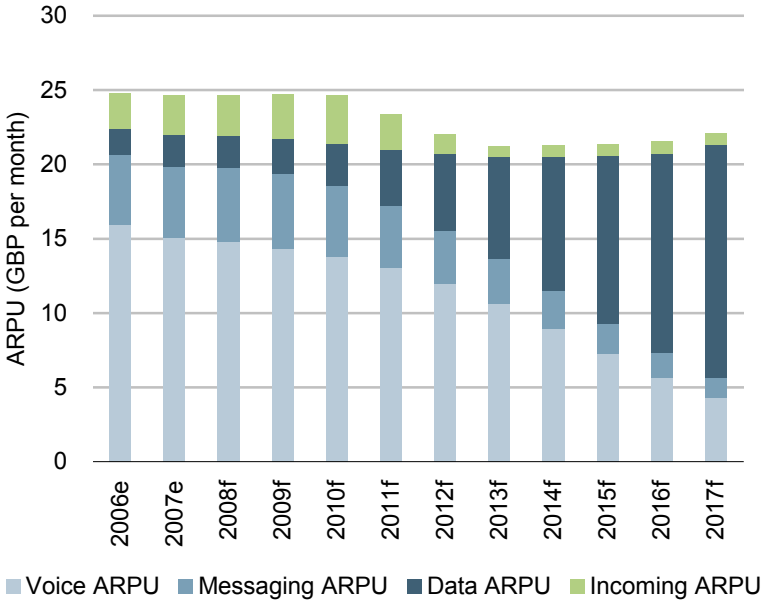

Figure A.10: Mobile handset ARPU per month – 'SIMs everywhere'

434 ARPU from mobile 'laptops' is forecast to decline over the next ten years. The decrease will be sharper in data-centric scenarios as a significantly higher take-up is assumed (from GBP16.2 to GBP8.5 in 2017), whilst the mobile 'laptops' ARPU only falls to GBP10.2 by 2017 in voice-centric scenarios.

435 ARPU from mobile 'laptops' for both voice-centric and data-centric scenarios is shown in the figure below.

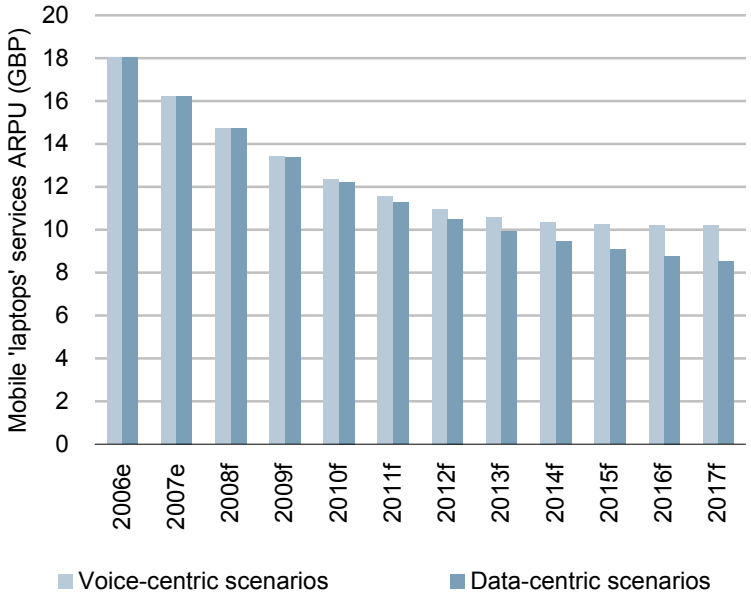

Figure A.11: ARPU from mobile 'laptops'

436 Mobile machine-to-machine ARPU is assumed to remain constant around GBP3.0 for both voice-centric and data-centric scenarios.

A.2.4 Costs assumptions by scenario

Interconnection costs

437 The main driver for both interconnection costs and interconnection revenues is the mobile termination rate. It is assumed to decline as the data take-up increases.

438 The mobile termination rate is used to drive other termination rates used in the model, such as the fixed interconnection rate, the international termination rate and the messaging termination rate.

439 Volumes are also driving both interconnection costs and interconnection revenues, the take-up of femtocells altering dramatically the volumes of minutes since femtocells are forecast to capture most of the fixed traffic by 2017. This effect is coupled with a change in the distribution of outgoing calls. Whilst 35% of outgoing calls are assumed to go to fixed destinations in 2017 without femtocells, this proportion falls to 5% with the introduction of femtocells. Most of these calls are then directed to mobile destinations, generating higher interconnection costs per minute.

440 The mobile termination rates assumed in the model are presented in the figure below.

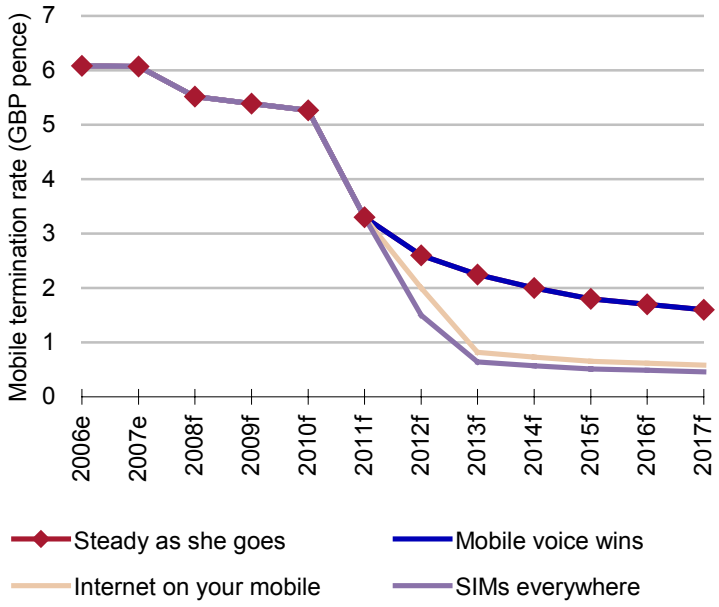

Figure A.12: Mobile termination rate by scenario

Marketing and sales costs

441 Marketing and sales costs vary from one scenario to another with varying degrees of competitive pressure and/or take-up of data services. They are modelled as the sum of handset subsidies, dealer commissions and marketing and advertising costs.

442 Handset subsidies are driven by the take-up of data services, which require a higher-quality handset and handset subsidies per gross additional subscriber are therefore higher in data-centric scenarios. Whilst they decrease from GBP60 to GBP42 in voice-centric scenarios, they increase from GBP60 to GBP73 in data-centric scenarios.

443 Dealer commissions are driven by the competitive pressure in the market caused by the presence of MVNOs. In highly competitive scenarios, commissions per gross additional subscriber grow at a rate above inflation, whilst they grow in line with inflation in less competitive scenarios.

444 Marketing and advertising costs are calculated as a proportion of the revenues, around 8%.

445 Handset subsidies and dealer commission per gross additional subscriber are presented in the figure below.

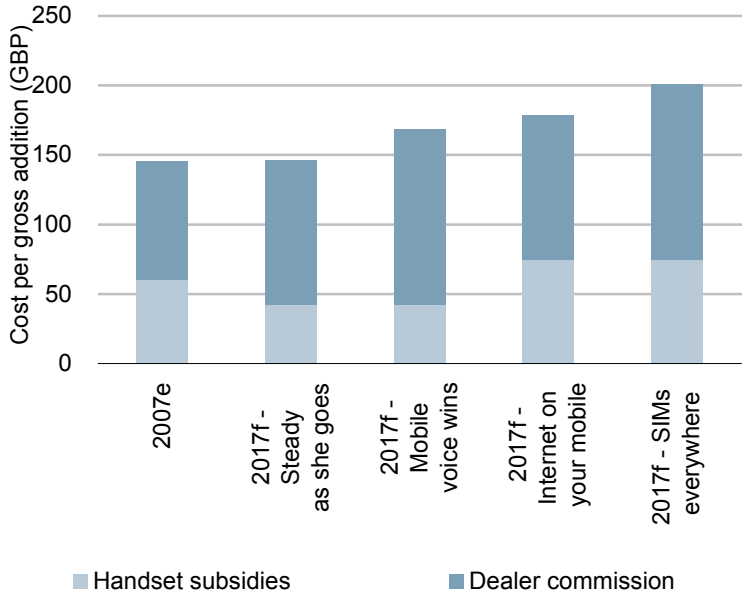

Figure A.13: Handset subsidies and dealer commission per gross additional subscriber by scenario

Staff and general and administrative costs

446 The key driver for staff costs is the number of retail handset subscribers, to which an efficiency ratio is applied to derive the total number of staff. Consequently, higher MVNO market shares result in a lower retail subscriber base and a lower efficiency ratio. As shown in the figure below, at a given level of competitive pressure from the MVNOs, data-centric scenarios are assumed to be less efficient that voice-centric scenarios.

447 Additional staff numbers are modelled to deal with machine-to-machine services, although with an efficiency ratio ten times that of handset services.

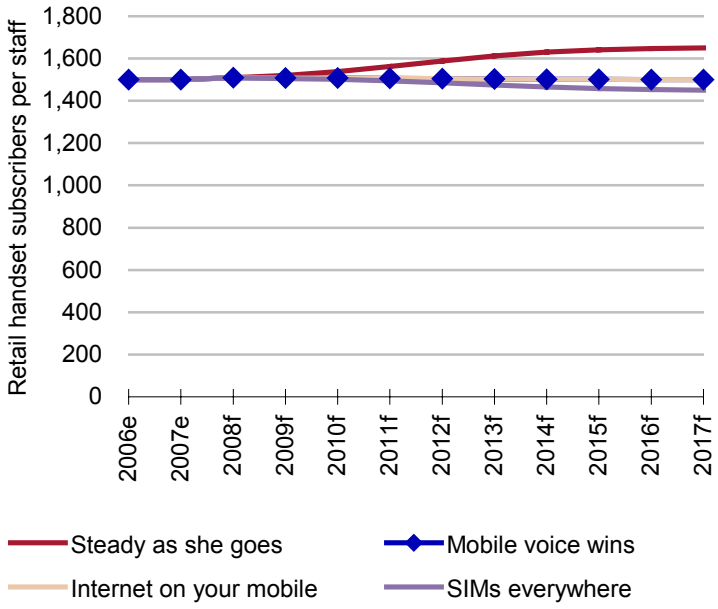

Figure A.14: Staff efficiency ratio by scenario

448 The average cost per staff per annum increases with inflation from around GBP42 000 in 2007.

449 General and administrative costs are calculated as a proportion of staff costs, and based on benchmarks.

Network operating costs

450 Network operating costs are calculated based on revenues. The ratio between network costs and revenues is assumed to increase with the take-up of data services, as the load on the network is significantly higher.

451 'Mobile voice wins' has lower network costs than the other voice-centric scenario since the introduction of femtocell is expected to generate network cost savings in the long run.

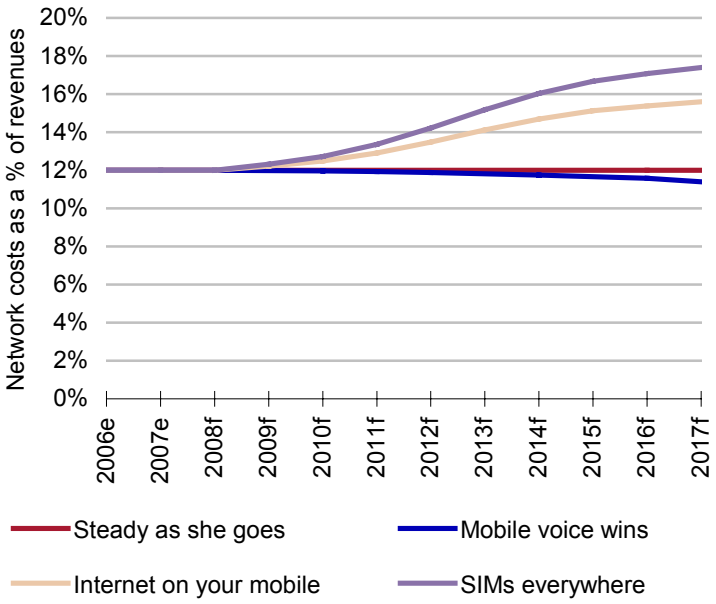

Figure A.15: Network operating costs by scenario

Capital expenditure

452 Similar underlying trends are driving capital expenditure and network operating costs.

453 The 'Steady as she goes' scenario assumes that the operator's capital expenditure remains constant at around 10% of revenues, whilst the other voice-centric scenarios' capital expenditure are forecast to be lower, since the introduction of femtocells reduces the investment requirement (e.g. fewer base stations required for indoor coverage). Both data-centric scenarios are expected to require much higher levels of capital expenditure to cope with the additional load on the network.

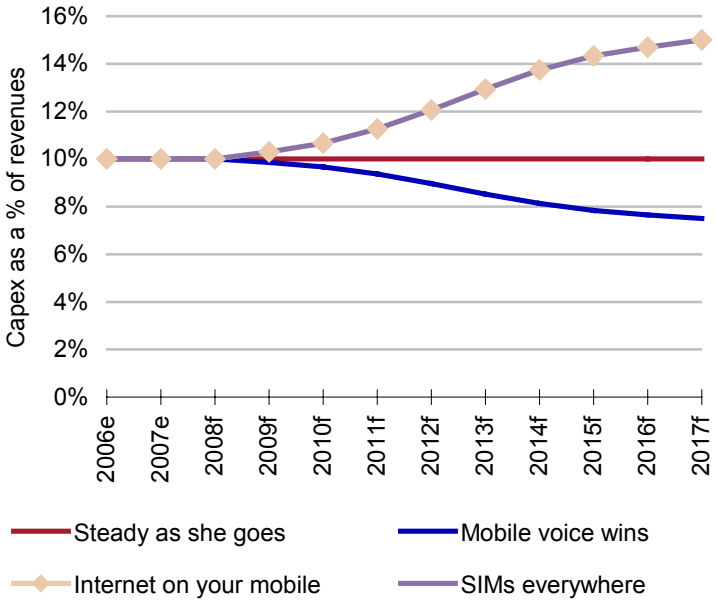

Figure A.16: Capital expenditure by scenario

Annex B: Modelling approach for flow of funds

B.1 Overview of approach to modelling

B.1.1 Modelling of historical flow of funds

454 This model of the flow of funds is based on data from the European Information Technology Observatory (EITO) database[24]. It specifies the size of the different ICT markets, including telecoms equipment and telecoms carrier services for a large number of European countries. Our model also builds on the modelling work described in Annex A for metrics such as device subsidies and dealer commissions that are necessary to allocate revenues between the main participants.

455 The following flowchart gives an overview of the way the historical flow of funds are modelled across the value chain:

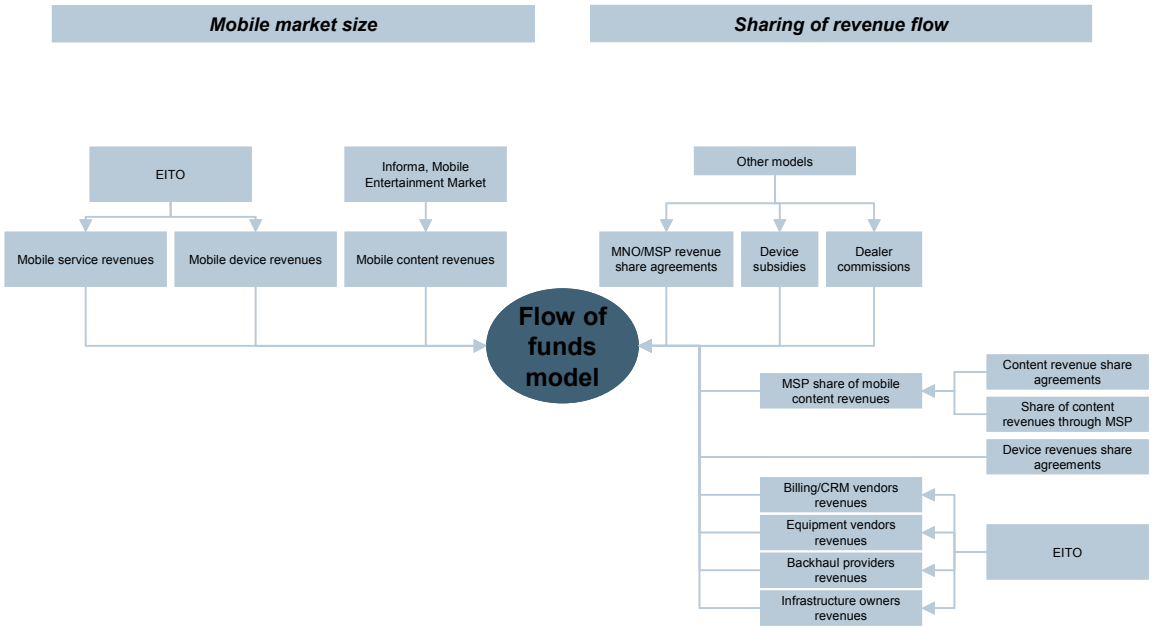

Figure B.1: Overview of the historical flow of funds model [Source: Analysys Mason]

24 European Information Technology Observatory 2003 and 2008 reports

B.1.2 Modelling of future flow of funds

456 This model builds upon the previous modelling work described in Annex A to assess the impact of the different scenarios on the flow of funds across the value chain. The 'mobile service revenues' model gives the flow of funds received by the service providers for carrier services. The 'mobile operator financials' model gives information on the key costs of network operators and service providers, such as revenue share agreement between MNO and service provider functions, device subsidies, dealer commissions, network opex and capex.

457 The remainder of the necessary inputs to the flow of funds model are modelled based on scenario-driven parameters. First, the size of the devices market is based on estimated device prices and the number of gross additional subscribers for the three categories of devices used in the previous model (handsets, laptops and machine-to-machine). Second, the total mobile content revenues are estimated based on scenario-driven growth, and then split between service and content providers using scenario-driven assumptions about the traffic split between on-portal and off-portal and the revenue sharing agreements terms. Finally, the split of the network costs between equipment vendors, backhaul providers and infrastructure owners is based on scenario-driven assumptions regarding the share of network costs those players may get.

458 The following flowchart shows how the future flow of funds model is integrated into the rest of the study:

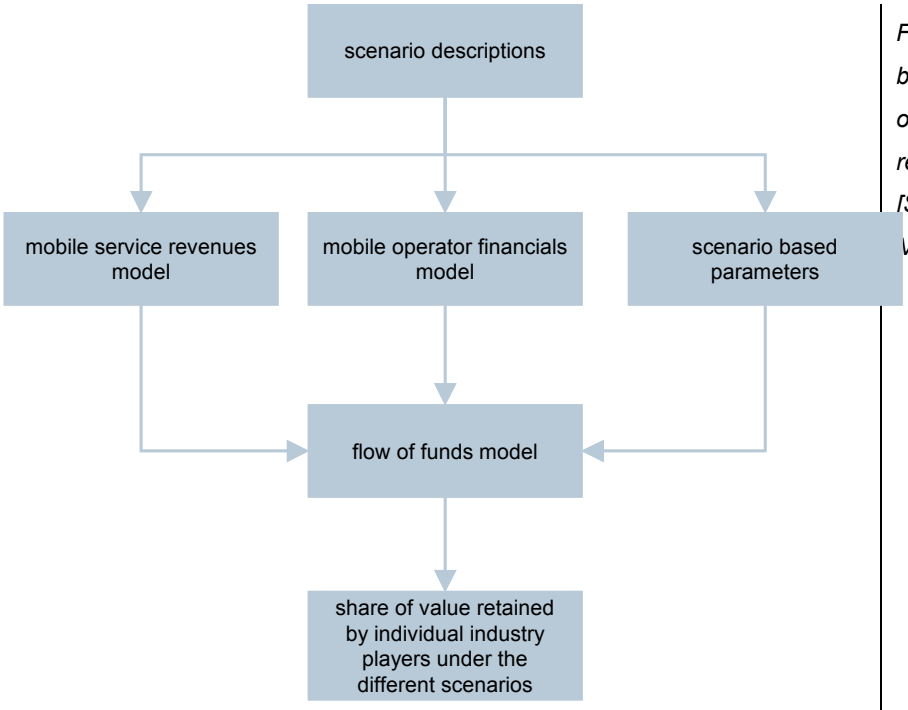

Figure B.2: Articulation between the future flow of funds model and the rest of the project [Source: Analysys Mason]

459 The following flowchart gives an overview of the way the future flow of funds are modelled across the value chain:

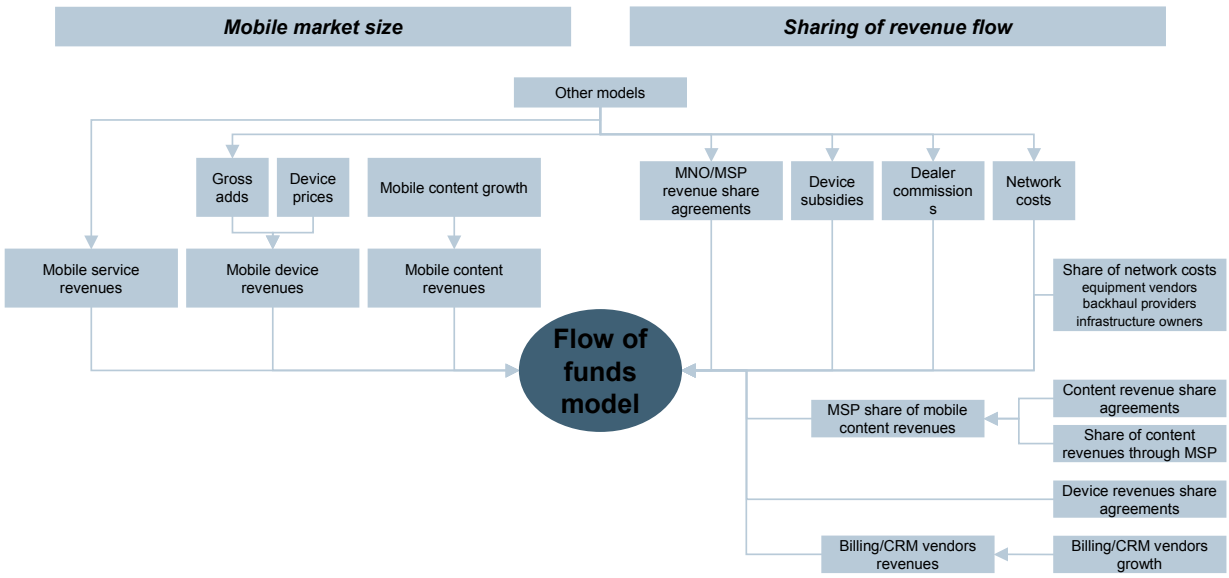

Figure B.3: Overview of the future flow of funds modelling [Source: Analysys Mason]

B.2 Structure and assumptions used in the historical flow of funds model

B.2.1 Assumptions on mobile market size

460 The revenue figures for ICT market segments used in the model originate from several EITO reports[24]. The 2007 revenues for the UK mobile entertainment market are based on Informa's Mobile Entertainment Market report[25].

461 As these raw figures include revenues outside the mobile value chain (e.g. billing systems sold to fixed telecom operators) the following assumptions were used to narrow them down to the mobile sector:

- 40% of the billing/CRM market revenues come from the mobile sector (based on benchmark from IDC, Gartner Research).
- 50% of revenues from voice switching equipment come from the mobile sector[26].
- 10% of revenues from WAN router equipment come from the mobile sector[26].

25 Informa Media and Telecoms report on Mobile Entertainment: Country Profiles, 2007

26 These numbers were not benchmarked against external sources but were subject to peer review by Analysys Mason experts. In addition, given their relative size, changes would not significantly affect the results

- 60% of revenues from transmission equipment (microwave systems) revenues come from the mobile sector[26].
- 50% of revenues from infrastructure services (tower and civil works) revenues come from the mobile sector[26].
- 10% of revenues from business data services (leased lines) come from the mobile sector[26].
- 10% of mobile content does not go through service provider revenues[26].

B.2.2 Assumptions on sharing of revenue flow

462 The device subsidies and dealer commissions used in the historical flow of funds model originate from previous modelling work described in Annex A.

463 The remainder of the data needed to split the overall mobile market revenues among the main participants are based on the following assumptions:

- 85% to 90% of device revenues are retained by manufacturers[26].
- 40% of gross service revenues are retained by service providers (figure based on MVNO traffic deals negotiated by Analysys Mason and on recent press articles).
- service providers subsidise handsets and pay dealer commissions, billing/CRM and content providers.
- MNOs pay network equipment vendors, tower and backhaul companies, and HM Government for spectrum.
- MNOs licence costs total GBP100 million (based on data provided by Ofcom).

B.3 Structure and assumptions used in the future flow of funds model

B.3.1 Assumptions on mobile market size

Device revenues

464 Device revenues are estimated based on the previous modelling work described in Annex A. First, figures for gross additional subscribers are taken from the model (Section A.2.2 describes how they are calculated) and increased by 20% to reflect sales of devices sold without new connections (e.g. replacement handsets). Then, handset retail prices are calculated based on current handset prices estimates and the scenario-based growth assumptions used in the previous modelling work

for handset subsidies i.e. –3.5% annual decline in voice-centric scenarios and +2.3% annual growth in data-centric scenarios. Prices and subsidies for laptops and machine-to-machine are assumed constant.

Content revenues

465 The content revenues are based on growth assumptions that vary according to the scenarios as shown in the figure below.

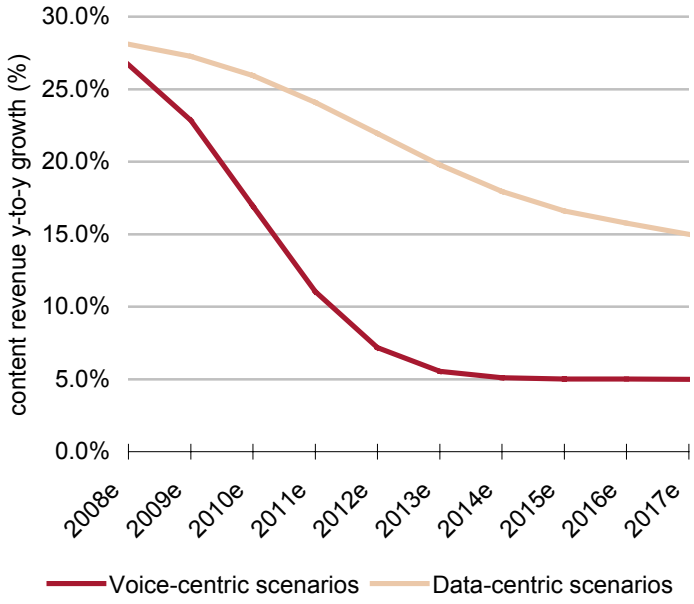

Figure B.4: Content revenues growth

Service revenues

466 The future flow of funds model uses results of previous modelling work described in Annex A for the size of the carrier service markets. However, interconnection revenues and roaming are excluded as mobile interconnection needs to be removed when looking at the overall market while fixed interconnection inflows and roaming outflows balance each other (based on data provided by Ofcom).

B.3.2 Assumptions on sharing of revenue flow

467 First, devices market revenues are based on estimated device prices and numbers of gross additional subscribers for the three categories of devices used in the previous modelling (handsets, laptops and machine-to-machine). Then, content revenues are estimated based on scenario-driven assumptions about growth, and then split between service and content providers based on scenario-driven assumptions about the traffic split between on-portal and off-portal and the revenue sharing agreements terms. Finally, the split of the network costs between equipment vendors, backhaul

providers and infrastructure owners is based on scenario-driven assumptions about the share of network costs those players get.

Device revenues

468 Device revenues are split between manufacturers and distributors based on assumptions about the device price wholesale terms. For handsets and dongles, 85% of the retail price is assumed to be passed on to the manufacturer. For laptops with embedded SIMs and machine-to-machine, 90% of the retail price is assumed to be passed on to the manufacturer.

Content revenues

469 Mobile content revenues are split between service and content providers based on scenario-driven assumptions about the evolution of traffic split between on-portal and off-portal and the revenue sharing agreements terms.

470 The share of mobile content revenues not flowing through service providers (i.e. the share of revenues off-portal) for voice-centric and data-centric scenarios is shown in the figure below.

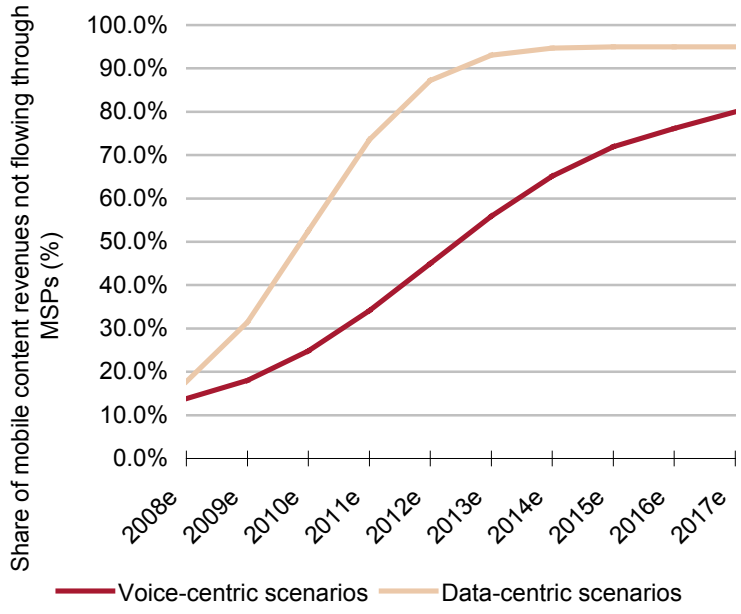

Figure B.5: Share of mobile content revenues not flowing through service providers

471 Service providers' share of content revenues flowing through them for voice-centric and data-centric scenarios is shown in the figure below.

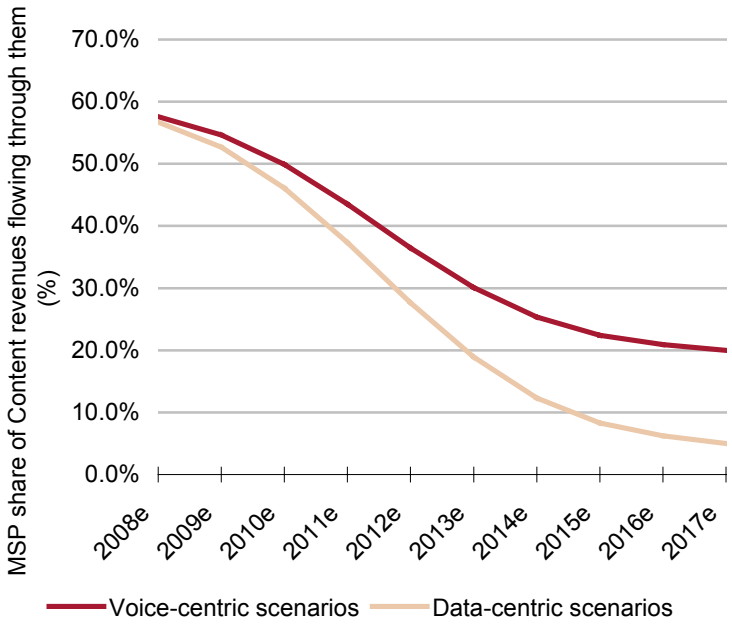

Figure B.6: Mobile service providers' share of content revenues flowing through them

Service revenues

472 MNOs and service providers share service revenues between each other and then pay their other suppliers/partners. The revenues share assumption between MNOs and service providers is a key one which is driven by the scenarios as shown in the figure below.

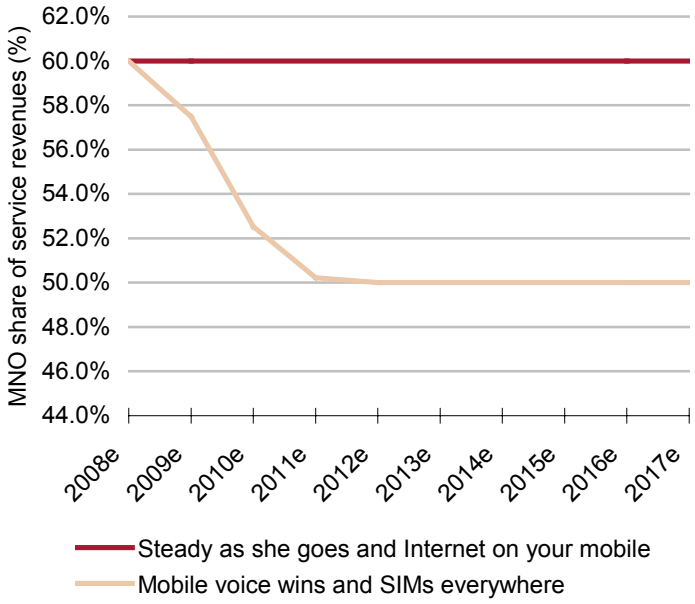

Figure B.7: MNO share of service revenues (%)

Device subsidies, dealer commissions and billing/CRM

473 Figures for device subsidies and dealer commissions come from the previous modelling work. Those values change according to the scenarios as the numbers of gross additional subscribers are significantly different between the scenarios. Device subsidies are calculated using –3.5% annual decline in voice-centric scenarios and +2.3% annual growth in data-centric scenarios. Dealer commissions are calculated using a 2% inflation-based annual growth rate for 'Steady as she goes' and 'Internet on your mobile' scenarios and a growth rate raising from 2% to 5% over the period for 'Mobile voice wins' and 'SIMs everywhere' scenarios where retail competition is expected to be higher.

474 Billing/CRM vendors revenues growth is a scenario-driven parameter as shown in the figure below.

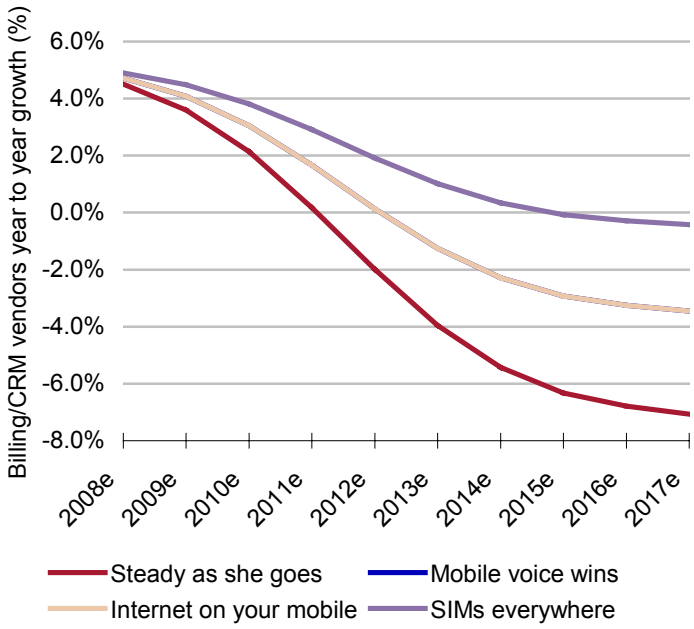

Figure B.8: Billing/CRM vendors revenues growth

Network equipment vendors, tower and backhaul companies, and spectrum fees

475 The previous modelling work described in Annex A calculates the amount spent by MNOs on network opex and capex (see Section A.2.4 for more details). Those figures are an important element of the flow of funds approach as part of those expenses are the revenues of network equipment vendors, tower and backhaul companies (the rest being internal expenses and other suppliers).

476 Network equipment vendors, tower and backhaul companies revenues, the 'identified external costs', represent 53% of MNOs' capex costs and 30% of their opex costs. Those numbers have been calculated based on data for 2007 and are assumed to stay constant over time.

477 Network equipment vendors share of identified external costs is a scenario-driven parameter as shown in the figure below.

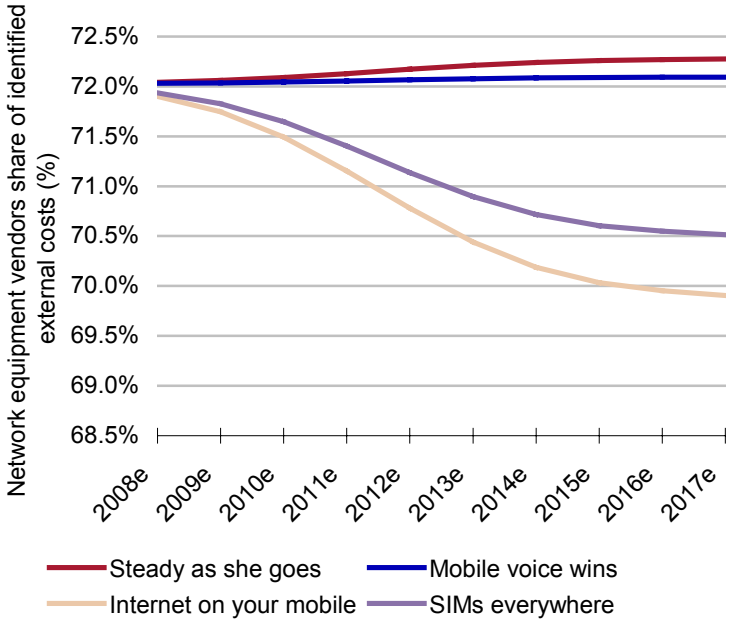

Figure B.9: Network equipment vendors share of identified external costs

478 Backhaul providers' share of identified external costs is a scenario-driven parameter as shown in the figure below.

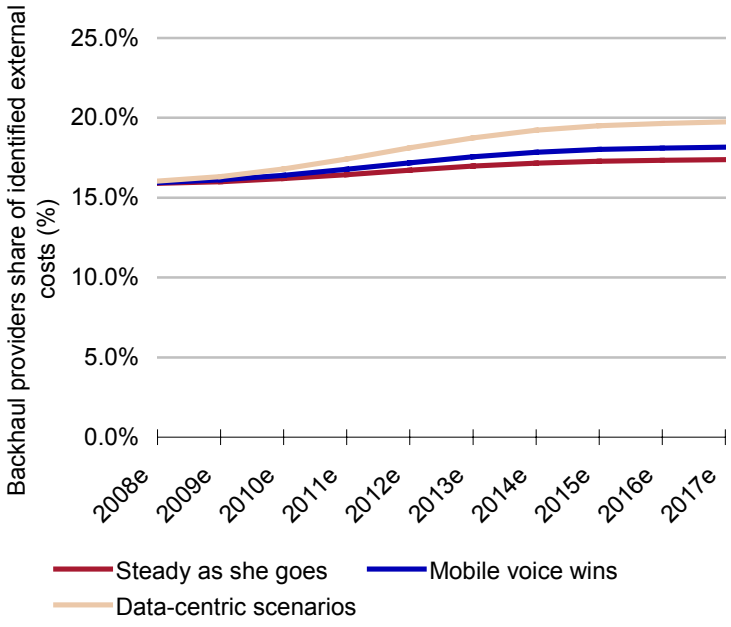

Figure B.10: Backhaul providers share of identified external costs

479 Infrastructure owners' share of identified external costs is a scenario-driven parameter as shown in the figure below.

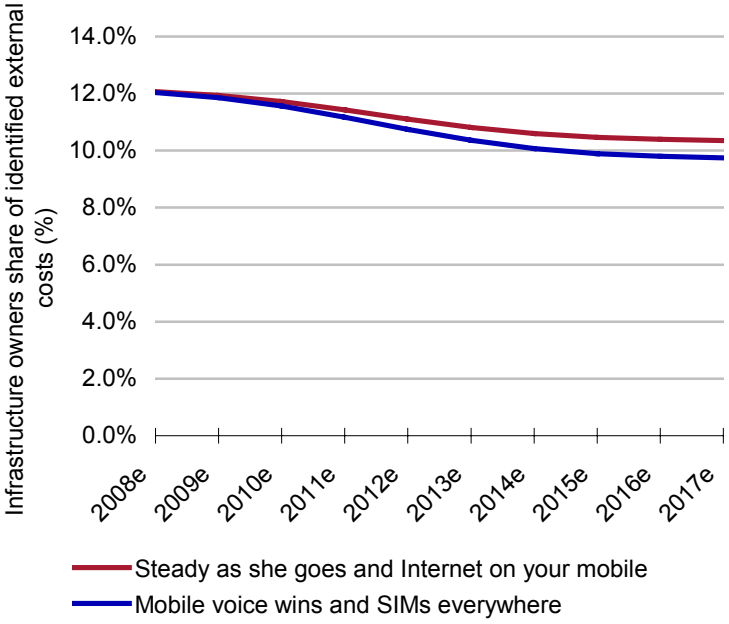

Figure B.11: Infrastructure owners share of identified external costs