GSMA Intelligence

Revisiting 5G monetisation: upping the experience

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GSMA

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www.gsmaintelligence.com

info@gsmaintelligence.com

Authors
Tim Hatt, Head of Research and Consulting
Pau Castells, Head of Economic Analysis
Shiv Putcha, Director, Consulting

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Putting the quest for monetisation in context

The mobile industry continues to drive connectivity around the world. At the end of 2023, 58% of the global population used mobile internet, equating to 4.7 billion users – an increase of 2.1 billion since 2015. 4G continues to account for the majority of the mobile connections base, but 5G – now at 20% of connections globally – is growing at a faster pace than anything before it.

While connection numbers have grown strongly, the same cannot be said for mobile operator revenues. Globally, operator revenue growth is in low, single digits, with pressure on ARPU unabating from competition, a lack of sustained pricing premiums, and an enterprise opportunity that remains nascent.

One of the biggest challenges faced by operators in recent years has been the increase in data traffic carried over mobile networks. Global mobile data traffic rose from an average monthly usage level per connection of 10.2 GB in 2022 to 12.8 GB in 2023. The six-fold increase in data traffic projected between now and 2030 has significant implications for operators. The most immediate challenge is to allocate capex funds for the acquisition of new spectrum and deployment of additional base stations in the radio access network (RAN), to increase coverage and capacity at the network access layer. However, RAN upgrades alone will not alleviate the capacity crunch for operators. Upgrades are also required for the backhaul and underlying transport layers of the network, as well as the core network as operators migrate from 4G and other legacy networks to 5G standalone (5G SA) and 5G-Advanced.

Revisiting the commercial options for monetisation

The environment outlined above has put increasing pressure on cashflow and, in turn, network investment budgets. While cost cutting can help, it can only go so far. The fundamental challenge is to renew revenue growth.

This report focuses on product and monetisation strategies in the consumer segment. Consumers account for 70–75% of most operators' revenues. Selling into enterprises remains a crucial dimension to 5G success and is covered in other GSMA Intelligence research.

How to gain further revenue from 5G is more a matter of product marketing and partnerships than networks. The 5G infrastructure component is largely in place. Where it is not, performance gaps (mostly in latency) will likely be filled through 5G-Advanced (or '5.5G') upgrades.

Operators have started to use a range of strategies to drive monetisation of 5G, including:

- speed-based pricing
- network APIs
- bundling and zero-rating
- customer segmentation
- 5G FWA.

Assessing success so far

The main challenge continues to be to drive a higher price premium for tariffs linked to content or speed, and for consumers to be willing to pay and sustain that level of payment over time. This comes down to consumers feeling 5G delivers something new or better than what is possible using an existing 4G service.

This analysis suggests FWA has proven the most effective of the options, offering an increased return by reusing spectrum and avoiding/reducing the costs of fixed access. Speed-linked tariffs remain at an early stage but have potential, with results from Finland and other early adopters looking promising where quality of service (QoS) can be fulfilled. Content-linked offers that bundle video and gaming are a more market-specific option. Success using the content approach is partly tied to local culture. For example, South Korea and other Asian countries have had digital-native content and gaming for years (well before 5G existed), and India and African countries are largely mobile-only, meaning fixed lines and (in many cases) TVs are not an option for content consumption.

While cost cutting can help, it can only go so far. The fundamental challenge is to renew revenue growth.

1 Context and strategic rationale

1.1 Huge strides forward in mobile connectivity

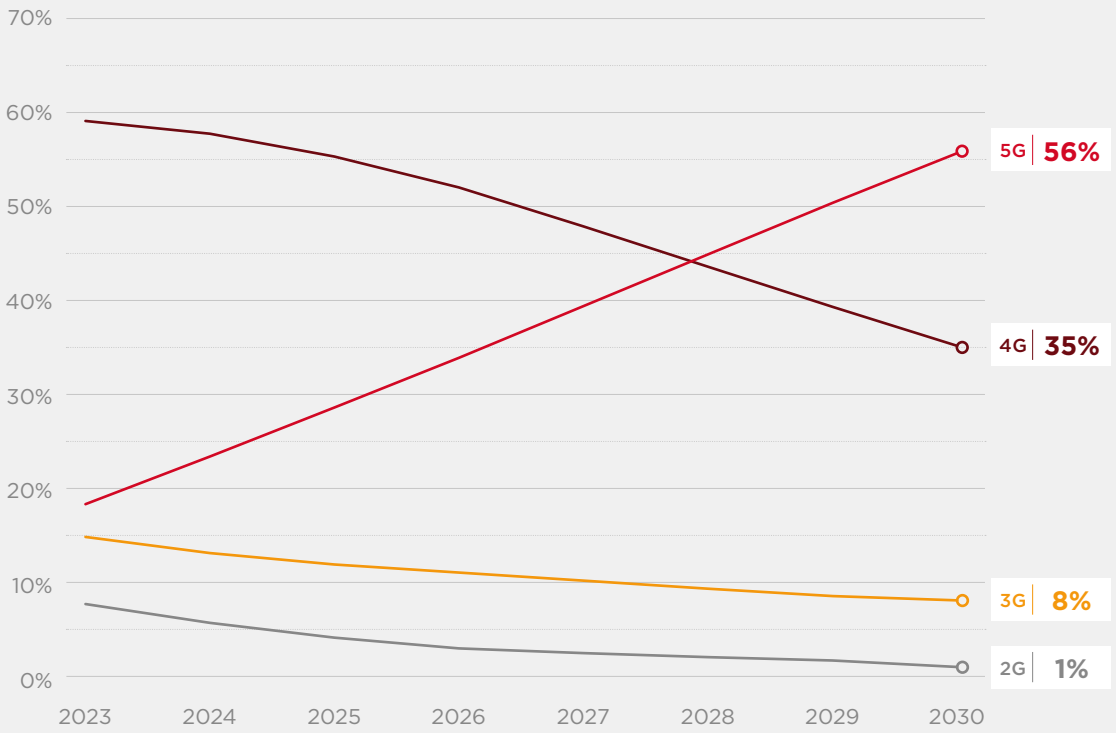
By the end of 2023, some 5.6 billion people (69% of the global population) subscribed to a mobile service, an increase of 1.6 billion people since 2015. Many countries are already saturated and reporting high levels of mobile penetration. Those that still have significant room for growth are typically low- and middle-income countries.

Growth in mobile internet penetration has been even faster. At the end of 2023, 58% of the world's population used mobile internet, equating to 4.7 billion users – an increase of 2.1 billion since 2015.

In terms of technology mix, at the end of 2023, most of the world's mobile connections (almost 60%) were still on 4G. However, 5G subscribers accounted for nearly 20% of total connections. 5G adoption has grown at the fastest rate of any mobile technology generation deployed at a global scale. 5G was the fastest to reach 1 billion connections. This happened by the end of the third year after the first commercial deployment.

Figure 1 Mobile adoption by technology

Percentage of total connections



Source: GSMA Intelligence

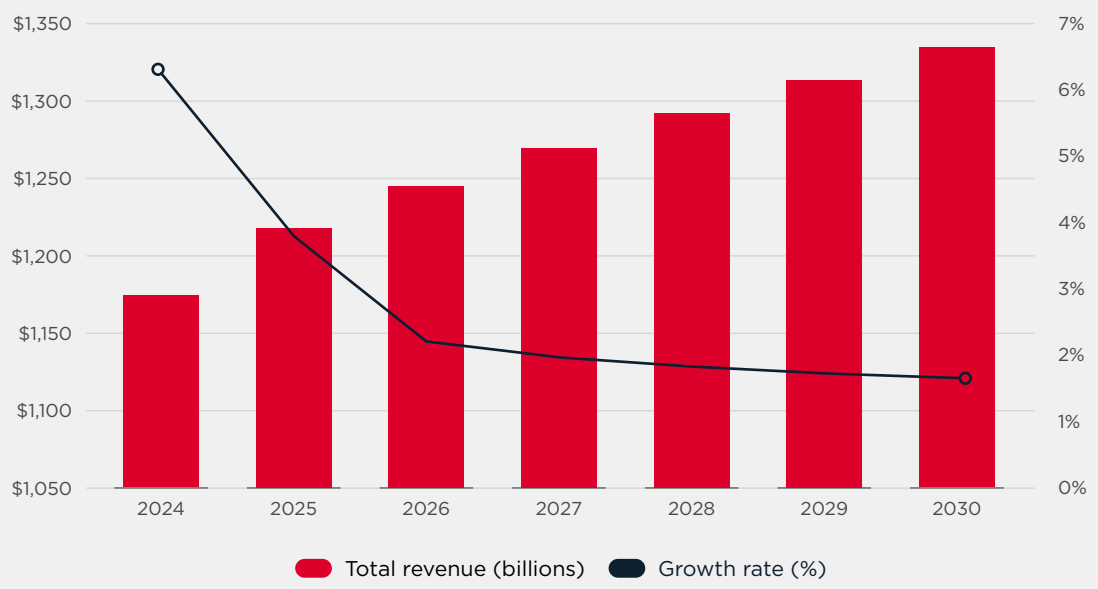
1.2 Continued financial pressure for operators

The growth in mobile connections has not been matched with a surge on the revenue side of the equation. Other than in the immediate years following 5G deployment, global mobile revenue growth has been in low, single digits. Figure 2 shows an average across the world for the forecast period ahead, therefore obscuring regional variation. Most of the increase is being driven by high-growth economies in China, India, Southeast Asia and parts of Africa. Operators in Europe and North America have been largely unable to sustain more than mid-single-digit mobile revenue growth since the 4G era. 5G price premiums, while real at 15–20%, are being competed away.

With operators challenged by near-flat revenue growth and rising costs, there is increasing pressure on bottom-line financial metrics such as gross margin and cashflow. These represent key measures of an operator's ability to invest in future network upgrades.

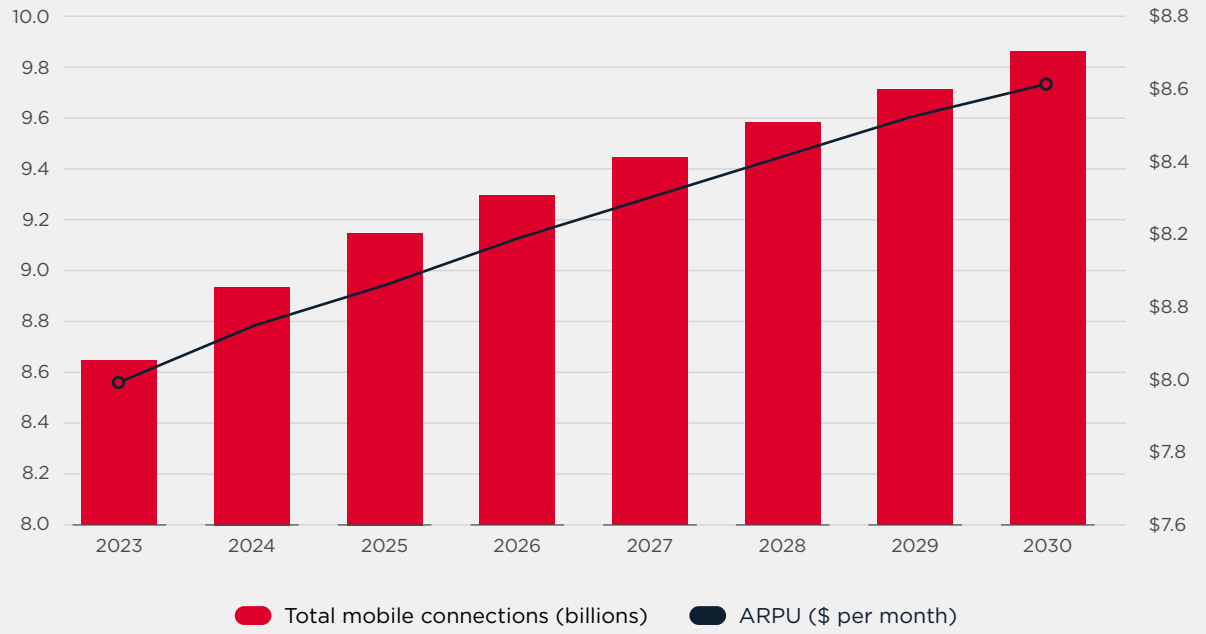
This picture is broadly consistent across the sector – even in vanguard countries where 5G adoption has been relatively buoyant (e.g. South Korea). The telecoms sector is fundamentally an infrastructure business, with the economics reliant on positive operating leverage, meaning rising revenues against a high fixed cost base. Since the 4G era, the flat revenue trajectory has been set against a cost base that continues to rise to fund 5G and fibre rollouts, as well as upgrades (notably, moving from non-standalone to standalone architectures).

Figure 2 Global mobile revenues, 2024–2030



Source: GSMA Intelligence

Figure 3 Global mobile connections and ARPU, 2023–2030



Source: GSMA Intelligence

1.3 Rising data traffic

At the global level, mobile data traffic rose from average monthly use per connection of 10.2 GB in 2022 to 12.8 GB in 2023.

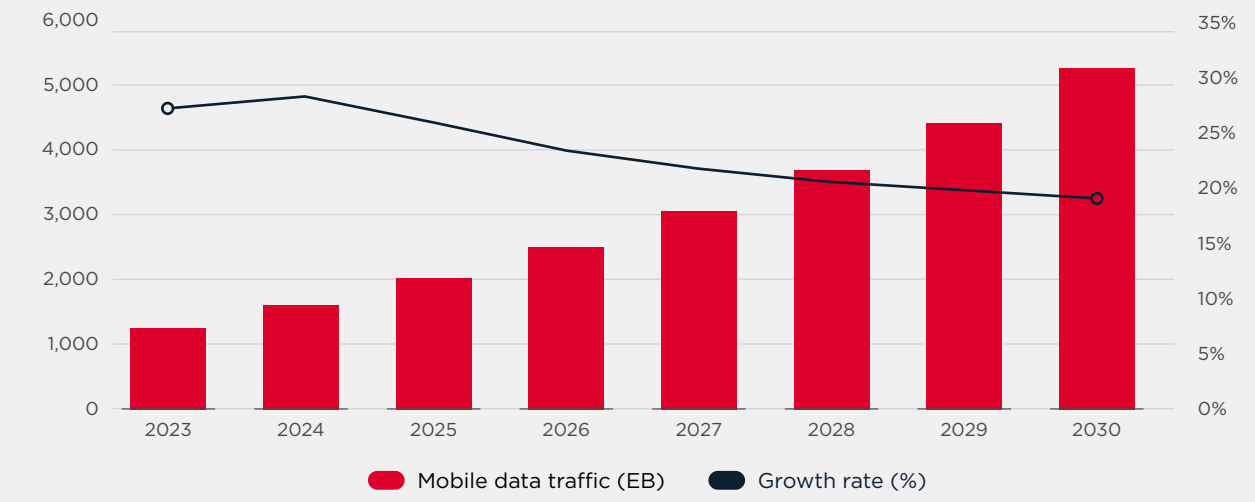
In mature markets, Finland records average monthly data use per connection of just above 50 GB, while the US records around 39 GB per month, though these numbers could be skewed higher due to use of 5G FWA in these markets.

In emerging markets, India recorded average monthly mobile data use of 20.3 GB per connection in Q1 2024, while China and Indonesia recorded 18.6 GB and 13.7 GB, respectively. Consumers in emerging markets tend to use their mobile devices as their primary broadband access device.

GSMA Intelligence forecasts mobile data traffic to grow at a CAGR of 23% between 2023 and 2030, which translates to an aggregate traffic volume globally in 2030 of 5,400 Exabytes (EB). See Figure 4.

GSMA Intelligence forecasts mobile data traffic to grow at a CAGR of 23% between 2023 and 2030

Figure 4 Global mobile data traffic, 2023–2030



Source: GSMA Intelligence

1.4 Grappling with multidimensional network upgrades

The increase in data traffic highlighted above has significant implications for operators, driving 5G network capex. Operators are grappling with the following priorities:

- **RAN** – Operators need to allocate capex to the acquisition of new spectrum and the deployment of additional base stations in the RAN, to increase coverage and capacity at the network access layer. They have to factor in several costs related to this, with significant investments related to wide-area (macro) base stations. There is also the need for network densification to increase coverage in hard-to-reach areas and provide capacity boosts in high-traffic zones that cannot be served through the macro network alone. The RAN accounts for more than 60% of overall network capex.
- **Backhaul and transport** – Upgrades will also need to take place to the backhaul and underlying transport layers of the network, to move growing levels of traffic seamlessly to the core network and back. In the past, data has mostly been consumed in the downlink channels, with consumers downloading content and applications. However, uplink traffic is now on the rise. This requires capacity to be added in the other direction. Moreover, there is an increasing shift to cloud RAN technologies, with the RAN components increasingly disaggregated. This shift also requires improved capacity links for backhaul and "fronthaul" (from the core to the RAN).
- **Core network** – Upgrades are required for the core network as operators migrate to 5G SA. Core network upgrades are necessary to handle the increase in devices connected to the network, which will rise exponentially as massive IoT scales up. The large increase in connections will also bring with it diversity in terms of capacity, latency and billing, requiring operators to provision dynamically. This will require more compute and platform resources, inevitably increasing costs. Operators are also investing in AI to help automate operations across the network, with a view to improving agility and time to market for new services. However, deploying AI in the network requires significant computing resources, with new processors and server components – again, increasing costs in the short term.
- **Energy efficiency** – With the advent of 5G and related investments in network and compute resources, operators face growing requirements for energy. Added compute will mean increased energy consumption and higher demands on electricity supply. Most of this consumption occurs in the RAN, where base stations are deployed in a distributed architecture to achieve coverage of populated areas.

2 Consumer trends impacting 5G adoption and monetisation

2.1 Beyond the first wave

The focus of 5G in the immediate term following deployment has been on delivering enhanced mobile broadband (eMBB) services. This has been in line with the evolution of the 3GPP standards and the initial focus on eMBB in the early updates through Release 15.

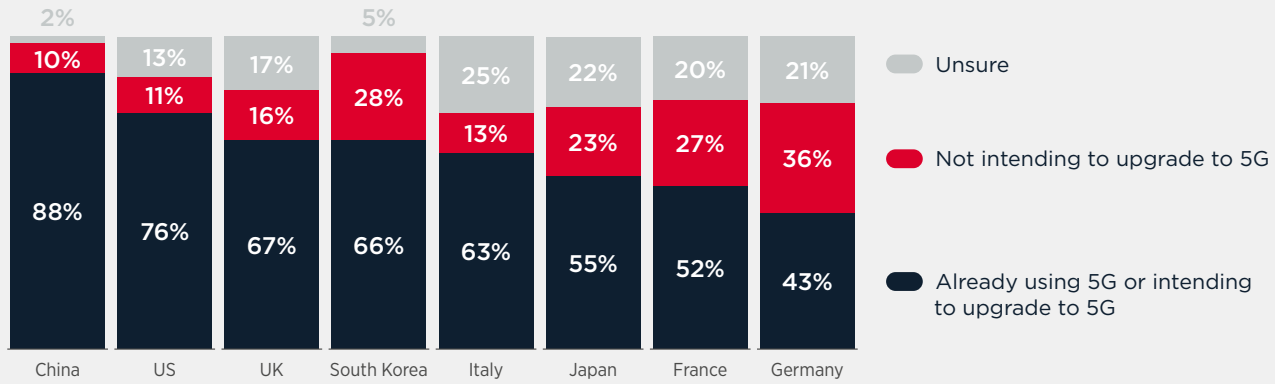
Many of the more hyped applications of 5G set to enable enterprise use cases through ultra-reliable, low-latency communications (URLLC) and massive IoT will only be commercialised with the availability and adoption of Releases 17 and 18 of the standards. New features will enable precise location, low latency for mission-critical communications, network slicing, and integration with satellite services. These services will map closely to the adoption and commercial launch of 5G SA and 5G-Advanced.

The first wave of 5G has now largely been completed, with many 5G commercial deployments in several markets coming online since 2019. Focus has now shifted to the monetisation of the 5G networks deployed.

Data on 5G adoption for the early years was somewhat mixed, with consumers not always seeing the need to upgrade to 5G merely for the higher speeds promised. However, more recent data indicates a shift. GSMA Intelligence's annual Consumers in Focus Survey collects responses from users in eight major markets (China, South Korea, Japan, Germany, France, Italy, the UK and US). A basic metric for gauging the popularity of 5G services is consumer intent to migrate to 5G. In nearly all markets (an exception being Germany), more than 50% of consumers surveyed indicated they already use or intend to upgrade to 5G (see Figure 5).

Figure 5 Intention to upgrade to 5G when the service is available

Percentage of smartphone users



Source: GSMA Intelligence Consumers in Focus Survey, December 2023

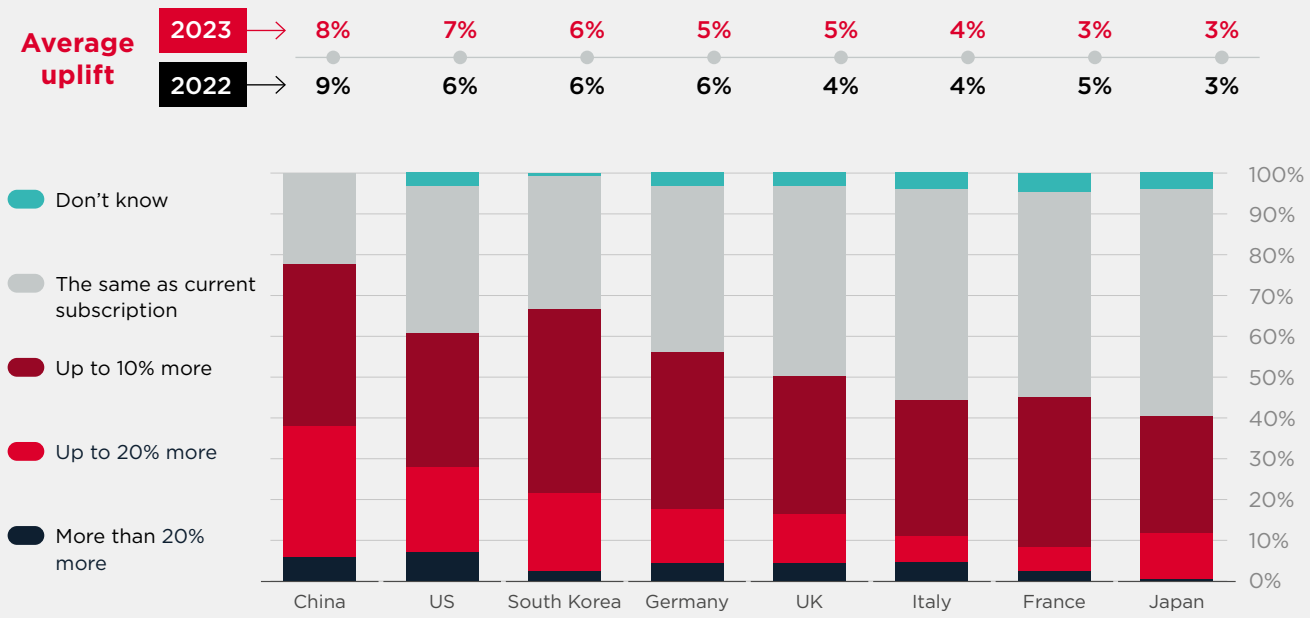
2.2 Willingness to pay more for 5G

GSMA Intelligence survey data indicates an uplift in ARPU from consumers upgrading from 4G to 5G services. See Figure 6. In 2023, leader 5G markets such as China and the US recorded an average uplift of 7–8% per user – a significant increase and indicative of the potential of 5G to make a significant impact on operators' bottom lines. Certain markets are seeing lower uplifts (e.g. France and Japan, at 3%), but these started relatively later with 5G deployment.

Data on demographic splits indicates it is the younger demographics (typically 18–34 year-olds) that show a stronger interest in 5G services, especially those interested in digital entertainment and those who purchase flagship 5G smartphones. For example, owners of flagship 5G smartphones are willing to spend an average of 9% more on 5G plans than the amount spent on their current 4G plans.

Figure 6 Willingness to pay more for a 5G subscription

Percentage of smartphone users



Base: Smartphone users who said they intend to upgrade to 5G when the service becomes available to them.
Source: GSMA Intelligence Consumers in Focus Survey, December 2023

2.3 Current consumer services focus

Reflecting the focus on eMBB in the evolving standards, mobile operators around the world that are launching 5G are focused on consumer applications and use cases. These draw on the enhanced capacity boost provided by 5G deployed in the 3.5 GHz and/or mmWave bands. Applications and services can be grouped into three categories:

- content and entertainment
- 5G FWA
- other services.

Content and entertainment

Content and entertainment has always ranked high in terms of revenue potential among ARPU-generating services. Some categories of content and entertainment have been prevalent across services spanning 2G to 5G networks, continuing in an enhanced form across the generations. There are now also a number of emerging categories focused on immersive experiences.

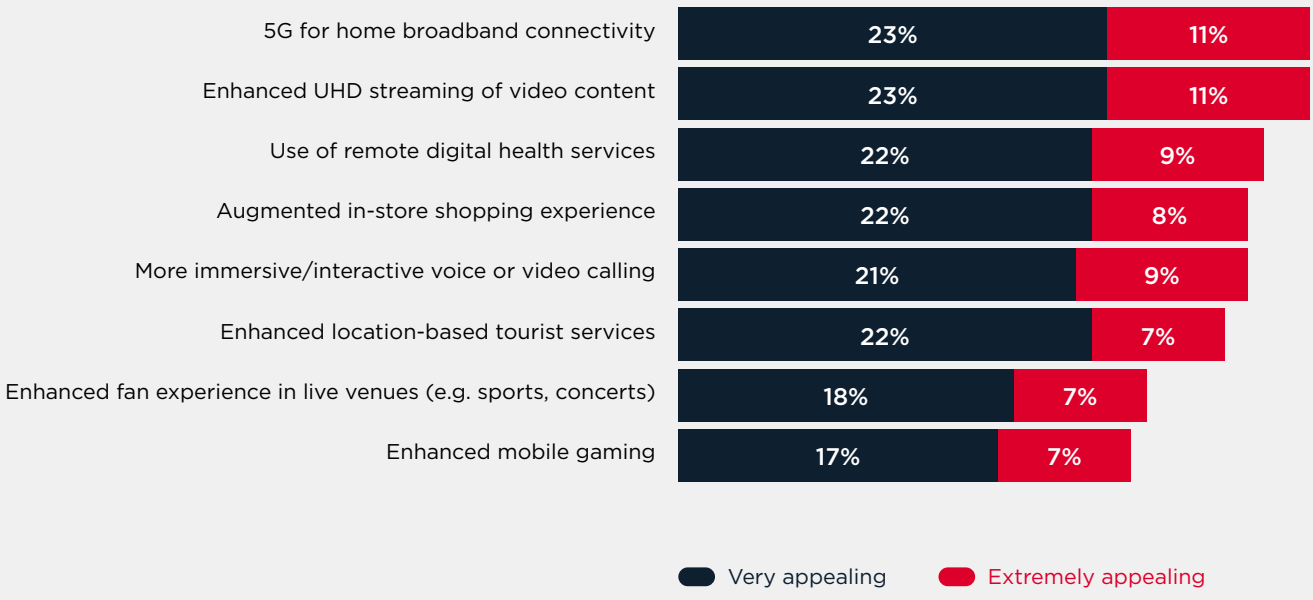
Data from the GSMA Intelligence Consumers in Focus Survey shows that in markets that have been at the forefront of 5G service deployments, such as China and South Korea, ultra-high-definition (UHD) content ranks among the highest in terms of 5G service usage by consumers. The younger demographic groups, particularly 18–34 year-olds, are heavy users of UHD content.

New and emerging services are also drawing on the significantly enhanced broadband capacity. The most disruptive and innovative are those based on augmented and virtual reality (AR/VR) and other categories of mixed reality content blending AR and VR. Consumer appetite for augmented experiences is growing.

Enhanced mobile gaming currently ranks last in the survey of consumer interest in 5G services. However, this is more an indicator of uneven regional interest in gaming. For example, gaming is very popular in Asian markets but less so in Western Europe and North America.

Figure 7 Consumer interest in 5G use cases

Percentage of smartphone users who find the following 5G use cases or 5G-enhanced services 'very' or 'extremely' appealing (aggregate figures across the eight countries analysed).



Source: GSMA Intelligence Consumers in Focus Survey December 2023

5G FWA

FWA has emerged as a technology option for operators in various market scenarios, particularly those where traditional fixed broadband connections to the home or enterprise premises are low in number, based on legacy copper circuits, or both. The challenge for fixed broadband has been reaching the last mile (connecting an optical line terminal with an optical network terminal at the customer premises). As a result, many operators have sought to leverage wireless technology to extend broadband access to a larger proportion of the population.

FWA has been available for several years with 4G. However, with 5G, CPE is now able to offer broadband speeds that can rival fixed broadband alternatives. 5G FWA can provide speeds of more than 10× those of 4G FWA, along with substantial improvements in capacity, enabling FWA to target a broader market. 5G FWA has shown promise in 5G markets such as the US and Finland, and is poised for a large-scale launch in India.

Other services

Operators have deployed several other services leveraging the eMBB features of 5G and emerging IoT technologies. These can be sold independently or tied to a tariff.

- **Smart home** – Recognising that most use of mobile data by consumers occurs indoors, operators are increasingly focused on creating end-to-end smart home solutions. Packages typically include a smart TV and the connectivity kit (CPE and broadband service), together with a number of content options bundled in. Deutsche Telekom's Magenta SmartHome offering and Telefónica's Movistar Home are examples of such offerings targeted at consumers.
- **Automotive** – The automotive segment is undergoing significant change as it looks to redefine the future of mobility. One of the biggest trends is the move to 'remotely assisted' and driverless vehicles. Many of the latest cars incorporate advanced driver assistance systems and use new technologies such as C-V2X for communications. With their wide area coverage, mobile operators have a key role to play in enabling these new systems.
- **Banking** – A number of use cases are emerging in banking and fintech. The biggest focus is on enabling digital experiences and improved customer service. Examples include upgrading ATMs with 5G to enable new services, enabling field service agents and others with IoT connectivity, enabling pop-up branches, and tapping into operator credentials through APIs for services such as instant identity verification (this would target the enterprise segment).

Table 1. Diverse service requirements make a differentiated experience possible

Use Case	Key requirement
Live streaming	Uplink
5G FWA	Downlink
XR and HD video	Downlink
Mobile/cloud gaming	Latency

Source: GSMA Intelligence

Operators have deployed several services leveraging the eMBB features of 5G and emerging IoT technologies

3 Monetisation strategies for 5G: mobile broadband

3.1 Key trends in 5G pricing strategies and the shift to experience-based pricing

The effective design of mobile tariffs is a key driver of commercial success in mobile communications. Bundling mobile connectivity with other services such as fixed broadband is one approach used. Another is consumer segmentation, such as prepaid versus contract, which allows operators to target and effectively address a range of customer needs in a market.

The arrival of 5G presents the opportunity for monetisation levers across new domains. Options available to operators in the consumer segment include higher performance, differentiated offerings, speed-based pricing and the bundling of advanced services such as cloud gaming and XR/VR.

Speed-based pricing for mobile has the potential to improve ARPU and, by extension, mobile operator revenue growth. While it is well established in many fixed broadband markets (with home broadband offered on an unlimited basis at different download speeds), its use in mobile is relatively recent. This can partly be explained by the inherent characteristics of mobile communication services. However, as networks become ubiquitous (at least in urban areas), offering a range of maximum speed options to customers has become more of a possibility.

For operators, speed-based tariffs enable better targeting of specific customer needs – both at the low end (customers on a budget who are happy with lower speeds) and the high end (customers looking for – and prepared to pay more for – higher speeds).

A further potential benefit from speed-based tariffs is improved management of data traffic. Speed-based tariffs can help smooth the peaks in network traffic – for example, by reducing live or peak-time streaming bitrates. At the same time, speed-based tariffs provide opportunities to better monetise the higher throughputs available with 5G-Advanced networks, offering better alignment of data traffic with ARPU growth for mobile operators.

Network APIs are a further possibility for operators looking to monetise higher speeds or network performance. Network APIs expose network functionality (such as network quality) to third-party developers. This in turn enables them to better and more easily build new applications and services. In particular, quality-on-demand APIs enable application developers to modify the network configuration of users of the application to provide specific download or other network quality features. Key use cases include gaming and streaming. Online gamers and viewers of real-time streaming media require a network with a high level of performance. A consumer's willingness to pay extra for a better user experience would result in the application tapping into the network for a higher QoS, which in turn would be billed back, with a resultant revenue uplift.

To meet the preceding requirements, extensive static network capability assurance based on user granularity is needed but challenging to deliver. This plays to the strategy of operators launching differentiated services to ensure users ‹feel› a new experience. The thinking is that the feel factor is most likely to translate into higher monthly consumer spend.

> **The arrival of 5G presents the opportunity for monetisation levers across new domains**

3.2 Breaking down the price of mobile services to understand the drivers of experience-based consumer value

To understand where and how mobile operators have been monetising their offerings so far, GSMA Intelligence carried out original econometric regression analysis based on the hedonic price method.

Hedonic price analysis is a quantitative, regression-based technique that helps establish the individual contribution of specific service features to the overall price.[1] The method offers a way to establish which attributes or features are significant drivers of consumers' willingness to pay, and which are not.

We analysed the full sample of tariffs offered by mobile operators across 39 countries and territories, representing 95% of all 5G mobile connections worldwide at the end of 2023.[2] The analysis covers nearly 4,000 consumer tariffs,[3] with pricing data provided by Tarifica and retail prices captured as of Q3 and Q4 2023, including all relevant taxes.

Tracking and comparing the price of mobile services often represents a significant challenge, as services vary across several dimensions. The nature and volume of these services can also change significantly over time, from one market to another, and even between operators in the same market.

In our case, we break down mobile services into several attributes, including data, minutes and SMS allowances; prepaid or contract; maximum speeds permitted; additional features such as international calls or free roaming; restrictions including time of use or throttling; and the bundling of additional services.

Through the regression analysis,[4] we estimate separate prices for each individual attribute of a tariff. The estimated price for each feature provides a robust metric that helps us understand the value consumers derive from each differential aspect of the service. For example, everything else being equal, how much are consumers prepared to pay for an additional 1 GB of data? How much value is being generated by improving available speeds for the service from 100 Mbps to 1000 Mbps?

5G-capable tariffs are offered at a premium

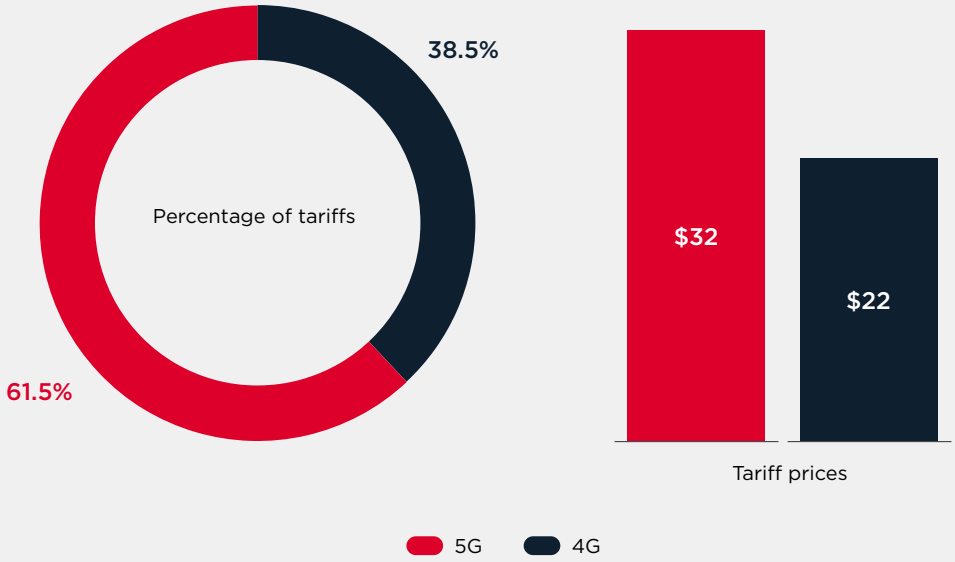
A significant proportion of tariffs in the sample (60%) are offered as 5G capable. In some countries (such as UAE and Norway), virtually all tariffs are 5G capable; in others, there is a clear split between 4G- and 5G-capable tariffs. This applies to both countries with large deployments of 5G (Finland, Austria) and countries with more limited 5G deployments so far (South Africa, Indonesia).

As Figure 8 shows, there are also significant differences in prices between 4G and 5G tariffs. The rest of this section leverages the results of the analysis to better understand what drives these differences and, more generally, what drives consumers' willingness to pay for the different features offered on plans.

5G tariffs generally include higher advertised speeds and data allowances, and may include additional features valued by consumers, such as more advanced entertainment or productivity applications. These could be key to explaining the difference.

1 The method has been applied to many fields in the past. Previous examples of the use of hedonic price analysis methods in mobile communication services include Houngbonon (2015), Nicolle et al (2018) and Dippon (2020).
2 65% of all mobile connections, considering all generations.
3 In Australia, Austria, Brazil, Bulgaria, Canada, Chile, China, Czechia, Denmark, Finland, France, Germany, Greece, Hong Kong, India, Indonesia, Israel, Italy, Japan, Kuwait, Malaysia, Mexico, Netherlands, New Zealand, Nigeria, Norway, Philippines, Qatar, Saudi Arabia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, UAE, UK and US.
4 We estimate hedonic price regressions with country fixed effects and include a range of features as controls to break down the value, such as data allowances and speeds. We apply a weighted least squares approach, where a weight reflecting the expected market share of each of the tariffs considered in the analysis is applied.

Figure 8 5G-capable tariffs: prevalence and average prices



Source: GSMA Intelligence analysis of Tarifica data

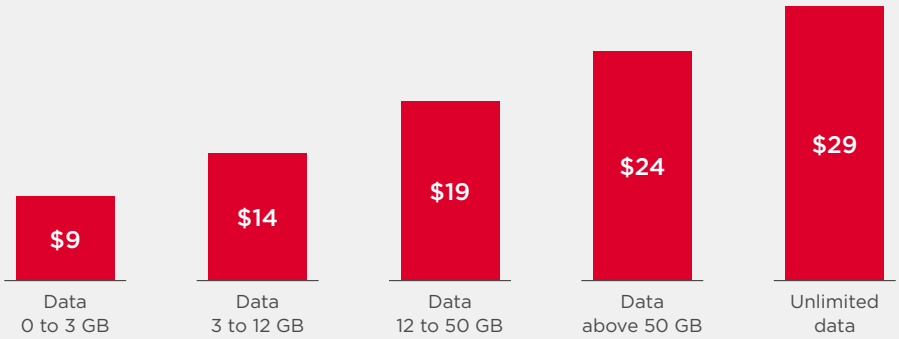
Larger allowances drive value: data is king, but voice still offers value

Consumers attribute significant value to greater data allowances, as the regression results confirm. Figure 9 shows these results by predicting the additional value that consumers are prepared to pay for additional data allowances.

Everything else being equal, an additional 1 GB of data is monetised on average at $0.30 per month – a significant uplift. On average, and again with everything else being equal, consumers are prepared to pay an additional $20 per month to increase their data allowance from 0–3 GB to unlimited.

Data allowances therefore remain a key driver of monetisation for mobile operators globally in the 5G era. As operators continue to carefully manage network capacity, the results are also a reminder that 5G networks, with their greater spectral efficiency, can more effectively monetise growth in data traffic than previous generations such as 4G.

Figure 9 Hedonic price analysis: estimated tariff price, by data allowance



Source: GSMA Intelligence analysis of Tarifica data

Does the same logic apply to voice and SMS? The answer is mixed. Voice minutes are still being monetised, particularly through unlimited plans. The results of the regression analysis show that a tariff with unlimited minutes can attract an increase of more than $3 per month on average, compared to a tariff without unlimited voice, and with everything else being equal.

However, the same is not true for SMS, with the analysis not showing a statistically significant effect, meaning monetisation of SMS features is (at least on average) a challenge. One possible reason is consumers' preference for alternative and well-established OTT messaging services such as WhatsApp and Telegram.

Speed-based tariffs are helping monetise superior network quality

While mobile tariffs can be designed to target customers with different data volume needs, they can also be designed to capture customers that value having access to the best available network quality and download speeds.

To help understand the extent of different pricing strategies in terms of speeds offerings, we classify all the tariffs in our sample according to three broad groups:

- **volume-based tariffs** – where an operator offers a set of different options when it comes to volume of data, but download speeds are offered on a best endeavour or unlimited basis
- **speed-based tariffs** – where an operator offers a set of different options when it comes to the maximum speed available for a tariff, with volumes of data generally unlimited within a given speed tier
- **hybrid tariffs** – where an operator offers a combination of the above or where the distinction is not clear-cut – that is, speed and volumes are unrestricted but not guaranteed.

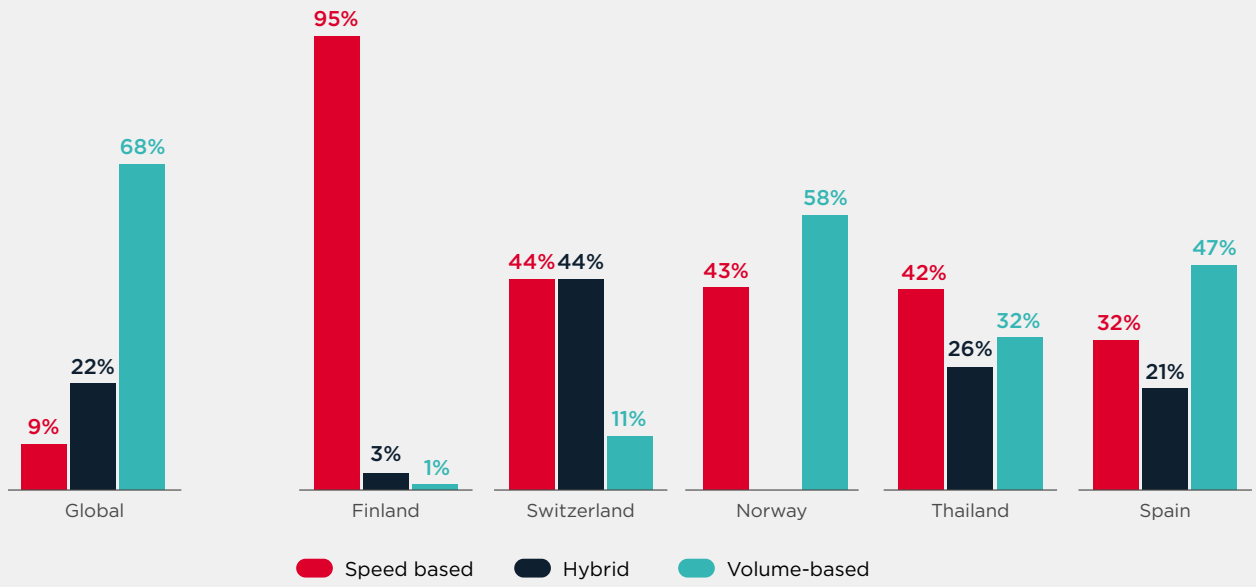
There has been limited use of speed-based tariffs so far, with only 9% of tariffs in our sample falling precisely within the definition. In fact, some countries are exclusively volume-based, such as South Korea, Qatar, Philippines, Chile, Greece, India and Indonesia.

However, in certain markets, speed-based tariffs are now available. This includes Finland, where 95% of all tariffs are speed-based, and markets as diverse as Switzerland, Spain, Norway and Thailand, where the range of speed-based offerings for consumers is extensive (see Figure 10).

Speed-based tariffs have been established the longest in Finland, with the country's operators offering them since the launch of 4G in the early 2010s. However, the trend has most recently extended to other markets. In Norway, Telia launched speed-based tariffs in 2019 and continues to offer them today. More recent examples of launches of speed-based tariffs include T-Mobile and Sunrise in Netherlands and Switzerland, respectively, in 2023.

Figure 10 Mix of tariff offerings, Q3/Q4 2023

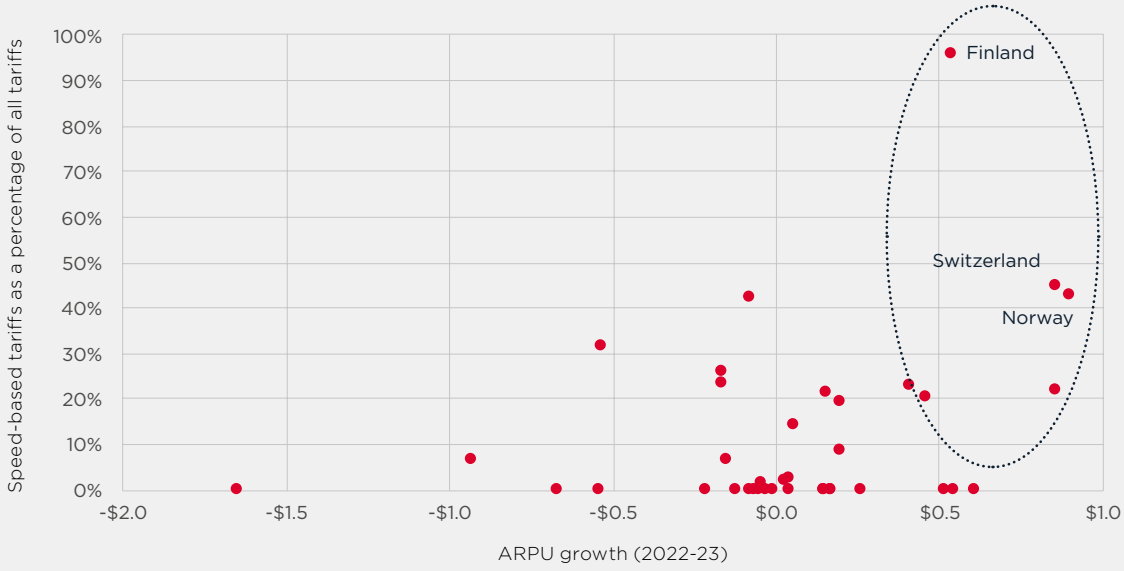
Percentage of tariffs



Source: GSMA Intelligence analysis of Tarifica data

To size the impact of speed-based tariffs on ARPU levels, we compare ARPU growth over the last year across markets where speed-based pricing is more/less prevalent. The results (shown in Figure 11) suggest that, while there is significant variation, a positive correlation exists. Markets with a greater number of speed-based tariffs have experienced faster ARPU growth. In fact, the three markets with the highest share of speed-based tariffs (Finland, Switzerland and Norway) are among the top performers in terms of ARPU growth. The pattern largely holds when looking over a longer time period (ARPU growth over the last two and three years).

Figure 11 Speed-based tariffs and ARPU growth

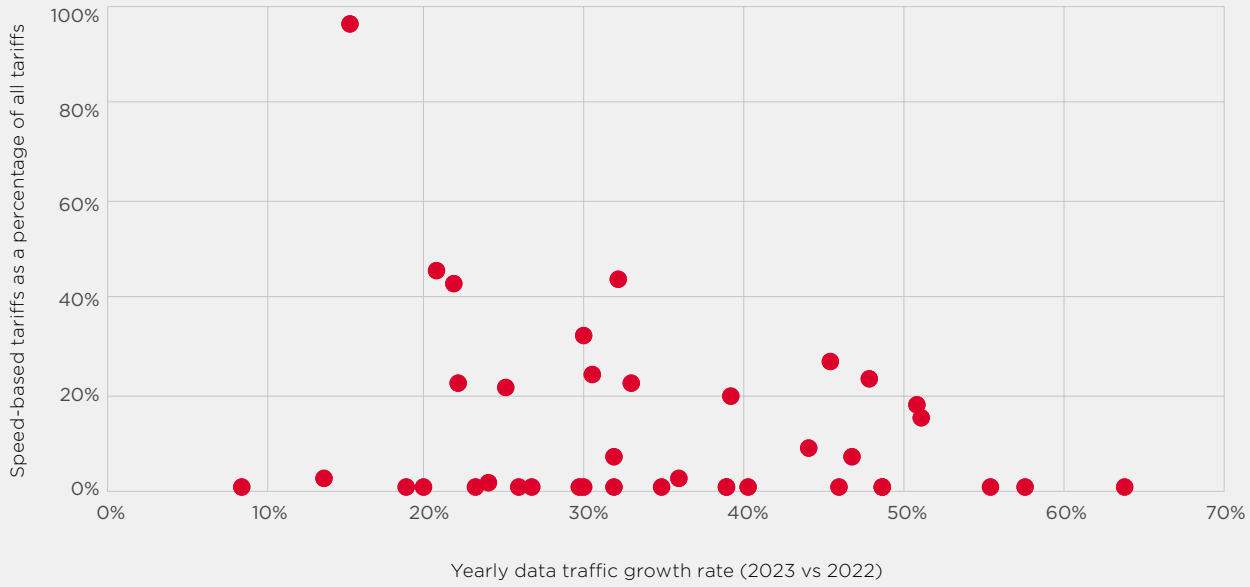


Source: GSMA Intelligence analysis of Tarifica data

An important aspect for operators considering the move to speed-based tariffs is the extent to which they can lead to changes in consumer patterns. In speed-based markets, users have unlimited data allowances, which means they may consume more data. However, some users will be downloading or streaming content at lower speeds, which is likely to help smooth out peaks in usage.

The available data suggests that traffic growth overall is not higher in speed-based markets. As Figure 12 shows, markets with a higher proportion of speed-based tariffs are not associated with greater data traffic growth in recent years. If anything, the opposite is true.

Figure 12 Speed-based tariffs and data traffic growth



Source: GSMA Intelligence

With speed-based tariffs, where data allowances are generally unlimited, the monetisation effort is logically focused on speed, with higher speeds charged at a premium (akin to how home broadband is commonly charged for). Our econometric results confirm that this is an effective monetisation strategy, with higher download speeds attracting a significant premium where they are offered as part of speed-based pricing strategies. See Figure 13.

Everything else being equal, consumers in leading speed-based tariff markets[5] are prepared to pay $14 extra per month to increase their download speeds from less than 100 Mbps to the maximum speeds available. The result does not hold to the same degree when considering markets where the focus is on volume-based or hybrid tariffs. This highlights the importance of designing distinct offerings on speeds if operators want to fully monetise these features.

5 Defined for the purpose of the regression analysis as Finland, Norway, Switzerland, Spain and Thailand.

Figure 13 Hedonic price analysis for top speed-based tariff markets

Estimated tariff price, by speed offered

Source: GSMA Intelligence analysis of Tarifica data

While speed-based tariffs are currently focused on offering download speed tiers, an emerging trend involves tariffs based on upload speeds. These can offer a higher level of performance for users looking to obtain a better consumer experience when gaming or streaming over mobile networks. China Unicom recently started marketing a 5G Live Broadcast Package, aiming to monetise the need for superior uplink performance for live broadcasters and social media influencers. By June 2024, nearly 300,000 people had used the service. Lower latency is another network feature that could be monetised through dedicated tariffs, by offering superior network performance for certain 5G consumer use cases.

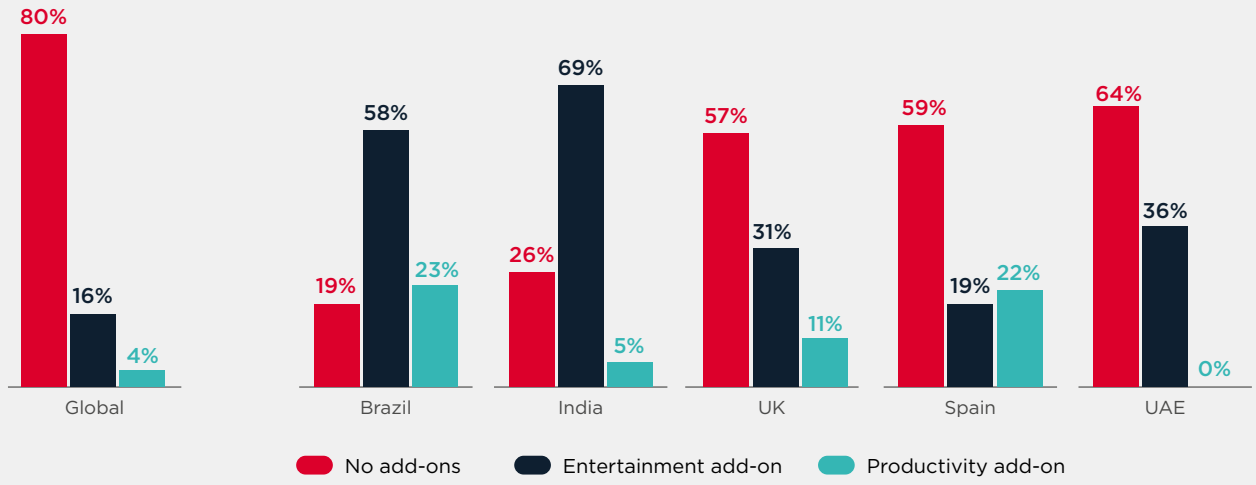
Content and entertainment services are widespread in some markets, with significant growth potential in others

Connectivity services are sometimes bundled with additional services that users can access as part of their tariff. However, with the exception of a few markets, most tariffs today still solely target connectivity services.

Globally, only 20% of tariffs bundle additional services, such as entertainment (e.g. Netflix, Disney+, Spotify) and productivity offerings (e.g. banking, cloud storage, Amazon Prime, security). As Figure 14 shows, entertainment add-ons are the most prevalent. Brazil and India merit a particular mention, with more than 70% of tariffs in these markets offering an add-on service.

Figure 14 Entertainment and productivity service offerings

Percentage of tariffs



Source: GSMA Intelligence analysis of Tarifica data

'Zero-rating' refers to the bundling of additional value into connectivity services by excluding certain applications from a user's data allowance. Its popularity varies around the world, in part due to significant differences in regulation. In the European Union, for example, zero-rating is, in practice, prohibited. However, it is common in markets such as Brazil, Mexico and Qatar. Overall, 16% of all tariffs offered worldwide incorporate an element of zero-rating.

Analysis of countries where additional services and zero rating are more widespread suggests there is a potential revenue upside. In the case of additional services, the estimated effect of productivity add-ons is particularly strong, with the inclusion of such services estimated to add up to $5 to the tariff value in leading add-on markets.[6] [7]

In the case of zero-rating, the results suggest it is an effective strategy for driving consumer value. In the top zero-rating markets,[8] consumers are prepared to pay an additional $1 per month when two applications are zero-rated, and an additional $6 per month when five applications are zero-rated. The results also suggest that where regulatory intervention results in an effective ban on zero-rating, it can lead to significant destruction of value and consumer harm.

6 For the purposes of the analysis, these are defined as Brazil, India, UK, Spain and UAE.
7 While both additional entertainment and productivity services offer the potential to monetise the generation of additional consumer value, our regression analysis does not identify conclusive results, potentially as a result of limitations on the sample size.
8 For the purposes of the analysis, these are defined as Brazil, Chile, Mexico, Qatar and Saudi Arabia.

Figure 15 Hedonic price analysis in top zero-rating markets

Estimated tariff price, by number of apps zero-rated

Note: figures rounded to nearest $0.10
Source: GSMA Intelligence

Customer segmentation strategies remain important in the 5G era

Prepaid and contract payment options have long been a way to differentiate between mobile tariffs, and these remain in the 5G era. Across our global sample, there were approximately as many prepaid tariffs as contract tariffs offered as of the end of 2023. Prepaid tariffs generally target customers that require smaller allowances of data, minutes and SMS.

While most countries have a balanced range of tariffs of each type, some countries (generally lower income) have a stronger focus on prepaid offerings, reflecting the higher prevalence of customers on lower incomes. In Nigeria and India, more than 90% of tariff offerings are prepaid. In contrast, South Korea, Norway and Japan are markets with a strong dominance of contract tariffs, at more than 90%.

Beyond payment options, segmenting customers into specific types is another option for operators. In our sample, this is limited to less than 10% of all tariffs but is significantly higher in some markets. South Korea has a particularly detailed range of tariffs targeting different segments of the population. This includes tariffs aimed at children and young adults, migrants, older people and students.

A further type of customisation in some markets is time-of-use tariffs, with data allowances restricted to certain times of the day, typically weekends or at night. These are relatively common in Nigeria and South Africa.

Customised tariffs generally share a common feature; they involve restricted use (whether speeds, data, time or type of use) at a lower cost. This ensures customer interest but also entails a lower cost for the operator (e.g. time-of-use tariffs promoting use during off-peak periods when marginal network costs are limited).

Some of the new features of 5G and 5G-Advanced open the door for operators to develop more advanced segmentation strategies. These include speed boosts for gaming or streaming segments, and offering time-limited data bundles for specific locations or points in time (e.g. a live concert or sports event). China Unicom, China Mobile and AIS Thailand are among the first mobile operators to have adopted such segmentation models, specifically targeting social media influencers, gamers and travellers.

In the case of AIS Thailand, its Living Network initiative allows mobile gamers to boost their 5G mobile broadband on demand by adding a gaming mode that guarantees high network performance. AIS also added three tariff tiers depending on the bandwidth demanded by users: Boost (higher speed), Game (low latency) and Live (uplink). In the case of China Unicom, it launched a 5G live streaming service designed to meet the requirements of live streamers, such as HD and an uninterrupted live streaming experience. Both cases provide avenues to consider for operators looking to better monetise 5G uplink bandwidth.

In Shanghai, the world's first city to commercially deploy 5G-Advanced, China Mobile proposes using the technology to provide key service-assurance solutions for business travellers. Users of the 5G-Advanced business travel package can obtain network benefits including up to 3 Gbps downlink and 200 Mbps uplink, which will enable smooth-running video conferences and faster file transfers. Meanwhile, customers of the 5G-Advanced live streaming package will have network access with a maximum downlink of 2 Gbps and a maximum uplink of 150 Mbps, enabling HD images, smoother streaming and a real-time, interactive experience. For gaming enthusiasts, the 5G-Advanced gaming package provides a downlink of up to 2 Gbps and an uplink of up to 150 Mbps, achieving lower latency, more stable operations and a better experience.

3.3 Network infrastructure requirements

The use of different strategies such as speed-based tariffs and segmented offerings with bundles can have a positive impact on ARPU and revenue growth. However, operators' 5G RAN and core networks need to keep pace with the increasing range of service categories with different requirements. Key elements that advanced core network solutions can enable include the following:

- **Strong network infrastructure and advanced policy controls** – As 5G connections increase, operators need network infrastructure that can provide good coverage and capacity, using the spectrum available and latest technologies. Operators need to keep track of the data traffic generated by consumers and enterprise customers. Core network software will have to handle a much greater load of connectivity requests and apply policies in a highly segmented and granular manner. At the same time, changes need to be made to the RAN to be able to implement advanced policies. Quality-of-service management through 5G QoS Identifier (5QI) is an important RAN enhancement that can implement policy controls. Similarly, deploying a digital twin of the RAN can help provision existing and new sites with the necessary policies and help monitor service levels.
- **End-to-end network monitoring and controls** – While implementing advanced policy goals is desirable for operators, this cannot be done without having granular, end-to-end visibility across the network. A huge amount of data is being generated across the network, coming through in structured, unstructured and other forms. Much of this is necessary for daily operations, but some can be analysed and used to generate crucial, real-time insights to help operators drive differentiated experiences as well as efficiencies in the network and in operations.
- **Delivering differentiated experiences** – With increasing segmentation of users and diverse requirements, operators are increasingly looking at ways to offer customers differentiated experiences. To this end, they are deploying new technologies, including network slicing. Slicing is a major new technology for operators, providing the ability to segment capacity on their network to suit multiple usage profiles. A network slice is end to end but it needs to be created and managed in the core network. For example, an enterprise may look for specific SLAs around speed, latency or both to meet use-case requirements.

For analysis of how core networks need to evolve in the 5G-Advanced era, see the GSMA Intelligence report *The 5G-Advanced era: the importance of 5G's evolution for the mobile core.*

> **Operators' 5G RAN and core networks need to keep pace with the increasing range of service categories with different requirements**

4 Monetisation strategies for 5G: FWA

Broadband connectivity to the home has traditionally been served by a number of technologies, including wired variants (e.g. FTTx and xDSL) and satellite. However, these face various challenges, especially around time-to-market and costs – both for the initial deployment and over the lifecycle. Covering the last mile via cable or fibre to the premises is costly, with barriers including the distance between the roads where cabinets are located and the user premises, and potential red tape around the required civil works. Satellite and xDSL alternatives have been available but they have their own shortcomings. Satellite connectivity has been available through geostationary satellites but it tends to be expensive, while xDSL lags in terms of latency and speed.

The advent of 5G has provided a boost to the FWA market. 5G FWA provides speeds of over 10× 4G FWA, along with substantial improvements in capacity. This enables FWA to target a broader market. The improvements have made 5G FWA a viable alternative to established fixed broadband services.

GSMA Intelligence's latest Consumers in Focus Survey indicates nearly 35% of consumers polled see FWA as their top use case for 5G. While this number is lower than previous years, it is indicative of sustained interest in FWA across the different markets included in the survey.

4.1 Use cases: greenfield versus direct competition

Four main deployment scenarios have emerged for operators looking to realise the FWA opportunity. Mobile operators are showing strong interest in delivering fixed wireless connectivity that targets the segments identified in Table 2.

Table 2: 5G FWA deployment scenarios

Primary broadband	Targeting demand for broadband among first-time users in households. First-time users could be in emerging markets such as Africa, or in underserved/rural areas in mature markets such as the US and Australia.
Competing broadband	Targeting fixed broadband users looking for faster speeds and/or faster installation in locations where FTTx is not available. FWA can help tackle the digital divide in rural towns and suburban areas lacking access to FTTx, as well as in areas with few alternatives.
Complementary alternative	Targeting demand for additional broadband connectivity within a household. Complementing fibre offerings, generally in urban and suburban areas with difficult terrain and/or regulatory red tape, or areas with few fixed broadband alternatives.
Enterprise opportunity	Targeting enterprises in underserved areas or those with few alternatives. The embedded security, reliability and high capacity of 5G make for a valid value proposition for the enterprise segment. Other targets include temporary work sites and large campuses that do not require permanent wiring.

Source: GSMA Intelligence

4.2 Deployments around the world

Commercial 5G FWA deployments around the world are growing fast, as many operators have identified FWA as the use case most likely to drive revenues from their 5G investments. As of Q1 2024, 131 fixed broadband service providers had launched commercial 5G-based fixed wireless services across 64 markets (see Figure 16). More than 50% of 5G commercial mobile launches worldwide include an FWA offering.

The **US** is the largest 5G FWA market globally, with around 10 million 5G FWA connections as of April 2024. T-Mobile has the largest number of FWA connections, but Verizon is gaining momentum in net additions. AT&T launched a new 5G FWA service in April 2023. This specifically targets DSL customers in locations due to have their legacy copper networks deactivated, but it is not yet available at scale.

Europe has the most operators offering 5G FWA services of any region. Operators in Europe had launched commercial 5G FWA networks in 23 countries as of Q1 2024. Finland has been a pioneer in adopting and promoting 5G networks and services. 5G FWA is seen as a key enabler in expanding broadband access in the country, with operators Telia and Elisa deploying 5G FWA to extend broadband services, especially in rural areas. In Italy, TIM launched a 5G FWA service in the 26 GHz band (mmWave) for enterprise customers, with download speeds of up to 1 Gbps and upload speeds of up to 200 Mbps.

In **Asia Pacific**, Japan, South Korea and China have some of the highest rates of fixed broadband penetration in the world. This is largely due to the availability of FTTx. As such, FWA is positioned more as a niche service and targeted at remote and underserved areas to help close the digital divide. At least one operator in every country in Southeast Asia (except Vietnam and Brunei Darussalam) offers 5G FWA services. In India, Reliance Jio and Bharti Airtel both launched 5G FWA services in 2023. Given India's limited fixed broadband penetration, operators are targeting a large addressable market. Jio expects to reach 200 million homes and premises over the next three years.

Figure 16 5G FWA commercialisation around the world

Note: The map considers all countries beyond the 36 markets covered in the GSMA Intelligence forecast. Status defined as live where at least one operator has commercially deployed a 5G FWA network
Data as of Q1 2024
Source: GSMA Intelligence

4.3 Network infrastructure requirements

FWA does not require a new overlay network. However, operators need to carefully plan which sites to deploy FWA on. Considerations include the following:

- **Backhaul transport** – The average data consumption for 5G FWA is much higher than for an individual mobile subscriber, as use within a household is across multiple people, devices and applications. This means a higher traffic volume from the premises must be transported through the base station to the core network. Traditionally, these backhaul links have been provided by microwave, particularly in emerging markets. Fibre to the base station site is desirable but not always affordable or easy to do in the short term. That said, FWA will not be enabled at all macro sites, so it gives operators the chance to 'cherry pick' sites and prioritise investment there.
- **Interference and path loss** – Operators will have to manage how to separate mobile and FWA traffic. As spectrum is essentially a shared resource, the available bandwidth will become challenged with more subscribers connecting to an individual base station. With higher range frequencies, such as mmWave, there are additional interference and path-loss challenges. Weaker signal strength means mmWave signals tend to fade, particularly indoors. FWA radio signal propagation is also susceptible to path loss from adverse weather and difficult terrains, such as mountainous regions and locations with heavy foliage. There is also a risk of signal degradation during peak consumption hours. To some extent, this can be offset by CPE with high-gain antennas. Network slicing can provide dedicated spectral resources for FWA, though this is currently restricted to 5G SA deployments.
- **Range/distance to CPE** – 5G connectivity can be achieved over several radio frequency bands, but most deployments have focused on sub-6 GHz, typically 3.5 GHz. While higher frequency bands can offer much larger channels and greater bandwidth, these frequencies also suffer from weaker propagation characteristics. As such, operators will need to plan their networks with the right cell density to cope with the available spectrum and usage characteristics.

4.4 Go-to-market considerations

Factors affecting an operator's ability to provide FWA services to consumers include installation costs and CPE trends:

- **Installation costs** – While capex for FWA could be significantly lower than for fixed alternatives, operating costs such as spectrum fees, power and site rental, and outdoor CPE installation could quickly add up. For this reason, operators are attempting to minimise costs by sharing network capacity between MBB and FWA services, and adding FWA to existing or planned RAN infrastructure in a specific area. Operators also incur operating costs from truck roll. This refers to the operator sending out a technician or team to the customer's site. Operators such as Verizon, T-Mobile and Telstra have all selected CPE with self-install capabilities to minimise the need for truck roll and reduce installation costs.
- **CPE trends** – Given the higher costs associated with 5G modems, the availability and affordability of 5G FWA CPE has been a major challenge hindering mass adoption. Until recently, FWA CPE was constrained by a shortage of chipset solutions from the major semiconductor vendors. The high price of CPE was also an issue that prevented mass-market adoption. With increasing supply and lower cost components, ex-factory costs of 5G CPE have reduced substantially in recent years, to around $150 or less in many cases. This has helped operators drive adoption.

4.5 Monetisation strategies

As FWA gains momentum around the world, operators are taking different approaches to drive adoption and offer differentiated experiences for customers. The aim across all of these is to drive revenue uplift and reduce churn:

- **Speed-based tiers** – While already adopted for consumer 5G services on smartphones, tiered packages based on speeds are now being offered for FWA. Recent examples include Zain in Saudi Arabia and Du in the UAE.
- **Guaranteed speeds** – Offering guaranteed minimum speeds is a further strategy for operators. For example, Zain offers a minimum average download speed of 70% of the advertised speed. This creates a better experience for customers and attracts higher pricing relative to best-efforts plans. Similarly, Zain Saudi Arabia offers its GeForce NOW gaming package to customers with an optimised service when connected over FWA.
- **Bundling** – This strategy is widespread, with operators bundling devices and premium content into offerings. Most operators bundle the 5G FWA CPE for free with service activation, but there has recently been a spike in bundling premium content. For example, in India, Reliance Jio offers its JioTV suite of OTT content bundled in for free. Higher tier packages are differentiated by access to premium channels (e.g. Netflix).

5 Open questions and outlook

5.1 Learnings from the evidence

Despite 5G being five years old, the first wave of infrastructure rollouts has only just been completed. There are sufficient learnings from rollouts so far, and experiences in markets with commercial services that can inform as to what is working and what is not.

Speed-based pricing for mobile has the potential to improve ARPU and, by extension, mobile revenue growth. The biggest benefit for operators is that they are better able to maintain the balance between surges in data traffic and monetisation.

Another major learning has been that FWA is a genuine product and revenue source. In some countries (such as the US), it has likely been the single biggest 5G revenue contributor. This is true for both integrated operators that have fixed broadband offerings and use FWA to complement these services (e.g. Verizon and Vodafone), and mobile-only operators with greenfield plays.

There is sufficient evidence to suggest that operators looking at bundling content, entertainment and other services have seen at least some revenue uplift, as consumers perceive more value from these offerings. Similarly, zero-rated services have been popular and seen ARPU uplift, though more so in emerging markets. There is significant regional and country variation. For example, operators in South Korea have successfully segmented a large number of 5G offerings, but this is not yet the case in other countries.

Considerations for 5G commercial strategies

Table 3 summarises our view of the different options, and the factors operators should consider as part of their go-to-market strategies.

Table 3. Considerations for 5G commercial strategies

Customer segment	5G monetisation strategy	Prerequisites for success	Go-to-market considerations	Revenue potential
Consumer	Speed-based pricing	— Mature markets with ubiquitous connectivity. — Highly digitised consumers. — Resilient and reliable networks.	— Trade-offs between monetising volumes and speeds — Network management considerations. For example, side benefits to better manage network congestion in peak areas or at peak times.	Medium
Consumer	Customer segmentation	— Significant number of new customers that would otherwise be underserved. — Market-specific factors make one-size-fits-all multi-market strategies challenging for operator groups.	— Avoiding cannibalisation of revenues. — Network management and capacity considerations (e.g. time-of-use tariffs).	Medium
Consumer	Bundling and zero-rating	— Partnerships with key OTT and content players. — Bilateral agreements with OTT and content players for zero-rating and bundling. — Availability of enabling regulations.	— Bundling of content and services is generally popular with consumers and drives stickiness immediately. — Assuming enabling regulatory environment, zero-rating can help boost ARPU indirectly, particularly in lower spend markets.	Low to medium
Home	5G FWA	— Level of fixed broadband penetration, especially fibre. — Level of cellular base-station coverage, especially in areas underserved by fixed broadband. — Proportion of 5G-enabled base stations in areas underserved by fixed broadband. — Availability of fibre-based backhaul from base stations. — Availability of affordable 5G FWA CPE.	— FWA remains the easiest and quickest 5G service to deploy for operators globally. — In mature markets, fixed broadband is generally high, but there remain lots of underserved segments in rural and remote areas, representing a sizable addressable market for FWA. — In emerging markets, fixed broadband is generally negligible. FWA offers the fastest and most cost-effective way to extend broadband access to underserved communities. — Assuming that the proportion of 5G-enabled base stations in underserved areas is sufficient, FWA should be a high priority for operators to deploy. The traffic carried over an FWA connection is much higher than the average smartphone user, but so too is the ARPU. In the relatively early days of 5G, FWA is a way to monetise and utilise idle network capacity.	High
B2B	Network APIs	— Implementation of an open architecture for APIs, based on frameworks such as the GSMA's Open Gateway. Linkages to core network and application payment systems to enable billing for all API calls.	— Need to identify use cases that add clear differentiation for developers relative to the options currently available. — Need to develop a simple and seamless onboarding experience for developers, with easy payment options.	Medium

Source: GSMA Intelligence

5.2 Outlook

Infrastructure upgrades to 5G SA and 5G-Advanced should provide the technical capability required for higher gain and lower latency services. 5G-Advanced offers a higher performance network, with added features and technologies that allow operators to offer differentiated services. An operator could offer tariffs geared to customers with an affinity for live streaming, such as gamers or social influencers. For example, in May 2024, China Mobile launched a 5G-Advanced package, offering consumers access to higher network performance for an additional charge.

This differentiated experience could command a premium and lead to ARPU uplift. Operators can also work to drive greater customer awareness of these differentiated experiences to extend the addressable market. The greater the number of users seeking a differentiated experience, the greater the revenue boost.

Ultimately, 5G monetisation will be more about product marketing and partnerships. The primary challenge is driving a higher price premium for tariffs linked to content or speed, with consumers being willing to pay and sustain this level of payment over time. This comes down to people feeling 5G delivers something new or better than what is possible using an existing 4G service. FWA and speed-linked tariffs are the best means of doing that, with content-linked offers a more market-specific play. Success using the content approach is partly tied to local culture. For example, South Korea and other Asian countries have had digital-native content and gaming for years (well before 5G existed), and India and African countries are largely mobile-only, meaning fixed line and (in many cases) TVs are not an option for consumption.

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