



GSMA Intelligence

Global Mobile Trends 2017

September 2017

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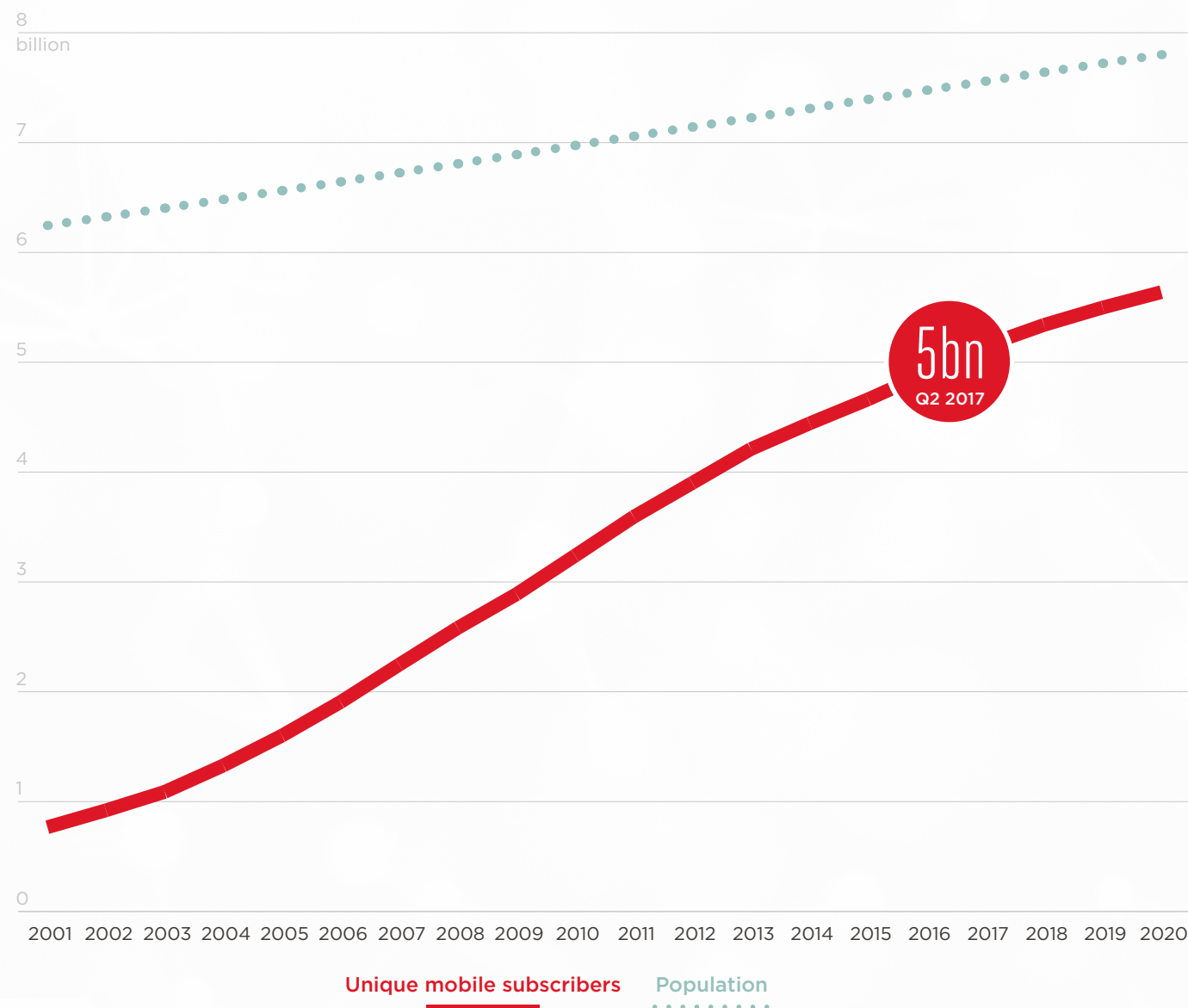
Key takeaways

1 5 billion people now use mobile – the highest scale consumer tech worldwide

Two thirds of the global population are now mobile subscribers; mobile has a greater reach than any other technology.

However, the rate of growth is slowing. It took four years to move from 4 billion to 5 billion; reaching 6 billion will take longer still.

EVOLUTION OF MOBILE SUBSCRIBER PENETRATION



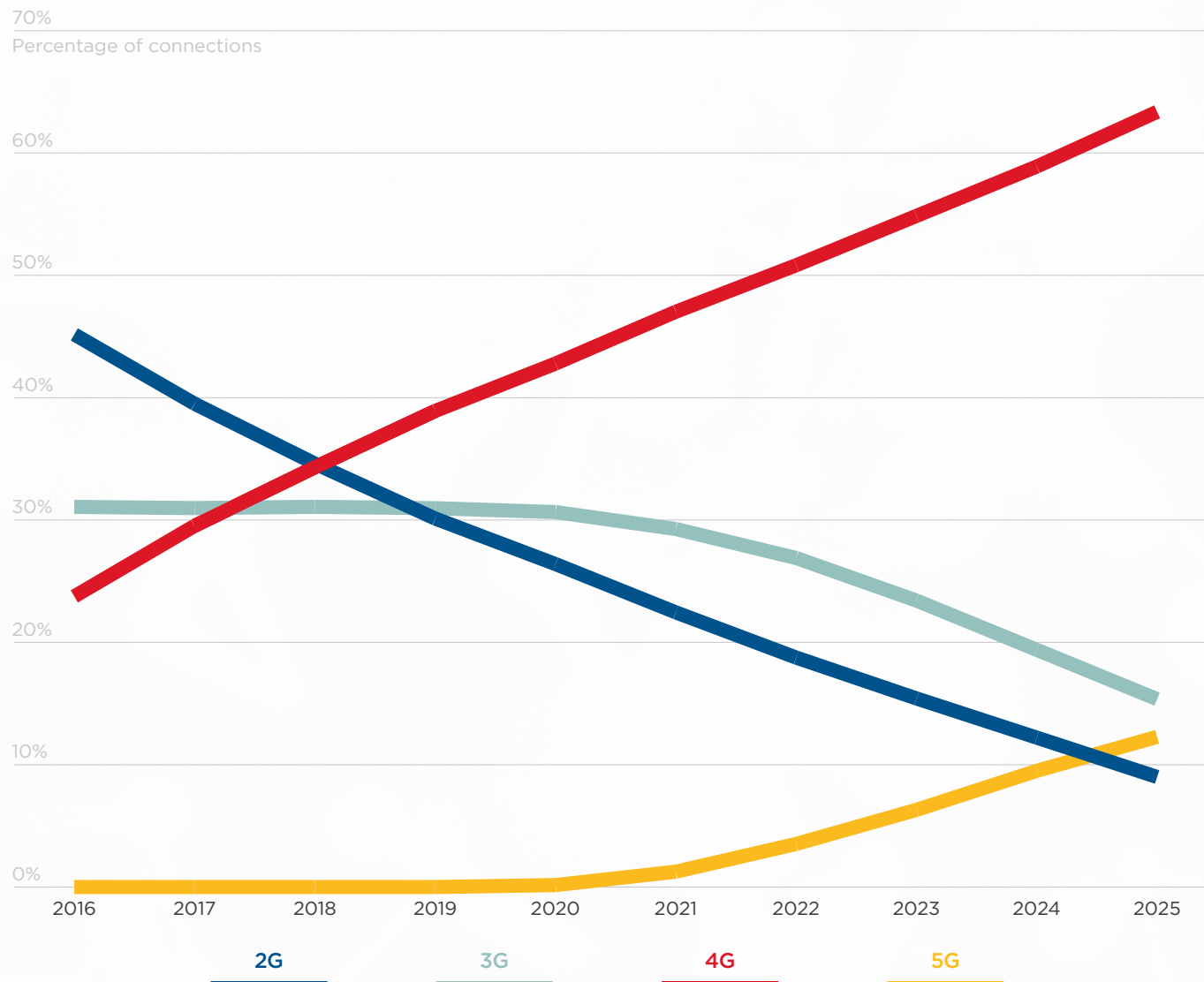
2 5G is attracting hype but, for much of the world, the 4G era has only just begun

5G continues to occupy thought space as the next big thing in mobile. 4G, however, will dominate in volume terms for at least the next 10 years.

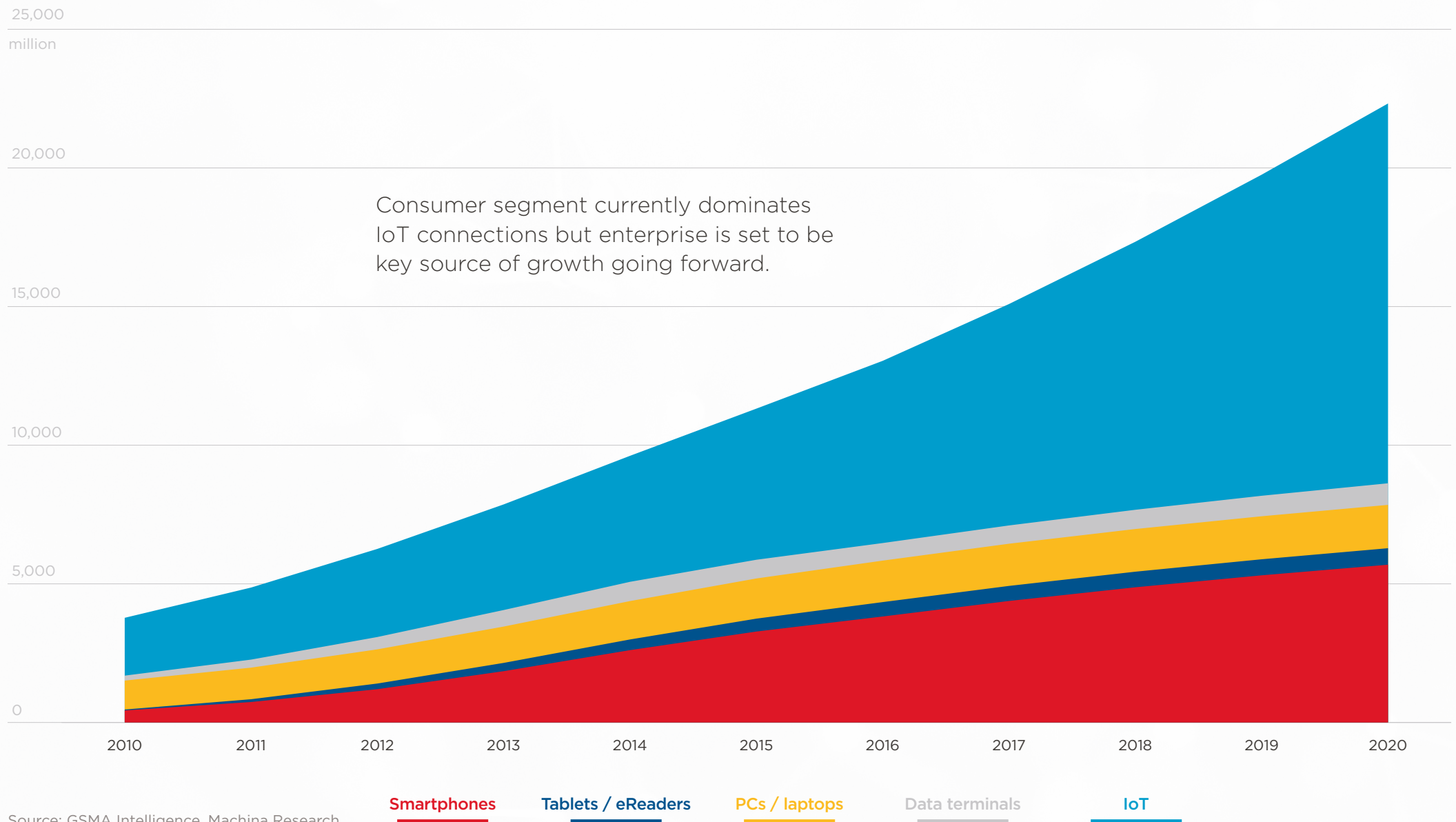
Between 2016 and 2025, we forecast a net 3.6 billion 4G users will be added, versus 1.2 billion 5G users.

Emerging markets are driving growth: India, Indonesia and Brazil will represent 35% of the 4G increase, underscoring the geographic shift in internet users.

BY 2025, 4G WILL ACCOUNT FOR TWO THIRDS OF THE GLOBAL MOBILE USER BASE



3 Connecting 'things' exponentially increases scale of connectedness



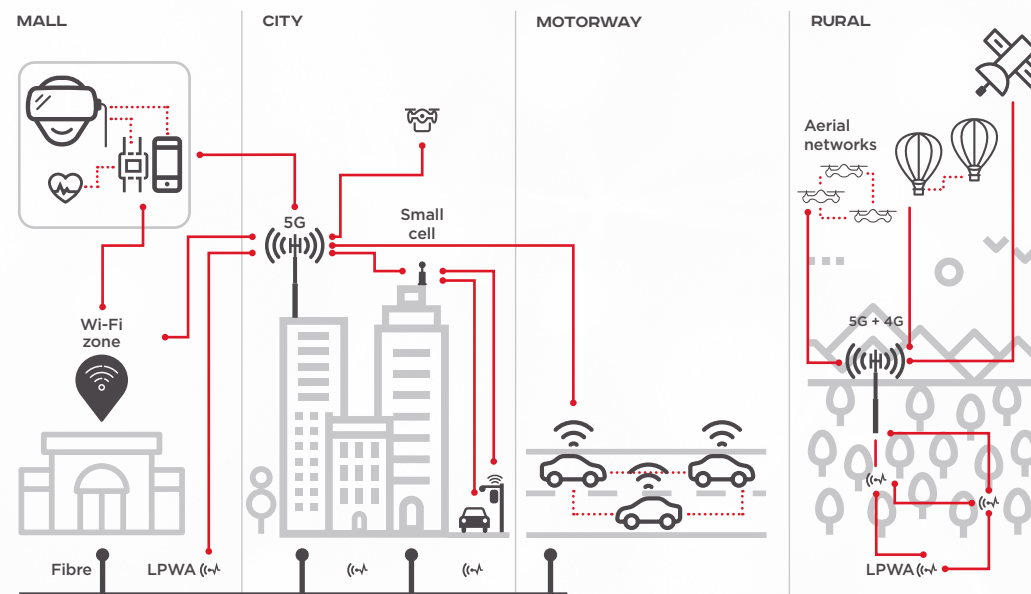
4 Paradigm shift in networks needed to realise IoT and 5G potential

POWER PUSHED FROM CORE TO EDGE



&

EXPLOSION IN HETEROGENEITY



- Decentralised
- Series of mini clouds (data centres) close to devices/objects/sensors
- Mesh or peer-to-peer networking between devices
- Required for very low latency applications with high bandwidth (cars, healthcare, robotics)

Heterogeneity across many aspects:

- Network planning – pico/small/macro cells, aerial (satellite)
- Software controls network functions; white-label hardware
- Licensed and unlicensed spectrum

5 Telecoms and media are converging but the path to value creation is unclear

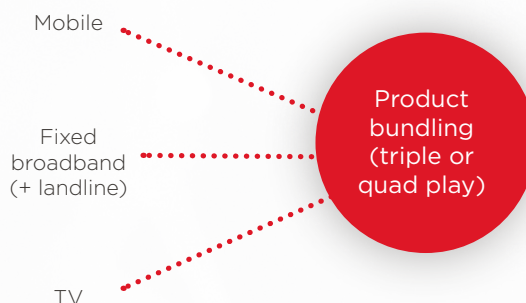
Convergence has taken several forms since the mid-2000s; the latest M&A boom targets cross-sector assets, the deepest level yet.

Telco-media conglomerates may not be the future everywhere, but the rationale of a content offer to pair with core network services is increasingly strong (joint venture, licensing, bundling are all options).



**FIXED-MOBILE
CONVERGENCE (FMC)**

2005



PRODUCT LEVEL

2009



INDUSTRY LEVEL

2015

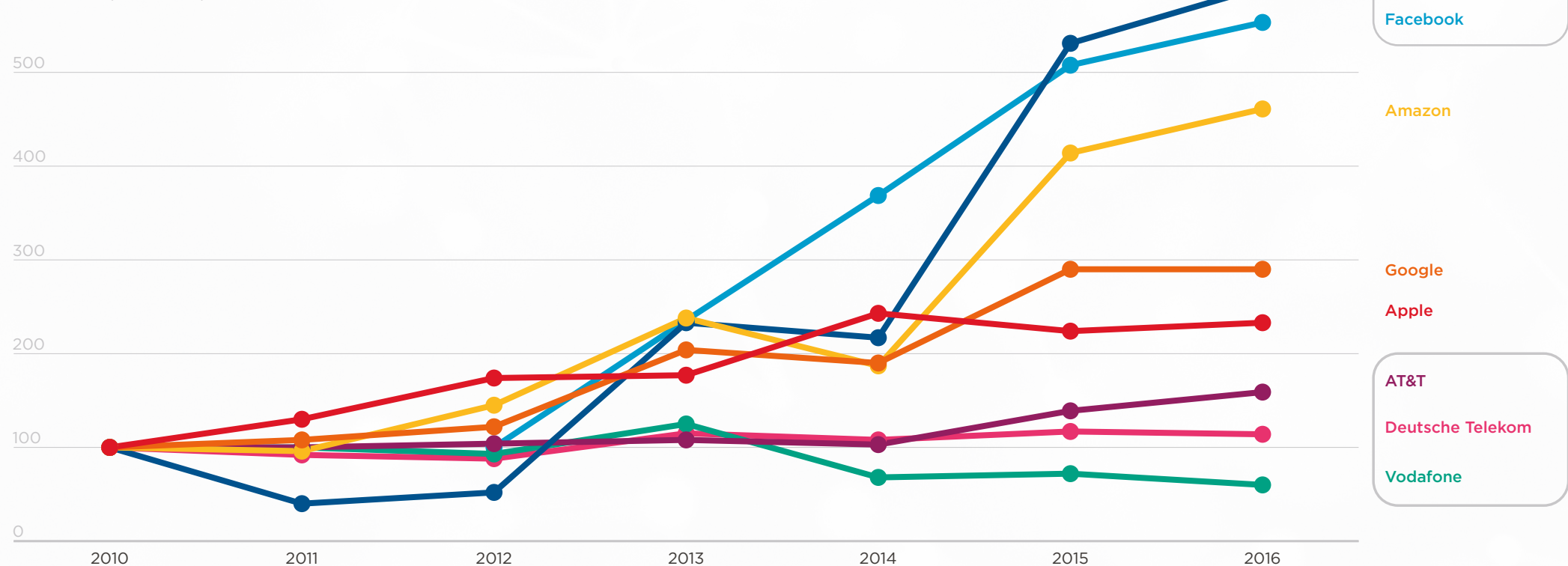
It remains to be seen whether converged telco-media plays have a long-term positive impact on growth. So far, investors have yet to price in a growth premium.

This contrasts with tech: Apple, Google, Amazon, Facebook and Netflix have collectively gone up 3.5× in enterprise value (EV) terms since 2010.

INDEXED ENTERPRISE VALUE

600

EV indexed (2010 = 100)



Note: EV data as of 5 July 2017. Source: Thomson Reuters Eikon, company data

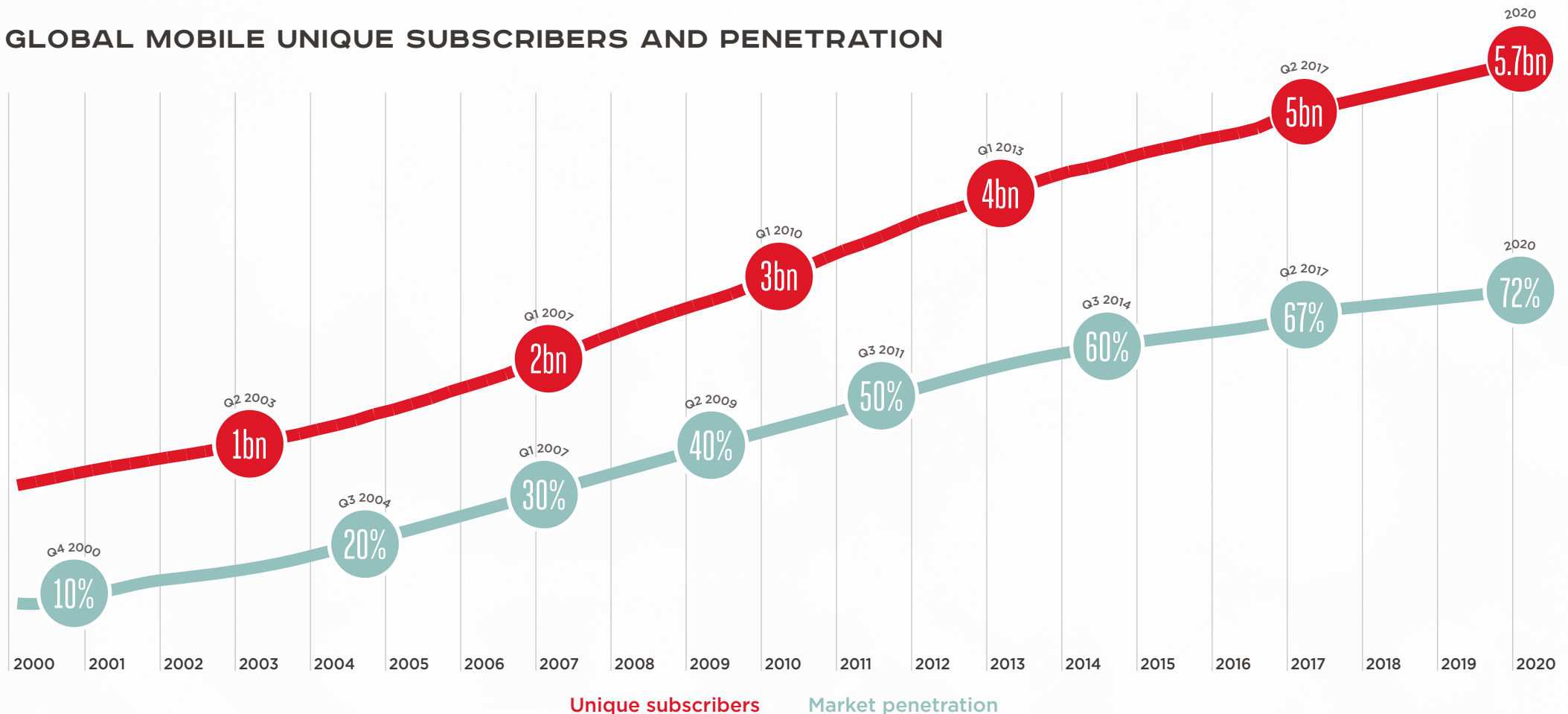


Consumers and mobile

The 5 billion mobile subscriber milestone was reached in Q2 2017.
Barring perhaps radio, it is the most prevalent technology on earth.

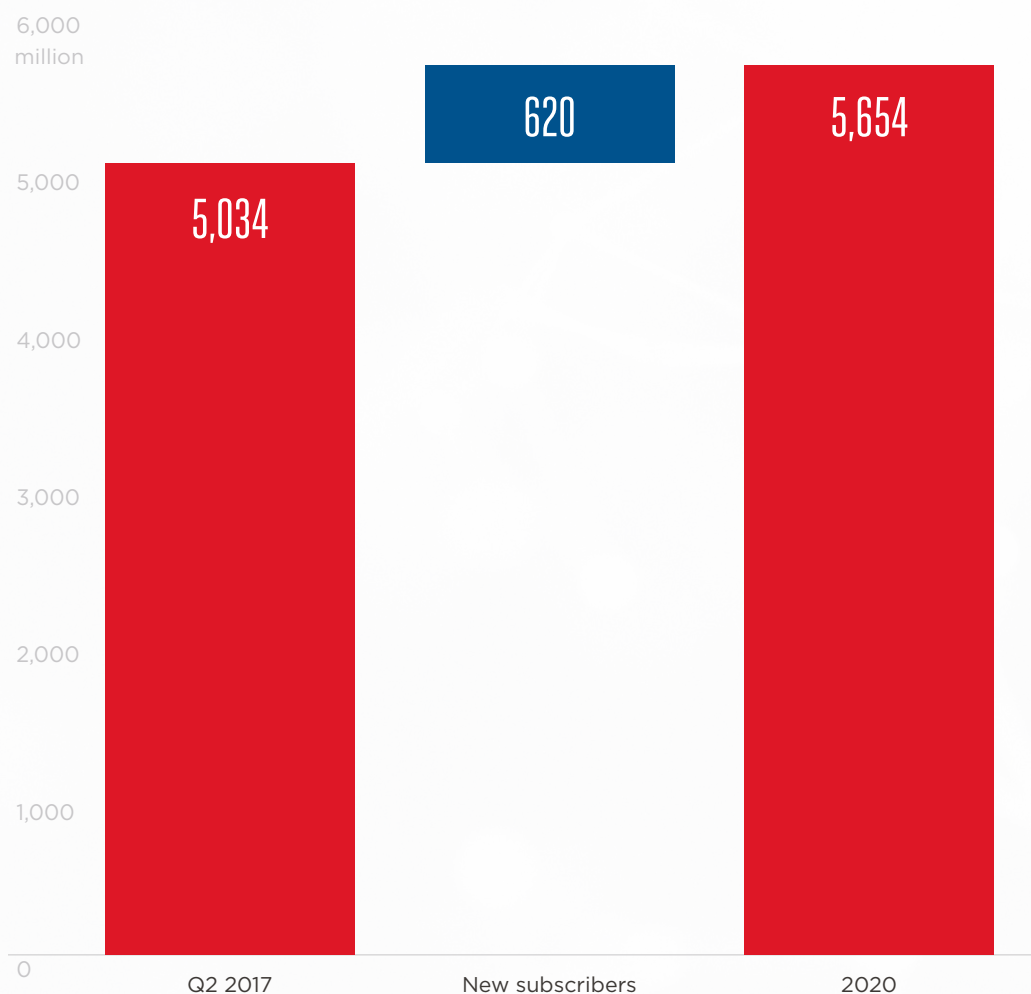
A further 620 million subscribers will be added by 2020, reaching almost three quarters of the global population.

GLOBAL MOBILE UNIQUE SUBSCRIBERS AND PENETRATION



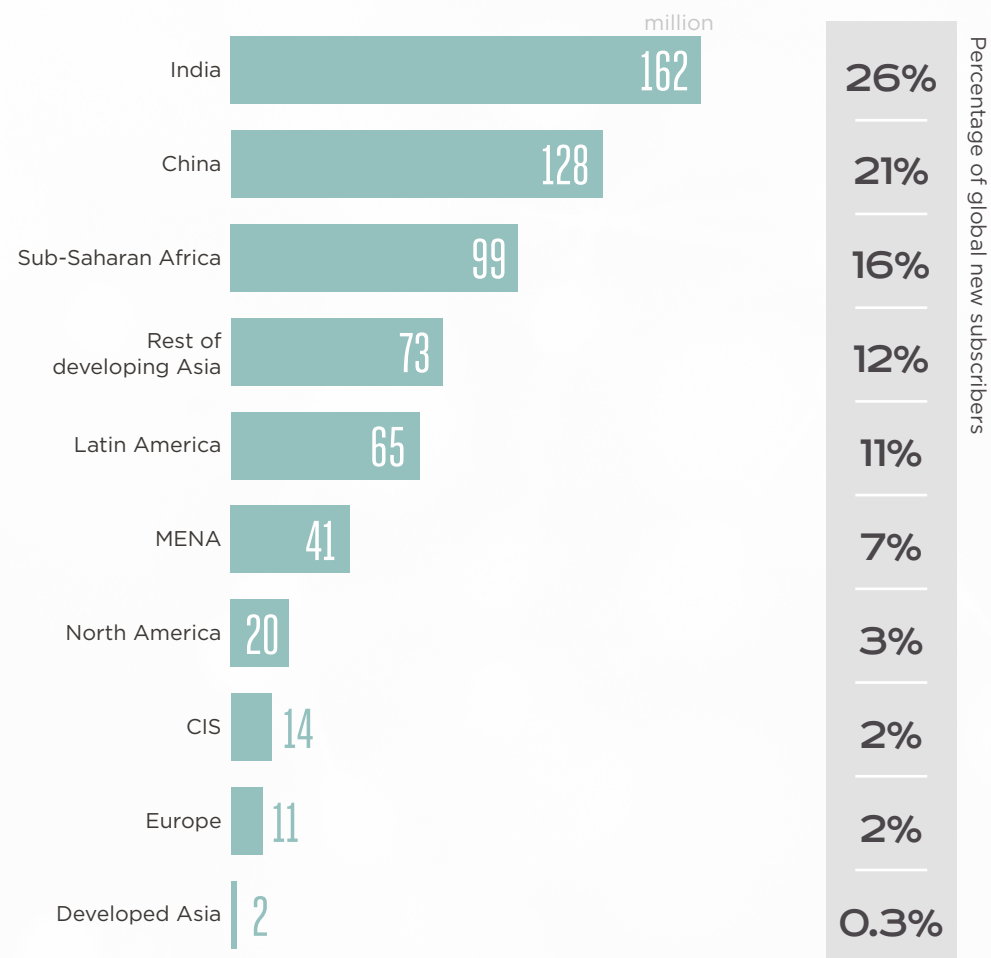
Asia will drive subscriber growth, accounting for 60% of new subscribers globally

UNIQUE MOBILE SUBSCRIBERS WORLDWIDE



Source: GSMA Intelligence

NET GROWTH IN MOBILE SUBSCRIBERS Q2 2017 - 2020



Source: GSMA Intelligence

Note: Developed = 'High' and 'Upper middle' income countries (GNI per capita above \$3,956).
Developing = 'Lower middle' and 'Low' income countries (GNI per capita below \$3,955) as classified by the World Bank

It took four years to move from 4 billion to 5 billion; reaching 6 billion will take longer still.

YEARS TO GROW AN INCREMENTAL 1 BILLION MOBILE SUBSCRIBERS (1990-2017)



Smartphone growth led by Asian and African markets as affordability improves

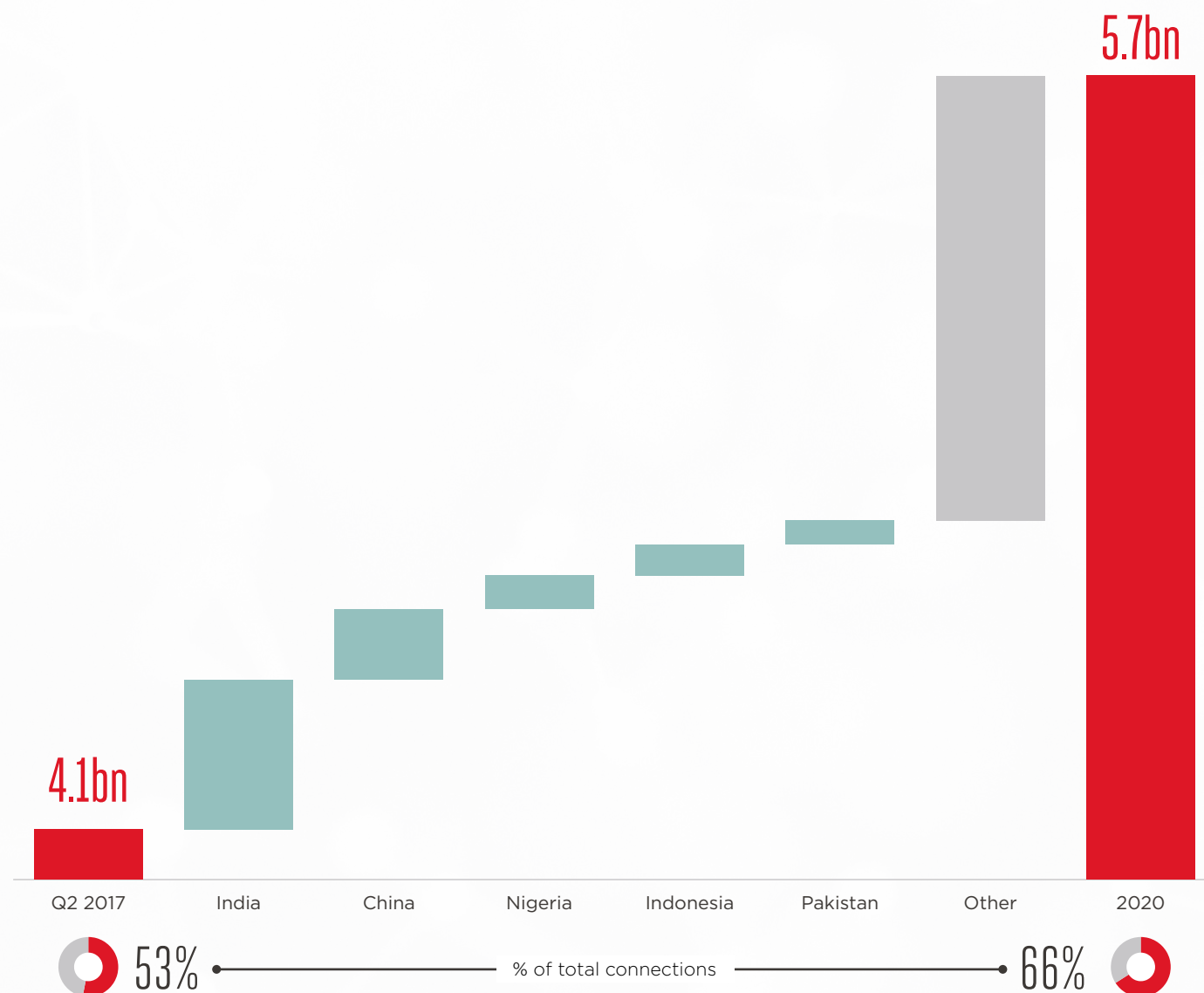
CONTRIBUTION TO SMARTPHONE GROWTH

Smartphones account for over half of total connections globally.

As with subscriber growth, smartphone growth is being driven by developing markets

Five markets will account for more than 40% of the 1.6 billion new smartphone connections by 2020.

Lower cost smartphones from local manufacturers such as Huawei, Oppo, OnePlus and Xiaomi in China, Micromax in India, and now AfriOne in Nigeria, are helping to address the affordability barrier.

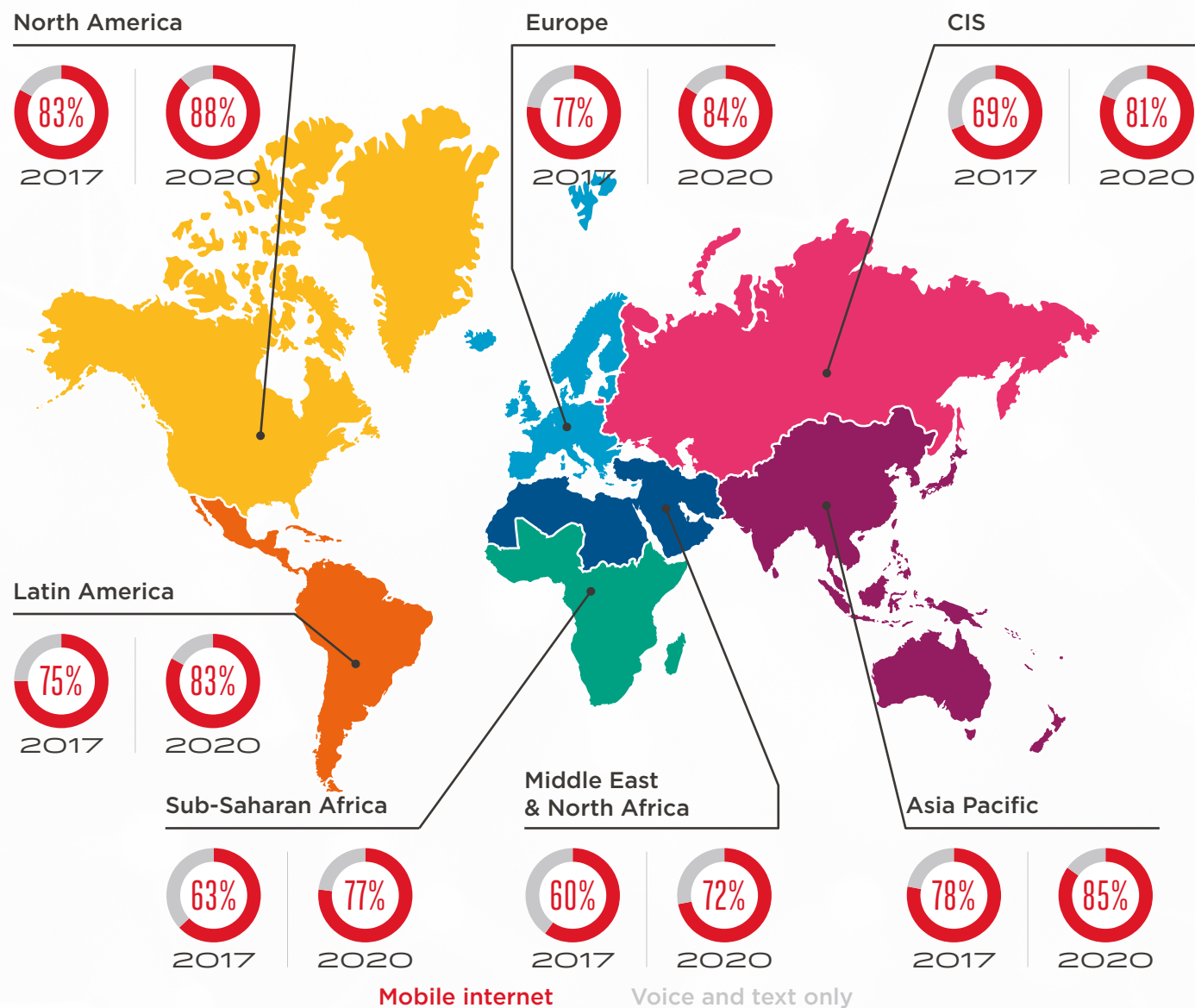


Three quarters of people with a mobile phone already use it for the internet

Almost 1 billion more people will start using their mobiles to access the internet by 2020. By this time, five-sixths of phone owners globally will be mobile internet subscribers.

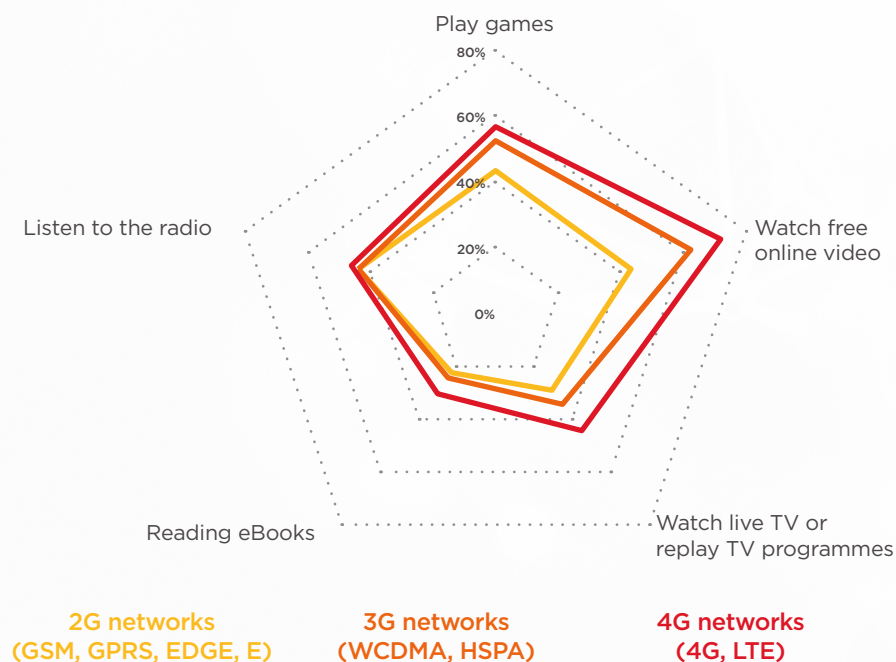
Asia Pacific will account for more than half of this growth, mostly in India and China. However, as a proportion of population, Africa will grow the fastest.

SHARE OF MOBILE PHONE OWNERS THAT ACCESS THE INTERNET



Migration to faster networks is driving engagement and data traffic

PERCENTAGE OF ADULT CONSUMERS WHO ENGAGE IN MOBILE ENTERTAINMENT SERVICES BY NETWORK CONNECTIVITY



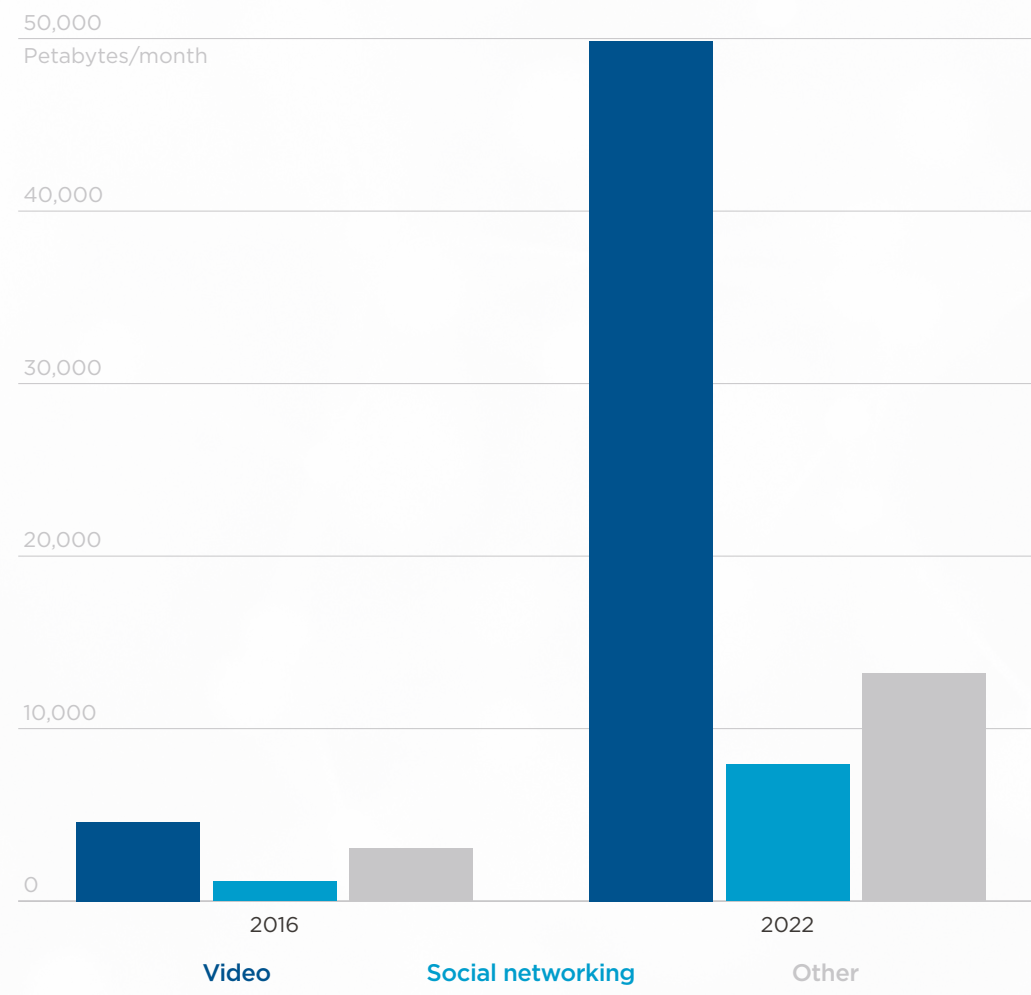
Nearly three quarters of smartphone users globally watch online videos on their phone and 50% of smartphone users watch or replay live TV on their phone.

Video traffic is driven by YouTube, embedded video and live streaming (e.g. Netflix).

In the near future, newer applications such as AR/VR, as well as 5G services from 2020, will drive video growth further.

Source: GSMA Intelligence Consumer Survey 2016

VIDEO TO DRIVE GLOBAL DATA TRAFFIC GROWTH



Source: Ericsson, GSMA Intelligence

Note: Other includes software download and update, audio and file sharing.

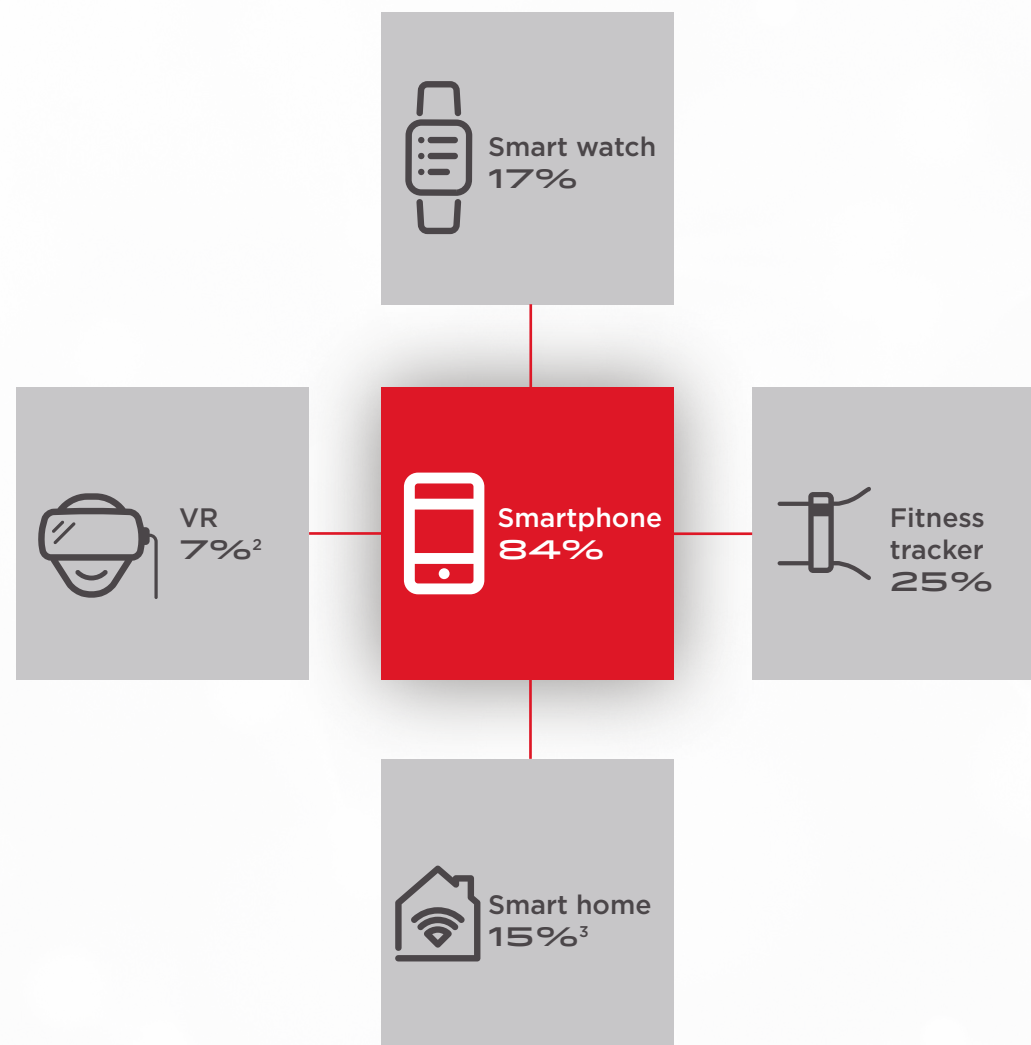
Innovation is shifting from smartphones to newer form factors

Innovation has plateaued in smartphone design and services over the last few years.

- It is now coming from the surrounding ecosystem of devices connected to smartphones.
- Smartphones are now serving as the 'gateways' into a variety of other devices such as fitness trackers, smart watches, connected home devices and virtual reality devices (in some cases) that rely on smartphones for control, connectivity and/or processing power.

Nearly 30% of mobile owners say that compatibility with companion accessories is 'very important' to their next purchase, and an additional 27% say that compatibility, while not necessarily a deal breaker, is 'important'.¹

DEVICE OWNERSHIP (US)



¹ GSMA Intelligence Consumer Survey 2016, US respondents

² Includes all VR form factors, not just smartphone-based headsets

³ Includes digitally connected and controlled devices within a house that can be remote controlled

Source: US ownership data from GSMA Intelligence Consumer Survey 2016, except VR from eMarketer (2017) and smart home household penetration from Statista (2017)

The growing popularity of smart home and personal assistants has led to the 'resurrection' of voice as a user interface.

- Voice (combined with advances in AI) has the capability to become a super platform that coordinates devices and data across a broad range of applications.
- More than 20% of Google's searches in the US are now via voice.

There will be an estimated 36 million users of smart speakers in the US in 2017, an adoption rate of just over 10%.*

Smart speakers are still a relatively early-stage technology with limited use cases, but there are a growing number of 'skills' and applications

These could challenge the smartphone as the control point for the connected home (e.g. thermostats, lights, doors, music systems).

AMAZON ECHO: GROWING BASE AND SKILL SET INSTALLED BASE, US



ALEXA SKILLS



* eMarketer

Source: Consumer Intelligence Research Partners, Amazon



Currently following two paths:

Smartphone based

- e.g. Google Daydream, Samsung Gear VR
- Relatively cheap, but experience not as immersive

Dedicated headsets

- e.g. Oculus Rift, HTC Vive, PlayStation VR
- Offers a true immersive experience, but hardware is expensive and requires tethering to a computer/console

Expected to have both consumer and enterprise applications


Consumer

- Gaming
- Entertainment experiences (e.g. live sports/concerts)

Enterprise

- Remote maintenance, design, construction, transport, healthcare and military
- A longer time horizon (5-10 years) than consumer applications, but could generate most of the value

COMPARING MAJOR VR HEADSETS



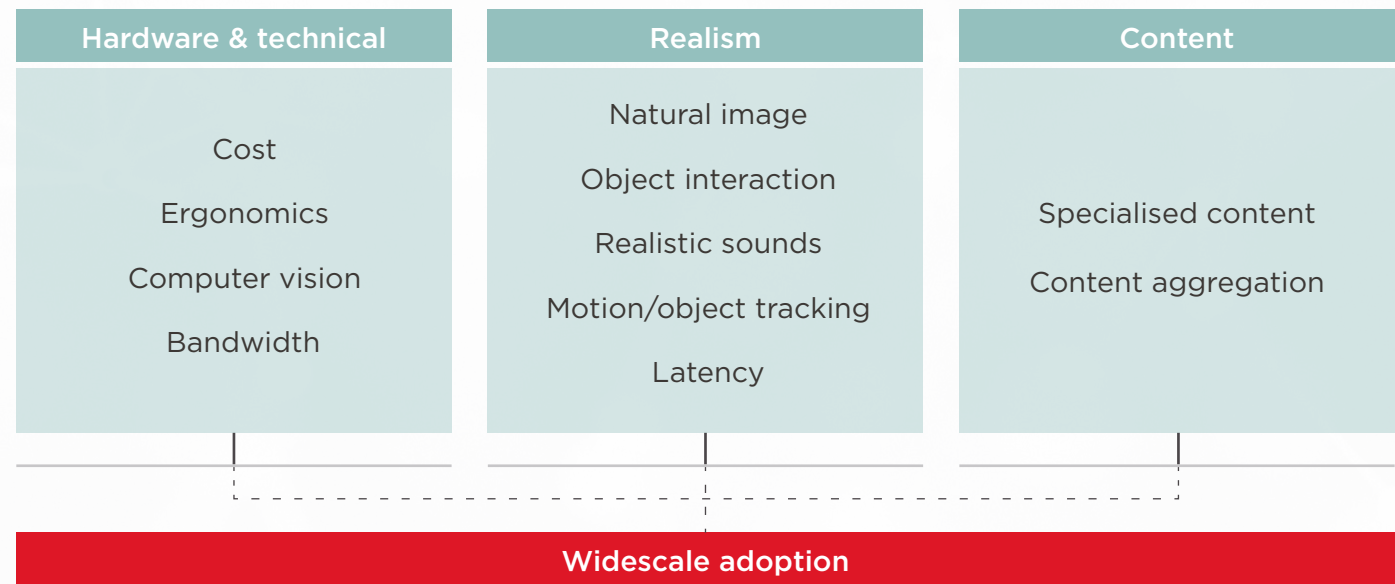
	Gear VR	Google Daydream	Oculus Rift	HTC Vive	PlayStation VR
Launch date	Nov 2015	Nov 2016	Mar 2016	Jun 2016	Oct 2016
Price	\$79	\$79	\$499	\$799	\$399
Requirements	Smartphone	Smartphone	High spec PC	High spec PC	PS4
Weight	318g	220g	470g	566g	610g
Resolution	-	-	1080×1200×2	1080×1200×2	960×1080×2
Field of view	-	-	110°	110°	100°
Refresh rate	-	-	90 Hz	90 Hz	120 Hz
Latency	-	-	20-30ms ³	22ms	18ms

Significant barriers to be addressed for VR to reach mainstream

Content needs to be specifically designed and created for the medium, as opposed to repurposed video content (one of the reasons for the failure of 3D TV) or content that is not actually VR.

Aggregation of content from different sources (geospatial data, open information, municipal databases etc.) is also a challenge, requiring collaboration and agreement on standards from various stakeholders and content providers.

BARRIERS TO REALISING THE POTENTIAL OF VR





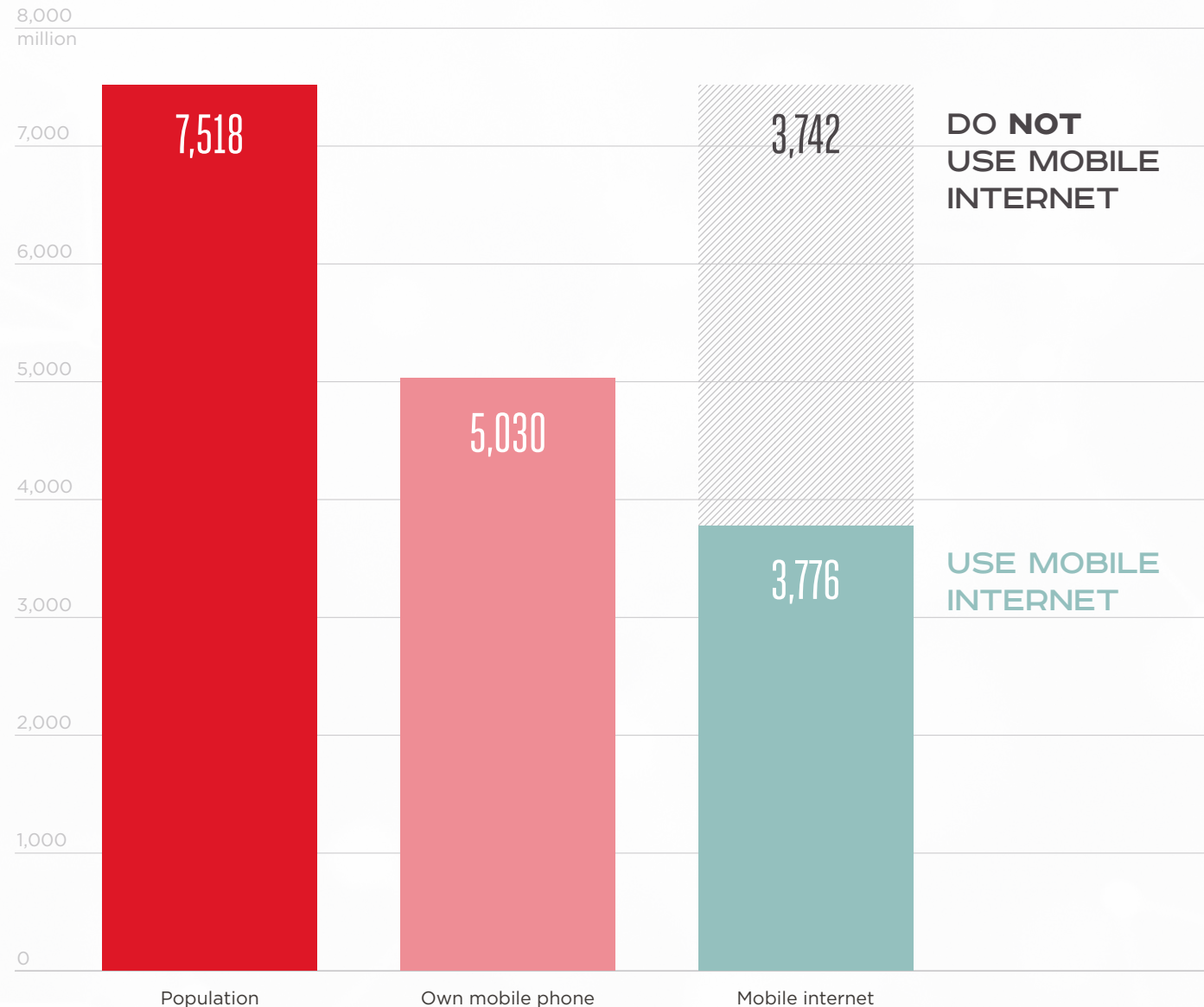
Internet unconnected – the other half

Even now, 50% of the world's population are not on the internet

Despite the fact that smartphone adoption is near saturated in many advanced markets and data usage continues to grow exponentially, half the world is not yet on the internet *at all*.

In population terms, this equates to 3.7 billion people, mostly in lower income developing countries.

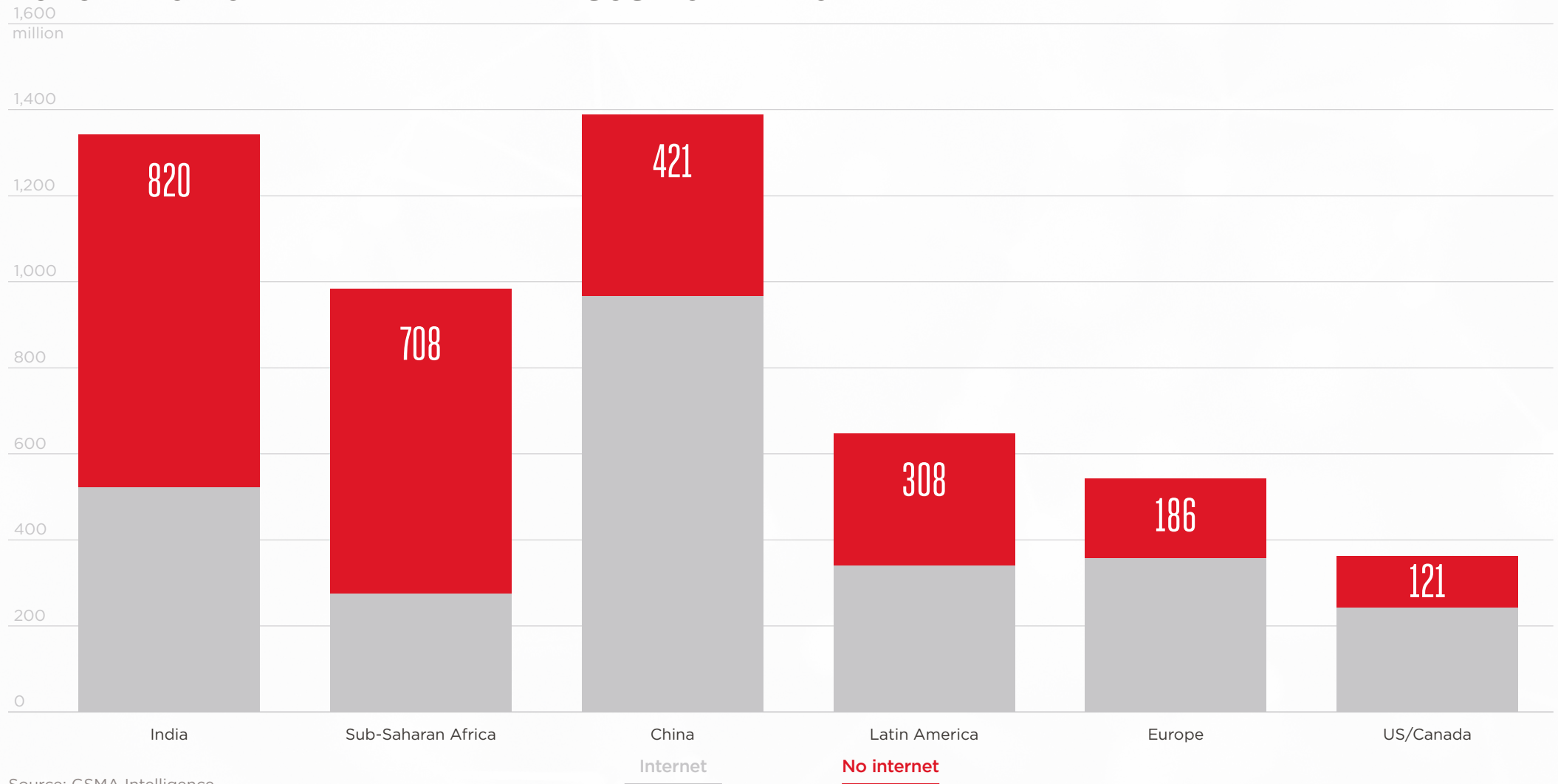
MOBILE PHONE AND INTERNET ACCESS (JUNE 2017)



The digital divide is greatest in India and Sub-Saharan Africa

India and Sub-Saharan Africa account for 42% of the world's unconnected, with more than 60% of their respective populations not yet on the internet.

POPULATION ON THE INTERNET VERSUS NOT YET ON THE INTERNET



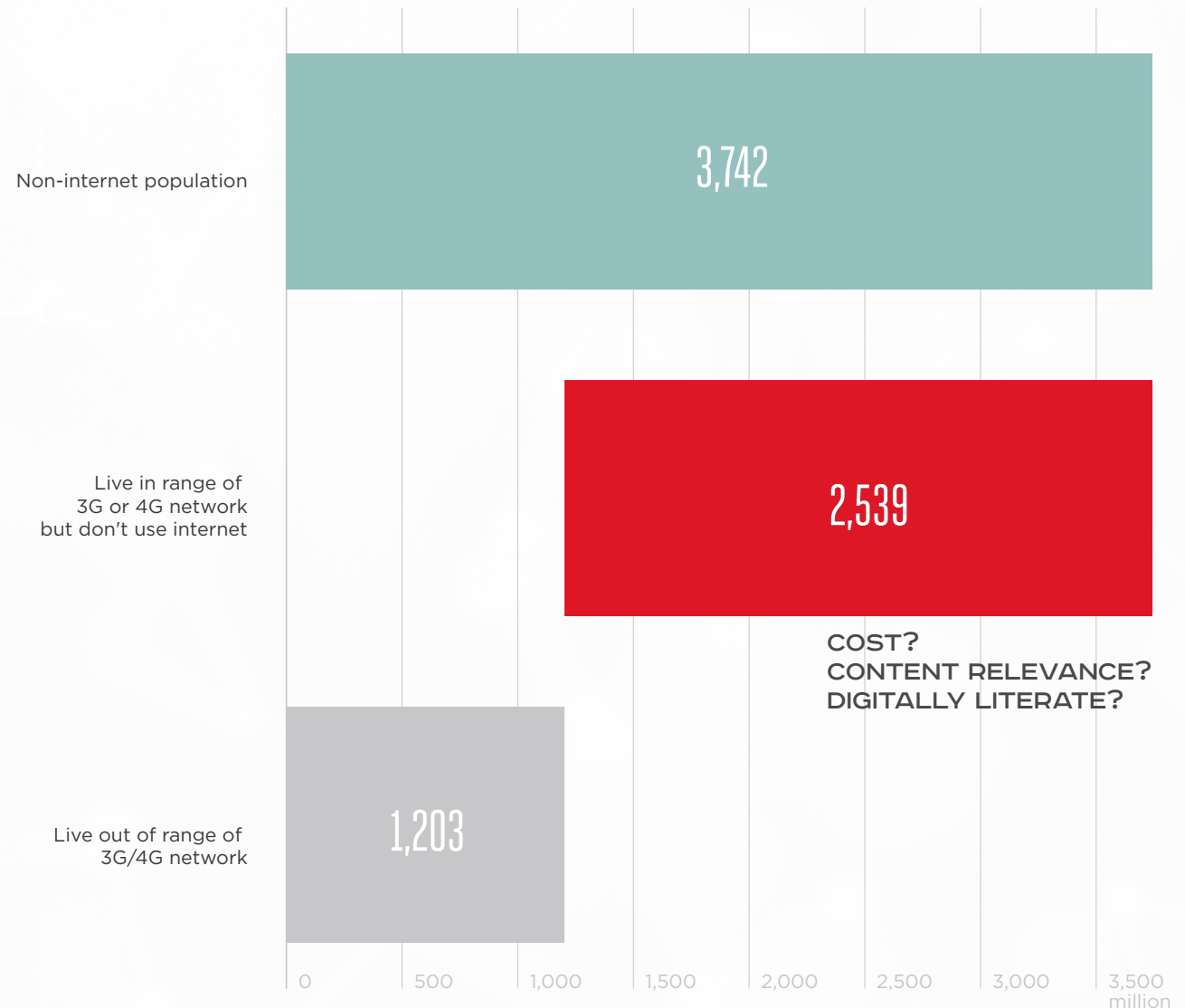
Source: GSMA Intelligence

The largely rural populations and lack of fixed line infrastructure make extending coverage a longstanding challenge for many developing countries.

Of the 3.7 billion not yet on the internet, around a third (1.2 billion) live outside a 3G or 4G signal and so could be considered excluded because they don't have fast enough coverage.

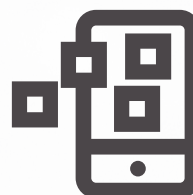
The corollary is equally important: for two thirds of the unconnected (2.5 billion), coverage is not the problem. Affordability, content relevance, literacy skills and gender factors are all part of the discussion.

ONLY A THIRD OF THE UNCONNECTED LIVE OUTSIDE A 3G OR 4G SIGNAL



The GSMA Mobile Connectivity Index measures the size of each barrier

MOBILE CONNECTIVITY INDEX



INFRASTRUCTURE

Mobile infrastructure
Network performance
Other enabling infrastructure
Spectrum

AFFORDABILITY

Mobile tariffs
Handset price
Income
Inequality
Taxation

CONSUMER READINESS

Basic skills
Gender equality

CONTENT

Local relevance
Availability

We developed the GSMA Mobile Connectivity Index to quantify the barriers to mobile internet access across four key enablers.

The index is built up through 39 specific indicators feeding into 13 dimensions which are aggregated to give a score for each of the four enablers. Scores fall within a range of 0-100.

The results and the data are available at www.mobileconnectivityindex.com. Scores at the country and regional level can be viewed from 2014 to 2016.

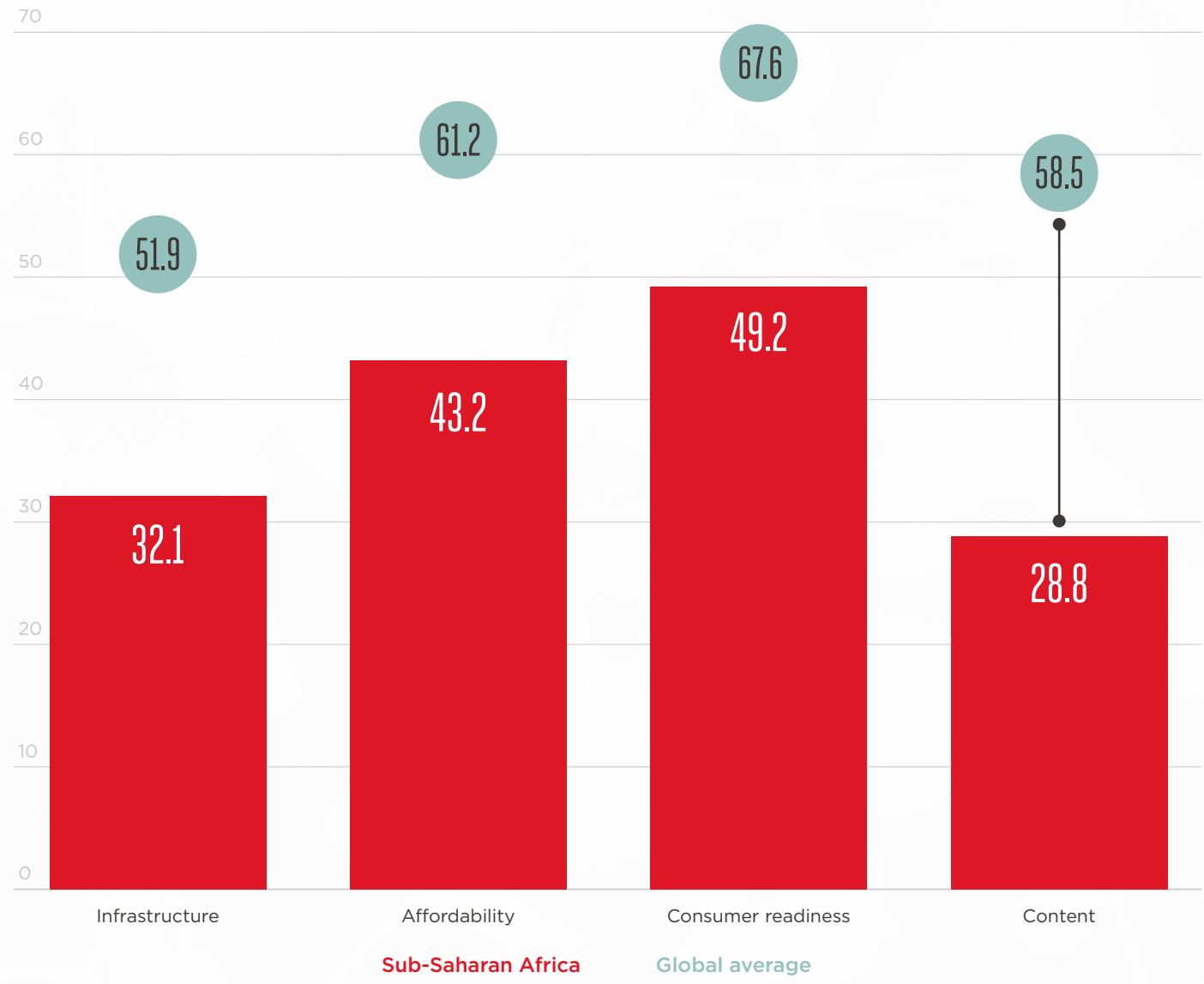
39 INDICATORS

Relevant local content as big a challenge as infrastructure

Africa has the lowest internet penetration and plots below the global average on all barriers.

Locally relevant content is a particular problem, with hundreds of dialects to cater for. Basic needs such as jobs information should be prioritised ahead of imported entertainment.

INDEX SCORES FOR SUB-SAHARAN AFRICA VERSUS GLOBAL AVERAGE (2016)





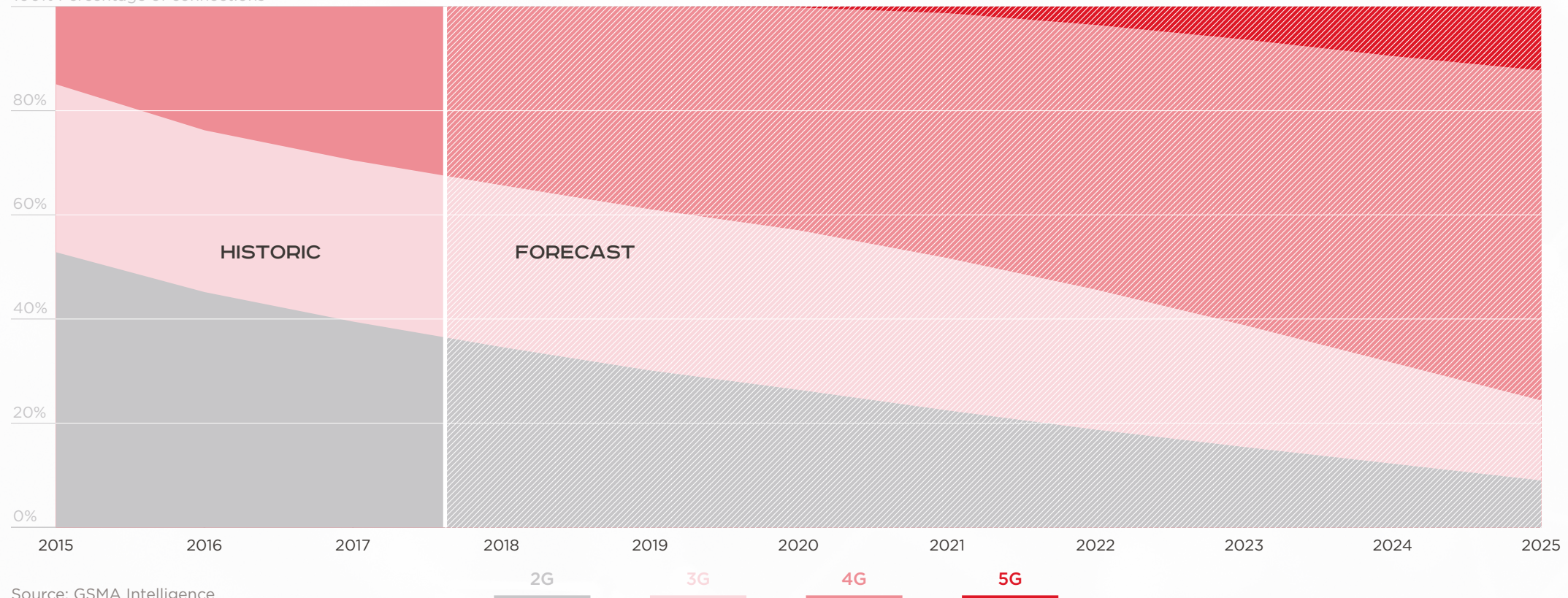
Networks

Although most LTE auctions happened 4-6 years ago, 4G still only accounts for around a quarter of mobile phone users worldwide, with 3G and even 2G servicing the vast featurephone and low-end smartphone market in large emerging markets such as India.

By 2025 the situation will have reversed: we expect 63% of the global base to be on 4G speeds. 5G, for its part, should come online around 2019/20 but will not significantly impact 4G, in part because the proposed use cases for consumers are not yet sufficiently different.

BY 2025, 4G WILL ACCOUNT FOR TWO THIRDS OF THE MOBILE BASE

100% Percentage of connections



The global picture masks underlying country and regional differences in how LTE has been rolled out.

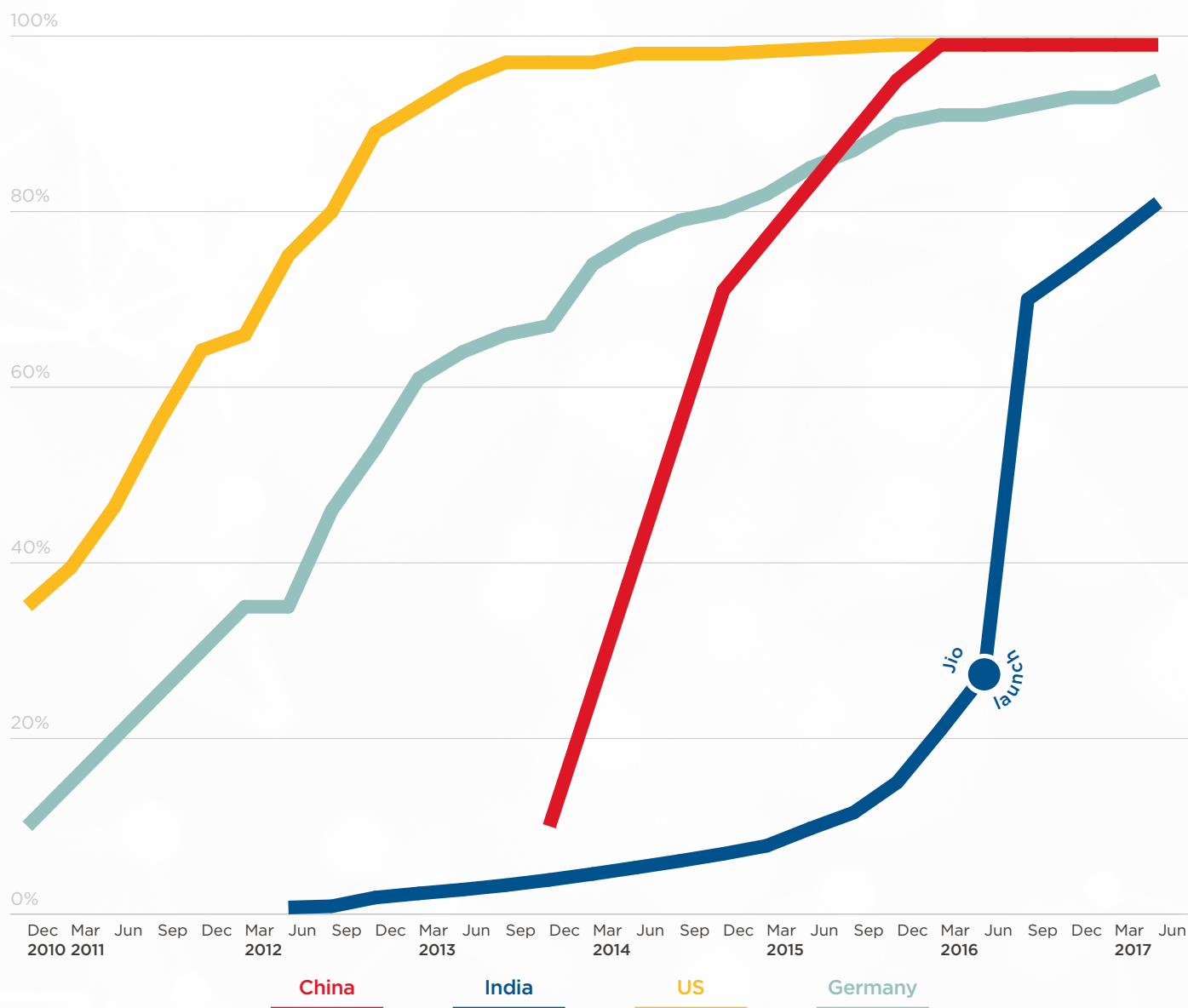
The US was an LTE leader, with both incumbents rolling out near-nationwide networks early as their key competitive differentiators.

Developing countries have been more focussed on 3G rollout (4G coverage is on average 35%). However, there are two notable exceptions:

- China has achieved 99% coverage in less than three years and is now 4G-first
- India has gone even faster, with a disruptive new entrant (Jio) forcing competitors to follow suit.

Europe has proven to be an LTE laggard, although the EC is intent on reasserting continental leadership in 5G.

4G POPULATION COVERAGE



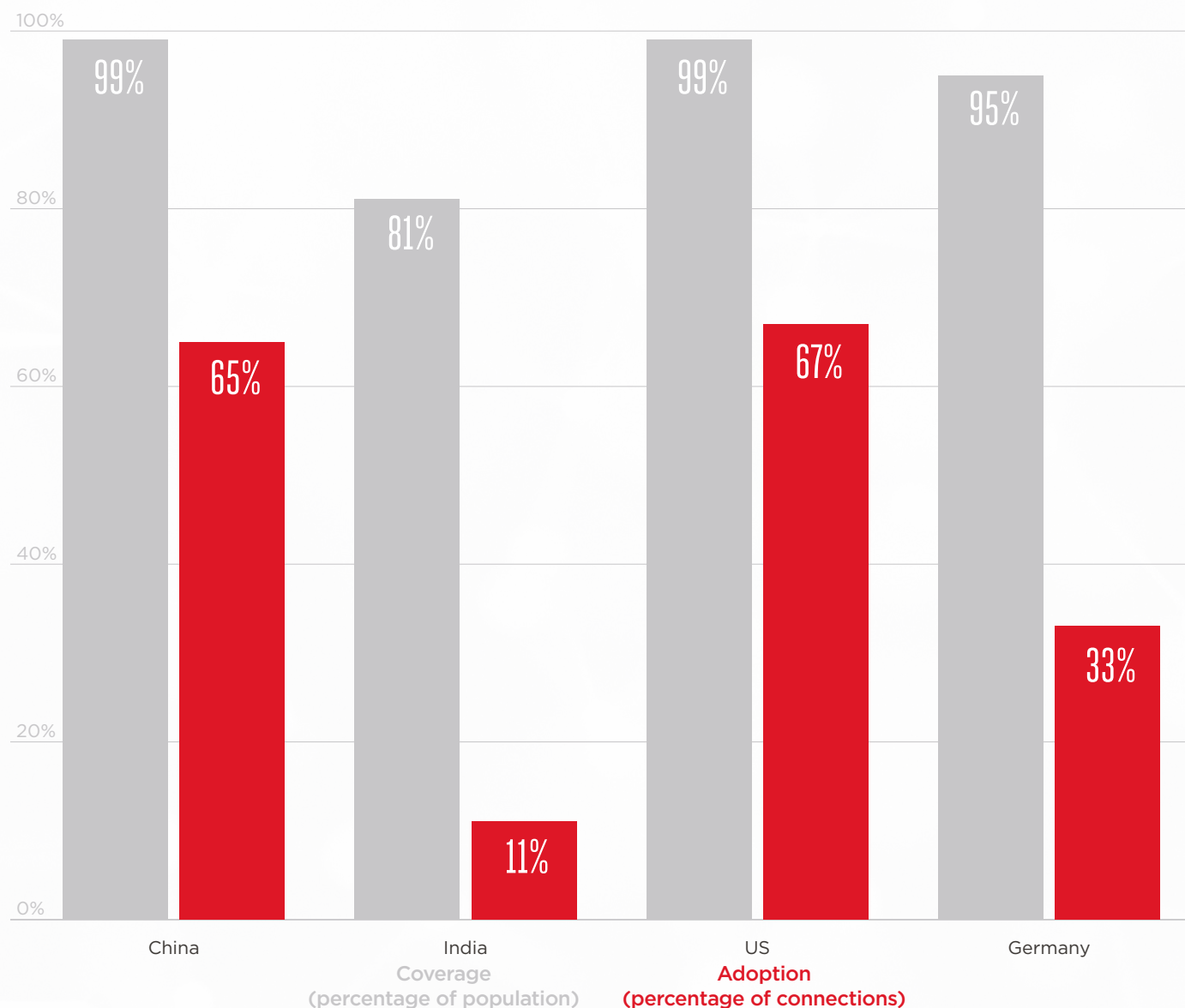
Despite the fact that most advanced countries now have national 4G networks, take-up patterns are mixed.

Two thirds of people in the US and China are on LTE smartphones, with mobile data traffic consequently still growing at 20-30% per year.

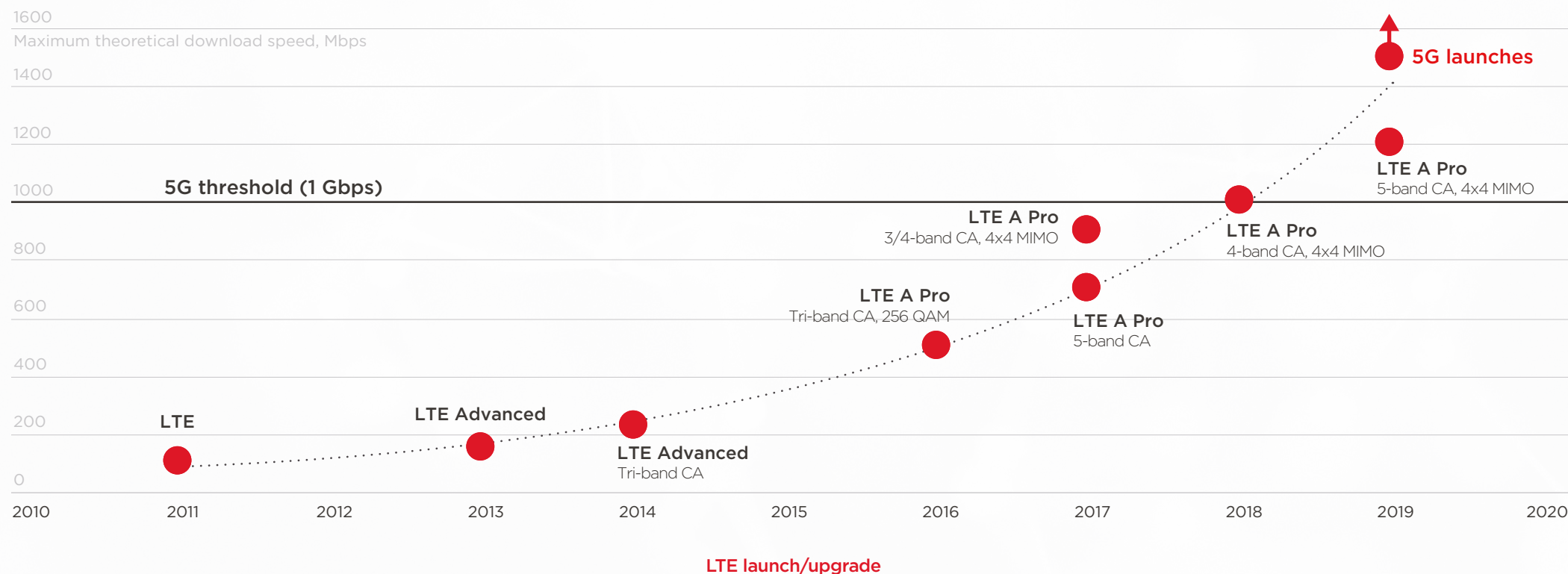
In Germany – as in many other European countries – adoption remains underpenetrated, but this is “glass half full” because of the latent potential for operators to migrate high-income 3G users upwards.

India is an anomaly; coverage is out of sync with consumer demand. With operators only able to reduce pricing so much in an already competitive market, the risk is that 4G becomes a ‘white elephant’.

4G ADOPTION - IT CAN TAKE TIME



LTE PATHWAY TO 5G



Source: SK Telecom

LTE was designed to evolve. With MIMO and other enhancing technologies, we could see speeds above 1 Gbps – in other words, 4G that is as fast as 5G.

Of course, these are *theoretical* speeds that would, at best, be reached in the lab. But even with decay, LTE is going to get faster, meaning that *networks can deliver* more intensive video traffic. This is one of the main reasons why 5G is likely to co-exist with 4G for many years, as opposed to replacing it.

Early 5G deployments will likely target high-bandwidth applications as an extension to 4G:

- 8K ultra-HD video
- VR and AR.

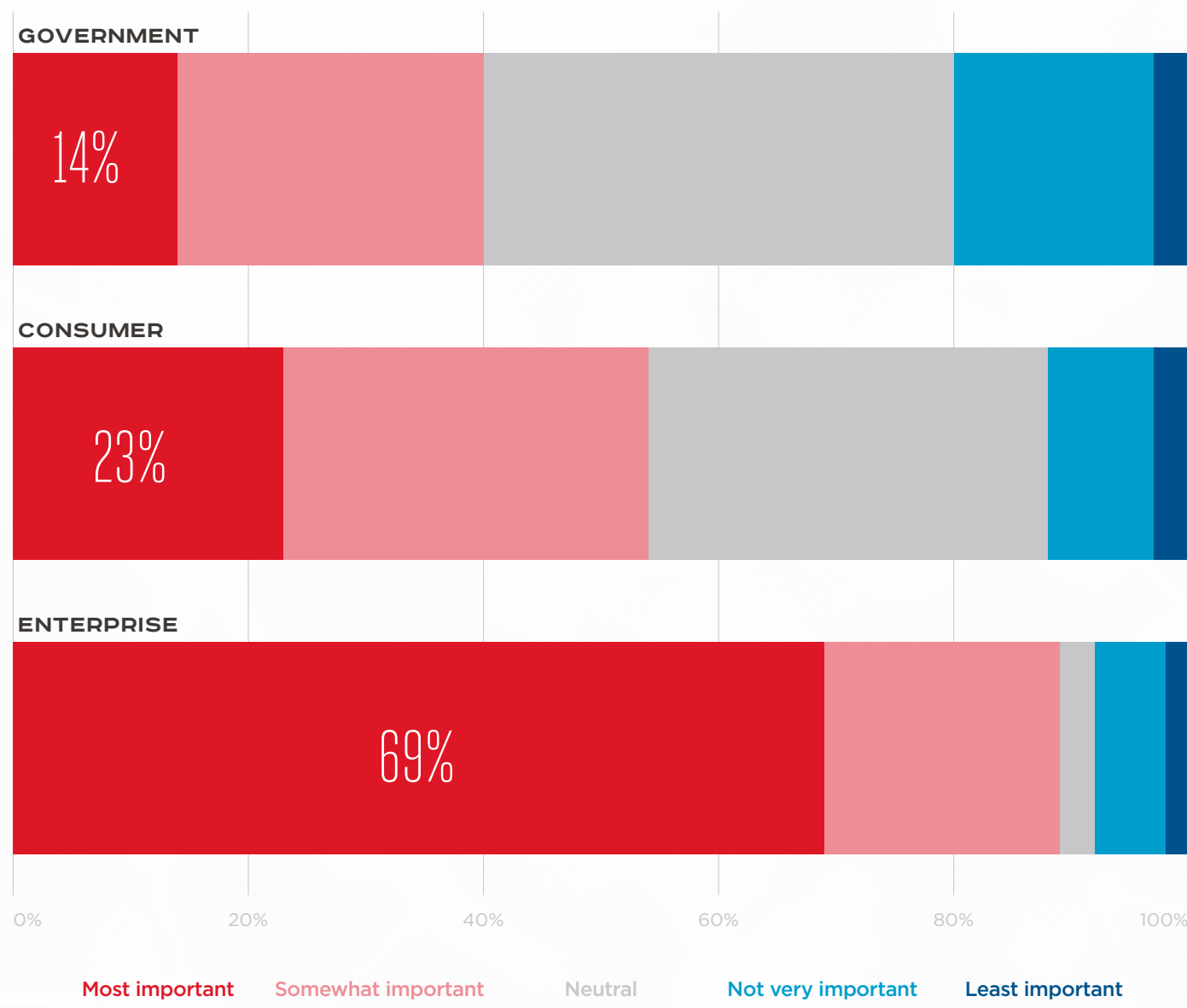
Equally important, but less talked about, is supplementing 4G capacity.

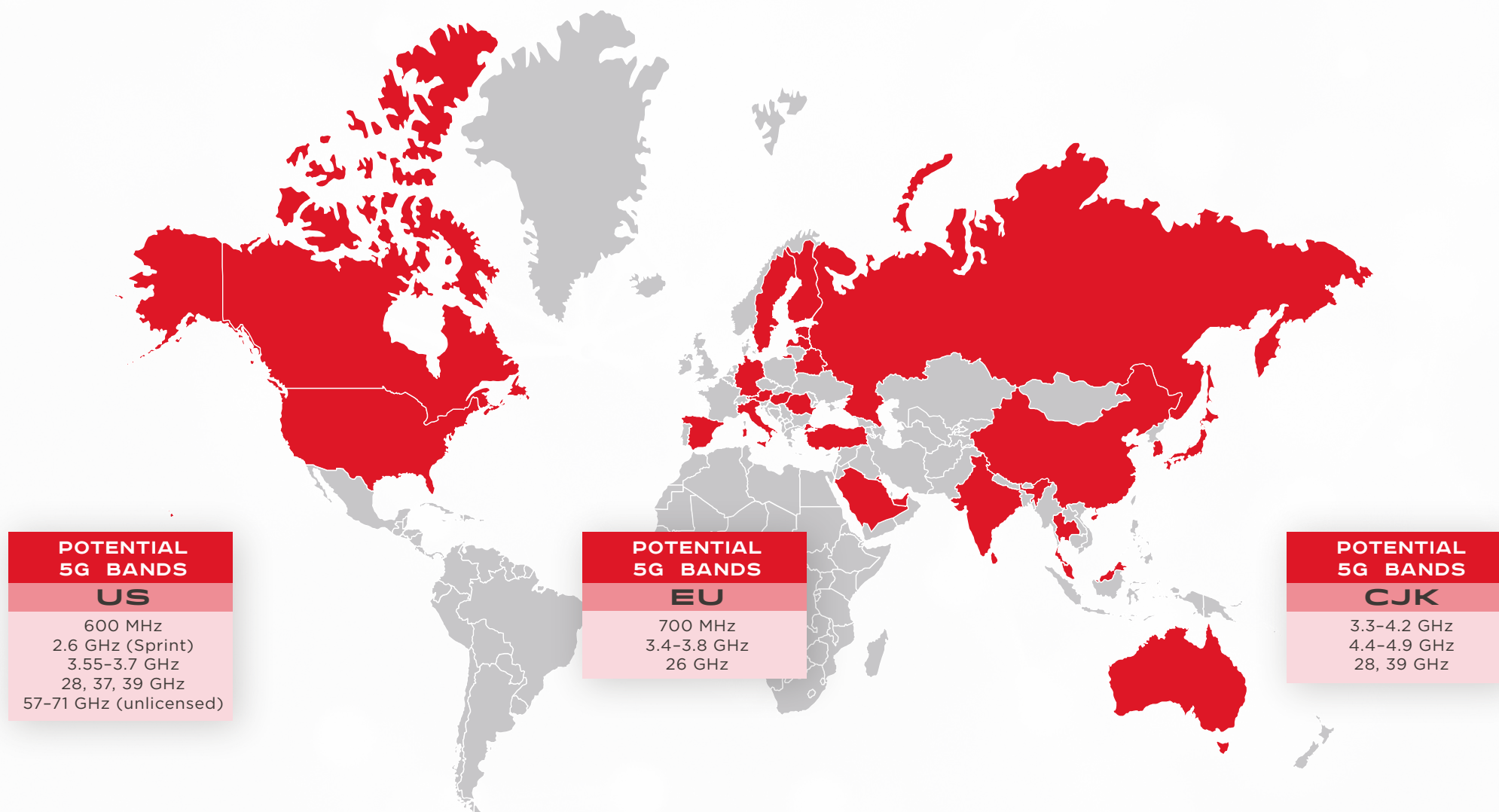
The US is pursuing a different approach, using 5G as a last-mile technology for home broadband.

The ability to apply a pricing premium remains to be seen – to a large extent, it depends on how sufficiently different consumers perceive 5G to be to LTE.

This is perhaps why enterprise services are generally recognised as the incremental revenue opportunity for 5G.

INCREMENTAL REVENUE POTENTIAL FROM 5G? SURVEY OF OPERATORS





Countries with 5G trials

There are two broad deployment scenarios for 5G networks: standalone and non-standalone.

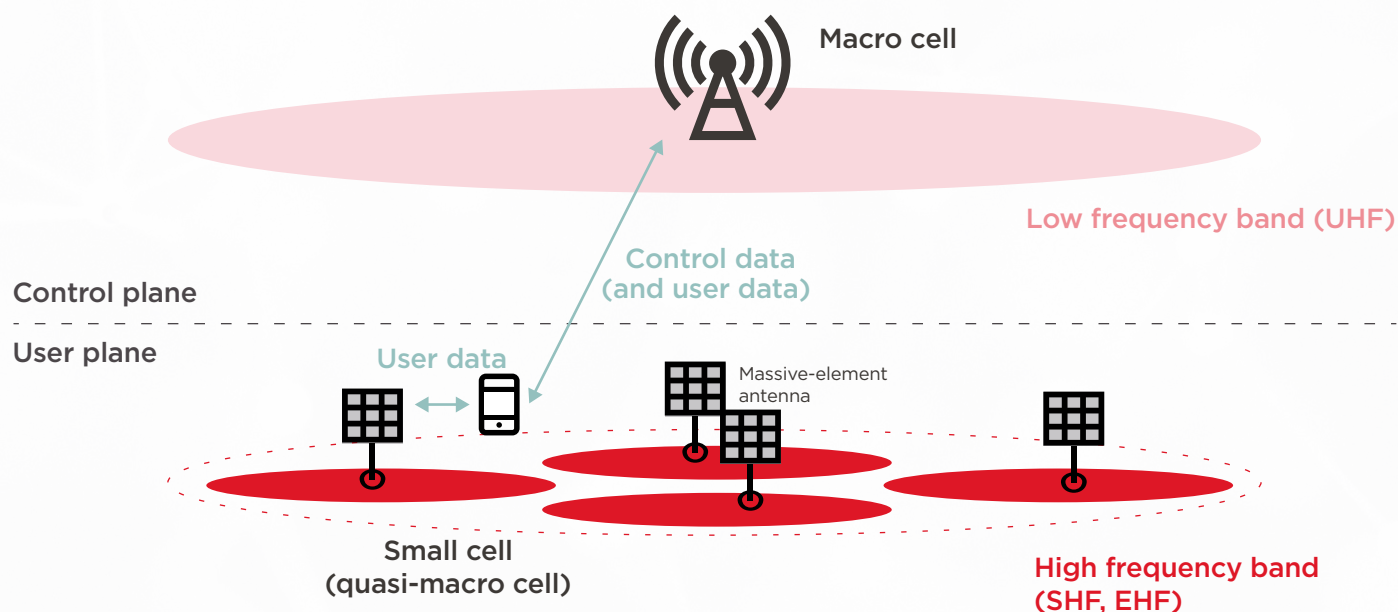
Standalone would be a new-build network, including new base stations, backhaul links and core. This provides higher scale economies and avoids legacy LTE integration.

A **non-standalone** network would piggy-back on existing infrastructure, supplemented by targeted small cell deployment in areas of high density. This offers a quicker route to market but is difficult to do beyond cities.

We expect the majority to choose the non-standalone route (at least at first), but China could be a notable exception.

Regardless, early 5G deployments will focus on dense city centres using small cells. National rollouts will happen at a slower pace than 4G; by 2025, about 40% of the global population will be covered by 5G.

HOW A NON-STANDALONE 5G NETWORK COULD WORK IN DENSE URBAN AREAS



High-income Asian markets are likely to be among the first 5G markets; for Korea and Japan, their Olympics in 2018 and 2020 provide global showcases. China has a national ICT agenda with 5G an integral part.

However, we anticipate 5G adoption will take longer than 4G because of slower network rollouts and uncertainties around the value proposition relative to LTE.

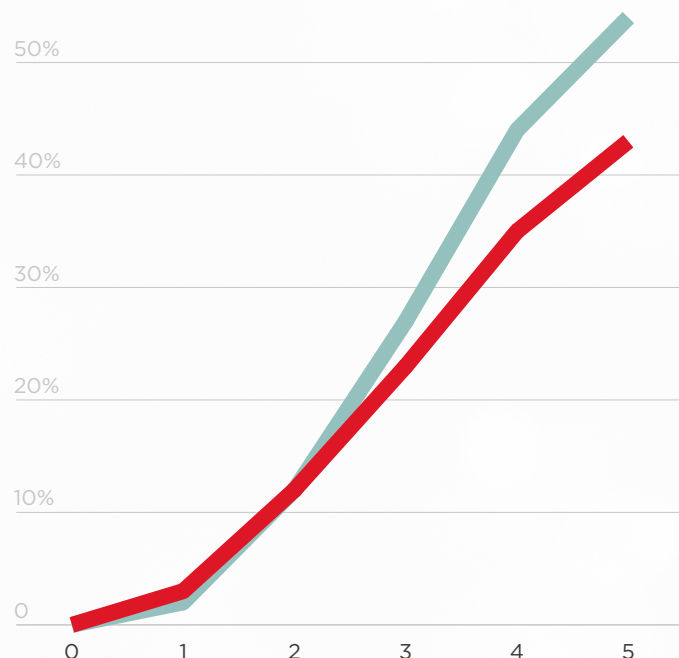
Europe is a possible exception. The EU sees 5G as an opportunity to retake a leadership position in technology, and even now 4G is still relatively immature.

4G AND 5G ADOPTION, YEARS AFTER FIRST LAUNCH

NORTH AMERICA

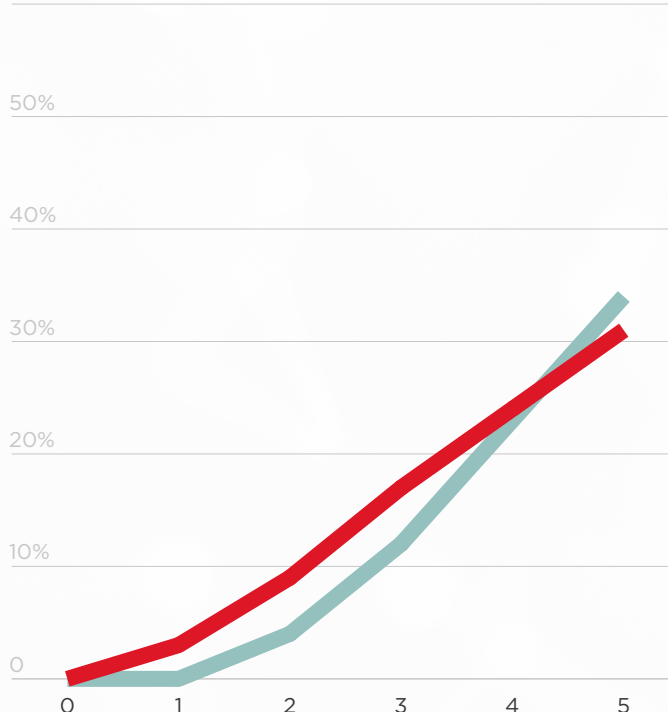
60%

Share of total connections



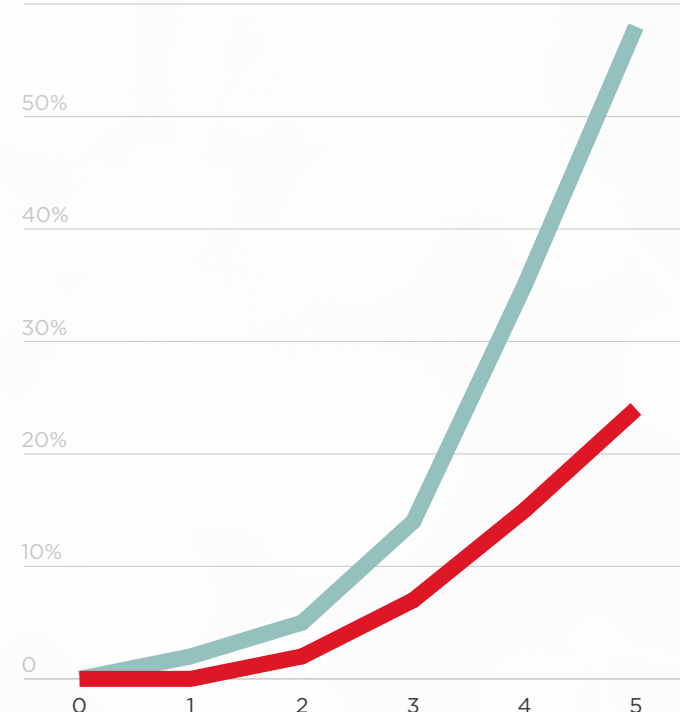
EUROPE

60%



CHINA, JAPAN AND SOUTH KOREA

60%



North America: 4G (2010), 5G (2019); Europe: 4G (2011), 5G (2020); CJK: 4G (2011), 5G (2019) Source: GSMA Intelligence

4G

5G

Whatever 'G' it is, networks are shifting towards an open paradigm...

Architecture and planning frameworks

Softwarisation of mobile networks through SDN
Virtualisation in the cloud

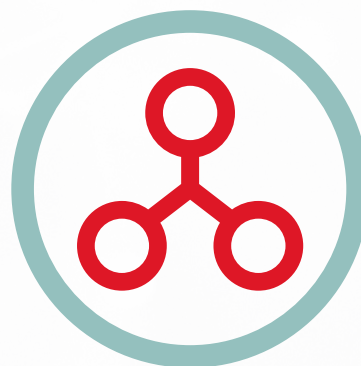
Cross-industry partnerships

Improve network economics to cope with data traffic that continues to rise exponentially

Facebook Telecom Infra Project (TIP)

Unlock new use cases, particularly in IoT

T-Mobile/Twilio
AT&T/IBM



Network core



Access and spectrum (unlicensed options)

Reaching unconnected populations with aerial-based solutions using satellites and drones on unlicensed WiFi (Facebook and Google)

Short-range connectivity using mesh cells (Veniam, Filament amongst others)

Experimentation in the use of unlicensed spectrum bands; for example LTE-Unlicensed, and the use of millimetre wave (24-86 GHz) for future 5G service

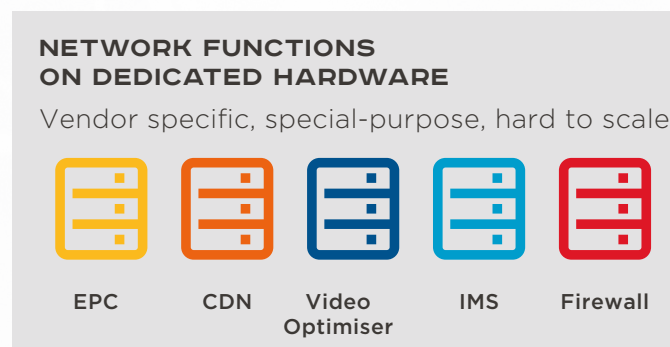
Network virtualisation flips the value of hardware and software in the network.

With network functions separated from hardware, performance and efficiency should improve, as should opex ratios.

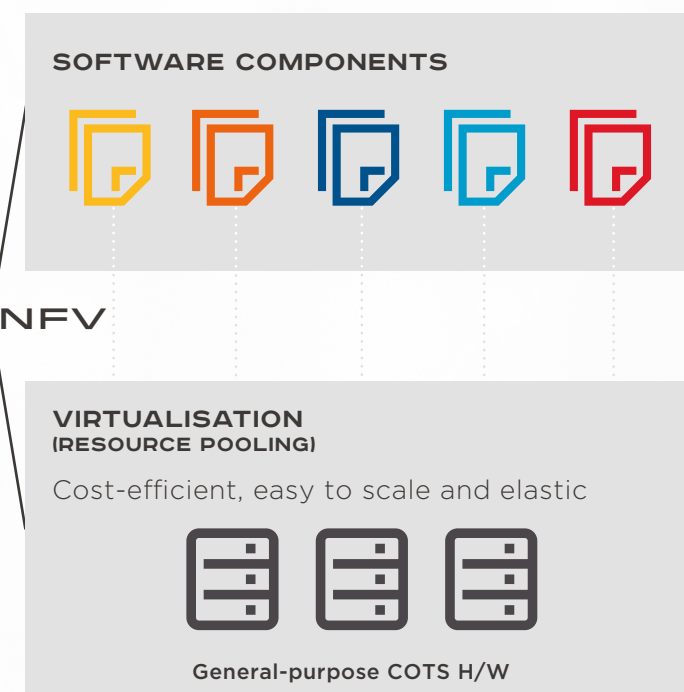
This is good for operators, but is a major risk for equipment makers whose core business is threatened by commoditisation and faces structural decline.

Several mobile operators have already launched virtualised heterogeneous networks, including AT&T, Deutsche Telekom, Telefónica, China Mobile, NTT DoCoMo and SK Telecom.

TRADITIONAL NETWORKS



NETWORKS WITH NFV

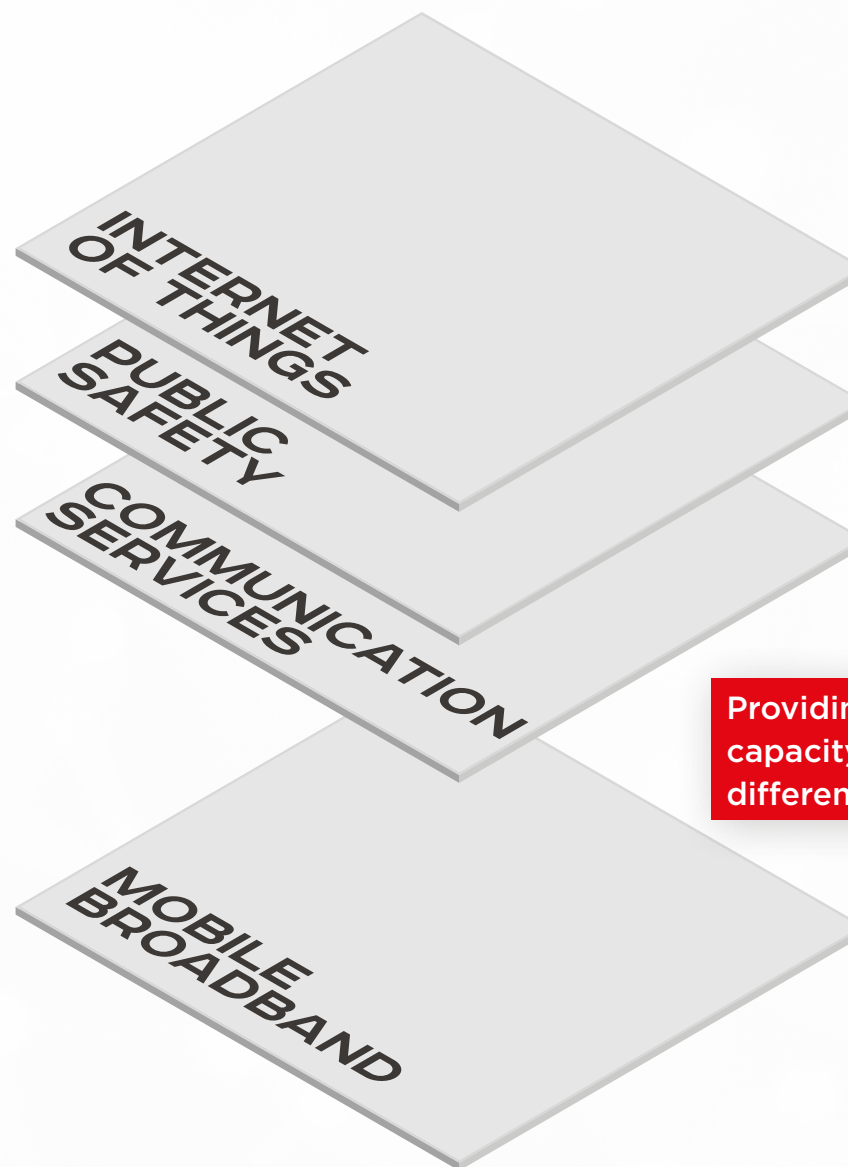


Edge computing and slicing need to happen if 5G hype is to be fulfilled

Attention is now focussed on pushing power to the network edge to satisfy very low-latency applications. This moves mobile networks from being broadly centralised to decentralised – and adoption of cloud principles.

The concept of ‘network slicing’ comes from this, allowing an operator to dedicate a certain amount of capacity at guaranteed quality of service for enterprise customers.

Sports events are touted as one use case but the real potential comes from 5G enterprise scenarios: massive IoT, industrial factories using robotics, transport monitoring and control, public safety, mass-market personalised content delivery and augmented reality.



Providing network capacity as a service for different use cases

Satellite as an alternative connectivity option has re-emerged from the ashes of failed attempts in the early 2000s.

SpaceX and OneWeb are the leaders but there are others such as O3b, traditional satellite companies and defence contractors.

The big change from previous efforts is to deploy at lower altitudes (around 1,100 km) and in much higher densities – the so-called ‘constellation’ approach.

This would increase end-user speeds and, crucially, reduce latency. SpaceX is targeting latencies of 25–35 ms; for context, GEO satellites have latencies around 600 ms and even LTE networks are around 80–100 ms.

Scale is driven by cost reductions in assembly process and, especially for SpaceX, vertical integration.

ACTIVE SATELLITES IN ORBIT WORLDWIDE
(PRE-SPACEX + ONEWEB)



Bubble shows number of active satellites

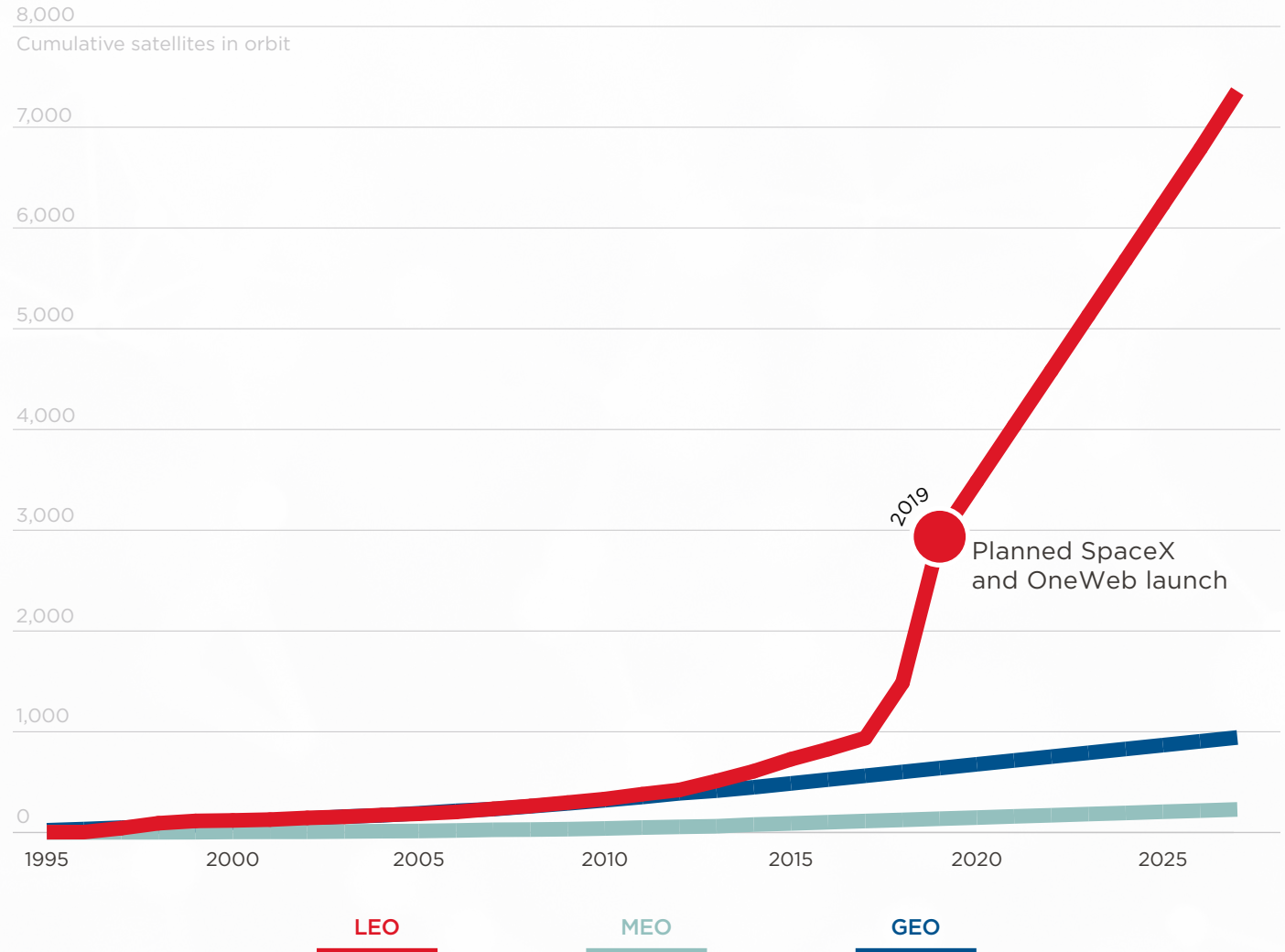
Over a 10-year period, SpaceX and OneWeb alone will at least quintuple the number of satellites in orbit worldwide, massively increasing industry capacity.

This could provide an alternative backhaul option in reaching rural unconnected areas in emerging markets such as Africa. Satellite would be a complement to mobile networks, offering capacity wholesale to operators.

The other area is IoT; existing satellite companies service maritime and logistics companies but new plays are likely to operate at a lower cost model and could displace some of this business and expand IoT connectivity.

Telcos have an interest in making a success of both areas, and the fact SpaceX and OneWeb have garnered strategic investment from companies such as Softbank and Bharti speaks to this mutual objective.

PROJECTED SATELLITES IN ORBIT WORLDWIDE (POST SPACEX + ONEWEB)

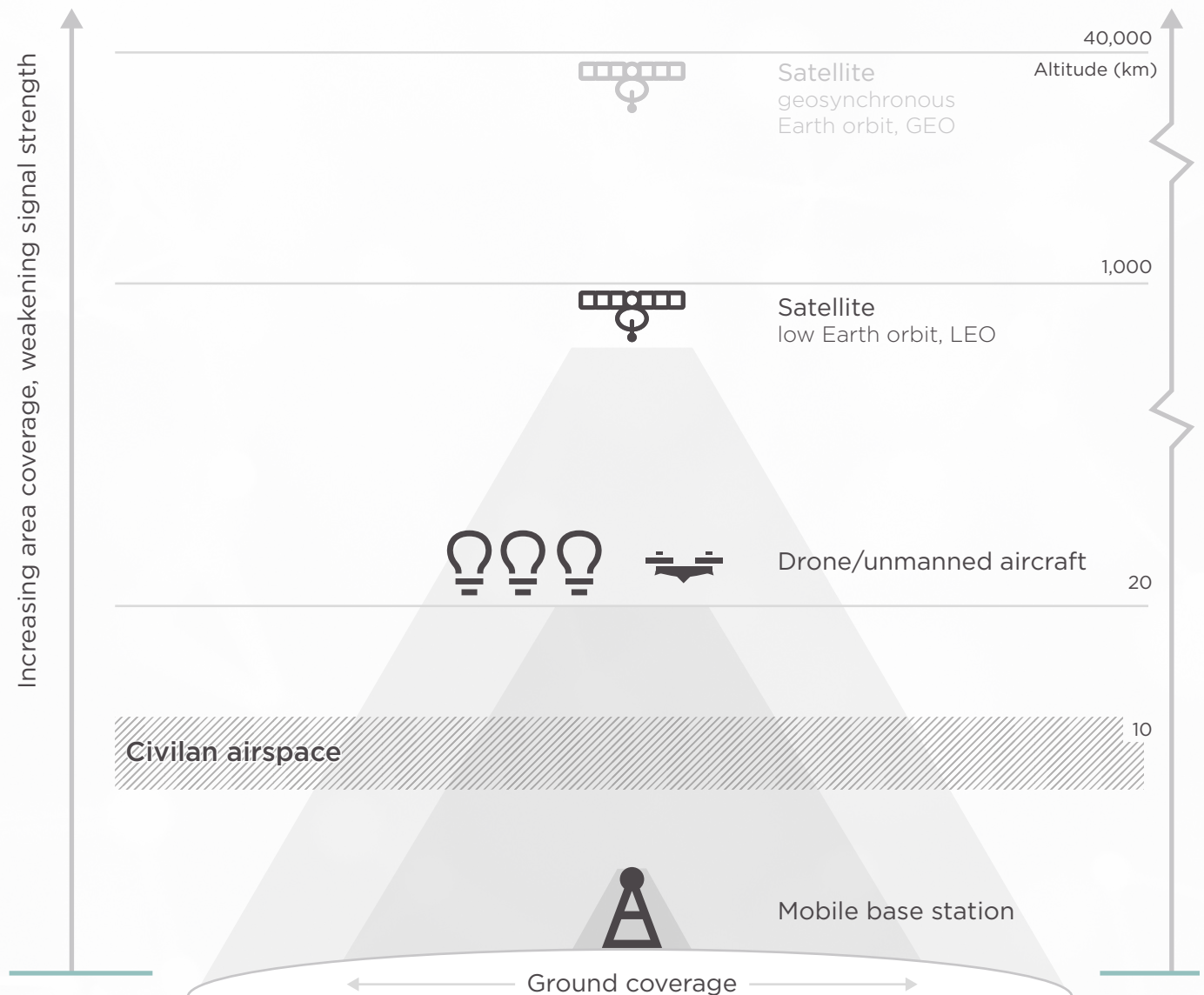


Google's balloon programme is the other play in the sky.

It has now trialled in at least six countries. Improvements in flight time have been made, and it now links with LTE instead of relying solely on WiFi.

Years of effort have, however, yet to result in a single connection.

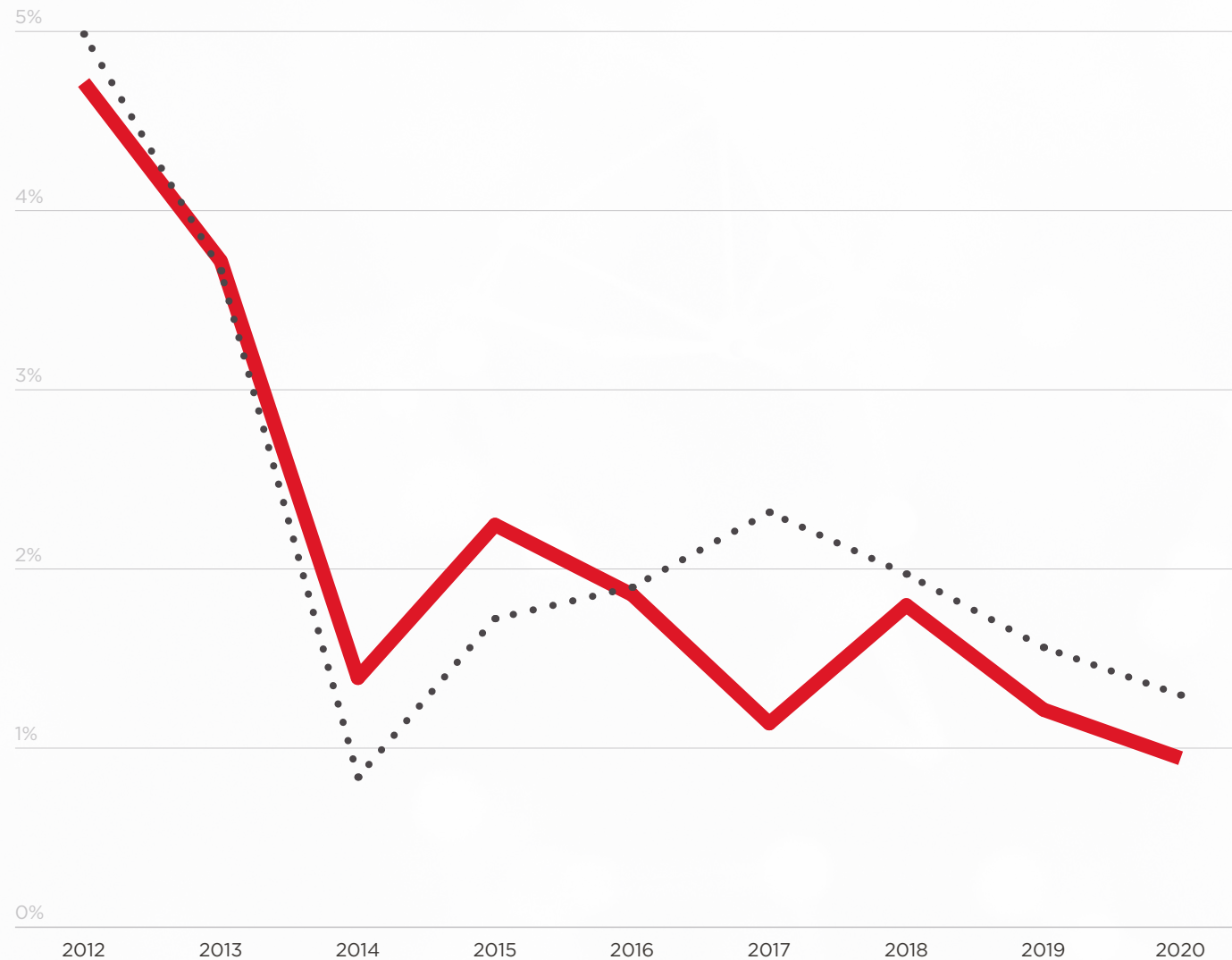
Sri Lanka came closest to commercial deployment before the ITU blocked it earlier in 2017 on risk of spectrum interference.





Financial performance

TOTAL GLOBAL MOBILE REVENUE GROWTH



Note: growth figures are year-on-year
Source: GSMA Intelligence

**Mobile revenue
growth (global)**

**Previous forecast
from 2016**

• • • • •

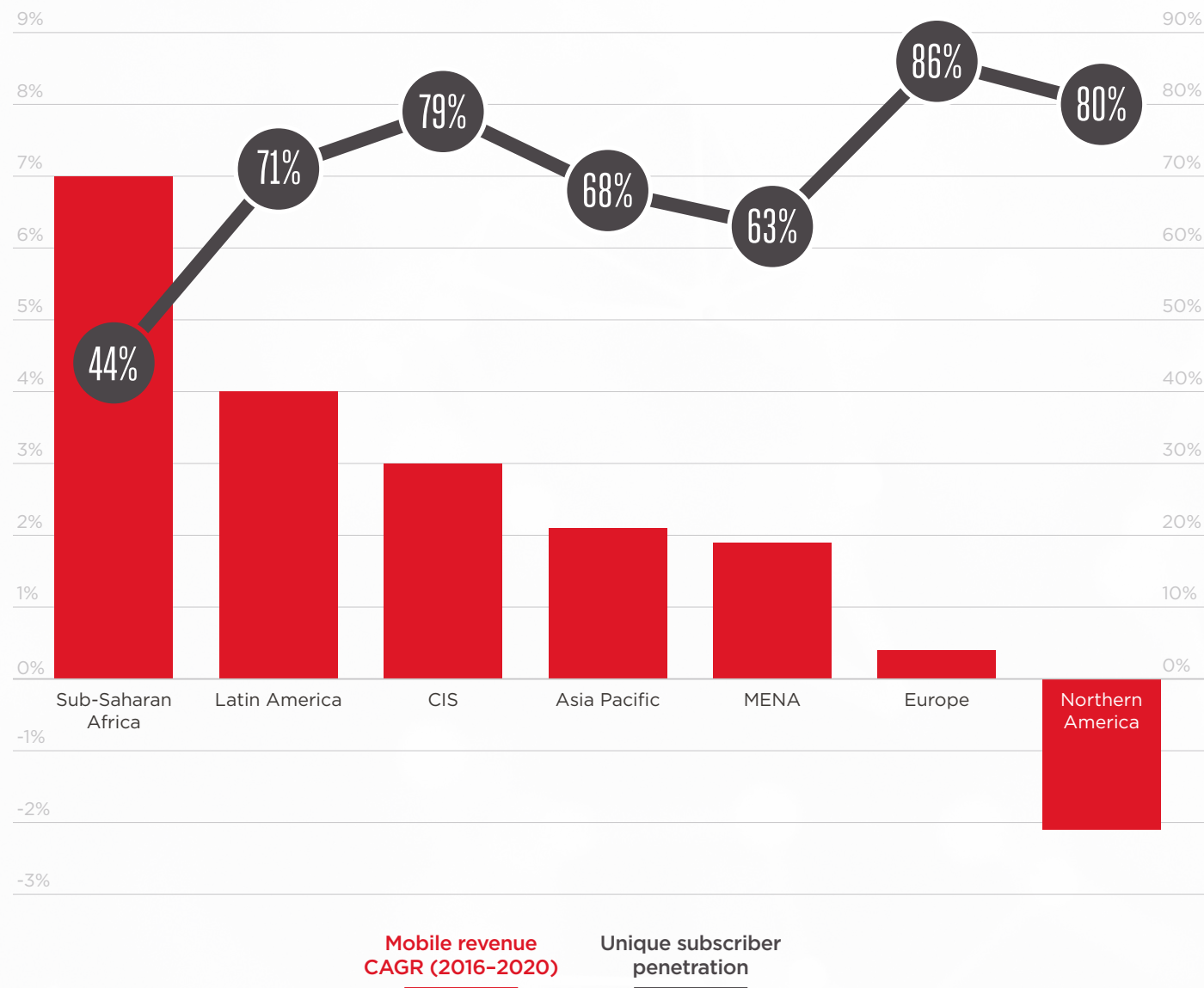
Total mobile revenues reached \$1.06 trillion in 2016, up 2% year-on-year. Our latest forecast for annual mobile revenue growth of between 1-2% globally to 2020 represents a marginal downgrade from our forecast made in 2016, due to a slightly weaker macro-economic backdrop.

Overall, the modest global growth outlook reflects a combination of slowing unique subscriber growth, regulatory intervention and increased competition.

The main question remains the longer term growth story. Data monetisation, competition and execution on convergence all play a role here.

New subscribers still the only obvious route to growth for operators

FORECAST MOBILE REVENUE CAGR (2016-2020) BY REGION WITH SUBSCRIBER PENETRATION RATES



Although global mobile subscriber growth continues to slow, regions where subscriber penetration is lower are forecast to achieve relatively higher revenue growth rates to 2020.

Europe and the US are saturated, with growth prospects much weaker, particularly in the US where competition is fierce.

Moves to become converged telecoms/media companies are bold but it will be some time before any impact on growth becomes evident.

Revenue headwinds in key markets will affect short-term global performance

CHINA AND INDIA



Mobile revenue growth

	2016	2017
China	5%	0%
India	6%	-5%



Key drivers

China has been affected by slowing subscriber growth and regulatory pressures including cuts in long-distance call tariffs and the end of domestic roaming charges.

The launch of Jio in India in September 2016, offering aggressively priced 4G data services, drove adoption but put significant pressure on market prices and hence revenues.

UNITED STATES



Mobile revenue growth

	2016	2017
US	1%	-3%



Key drivers

Competition in the US remains intense, driven by T-Mobile, which continues to gain market share. These competitive pressures have negatively affected sector ARPU levels. It remains to be seen how sustainable the unlimited data plans offered by all four major operators are.

EUROPE



Mobile revenue growth

	2016	2017
Europe	-0.4%	0.3%



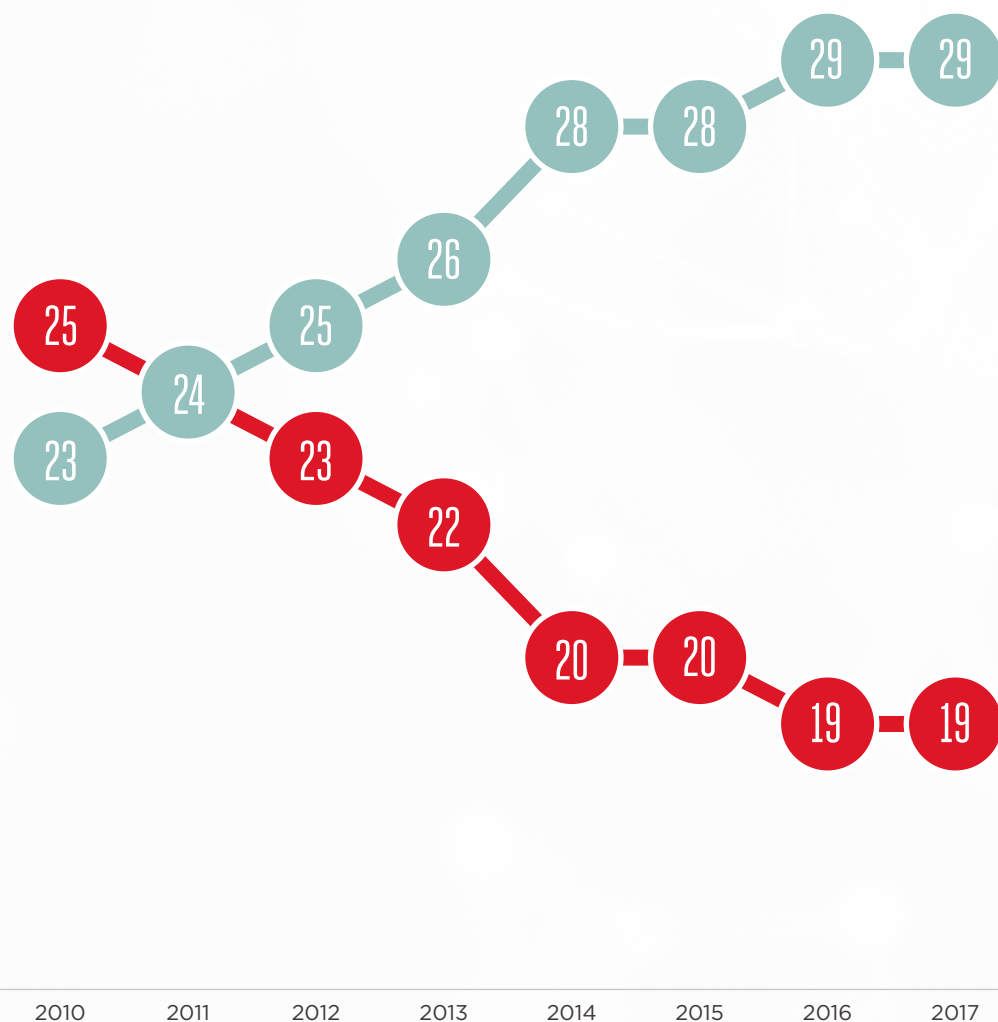
Key drivers

The European mobile sector is benefitting from a lessening regulatory impact (MTRs), in-market consolidation, the shift towards higher 4G data usage across the region and an improved macro-economic performance.

The recovery in Spain is particularly noteworthy, as revenue growth rebounded in 2016 to grow 5%, following years of decline, and is forecast to achieve low single-digit growth to 2020.

An improved growth outlook in Europe follows a period of consolidation

NUMBER OF EUROPEAN COUNTRIES SPLIT BY NUMBER OF LIVE OPERATORS



European countries with 3 or fewer operators

European countries with 4 or more operators

Note: excludes MVNOs

IMPACT OF NETWORK LAUNCHES, CLOSURES AND MOBILE MERGERS IN EUROPE

	From 3 to 4 mobile operators	From 4 to 3 mobile operators
2011		Portugal
2012	France, Netherlands	Estonia, Liechtenstein, Switzerland
2013		Austria
2014		Germany, Ireland
2015	Slovakia	Norway
2016		Italy

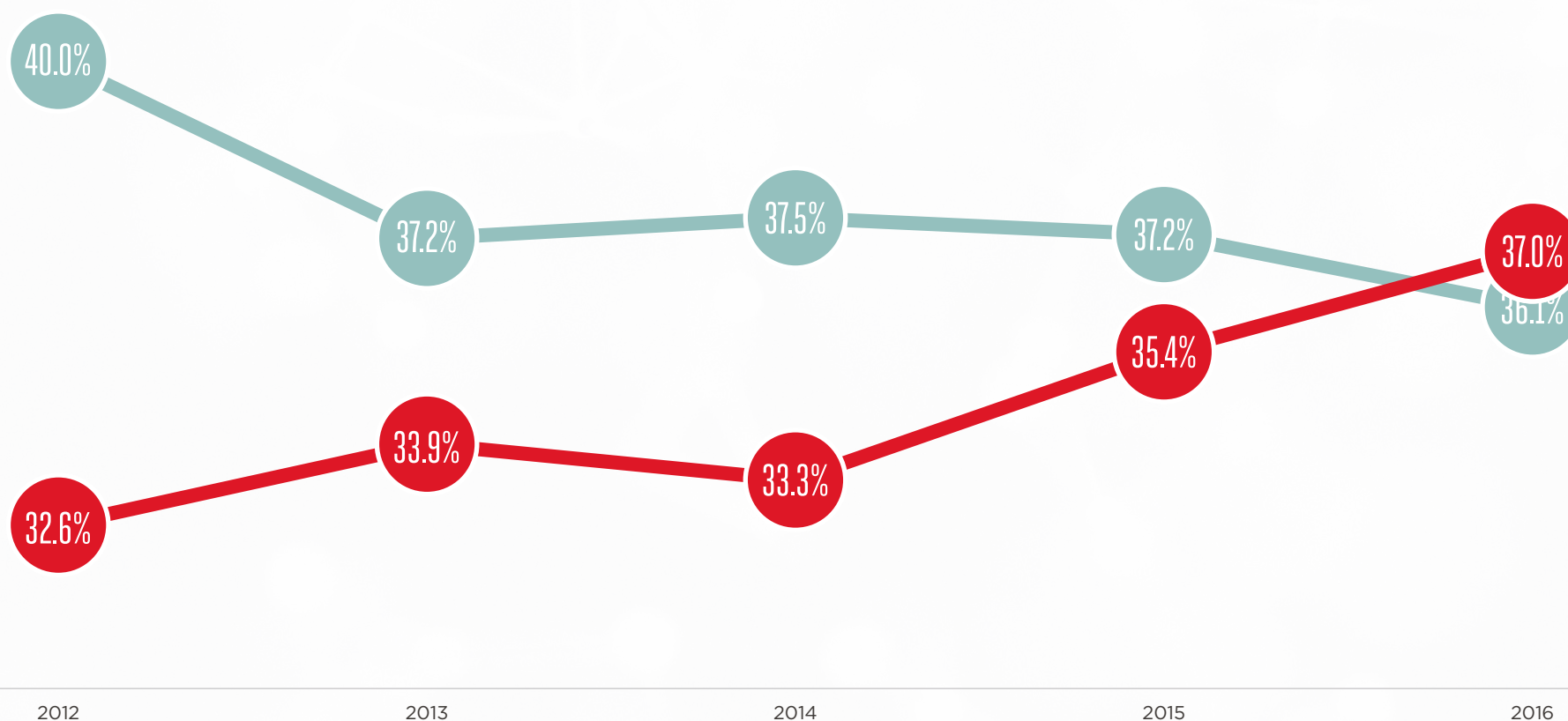
Since 2010 around 20 European mobile operators have either merged or closed, which has resulted in an increase in the number of countries with three or fewer operators, helping to provide a more sustainable competition environment.

EBITDA margins converge, developed world now ahead

Margins in the developed world are benefitting from improving growth outlook, consolidation and a focus on cost cutting. Completion of 4G rollouts and moves away from handset subsidies also allow operators to better control costs.

Margins in the developing world remain under pressure reflecting growth and competitive challenges, increased regulatory action and ongoing network investments to roll out 4G.

EBITDA MARGIN



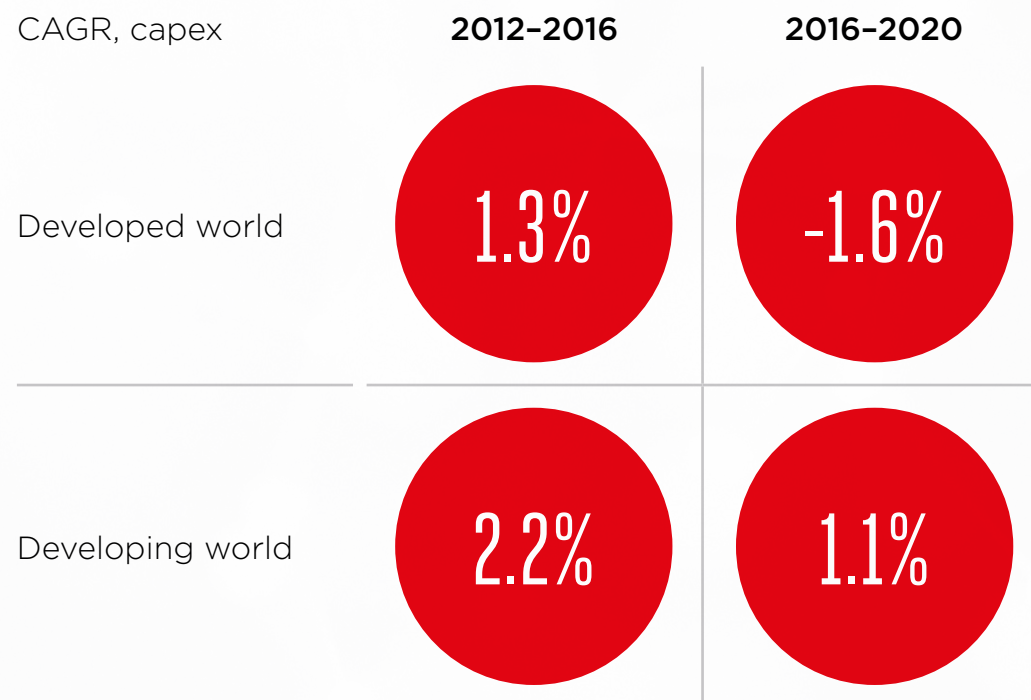
Mobile industry capex has peaked for 4G but 5G is still to come post-2020

With 4G coverage now almost at 3G levels, operators in developed markets are focusing their investments on LTE upgrades and network densification to generate additional revenues from rising data traffic.

There is also an increased focus on investment in fibre networks, which can backhaul data and provide a competitive edge in the move to 5G, as well as giving operators the opportunity to offer converged products.

In developing markets, operators are still investing in increasing coverage and capacity of their 3G and 4G networks.

The slowdown in developing market capex is almost entirely due to China's 4G rollout being largely complete.

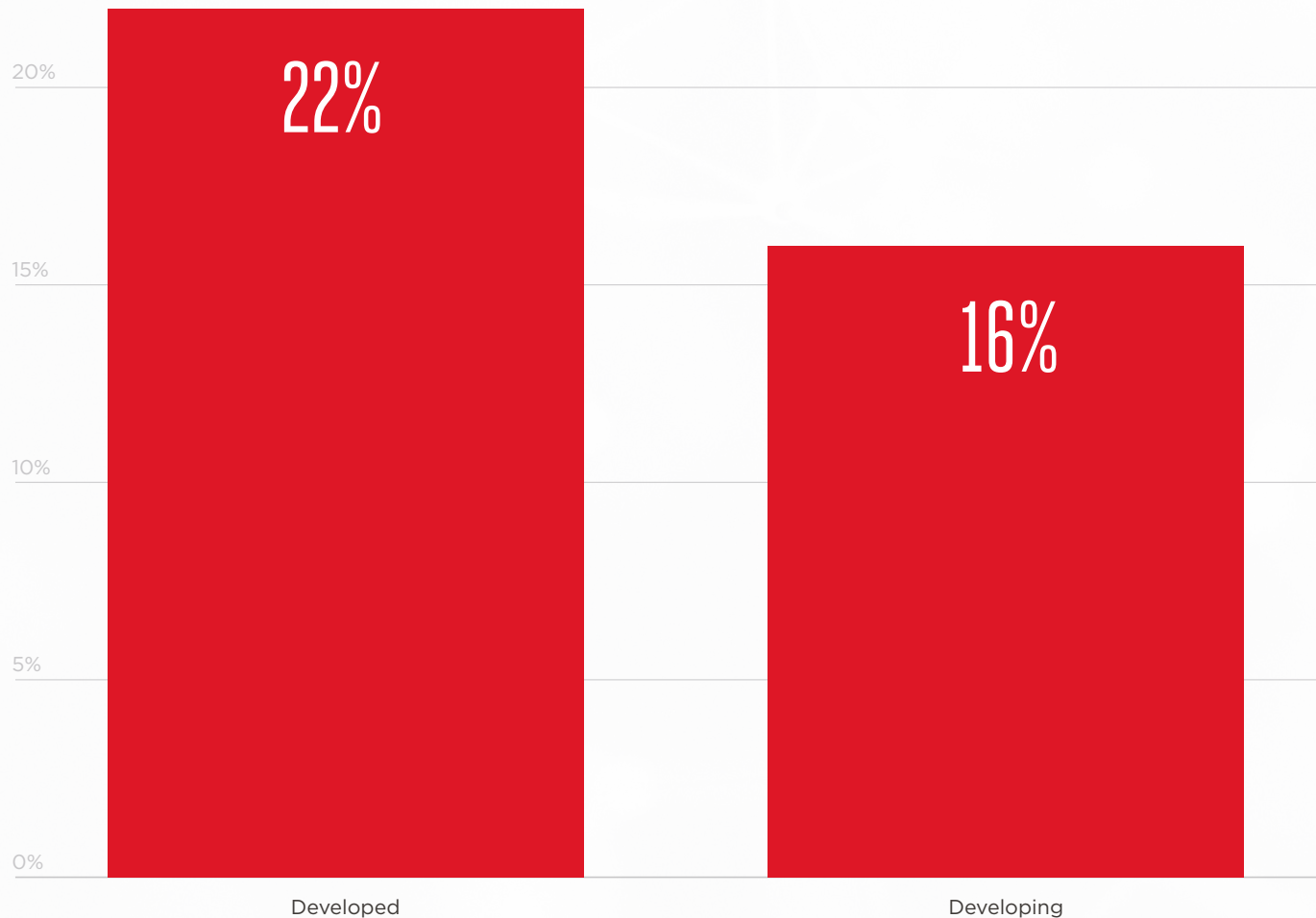


4G tech cycle continues to apply pressure on developing world OFCF

OPERATING CASHFLOW MARGINS (2016)

25%

Share of mobile revenue



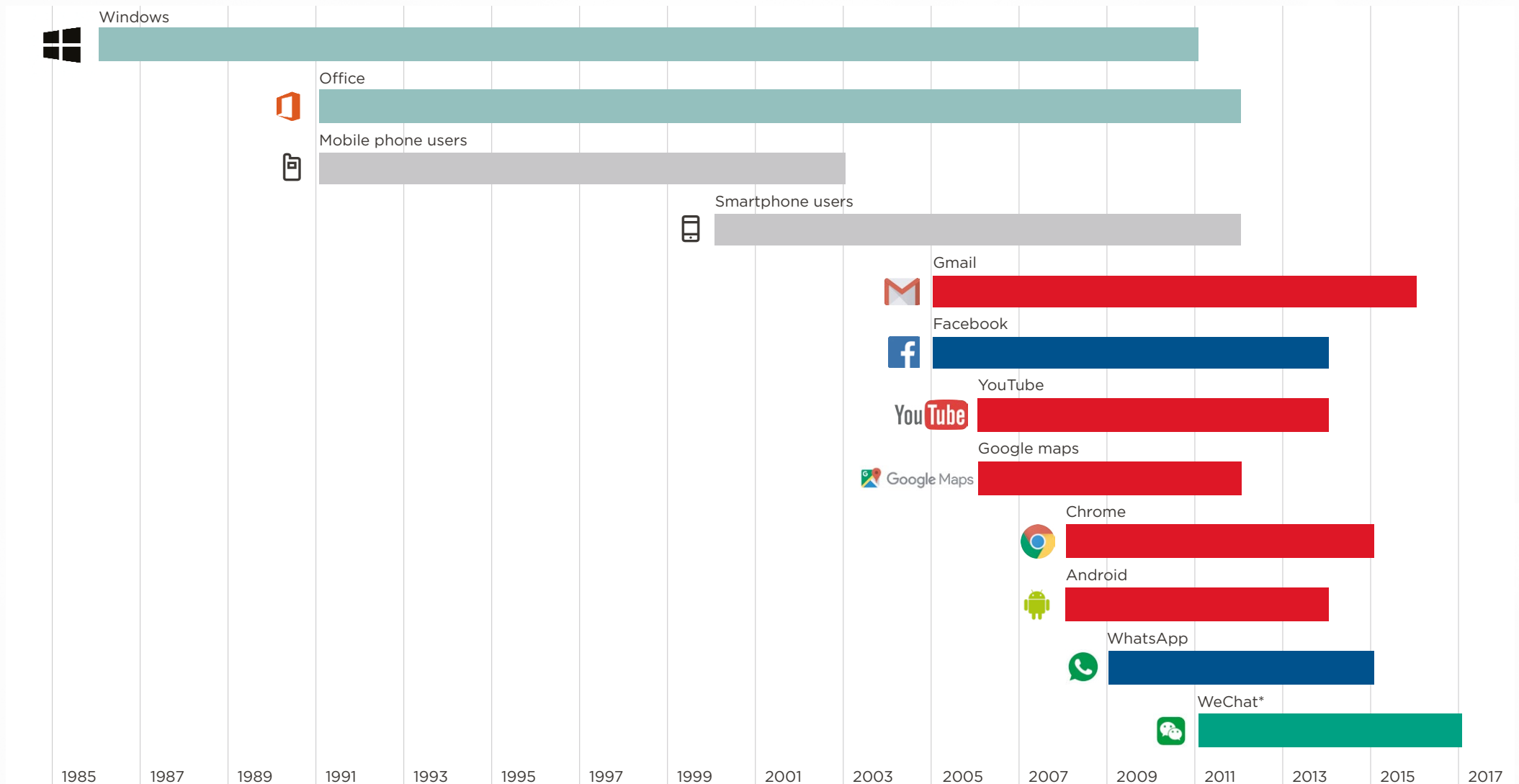
OCF margins are significantly lower in the developing region, mainly due to the capex constraints from network expansion.

Higher capex/sales offsets the improving EBITDA margin trends.

Operators in developed markets have largely completed their 4G rollouts, while operators in developing markets have room to grow in both 4G population coverage and capacity.

Competitive landscape and cross-sector competition

NUMBER OF YEARS TO REACH 1 BILLION USERS



*Expected in 2017

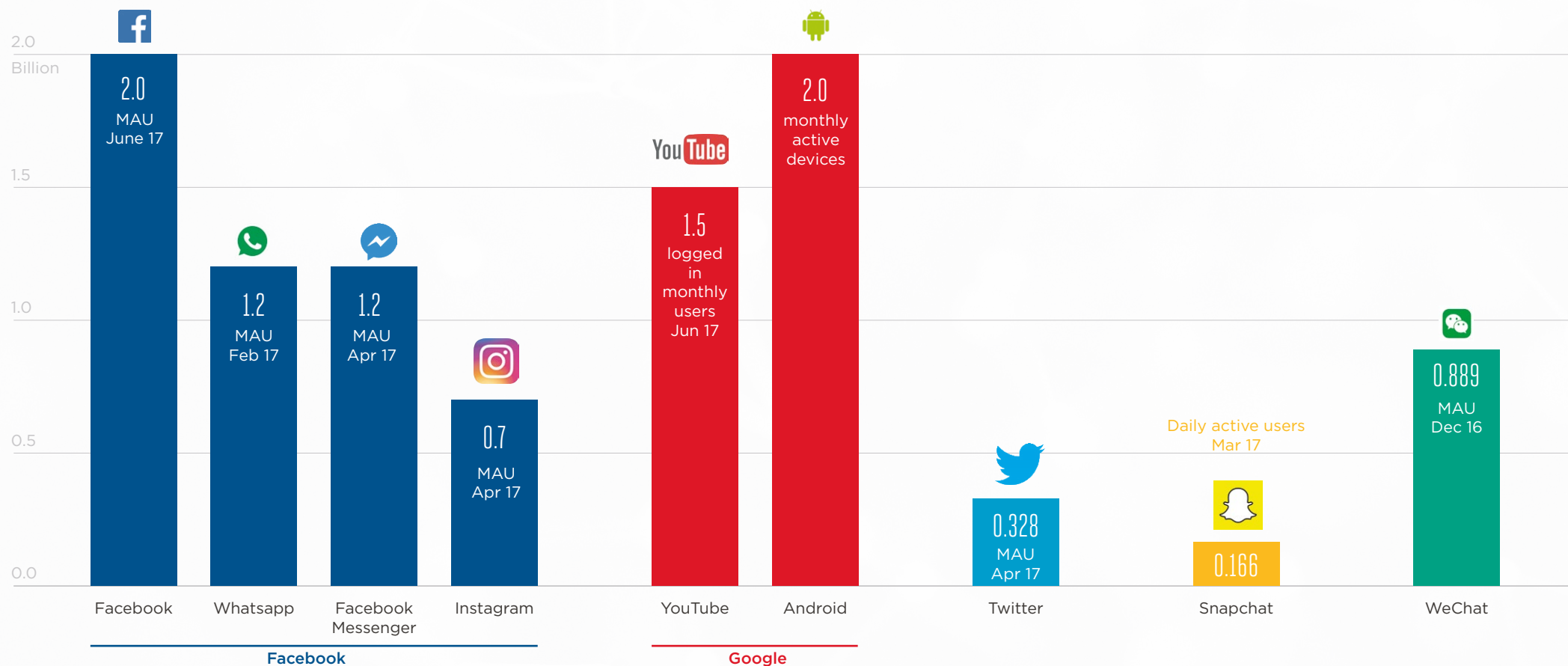
Source: reproduced based on Visual Capitalist. Mobile phone and smartphone users have been added

The era of digital platform 'conglomerates' has begun

Facebook and Google are now digital conglomerates, with at least one core 1 billion+ platform buttressed by others that serve different use cases.











WeChat is a single 'life platform' that offers anything from messaging to e-commerce to maps to taxi bookings.

The common denominators are that a) scale is power, and b) everyone is competing for consumer engagement time.










Source: company reports, GSMA Intelligence

EMERGING

INVESTMENT	HEALTH	LEARNING	ARCHITECTURE	HOME SECURITY
Brokers ↓ Crowd + AI	In person ↓ Online	Classroom ↓ Virtual	Drawings ↓ 3D VR	Security guards ↓ Real time cameras
 	 PUSH DOCTOR 	 	 	 

MATURE

TRANSPORT	ENERGY	FOOD	HOTELS	RETAIL	FITNESS
Hail ↓ Tap	Analogue supply chain ↓ Digital supply chain	Centralised ↓ Distributed	Hotels ↓ Platforms	Physical ↓ Digital	'Run & hope' ↓ Data driven
 	 	 	 	  	 

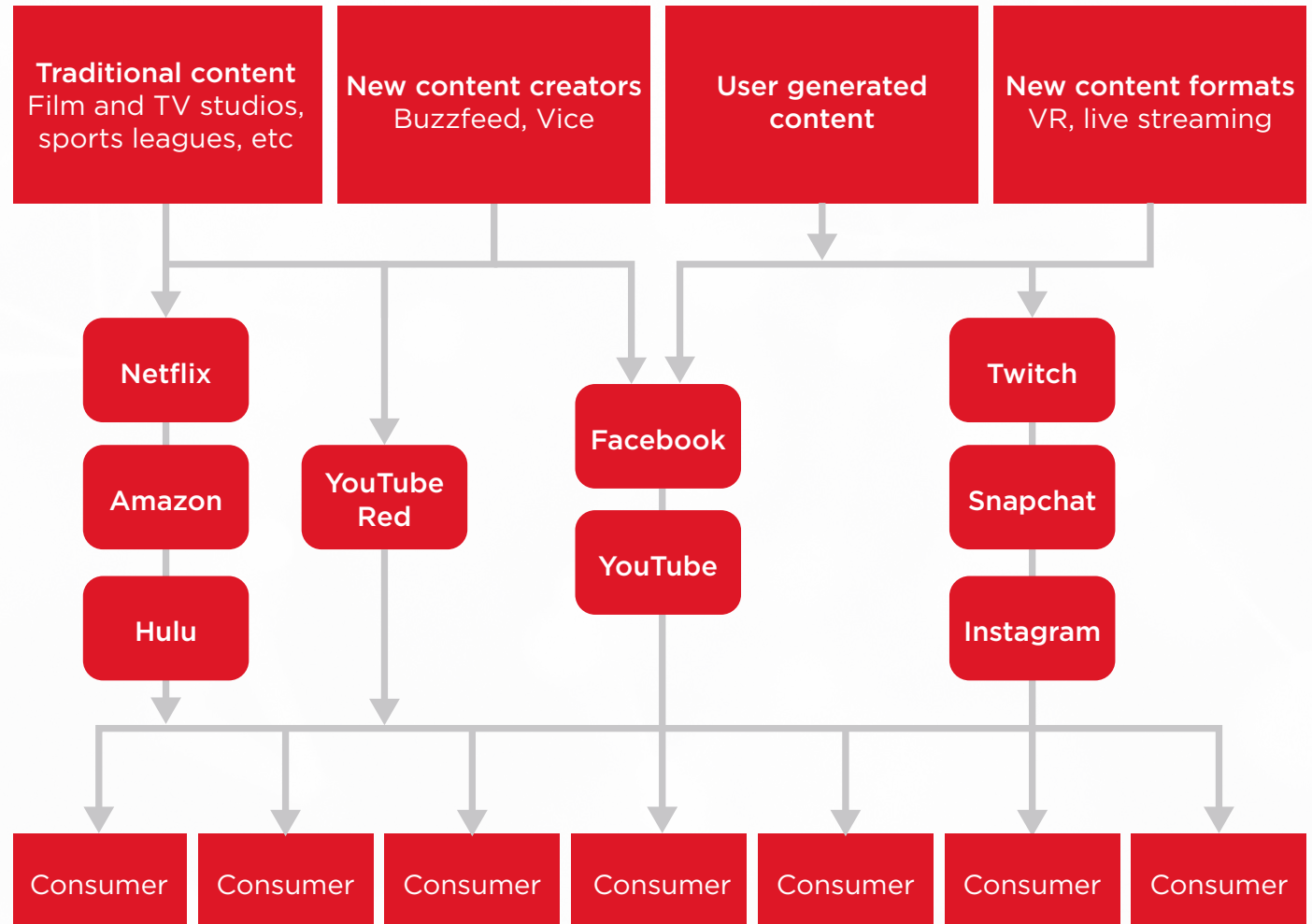
Video is becoming a focal point of competition between telcos and OTTs

Online has effectively formed an entire video ecosystem in parallel with traditional distribution (cable, satellite, IPTV).

OTTs are winning in consumption model (Netflix SVOD) and new formats (self-generated, live).

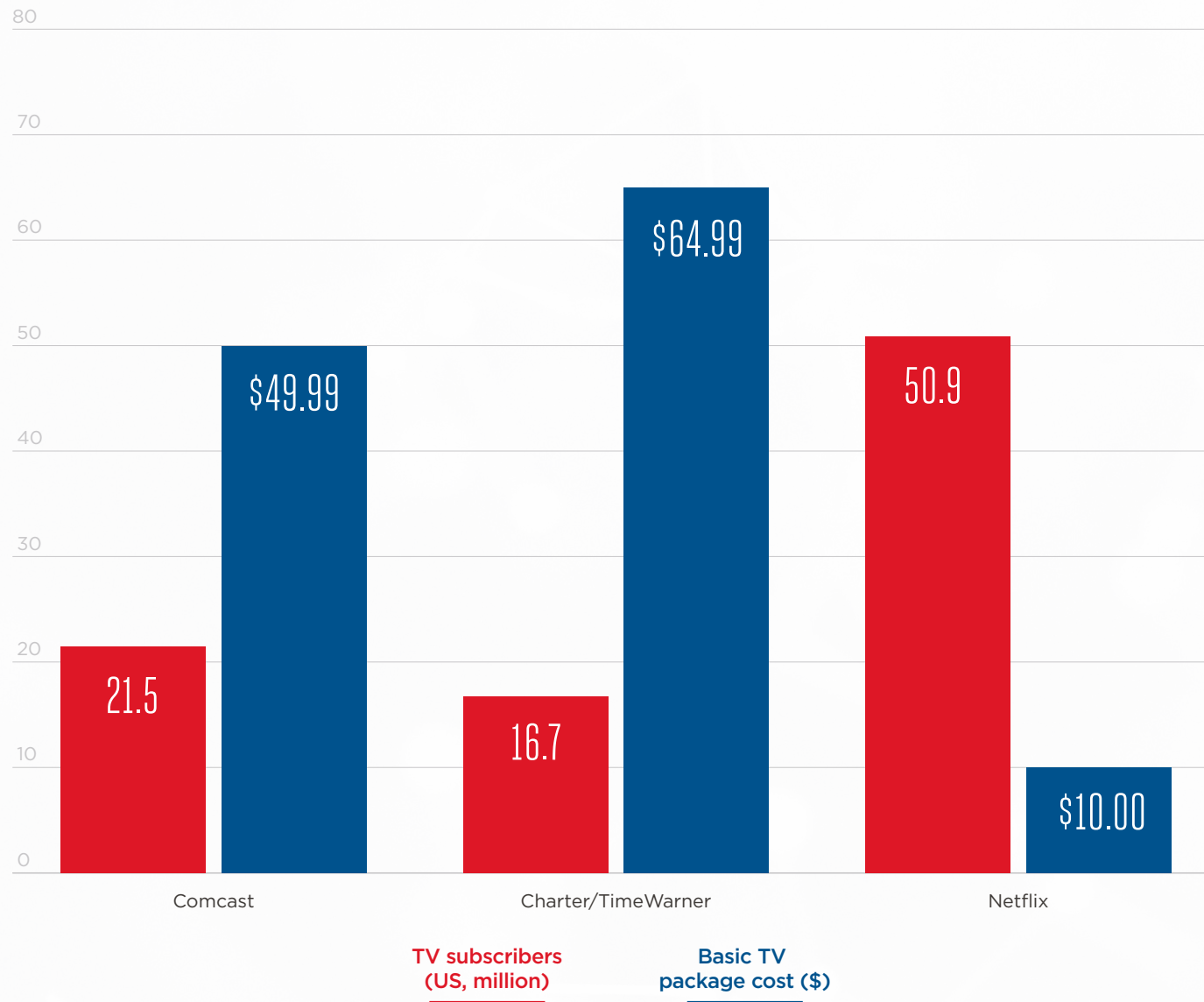
The next iteration of video will involve more immersive user experiences such as 360-degree video, though VR is more uncertain.

ONLINE VIDEO ECOSYSTEM



This continues to put pressure on traditional video distribution

NETFLIX IS 20% OF THE COST OF CABLE TV (US FIGURES)



The priority is scale and seamless access of content for consumers across multiple devices. The differences come in *how* to offer that.

Cable, DSL and satellite distribution is under pressure as consumers, especially millennials, demand premium content without the contract lock-in.

This goes to the heart of what a modern telco looks like, with increasing signs of them becoming converged media and communications companies.

TMT M&A continues as route to diversify from pure comms

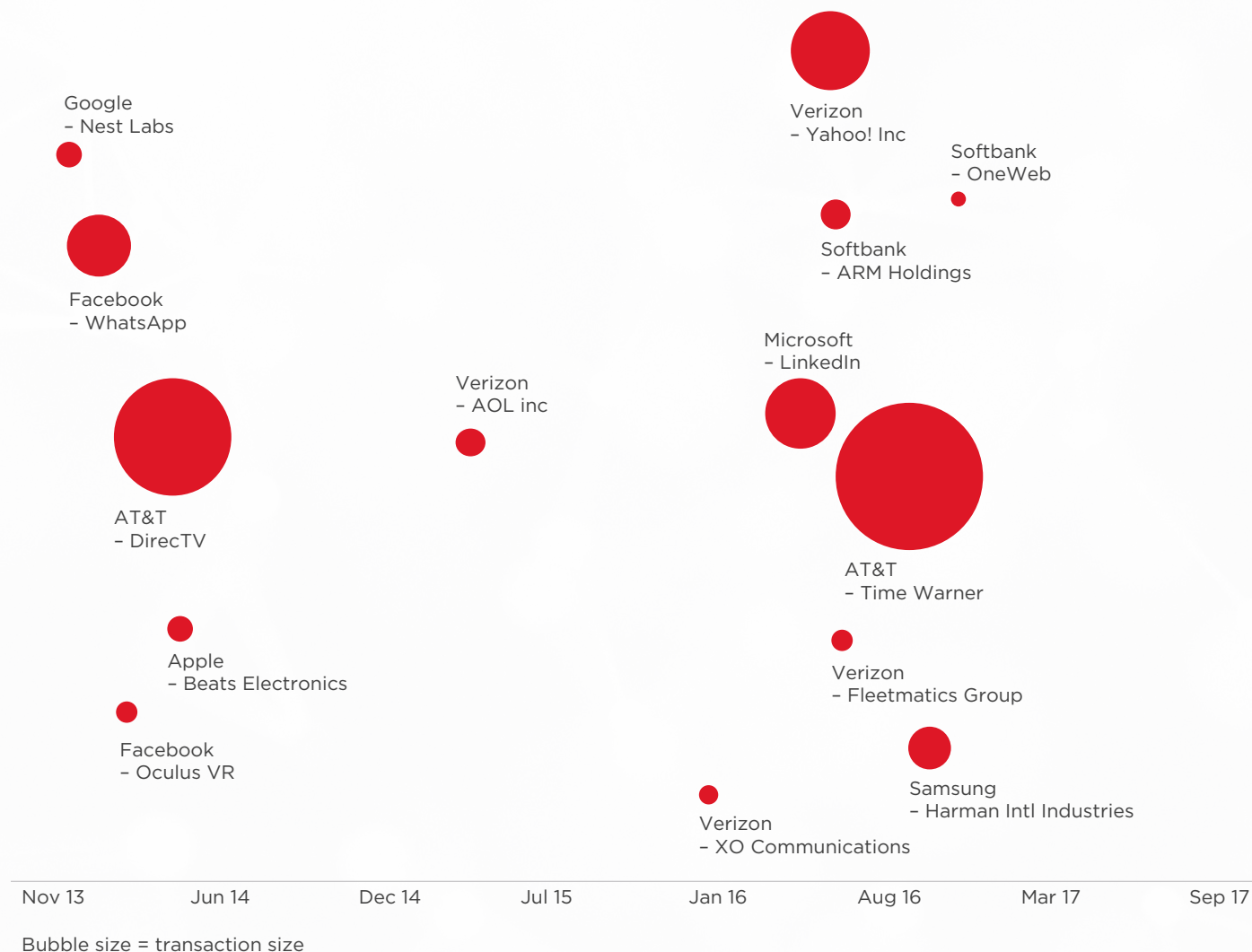
The proposed AT&T/Time Warner acquisition, valued at almost \$100 billion, could represent a watershed moment in major cross-sector TMT mergers.

Verizon's acquisitions of AOL and Yahoo underline its shift towards becoming a converged TMT operator.

In Europe, Vodafone is converged in most of its markets, as are national incumbents in each of the top five European countries.




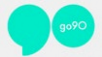



Softbank meanwhile is one of a number of companies using M&A to support its IoT and future network ambitions through acquisitions including ARM and OneWeb.

SELECT CROSS-SECTOR M&A DEALS (\$1 BILLION+)



Telecoms and media convergence has many flavours

CONVERGED TMT COMPANIES IN THE US AND UK

	Country	Mobile	Fixed broadband	Pay TV	Content and media	IoT
AT&T	US			 DIRECTV	TimeWarner	
Verizon	US	verizon✓	verizon✓	verizon✓ 	YAHOO! Aol.	verizon✓
T-Mobile	US	T-Mobile				
Sprint	US	Sprint 				
Comcast*	US	verizon✓	 COMCAST	 COMCAST	 COMCAST	
Charter*	US	verizon✓	 Charter Time Warner Cable	 Charter Time Warner Cable		
BT	UK					
Sky*	UK	O ₂				

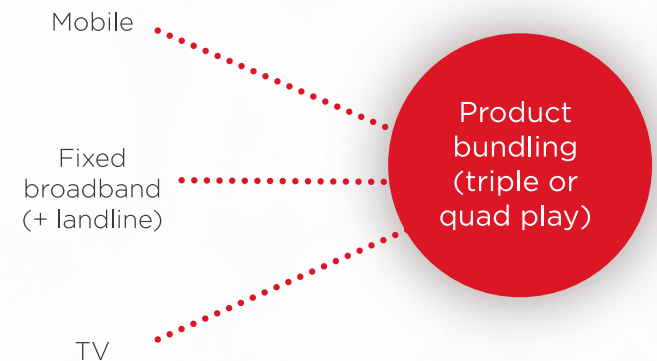
Product bundling can have mixed consequences

Quad play (fixed voice, broadband, TV and mobile) has been tried in several countries but to date this has been successful in only a limited number of markets.

Spain is the largest market with appreciable take-up, with an estimated 26% of households on a quad-play package as of 2016.

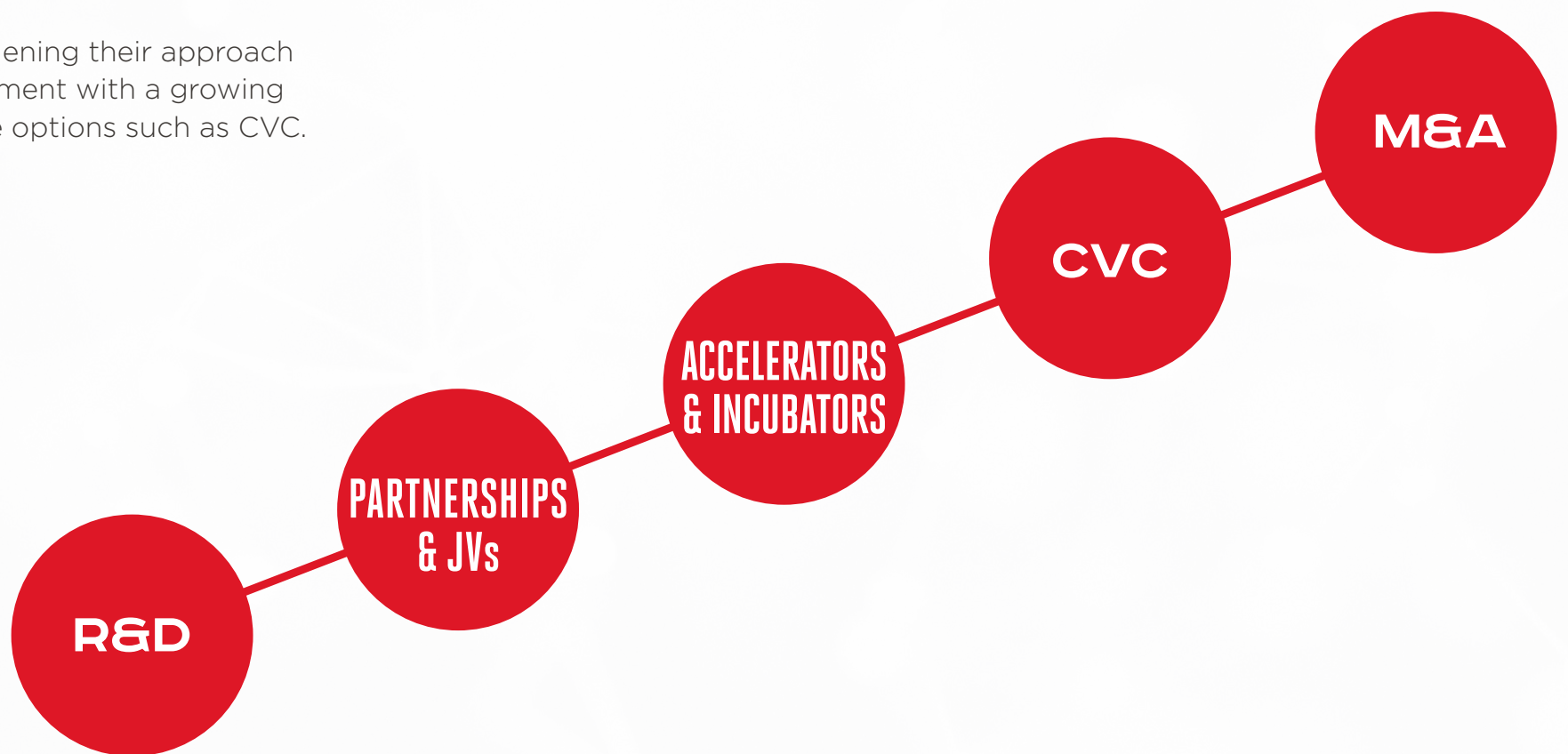
Portugal, Belgium, France and the Netherlands are also high adopters, but the UK and Germany have seen much lower traction.

Even where take-up is high, bundling has mixed consequences; the positive is a revenue mix that is less vulnerable to churn; the negative is that success has required heavy price discounting.



Future businesses take time to nurture; corporate venture capital on the rise

Operators are broadening their approach to business development with a growing focus on early-stage options such as CVC.



Inorganic

Organic

Objective

Feed company product or service pipeline

Industry collaboration

Testing environment for early-stage start-ups

Investment in start-ups

Strategic acquisitions and disposals

Investment round (approximate)

Variable, part of company P&L

Variable

Under \$250k

\$2-30m

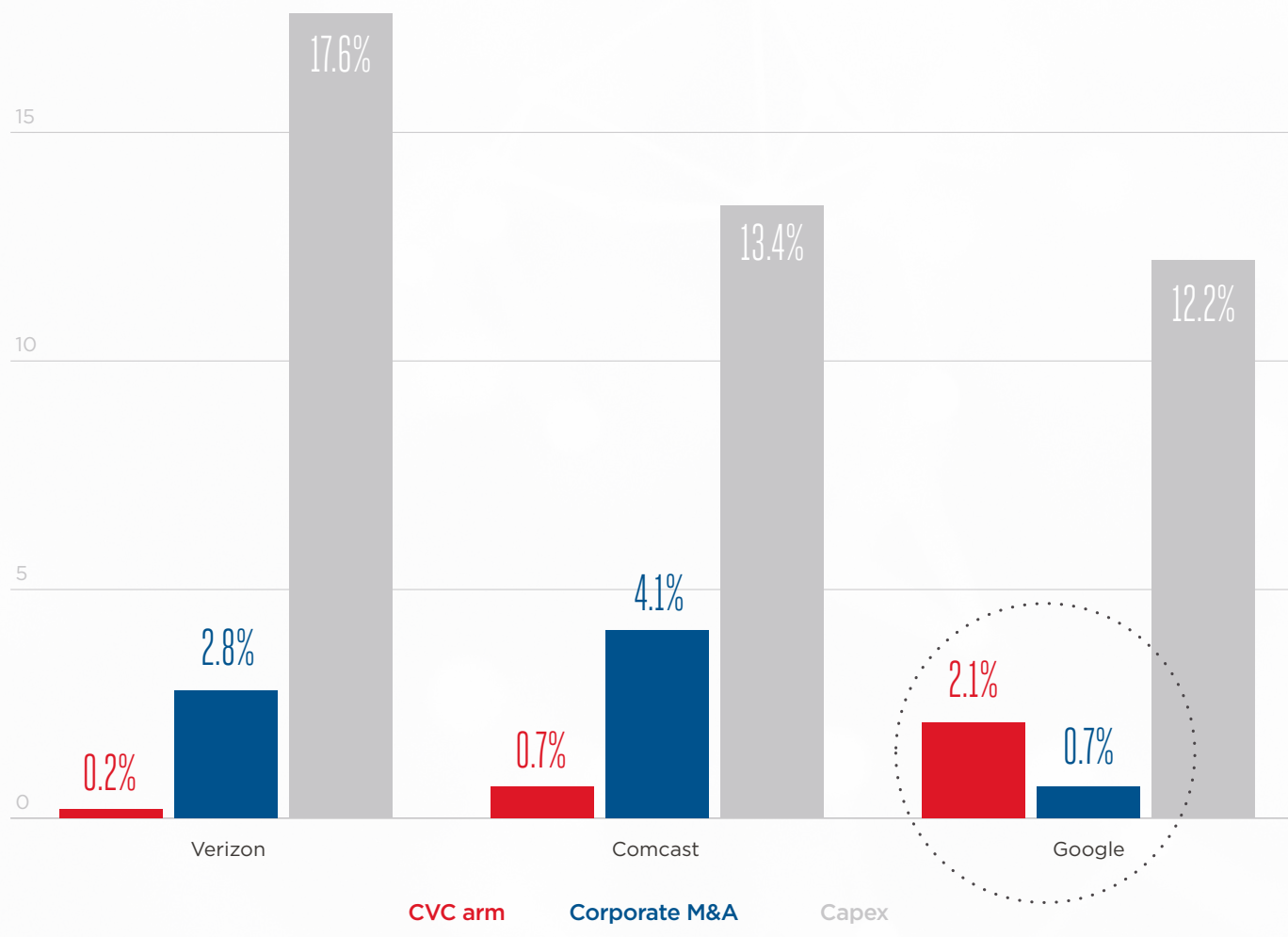
\$100m+

Google prioritises high volume of bets on small companies

INVESTING IN 'SEEDS' OF GROWTH AS OPPOSED TO READY-MADE BUSINESSES

20

Share of group revenue



CVC, alongside R&D, is conveyed *and seen* as part of Google's core business – the fact it is loss making is not the point.

The relationship is the opposite for Verizon and Comcast, which spend much more on M&A (3–4% of revenues). This is starting to change; the key point is whether smaller scale investment and business building has management commitment to be sustained.

Note: figures aggregated for 2015 and 2016
Source: Thomson Reuters, CB Insights, GSMA Intelligence

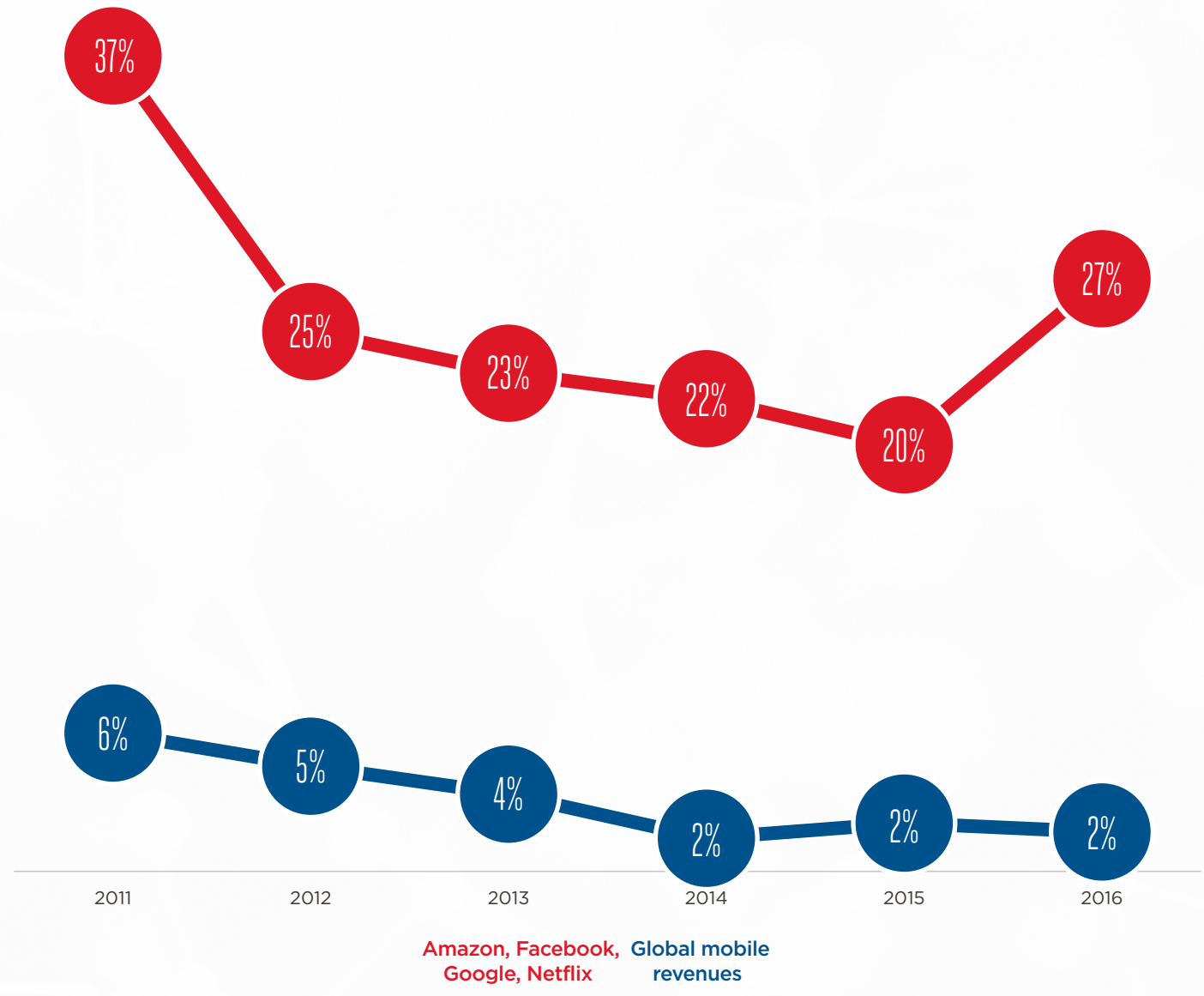
Tech still outgrowing telecoms by a big margin

The growth premium is not hard to understand when looking at long-term revenue growth trends.

Amazon, Facebook, Google and Netflix have posted aggregate revenue growth of 20–30% per year since 2011.

Amazon in particular has defied traditional thinking about the need for profitability, with investors sanguine about sacrificing profits as long as growth continues.

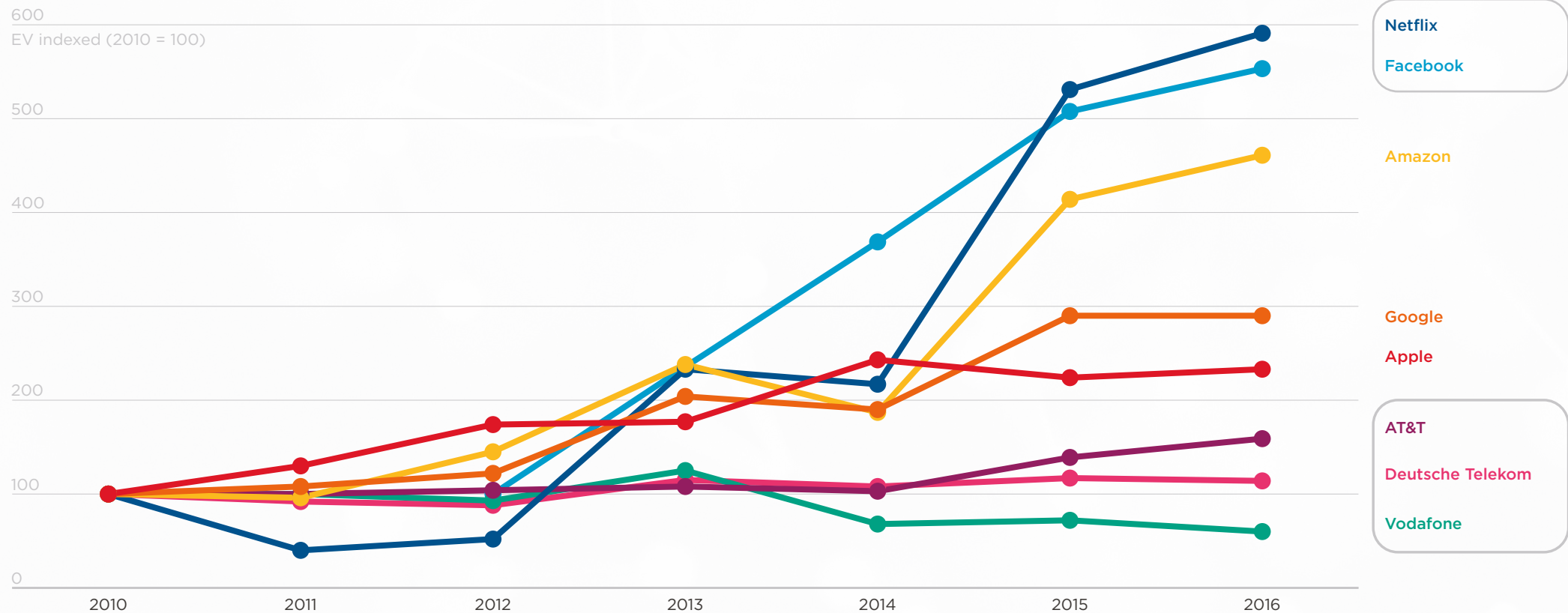
REVENUE GROWTH: TECH VERSUS TELECOMS



It remains to be seen whether converged telco-media plays have a long-term positive impact on growth. So far, investors have yet to price in a growth premium.

This contrasts with tech: Apple, Google, Amazon, Facebook and Netflix have collectively gone up 3.5× in enterprise value (EV) terms since 2010.

INDEXED ENTERPRISE VALUE



Note: EV data as of 5 July 2017. Source: Thomson Reuters Eikon, company data

Regional view

Europe

North America

China

India

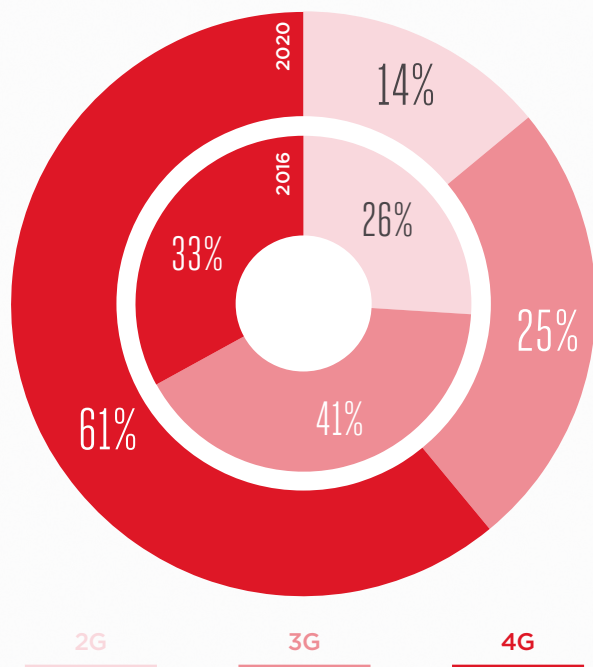
Asia

Latin America

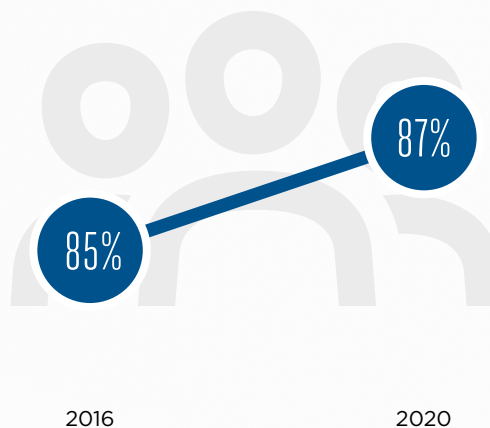
Sub-Saharan Africa

Middle East and
North Africa

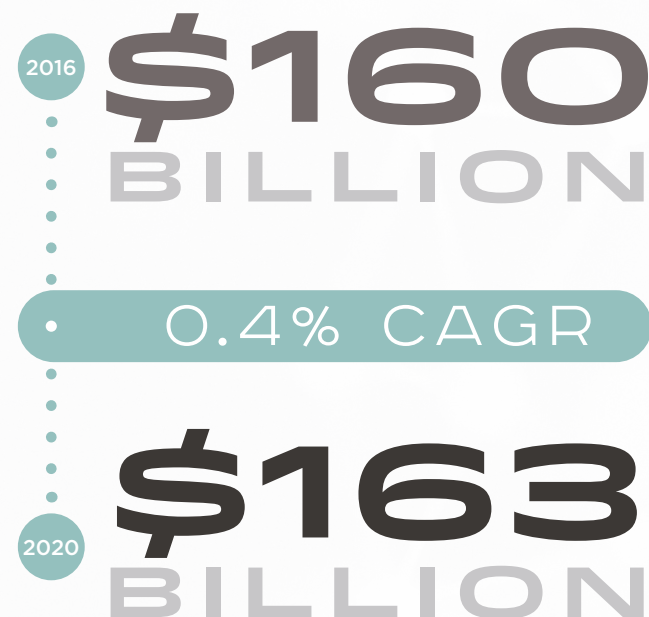
TECHNOLOGY MIX



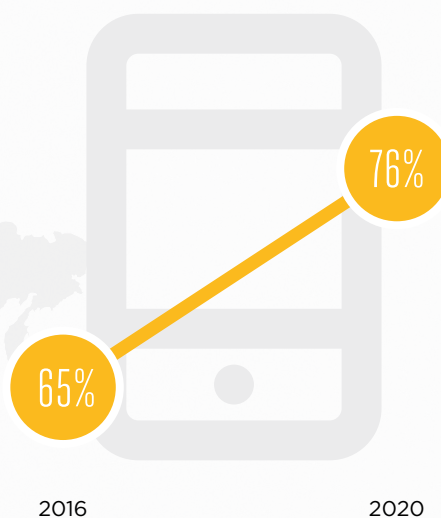
SUBSCRIBER PENETRATION



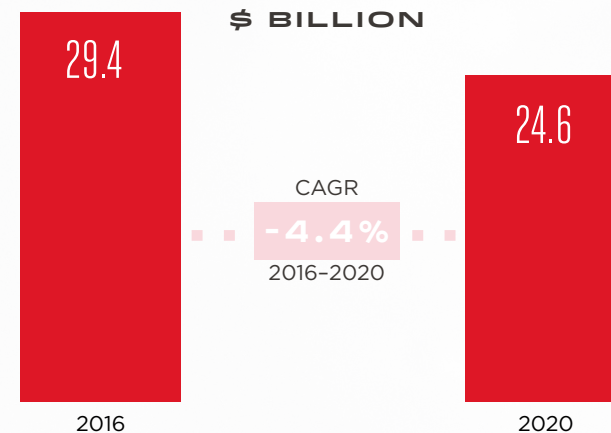
OPERATOR TOTAL REVENUES



SMARTPHONE ADOPTION



CAPEX \$ BILLION



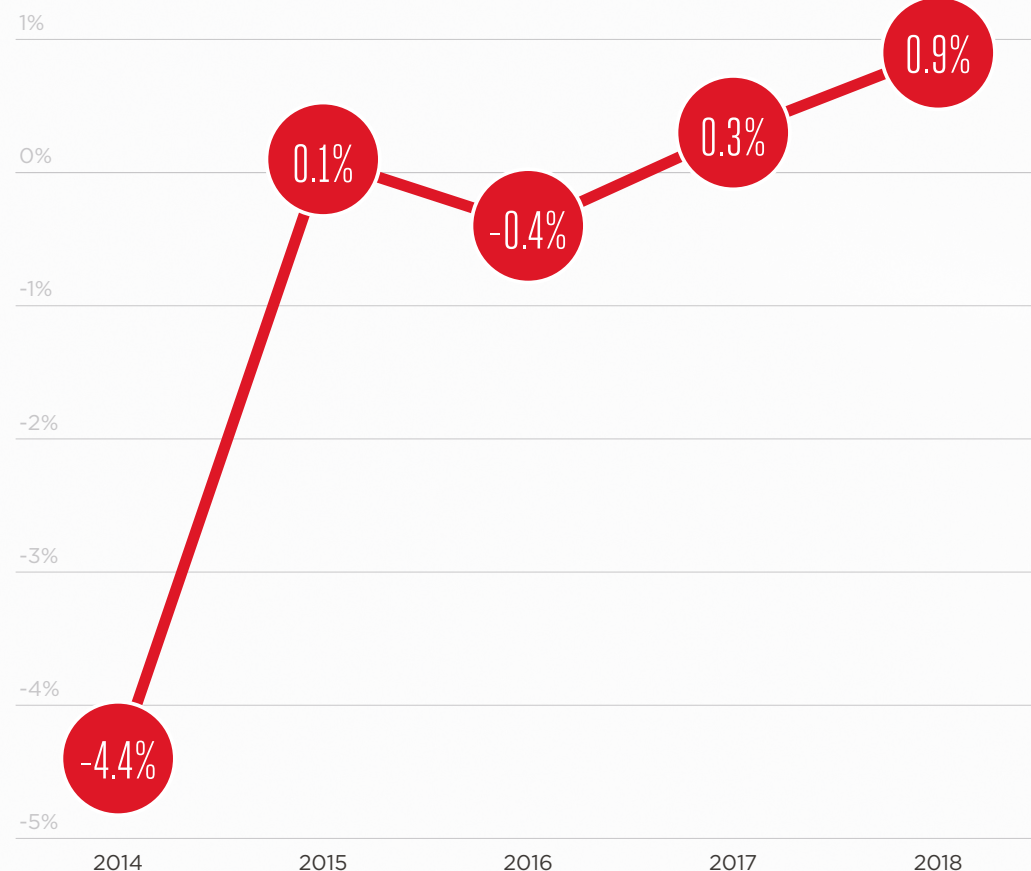
European mobile industry revenue recovers into positive ground

European mobile revenue growth is turning positive after years in negative territory, helped by a slowly improving economic environment and continued shift to higher usage 4G tariffs.

Data growth and continued migration to contract tariffs are driving ARPU stabilisation

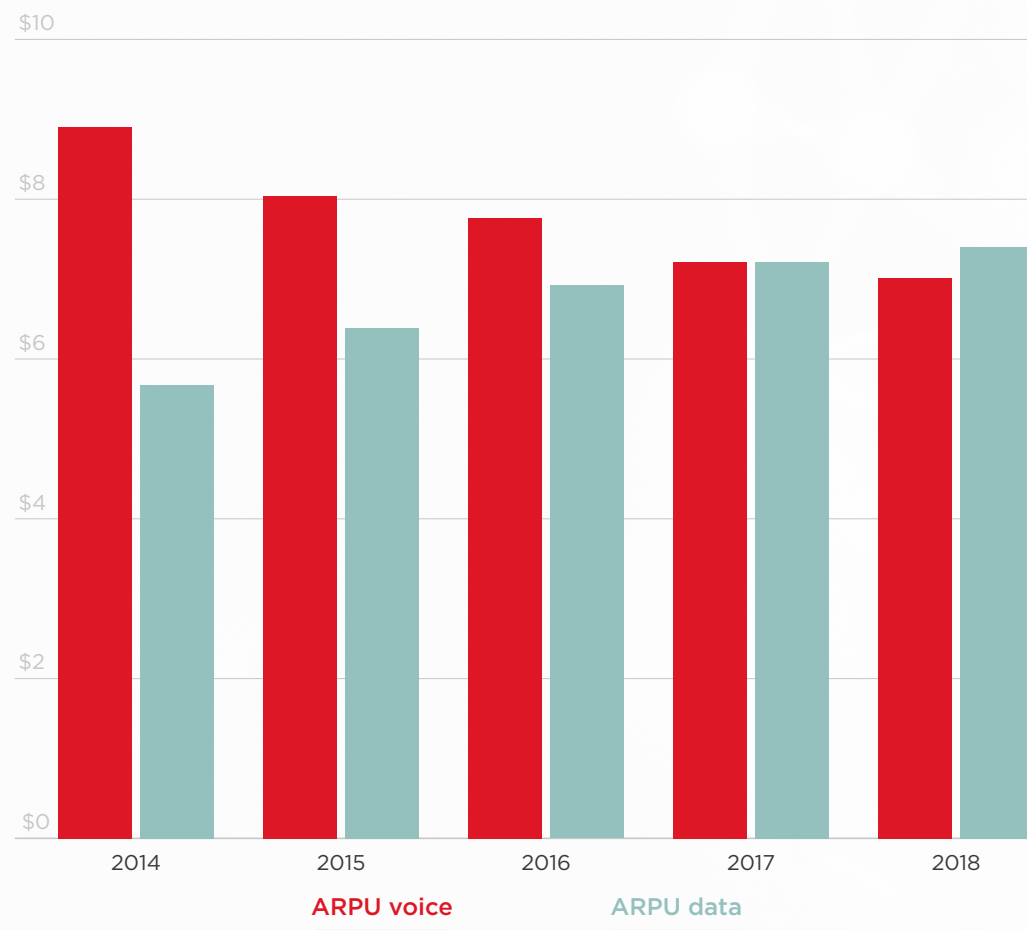
However, there are rising concerns over the sustainability of unlimited data plans.

MOBILE REVENUE GROWTH (YEAR-ON-YEAR)



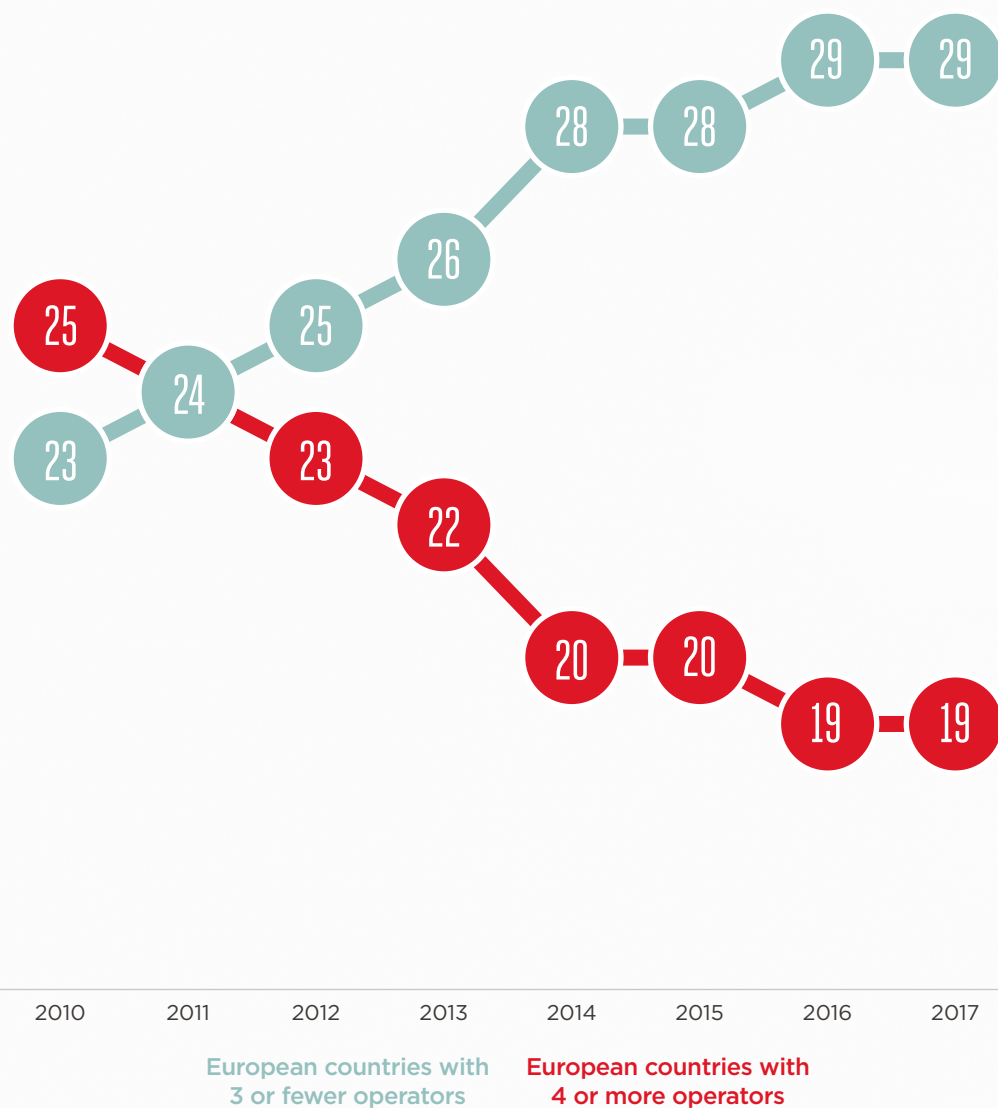
Source: GSMA Intelligence

ARPU EVOLUTION (EUROPEAN AVERAGE)



An improved growth outlook in Europe follows a period of consolidation

NUMBER OF EUROPEAN COUNTRIES SPLIT BY NUMBER OF LIVE OPERATORS



Note: excludes MVNOs

IMPACT OF NETWORK LAUNCHES, CLOSURES AND MOBILE MERGERS IN EUROPE

	From 3 to 4 mobile operators	From 4 to 3 mobile operators
2011		Portugal
2012	France, Netherlands	Estonia, Liechtenstein, Switzerland
2013		Austria
2014		Germany, Ireland
2015	Slovakia	Norway
2016		Italy

Since 2010 around 20 European mobile operators have either merged or closed, which has resulted in an increase in the number of countries with three or fewer operators, helping to provide a more sustainable competition environment.

High levels of competition are driving operators in some markets to push for pre-standard 5G launches.

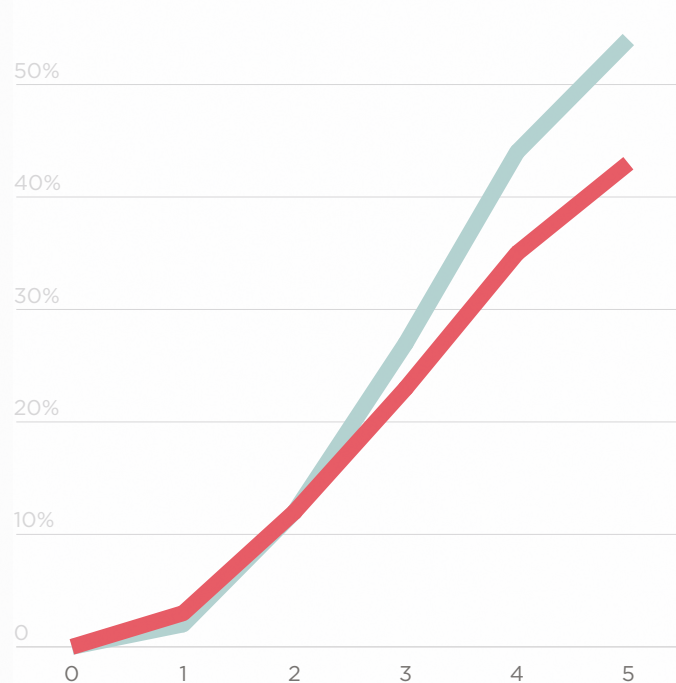
Challenges in Europe include lower 4G penetration, fibre penetration and spectrum availability.

The EC is looking to promote early 5G deployments by addressing spectrum availability and encouraging collaboration.

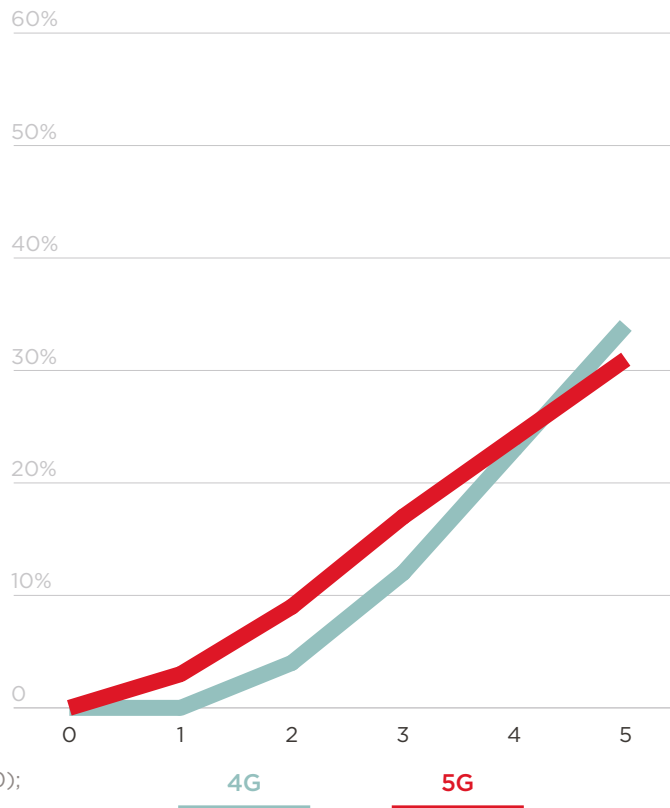
4G AND 5G ADOPTION, YEARS AFTER FIRST LAUNCH

NORTH AMERICA

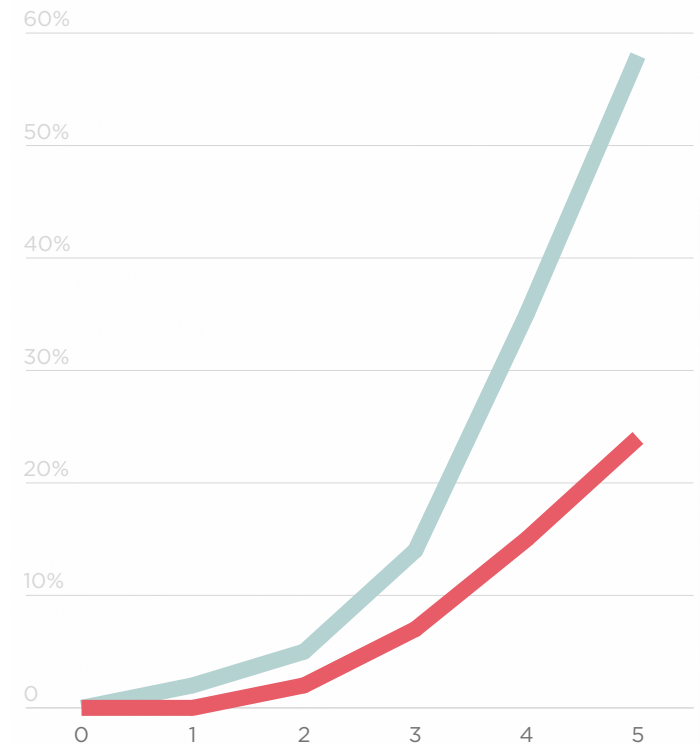
Share of total connections



EUROPE



CHINA, JAPAN AND SOUTH KOREA



North America: 4G (2010), 5G (2019); Europe: 4G (2011), 5G (2020); CJK: 4G (2011), 5G (2019) Source: GSMA Intelligence

Regional view

Europe

North America

China

India

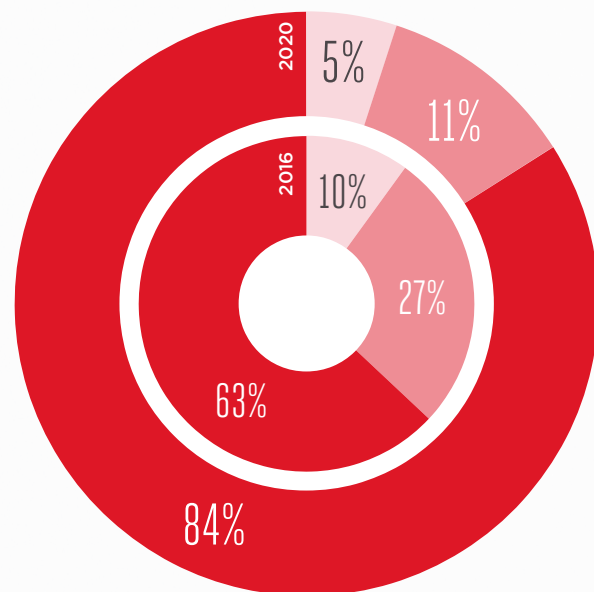
Asia

Latin America

Sub-Saharan Africa

Middle East and
North Africa

TECHNOLOGY MIX



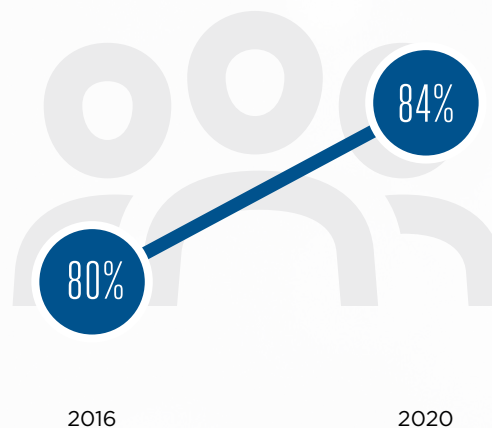
2G

3G

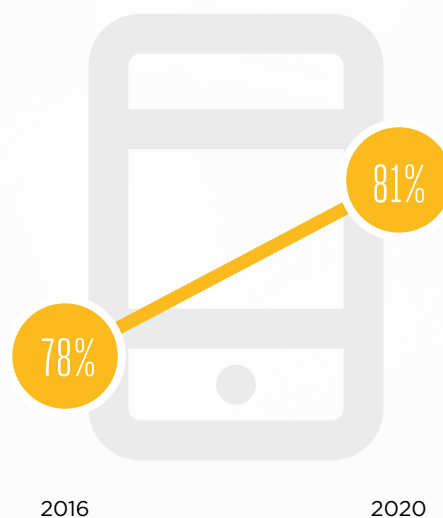
4G



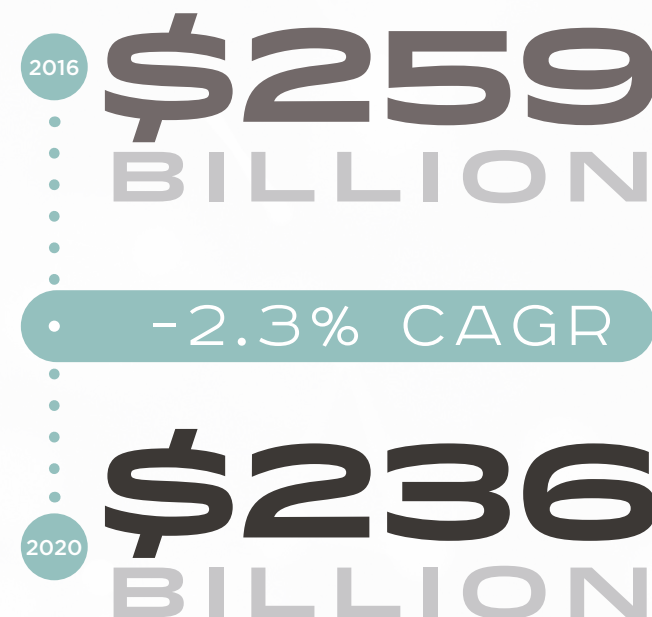
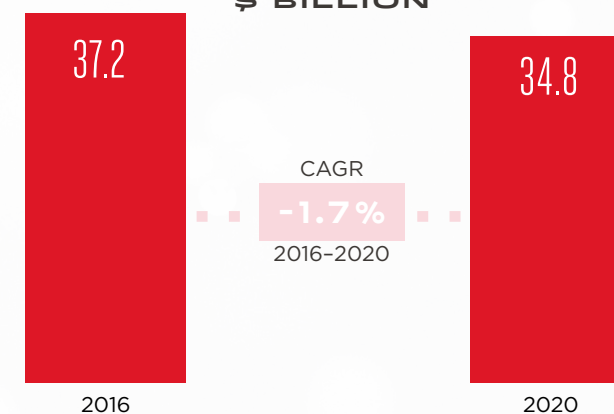
SUBSCRIBER PENETRATION



SMARTPHONE ADOPTION

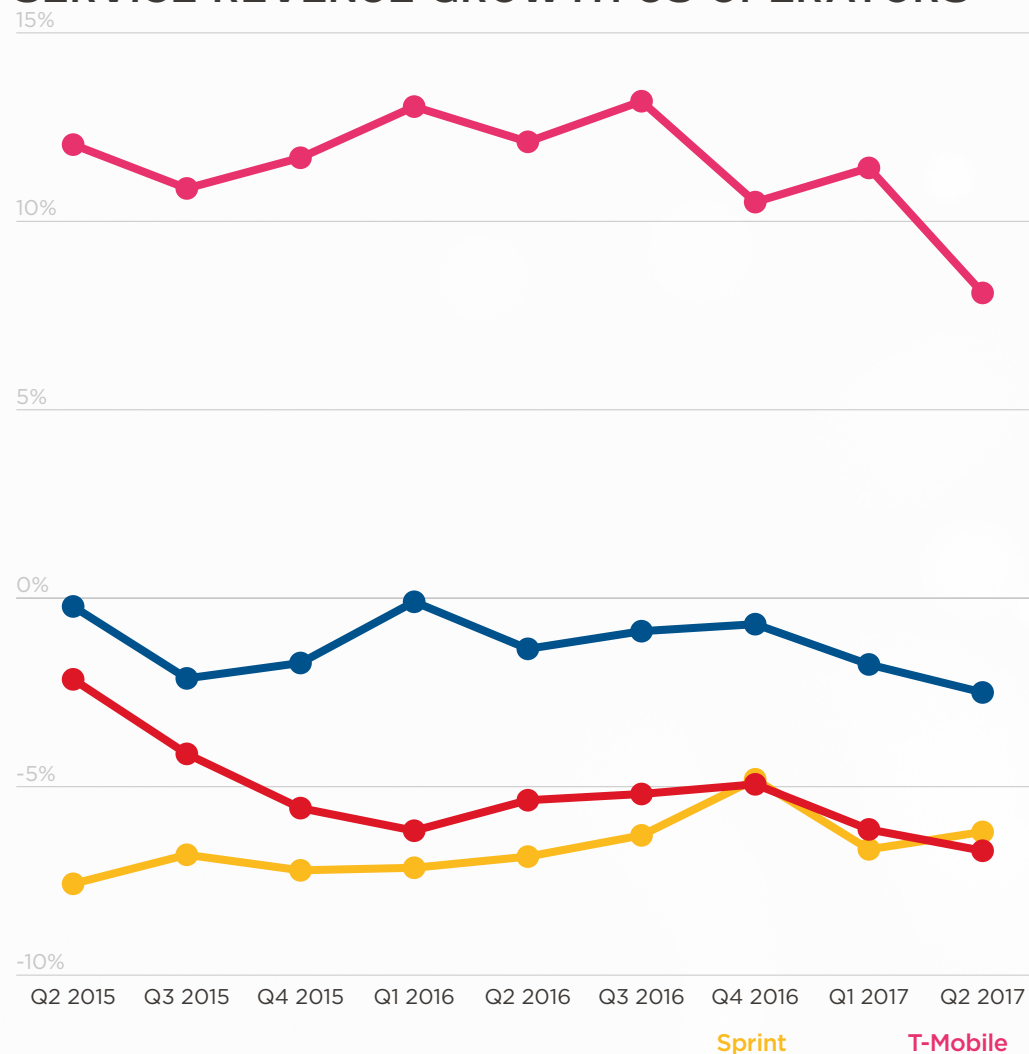


OPERATOR TOTAL REVENUES

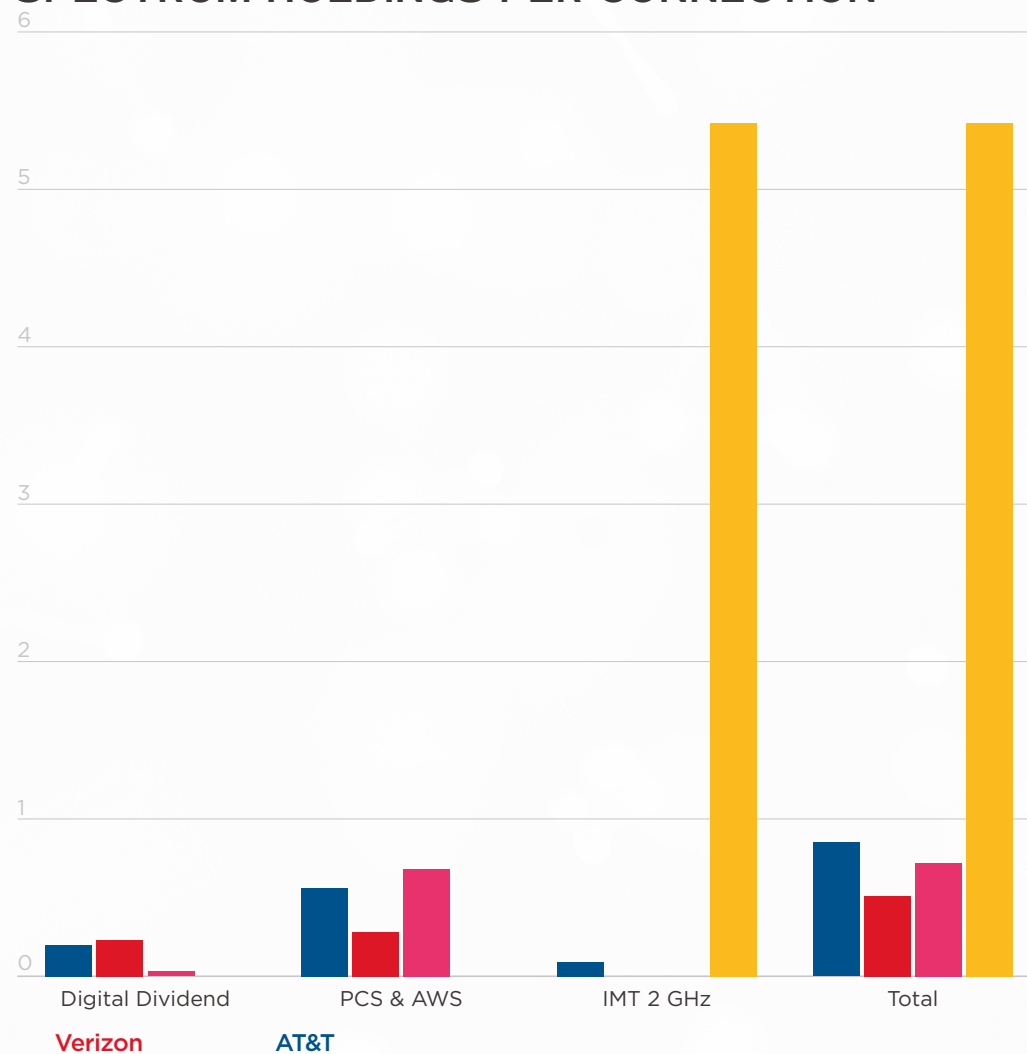
CAPEX
\$ BILLION

T-Mobile has become the fastest growing operator in the US, with mobile service revenues growing around 10% over the last four quarters. This is also reflected in its ability to win new contract customers, taking 45% of net adds over the two years.

SERVICE REVENUE GROWTH US OPERATORS



SPECTRUM HOLDINGS PER CONNECTION






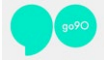





Convergence, consolidation and cable: outlook uncertain

AT&T and Verizon continue to pursue diversification strategies with a focus on content and new services such as IoT.

A possible consolidation deal between Sprint and T-Mobile has resurfaced with the likelihood of a more supportive regulatory regime.

Cable operators have launched mobile services, though as MVNOs as opposed to fully fledged operators.

M&A is likely to have a significant impact on the medium-term outlook for the US mobile market.

	Mobile	Fixed broadband	Pay TV	Content and media
AT&T			 DIRECTV	TimeWarner
Verizon	verizon✓	verizon✓	verizon✓ 	YAHOO! Aol.
T-Mobile	T-Mobile			
Sprint	Sprint			
Comcast*	verizon✓	 COMCAST	 COMCAST	 COMCAST
Charter	verizon✓	 Time Warner Cable	 Time Warner Cable	

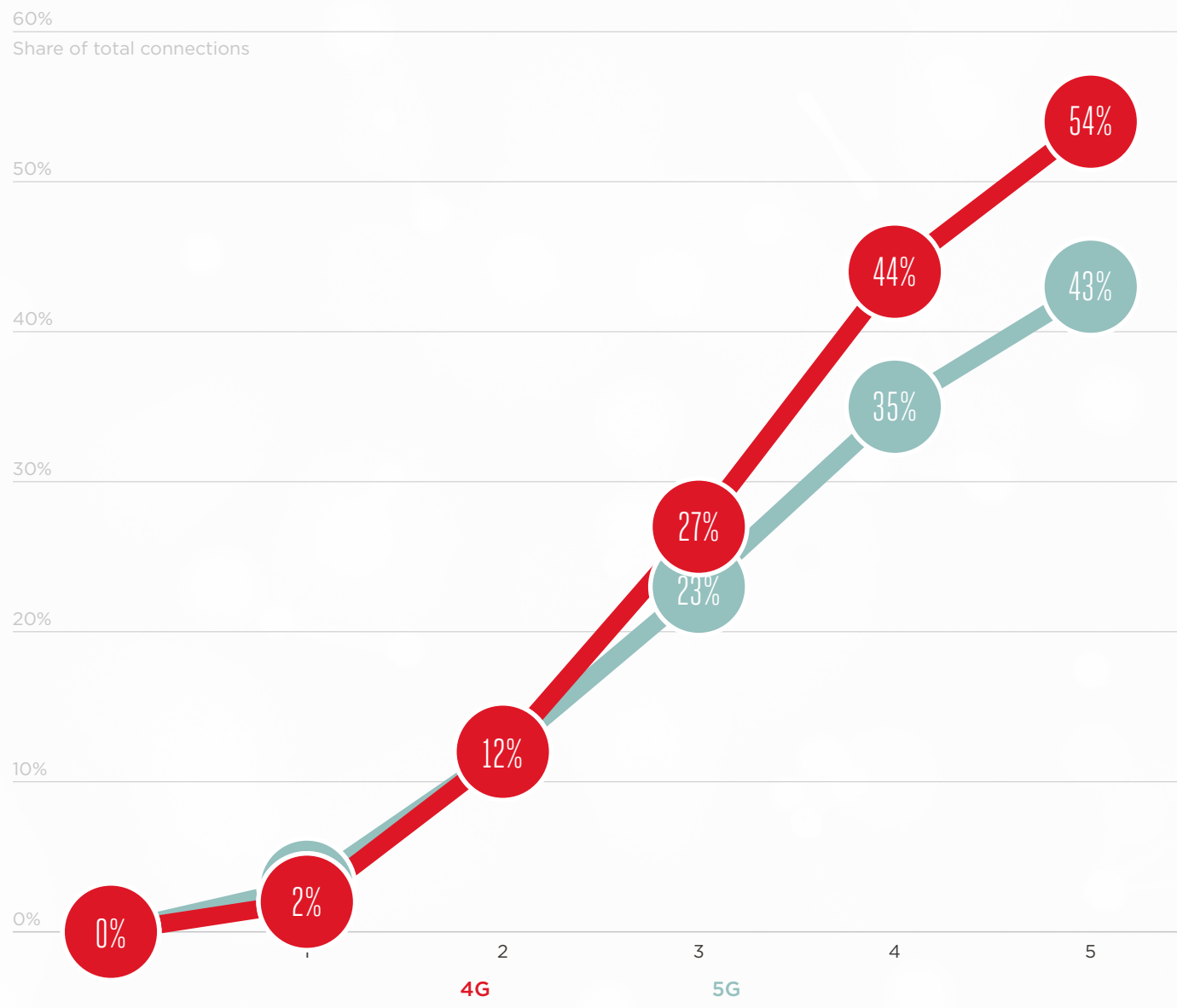
US is focused on 5G, with fixed broadband an early use case

There are differing approaches to 5G across the leading operators, with Verizon appearing focused on a fibre replacement service to deliver video and broadband services to consumers:

- AT&T is awaiting finalisation of standards to launch standards-based 5G and has suggested a commercial launch by the end of 2018.
- Verizon has released its own 5G technical specification and will launch fixed wireless trials in 2017.
- T-Mobile plans to start deployments in 2019, and 'nationwide' by 2020. Sprint is suggesting a commercial launch in 'late 2019'.

Fibre and high frequency spectrum (millimetre wave) will be key assets for 5G services.

4G AND 5G ADOPTION: YEARS AFTER LAUNCH



Regional view

Europe

North America

China

India

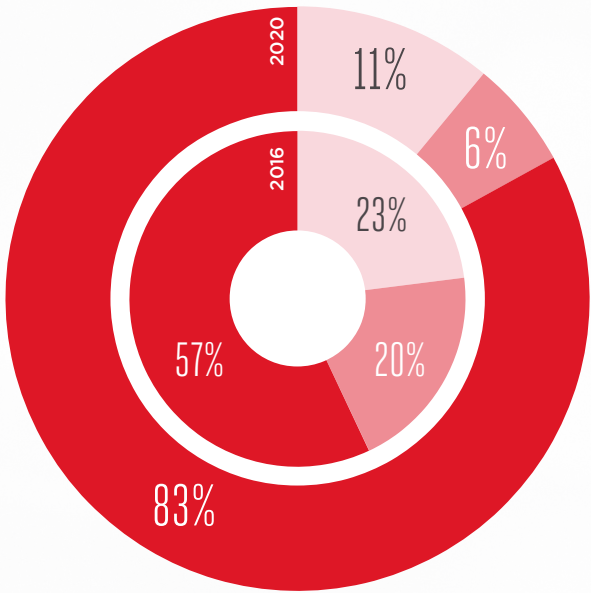
Asia

Latin America

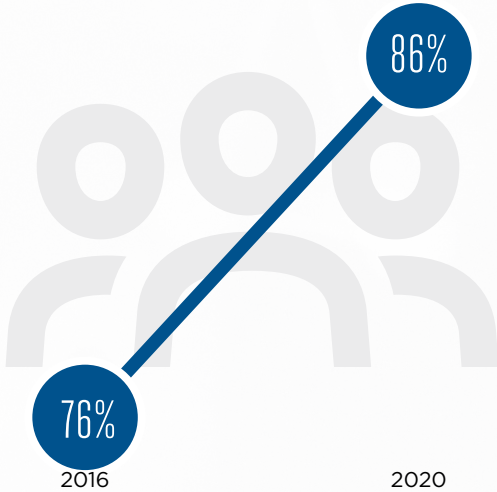
Sub-Saharan Africa

Middle East and
North Africa

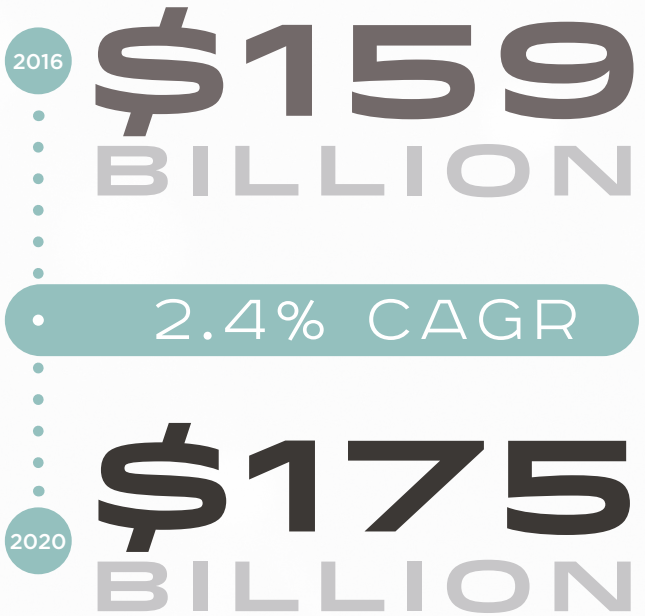
TECHNOLOGY MIX



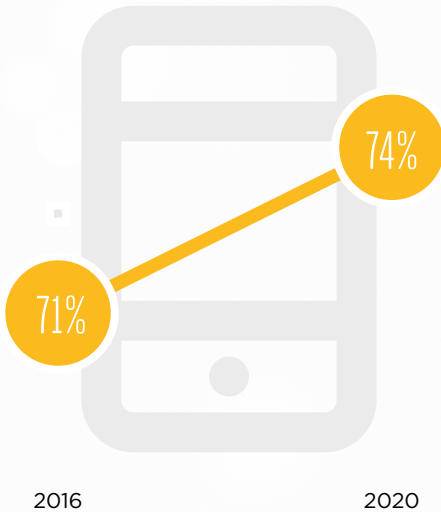
SUBSCRIBER PENETRATION



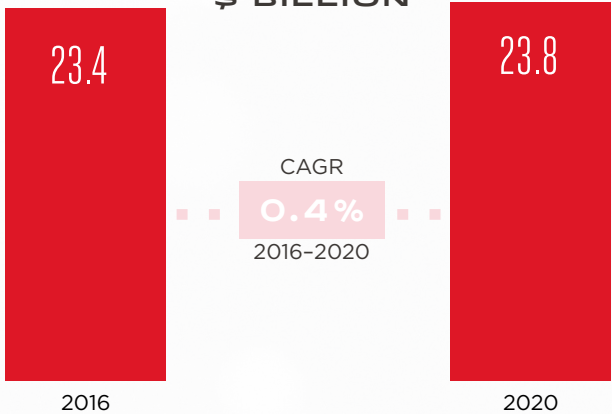
OPERATOR TOTAL REVENUES



SMARTPHONE ADOPTION



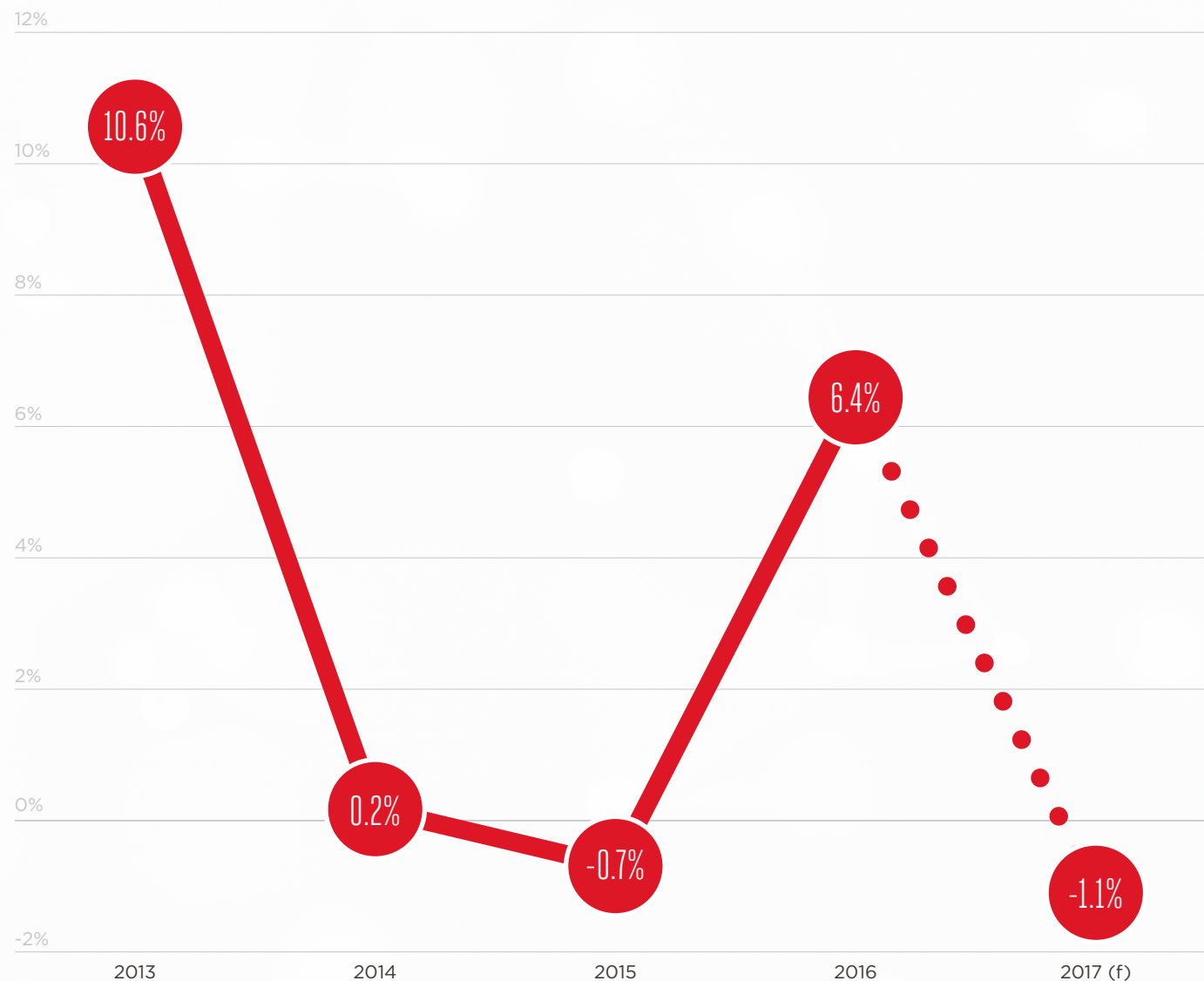
CAPEX \$ BILLION



Growth in operator service revenue is expected to fall into negative territory in 2017.

With the 4G uplift largely complete and regulatory headwinds on the horizon (roaming charges and long-distance fees), the outlook for the next two years is weak.

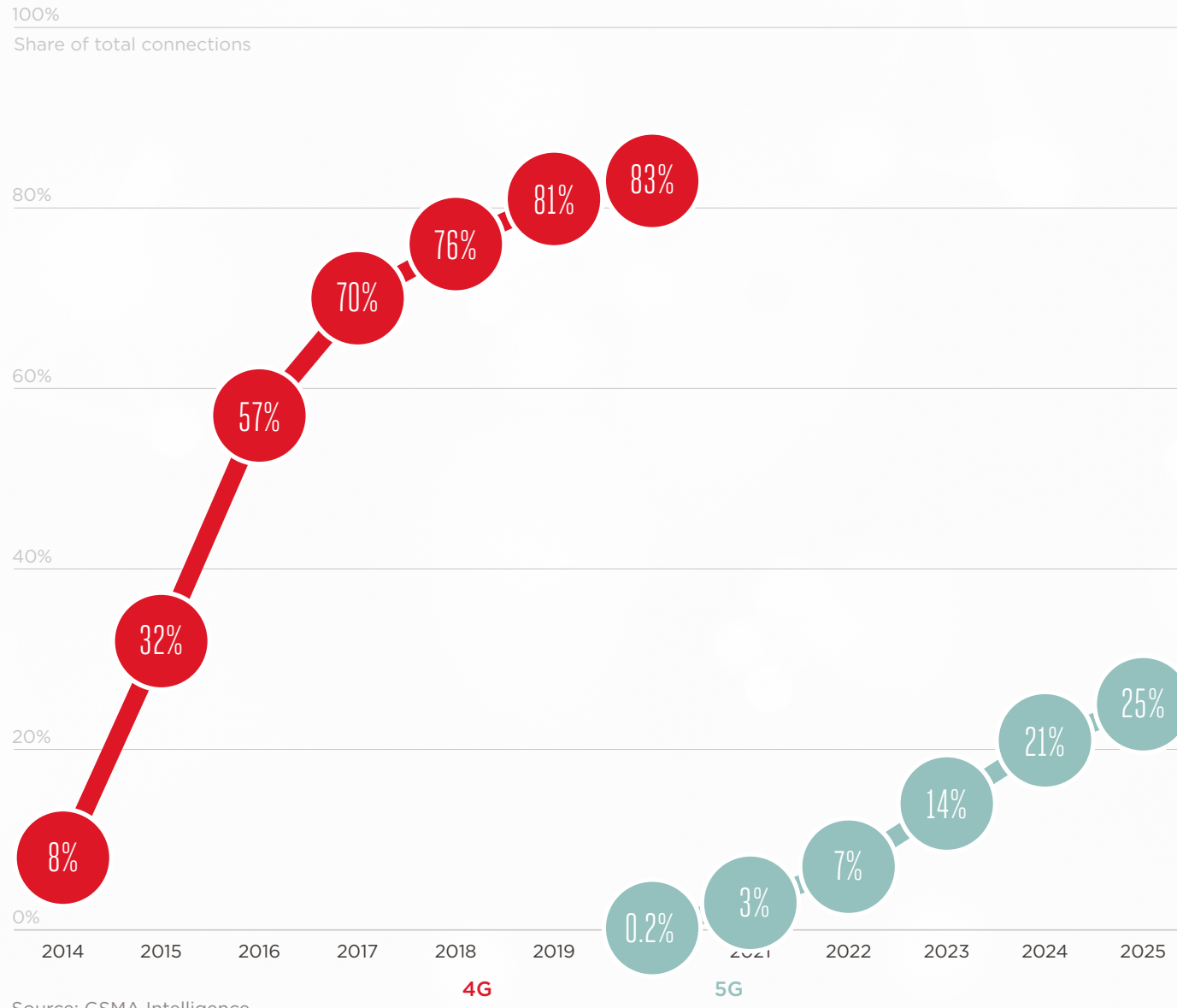
MOBILE OPERATOR SERVICE REVENUE GROWTH



Note: growth is year-on-year. For some operators, fixed line revenue is also included
Source: GSMA Intelligence

Sights set on 5G but impact on revenue growth will take time

4G VERSUS 5G EVOLUTION IN CHINA



Source: GSMA Intelligence

China will be one of the early 5G launch markets alongside its regional peers, Korea and Japan.

Unlike other countries, China is likely to launch 5G with a predominant standalone model. Most of this will be in cities using small cells, and indications are that C band spectrum (3.3–3.6 GHz and 4.8–5.0 GHz) is favoured.

Reduced coverage footprint and LTE speed improvements mean overall 5G take-up is likely to be slower than 4G. It will therefore also take longer to have any impact on operator revenue growth.

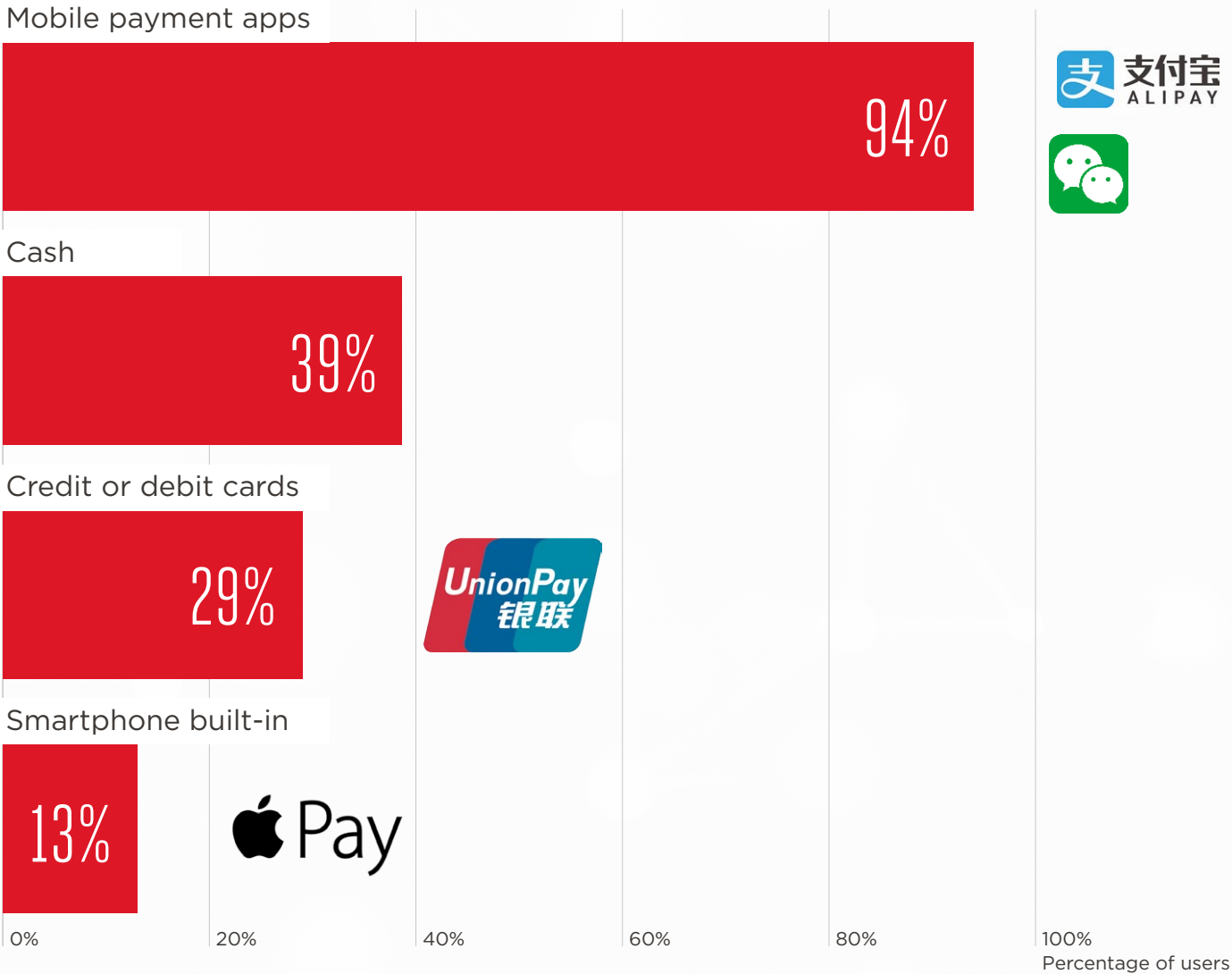
Chinese consumers spent an enormous \$5.5 trillion through mobile payments in 2016, by far the largest in the world.

This has been driven by smartphone ubiquity, the seamless integration of e-commerce onto messaging platforms and the prevalence of QR codes as the de-facto standard.

WeChat and Alipay account for over 90% of the market, creating a virtuous circle with their core platforms; Apple has less than 5% share.

The sheer scale may make China a unique case, but the conditions for cashless (small payment values for small merchants, lack of credit cards, smartphone mass adoption, cash inefficiency) are present in many other emerging markets.

MAIN PAYMENT METHOD FOR OFFLINE PURCHASES IN CHINA (FIRST TIER CITIES)



Note: first-tier cities are the largest metropolitan areas (e.g. Shanghai, Beijing)
 Source: 2017 WeChat user behaviour report (China Channel)

Regional view

Europe

North America

China

India

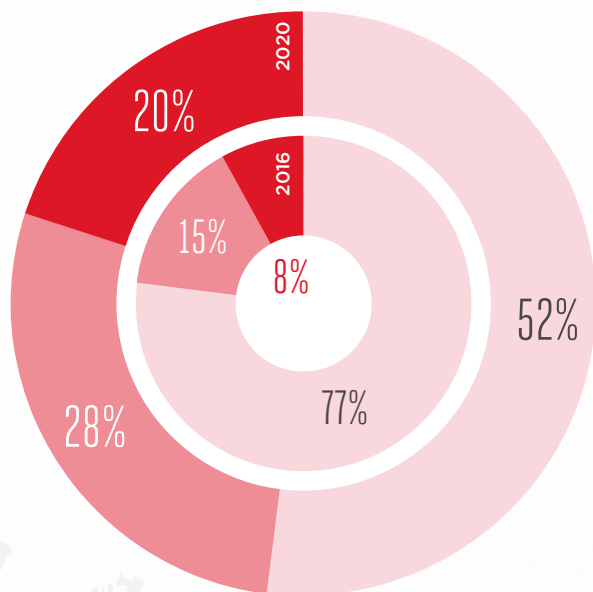
Asia

Latin America

Sub-Saharan Africa

Middle East and
North Africa

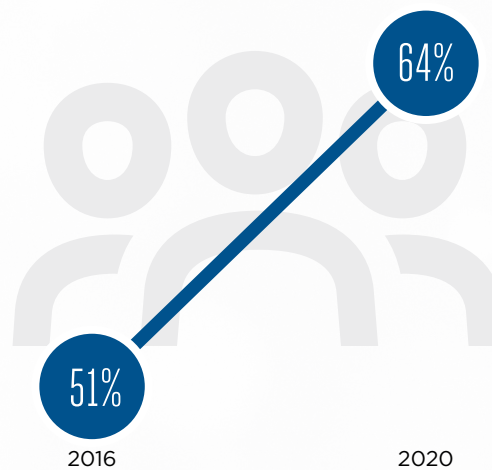
TECHNOLOGY MIX



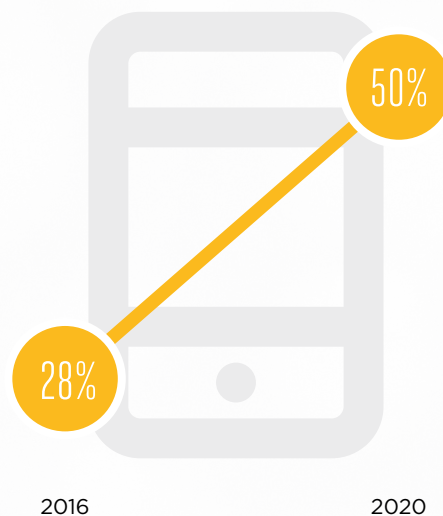
2G 3G 4G



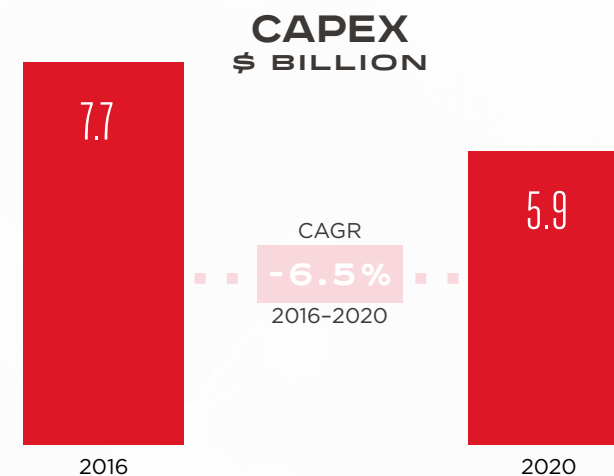
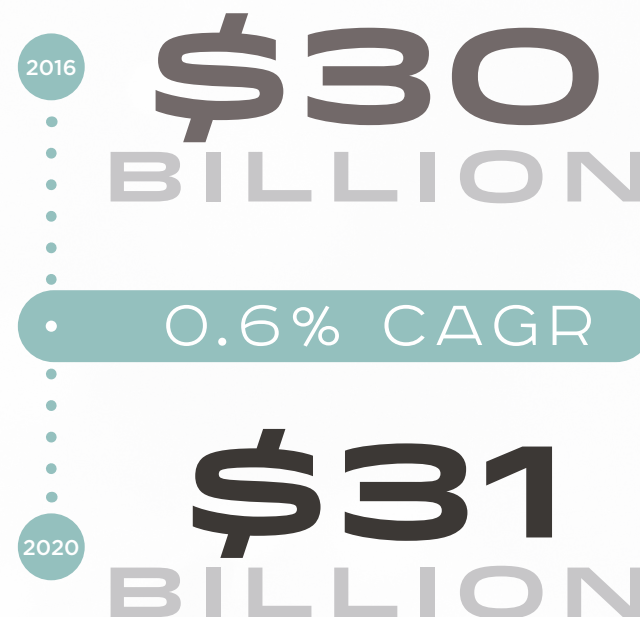
SUBSCRIBER PENETRATION



SMARTPHONE ADOPTION



OPERATOR TOTAL REVENUES

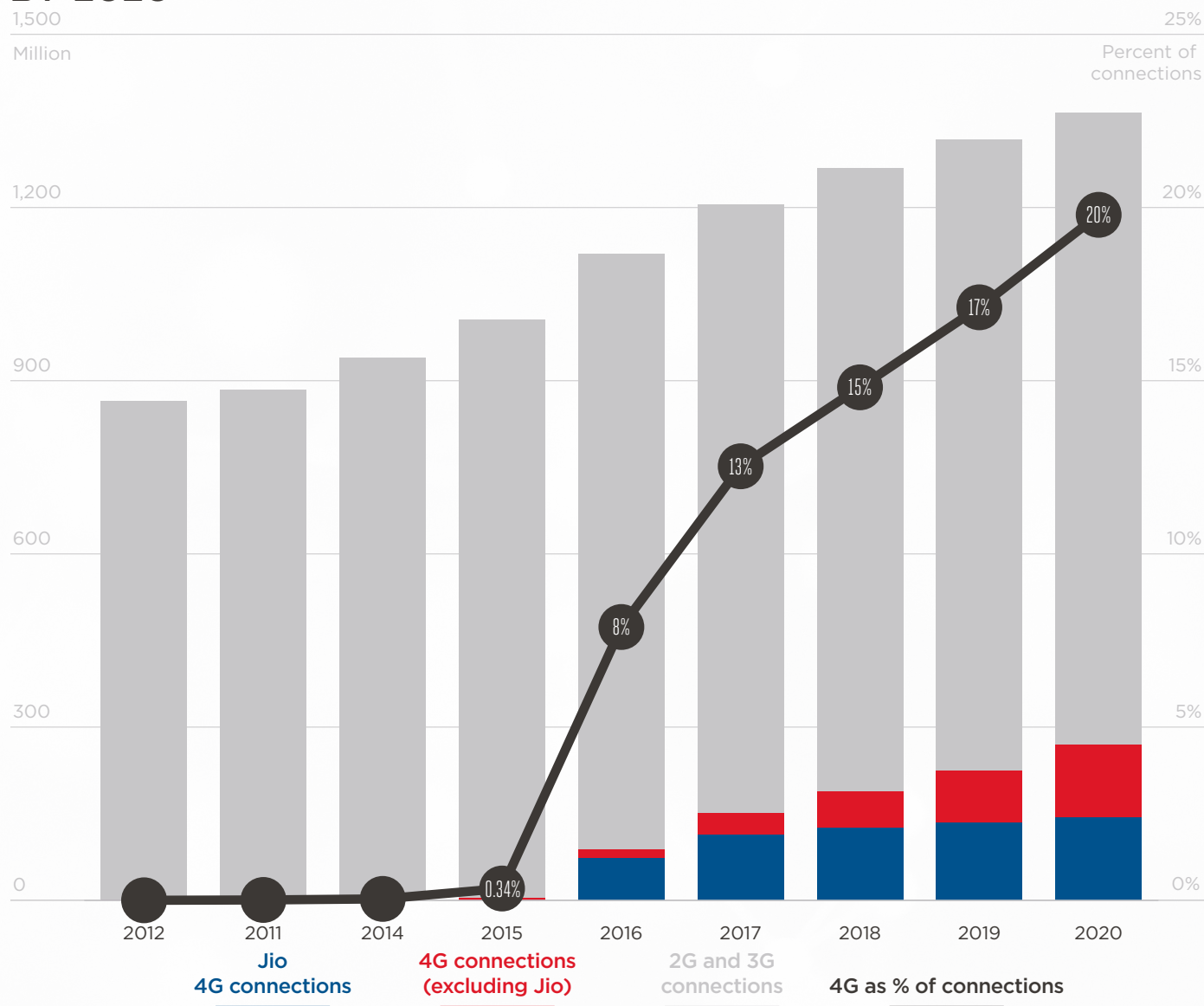


4G saw sluggish growth in India following its initial launch in 2012, hindered in part by the lack of affordable, harmonised spectrum in the sub-1 GHz coverage bands.

However, the commercial launch of services by Reliance Jio in September 2016 and investments by the existing operators have driven rapid growth in 4G connections.

The 4G connection base is forecast to grow to 270 million by 2020. By then, mobile broadband (3G and 4G) will account for almost 50% of total connections.

4G WILL ACCOUNT FOR 20% OF THE INDIAN MOBILE MARKET BY 2020



REVENUES (MILLION) AND ARPU UNDER PRESSURE SINCE THE LAUNCH OF JIO

Reliance Jio launched its operations in the market by offering free services for six months. This led to significant pressure on market pricing and revenues.

Data ARPU levels fell to \$1.88 in Q1 2017 from \$2.33 12 months earlier.

In Q4 2016 total revenues in India declined for the first time by 1% annually, compared to annual growth of more than 6% for the three quarters previously.

India has remained one of the most competitive mobile markets in the world as measured by the Herfindahl-Hirschman Index.

The launch of Jio has triggered an unprecedented wave of consolidation in the country:

- Bharti Airtel announced the acquisition of Telenor's India unit
- the Vodafone and Idea merger was approved by the Competition Commission of India and is likely to reach completion by 2018
- the Reliance Communications and Aircel merger has also been approved.

Consolidation could provide upside to both revenue and margin outlooks.

Regional view

Europe

North America

China

India

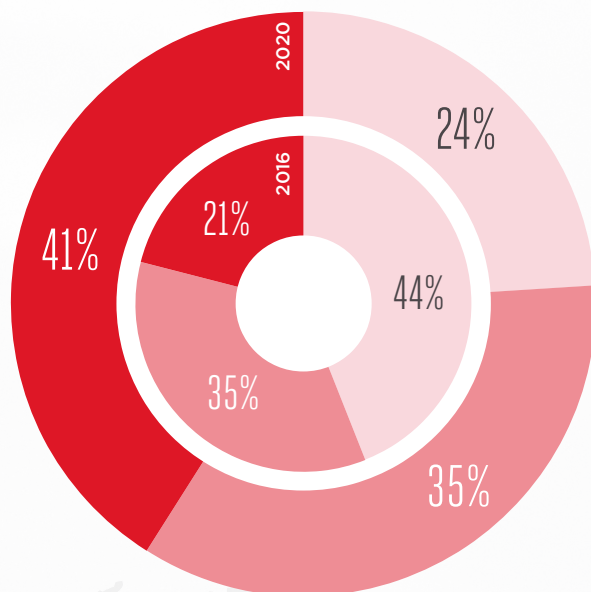
Asia

Latin America

Sub-Saharan Africa

Middle East and
North Africa

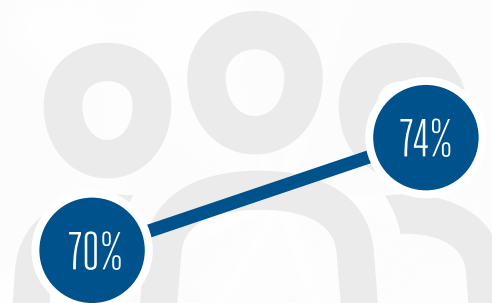
TECHNOLOGY MIX



2G 3G 4G



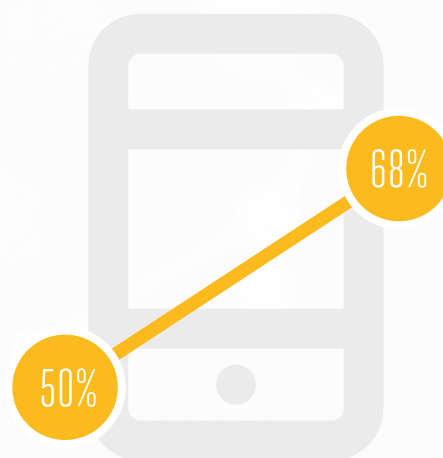
SUBSCRIBER PENETRATION



2016

2020

SMARTPHONE ADOPTION



2016

2020

OPERATOR TOTAL REVENUES

2016 **\$243**
BILLION

2.3% CAGR

2020 **\$267**
BILLION

CAPEX
\$ BILLION

40.0

37.4

CAGR

-1.7%

2016-2020

2016

2020

A region of contrasts: hyper-tech versus emerging economies

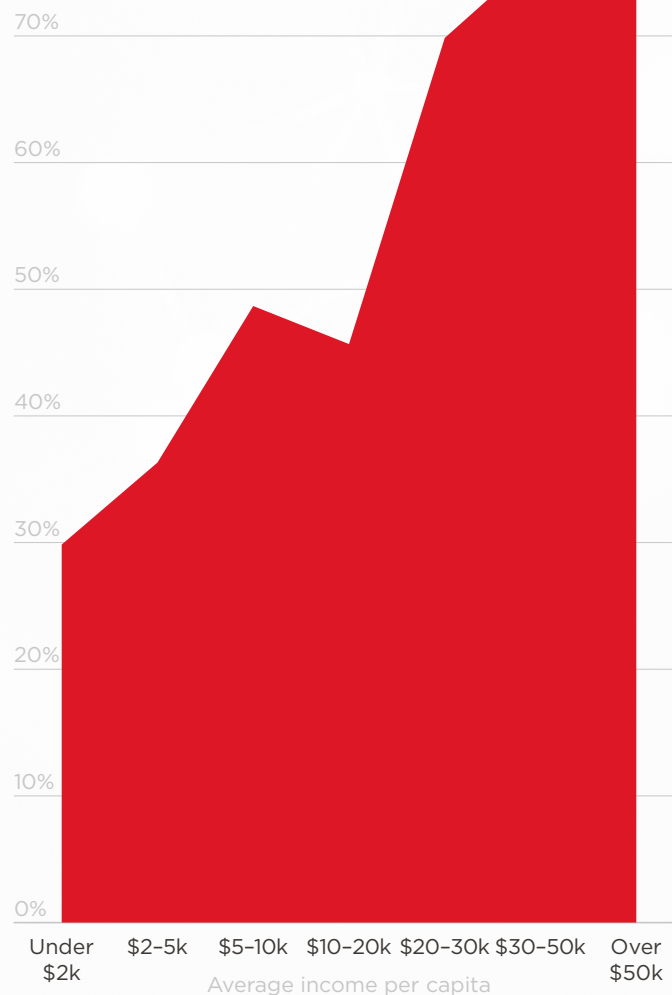
POPULATION DISTRIBUTION

700
People (million)



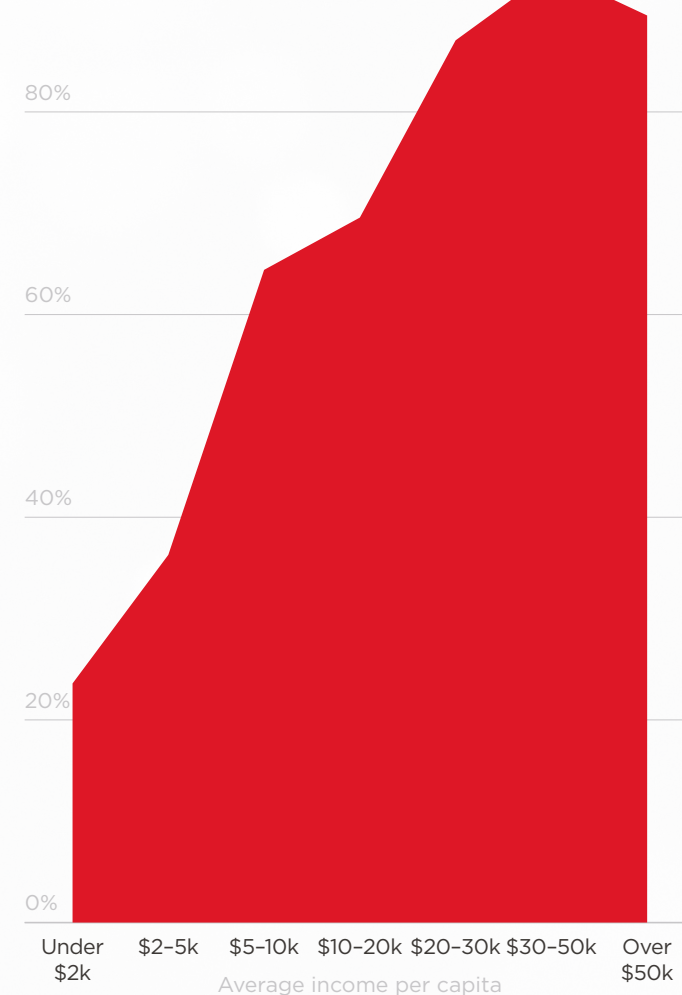
MOBILE INTERNET PENETRATION

80%



MOBILE BROADBAND PENETRATION (3G + 4G)

100%



Note: population figures as of 2015. Internet and 3G/4G as of June 2016.

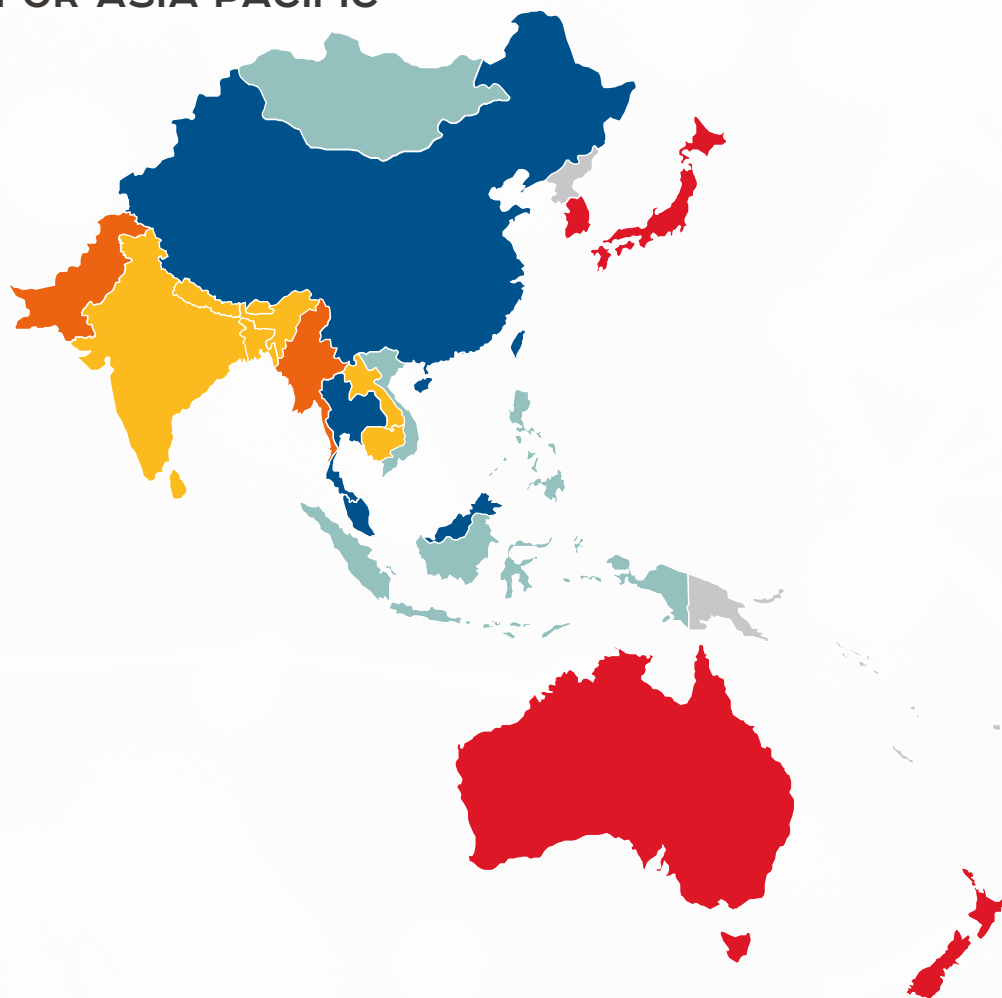
Source: GSMA Intelligence

National digital overhauls aim to rapidly modernise developing economies

	Programme	Target year	Key targets
India	Digital India	2020	<ul style="list-style-type: none"> Broadband connectivity across 250,000 Gram Panchayats, reaching 600 million rural dwellers by 2016
Pakistan	Vision 2025	2025	<ul style="list-style-type: none"> Establish a national broadband infrastructure, national telecentres and central databases Create five or six highly connected cities, building on a common digital services platform
Bangladesh	Digital Bangladesh	2021	<ul style="list-style-type: none"> 100% internet penetration and 50% broadband penetration by 2021
Malaysia	Digital Malaysia	2020	<ul style="list-style-type: none"> Adoption: overcome barriers by increasing skills and knowledge thresholds, improving affordability, Access: improve access to affordable, broadband, applications content and devices
Indonesia	Indonesia broadband plan	2019	<ul style="list-style-type: none"> Provide mobile data access to the entire urban population at speeds of at least 1 Mbps, Provide mobile access to 52% of rural households at speeds of at least 1 Mbps

Wide gaps exist in access to basic connectivity and internet

THE MOBILE CONNECTIVITY INDEX FOR ASIA PACIFIC



Leaders

Fast
transitioners

Transitioners

Emerging

Discoverers

FACTORS BEHIND THE CONNECTIVITY GAP

	Mobile Connectivity Index	Infrastructure	Affordability	Consumer readiness	Content	Mobile Internet penetration	Unconnected population (m)
Asia Pacific	56	48	66	69	50	50%	2,029
China	61	43	69	72	65	67%	453
Indonesia	54	40	69	69	44	40%	156
Bangladesh	41	33	56	52	30	33%	109
India	38	25	58	43	33	35%	871
Pakistan	34	23	55	25	41	31%	134

For further information, visit
www.mobileconnectivityindex.com

Regional view

Europe

North America

China

India

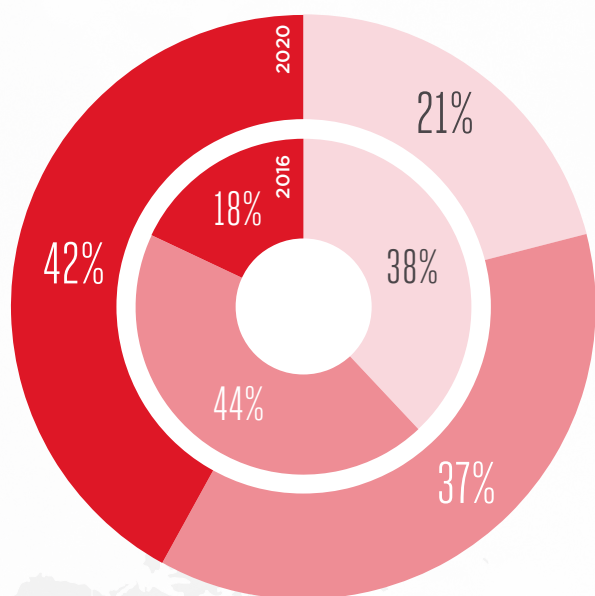
Asia

Latin America

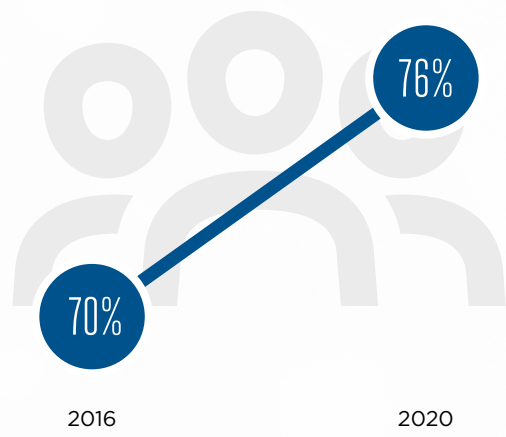
Sub-Saharan Africa

Middle East and
North Africa

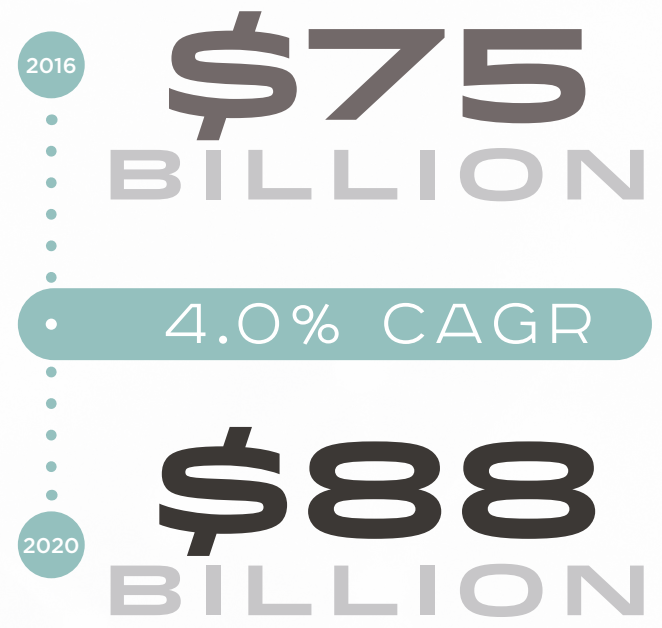
TECHNOLOGY MIX



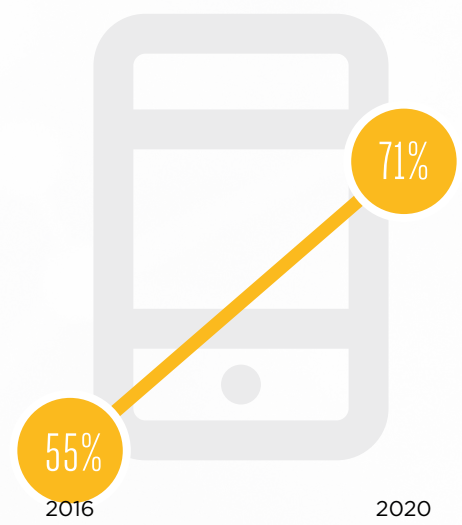
SUBSCRIBER PENETRATION



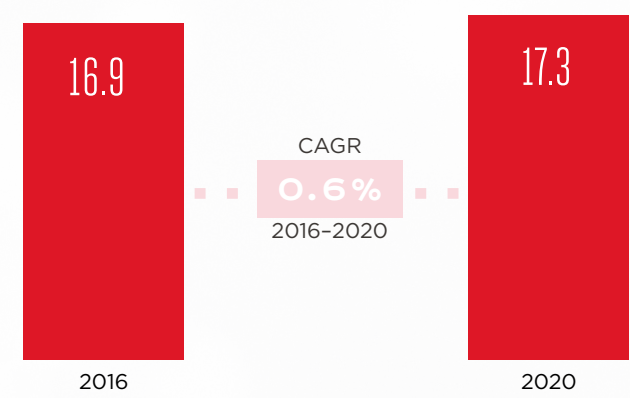
OPERATOR TOTAL REVENUES



SMARTPHONE ADOPTION



CAPEX \$ BILLION

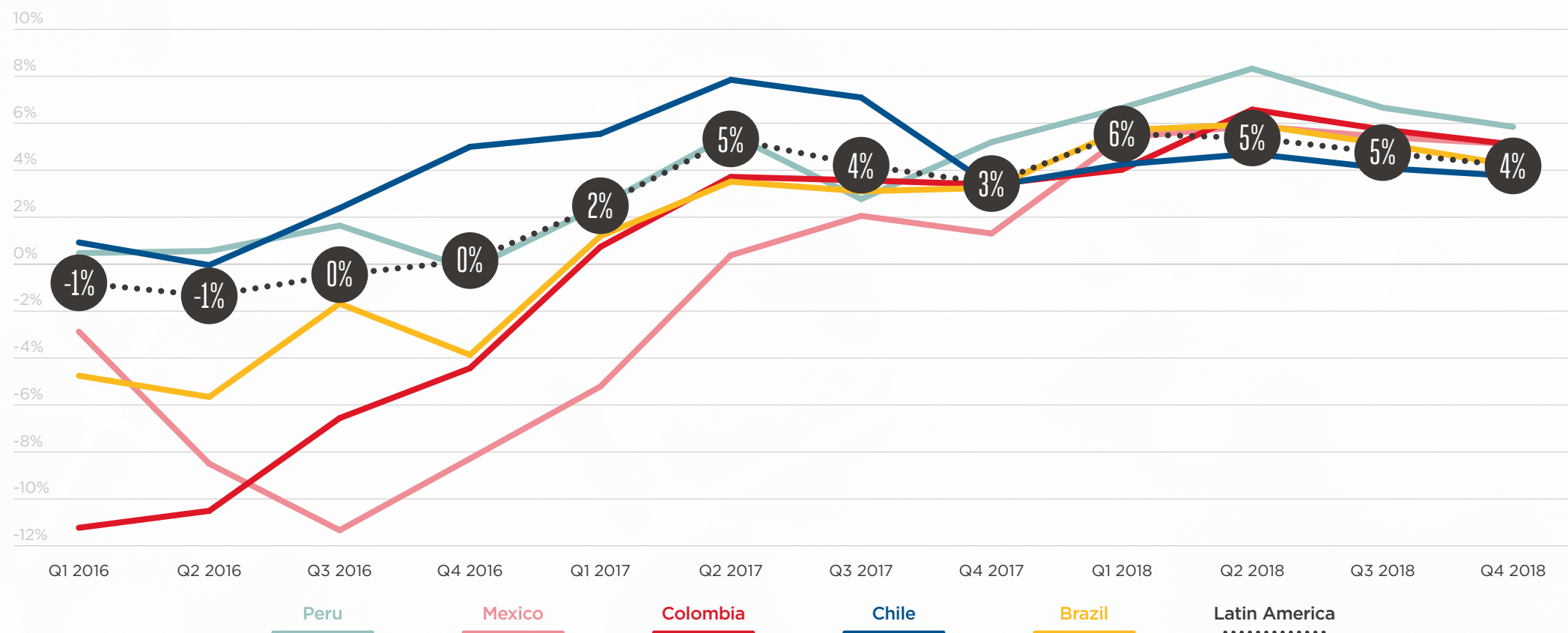


ARPU is expected to increase in 2017 after several years of decline, driven by increased 4G adoption and higher data usage.

Brazil is the largest market and seeing the strongest growth.

Regulatory impositions, such as those in Mexico, are factored in, as is increased competition in Mexico, Argentina, Chile and other markets.

MOBILE SERVICE REVENUE GROWTH (YEAR-ON-YEAR)*



*Revenue figures adjusted for Q1 2017 US dollar exchange rate

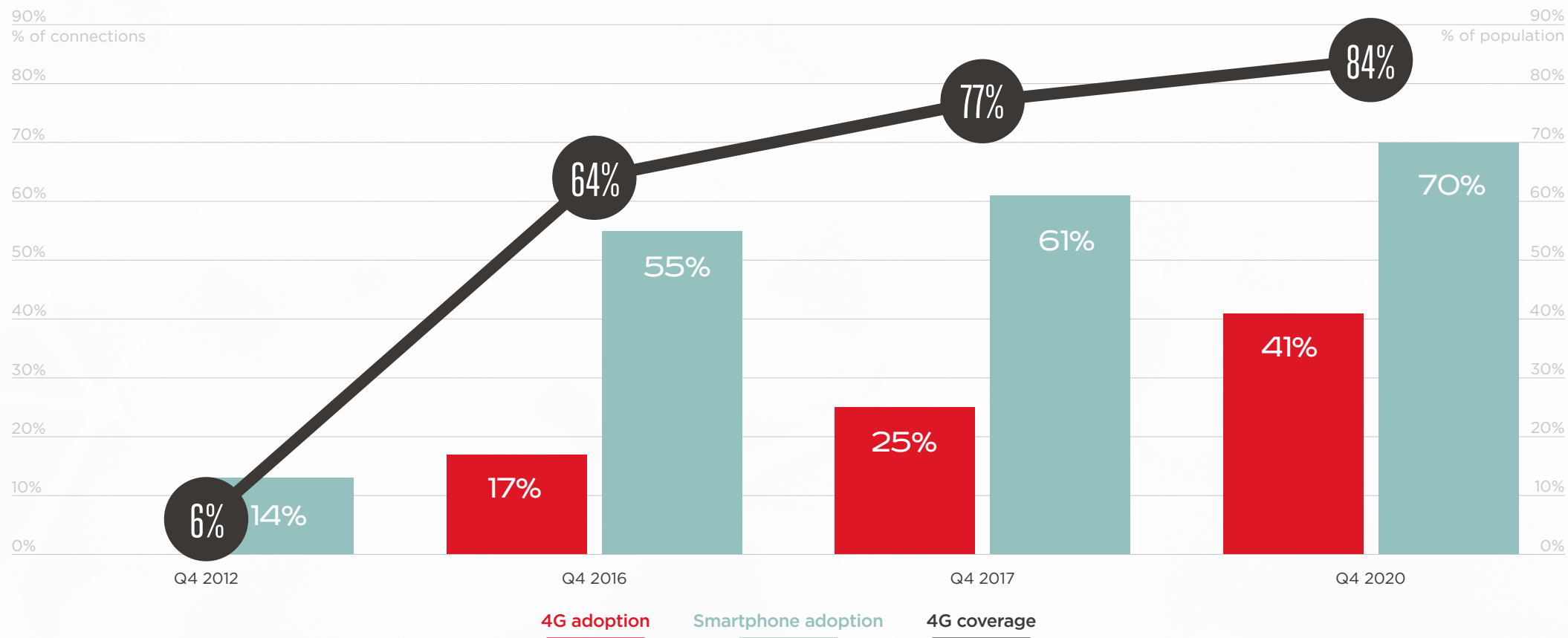
Source: GSMA Intelligence

4G yet to really happen despite rising smartphone adoption

Smartphone adoption is uniformly strong across Latin America, but 4G remains a minority at around 25% of the mobile base. Coverage rollouts have picked up, suggesting a lack of willingness among consumers to pay a premium to migrate from 3G.

Encouragingly, key markets such as Brazil and Argentina have smartphone adoption levels of over 40% (December 2017) but lower income countries such as Mexico, Venezuela and Panama are below 20%.

4G AND SMARTPHONE ADOPTION IN LATIN AMERICA



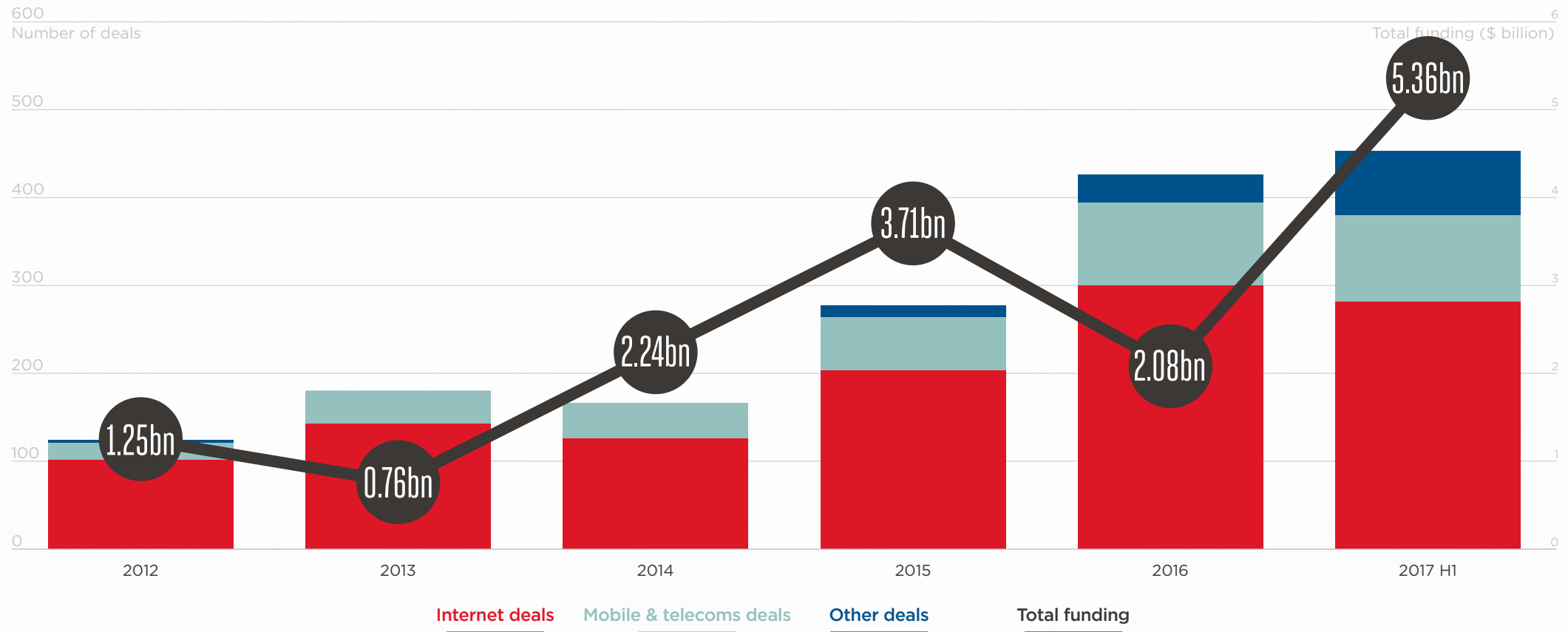
Venture capital and private equity deals in Latin America have surged

Funding of start-ups (across all sectors) through venture capital and private equity in the region has surged in recent years.

Momentum has grown into 2017, which has already seen more deals in six months than in all of 2016.

Several countries/cities (e.g. Buenos Aires) in the region have pulled out all the stops to incentivise start-ups to launch and (crucially) stay local given the constant threat of being lured to Silicon Valley.

VENTURE CAPITAL AND PRIVATE EQUITY FUNDING





Regional view

Europe

North America

China

India

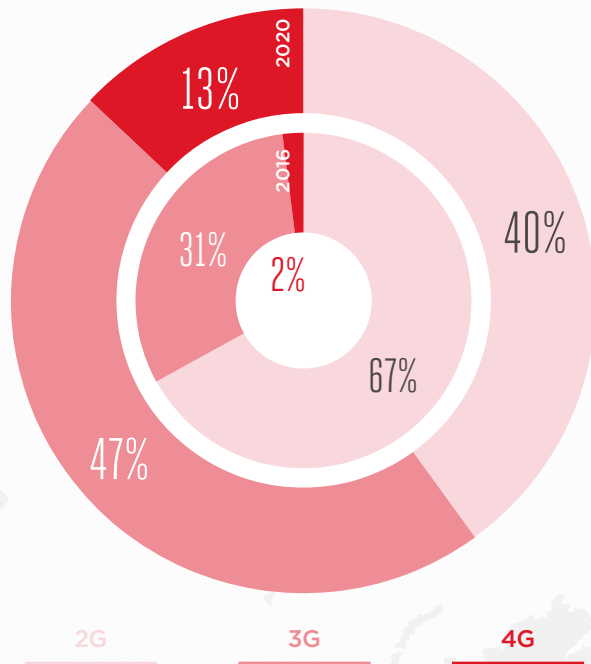
Asia

Latin America

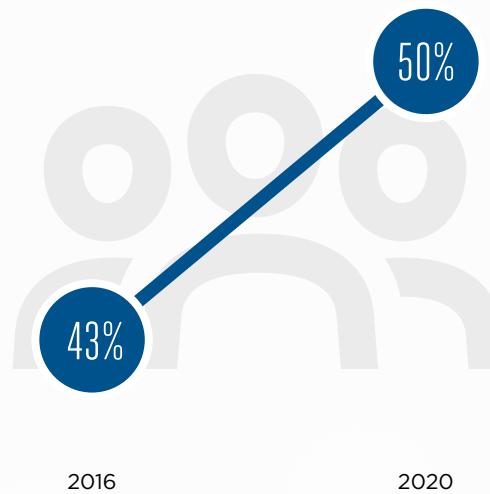
Sub-Saharan Africa

Middle East and
North Africa

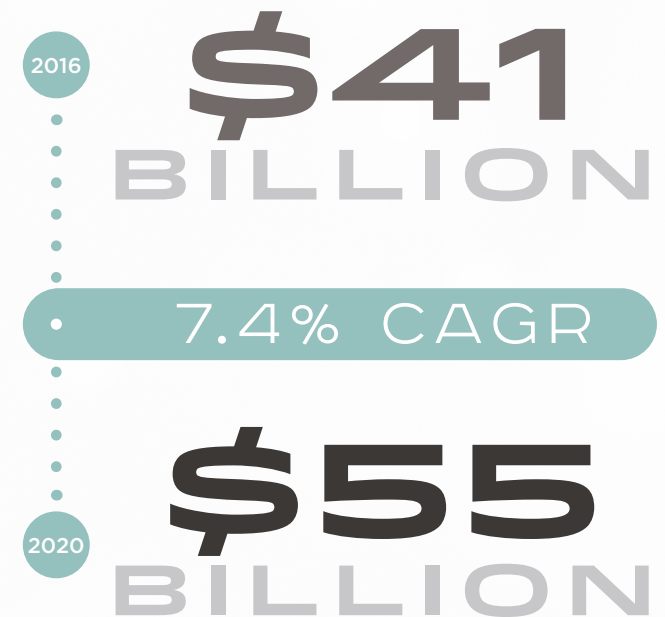
TECHNOLOGY MIX



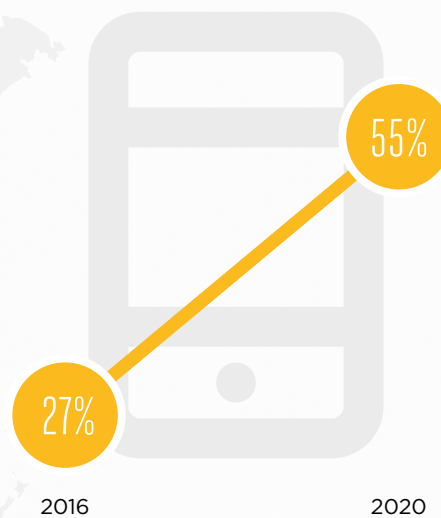
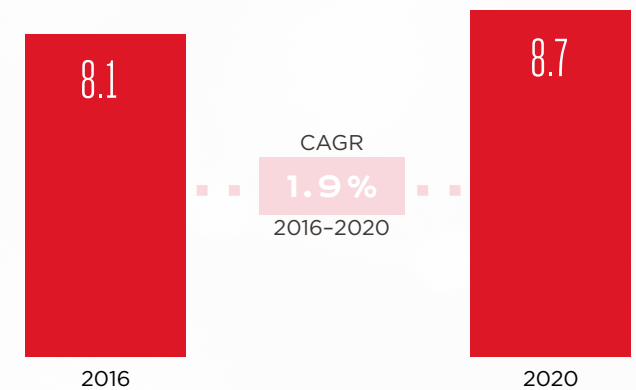
SUBSCRIBER PENETRATION



OPERATOR TOTAL REVENUES



SMARTPHONE ADOPTION

CAPEX
\$ BILLION

AFRICA

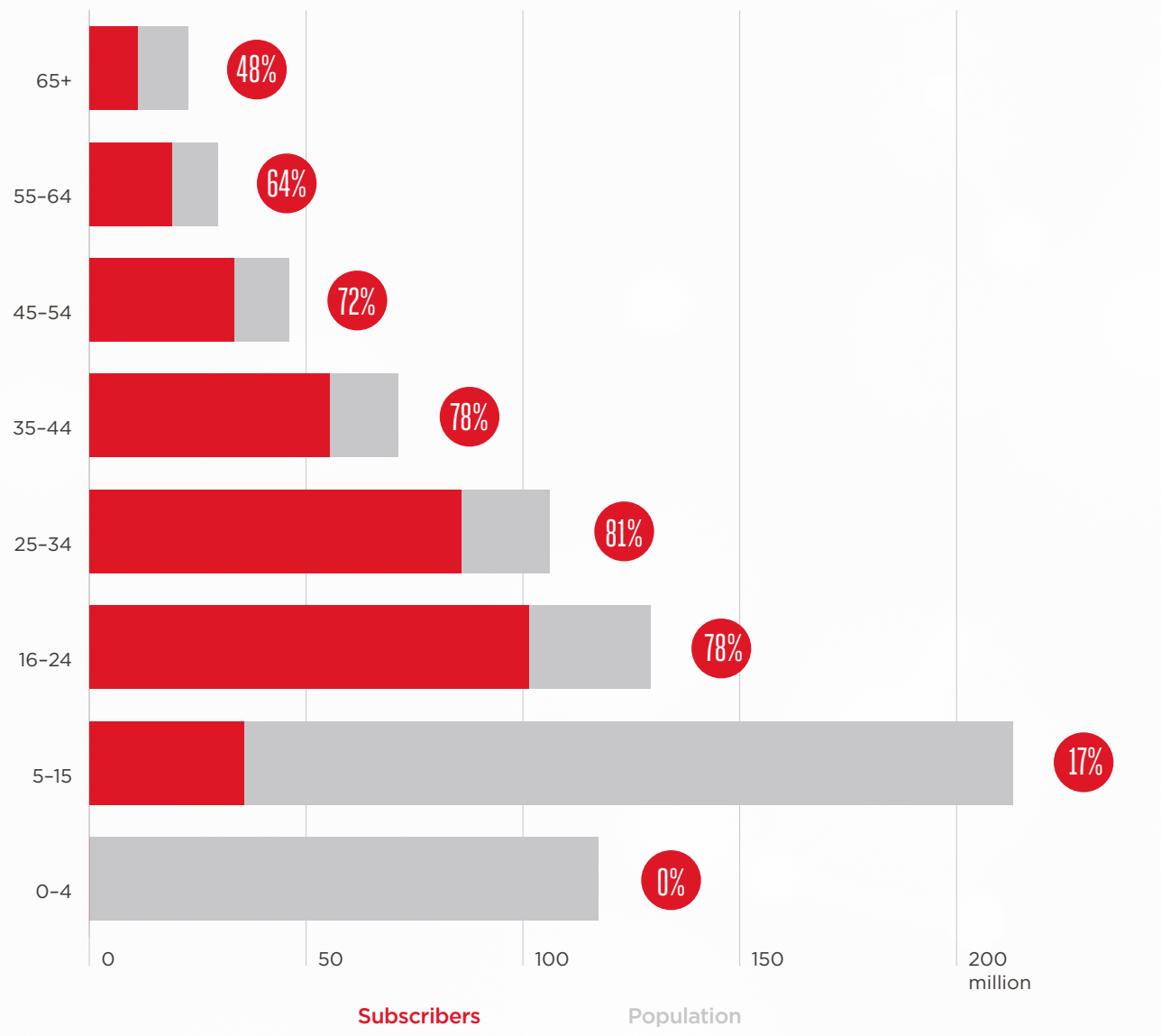
Overall mobile penetration was 43% at the end of 2016, the lowest in the world.

On average, 70% of adults above 16 years old already have a mobile subscription.

New growth will largely come from the region's under 16 year-olds, who account for 45% of the total population and only 10% of total mobile subscriptions.

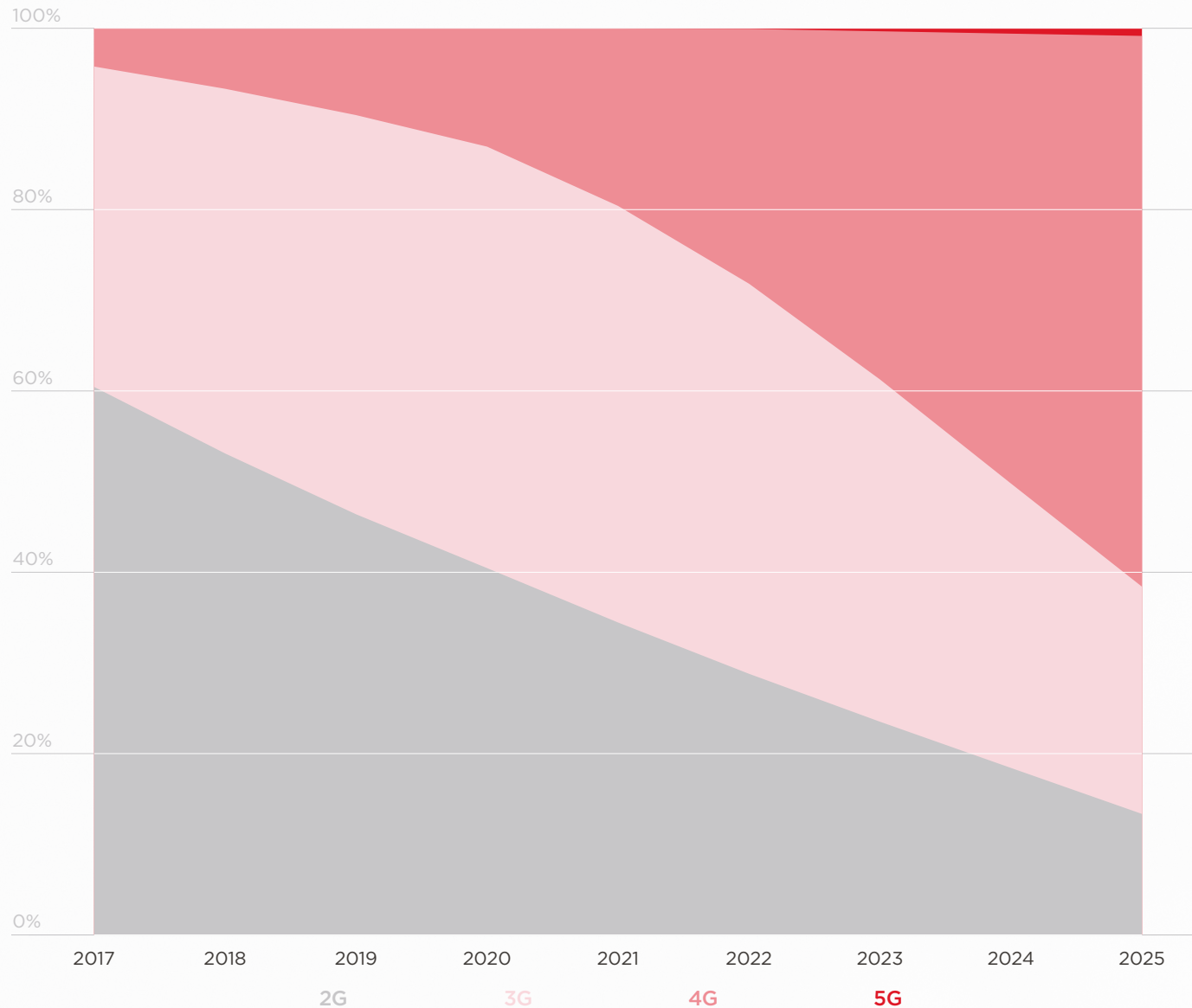
Mobile uptake by the young, tech-savvy population will drive smartphone adoption and demand for data-centric services, leading to higher levels of mobile engagement in the region.

MOBILE SUBSCRIBER PENETRATION OF DIFFERENT AGE GROUPS IN SUB-SAHARAN AFRICA, 2016



Tech migration: shift to mobile broadband gains momentum

TECHNOLOGY MIX (PERCENTAGE OF CONNECTIONS)



Source: GSMA Intelligence

Most Africans are still on 2G but this is rapidly changing; 3G/4G will account for 60% of connections by 2020 and 85% by 2025.

This trend is a double-edged sword for mobile operators: the rise in data traffic is boosting data revenues, but IP-comms substitution takes away from voice and SMS, which still account for more than 70% of service revenues and are exposed when most consumers are on prepaid tariffs.

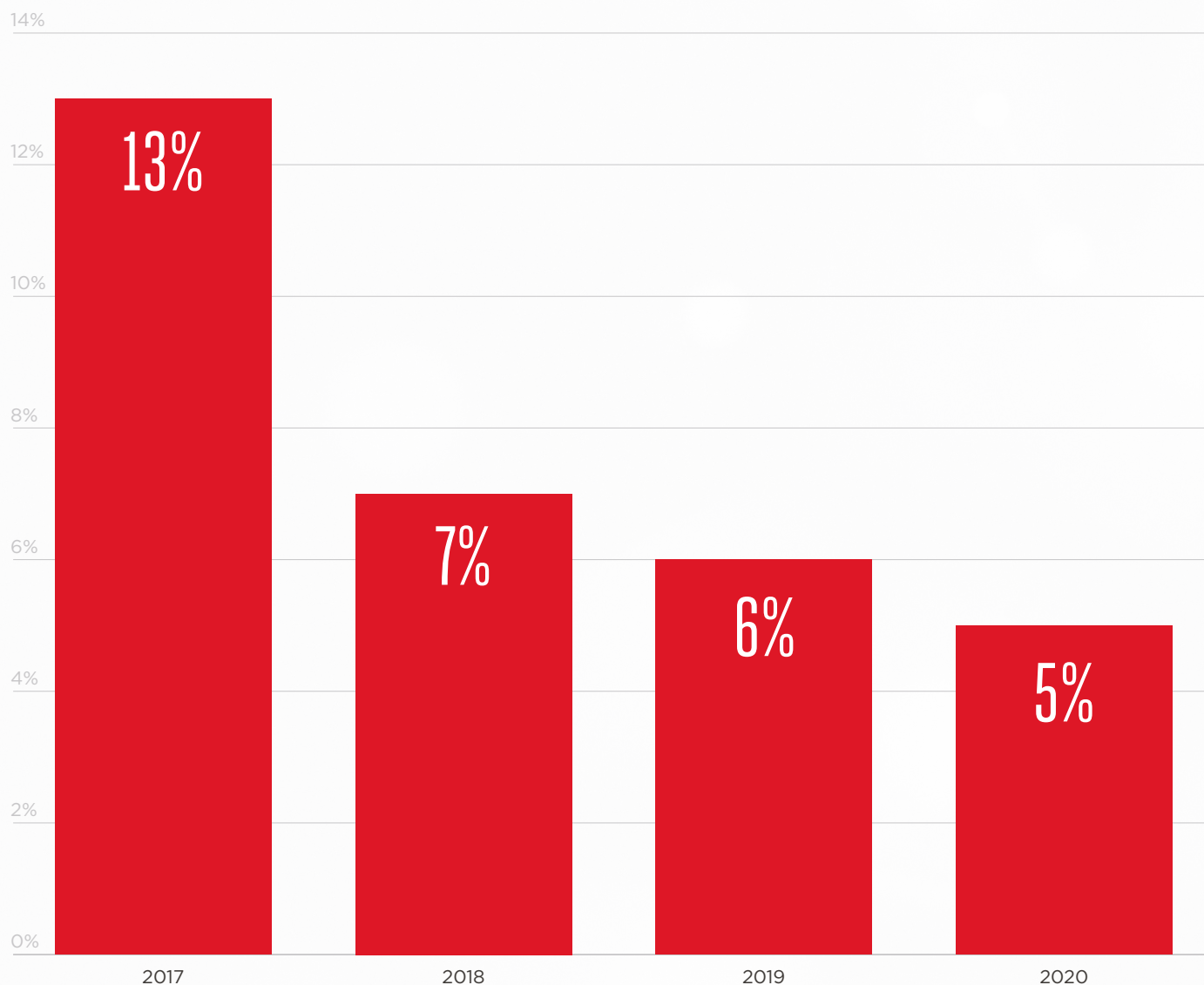
Telcos are at a crossroads, with challenging macro and regulatory environments

Economic growth in Sub-Saharan Africa slowed to its lowest level in 20 years during 2016 due to lower commodity prices and external shocks. Although the economic outlook for 2017 and beyond has improved, the regulatory environment remains challenging.

As a result, our near-term revenue growth is still healthy but will decline markedly from 2018.

This, combined with consumer time continuing to migrate to OTT services, means African operators need to place a greater urgency on searching for new growth streams other than subscriber growth.

MOBILE REVENUE GROWTH SLOWING



Regional view

Europe

North America

China

India

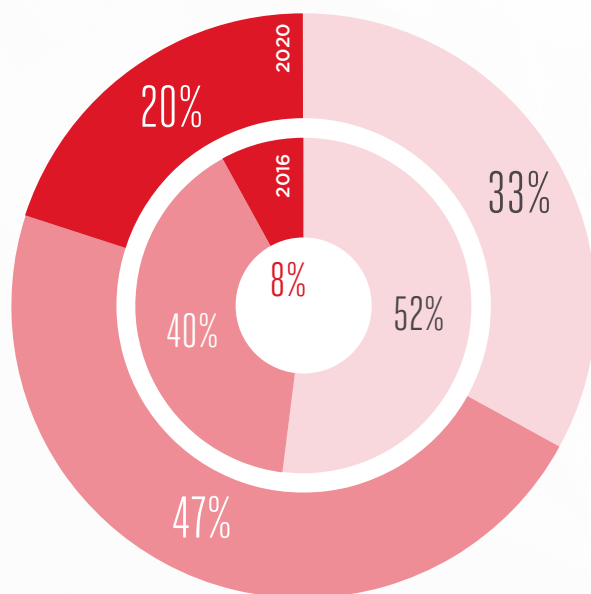
Asia

Latin America

Sub-Saharan Africa

Middle East and
North Africa

TECHNOLOGY MIX

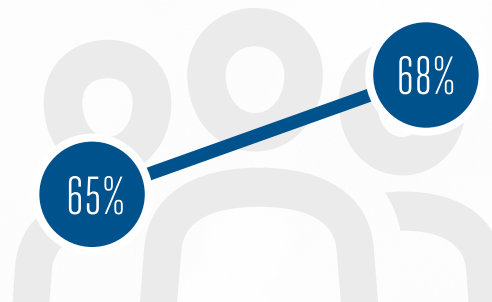


2G 3G 4G



MENA

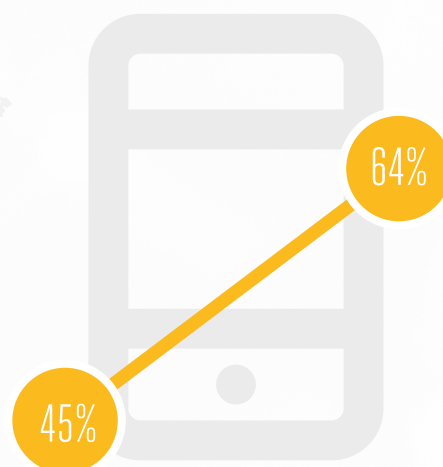
SUBSCRIBER PENETRATION



2016

2020

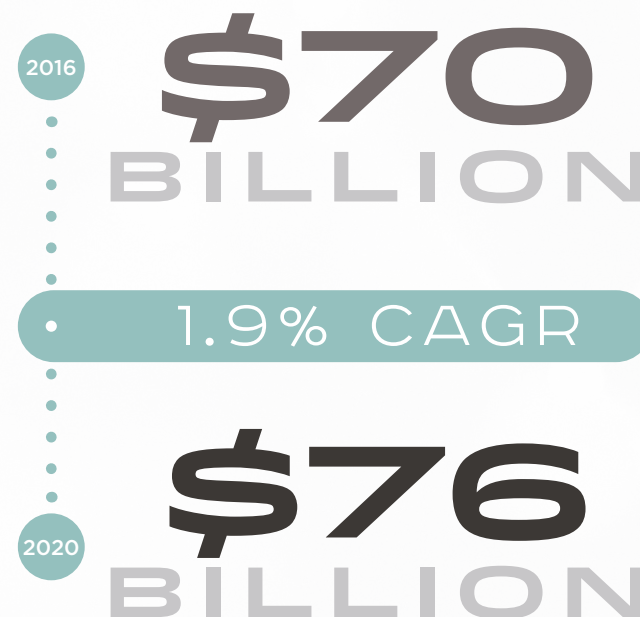
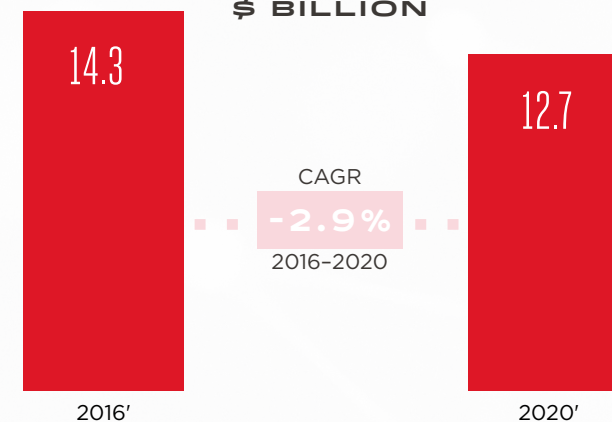
SMARTPHONE ADOPTION



2016

2020

OPERATOR TOTAL REVENUES

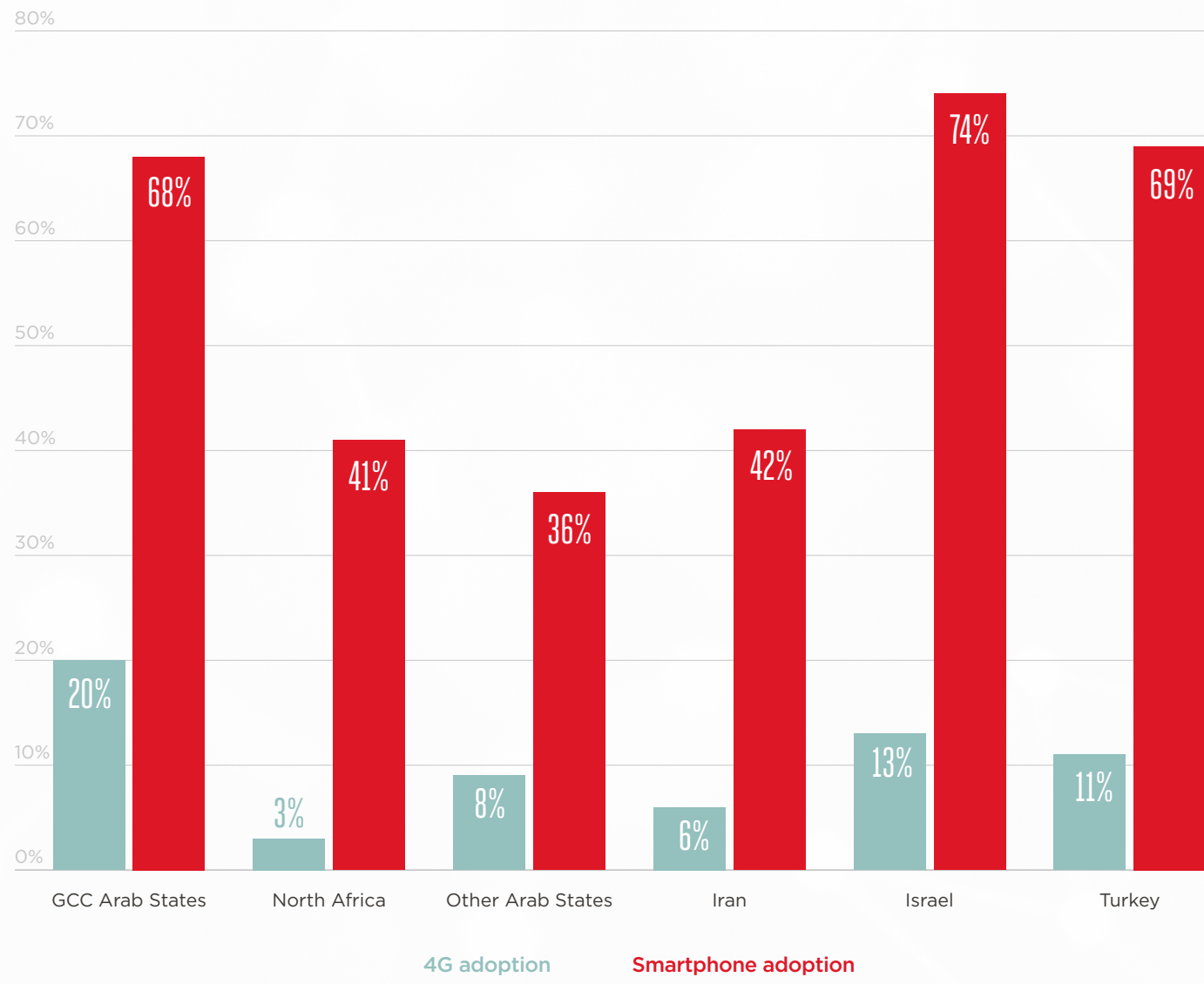
CAPEX
\$ BILLION

There is wide diversity in smartphone take-up, with the rich Gulf States, Turkey and Israel well ahead of North Africa.

4G adoption is uniformly lower, but network investment is increasing at pace.

This means there is upside from the increased data usage and ARPU uplift that should come from 3G to 4G migration.

MENA IS A REGION OF DIVERSITY



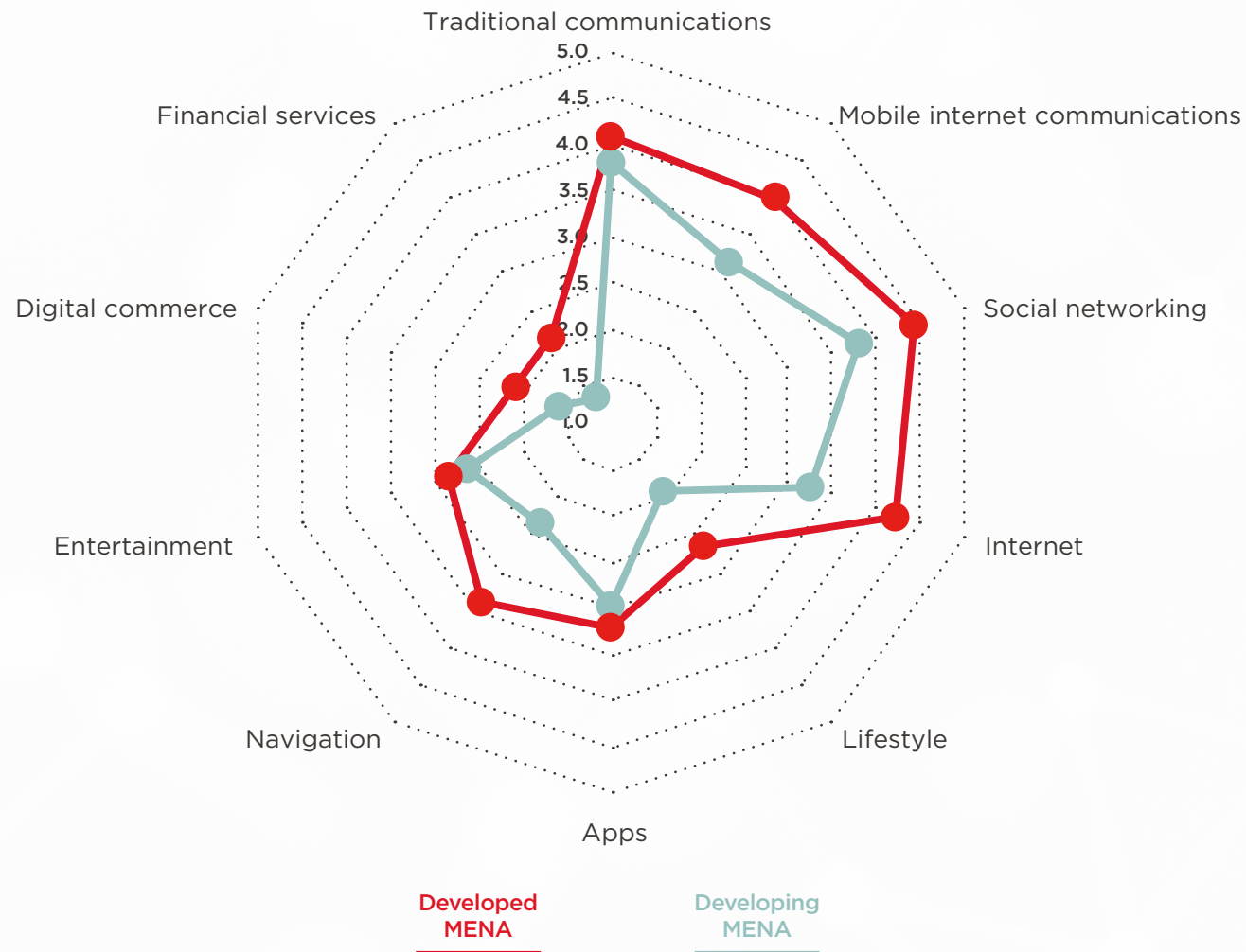
Note: MENA region defined as GCC Arab States (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, UAE); North Africa (Algeria, Egypt, Libya, Mauritania, Morocco, Tunisia); other Arab States (Comoros, Djibouti, Iraq, Jordan, Lebanon, Palestine, Somalia, Sudan, Syria, Yemen); and Iran, Israel and Turkey.

Source: GSMA Intelligence

Even within the smartphone user base, engagement in the mobile internet is generally lower in less developed countries.

This may reflect people in these countries being less likely to be on 4G (some will even use 2G smartphones), but it may also be affected by the availability (or lack thereof) of high-quality local content and basic digital literacy.

SMARTPHONE USERS IN DEVELOPED MENA MARKETS ENGAGE MORE FREQUENTLY IN A VARIETY OF USE CASES



Note: The survey covers 54 countries globally, including six countries in the MENA region: Algeria, Egypt and Morocco (developing) and Israel, Qatar, Saudi Arabia (developed). The chart shows the average frequency of mobile internet engagement by use case category based on the answers given by smartphone users of a representative sample of 1,000 respondents per country.

Spotlight on Turkey: a successful convergence play

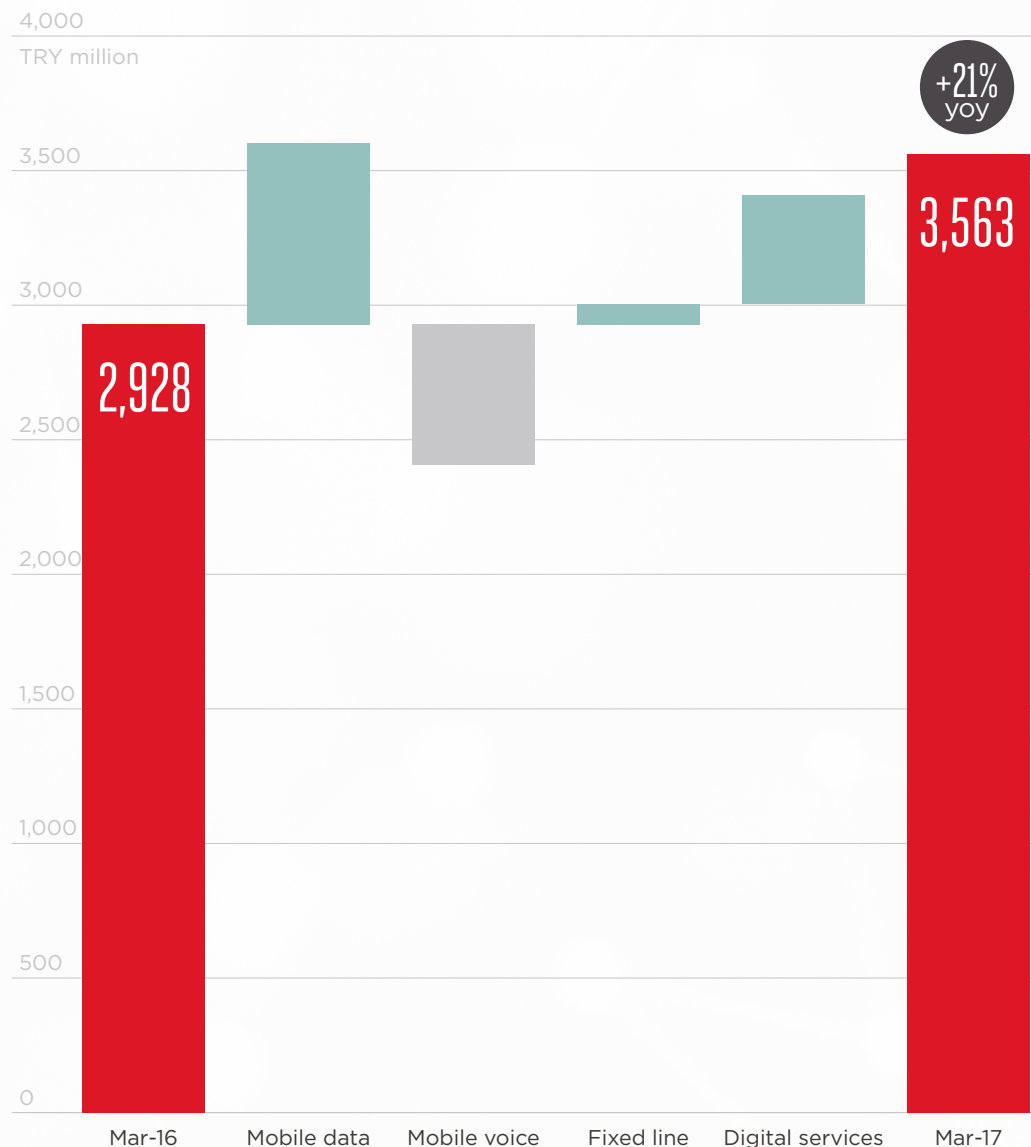
DIGITAL SERVICES

Turkey is in many ways a crossroads market, which is also true with telecoms/media convergence.

Turkcell is growing revenue at 21%, with digital (anything from fintech to identity to home energy) now 18% of domestic revenues.



TURKCELL REVENUE GROWING OVER 20%, DRIVEN BY MOBILE DATA AND DIGITAL SERVICES



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Analyst

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Senior Manager

Robert Wyrzykowski
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Lead Analyst, M2M



The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 300 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies,

as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai, Mobile World Congress Americas and the Mobile 360 Series of conferences.

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