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Accelerating Digital Connectivity Through Infrastructure Sharing

By Davide Strusani and Georges V. Houngbonon

Digital connectivity has enormous potential to support development. Yet today some four billion people in emerging economies remain offline, partly due to a lack of affordable Internet access. Sharing infrastructure among operators and across sectors is a potential solution. It can accelerate digital connectivity at lower cost, especially in the least developed markets where returns to investment can be limited. It can also reduce investment costs and operating expenses for investors and operators, and increase their balance sheet sustainability. Sharing models can also benefit consumers by increasing competition, lowering prices, and raising service quality. The private sector has already embraced this model; further expansion requires targeted policies that promote competition and facilitate sharing.

Internet access enables the connection of individuals and businesses to each other, to government, to markets, and to economic and social opportunities. Digital services such as e-payments, e-commerce, and e-identification are transforming business models across sectors, including financial services, healthcare, and education, as well as the delivery and consumption of goods across the wider economy. Disruptive technologies such as the Internet of Things and artificial intelligence have the potential to turbocharge the digital economy.[1] In emerging markets, evidence shows that digital connectivity has been a major driver of development over the past two decades,[2] with the potential to raise economic output, create jobs, and reduce poverty by expanding markets, increasing efficiency in businesses and government, and promoting innovation across traditional sectors.[3]

However, the benefits of digital connectivity cannot be fully realized without universal access to the Internet. Significant progress has been made over the past two decades to increase the reach of telecommunication networks, with 90 percent of the world population covered by a mobile broadband network, and 73 percent in the poorest countries.[4] Yet, service coverage and availability have yet to deliver universal *usage*: Some four billion people remain offline, i.e., not using the Internet, and over 90 percent of them live in developing countries. At the current rate of progress, it could take up to 15 years to reach universal access in the typical developing country, and up to 30 years in the poorest.[5]

While several factors impede Internet access in emerging markets, affordability remains one of the biggest challenges.[6] Even in countries with high connectivity, a lack

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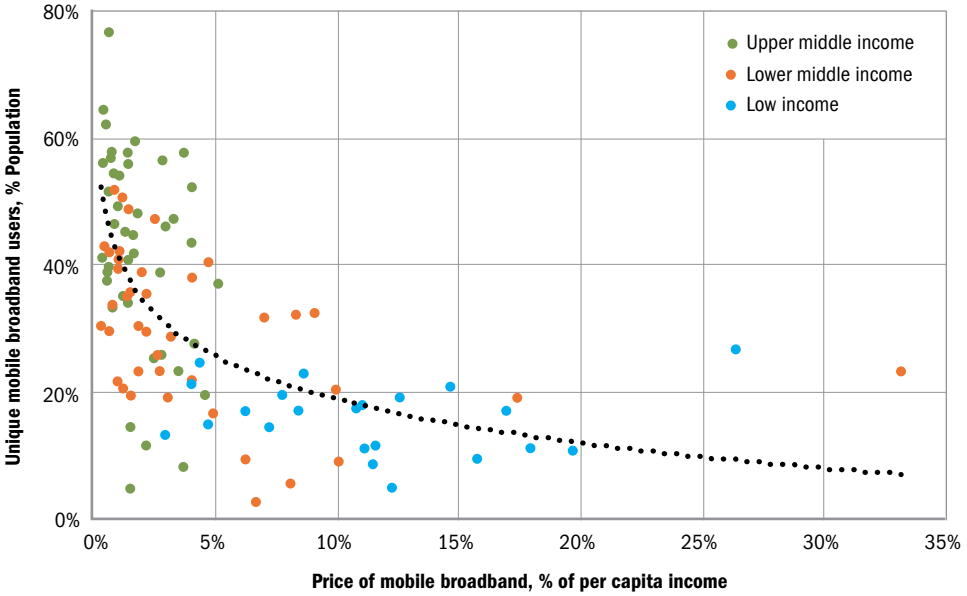

FIGURE 1 Digital Connectivity and Affordability in Emerging Markets

Source: Data on users from GSMA Intelligence. Data on price from ICT Price Basket, ITU: Average price of prepaid mobile plan with 500 MB Internet allowance, in percentage of monthly gross national income. All data from 2017. Country-level data presented by income group (World Bank's classification). Overall fit in dotted line.

of affordability can be a constraint. In Senegal, where more than 90 percent of the population is covered by a mobile broadband network, basic Internet access costs 9 percent of income per capita, and less than a quarter of the population has subscribed to mobile Internet (as of 2018). Likewise, in Nicaragua, 95 percent of the population is covered by a mobile broadband network, but basic Internet access costs 8 percent of income per capita and less than a third of the population has subscribed to mobile Internet.[7] More generally, countries with more affordable Internet access tend to have higher levels of digital connectivity (Figure 1). In emerging markets, especially the poorest countries, the cost of basic Internet access represents on average 15 percent of income per capita for mobile broadband and 54 percent for fixed broadband, significantly higher than in developed economies.[8] These elevated costs have persisted since 2015, limiting access to the digital economy for the poor. Efforts to deliver universal digital connectivity should therefore focus primarily on bringing down connectivity prices and increasing service affordability.

A number of business and policy approaches have been undertaken to promote affordable digital connectivity in emerging markets.[9] These include the introduction of pay-as-you-go plans, policies to promote competition in retail markets and the entry of new players, and price caps. But focusing on the demand side has brought limited success.

Focusing on Infrastructure

Shared infrastructure can improve service affordability through numerous channels, including cost savings, balance sheet optimization, and competition. By reducing redundancy, infrastructure sharing spreads the cost of network expansion across multiple market participants and can generate significant capital expenditure (capex) savings for connectivity service providers (telecom network operators), digital infrastructure providers (tower companies and wholesale fixed broadband companies), and IT infrastructure users in the wider economy (businesses, in the case of data centers). The cost of broadband transmission and core network deployment can be reduced by relying on existing railway lines, power transmission grids, and pipelines, or by coordinating with road construction.

In general, any infrastructure can be shared among users or different uses, principally to reduce the often-substantial sunk costs of installation. Roads and railways, electric poles and transmission grids, and sewage and water systems have long been shared among different service providers. Likewise, digital infrastructure also offers a wide range of sharing opportunities, not only within the telecom and technology sectors but also as part of other infrastructure works.

Infrastructure-based competition, in which each market participant invests in its own infrastructure, has delivered substantial competition and consumer benefits, but predominantly in developed economies with sufficient funding and purchasing power to sustain multiple investments. In emerging markets, and particularly in the poorest countries where infrastructure costs and associated risks are relatively higher, this model may not be the most appropriate.[10] Instead, shared infrastructure, a trend now increasing both in emerging markets and developed economies, has greater potential to accelerate digital connectivity.

For mobile broadband networks, sharing can reduce operator expenditures related to land acquisition, tower construction, and base transceiver station setup. For fixed

broadband network, the cost of last-mile deployment can be reduced by relying on existing sewage and water systems or by sharing the ducts and poles with other operators.

Cost Savings

In emerging markets, these capex savings can be substantial and could be used to improve service quality or innovate across verticals. Civil works can account for more than half of capex in these countries, especially due to higher labor costs, more expensive land acquisition, and longer time to obtain construction permits.[11] While the magnitude of the capex savings depends on the number of operators involved in the sharing, recent estimates suggest that a network operator can save as much as 40 percent of capital expenditures.[12] For instance, the cost of deploying 5G mobile network technology could be reduced by more than 40 percent by sharing antenna sites.[13]

By shifting some capex into operating expenditure, shared infrastructure can help improve balance sheets and profitability and drive further investment. Integrated connectivity providers can sell their assets (e.g., towers, data centers) and lease back access to them to improve their cash flow, potentially reducing investment risk related to infrastructure expansion. This benefit could be significant for resource-constrained companies seeking to expand their use of digital infrastructure. Recent estimates suggest that network operators' cash-flow can increase as much as 31 percent.[14]

Shared infrastructure can generate operating expenditure (opex) savings for connectivity service providers by reducing costs accrued from energy, network maintenance, land rent, and infrastructure security, which may be significant in some fragile and conflict-affected countries. Because these costs are related to infrastructure and can account for almost half of total opex in emerging markets, their reduction through shared infrastructure can generate substantial savings. Reduced opex can be passed-through to end-users in the form of lower service prices if there is some competition in the retail market.

Competition

Shared infrastructure can also raise the intensity of competition among market participants by reducing barriers to entry and increasing market contestability. For example, sharing the extra fiber of electricity and railways can enable upstream competition both at the backbone and backhaul levels, and downstream competition at the access level. Infrastructure sharing allows competitors to access the essential facilities of vertically integrated operators, increasing competition across the broadband value chain.

Under shared infrastructure, new entrants no longer need to incur the often-significant upfront cost of building their own infrastructure and can save time and resources that would otherwise be dedicated to administrative authorization and licensing. However, potential risks to competition, governance, and implementation need to be managed to achieve the greatest benefit from infrastructure sharing. For instance, shared infrastructure can reduce the number of providers and result in collusion to maintain a high price of access to that infrastructure or low levels of investment and innovation. Incumbent network operators can also exclude smaller rivals from a sharing arrangement. Therefore, effective regulation is needed to ensure that shared infrastructure is open, particularly to smaller market participants.

Open and accessible shared infrastructure can enable more mobile network operators (MNOs) and Internet service providers (ISPs) to expand their footprints into low-income areas, increasing the availability of connectivity in these areas and contributing to bridging the digital divide. Mobile Virtual Network Operators (MVNOs), which are retail connectivity service providers without spectrum licenses, can take advantage of the availability of a wholesale open-access network when the sharing involves frequency spectrum (roaming agreement) or a nationwide wholesale network. By increasing the intensity of competition through actual or potential entry, shared infrastructure can contribute to reducing connectivity service prices, thereby enabling greater affordability and digital connectivity. Data center colocation services can also create competition and demand for digital connectivity as new firms can take advantage of the efficiencies of IT infrastructure without incurring the cost of building their own facilities. In addition, shared infrastructure can stabilize wholesale demand, reducing investment risks.

Shared broadband infrastructure already contributes to improved service affordability in some emerging markets.[15] And nearly three out of four countries that have implemented and tracked the outcomes of infrastructure sharing reported a decline in retail prices.[16] Likewise, after the three largest MNOs in the Nigerian mobile market transferred their assets to independent tower companies, the price of mobile Internet access as a percentage of gross national income per capita declined by 3 percentage points (pp) per year, compared to just 0.4 pp the year before. In Colombia, the price of calls was rising by 0.15 pp until 2011 when the two largest MNOs transferred a large portion of their tower portfolio to an independent company. The price of calls as a percentage of income per capita declined by 1.5 pp per year afterward and the price of mobile broadband also fell by 3.3 pp per year between 2012 and 2017. In

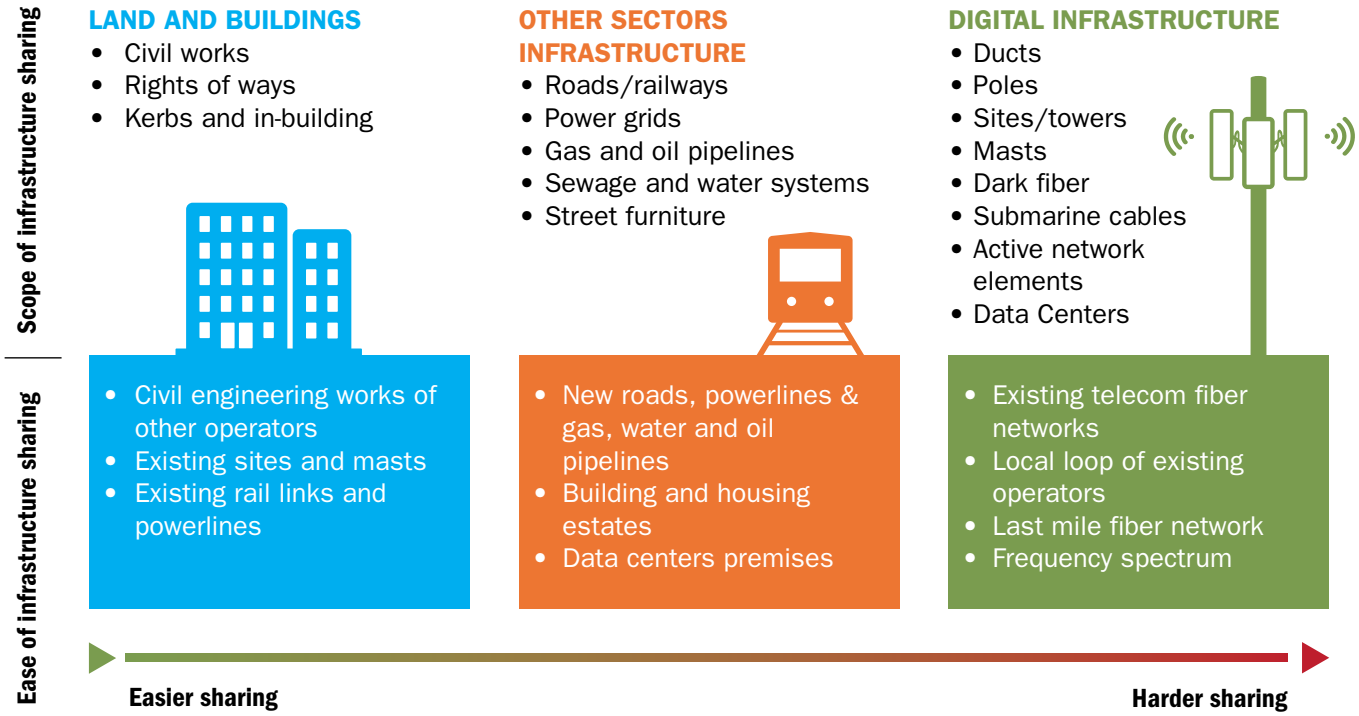

FIGURE 2 Key opportunities for infrastructure sharing

Source: Adapted from Deloitte & Association for Progressive Communication, 2015. Unlocking Broadband for All: Broadband Infrastructure Sharing Policies and Strategies in Emerging Markets.

Myanmar, the price of mobile calls decreased from 4.6 percent of income per capita in 2014 to 1.8 percent in 2015 and the price of mobile broadband fell from 10.2 percent of income per capita to 2.4 percent one year after the transfer of 1,250 towers from Digicel to the tower company Edotco. These trends highlight the potential of shared infrastructure to drive service affordability, though factors such as technological progress and regulation may also contribute.

Other Benefits and Risks of Sharing

Beyond these economic benefits, shared infrastructure can help reduce adverse environmental and visual impacts. Infrastructure-based competition often induces operators to duplicate their infrastructure, with the potential to generate redundant energy consumption, often from non-renewable sources. Shared infrastructure can help reduce greenhouse gas emissions by limiting the duplication of infrastructure such as mobile base stations, main distribution frames, and in-house data centers. Also, new network technologies such as 5G and the Internet of Things require the installation of a larger number of sites—typically up to ten times the number of mobile base stations. Sharing mobile broadband infrastructure can help optimize the number of sites and reduce the visual impact of network expansion.

However, shared infrastructure typically involves several parties, including private operators and central and local governments, thereby raising governance risks. Conflicting interests from stakeholders can result in delayed deployment of the infrastructure or a collapse of sharing agreements, with each individual operator deploying its own infrastructure. Also, when sharing solutions involves active infrastructure such as antennas and servers, access to that infrastructure assumes operation and ongoing investment, complicating governance over time. Government-led infrastructure sharing can also result in poor implementation, especially when new individual licenses are awarded after a sharing agreement.

Opportunities and Trends

Most components of broadband networks present an opportunity for sharing (Figure 2). Broadband Internet access involves the connection of end-users (individuals or businesses) to a city-level network node. This connection entails the deployment of fiber-optic cables through ducts or poles between the end-user's premises and the node, which can be shared with water and electricity cables. Also, the acquisition of land and the construction of a building to house the electronic equipment that aggregates

signals at the node can be shared across providers. Access to the end-user's premises also presents opportunities for sharing, including curbs and in-building civil works when new buildings are constructed, as is the case in cities in developing countries. Mobile broadband Internet access involves the acquisition of a site, the construction of towers to install an antenna, and the use of radio waves to connect end-users with the antenna; and all these components can be shared across mobile operators. Signal conveyance between the network node and other users on the Internet is carried out by deploying fiber-optic cables between cities (backhaul and backbone networks), and states and continents (submarine cables), activities that entail heavy and costly civil works and can be shared among network operators.

Submarine cables that interconnect national networks, often across continents, illustrate infrastructure sharing within the telecom sector. Because they are capital-intensive and require large sunk costs upfront, they are often jointly deployed by several companies, with additional funding from governments and international institutions like the World Bank and IFC. Examples include the Eastern Africa Submarine Cable System (ESSAy), a consortium of several telecom operators that jointly invested in and shared the first high-capacity submarine cable that connects several African countries, including landlocked countries, to the rest of the world; and the Africa Coast to Europe submarine cable managed by a consortium of 19 operators that interconnects 24 African countries—seven of them for the first time—with Europe.

The scope of sharing opportunities ranges from network elements like ducts, poles, tower, and masts, to dark fiber (unused fiber-optic cable) and frequency spectrum. Telecom operators are employing various forms of infrastructure sharing, with different implications in terms of risk sharing, access, ownership, and funding.[17] Vertically integrated network operators (i.e., those that own the network and offer retail services) can create a *joint venture* to pool their capital resources to finance a fiber optic network or a tower company. Examples include Indus Towers in India, a joint venture between Bharti Airtel, Vodafone, and Idea; and a duct sharing agreement between Neotel (Liquid), MTN, and Vodacom in South Africa to deploy their transmission network. Other network operators transfer their assets to an *independent company* under various contractual arrangements.[18] Examples from the mobile sector include an agreement between tower company IHS and Orange to manage and lease back mobile towers in Cote d'Ivoire and Cameroon; and the acquisition of a portfolio of towers by American Tower in India. CSquared across Africa and Power Telecom in Indonesia are examples of independent wholesale broadband infrastructure providers, enabling operators to share a broadband network. Another sharing approach involves direct or indirect government support through *public-private partnerships* to deploy national broadband, as in Rwanda (KTRN) or Mexico (Altan Redes).[19]

Broadband network expansion can also take advantage of sharing opportunities from other sectors. Because most infrastructure involves substantial civil works, fiber-optic cable deployment can be simultaneously planned along with other infrastructure works like roads, railways, power transmission grids, sewages, and pipelines. By "digging once" and explicitly making space for future deployment, sharing of new construction adds little extra cost to infrastructure rollout. For instance, coordinating network rollout with road construction is estimated to add only between 0.9 and 2 percent to the total cost of a road.[20] An early example of cross-sector infrastructure sharing is Broadband InfraCo in South Africa. Also, mobile antennas can be installed on top of electric poles and pylons, as well as on water towers, eliminating the need to build a separate tower for them. Cross-sector sharing also offers infrastructure owners the opportunity to monetize the latent value of their assets, reduces capital expenditure required to install or upgrade their internal communications networks, and more generally improves their operating efficiency, reliability, and safety.[21]

Sharing is Limited So Far

So far, shared digital infrastructure remains limited and several emerging markets are lagging (Figure 3). At the global scale, an estimated 70 percent of countries reported mandated infrastructure sharing, and just 44 percent in the Asia-Pacific region, the lowest among regions worldwide.[22] Sharing of mobile network elements, including towers and spectrum, is rising but at a slow pace.[23] Over the past 10 years, only 10 active network sharing agreements have been announced across the Middle East and Africa region.[24] Countries including Algeria, Ethiopia, Senegal, Morocco, Zimbabwe, Bolivia, Philippines, the Lao People's Democratic Republic, and Nepal have virtually no independent tower company. Fixed broadband network sharing, whereby incumbent operators provide access to their last-mile network to competitors, is virtually absent in most emerging markets.

Beyond broadband infrastructure, data centers can also be shared. Most large companies with sensitive customer data—banks, healthcare firms, telecoms companies, and government agencies, for example—can share building, connectivity, and power by housing their IT infrastructure with an independent data center operator. Likewise,

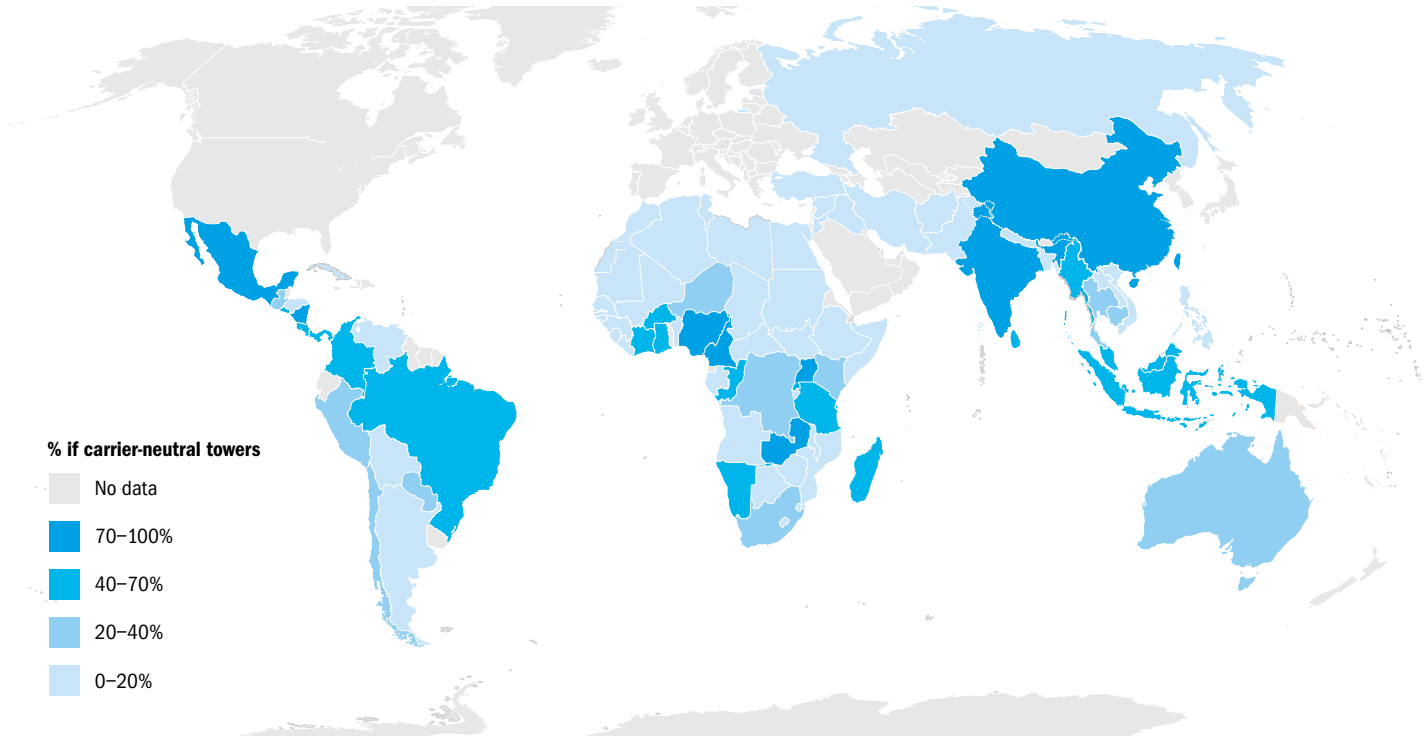

FIGURE 3 Tower sharing through independent companies in selected markets

Source: IFC Mapping, 2018. Geographic boundaries are only for illustration purposes.

medium and small businesses can take advantage of cloud-based services to store and process their digital data on remote IT infrastructure without incurring the costs of installing and maintaining their own data centers. Data centers require high-quality connectivity and can also benefit from shared broadband infrastructure.

Supporting Private Investment in Shared Infrastructure

Shared infrastructure can be a winning model for private stakeholders, including network operators and infrastructure companies. In the mobile sector, recent data about independent tower companies across four emerging markets suggests that infrastructure sharing can be a profitable business.[25] The estimated gross margin is close to 50 percent and the tenancy ratio, or the number of mobile operators per tower, rose from 1.3 to 1.4 one year after the beginning of operations, highlighting the increased attractiveness of the tower sharing model for mobile operators. In India, independent tower company Bharti Infratel has a tenancy ratio close to two operators per tower with a gross margin of 44 percent.[26] In Africa, Helios Towers reported a tenancy ratio ranging from 1.39 in the Republic of Congo to 2.12 in Tanzania, with a 52 percent gross margin at the end of 2018.[27]

Private operators are already active in shared infrastructure, but better public policies are needed to further drive this trend. Across emerging markets, network operators are engaging with independent infrastructure providers to share fixed and mobile broadband infrastructure using a variety of innovative business models.[28]

Yet a lack of incentives from integrated network operators continues to limit the expansion of shared infrastructure. As in some advanced economies, public policy can promote co-investment in fiber networks by requiring all operators to share deployment plans with competitors and facilitate the use of rights of way. Although there is limited evidence from emerging markets, studies from advanced economies suggest that co-investment policies can be effective in increasing the availability of fiber-based broadband Internet access for end-users.[29] Regulators can also use financial incentives to support infrastructure sharing by reducing universal service requirements when voluntary sharing is undertaken with market competitors.

Public policy can also help to support cross-sector infrastructure sharing. Recent examples include CEC Liquid Telecom, a joint venture between CEC, a Zambian power transmission electricity distribution company, and Liquid Telecom, a wholesale broadband provider. This

joint venture enabled the provision of connectivity in Zambia, a landlocked African country, by relying on the electric grid to deploy fiber. In more advanced economies, utilities providers like EPB in the United States, ENEL in Italy, and Northpower in New Zealand have set up fiber optic companies leveraged from their power distribution networks. However, many infrastructure owners still do not share due to regulatory constraints, especially for state-owned enterprises, and limited coordination across government agencies. Regulators can alleviate these constraints by refraining from offsetting sharing revenues of infrastructure owners, a practice that consists of reducing allowed revenue from core business as a result of new revenue earned from sharing. Also, a publicly available database can help operators to collect and share geographic information from projects and lead to more shared infrastructure.

Overall, infrastructure sharing will require effective regulation in order to avoid predesigned business models interfering with competitive market dynamics. In some instances, it may be desirable to enable models where the sharing of infrastructure is the result of a voluntary process and market adjustment, and not a predetermined market structure. However, regulators may need to enforce shared infrastructure where there is a market failure, for example by mandating infrastructure sharing in the context of a rural broadband connectivity program.

Looking Forward

Shared infrastructure offers significant opportunities to improve affordability and accelerate digital connectivity in emerging markets. However, alone it may not be enough to achieve universal access by 2030. In most emerging markets, especially the poorest, the majority of unconnected individuals live in rural areas where factors such as a lack of network availability, electricity, digital skills, and locally relevant digital content constrain access to the Internet. In addition, issues surrounding anticompetitive practices from incumbents, often government-owned operators, remain. Shared infrastructure should be complemented with the gradual removal of these barriers to yield the greatest impact.

Infrastructure sharing can be an essential feature of the technology evolution toward 5G and may impact business models and regulation. Infrastructure sharing in light of 5G evolution is also justified by the de-emphasis of physical infrastructure as a competitive advantage, as network virtualization becomes a source of competitive advantage.[30]

Finally, sharing can be gradually extended to all digital infrastructure, especially Data Centers, the vast majority of which remain under the ownership of single users, limiting the availability of digital data storage and processing capacity, especially for small and medium enterprises. This extension could offer additional opportunities for the private sector and generate larger benefits for society by supporting faster expansion of the digital economy.

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Please see the following additional reports and EM Compass Notes about technology and its role in emerging markets and private investments in infrastructure:

Reinventing Business Through Disruptive Technologies - Sector Trends and Investment Opportunities for Firms in Emerging Markets (March 2019); *Blockchain: Opportunities for Private Enterprises in Emerging Markets* (Jan 2019); *Artificial Intelligence and the Future for Smart Homes* (Feb 2020); *Artificial Intelligence and 5G Mobile Technology Can Drive Investment Opportunities in Emerging Markets* (Note 76, Dec 2019); *How Artificial Intelligence is Making Transport Safer, Cleaner, More Reliable and Efficient in Emerging Markets* (Note 75, November 2019); *Bridging the Trust Gap: Blockchain's Potential to Restore Trust in Artificial Intelligence in Support of New Business Models* (Note 74, Oct 2019); *Artificial Intelligence: Investment Trends and Selected Industry Uses* (Note 71, Sept 2019); *The Role of Artificial Intelligence in Supporting Development in Emerging Markets* (Note 69, July 2019).

[1] The size of global digital economy is predicted to grow from 15.5% of GDP in 2016 to 24.3% in 2025. https://www.huawei.com/minisite/gci/en/digital-spillover/files/gci_digital_spillover.pdf.

[2] World Bank Group. 2016. "World Development Report Digital Dividends." https://www.worldbank.org/en/publication/wdr2016.

[3] Deloitte. 2014. "The Value of Connectivity: Economic and Social Benefits of Expanding Internet Access." https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/TechnologyMediaCommunications/2014_uk_tmt_value_of_connectivity_deloitte_ireland.pdf.

[4] Source: GSMA Intelligence.

[5] Our own estimations using data on the penetration rate of unique mobile Internet users from GSMA Intelligence. The annual rate of progress is 3.36% for developing countries and 2.13% for least developed countries, starting from respectively 43.9% and 23% penetration rate in 2019.

[6] Other key barriers to Internet access are: lack of awareness and locally relevant contents, lack of digital skills and lack of access device (computer/smartphones). AfterAccess. 2017. "The Inside Internet Story of Africa, Asia and Latin America." https://afteraccess.net/wp-content/uploads/After-Access-Website-layout-r1.pdf. GSMA. 2015. "Consumers Barriers to Mobile Internet Adoption in Africa." https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/07/Consumer-Barriers-to-mobile-internet-adoption-in-Africa.pdf

[7] Coverage and penetration data from GSMA Intelligence. Cost data from ITU price basket. https://www.itu.int/net4/ITU-D/ipb/.

[8] Price in 2017 in "Least Developed Countries". Price of postpaid computer-based 1GB of mobile-broadband basket. Data from ITU's ICT Price Basket: https://www.itu.int/net4/ITU-D/ipb/.

[9] World Bank Group. 2018. "Innovative Business Models for Expanding Fiber-Optic Networks and Closing the Access Gaps." http://documents.worldbank.org/curated/en/674601544534500678/pdf/132845-7-12-2018-17-20-11-InnovativeBusinessModels.pdf.

[10] In 2019, average revenue per subscriber for fixed and mobile telecommunications was estimated at $7.8 in developing countries, compared to $37.3 in developed markets. GSMA Intelligence, 2019. https://www.gsmaintelligence.com/metrics/189/0/data/?report=5d1bdf2780a98.

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[13] McKinsey. 2018. "Network Sharing and 5G: A turning point for lone riders." https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/network-sharing-and-5g-a-turning-point-for-lone-riders.

[14] Ericsson. 2012. "Successful Network Sharing: A Structured Approach to Network Sharing – How to Benefit While Maintaining Competitive Advantage."

[15] Data from TowerXchange. 2019: https://www.towerxchange.com/wp-content/uploads/2019/07/TXJ26.pdf. And ITU's ICT Price Basket: https://www.itu.int/net4/ITU-D/ipb/.

[16] ITU's ICT Eye Survey, 2018. Of 61 countries where shared infrastructure is implemented with tracked outcomes, 45 report a decline in price. https://www.itu.int/net4/itu-d/icteye/Topics.aspx?TopicID=15.

[17] See Sousa and Heinrich. 2019. "Infrastructure Regulation: Overview and Impact on Towercos. The Delta Perspective." https://www.deltapartnersgroup.com/sites/default/files/The%20Delta%20Perspective%20-%20Tower%20Regulation%20-%20Apr2019_0.pdf. Deloitte & APC. 2015. "Unlocking Broadband for All: Broadband Infrastructure Sharing Policies and Strategies in Emerging Markets." https://www.apc.org/sites/default/files/Unlocking%20broadband%20for%20all%20Full%20report.pdf.

[18] These arrangements include asset acquisition, sale, and leaseback (SLB), manage with license to lease (MLL) agreements; or built-to-suit (BTS) contract.

[19] GSMA. 2017. "Wholesale Open Access Networks." https://www.gsma.com/spectrum/wp-content/uploads/2017/07/GSMA_SWN-8-pager_R3_Web_Singles.pdf. Other examples include the National Broadband Network in Australia and the Next Generation National Broadband Network in Singapore.

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[22] ITU's ITC eye: https://www.itu.int/net4/itu-d/icteye/Topics.aspx?TopicID=15.

[23] Spectrum sharing typically involves roaming agreement between network operators, or a secondary market for spectrum trading.

[24] McKinsey. 2018. "Network Sharing and 5G: A turning point for lone riders." https://www.mckinsey.com/~/media/McKinsey/Industries/Telecommunications/Our%20Insights/Network%20sharing%20and%205G%20A%20turning%20point%20for%20lone%20riders/Network-sharing-and-5G-A-turning-point-for-lone-riders.ashx.

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