

**THE ECONOMIC IMPACT OF  
TELECOMMUNICATIONS AND BROADBAND  
IN CÔTE D'IVOIRE**

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# The Economic Impact of Telecommunications in Côte d'Ivoire

## EXECUTIVE SUMMARY

**The Côte d'Ivoire telecommunications sector generates a significant direct and indirect impact on the country's economy, representing 4.55% of 2021 GDP.**

**The contribution of mobile broadband telecommunications to GDP growth reached 20.57% between 2010 and 2021 in Côte d'Ivoire.**

- From a direct effect standpoint, the Côte d'Ivoire's telecommunications companies have generated in 2021 US\$ 2,056 million in revenues; total industry revenues represent 2.9% of the country's Gross Domestic Product.
- On the other hand, the sector generates approximately 3,000 direct jobs and 2.0% of total salaries of the local workforce.
- Beyond the direct effects, the Côte d'Ivoire's mobile broadband industry has indirectly contributed US\$ 667 million on average per year to the whole economy between 2010 and 2021 (0.9% of the 2021 GDP).
- In addition, fixed broadband has indirectly contributed US\$ 469 million on average per year to the whole economy between 2010 and 2021 (0.7% of the 2021 GDP).

### Mobile broadband

- The Côte d'Ivoire mobile internet services have achieved a penetration rate of 78% of the population in the first quarter of 2022 according to the ARTCI, enabling the delivery of multiple voice and data services (over the 2G, 3G and 4G networks).
- Combining direct and indirect effects, mobile broadband had an impact of US\$ 2,422 million, which represent 3.46% of the Côte d'Ivoire's GDP in 2021.
- The contribution of mobile broadband to GDP growth reached 20.57% between 2010 and 2021.

### Fixed broadband

- The Côte d'Ivoire fixed broadband services have achieved a penetration rate of 1.24% of the population (or 11.56% of households) in the first quarter of 2022 enabling the delivery of multiple voice and data services over the ADSL, WiMAX, and FTTH networks.
- Combining direct and indirect effects, fixed broadband has an impact of US\$ 769 million, which represent 1.10% of the Côte d'Ivoire's GDP in 2021.
- The contribution of fixed broadband to GDP growth reached 14.47% between 2010 and 2021.

**In particular, the sectors mostly impacted by telecommunications are business services (55% of the downstream effect), followed by financial services (16%), and transportation (9%).**

### **Implications**

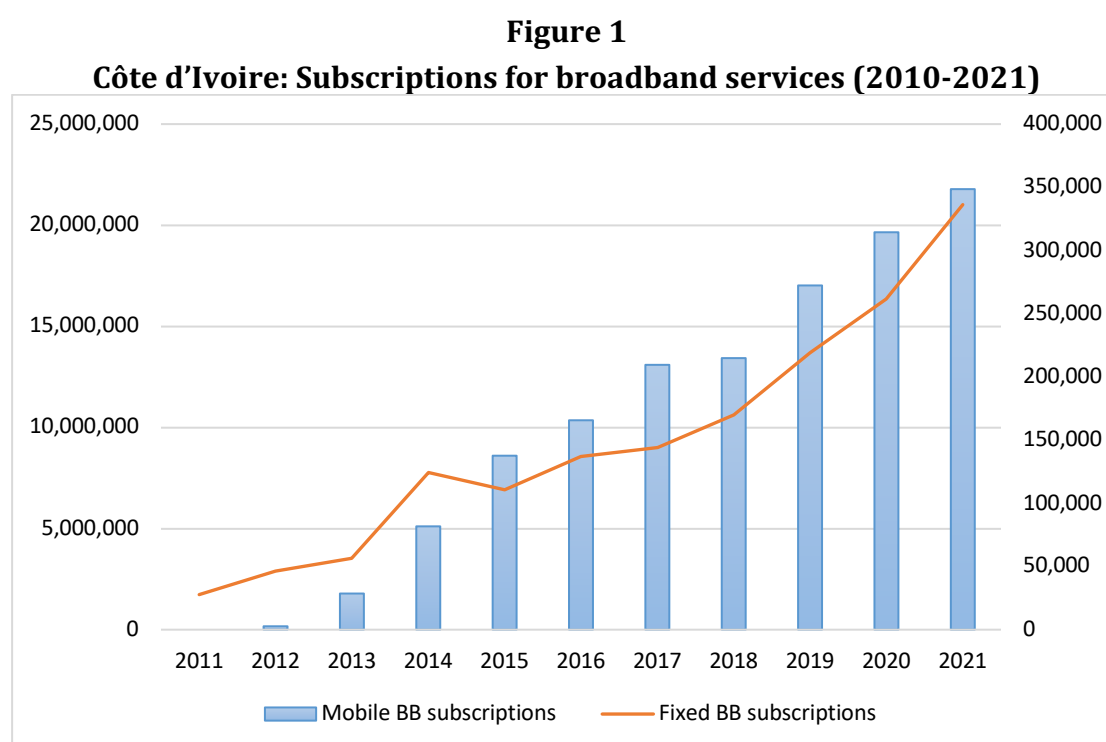
Given the economic importance of telecommunications, public policies and regulatory frameworks need to be defined in order to maximize investment in network deployment and modernization, particularly in mobile broadband.

Policies related to taxation, the cost of accessing spectrum frequencies, and infrastructure sharing should allow telecommunications operators to continue their efforts to foster connectivity and the deployment of broadband services, in order to support economic growth.

## 1. THE DEVELOPMENT OF TELECOMMUNICATIONS IN CÔTE D'IVOIRE AND ITS ECONOMIC IMPORTANCE

The latest Telecommunications Statistics report (Q1 2022)<sup>1</sup> published by the Autorité de Régulation des Télécommunications/TIC de Côte d'Ivoire (ARTCI) highlights the recent advances of the telecommunications industry in the country, reaching 46.9 million wireless subscriptions by the first quarter of 2022, of which 22.9 million are mobile internet connections. Those figures represent a mobile internet penetration of 77.45%. In addition, fixed broadband has also reached a significant development, with 365,958 subscriptions, representing a penetration rate of 1.24% (or 11.56% in terms of households) in the first quarter of 2022.

Figure 1 depicts the recent evolution in terms of subscriptions for the different broadband services since 2011.



Sources: ARTCI for 2014-2020. GSMA Intelligence for mobile and ITU for fixed during 2011-2014.

In 2021, the telecommunications industry of Côte d'Ivoire reached total revenues that accounted for 2.93% (US\$ 2,056 million<sup>2</sup>) of the country's GDP (US\$ 70,080 million<sup>3</sup>), providing evidence of the relevance of this sector for the national economy. Mobile telecommunications represent 88% of total industry revenues (see table 1).

<sup>1</sup> ARTCI (2022): "Statistiques du secteur des Télécommunications en Côte d'Ivoire / 1er Trimestre 2022", downloadable at: [https://www.artci.ci/images/stories/pdf/rapport\\_activite/statistiques-1er-trimestre-2022.pdf](https://www.artci.ci/images/stories/pdf/rapport_activite/statistiques-1er-trimestre-2022.pdf)

<sup>2</sup> ARTCI

<sup>3</sup> IMF

**Table 1**  
**Côte d'Ivoire Telecommunications Industry Annual Revenues (2021)**

Segment	Revenues (in US\$)
<b>Fixed broadband</b>	<b>\$ 238 million</b>
<b>Mobile telecommunications</b>	<b>\$ 1,818 million</b>
<b>Total telecommunications</b>	<b>\$ 2,056 million</b>

Sources: ARTCI; GSMA Intelligence; Telecom Advisory Services analysis

GSMA Intelligence reports that by 2030 annual revenues of the mobile telecommunications segment will reach US\$ 2,591 million, providing evidence of the current and future relevance of this sector for the country's economy. That said, fixed broadband, in particular FTTH, is one of the sector's growth engines. Orange alone reported 100,000 FTTH customers by the end of 2021.

The importance of the sector can also be validated when looking at the number of jobs it generates. In the first quarter of 2022, the sector directly employed 2,960 workers<sup>4</sup>. In addition, according to the Input/output Matrix developed for this study, the telecommunications sector represents 2.09% of the total salaries in the country.

On a side note, the mobile industry presents a healthy level of competition. With three operators (Orange: 43%, MTN: 34%, MOOV: 23%), the Herfindahl Hirschman Index measuring market concentration as of the end of 2022 is 3,430.<sup>5</sup>

## **2. ECONOMIC CONTRIBUTION OF MOBILE BROADBAND TO THE CÔTE D'IVOIRE ECONOMY**

The economic contribution of mobile broadband is proportional to the development of the wireless internet market with its corresponding maturity level<sup>6</sup>. The contribution of mobile internet services to economic growth is driven by the sector internal dynamics (such as the investments linked to the deployment of networks and services) and the positive externalities derived from private and enterprise use of services (*spill-over effects*). By allowing a more efficient functioning of the economy, telecommunications networks and services contribute to overall value creation.

The analysis of spill-over effects (also called indirect) of mobile broadband on the economy is measured through a structural econometric model, composed of an

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<sup>4</sup> Source: ARTCI

<sup>5</sup> Source: GSMA Intelligence. Note, the ARTCI reports an HHI of >2,500.

<sup>6</sup> Gruber, H., & Koutroumpis, P. (2011). Mobile Telecommunications and the impact on Economic Development. *Telecommunications Policy*, 67, 278-286. Kathuria, R., Uppal, M., Mamta (2009). *An Econometric Analysis of the Impact of Mobile*, The Vodafone Policy Paper Series (9), pp. 5-20. Shiu, A., & Lam, P. (2008, June 25). Relationships between Economic Growth, Telecommunications Development and Productivity Growth: Evidence around the World. In *Africa-Asia-Australasia Regional Conference of the International Telecommunications Society*. Retrieved from [http://www.apeaweb.org/confer/hk10/papers/shiu\\_alice.pdf](http://www.apeaweb.org/confer/hk10/papers/shiu_alice.pdf). Waverman, L., Meschi, M., Fuss, M. (2005). "The impact of telecoms on economic growth in developing countries", The Vodafone Policy paper Series (2), pp. 10-23.

aggregated production function, a demand function, a supply function, and an infrastructure function (see Appendix for complete details).

## 2.1 Contribution of mobile broadband to Côte d'Ivoire's economic growth between 2010 and 2021

- According to the structural econometric model developed for this study with time series for the country (Table A-1 in the Appendix), a 10% increase in unique mobile internet subscriber's penetration yields 0.76% of GDP growth. This coefficient is higher than the one estimated in a study with a similar model conducted by the authors in 2013 (0.59%).<sup>7</sup> The increase in the coefficient of impact indicates the "return to scale" effect that characterizes the economic contribution of telecommunications. According to this concept, the economic impact of mobile broadband increases with its penetration. While in 2012, unique mobile internet subscriber penetration was 9.25%, it had increased to 24.55% by 2021.<sup>8</sup>
- Based on this coefficient, mobile broadband has contributed annually an average of US\$ 667 million to Côte d'Ivoire's economic growth per year between 2010 and 2021 (see Table 2 for full details).

**Table 2**  
**Mobile broadband contribution to Côte d'Ivoire's economic growth 2010-2021**

Item	Factor	Value	Source and / or estimation formula
1	Annual contribution of unique mobile internet subscriber's penetration to GDP growth (for a 10% increase in additional penetration).	0.76%	Coefficient resulting from structural model
2	Unique mobile internet subscribers' penetration, 4Q 2021	24.55%	GSMA Intelligence
3	Unique mobile internet subscribers' penetration, 4Q 2010	3.95%	GSMA Intelligence
4	Compound Annual Growth Rate (CAGR) of mobile internet unique subscribers' penetration	18.07%	$(\text{Unique mobile subscribers' penetration } 2021/2010)^{1/11} - 1$
5	Annual impact of mobile internet on GDP	1.37%	$(\text{Annual impact}/10) * (\text{CAGR Unique mobile subscribers' penetration})$
6	CAGR GDP (2010-2021)	6.67%	$(\text{GDP } 2021/\text{GDP } 2010)^{1/11} - 1$
7	Percent contribution of mobile internet to GDP growth	20.57%	$\text{Annual impact of mobile internet on GDP} / \text{CAGR GDP (2021-2010)}$
8	Incremental GDP growth (2021/2010)	\$ 35,649 M	$\text{GDP } 2021 - \text{GDP } 2010$
9	Total impact of mobile internet on incremental GDP growth	\$ 7,335 M	$\text{Incremental GDP (2021/2010)} * \% \text{ contribution of mobile internet to GDP growth}$
10	Annual impact of mobile internet on GDP	\$ 667 M	$\text{Total impact} / 11 \text{ years}$

Source: Telecom Advisory Services analysis

<sup>7</sup> See Katz, R. and Koutroumpis, P. (2013). *Assessment of the economic impact of telecommunications in Côte d'Ivoire*. Columbia Institute<sup>4</sup> for Teleinformation.

<sup>8</sup> Source: GSMA Intelligence

## 2.2. Contribution of fixed broadband to Côte d'Ivoire's economic growth between 2010 and 2021

- According to the econometric model developed for this study with time series for the country (Table A-1 in the Appendix), a 10% increase in fixed internet penetration yields 0.34% of GDP growth.
- Based on this coefficient, fixed broadband has contributed annually an average of US\$ 469 million to Côte d'Ivoire's economic growth per year between 2010 and 2021 (see Table 3 for full details).

**Table 3**  
**Fixed broadband contribution to Côte d'Ivoire's economic growth 2010-2021**

Item	Factor	Value	Source and / or estimation formula
1	Annual contribution of fixed BB penetration to GDP growth (for a 10% increase in additional penetration).	0.34%	Coefficient resulting from structural model
2	Fixed BB penetration, 4Q 2021	10.65%	ITU <sup>9</sup>
3	Fixed BB penetration, 4Q 2010	0.68%	ITU
4	Compound Annual Growth Rate (CAGR) of fixed BB penetration	28.41%	$(\text{Fixed BB penetration } 2021/2010)^{\wedge (1/11 \text{ years})-1}$
5	Annual impact of fixed BB on GDP	0.97%	$(\text{Annual impact}/10) * (\text{CAGR fixed BB penetration})$
6	CAGR GDP (2010-2021)	6.67%	$(\text{GDP } 2021/\text{GDP } 2010)^{\wedge (1/11 \text{ years})-1}$
7	Percent contribution of fixed BB to GDP growth	14.47%	$\text{Annual impact of fixed BB on GDP} / \text{CAGR GDP (2021-2010)}$
8	Incremental GDP growth (2021/2010)	\$ 35,649 M	$\text{GDP } 2021 - \text{GDP } 2010$
9	Total impact of fixed BB on incremental GDP growth	\$ 5,160 M	$\text{Incremental GDP (2021/2010)} * \% \text{ contribution of fixed BB to GDP growth}$
10	Annual impact of fixed BB on GDP	\$ 469 M	$\text{Total impact} / 11 \text{ years}$

Source: Telecom Advisory Services analysis

## 2.3 Total Contribution of telecommunications to the Côte d'Ivoire's 2021 GDP

In total, telecommunications represent 4.55% (or USD 3,191 million) of the Côte d'Ivoire 2021 GDP, broken down as follows:

- 2.93% represents the gross revenues (US\$ 2,056 million<sup>10</sup>) as a percentage of the country's 2021 GDP (US\$ 70,080 million<sup>11</sup>)

<sup>9</sup> Fixed broadband penetration was calculated with subscription and household data from ITU World Telecommunication/ICT Indicators Database 2022 (26th edition/December 2022), accessible in: <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx>. The data reported in ITU is annual, so it was converted into quarters by assuming a constant growth rate across each quarter.

<sup>10</sup> ARTCI

<sup>11</sup> IMF



- 0.95% is the indirect contribution of mobile broadband (US\$ 667 million) as a percentage of 2021 GDP.
- 0.67% is the indirect contribution of fixed broadband (US\$ 469 million) as a percentage of 2021 GDP.

**Table 4**  
**Direct and indirect contribution of telecommunications to the Côte d'Ivoire's economic growth**

Indicator	Million US\$ (2021)	As % of GDP
Direct contribution - mobile and fixed	\$ 2,055,629,904	2.93%
Indirect contribution - mobile	\$ 666,794,652	0.95%
Indirect contribution - fixed	\$ 469,089,367	0.67%
Total contribution	\$ 3,191,513,923	4.55%

*Source: Telecom Advisory Services analysis*

These estimates are consistent with those registered in an Input / Output matrix developed for Côte d'Ivoire. According to Table 4, the total contribution (\$ 3,191 million) divided by the total direct contribution (\$ 2,055 million) is 1.5, while the multiplier calculated for the telecommunications sector according to the Input / Output matrix is 1.3.<sup>12</sup>

### **3. TOTAL IMPACT OF TELECOMMUNICATIONS ON THE CÔTE D'IVOIRE 2021 GDP AND BREAKDOWN BY ECONOMIC SECTORS**

As stated above, when considering the aggregate industry revenues and the spill-over indirect effects on the rest of the Côte d'Ivoire economy, telecommunications have an impact of 4.55% on Côte d'Ivoire's GDP.

In terms of its sector impact, the increase in indirect economic contribution from both mobile and fixed broadband (from Table 4), amounts to US\$ 1,136 million in spillovers. According to Côte d'Ivoire's Input / Output matrix<sup>13</sup>, this amount would have a downstream impact in the following sectors (see Table 5).

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<sup>12</sup> The multiplier for the I/O table is calculated by assuming the impact of USD 1 of input in the telecommunications sector over the total economy.

<sup>13</sup> The I/O matrix was developed from the Global Trade Analysis Project Database (GTAP) calculated on the basis of extrapolating the trend from changes between the tables for the years 2011 and 2014.

**Table 5**  
**Sector impact on the Côte d'Ivoire's GDP increase in telecommunications output**

Sector	Percentage of the impact	Sector weight on GDP (*)	Amount (US\$ million)	Amount (% GDP)
Agriculture	0.71%	36.58%	\$ 8.02	0.01%
Textiles and apparel	0.10%	1.46%	\$ 1.14	0.00%
Wood, paper, petroleum, rubber, and plastic products	6.69%	5.54%	\$ 76.05	0.11%
Metal products	0.21%	1.03%	\$ 2.42	0.00%
Machinery and equipment	0.85%	0.93%	\$ 9.65	0.01%
Electricity, gas, and water	4.29%	3.45%	\$ 48.78	0.07%
Construction	0.00%	3.04%	\$ 0.04	0.00%
Trade	7.00%	12.17%	\$ 79.51	0.11%
Transportation	8.69%	3.01%	\$ 98.72	0.14%
Financial services	16.23%	8.45%	\$ 184.32	0.26%
Business services	55.05%	10.25%	\$ 625.25	0.89%
Other services	0.18%	14.08%	\$ 1.99	0.00%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>\$ 1,135.88</b>	<b>1.62%</b>

(\*) Excluding communication sector

Source: Telecom Advisory Services Analysis; Global Trade Analysis Project Database (GTAP)

As the data on Table 5 indicates, the sectors mostly impacted by telecommunications are business services (55.05% of the downstream effect), followed by financial services (16.23%), and transportation (8.69%).

It is important to indicate that the sectoral impact in the Côte d'Ivoire is driven by the amount that telecommunications currently represent of intermediate inputs of each sector<sup>14</sup>, and not the potential it could have in the future. For example, in advanced economies where policies and strategies are implemented to accelerate the adoption of telecommunications in agriculture, manufacturing and transportation, mobile and fixed telecommunications significantly increase their indirect economic contribution.

#### 4. IMPLICATIONS

The strong contribution of telecommunications to Côte d'Ivoire's economy is a function of two factors:

1. The sector dynamism: the telecommunications sector is growing, generating in turn direct and indirect jobs. In fact, mobile operators trigger a significant number of local suppliers, distributions agents, and providers of various services, which enhance the local value added to the economy.

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<sup>14</sup> An input/output table quantifies the inputs acquired by each industry to produce their output. As such, it does not estimate the impact telecommunications could have in increasing sector productivity.

2. The positive externalities (« Spill-over effects »): telecommunications networks and services result in a more efficient functioning of the economy particularly in terms of:
- Productivity gains in existing sectors (such as tourism, exports, manufacturing) as well as social services, such as education and public administration.
  - Innovation incentives, leading to the creation of new businesses in the digital economy (applications, software platforms, local content).
  - Integration of isolated regions, leading to further development of economic activities.
  - Better coordination among economic agents through improved knowledge of inputs market prices, better coordination between economic agents resulting in low transaction costs, enhanced ability to negotiate selling prices, inventory management and delivery tracking.
  - Improvement and extension of domestic economic exchanges, as well as at the regional and global scale.

#### Public policies and regulation

- Given the economic importance of telecommunications, public policies and regulatory frameworks need to be defined to maximize investment in network deployment and modernization, particularly in mobile broadband.
- Policies related to taxation, the cost of accessing spectrum frequencies, and infrastructure sharing should allow telecommunications operators to continue their efforts to foster connectivity and the deployment of broadband services, to support economic growth.

## APPENDIX

**Table A-1.**  
**Econometric model to measure impact on Côte d'Ivoire's economic growth**

**Aggregate production function:**  $GDP_{pcit} = a_1 K_{it} + a_2 L_{it} + a_3 BB\_Pen_{it} + e_{it}$   
**Demand function:**  $BB\_Pen_{it} = b_1 GDP_{pcit} + b_2 BB\_Price_{it} + b_3 HHI_{it} + e_{it}$   
**Supply function:**  $Rev_{it} = c_1 BB\_Price_{it} + c_2 GDP_{pcit} + c_3 HHI_{it} + e_{3it}$   
**Infrastructure function:**  $\Delta BB\_Pen_{it} = d_1 Rev_{it} + e_{4it}$

	[I]	[II]
<b>Aggregate prod. function</b>	Log(GDPpc)	Log(GDPpc)
Log(Mobile BB unique subscriber penetration)	0.076*** [0.020]	
Log(Fixed BB penetration)		0.034* [0.019]
Log(Gross Fixed Capital Formation)	0.216*** [0.046]	0.245*** [0.049]
Log(Labor)	0.433** [0.191]	0.609*** [0.203]
<b>Demand function</b>	Log(Mobile BB unique subscriber penetration)	Log(Fixed BB penetration)
Log(GDPpc)	1.769*** [0.342]	-0.109 [0.174]
Log(Mobile ARPU)	0.215 [0.177]	
Log(Fixed BB ARPU)		-1.086*** [0.031]
HHI Mobile	4.406*** [0.489]	
HHI Fixed BB		1.280*** [0.170]
<b>Supply function</b>	Log (Mobile Revenue)	Log (Fixed Revenue)
Log(GDPpc)	0.935* [0.506]	0.396** [0.160]
Log(Mobile ARPU)	0.475** [0.214]	
Log(Fixed BB ARPU)		-0.022 [0.031]
HHI Mobile	2.524*** [0.623]	
HHI Fixed BB		0.402*** [0.131]
<b>Infrastructure function</b>	Mobile internet unique subscriber adoption growth	Fixed BB adoption growth
Log(Mobile Revenue)	-0.050 [0.047]	
Log(Fixed Revenue)		-0.227** [0.113]
Observations	47	47
Years	2010-2021	2010-2021
R-Squared first equation	0.92	0.91

Note: \*\*\*, \*\*, \* significant at 1%, 5% and 10%, respectively.

Source: Telecom Advisory Services analysis

**Table A-2.  
Variables Description and Source**

<b>Variable</b>	<b>Source</b>	<b>Description</b>
GDP	International Monetary Fund	Data converted to quarterly frequency by assuming constant CAGR within each year.
Gross Fixed Capital Formation	World Bank World Development Indicators	Gross Fixed Capital Formation. Data converted to quarterly frequency.
Labor	World Bank World Development Indicators	Labor force. Data converted to quarterly frequency.
Mobile Broadband unique subscribers' penetration	GSMA Intelligence	Mobile broadband unique subscribers as a share of the population
Fixed Broadband penetration	ITU	Fixed broadband subscriptions as a share of households. Data converted to quarterly frequency.
Population	GSMA Intelligence	Total population
Mobile ARPU	GSMA Intelligence	Average revenue per connection
Fixed BB ARPU	ITU	Calculated as the portion of total revenue attributed to fixed networks (subtracting mobile), divided by the number of subscriptions
HHI Mobile	GSMA Intelligence	Industrial concentration index for overall mobile services
HHI Fixed BB	Ovum	Calculated from fixed broadband market shares.
Mobile Revenue	GSMA Intelligence	Revenue from mobile services
Fixed Revenue	ITU	Calculated as the portion of total revenue attributed to fixed networks (subtracting mobile).