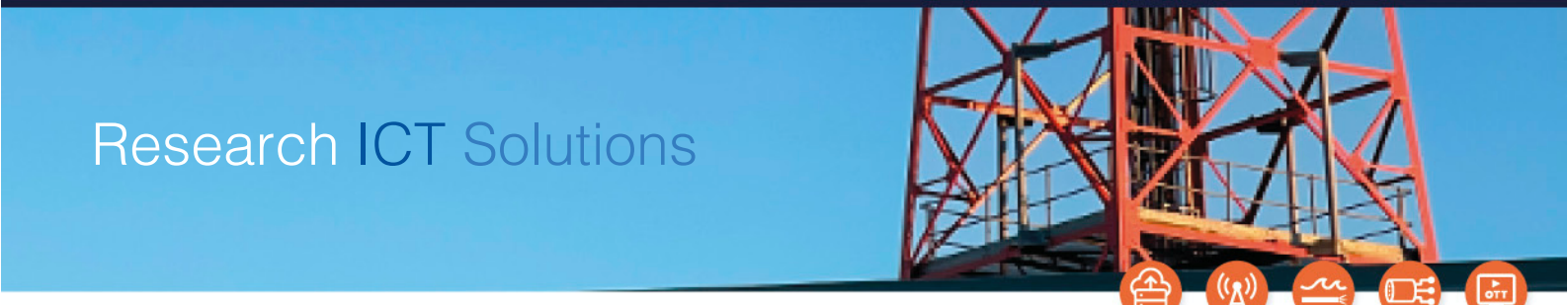
COMPETITION AND INVESTMENT IN THE INTERNET VALUE CHAIN IN AFRICA



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Executive Summary

The central claim in the debate on network fees is that there is market failure. Telcos claim that content providers are free-riding on telco networks, which reduces the incentive to invest in their networks. This report investigates this claim by analysing several key indicators to determine the presence of market failure (if any), including profitability, revenue growth, network costs and investment. The findings are based on an in-depth analysis of the Internet value chain, focusing on the connectivity segment and case studies of MTN Group and Airtel Africa.[1]

MTN and Airtel Africa are highly profitable operator groups with healthy EBITDA[2] margins and high returns on equity. MTN and Airtel Africa were chosen for a detailed analysis in this study due to their presence across Africa and disclosure of operational and financial data. MTN[3] operates in 16 African countries and Airtel Africa[4] in 14 African countries. Their financial performance challenges the notion that African telcos are unable to make viable returns on their investments. The telecom sector remains one of the most profitable sectors, with efficiency gains evident by the decreasing capital expenditures (CAPEX) and operating expenses (OPEX) per data subscriber and per gigabyte (GB). For MTN, assets per billable GB decreased by 92% from 2017 to 2024. The average network operating expenditure per GB sold across Airtel Africa's operation declined from USD 1.3 in the 2019 financial year to US 17 cents in the 2025 financial year. Despite the growth in data traffic, both operator groups have managed to keep their network costs stable as a percentage of revenue, debunking the claim that increased data traffic from over-the-top (OTT) services leads to unsustainable expenses.

		MTN Group			Airtel Africa		
		FY 2017	FY 2024		FY 2019	FY 2025	
KPIs	Revenue in USD billion	10	10.3	up	3.1	5.0	up
	EBITDA in USD billion	3.5	3.8	up	1.3	2.3	up
	EBITDA margin	35%	37%	up	43%	46.5%	up
OPEX	Network expenditure per data subscriber in USD	27.2	12.7	down	18.6	13.3	down
	Network expenditure per GB in USD	1.45	0.10	down	1.3	0.17	down
	Network expenditure as % of revenue	19%	19%	Same	18.1%	19.7%	up
CAPEX	Assets per data subscriber in USD	263	149	down	304	164	down
	Assets per GB in USD	13.9	1.1	down	21	2	down
	Assets as % of revenue	183%	229%	up	296%	243%	down

The report finds no evidence of market failure in the value chain. The connectivity segment is experiencing significant growth contradicting operators' claims of decline. User-generated content and streaming content drives broadband demand, benefiting all players in the Internet value chain, including telcos, indicating mutual interdependence rather than a one-sided

[1] MTN and Airtel are used because they make disaggregated data available for individual countries in their Annual Financial Statements. Other operator groups, such as Orange, hide their individual country performance in aggregated statistics, making country level analysis and conclusions difficult.

[2] Earnings before interest, taxes, depreciation, and amortisation. It is a measure of profitability that is suitable for comparison across countries as it omits depreciation and capital costs. Depreciation rules differ between countries and the cost of capital includes the sovereign risk of a country.

[3] Benin, Botswana, Cameroon, Côte d'Ivoire, Eswatini, Ghana, Liberia, Nigeria, the Republic of Congo, Rwanda, South Africa, Sudan, South Sudan, Swaziland, Uganda and Zambia

[4] Chad, Congo Brazzaville, Democratic Republic of the Congo, Gabon, Kenya, Madagascar, Malawi, Niger, Nigeria, Rwanda, Seychelles, Tanzania, Uganda, and Zambia

burden on telcos. The market for each segment of the Internet value chain is still expanding, emphasising continuous growth and opportunity. The cases of MTN and Airtel Africa demonstrate that operators benefit, not suffer, from the demand for content and streaming services.

Regulated network fees would trigger cost and bureaucratic inefficiencies for all parties involved. While telcos expect to be the ultimate beneficiary of such an intervention, the complexities of global internet traffic may very well achieve the opposite result. In the current simple business model, telcos charge their customers to access content on the public Internet. Regulated network fees would change this business model into a two-sided market, where telcos charge both their customers and the suppliers of content. The change from a simple one-sided business model to a two-sided business model introduces new complexities where investments could be geared towards maximising network fees instead of consumer quality of service or network optimisation.

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Introduction

This study investigates claims by certain African telcos[5] that there is a market failure in the Internet value chain. The claim is that companies that provide services via the public Internet (Over the Top companies or OTTs) are free-riding on mobile and fixed telecommunication infrastructure which is leading to a range of negative impacts on telcos. These claims include under-investment due to declining profitability because of excessive data traffic overloading broadband networks as well as declining revenues. They state that higher operating costs and more expensive network infrastructure mean less funds available for investment. Their argument is that congestion on existing networks and less innovation will cause new technologies, like 5G, to be delayed or even abandoned.

To overwrite commercial peering agreements and prescribe network fees would be a regulatory intervention that requires evidence of market failure. The ITU states that regulatory interventions should only be enacted when "problematic behaviour or proof of harm is found".[6] The process for a national regulatory body would be to define the relevant market, determine whether any company has significant market power and than to determine whether dominant companies abuse their market power leading to harm for investors and/or consumers. None of the MNOs that complained about market failure have produced any evidence of it. The complaints are mostly in the form of casual comparisons of profit margins and nostalgic reflections of past profit margins during the initial rollout of mobile telephony in the 1990s.

This study looks for evidence of market failure by looking at publicly available data. Based on audited financial statements (AFS), we look at reported revenues by operator to see if revenue and profitability are declining. We look at trends in global averages for other sectors. The report examines the capital expenditure (CAPEX) and the operating expenditure (OPEX) from select African operators[7] in relation to revenues, subscribers and traffic to see the impact as broadband users demand for content grows.

This report is structured as follows:

- **Network-Fee Debate:** Investigating and understanding the precise arguments supporting the network fees debate from the perspective of African telcos.
- **Two-Sided Market Business Models and Network Effects:** Defines a two-sided market and why African telcos insist that the broadband access market is a two-sided market. This

[5] In this report telcos refers to all telecommunications operators, including fixed and mobile

[6] ITU-D, Economic impact of OTTs on national telecommunication/ICT markets, https://www.itu.int/dms_pub/itu-d/oth/07/23/D07230000030001PDFE.pdf

[7] The report is limited to publicly available data and specifically data from Annual Financial Statements. Some African operators are not publicly listed. Others are part of larger operator groups and do not disaggregate data by country (like Orange). For these reasons, the data for this report is limited to Vodacom, MTN and Airtel because they provide details AFS that are publicly available.

section explains the consequences of making the broadband access market a two-sided market.

- **Internet value Chain**: Explains the global Internet value chain's structure and growth; profitability of segments of the Internet value chain, a description of the transition of telecom business models towards a data-centric model, compares profitability metrics across various segments and ends by examining mobile broadband affordability in Africa.
- **Content Platform (CP[8]) investments into submarine cable systems:** CPs have invested or are investing into six African submarine cable systems. CP's 'ownership models varies from sole ownership to part ownership through consortia. These strategic investments provide significant benefits to end-users by improving latency, increasing download speeds and improving affordability.
- **MTN Case Study**: A detailed analysis of MTN's operating expenses, capital expenditures and their impact on efficiency and sustainability.
- **Airtel Africa Case Study**: An analysis of Airtel Africa's operating expenses and an overview of capital investments and infrastructure developments, including Nigeria and regional breakdown of East Africa and Francophone countries.
- **Conclusion**: The report ended with a conclusion providing a brief summary of the main points of the report.

[8] Content Platforms include, for example, streaming services and social media platforms.

2

The Network Fees Debate

The network fees debate has been around for more than a decade. Each iteration has a new name but the underlying argument is identical. In 2012, the European Telecommunications Network Operators' Association (ETNO[9]) proposed a concept called "quality based delivery"[10], which was essentially a Sending Party Network Pays (SPNP) model for IP interconnection. ETNO argued that Internet traffic is increasingly asymmetric, driven by video streaming applications from content providers (CPs). It argued that this imbalance meant that settlement-free peering no longer made sense and that a new regime was required to ensure that costs are shared.[13] ETNO did not want a subsidy from CPs to network providers, but rather to charge differentiated fees based on the quality of service. For example, broadband for medical or banking applications that required low latency would have a higher price compared to search queries where latency is not an issue.[14] This would have introduced a tiered Internet, where some content is given priority compared to others and would represent a move away from the "best effort" approach to data delivery. ETNO's proposal was rejected by regulators, non-government organisations, and ultimately the Member States of the International Telecommunication Union (ITU).[11]

The network fees debate has been revived with new claims of an unsustainable broadband business model. A joint statement of CEOs of Deutsche Telekom, Vodafone, Telefónica and Orange was released on 14 February 2022 and stated that *"we cannot make a viable return on our very significant investments"*. The operators argued that "our retail markets are in perpetual decline in terms of profitability".[12] There have been similar statements by African operators. Vodacom's CEO has stated that over-the-top (OTT) players "*have destroyed the revenue of telecoms operators"*.[13] The GSMA, as an industry representative for many mobile operators, makes similar claims: *"At the same time, those benefitting the most from using existing networks contribute the least to national digital infrastructure. Six content and application providers are generating more than 60% of all traffic on the web, but the investment burden isn't being shared equitably. We have seen data demand grow continually, but unless the investment model changes, telcos cannot deliver the necessary supply*".[14]

[9] Now called 'Connect Europe' https://connecteurope.org/news/etno-becomes-connect-europe-prepares-tech-policy-future

[10] ETNO, 2012. ITRs Proposal to Address New Internet Ecosystem, available at https://www.etno.eu/datas/itu-matters/etno-ip-interconnection.pdf

[11] The ITU is governed by its member states and future of the organization is determined every four years at the plenipotentiary conference, see https://www.itu.int/en/plenipotentiary/2014/newsroom/Documents/backgrounders/pp14-backgrounder-itu-governed.pdf.

[12] https://www.telefonica.com/en/communication-room/blog/a-call-for-large-content-platforms-to-contribute-to-the-cost-of-the-european-digital-infrastructure-that-carries-their-services/

[13] Joosub in Techcentral, https://techcentral.co.za/vodacom-mtn-internet-giants-fair-share/229988/

[14] GSMA, 2023. https://www.gsma.com/solutions-and-impact/connectivity-for-good/public-policy/gsma-ministerial-programme-2023-leadership-for-future-connectivity

Table 1: Telco claims about market failure

#	Claims	Comment	Negative Externality		
			Telcos	CPs	Consumers
1	Free rider problem	• Internet access and Internet content complement each other, they are mutually beneficial services. • "Getting the benefit but not paying for the cost", applies to both telcos and CPs in their segments of the value chain. • Telcos benefit from demand for broadband because of content. • CPs benefit from people being subscribed to broadband.	No	No	No
2	Revenues are declining because voice has been replaced by OTTs	• The connectivity segment of the value chain is still expanding, i.e., revenues are still growing. • The switch from analogue calls to IP based calls is not an externality but technological progress. • Telcos transition from voice to data revenues due to technological change and voice revenues are being replaced by data revenues. • Consumers benefit from nearly free voice and SMS communication.	No	No	No
3	Profitability decline	• EBITDA margins and asset to revenue ratios are stable. • The connectivity segment is still among the most profitable sectors across the economy.	No	No	No
4	Network overload	• Network overload is not an externality but an internality. • There are technical solutions to network overload as a result of increased demand, including CDNs, video compression and network backhaul expansion. This requires investments from telcos and CPs. • It is in the interest of CPs and telcos to provide the best possible user experience for their customers. Consumers may change ISP and CP if unhappy. • There are examples of voluntary CP/ISP cooperative partnerships on video optimization in the market and these are working well. • Increased demand is generally a good thing in business.	No	No	No
5	Investment Gap	• The perceived investment gap is the result of policy objectives that are not binding on the private sector. • If policy objectives are not commercially viable, then the state must contribute to the funding, through Universal Service Funds, for example.	No	No	No

The alleged loss of revenues and profits has resulted in calls by operators for free market arrangements to be overruled by state intervention. For example, some European operators have called upon large content platforms "***to contribute to the cost of the European digital infrastructure that carries their services.***"[15] Vodacom and MTN want "internet giants" to pay their so-called fair share.[16] Airtel India (the parent company of Airtel Africa) wants ***"tech firms to pay***

[15] https://www.ft.com/content/68f989f5-96e6-440e-90f4-2a11840d9c99, https://www.telefonica.com/en/communication-room/blog/a-call-for-large-content-platforms-to-contribute-to-the-cost-of-the-european-digital-infrastructure-that-carries-their-services/, https://www.telekom.com/en/company/details/united-appeal-of-the-four-major-european-telecommunications-companies-646166

[16] https://techcentral.co.za/vodacom-mtn-internet-giants-fair-share/229988/

for network usage".[17] This implies changes to the current IP peering and transit regimes, which are commercially negotiated. Telcos would charge their subscribers to access the Internet and also charge content providers to send content to their subscribers.

CPs do not operate in national broadband markets but operate mostly in the online content segment of the Internet value chain. Telcos claim that CPs hold a dominant position in the content segment, which leads to negative externalities in the access market. To show that CPs hold abuse their dominant position and are abusing such position, telcos need to show that there are negative externalities caused by CPs. A negative externality is when a firm has all the benefits of a service but none of the costs. Table 1 shows each of the telco claims and whether there is a negative externality.

An analogy provides a simple explanation: roads were originally designed for horse-drawn carts. When the motor vehicle was invented, horses were pushed off the roads. This is simply technological progress. Car owners pay for the construction of roads via fuel and road taxes. Car manufacturers rely upon roads for their vehicles but do not pay for the construction of roads. The more vehicles on the road, the more taxes are collected from road users. The costs of road construction are recouped from the users. In the broadband access market, the same system applies: content providers do not pay to build access networks. The mistake that telcos are making is to claim that content creation (like car manufacturing) requires CPs to pay to build networks (or roads).

Generally, broadband subscribers and telcos make up a specific market that excludes content providers. But that does not mean that CPs do not invest into broadband infrastructure. CPs like Alphabet and Meta have invested in private submarine cable systems and in Internet Exchange Points (IXPs). Also, the market for online content in not restricted and telcos have in the past entered this market. Telkom South Africa, Vodacom, MTN, Airtel, Globacom, Orange and Safaricom are telcos that are players in the video-streaming market in Sub-Saharan Africa.[18] MTN has a music streaming service called MTN Pay.[19]

Claim 1: Market failure due to the free-rider problem

The central claim in the debate on network fees is that CPs are free-riding on telco networks. Telcos argue that "OTT providers benefit from the network infrastructure investments made by network operators without sharing the associated costs".[20] This leads to increased financial pressure due to the rising popularity of streaming services alongside flat or declining telecom sector revenues. As a result, "[e]xponential data traffic growth, relatively flat telecom sector revenues, and low return on capital have contributed to an investment gap".[21] Free-riding by CPs reduces the incentive for telcos to invest in their networks. This inefficiency is characteristic of a market failure.

[17] https://techcrunch.com/2023/09/04/telecom-operators-in-india-want-tech-companies-to-pay-for-network-usage/?guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAIKkAXOUViAKWmDSlGgbUjGNH1f6Pf2ukdntpjIN0-NN18q0XDtp0WWNinn04oPShQ4rngWMLhgQgSpdqbd8Rhx7XiQCup-wrhjvREQDKptK65o8A72POm9rHcLKtPxOCMqoZZbXNNNL-2-CYuVT5yaZ67NThQuBDIKBGjrkRd1K&guccounter=2

[18] https://www.itweb.co.za/article/video-telkom-in-video-streaming-push-to-diversify-services-revenue/Gb3Bw7WaVYoq2k6V

[19] https://play.mtn.co.za/music

[20] ACT, 2023, page 34

[21] GSMA Ministerial Programme 2023: Leadership for future connectivity, https://www.gsma.com/solutions-and-impact/connectivity-for-good/publ.../gsma-ministerial-programme-2023-leadership-for-future-connectivity

There is, however, no evidence to support the free-rider claim. BEREC states, a "closer look suggests that there is no evidence of "free-riding" along the value chain".[22] The free-riding claim implies negative externalities given that CAPs and telcos operate in different segments of the Internet value chain, i.e., in different markets. Availability of content on the public Internet is a positive externality because it generates demand for telco services. Investments by CPs increases demand for telco services and investments by telcos increases the demand for content. The relationship is one of mutual benefit and not one of free-riding on the other's investments.

The international IP interconnection and the online content markets are both competitive. The only segment of the Internet value chain that is not competitive is that of national broadband networks. Nothing stops telcos from investing in the content segment of the value chain, and as noted above, telcos have entered this market with relative ease. However, market access to national telecommunication infrastructure is regulated through licensing by national regulatory authorities. As a result, this market is characterised by oligopolies and is thus regulated to ensure fair competition. Regulating network fees would intervene in a competitive market to produce a result that would distort competition and lead to inefficient allocation of resources.

Claim 2: Declining revenues

African telco revenues are not in decline. Even so, some African telcos[23] claim that "*[d]espite the growing number of subscribers and data usage, the revenue growth rates per subscriber is declining*".[24] This claim is about declining growth rates, revenues are still growing but at a slower pace. The MTN case study shows that revenues increased by 42% in South African Rand and 10% in USD between 2017 and 2024. The Airtel case study shows that revenues increased by 61% in USD between financial year 2019 and 2025. Voice revenue for Airtel actually showed a steady increase and not a decline. Data revenue continues to grow steadily for both MTN and Airtel.

European telco revenues are partially stagnant but the cause is their own business model decisions. European telcos have mostly switched to uncapped products, where revenue does not increase with higher data use of subscribers. The situation is different in Africa. African telcos mostly charge per GB. This means more data demand equals more data revenue. This is a commercial / business decision.

Claim 3: Declining profitability

African telcos profitability is not in decline. The MTN Group EBITDA increased by 49% between 2017 and 2024. MTN's EBITDA margin increased from 35% in 2017 to 44% in 2022 and 37% in 2024. MTN's lower profitability in 2024 is the result of continued exchange rate losses in the Nigerian market. The Airtel case study shows that its EBITDA margin improved from 43% to 46.5% between FY 2019 and 2025. This is far higher than all other segments of the value chain.

An analysis of the Internet value chain shows that the connectivity segment is still growing and profitable. The connectivity segment is among the most profitable sectors in the

[22] BEREC, 2022. BEREC preliminary assessment of the underlying assumptions of payments from large CPs to ISPs, page 12
[23] These claims are in a report from the Association of Comms and Technology, which is a company representing MTN, Vodacom, Cell C, Rain and Telkom. Despite the exhortation that "evidence-based decision-making is crucial", the report offers zero primary evidence to support its assertions and rather relies on a series of dubious secondary sources.
[24] ACT, 2023, page 5

economy. Returns for the connectivity segment are significantly higher than the cost of capital, both globally and for emerging markets. The analysis in Chapter 4 shows that Telcos enjoy the double benefit of below-market cost of capital and above-market profitability.

Claim 4: Network overload

In South Africa, telcos claim that mobile networks were never designed for OTTs. "IoT and OTT services, and their rapid and continued growth, consume ever increasing capacity of networks that were not designed for this kind of use".[25] The net result, according to these telcos, is "lower profits and potentially less/slower investment in network expansion and improvement catering to those services."[26] This argument would arguably be true for the first and second generations of mobile networks which offered voice and SMS only. However, any subsequent generation of mobile network upgrade from 2.5G onwards was and still is about delivering more and faster data. This is such a bizarre claim that it is difficult to assess in any meaningful mannerseriously. How a packet of data is used is irrelevant to modern IP networks.

The Internet is a connected ecosystem. Telcos benefit from the demand for, and supply of, content. CPs have as much incentive for a high-quality user experience as telcos. Likewise, CPs also have an incentive to supply users with high quality experiences. Quality deteriorates as networks become congested and CPs have invested in tools, such as on-net CDNs, to bring content ever closer to the edge (i.e., towards the end user), as well as partnerships with telcos to boost the video experience and improve network efficiency and lower congestion during peak times.[27]

Claim 5: Investment gap

In Europe, the debate on ICT investments is shaped by ambitious policy objectives for 5G coverage. However, the capital requirement to meet political coverage objectives are well within the regular investment pattern of European telcos. The Digital Decade Policy Programme 2030 established by the EU[28] sets targets for 5G for EU member states that ***"all populated areas should be covered by a next-generation wireless high-speed network with performance at least equivalent to that of 5G"***[29]. The EC estimated that if fixed and mobile deployment is coordinated, a total investment of nearly €153 billion is required.[30] . Between 2016 and 2021, total CAPEX was €309.5 billion, or €51.6 billion per year on average.[31] Existing CAPEX, therefore, is easily within the requirements needed to meet the EU targets by 2030. The EC also found that the current investment climate for digital infrastructure is highly attractive to institutional investors,[32] indicating that there is no 'investment gap' in Europe.

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[25] ACT, 2023, page 5
[26] ACT, 2023, page 5
[27] ARCEP, 2021. https://en.arcep.fr/uploads/tx_gspublication/report-state-internet-2021-edition-july2021.pdf and also WIK Consult 2022, Competitive conditions on transit and peering markets, page 27, available at https://www.wik.org/en/veroeffentlichungen/studien/weitere-seiten/transit-and-peering-markets, see most recent announcements by Telefonica (https://www.telefonica.com/en/communication-room/press-room/telefonica-meta-boost-short-video-experience-network-efficiency/) and by Vodafone (https://www.vodafone.com/news/technology/vodafone-and-meta-optimise-short-form-videos-to-improve-network-efficiency#) concerning partnerships with Meta to improve network optimisation.
[28] https://eur-lex.europa.eu/eli/dec/2022/2481/oj
[29] https://eur-lex.europa.eu/eli/dec/2022/2481/oj, item 13
[30] https://ec.europa.eu/newsroom/dae/redirection/document/97376
[31] ETNO, 2023. https://etno.eu/component/attachments/attachments.html?task=download&id=8340, page 29
[32] EC, 2022. Investing in local and regional Gigabit broadband deployment, available at https://digital-strategy.ec.europa.eu/en/library/study-investing-local-and-regional-gigabit-broadband-deployment-opportunities-and-challenges-market

Some operators argue that the cost of rolling out new technology, such as 5G, is resulting in negative returns on investment.[33] The point is that 5G may not be the appropriate technology for universal coverage and attempting 5G rollout for areas other than for urban areas may very well lead to loss making investments. Where and when to rollout 5G or fibre or an alternative technology is up to operators and depends on a multiplicity of factors, such as consumer demand, availability and cost of spectrum and investment incentives. Therefore, the issue is not that there are "negative returns on investment", but that the technology mix and the business case for a particular technology might not be there. For areas where 5G is politically desirable and economically not viable, universal service funds and a subsidy scheme may be used.

The way the Internet is accessed in Africa is different to Europe. Historically, in Europe and the USA, fixed broadband services could not compete with mobile broadband services in terms of either speed, price or convenience or a combination of all three. This was when fixed broadband was delivered via copper cables using xDSL. Nowadays, mobile broadband cannot compete with fixed broadband on speed and price, now being delivered via fibre to the home FTTh or high speed point to point wireless. In Europe, mobile broadband is supplementing fixed broadband at home, school or work. In Africa, FTTh is still a niche product and not available to the vast majority of Africans. Mobile remains the primary form of Internet access. Also, 5G-ready handset penetration in Africa is minimal. African telcos thus have a very different investment outlook. Improving backhaul capacity to RAN sites may boost revenues more than upgrading end user access technology from 4G to 5G. The analysis of profitability from AFS of African operators shows that returns on investment are very attractive and that there is also, like Europe, no investment gap.

[33] Joosub in Techcentral, https://techcentral.co.za/vodacom-mtn-internet-giants-fair-share/229988/

Summary

There is no market failure. Telcos are trying to show that the content segment places negative externalities on the connectivity segment of the value chain. According to this argument, CPs do not pay the costs of building network infrastructure, but claim significant benefits and the negative impacts of CPs free-riding on telco infrastructure is only on the telco side: declining revenues and profitability, network overload, investment gaps. These supposed negative externalities are not supported by any evidence. The proposed remedy of network fees intervenes in a competitive market, for which a market failure has not been demonstrated and for which national regulators only have partial jurisdiction.[34]

Not only is an intervention by regulators not warranted, but regulated network fees would have far-reaching negative effects. A recent study shows that regulated network fees provoke more disputes and thus raise costs for nearly all players in the Internet value chain. The study emphasises that IP interconnection is not a broken market and that the small number of disputes that occurred in the past have all been adequately resolved with existing regulatory tools. Regulated network fees also raise significant net neutrality concerns, apart from distorting markets.

[34] National regulators can only set network fees for domestic networks and cannot prescribe what Tier 1 ISPs in other jurisdiction charge. BEREC states that network fees would cause more harm than good (BEREC 2022, page 15: https://www.berec.europa.eu/system/files/2022-10/BEREC%20BoR%20%2822%29%20137%20BEREC_preliminary-assessment-payments-CPs-to-ISPs_0.pdf)

3

Two-Sided Market Business Models and Network Effects

Network effects are a crucial part of the success of the communications market. Communications systems gain value as more users enter the market. New subscribers increase the value of the telco network and for all its subscribers, which is known as the network effect. Social media platforms and user generated content are important drivers for broadband adoption, and thus for the increase in value of telco networks. New users mean new interactions and more content to share and exchange. The value add for the telco network of a new user that also uses social media is higher than a new user that does not due to the additional data revenues.

Network effects apply to a lesser extent to streaming platform subscriptions. While a streaming subscriber increases the demand for data usage, a new streaming subscriber does not increase the value for other streaming subscribers directly for the content provider. The interaction is not between streaming subscribers but between the content provider and the streaming subscriber. Network effects are, however, at play in the long term. More subscribers also means more funds to produce or acquire content. One of the reasons why so many telcos have failed to develop a successful streaming platform is that they target their existing subscribers but ignore the full market. In contrast, Netflix is telco-independent and can target the whole population of a country or region, independently of the telecom network its customers are subscribed to.

Some companies in the online service and content rights segments of the Internet value chain operate a two-sided market business model. A two-sided market is characterised by two distinctly different but interlinked markets. The classic example of a two-sided market is the newspaper business. A newspaper can sell its newspapers below cost or give it away for free to attract more readers. More readers mean it can charge more for adverts. For the newspaper, one market is its readers, and the other market is advertisers. Essentially, one market subsidises the other - advertisers fund the losses from the sale of newspapers. Prices for the newspapers and the advertisements are interlinked and the company has to consider both markets together in its business strategy.

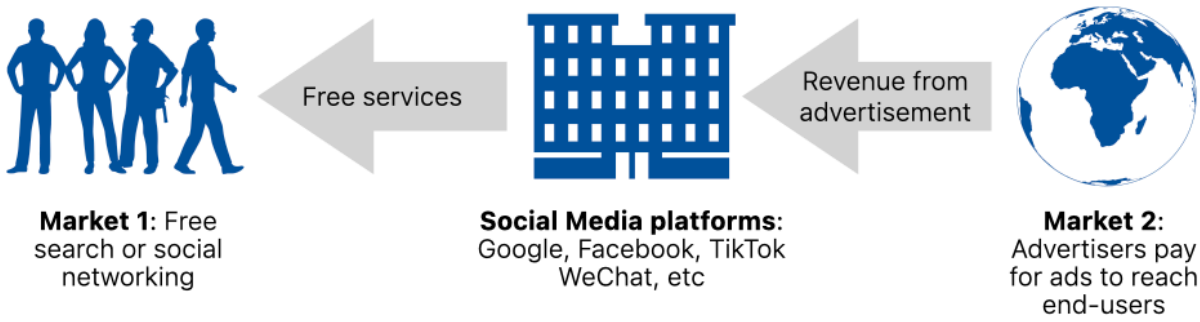

Figure 1: Social media platforms operate in two-sided markets

Social media platforms and search engines operate a two-sided market[35] model, where access to platform or searches are free and revenue is generated through advertisements. Companies in the content rights segment may also operate a two sided-market model, such as CNN and other broadcasting or streaming services. A subscription streaming service is usually a simple single-sided market. If a streaming service offers an alternative cheaper or free service, funded partially by advertisements, then that service would also be a two-sided market.[36]

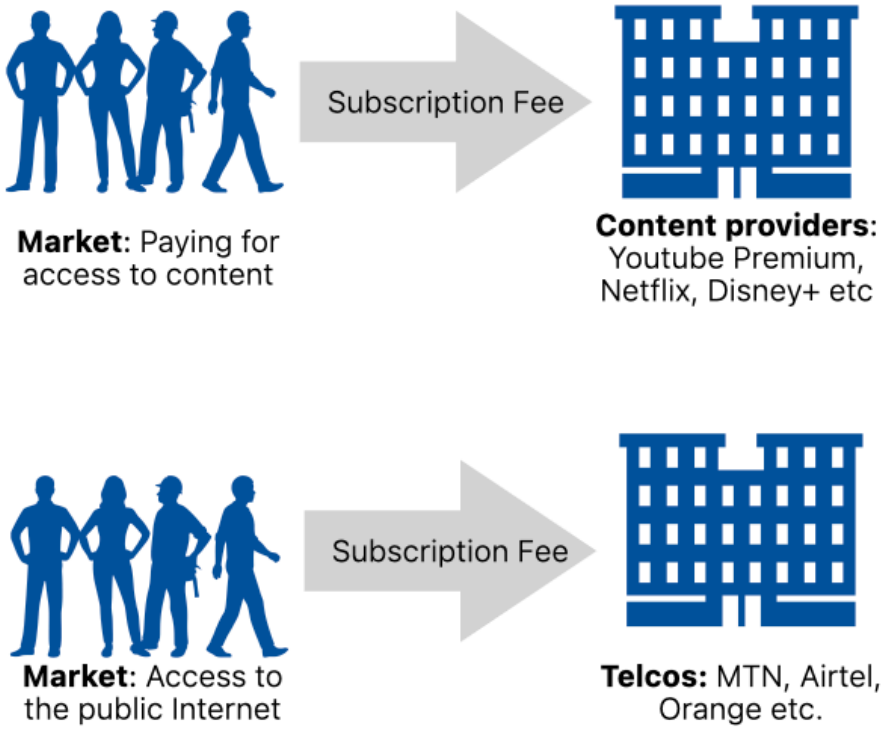

Figure 2: Telcos and content providers mostly operate in regular markets

Replacing commercial peering agreements with regulated network fees triggers cost and bureaucratic inefficiencies for all parties involved. While telcos expect to be winners of such state interventions, the complexities of global internet traffic may very well result in negative

[35] In some countries, the term multi-sided market is preferred. In this report, the terms are interchangeable.
[36] Netflix does this and offers an ad-supported version (standard with ads) and a no-adverts version (standard and also premium). See https://help.netflix.com/en/node/24926

outcomes for telcos as well. In the current simple business model, telcos charge their customers to access content on the public Internet. Regulated network fees changes this business model into a two-sided market, where telcos charge both their customers and the suppliers of content. The incentive structure changes and the investments are more likely to be geared towards maximising network fees instead of consumer interests or network optimisation.[37] What is currently a relatively simple system dominated by settlement-free peering would need to change to a wide range of network payments between subsidiaries of multinational telcos and local ISPs.

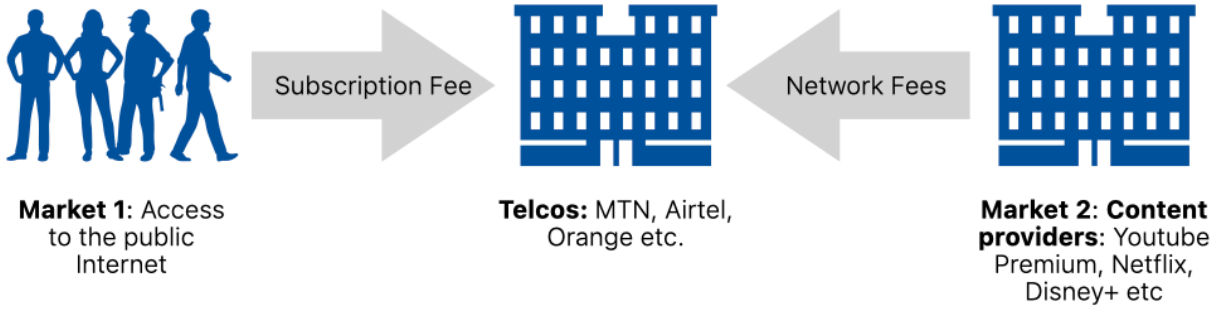

Figure 3: Network fees turn regular markets to two-sided ones for telcos

National regulatory authorities can only implement network fees at a national level. It is thus unlikely to be evenly implemented across the globe. Small African regulators do not have the same resources such as the FCC or Ofcom and it is quite reasonable to assume that consumers will have to bear the consequences of uneven implementations across the globe. Further it is not clear how network fees for international peering could be implemented. For example, in South Korea, if the traffic imbalance is greater than 1:8, then transit fees are applicable and peering is not allowed. Other countries might follow a different ratio.

Vertically integrated Tier 1 ISPs already charge network fees. In an analysis of the IP interconnection market completed in 2024, BEREC found that vertically integrated Tier 1 ISPs have a far lower percentage of peering compared to transit and that these providers try to limit the availability of peering compared to transit. One consequence is that these tier 1 ISPs are more likely to use their termination market power to extract monopoly rents by charging 'premium transit' services, especially to CPs.[38] Deutsche Telekom has done precisely this and it only peers with Tier 1 backbone operators and does not allow any CDNs on its network.[39]

[37] This is precisely the concern raised by The European Consumer Organisation in its report "Fair for Consumers: The future of connectivity and the Open Internet", page 7.
[38] BEREC, 2024. BEREC Report on the IP Interconnection ecosystem, page 28, https://www.berec.europa.eu/system/files/2024-06/BoR (24) 93_draft BEREC Report on the IP-IC ecosystem_1.pdf.
[39] WIK, 2022. Competitive conditions in the transit and peering markets, page IX, https://www.wik.org/fileadmin/user_upload/Unternehmen/Veroeffentlichungen/Studien/2022/Studie_Wettbewerbsverhaeltnisse_auf_den_Transit-_und_Peeringmaerkten.pdf.

4

Internet Value Chain

The global Internet value chain incorporates various industries across jurisdictions and has five distinct segments: content rights, online services, enabling services, connectivity, and user interface (Table 2). The market value of the global Internet value chain quadrupled between 2008 and 2020. The connectivity segment more than tripled in market value. Growth between 2008 and 2020 was 331%. These growth figures show that the connectivity segment of the value chain is not in decline, contrary to claims by some telcos. There is, however, a shift in market shares within the connectivity segment. This shift follows global, and also country-specific, trends and will be discussed throughout this report.

Table 2: Value creation along the global Internet value chain[40]

Segment	Example activities	2008		2015		2020		Growth
		USD billion	Share %	USD billion	Share %	USD billion	Share %	
Content Rights	Premium content rights	37	3%	66	2%	186	3%	**403%**
Online Services	e-Travel, video and audio publishing, gaming, gambling, search, social media, information & reference, cloud based services, other online services	477	40%	1,595	48%	3,792	57%	**695%**
Enabling Technologies & Service	Web design & hosting, payment systems, advertising exchanges, CDNs	188	16%	442	13%	812	12%	**332%**
Connectivity	Mobile access, tower companies, fixed access	229	19%	586	18%	988	15%	**331%**
User Interface	Hardware devices, software and systems	251	21%	659	20%	897	13%	**257%**
Total		**1,182**		**3,348**		**6,675**		**465%**
Source:	GSMA 2022							

Each segment is subject to its own laws, rules, regulations, and regulatory bodies. Each segment also comes with its own risks, investment requirements, and profit opportunities. Telcos are generally part of the connectivity segment of the Internet value chain. However, some telcos also offer services in other segments of the value chain, including enabling services, online services and content segments.

[40] https://www.gsma.com/solutions-and-impact/connectivity-for-good/public-policy/wp-content/uploads/2022/05/Internet-Value-Chain-2022-1.pdf

For any government, the Internet poses legal and regulatory challenges. Goods and services are sold across borders; consumers watch videos from other countries, and applications may in some ways replicate features of regulated services, such as voice calls and SMS. OTT applications generally do not make use of limited resources, such as spectrum, numbering, etc. and are generally not regulated, or only lightly regulated, by country-specific telecommunication regulations, to reflect the different functional characteristics of these services compared to regulated telecoms services.[41] The term 'OTT' is extremely broad because it is just another term for Internet content and things to do on the Internet.[42] It distracts from actual regulatory challenges to maintain fair competition across the Internet value chain and within the connectivity segment.

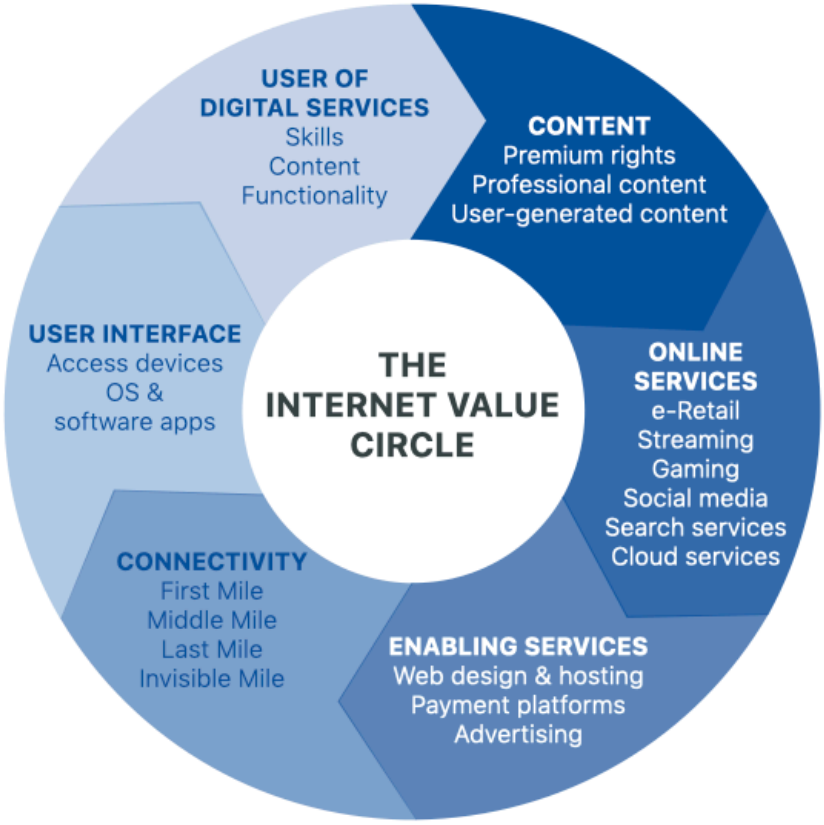

Figure 4: Internet value chain turning into an Internet value circle

The connectivity segment of the value chain is subject to ex-ante regulation by the telecommunications regulator. Telecom regulators primarily have jurisdiction within the connectivity segment of the value chain.[43] Other segments of the value chain have the distinguishing characteristic of being transnational. The consequence is that telecom regulators can only intervene in instances where they see market failure in the connectivity segment. In other segments of the value chain, collaboration between different institutions, such as competition authorities, telecom and broadcasting regulators as well as cooperation across national boundaries is required.

[41] An example is a Skype call to a mobile or fixed-line number, i.e., terminating on an operator's network. Regulated termination rates are then applicable.

[42] BEREC defines OTTs as a "content, a service or an application that is provided to the end user over the public Internet". https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-ott-services

[43] Some NRAs have regulatory powers over the content segment of the value chain.

The self-reinforcing mechanism of user-generated content makes the Internet value chain a virtuous circle. Figure 4 adds a sixth element - User - to the traditional broadband value chain. User-generated content drives broadband demand, driving consumers to purchase broadband access and more data and ultimately generating the revenue that broadband providers can use to reinvest in expanding network capacity and coverage.[44] User-generated content is different to the other content (such as streaming services) because of its self-reinforcing nature: the more users that are online, the more content is produced by users, and the more attractive the Internet is for new users. For conventional premium content providers, the relationship between subscribers and content investment is linear. The more subscribers, the more funds are available to either buy or produce content. It lacks the network effects that user generated content has and thus its exponential nature. The classical example of the network effect has been the fax machine. The first one was not of use to anyone. The second fax machine made the first one more valuable and so forth.

OTT use benefits all segments of the Internet value circle. The transition from traditional content-delivery mechanisms (such as broadcasting or cable services) to content on demand or streaming further adds to the demand for broadband. As BEREC confirms,[45] higher demand for content translates into demand for better speeds and data allowances, and this increases telcos' revenues. BEREC calls this 'mutual interdependence' and sees claims by telcos for payment from content application providers (CPs) to access telcos' networks as ignoring this interdependence.

The Internet is a connected ecosystem. Telcos benefit from the demand for, and supply of, content. CPs have as much incentive for a high-quality user experience as telcos. Likewise, CPs also have an incentive to supply users with high quality experiences. Quality deteriorates as networks become congested and CPs have invested in tools, such as on-net CDNs, to bring content ever closer to the edge (i.e., towards the end user), as well as partnerships with telcos to boost the short video experience and improve network efficiency and lower congestion during peak times.[46]

Profitability of segments of the Internet value chain

Market access to the last-mile is restricted by operating and spectrum licenses. This naturally limits investment by content providers and social media platforms, whose business is not that of 'last mile connectivity'. They therefore invest mainly in data centers, caches and international connectivity. Investment into a sector with restricted market access through operating and spectrum licenses is not a burden but a privilege. A result of this privilege is the lower cost of capital, higher EBITDA margins,[47] and a higher return on equity than other sectors. The connectivity segment is the most profitable segment of the Internet value chain, and returns are significantly higher than the cost of capital, globally (Table 3) and for emerging markets (Table 4).

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[44] See eg Stork, C., Esselaar, S. and Chair, C. (2017). OTT - threat or opportunity for African Telcos?, Telecommunications Policy, Volume 41 (2017), http://www.sciencedirect.com/science/article/pii/S0308596117302069.

[45] BEREC, 2022. BEREC preliminary assessment of the underlying assumptions of payments from large CPs to ISPs, https://www.berec.europa.eu/en/document-categories/berec/opinions/berec-preliminary-assessment-of-the-underlying-assumptions-of-payments-from-large-caps-to-isps

[46] ARCEP, 2021. https://en.arcep.fr/uploads/tx_gspublication/report-state-internet-2021-edition-july2021.pdf and also WIK Consult 2022, Competitive conditions on transit and peering markets, page 27, available at https://www.wik.org/en/veroeffentlichungen/studien/weitere-seiten/transit-and-peering-markets, see most recent announcements by Telefonica (https://www.telefonica.com/en/communication-room/press-room/telefonica-meta-boost-short-video-experience-network-efficiency/) and by Vodafone (https://www.vodafone.com/news/technology/vodafone-and-meta-optimise-short-form-videos-to-improve-network-efficiency#) concerning partnerships with Meta to improve network optimisation.

[47] Earnings Before Interest, Taxes, Depreciation, and Amortisation

Table 3: Profitability along the global Internet value chain

Segment	Sectors	EBITDA Margins	Return on Equity	Cost of Capital
Content Rights	Broadcasting	17.1%	-0.4%	7.7%
	Entertainment	13.6%	2.3%	9.86%
Online Services	Advertising	11.9%	7.5%	10.7%
	Information Services	15.8%	9.0%	9.9%
	Software (Entertainment)	26.1%	20.9%	12.2%
Enabling Technologies	Telecom. Equipment	14.5%	12.9%	10.7%
	Software (Internet)	3.4%	-10.0%	11.8%
Connectivity	Telecom (Wireless)	**30.8%**	**8.2%**	**7.7%**
	Telecom. Services	**30.7%**	**7.8%**	**7.3%**
User Interface	Electronics (Consumer & Office)	8.8%	7.3%	10.1%
	Software (System & Application)	23.4%	17.0%	11.8%
Average across 94 sectors		**14.3%**	**0.6%**	**9.2%**
Source:		Aswath Damodaran, updated 22 May 2024		

Telcos enjoy the double benefit of below-market cost of capital and above-market profitability. The cost of capital reflects risks associated with a business. Telcos are clearly not seen as risky undertakings any longer, rather as blue-chip investments. Blue-chip companies are associated with lower profitability expectations compared to growth companies. Nonetheless, the telco sector, in contrast, has amongst the highest EBITDA margins of all sectors globally, around 33%, way above the average of 14.5% across 94 sectors.

While high EBITDA margins are required to replace radio-access equipment every five to seven years, the higher-than-average profitability of the connectivity segment is also captured in the above-average return on equity (ROE) globally. The ROE for mobile operators was 6% and for other telecom service providers 9.8%, compared to the average of 5% across 94 sectors globally. The telecom ROE for emerging markets is higher than the global average. Telco ROE was three times that of the average across 94 sectors in May 2024 (Table 4).

Segment	Sectors	EBITDA Margins	Return on Equity	Cost of Capital
Content Rights	Broadcasting	17.7%	1.3%	10.6%
	Entertainment	14.5%	-0.5%	13.0%
Online Services	Advertising	5.4%	5.0%	15.7%
	Information Services	12.8%	15.2%	12.0%
	Software (Entertainment)	15.7%	18.9%	16.6%
Enabling Technologies	Telecom. Equipment	6.7%	5.7%	13.1%
	Software (Internet)	3.8%	2.9%	11.7%
Connectivity	Telecom (Wireless)	**31.3%**	**11.4%**	**9.4%**
	Telecom. Services	**28.4%**	**6.7%**	**8.9%**
User Interface	Electronics (Consumer & Office)	6.0%	4.3%	11.6%
	Software (System & Application)	3.3%	-0.5%	14.8%

Segment	Sectors	EBITDA Margins	Return on Equity	Cost of Capital
Average across 94 sectors		12.9%	0.3%	10.3%
Source:		Aswath Damodaran, updated 22 May 2024		

Table 4: Profitability along the Internet value chain for emerging markets

The above-average profitability is not going to last forever. The growth of the ICT sector is bound to slow down with increasing market penetration. Once most households have fixed Internet and most adults have a smartphone, it will be difficult to grow the market. New use cases and user demand for higher-resolution streaming and lower-latency gaming may expand the sector and become the main source of growth.

Users increasingly demand faster speeds and higher quality of broadband services and this demand has risks and opportunities for telcos. It will also shape the competition dynamics within the telecom sector. Fixed-broadband providers may offer higher speeds and lower latencies than mobile operators, reversing the paradigm (at least in the developed world): instead of fixed as the complement to mobile, mobile might revert to being the complement to fixed. In the developing world, most people have no alternative to mobile broadband access. This is going to change, for some countries faster than for others.

Towards a data-centric business model

Data is an integral part of the telco business model. Generally, revenues depend on many factors, among them the number of subscribers, subscriber profiles, product design, retail prices, level of competition in the sector, and regulation. These factors can be grouped into four categories.

- Economic factors: demand for mobile and fixed services as a function of population, GDP per capita, GDP growth, unemployment rates, and other factors.
- Regulatory environment: market structure and fairness of competition[48] and transparency and predictability of regulations.
- Telco strategies: product design, response to other telcos, and own business model.
- Investment: network coverage, investment cycle, and quality of service.

	Analogue	Digital
Business model	Service	Connectivity
Metric	Minutes and SMS	Bandwidth or throughput
Cost sensitivity	Distance, duration, and location sensitive	Time, distance, and location insensitive
Billing	Access and usage billing (voice and SMS off-net / on-net, peak / off-peak)	Simple access billing
Traffic Monitoring	Detailed traffic monitoring as part of the billing system	Usage monitoring limited to data use

[48] " Fair competition" means that firms sell products that consumers want at a price they can afford. In contrast, limited competition means that firms hold the balance of power and can dictate terms to consumers. See the discussion here: https://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/04568.html.

	Analogue	Digital
Postpaid subscribers	Detailed vetting to reduce risk or revenue loss and expenses that arise from call termination and subsidized handsets	• Postpaid risk is limited to revenue of one billing cycle • No external expense risks (interconnection / roaming) • Prepaid and postpaid do not need to be distinguished by pricing • Postpaid may be extended without significant vetting
Network infrastructure	GSM 1G and 2G	2.5G, 3G, 4G, 5G

Table 5: Transition to a data-centric business model for mobile operators

The mobile business model is moving from a voice and SMS to a data-centric business model. The fixed business model started to transition to a broadband access model in the early 1990s. The mobile business model started to transition with the introduction of data services based on 2.5G technology. Today, data is the primary source of revenue for mobile operators. The majority of mobile network operator (MNO) investment of the last two decades has gone into data networks. MNOs have become mobile Internet access providers, distinguishing their products by speed and quality of service, and competing with other forms of access, such as public WiFi and connectivity in places of work, study and home. Many MNOs across competitive ICT markets no longer charge for voice and SMS, only for bandwidth and/or data consumption. Anticipating the global trend to data is paramount for a sustainable telco business. This global transition towards the data-centric business model also applies to Africa.

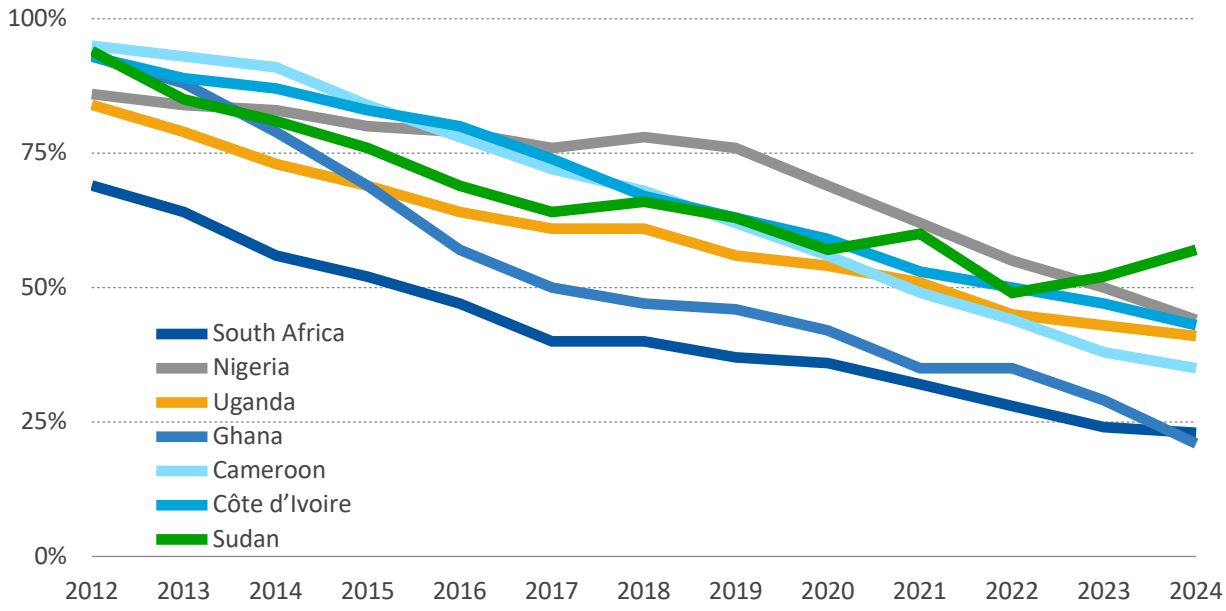

Figure 5: MTN Voice and SMS revenue as percent of total revenue

Profitability compared

Profitability for telecom companies in emerging markets compare favourably to the global average. There are regional variations, but EBITDA margins are very healthy. Emerging markets exhibit a strong ROE, particularly in the wireless sector, surpassing the global average and most individual regions except for Europe. Emerging markets face a higher cost of capital compared to developed regions like the USA and Europe, indicating a higher perceived risk or cost of

financing. Table 6 highlights the profitability and financial challenges of operating in emerging markets, with competitive margins and returns but slightly higher financing costs (with the exception of China).

Table 6: Profitability of telecommunication companies

		EBITDA Margins	Return on Equity	Cost of Capital
Telecom (Wireless)	USA	32.6%	9.7%	7.0%
	Europe	28.8%	17.8%	5.9%
	Global	30.8%	8.2%	7.7%
	Emerging	31.3%	11.4%	9.4%
	China	28.9%	9.8%	11.1%
Telecom. Services	USA	36.4%	-0.3%	5.6%
	Europe	28.7%	15.8%	6.6%
	Global	30.7%	7.8%	7.3%
	Emerging	28.4%	6.7%	8.9%
	China	25.8%	5.7%	7.6%
Source:		Aswath Damodaran, updated 22 May 2024		

Mobile broadband affordability in Africa

There was a significant price drop between Q1 2016 and Q1 2025 across Africa. The price of a 20GB basket from the cheapest operator in 2025 is twelve and a half times less than in 2016. Prices have decreased significantly over the past ten years. Figure 6 displays the average o price across Africa, weighted by the population. It is the average out of the cheapest price available in a country for a 20GB usage basket per month.

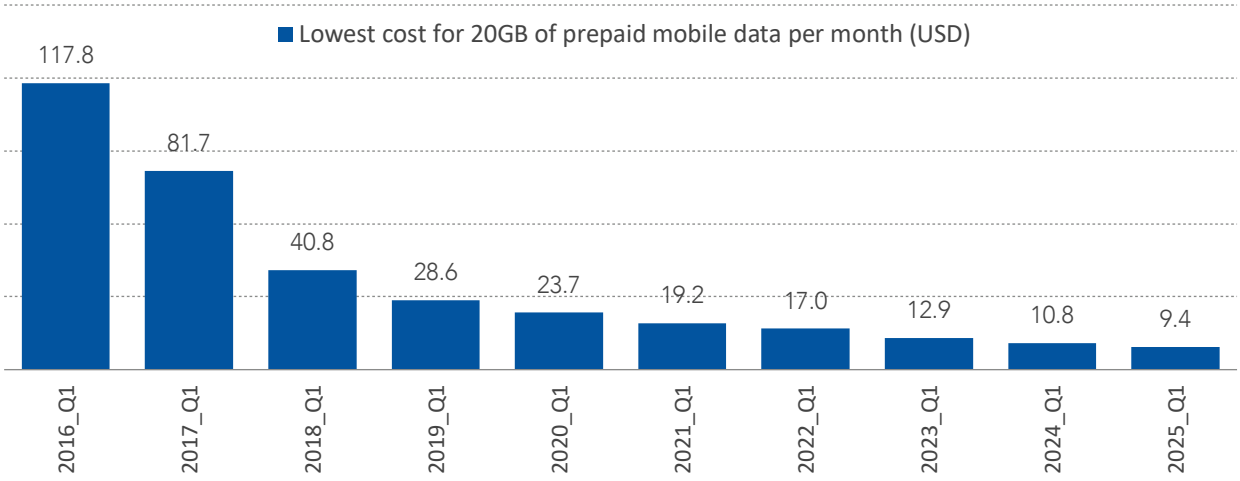

Figure 6: African average mobile data price for 20GB in USD, weighted by population

The telco business model is to provide access to the Internet. Content growth drives their revenues and inspires their investments. It is a symbiotic relationship where all sides win when connectivity is expanded and when more content is made available. Telcos are generating above average EBITDA margins from the demand for broadband connectivity. The growing demand for broadband connectivity initially came from user-generated content from social

media platforms such as Facebook, WeChat, TikTok, YouTube, and others. It will increasingly be driven by high quality streaming and gaming.[49]

The global Internet value chain comprises five segments: content rights, online services, enabling services, connectivity, and user interface. The market value quadrupled between 2008 and 2020, with the connectivity segment more than tripling. This growth indicates that the connectivity segment is not in decline, countering operators' claims. Content drives broadband demand, increasing revenues for broadband providers, which in turn reinvest in expanding network capacity. This cycle challenges the operators' argument for network fees, as OTT services generate significant demand for telcos' core services. OTT services, by increasing broadband demand, enhance telcos' revenues through higher data consumption and speeds, which indicates mutual benefit rather than a one-sided burden on telcos.

The connectivity segment remains highly profitable, with above-average EBITDA margins and ROE, with no indication of market failure. Operators' push for network fees from OTT providers overlooks the segment's financial strength and the benefits they already receive from increased data traffic driven by OTT services. As mobile operators transition to data-centric models, the investment focus shifts to data networks. This transition supports the argument that increased data demand from OTT services is already integral to their evolving business models.

[49] See eg Stork, C. Calandro, E. and Gillwald, A. (2013). Internet going mobile: Internet access and use in eleven African countries, Emerald Group Publishing Limited, info-05-2013-0026, ISSN: 1463-6697, info, Vol. 15 Iss: 5, https://www.emerald.com/insight/content/doi/10.1108/info-05-2013-0026/full/html.

5

CP investments into submarine cable systems

CPs typically are not licensed as fixed or mobile operators and are thus not allowed to build retail telecommunication networks. As a result, their investments are generally limited to infrastructure such as submarine cable systems and the deployment of local content network caches and edge PoPs. Submarine cable systems are the critical backbone of global internet connectivity. Submarine cables provide the essential "first mile" connection between national telecommunications networks and the global Internet, making them fundamental to enabling high-speed, high-capacity digital communication.[50] The impact of submarine cables goes beyond technical connectivity and has an impact on the affordability of the Internet as well as economic growth.

- **Lowering Internet Prices:** Every doubling of international bandwidth capacity associated with submarine cables can reduce fixed broadband prices by up to 14% and mobile broadband prices by up to 21%.[51] This price reduction stems from cost savings due to more bandwidth and lower transport costs and intensified competition in domestic telecom markets.
- **Economic Growth Effects**: Infrastructure that enhances international connectivity is strongly linked to broader economic growth. In Malaysia, for example, it has been estimated that for every 10% increase in international bandwidth consumption per user, there was a 0.24% increase in GDP per capita.[52]
- **Catalyst for Digital Services and Business Expansion**: Submarine cables facilitate the growth of cloud services, streaming media and e-commerce, enhancing productivity and enabling new business models.[53]
- **Impact on Affordability and Access**: The presence of submarine cable connections significantly increases internet speed and quality, allowing for lower per-unit costs of data and expanding broadband access to more users.[54]
- **Redundancy:** The World Bank (2024) points out that cost savings are the result of economies of scale through increased international bandwidth, a reduction in re-routing

[50] World Bank, 2023. Digital Progress and Trends Report 2023, https://www.worldbank.org/en/publication/digital-progress-and-trends-report
[51] World Bank, 2024. The Impact of Submarine Cables on Internet Access Price, and the Role of Competition and Regulation, https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099223207092441042
[52] RTI (2020). Economic Impacts of Submarine Fiber Optic Cables and Broadband Connectivity in Malaysia, https://www.researchgate.net/publication/344190815_Economic_Impacts_of_Submarine_Fiber_Optic_Cables_and_Broadband_Connectivity_in_Malaysia
[53] Ibid, page 3
[54] Ibid, page 3

costs as a result of more cable availability and a reduction in network maintenance costs as a result of greater redundancy.[55]

The role of CPs in the deployment of submarine cable systems has become increasingly important over the past decade. Traditionally, international submarine cables were financed and operated by telcos. However, the rapid growth in demand for cloud services, video streaming and data-heavy applications has led major content providers, such as Meta, Google, Amazon and Microsoft, to take a more active role in building global connectivity infrastructure.

Table 7: CP's submarine cable investments in Africa

	Landing Points	Date going Live	Max capacity (Tbps)	CP's Ownership
2Africa	Angola, Bahrain, Comoros, Congo Dem Rep, Congo Rep, Cote d'Ivoire, Djibouti, Egypt, France, Gabon, Ghana, Greece, India, Iraq, Italy, Kenya, Kuwait, Madagascar, Mozambique, Nigeria, Oman, Pakistan, Portugal, Qatar, Saudi Arabia, Senegal, Seychelles, South Africa, Spain, Sudan, Tanzania, UAE, UK	2024	180	Meta Part owner
Equiano	Namibia, Nigeria, Portugal, South Africa, Togo	2023	144	Google sole owner
Umoja	South Africa, Australia	2027	Unknown	Google sole owner
Raman	Djibouti, India, Jordan, Oman, Saudi Arabia	Q4 2025	218	Google part owner
Project Waterworth	Australia, Brazil, India, South Africa, United States	Unknown	Estimated between 480 and 1.2 Pbps	Meta sole owner
SeaMeWe-6	Djibouti, Egypt, France, India, Malaysia, Maldives, Oman, Pakistan, Qatar, Saudi Arabia, Singapore, Sri Lanka, United Arab Emirates	2026	126	Microsoft part owner
Sources	https://blog.telegeography.com/telegeography-content-providers-submarine-cable-holdings-list-new			

CPs have invested or are investing into six African submarine cable systems (Table 7). CP's ownership models vary from sole ownership to part ownership through consorta. These strategic investments enable CPs to manage data flows more efficiently, lower transit costs and improve service quality for users. These investments span key geographies:

- Meta invested in the 2Africa cable connecting Africa, Europe and the Middle East and the Project Waterworth cable, in which Meta is the sole owner, running across the entire globe from east to west.
- Google has established a substantial footprint in Africa's submarine cable market with major transoceanic routes such as the Equiano cable (Europe-West Africa) and the Umoja cable between South Africa and Australia.
- Microsoft holds ownership stakes in the SeaMeWe-6 connecting Asia, Africa, the Middle East and Europe. This investment is critical for supporting Microsoft's growing cloud services (Azure, Office 365) by ensuring resilient and low-latency global connectivity.[56]

[55] World Bank, 2024, page 3.

[56] https://azure.microsoft.com/en-us/blog/how-microsoft-builds-its-fast-and-reliable-global-network/

The growing ownership of international connectivity by CPs represents a structural shift in the digital ecosystem. It underlines the increasingly intertwined relationship between internet services, physical network infrastructure and national broadband affordability and availability. Submarine cables and PoPs are inputs into the Internet value chain, which contribute to economic growth and job creation.

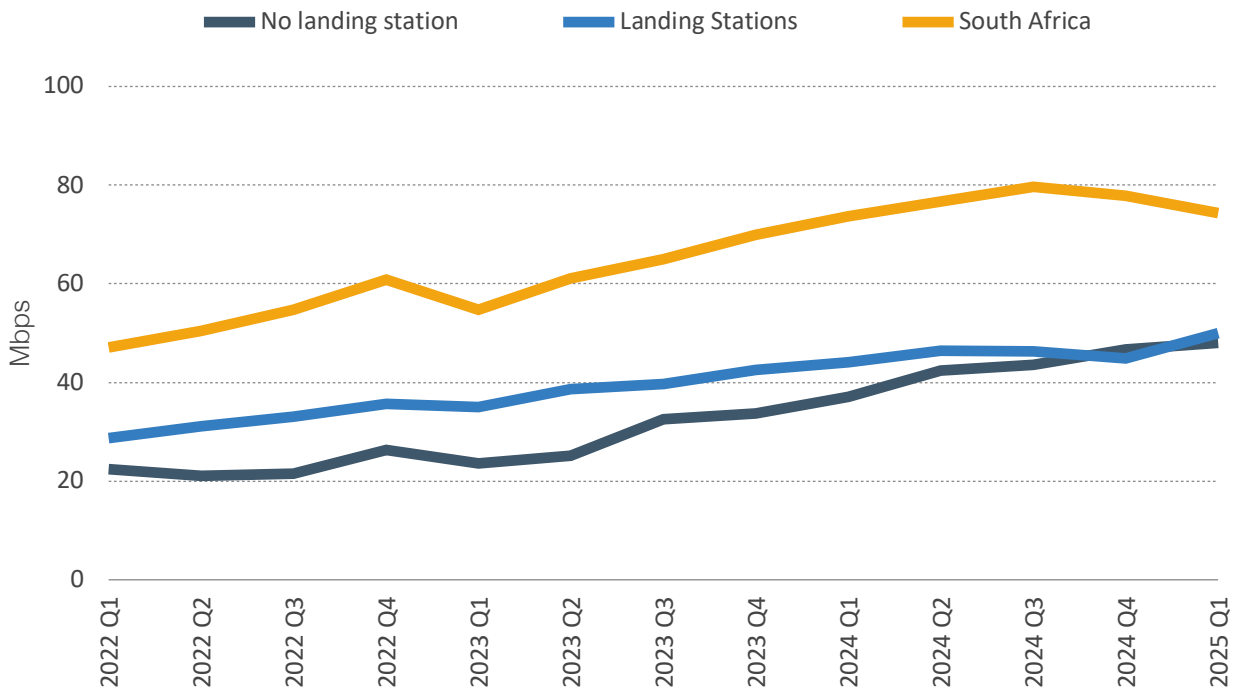

Figure 7: Average mobile download speeds in Mbps (Source Ookla)

African countries with submarine cable landing stations on average registered higher average download speeds compared to land-locked countries. Download speeds increased from approximately 29 Mbps in 2022 Q1 to 49 Mbps by 2025 Q1 based on Ookla end-user speed tests. Interestingly, countries without landing stations showed the most rapid relative improvement, starting from just over 22 Mbps in early 2022 and nearly matching the landing station group by Q1 2025, reaching over 48 Mbps. This convergence suggests that improvements in terrestrial infrastructure, backhaul investment and possibly regional peering arrangements have allowed non-landing station countries to narrow the performance gap. The upgrade to faster 4G and 5G networks across Africa has also contributed towards faster end-user download speeds. South Africa is a top performer in terms of download speeds due to its nearly universal 4G coverage even for rural areas and access to multiple submarine cables.

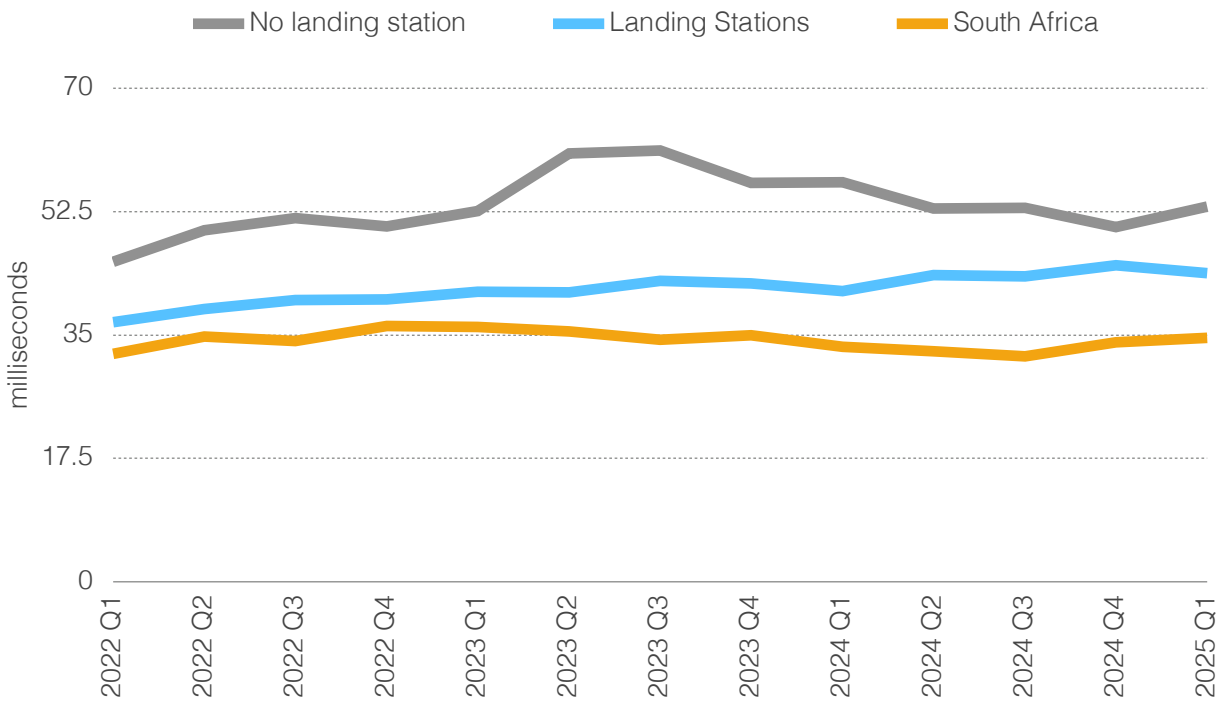

Figure 8: Average mobile latency in milliseconds (Source Ookla)

African countries without landing stations experience significantly higher latency than those with direct access to international bandwidth. Between Q1 2022 and Q1 2025, latency in non-landing station countries increased from approximately 45 ms to over 53 ms, peaking around 2023 Q2–Q3. This likely reflects continued reliance on indirect and congested routes for international traffic. In contrast, countries with landing stations maintained lower latency, mostly in the 38–42 ms range. South Africa again outperformed both groups, with latency remaining stable around 33–36 ms throughout the period. Lower latency is particularly important for time-sensitive applications such as video calls, real-time gaming and digital financial services. These findings underscore the importance of landing station infrastructure in improving end-user experience and enabling the growth of latency-sensitive digital services.

6

MTN Group Case Study

MTN operates in 16 African countries[57] and publishes the most detailed data on traffic, subscribers and financials of any operator group in Africa. This study will use the MTN group as the primary example for cost and traffic trends in Africa. MTN is a profitable business with generally an above 40% EBITDA margin. MTN Group revenues increased by 42% between 2017 and 2024. Its shareholders equity increased by 47%. Expressed in USD, MTN increased shareholders equity by 7% and revenues by 3%.

Table 8: MTN Group AFS ZAR million

MTN Group	Unit	2017	2018	2019	2020	2021	2022	2023	2024	Change
Revenue	R billion	132.8	134.6	151.5	179.4	181.6	207.0	221.1	188.0	42%
Profit after tax	R billion	9.6	9.6	10.7	19.6	17.0	23.9	4.0	-11.2	-217%
Liabilities	R billion	148.1	168.6	216.2	242.7	250.8	265.7	284.5	292.5	97%
Assets	R billion	242.4	256.8	302.3	348.9	365.8	385.4	434.7	431.0	78%
Assets as % of revenue	%	183%	191%	200%	195%	201%	186%	197%	229%	26%
Shareholders Equity	R billion	94.3	88.2	86.1	106.2	115.0	119.6	150.2	138.4	47%
EBITDA	R billion	47.0	48.2	62.6	75.3	79.8	90.0	89.8	70.1	49%
ROE	%	10%	11%	12%	18%	15%	20%	3%	-8%	
EBIDTA margin	%	35%	36%	41%	42%	44%	44%	41%	37%	
Direct network & technology operating costs	R billion	25	25	22	28	28	33	39	36	43%
	% revenue	19%	19%	15%	16%	15%	16%	17%	19%	
FX	#	13.3	13.2	14.5	16.5	14.8	16.4	18.5	18.3	
Revenue	USD billion	10.0	10.2	10.5	10.9	12.3	12.6	12.0	10.3	3%
Profit after tax	USD billion	0.7	0.7	0.7	1.2	1.1	1.5	0.2	-0.6	-185%
Liabilities	USD billion	11.1	12.7	15.0	14.7	17.0	16.2	15.4	16.0	44%
Assets	USD billion	18.2	19.4	20.9	21.2	24.7	23.5	23.6	23.5	29%
Shareholders Equity	USD billion	7.1	6.7	6.0	6.5	7.8	7.3	8.1	7.6	7%
EBITDA	USD billion	3.5	3.6	4.3	4.6	5.4	5.5	4.9	3.8	8%
Direct network & technology operating costs	USD billion	1.9	1.9	1.5	1.7	1.9	2.0	2.1	2.0	4%
Source		MTN Investor Relations								

In the 2025 financial year, MTN made a loss at a Group level and its EBIDTA margin dropped to 37%. This was the result of the collapse of the Nigerian Naira, MTN's biggest market. In 2024, loss after tax amounted to R11 billion, from nearly R24 billion profit in 2022 due to the devaluation of the Nigerian Naira from NGN 461 at the end of May 2023 to NGN 1535 at the end

[57] Benin, Botswana, Cameroon, Ivory Coast , Ghana, Liberia, Nigeria, Rwanda, South Africa, Sudan, South Sudan, Swaziland, Uganda, Zambia. MTN sold their operations in Guinea, Guinea Bissau and, Afghanistan in 2024: It previously also sold its operations in Syria and Yemen. https://www.mtn.com/mtn-concludes-the-sale-of-its-guinea-operations-to-the-state-of-guinea/.

of 2024 against the US dollar. This resulted in foreign exchange losses of NGN740 billion (R21 billion) in 2023.[58] In 2024, the downward trend continued and MTN made foreign exchange losses of NGN925 billion (R14 billion).[59] However, MTN believes that this volatility will end in the FY 2025 year and expects service revenue growth of "at least mid-40%' and EBITDA margin of 'at least mid-40%', as tariff adjustments take effect".[60]

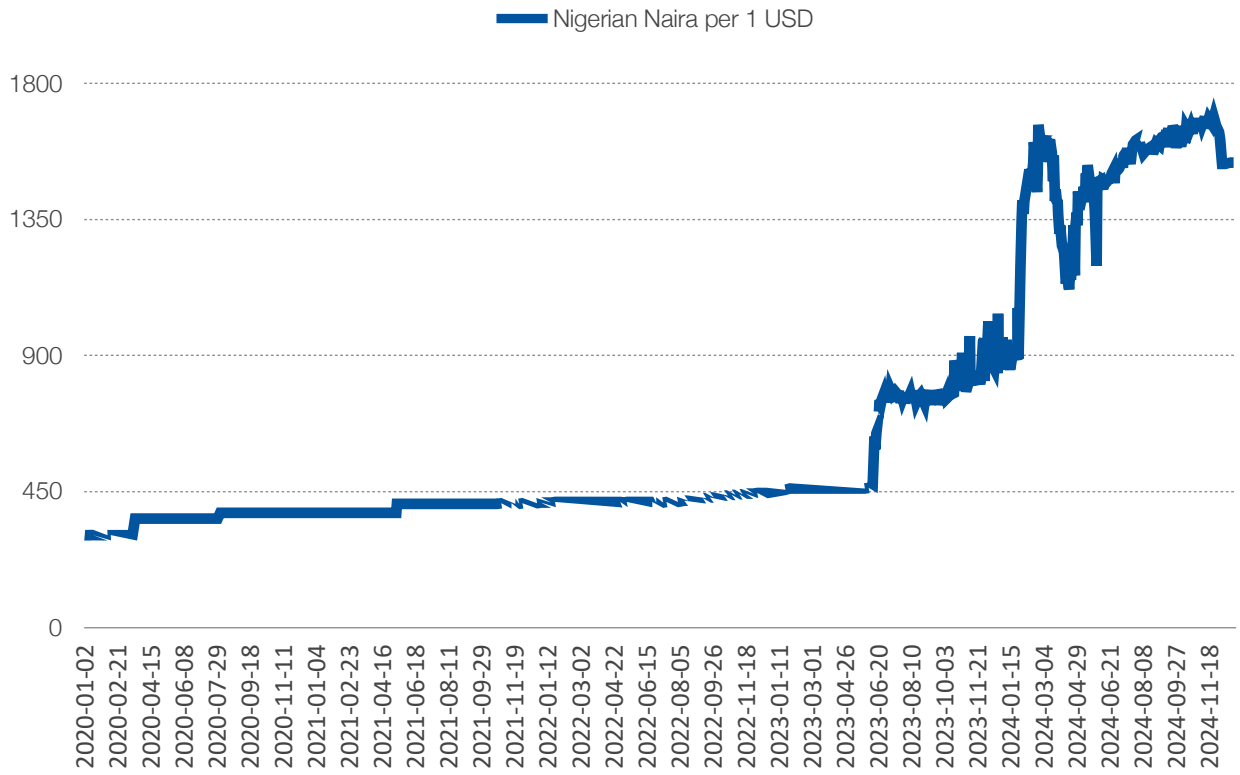

Figure 9: Exchange rate for the Naira against the USD (Central Bank of Nigeria)

The MTN Group billed for 20.9 billion GBs of data and 510 billion minutes in 2024. This figure is derived by multiplying the number of active data users by the megabytes per active user per month times twelve. Table 9 provides traffic and subscriber information for 2024. The minutes on MTN's network are calculated in a similar way. The average number of outgoing minutes is multiplied by the number of subscriptions and then multiplied by 12.

Table 9: MTN Group traffic and subscriber information for FY 2024

	2024	Out going Minutes	Smartphones 1000	MB per active user per month	Active data subscribers 4Q 24 in 1000	Subscribers 4Q 24 in 1000	Voice traffic in million minutes per year	Data Traffic in GB million per year
1	South Africa	66	22,928	5,689	21,847	39,832	31,547	1,491

[58] "During the 2023 financial year, the Naira devalued from NGN461 to NGN907 against the US$ and foreign exchange losses of NGN740 billion (R20 975 million) were recognised in MTN Nigeria. These losses include NGN367 billion (R10 612 million) unrealised forex losses on leases."MTN Annual Financial Statement, 2023, page 9

[59] "During the 2024 financial year, the Naira devalued from NGN907 to NGN1 535 (2023: NGN 461 to NGN907) against the US$ and foreign exchange losses of NGN925 billion (R14 111 million) (2023: NGN740 billion (R20 975 million)) were recognised in MTN Nigeria." (MTN Group Limited Annual financial results booklet, 2024, page 72, https://www.mtn.com/wp-content/uploads/2025/03/MTN-Group-FY-24-results-complete-booklet-HR.pdf).

[60] MTN Group Limited Annual financial results booklet, 2024, page 5, https://www.mtn.com/wp-content/uploads/2025/03/MTN-Group-FY-24-results-complete-booklet-HR.pdf.

	2024	Out going Minutes	Smartphones 1000	MB per active user per month	Active data subscribers 4Q 24 in 1000	Subscribers 4Q 24 in 1000	Voice traffic in million minutes per year	Data Traffic in GB million per year
2	Nigeria	149	47,114	11,159	47,669	80,901	144,651	6,383
3	Uganda	171	9,897	2,699	10,094	22,031	45,208	327
4	Rwanda	233	2,678	3,926	2,434	7,632	21,339	115
5	Zambia	83	3,622	7,145	2,886	6,452	6,426	247
6	South Sudan	166	1,776	3,105	1,091	3,333	6,639	41
7	Botswana	154				1,673	3,092	
8	eSwatini	220	807	1,638	617	1,037	2,738	12
9	Ghana	311	19,298	10,986	17,468	28,549	106,545	2,303
10	Cameroon	87	7,686	4,837	7,081	11,868	12,390	411
11	Côte d'Ivoire	61	10,343	3,733	8,165	16,302	11,933	366
12	Benin	37	4,102	5,518	2,835	7,221	3,206	188
13	Republic of the Congo	107	2,013	3,498	1,769	3,761	4,829	74
14	Liberia	55	986	5,547	917	2,172	1,434	61
15	Iran	161	48,623	23,009	32,047	55,641	107,498	8,848
16	Sudan	12	2,878	2,453	903	2,471	356	27
	Total				**157,821**	**290,878**	**509,831**	**20,894**

The number of active data subscribers and the megabytes used per active data subscriber have increased from year to year. Active data subscribers have increased by 128% between 2017 and 2024 (Figure 10).

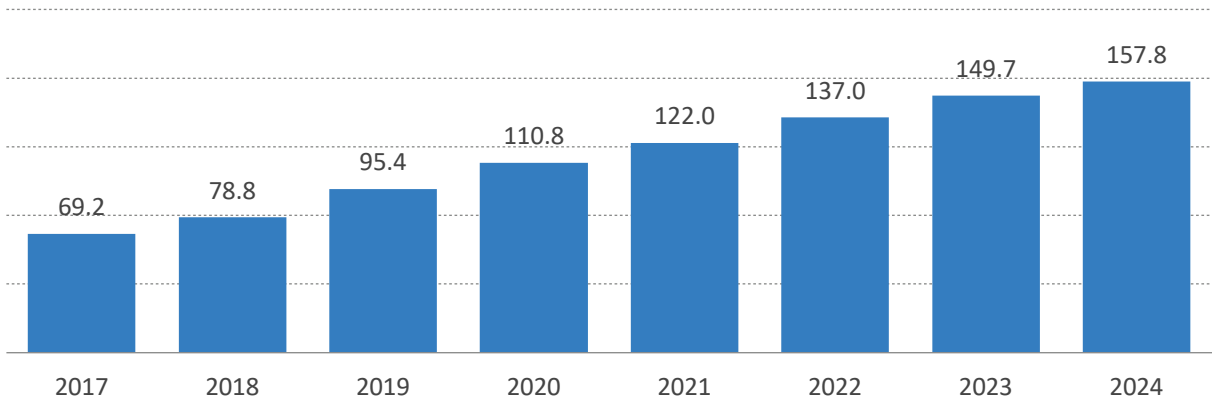

Figure 10: Active data subscribers in million (Source MTN)

Data traffic on MTN's network has increased significantly. In 2017, data sold was only 1.3 billion GBs. By 2024, this had grown to 20.9 billion GBs (Figure 11). The question is whether the growth in data usage has resulted in a proportional increase in expenses. This is the subject of the following section.

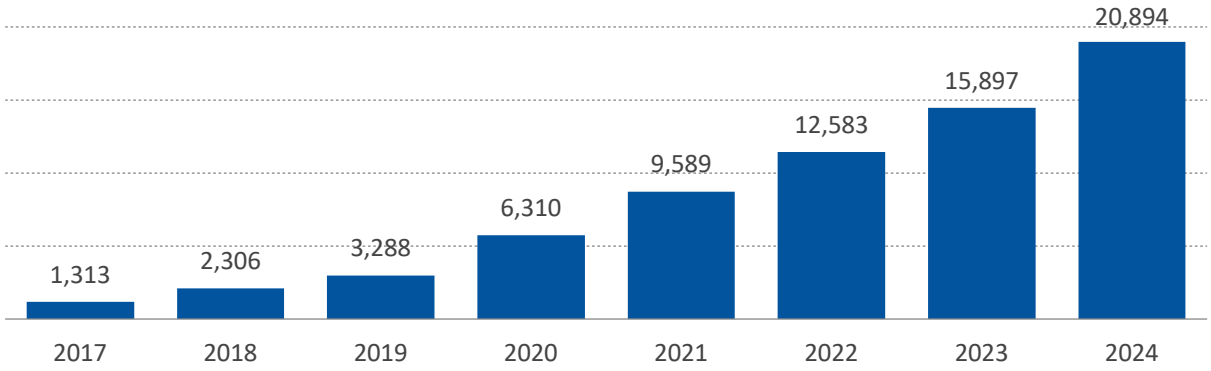

Figure 11: MTN group annual billable data traffic in million GBs on its network

Operating Expenses (OPEX)

Operators claim that profits are declining as a result of high operating expenses. An increase in direct network and operating costs is to be expected if the number of active data subscribers is also increasing. However, revenues are increasing at the same rate as operating expenses. This means that network operating costs are fairly stable as a percentage of revenues. Figure 12 shows that direct network operating costs as a percentage of revenue ranged from 15% to 19%. In 2024, operating costs made up 19% of revenue for the MTN group.

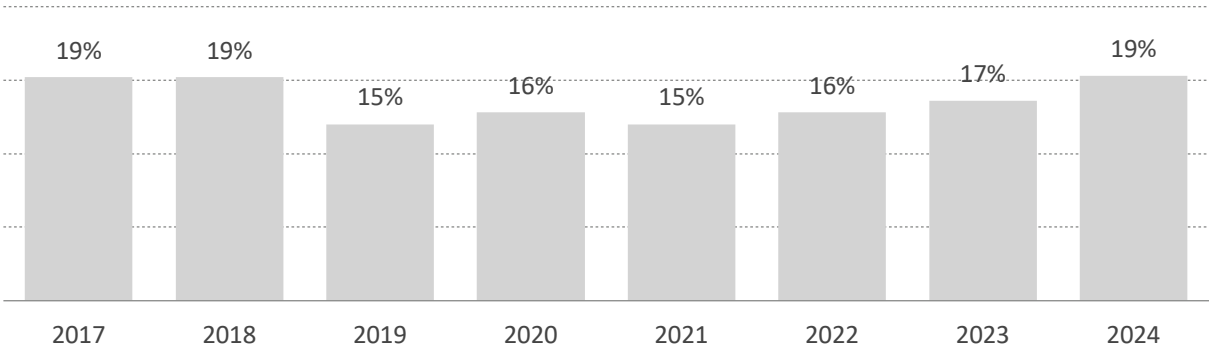

Figure 12: MTN Group - Direct network & technology operating costs as % of revenue

Direct network operating costs per active subscriber declined. Network costs per active subscriber dropped from USD 27 in 2017 to USD 12.7 in 2024 (Figure 13). Similarly, the direct network operating cost per GB declined (Figure 14). It dropped from USD 1.45 per GB in 2017 to USD 10 cents per GB in 2024. Even though there is strong growth in data usage, the cost of supplying this data is lower per subscriber than any time in the past 8 years. This is in direct contrast to the statements made by operators.

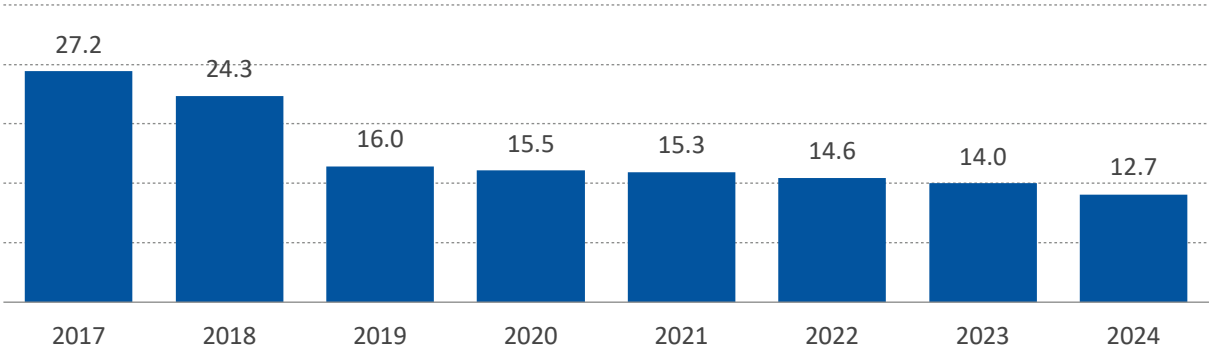

Figure 13: MTN Group - Direct network & technology cost per active data subscriber in USD

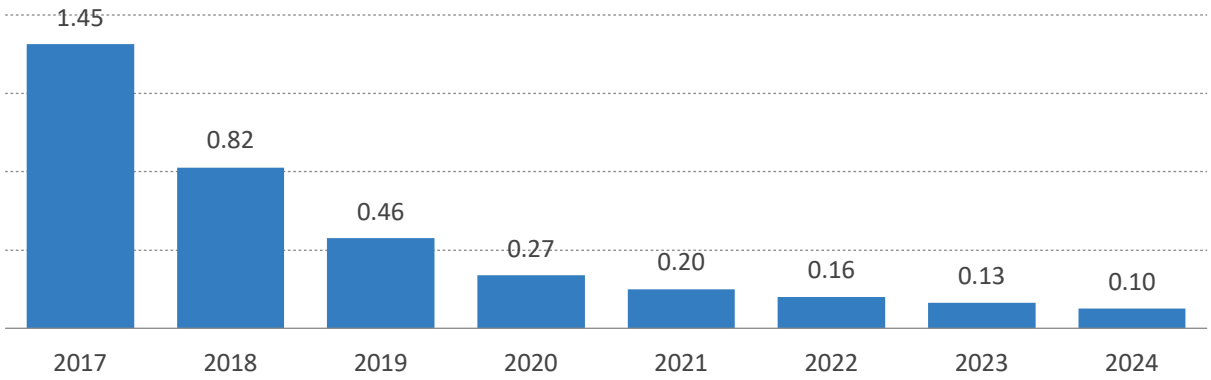

Figure 14: MTN Group - Direct network & technology operating cost in USD per GBs

Operators might point to higher infrastructure costs as a result of 5G rollout. One argument could be that the higher network costs would only arise once 5G is widely rolled out. At the end of 2024, MTN rolled out 5G sites in South Africa, Nigeria, Uganda, Benin, Congo-Brazzaville, Eswatini and Zambia. 5G rollout is market-dependent and only taking place where conditions are appropriate. There is no obligation to roll out 5G if it is not profitable.

Table 10: MTN Group base stations

2024	2G	3G	4G	5G
South Africa	13,056	13,117	13,073	3,517
Nigeria	18,779	18,554	17,170	2,254
Uganda	3,578	3,575	3,485	538
Rwanda	1,525	1,501	1,138	–
Zambia	1,581	1,586	1,556	274
South Sudan	565	560	338	–
eSwatini (joint venture)	445	446	446	2
Ghana	5,016	5,022	4,646	–
Cameroon	2,234	2,267	2,221	–
Côte d'Ivoire	2,875	2,672	2,212	–
Benin	1,261	1,126	1,125	79
Congo-Brazzaville	680	672	557	100
Liberia	297	285	255	–
Iran (joint venture)	18,325	18,337	18,679	1,153
Sudan	2,084	1,598	1,135	–
Total	**72,301**	**71,318**	**68,036**	**7,917**

At a group level, operating expenses as a share of data revenues are declining and this is the same trend for key countries. As Figure 15 shows, between 2017 and 2024, all major MTN countries have followed the same downward trend for network and IS maintenance expenses as share of data revenues. South Africa has been fairly stable, at about 30% of data revenues. The real decline has been in markets such as Nigeria, where the operating costs as a percentage of data revenue have declined from 240% to 58% in 2023. The uptick in 2024 to 81% was due to the exchange rate volatility, as already discussed. This decline is the result of the transition to a data-centric data model. Data services will need to cover all network operating expenses in future.

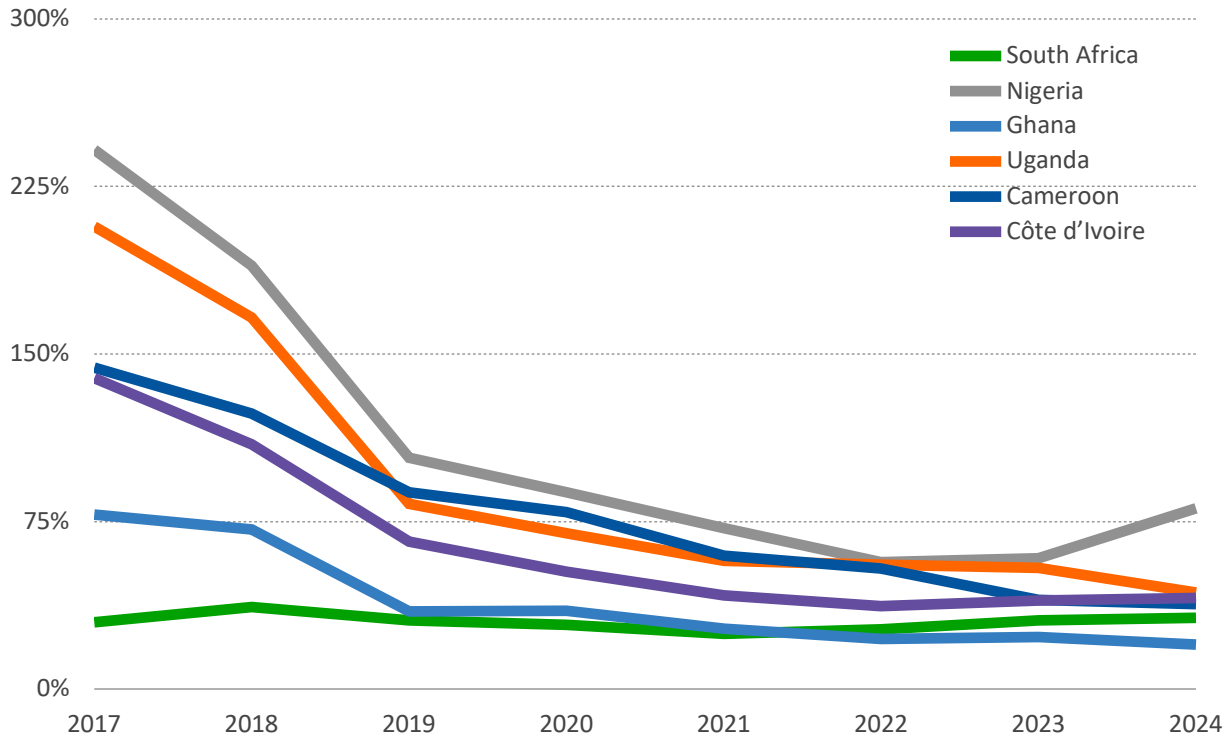

Figure 15: MTN Group - Network and IS maintenance % data revenue

The downward trend is even more pronounced for network operating costs per GB. In 2017, some countries, like Uganda, showed a high cost, but MTN has managed to reduce this significantly. Uganda went from a price per GB of ZAR 73.4 in 2017 to ZAR 5.2 in 2024. This is a 90% reduction in network operating costs. Network operating costs are, of course, also recovered by voice, SMS and mobile money revenues. For Figure 16, the total network cost is allocated to data traffic only to identify trends. In 2024, network expenditure per GB ranged from ZAR 1 to 5.2, compared to a much wider range of between ZAR 25.4 to ZAR 73.4 in 2017.[61]

[61] The tables with the detailed data are in the appendix.

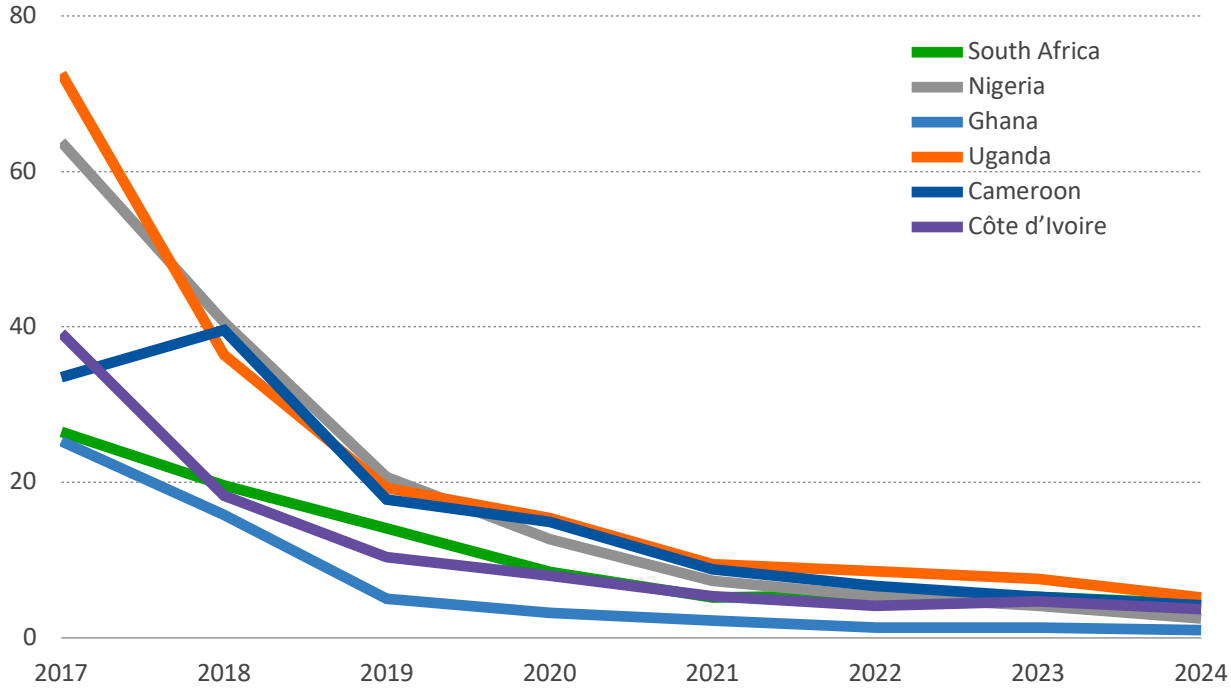

Figure 16: MTN Group - Network and IS maintenance per GB in ZAR

Capital Expenditure (CAPEX)

If the operator statements are true and capital expenditure is unsustainable, then CAPEX per data subscriber should be increasing significantly. This is not the case. Figure 17 shows that the trend in assets per active data subscriber has declined between 2017 and 2024. In 2017, USD263 in assets were used per active data subscriber and this dropped to USD149 in 2024.

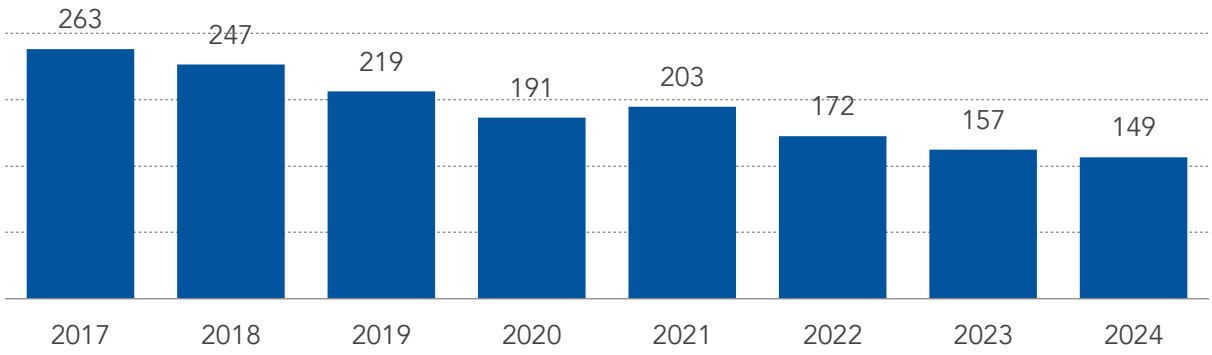

Figure 17: MTN Group - Assets per active data subscriber in USD

Between 2017 and 2024 assets per billable GB dropped significantly, indicating increased efficiency in delivering mobile data service. The declining cost per unit of data could be attributed to technological advancements, improved network infrastructure, and economies of scale. The efficiency gains expressed by reduced costs per GB challenge the claim that CAPEX is unsustainable. The assets per billable GB in data traffic declined from USD to USD (Figure 18).

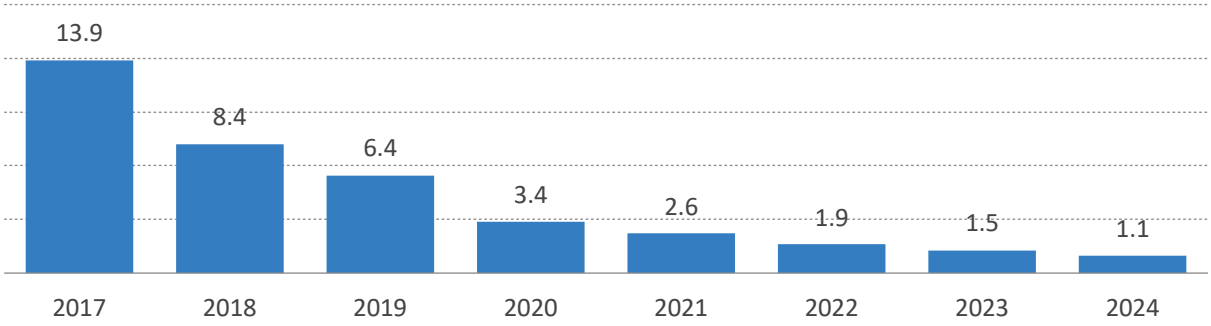

Figure 18: MTN Group - Assets per billable GB in USD

Summary

The MTN case study shows that the MTN Group is a profitable business with an EBITDA margin generally around 40% and an attractive return on equity. The 2024 decline is due to exchange rate volatility in the Nigerian market and MTN believes that this will end in the 2025 FY. The marginal cost (defined as the additional cost associated with providing an additional GB of data) has declined significantly: network costs per active subscriber have dropped from USD 27 in 2017 to USD 12.7 in 2024. In addition, CAPEX level are entirely sustainable. The risks that MTN faces are not excess demand through OTTs but the risk from exchange rate fluctuations and regulatory fines.

7

Airtel Africa Case Study

Airtel Africa is a highly profitable company. Airtel Africa operates in 14 African countries[62] and publishes data on subscribers, traffic, and RAN site deployment for 3 segments, Nigeria, East Africa and Francophone Africa. Airtel reports for Nigeria separately because it makes up 30% of total revenues for the Group. The EBITDA margin for the Airtel Africa group improved from 43% in 2019 to 46.5% in 2025.

Table 11: Airtel Africa financial performance

GROUP - FINANCIALS	Unit	FY19	FY20	FY21	FY22	FY23	FY24	FY25
Revenue	$m	3,077	3,422	3,908	4,714	5,255	4,979	4,955
Voice revenue	$m	1,915	1,970	2,103	2,358	2,491	2,179	1,964
Data revenue	$m	683	930	1,157	1,525	1,787	1,734	1,804
Mobile money revenue	$m	234	220	301	553	692	837	770
Other revenue	$m	309	302	347	407	437	417	417
Profit/(Loss) after Tax	$m	426	408	415	755	750	-89	328
Assets	$m	9,106	9,325	9,992	10,364	11,166	9,861	12,023
Liabilities	$m	6,676	6,044	6,639	6,715	7,358	7,561	9,248
Shareholders Equity	$m	2,430	3,281	3,353	3,649	3,808	2,300	2,775
Return on Equity	%	17.5%	12.4%	12.4%	20.7%	19.7%	-3.9%	11.8%
EBITDA	$m	1,332	1,515	1,792	2,311	2,575	2,428	2,304
EBITDA margin	%	43.3%	44.3%	45.9%	49.0%	49.0%	48.8%	46.5%
Network operating expenses	$m	558	628	694	817	1,027	926	974
Network operating expenses as % of revenue	%	18.1%	18.4%	17.8%	17.3%	19.5%	18.6%	19.7%
Licence fee/spectrum usage charges	$m	182	189	198	244	241	244	263
Depreciation and amortisation	$m	532	605	681	744	818	788	831
Operating profit	$m	734	901	1,119	1,535	1,757	1,640	1,457
Total customer base	million	99	110.6	118.2	128.4	140.0	152.7	166.1
Data customer base	million	30	35.4	40.6	46.7	54.6	64.4	73.4
Average revenue per user (ARPU)	$	3	2.7	2.8	2.9	2.9	2.5	2.2
Voice ARPU	$	1.7	1.6	1.5	1.6	1.5	1.2	1.0
Data ARPU	$	2.1	2.4	2.5	2.9	3.0	2.4	2.2
Minutes on the network	billion	207	250	323	378.7	439.1	504.4	570.2
Voice usage per customer/month	minutes	207	201	234	257	272	286	300
Total MBs on the network	billion	429	711	1,242	1,848	2,704	3,934	5,803
Total GBs on the network	million	429	711	1,242	1,848	2,704	3,934	5,803
Data usage per customer/month	MBs	1,192	1,863	2,686	3,520	4,546	5,492	7,159
Network Towers	No	21,059	22909	25,368	28,797	31,546	34,534	37,117
Data Revenue per Tower	$	32,433	40,595	45,609	52,957	56,647	50,211	48,603
GBs per Tower	No	20,371	31,036	48,959	64,173	85,716	113,917	156,338
Assets as share of revenue	%	295.9%	272.5%	255.7%	219.9%	212.5%	198.1%	242.6%

[62] Chad, Congo, DRC, Gabon, Kenya, Madagascar, Malawi, Niger, Nigeria, Rwanda, Seychelles, Tanzania, Uganda, Zambia

GROUP - FINANCIALS	Unit	FY19	FY20	FY21	FY22	FY23	FY24	FY25
Assets per GB	$	21.2	13.1	8.0	5.6	4.1	2.5	2.1
Assets per data subscriber	$	304	263	246	222	205	153	164
Network operating expenses per GB	$	1.30	0.88	0.56	0.44	0.38	0.24	0.17
Network operating expenses per data subscriber	$	18.6	17.7	17.1	17.5	18.8	14.4	13.3
Source		Airtel Africa Investor Relations						

Airtel Nigeria also experienced significant revenue losses in Nigeria due to the devaluation of the Naira. Revenues for FY 2024 dropped by 29% and for the FY 2025 by another 30%. The EBITDA margin remained very high in FY 2025 at nearly 50%.

Table 12: Airtel Nigeria - Consolidated financials

	Units	FY19	FY20	FY21	FY22	FY23	FY24	FY25
Revenue Total	$m	1,106	1,373	1,552	1,878	2,128	1,504	1,048
	YoY		24%	13%	21%	13%	**-29%**	**-30%**
Voice revenue	$m	740	850	897	985	1,053	711	448
Data revenue	$m	259	435	549	734	884	654	483
Data Revenue as % of total	%	23%	32%	35%	39%	42%	43%	46%
Mobile money revenue	$m	0	0	0	0	0	2	4
Other revenue	$m	107	88	106	159	191	138	114
EBITDA	$m	550	744	839	1,042	1,093	805	521
EBITDA margin	%	49.7%	54.2%	54.1%	55.5%	51.4%	53.5%	49.7%
Subscribers total	million	37.1	41.8	42.0	44.4	48.4	50.9	53.3
Subscribers data	million	14.7	16.7	17.7	20.3	23.8	27.4	29.1
Average revenue per user (ARPU)	$	2.7	2.9	3.0	3.8	3.8	2.5	1.7
	YoY		7%	3%	27%	0%	**-34%**	**-32%**
Voice ARPU	$	1.7	1.7	1.8	2.0	1.9	1.2	0.7
	YoY		2%	5%	12%	**-5%**	**-37%**	**-42%**
Data ARPU	$	1.5	2.2	2.6	3.3	3.4	2.2	1.5
	YoY		48%	19%	28%	3%	**-35%**	**-32%**
Minutes on the network	billion				102.0	110.8	121.4	137.4
Voice usage per customer/month	minutes				205	198	205	226
Total MBs on the network	billion				915	1,328	1,931	2,818
Data usage per customer/month	MBs				4,134	5,158	6,470	8,632
Source		Airtel Africa Investor Relations						

Voice and data ARPUs for Airtel Nigeria declined in USD terms due to the Naira devaluation in FY 2024 and FY 2025. Given that Airtel Nigeria makes up 30% of the revenue of the Airtel Africa group, that also led to a decline in voice and data ARPUs at a group level. A general trend is that voice ARPU is slowly declining as the market matures and more low-income people enter the market. Data ARPU is increasing as data becomes more important to subscribers and smartphone penetration increases.

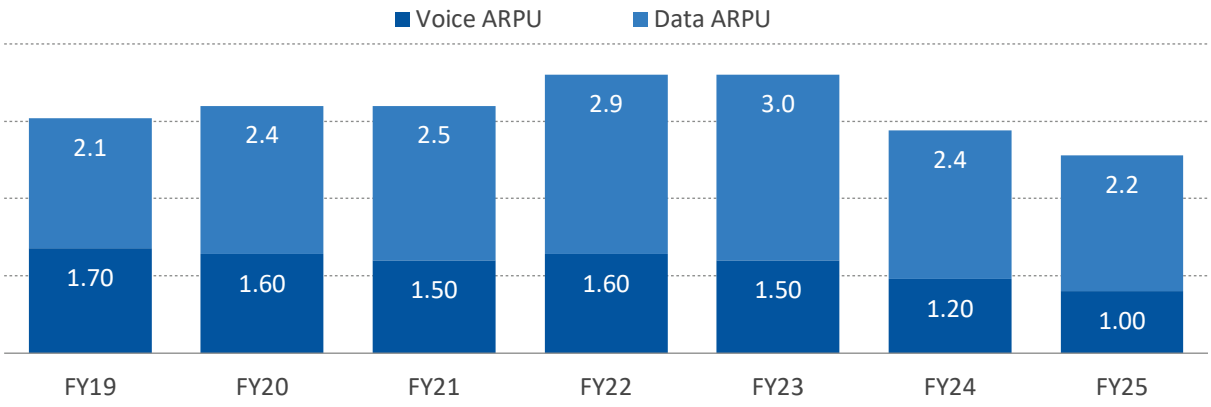

Figure 19: Airtel Africa ARPU in USD

Airtel Africa's transition to a data centric business model is apparent in the increasing data traffic per RAN site. Measured as GBs per RAN site, it has grown by 667% in 7 years. Data revenue per RAN site has a strong upward trend, with the exception of FY 2024 and FY 2025 associated with the devaluation of the Naira. The data revenue increase is the result of the increase in data traffic.

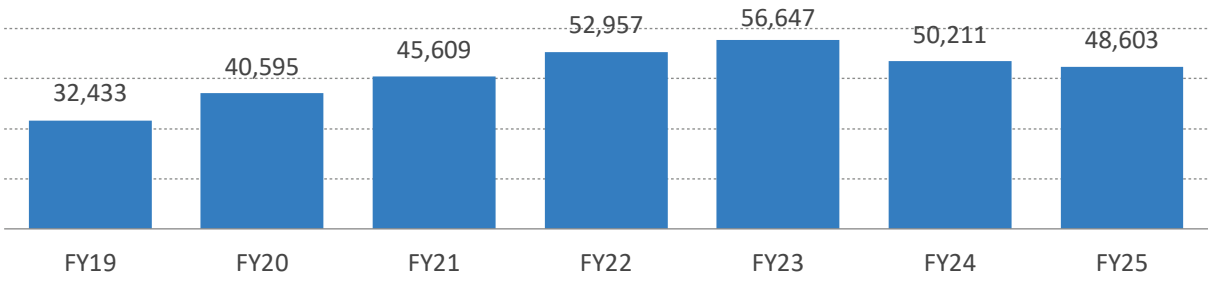

Figure 20: Annual data revenue per RAN site in USD

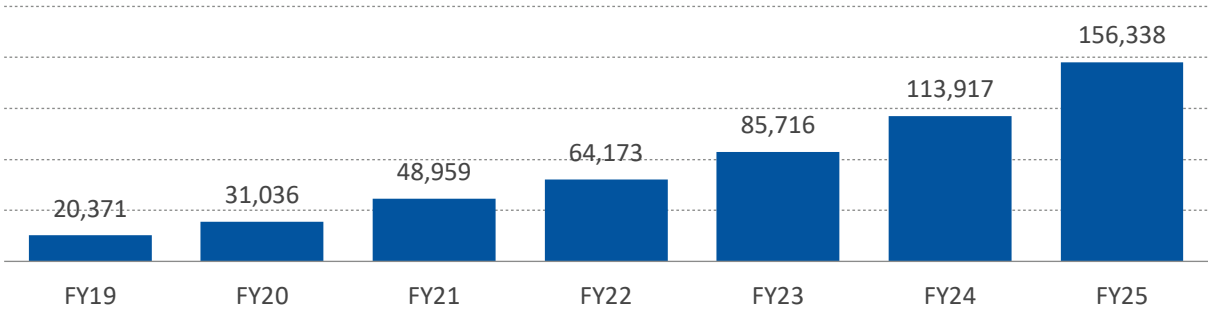

Figure 21: Annual GBs per RAN site in USD

Airtel Africa has invested in a total 1,500+ 5G sites that were operational by the end of FY 2025. 5G is operational in Nigeria, Uganda, Zambia, Tanzania and Kenya. It has added approximately 3,300km of fibre to reach a total of 78,700+ kilometres and is partnering with Meta to land the 2Africa submarine cable in four of its key markets. In 2023, data capacity has increased by 32.7% to 31,700+ TB per day, with peak hour data utilisation at 53.0%.[63]

[63] Airtel FY'24-investor-presentation

Operating Expenses (OPEX)

Airtel Africa shares the same declining trend for operating expenses as MTN. As with MTN, the question is whether costs are increasing faster than revenues. Network costs per active subscriber dropped from USD 18.6 in FY2019 to USD 13.3 in FY2025. Network operating expenses also declined when expressed per GB. The average network operating expenditure per GB sold across Airtel Africa's operation declined from USD 1.3 in the 2019 financial year to US 17 cents in the 2025 financial year.

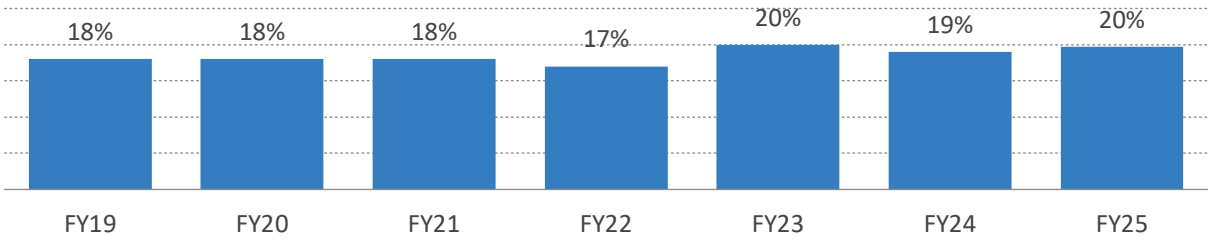

Figure 22: Network operating expenses as % of revenue

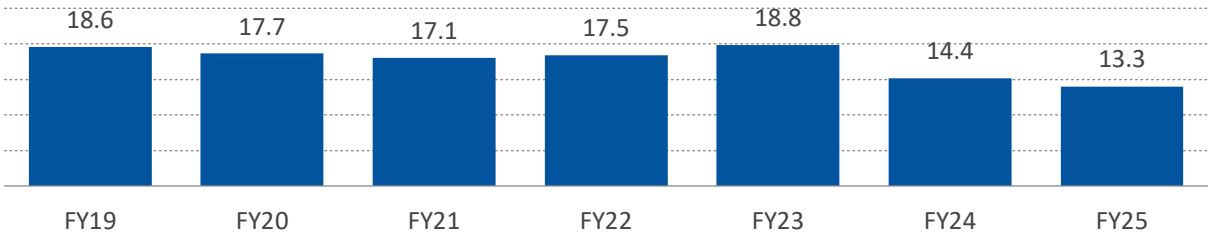

Figure 23: Network operating expenses per data subscriber in USD

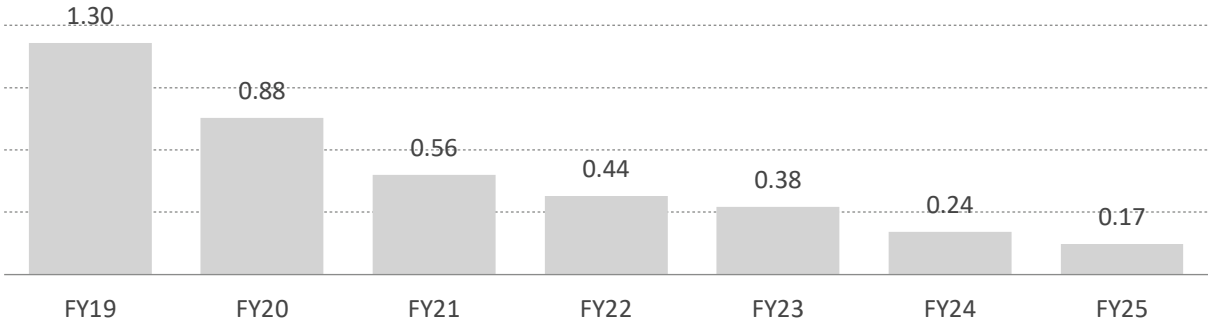

Figure 24: Network operating expenses per GB in USD

Capital Expenditure (CAPEX)

Assets as a share of revenue increased in FY 2025 but is still below its FY 2019 - FY 2021 levels. CAPEX per GB and CAPEX per active subscriber are following the same trend as OPEX. Assets per billable GB dropped from USD 21.20 to USD2.1 between the financial years of 2019 and 2025. Assets per data subscriber nearly halved during the same period, from USD 304 to USD 164.

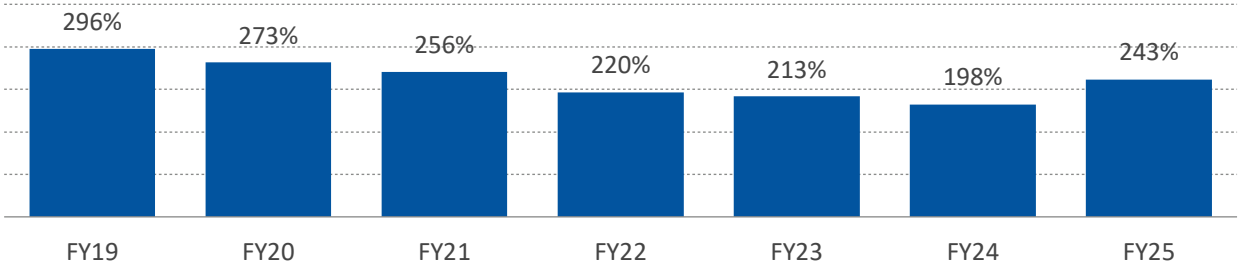

Figure 25: Assets as share of revenue

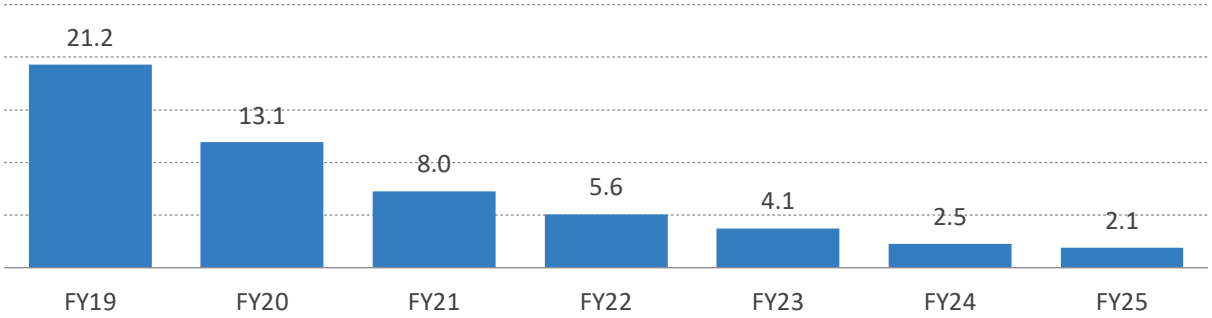

Figure 26: Assets per billable GB in USD

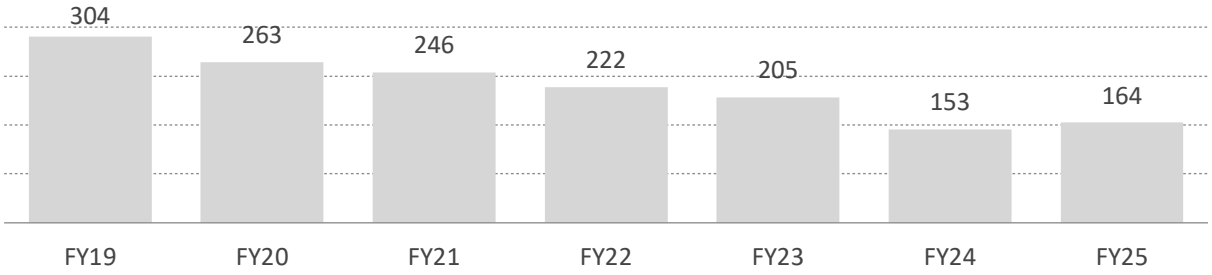

Figure 27: Assets per data subscriber in USD

Summary

The Airtel case study shows that it is a highly profitable business. Airtel Africa's revenue increased from USD 3,077 million in FY19 to USD 4,955 million in FY25. Despite a dip in FY24 and FY 25 due to the devaluation of the Nigerian Naira, profitability improved significantly, with EBITDA increasing from USD 1,332 million to USD 2,304 million, and the EBITDA margin rising from 43% to 46.5%. Airtel Africa's network operating costs per data subscriber and per GB have declined, not increased. Also assets per data subscriber and per GB have decreased.

8

Conclusion

The network fees debate relies upon a misinterpretation of the value chain. Telcos claim that CPs do not pay any of the infrastructure costs associated with content delivery. They claim a range of negative consequences, such as declining profitability, revenues, investment gap and overloaded networks. Aside from the fact that the data does not support any of this, the potential solution of network fees requires intervention into a competitive segment of the value chain - IP interconnection.

The claim of market failure because operators cannot recover their costs from their customers has no merit. The Internet value chain consists of five segments, with the connectivity segment growing significantly, contradicting the operators' claims of decline. Content drives broadband demand, benefiting both content providers and telcos, indicating mutual interdependence rather than a one-sided burden on telcos. The market for each segment of the Internet value chain is still expanding, emphasising continuous growth and opportunity.

Table 13: Change in CAPEX and OPEX per data subscriber and GB

		MTN Group			Airtel Africa		
		FY 2017	FY 2024		FY 2019	FY 2025	
KPIs	Revenue in USD billion	10	10.3	up	3.1	5.0	up
	EBITDA in USD billion	3.5	3.8	up	1.3	2.3	up
	EBITDA margin	35%	37%	up	43%	46.5%	up
OPEX	Network expenditure per data subscriber in USD	27.2	12.7	down	18.6	13.3	down
	Network expenditure per GB in USD	1.45	0.10	down	1.3	0.17	down
	Network expenditure as % of revenue	19%	19%	same	18.1%	19.7%	up
CAPEX	Assets per data subscriber in USD	263	149	down	304	164	down
	Assets per GB in USD	13.9	1.1	down	21	2	down
	Assets as % of revenue	183%	229%	up	296%	243%	down

Both MTN and Airtel Africa are highly profitable, with substantial EBITDA margins and returns on equity. Both operator groups are transitioning to data centric business models but voice and SMS are an important revenue source. The audited financial statements revealed that OPEX and CAPEX in relation to data subscribers and data traffic are declining. This indicates that the efficiency in delivering mobile data service has increased significantly. Table 13 summarises key indicators for MTN and Airtel and shows that there is zero evidence of market failure. When there is a dip, like there has been in the past two years, it is the result of other, simple factors, such as exchange rate volatility in one of the biggest African markets, Nigeria.

African telcos mostly charge per GB. This is in contrast to European telcos that have mostly switched to uncapped products, where revenue does not increase with higher data use of subscribers. Charging per GB means that higher demand for data equals more revenue. Therefore, there is a linear relationship between demand for data and revenue.

Operators might point to higher infrastructure costs as a result of 5G rollout. However, there is no obligation to roll out 5G if it is not profitable. 5G may not be profitable as a universal service technology but mostly for densely populated areas. Where and when to rollout 5G is up to operators. This is not a regulatory decision.

The situation in Europe and Africa is different. Historically, in Europe and the USA, fixed broadband services could not compete with mobile broadband services in terms of either speed, price or convenience or a combination of all three. Nowadays, mobile cannot compete with fixed on speed and price. In Europe, the trend for mobile broadband is to supplement fixed broadband at home, school or work. In Africa, fibre to the home is still a niche product and not available to the vast majority of Africans. Mobile remains the primary form of Internet access. Also, 5G ready handsets penetration in Africa is minimal. African telcos thus have a very different investment outlook. Improving backhaul capacity to RAN sites may boost revenues more than upgrading end user access technology from 4G to 5G. The African telco market is still in an expansion phase and stagnant telco revenues are not expected.

The significant price drop for data in Africa between 2019 and 2024 increases the number of mobile broadband users and use cases. As market penetration increases, new use cases and higher data demands (e.g., streaming, gaming) will drive data revenue growth. The data shows that Africa is a healthy market, with opportunities for growth.

Annex 1: MTN KPIs

Table A1: MTN OPEX for South Africa

South Africa	Unit	2017	2018	2019	2020	2021	2022	2023	2024
Revenue	R (m)	42,542	44,658	45,447	45,473	48,716	50,640	51,807	52,596
Data revenue	R (m)	14,164	12,001	12,631	14,565	16,479	18,640	20,027	20,617
Network and IS maintenance	R (m)	4,251	4,408	3,883	4,174	4,071	4,969	6,176	6,586
MB per active user	MB	1,080	1,382	1,626	2,617	3,685	4,009	4,738	5,689
Active data subscribers	1000	12,366	13571	14,134	15,705	17,662	18,925	20,447	21,847
GBs	Million	160	225	276	493	781	910	1,163	1,491
Network and IS maintenance % revenue	%	10.0%	9.9%	8.5%	9.2%	8.4%	9.8%	11.9%	12.5%
Network and IS maintenance % data revenue	%	30.0%	36.7%	30.7%	28.7%	24.7%	26.7%	30.8%	31.9%
Network and IS maintenance per active data subscriber	R	343.8	324.8	274.7	265.8	230.5	262.6	302.0	301.5
Network and IS maintenance perGB	R	26.5	19.6	14.1	8.5	5.2	5.5	5.3	4.4
Source		MTN Investor							

Table A2: MTN OPEX for Nigeria

Nigeria	Unit	2017	2018	2019	2020	2021	2022	2023	2024
Revenue	R (m)	36,005	37,971	46,696	57,980	60,050	77,260	74,270	41,043
Data revenue	R (m)	4,376	5,647	8,796	14,360	18,729	29,405	31,690	19,460
Network and IS maintenance	R (m)	10,567	10,709	9,114	12,668	13,486	16,715	18,507	15,747
MB per active user	MB	976	1,177	1,459	2,555	4,499	6,500	8,353	11,159
Active data subscribers	1000	14,144	18672	25,180	32,560	34,279	39,528	44,554	47,669
GBs	Million	166	264	441	998	1,851	3,083	4,466	6,383
Network and IS maintenance % revenue	%	29.3%	28.2%	19.5%	21.8%	22.5%	21.6%	24.9%	38.4%
Network and IS maintenance % data revenue	%	241.5%	189.6%	103.6%	88.2%	72.0%	56.8%	58.4%	80.9%
Network and IS maintenance per active data subscriber	R	747.1	573.5	362.0	389.1	393.4	422.9	415.4	330.3
Network and IS maintenance per GB	R	63.8	40.6	20.7	12.7	7.3	5.4	4.1	2.5
Source		MTN Investor							

Table A3: MTN OPEX for Ghana

Ghana	Unit	2017	2018	2019	2020	2021	2022	2023	2024
Revenue	R (m)	10,382	11,860	13,820	17,245	19,187	18,031	20,771	25,272
Data revenue	R (m)	2,569	3,102	3,899	5,066	6,865	7,041	9,104	11,289
Network and IS maintenance	R (m)	2,007	2,216	1,355	1,779	1,856	1,571	2,131	2,244
MB per active user	MB	1,017	1,819	2,750	4,256	5,716	7,733	9,229	10,986
Active data subscribers	1000	6,497	6,435	8,144	10,786	12,441	13,478	15,367	17,468
GBs	Million	79	140	269	551	853	1,251	1,702	2,303
Network and IS maintenance % revenue	%	19.3%	18.7%	9.8%	10.3%	9.7%	8.7%	10.3%	8.9%
Network and IS maintenance % data revenue	%	78.1%	71.4%	34.8%	35.1%	27.0%	22.3%	23.4%	19.9%
Network and IS maintenance per active data subscriber	R	308.9	344.4	166.4	164.9	149.2	116.6	138.7	128.5
Network and IS maintenance perGB	R	25.3	15.8	5.0	3.2	2.2	1.3	1.3	1.0
Source		MTN Investor							

Table A4: MTN OPEX for Uganda

Uganda	Unit	2017	2018	2019	2020	2021	2022	2023	2024
Revenue	R (m)	5,193	5,423	6,700	8,320	8,549	10,126	13,184	15,459
Data revenue	R (m)	496	682	1,035	1,505	1,717	2,267	3,072	3,955
Network and IS maintenance	R (m)	1,027	1,134	859	1,048	985	1,263	1,666	1,710
MB per active user	MB	763	1,162	1,090	1,237	1,623	1,815	2,218	2,699
Active data subscribers	1000	1,546	2236	3,402	4,586	5,318	6,732	8,243	10,094
GBs	Million	14	31	44	68	104	147	219	327
Network and IS maintenance % revenue	%	19.8%	20.9%	12.8%	12.6%	11.5%	12.5%	12.6%	11.1%
Network and IS maintenance % data revenue	%	207.1%	166.3%	83.0%	69.6%	57.4%	55.7%	54.2%	43.2%
Network and IS maintenance per active data subscriber	R	664.3	507.2	252.5	228.5	185.2	187.6	202.1	169.4
Network and IS maintenance perGB	R	72.6	36.4	19.3	15.4	9.5	8.6	7.6	5.2
Source		MTN Investor							

Table A5: MTN OPEX for Cameroon

Cameroon	Unit	2017	2018	2019	2020	2021	2022	2023	2024
Revenue	R (m)	5,373	4,959	5,389	6,686	7,244	7,727	9,905	11,063
Data revenue	R (m)	798	1,048	1,308	1,834	2,300	2,750	3,816	4,568
Network and IS maintenance	R (m)	1148	1,293	1,153	1,450	1,372	1,482	1,520	1,737
MB per active user	MB	884	1,065	1,626	2,058	2,872	3,629	4,090	4,837
Active data subscribers	1000	3,226	2553	3,314	3,935	4,535	5,112	5,885	7,081
GBs	Million	34	33	65	97	156	223	289	411
Network and IS maintenance % revenue	%	21.4%	26.1%	21.4%	21.7%	18.9%	19.2%	15.3%	15.7%
Network and IS maintenance % data revenue	%	143.9%	123.4%	88.1%	79.1%	59.7%	53.9%	39.8%	38.0%
Network and IS maintenance per active data subscriber	R	355.9	506.5	347.9	368.5	302.5	289.9	258.3	245.3
Network and IS maintenance perGB	R	33.5	39.6	17.8	14.9	8.8	6.7	5.3	4.2

Cameroon	Unit	2017	2018	2019	2020	2021	2022	2023	2024
Source		MTN Investor							

Table A6: MTN OPEX for Côte d'Ivoire

Côte d'Ivoire	Unit	2017	2018	2019	2020	2021	2022	2023	2024
Revenue	R (m)	7,421	7,158	6,917	8,776	8,903	8,918	10,302	9,402
Data revenue	R (m)	716	891	1,080	1,645	2,154	2,624	3,341	3,320
Network and IS maintenance	R (m)	997	977	712	863	901	974	1,324	1,350
MB per active user	MB	802	1,351	1,493	1,924	2,473	2,857	2,977	3,733
Active data subscribers	1000	2,641	3294	3,818	4,665	5,611	6,911	7,803	8,165
GBs	Million	25	53	68	108	167	237	279	366
Network and IS maintenance % revenue	%	13.4%	13.6%	10.3%	9.8%	10.1%	10.9%	12.9%	14.4%
Network and IS maintenance % data revenue	%	139.2%	109.7%	65.9%	52.5%	41.8%	37.1%	39.6%	40.7%
Network and IS maintenance per active data subscriber	R	377.5	296.6	186.5	185.0	160.6	140.9	169.7	165.3
Network and IS maintenance per GB	R	39.2	18.3	10.4	8.0	5.4	4.1	4.7	3.7
Source		MTN Investor							

Table A7: MTN Group traffic and subscriber information for FY 2023

	2023	Out going Minutes	Smartphones 1000	MB per active user per month	Active data subscribers 4Q 23 in 1000	Subscribers 4Q 23 in 1000	Voice traffic in million minutes per year	Data Traffic in GB million per year
1	South Africa	56	27,531	4,738	20,447	37,431	25,154	1,162.5
2	Nigeria	214	44,260	8,353	44,554	79,663	204,575	4,465.9
3	Uganda	163	7,614	2,218	8,243	19,458	38,060	219.4
4	Rwanda	222	1,957	2,892	2,646	7,261	19,343	91.8
5	Zambia	87	3,345	5,661	2,824	6,886	7,189	191.8
6	South Sudan	155	1,135	2,666	808	2,711	5,042	25.8
7	Botswana	159	–	–	–	1,880	3,587	
8	eSwatini	224	819	1,367	600	1,050	2,822	9.8
9	Ghana	286	17,094	9,229	15,367	26,798	91,971	1,701.9
10	Cameroon	103	6,795	4,090	5,885	11,291	13,956	288.8
11	Côte d'Ivoire	70	11,432	2,977	7,803	16,988	14,270	278.8
12	Benin	46	3,968	4,305	3,116	7,710	4,256	161.0
13	Guinea-Conakry	31	1,845	3,425	813	3,419	1,272	33.4
14	Congo-Brazzaville	105	1,730	3,318	1,475	3,502	4,413	58.7
15	Liberia	44	1,080	3,487	916	2,204	1,164	38.3
16	Guinea-Bissau	45	327	3,089	314	838	453	11.6
17	Iran	155	46,510	19,211	30,273	54,189	100,792	6,978.9
18	Sudan	103	2,878	4,396	1,553	5,700	7,045	81.9
19	Afghanistan	187	3,007	3,952	2,031	5,858	13,145	96.3
	Total				**149,668**	**294,838**	**558,507**	**15,897**

Annex 2: Airtel KPIs

Table A8: East Africa - Consolidated financials (reported currency)

	Units	FY19	FY20	FY21	FY22	FY23	FY24	FY25
Revenue Total	$m	1,102	1,201	1,381	1,717	1,931	2,125	2,432
Voice revenue	$m	596	606	650	783	836	851	906
Data revenue	$m	266	307	354	457	537	621	755
Mobile money revenue	$m	154	213	291	411	530	635	747
Other revenue	$m	126	131	150	152	131	145	176
EBITDA	$m	442	485	631	881	1,032	1,134	1,284
EBITDA margin	%	40%	40%	46%	51%	54%	53%	53%
Data revenue as % of total	%	24%	26%	26%	27%	28%	29%	31%
Subscribers total	million	42.9	48.6	53.1	57.2	62.7	69.4	77.6
Subscribers data	million	10.9	13.3	16.2	18.3	21.9	26.6	31.5
Average revenue per user (ARPU)	$	2.2	2.2	2.3	2.1	2.1	2.0	2.1
Voice ARPU	$	1.2	1.0	1.0	1.2	1.2	1.1	1.0
Data ARPU	$	2.0	1.9	1.8	2.1	2.2	2.1	2.2
Minutes on the network	billion				235.4	279.0	327.5	370.6
Voice usage per customer/month	minutes				349	384	407	417
Total MBs on the network	billion				711	1,027	1,482	2,234
Data usage per customer/month	MBs				3,332	4,274	4,911	6,393
Data Revenue as % of total	%	24%	26%	26%	27%	28%	29%	31%
Source		Airtel Africa Investor Relations						

Table A9: Francophone Africa - Consolidated financials (reported currency)

	Units	FY19	FY20	FY21	FY22	FY23	FY24	FY25
Revenue total	$m	888	859	964	1,131	1,201	1,350	1,469
Voice revenue	$m	597	525	541	594	607	622	614
Data revenue	$m	159	189	254	334	366	459	566
Mobile money revenue	$m	75	93	110	142	161	200	243
Other revenue	$m	81	86	96	104	115	131	119
EBITDA	$m	339	292	364	500	563	620	637
EBITDA margin	%	38%	34%	38%	44%	47%	46%	43%
Data revenue as % of total	%	18%	22%	26%	30%	30%	34%	39%
Subscribers total	million	18.9	20.2	23.1	26.8	28.9	32.3	35.2
Subscribers data	million	4.4	5.4	6.7	8.2	8.9	10.4	12.8
Average revenue per user (ARPU)	$	4.0	3.7	3.8	3.4	3.3	3.3	3.2
Voice ARPU	$	2.6	2.2	2.0	2.0	1.8	1.7	1.5
Data ARPU	$	3.0	2.9	3.2	3.7	3.8	4.0	4.2
Minutes on the network	billion				41.3	49.3	55.5	62.2
Voice usage per customer/month	minutes				136	150	151	154
Total MBs on the network	billion				221.5	349.4	520.9	750.9
Data usage per customer/month	MBs				2,458	3,595	4,486	5,574
Data Revenue as % of total	%	18%	22%	26%	30%	30%	34%	39%
Source		Airtel Africa Investor Relations						

Authors: Dr Christoph Stork and Steve Esselaar

Disclaimer: The study was partially funded by Meta. The objective of this policy brief is to inform the current debate on investment into Internet infrastructure. The views expressed in the policy brief are those of the authors only.

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