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Development Sector

The role of government and the public sector in the post COVID-19 digital world

8th ITU Economic Experts Roundtable: Outcome report

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The roundtable discussions were moderated by Ms Sofie Maddens, Head, Regulatory and Market Environment Division, Telecommunication Development Bureau (ITU) and Mr Catalin Marinescu, Head, Strategy and Planning Division (ITU).

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Promote a cross-sector infrastructure sharing policy to unify all fibre-optic assets to create a fail-proof nationwide transmission network.

Promote private investment in wholesale networks and international gateways, if possible.

Foreword

The importance of reliable broadband to people and businesses has been underscored by the COVID-19 pandemic. ITU research shows that ICTs have contributed to increasing countries' economic resilience during the pandemic.

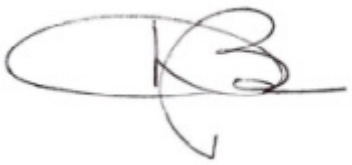
The faster a country deploys and upgrades ICT networks, the higher the economic impact, and the stronger its economic resilience will be in the face of pandemics. Furthermore, the faster the country will be able to address different aspects of the digital divide.

Superfast broadband networks are important to meet future needs. Rolling out and upgrading infrastructure to deploy superfast broadband networks is, and will remain, crucial to ensuring affordable access and expanding digitalization for social and economic wellbeing.

During the roundtable discussions, many experts warned that there is no panacea for the universal connectivity challenge but the conditions under which countries can accelerate the deployment of networks and the modernization of technology must be closely examined.

In line with the theme of the upcoming World Telecommunication Development Conference (WTDC) ''*Connecting the unconnected to achieve sustainable development*'', the outcomes of this Economic Experts Roundtable provided a great opportunity to discuss approaches to harnessing data to target interventions and creating space for regulators and industry to experiment together and build solutions that protect consumers while encouraging market growth and innovation.

It is my hope that this outcome report will serve as a useful resource for ITU members and all ICT stakeholders to better understand how the implementation of a combination of effective, enabling policy and regulatory tools, business models and financing approaches can stimulate investment. This will be key to achieving affordable and meaningful connectivity and unlock the catalysing force of connectivity for socio-economic development the world over.



Doreen Bogdan-Martin
BDT Director
International Telecommunication Union

Executive summary

The 8th Economic Experts Roundtable was convened to take stock of the role of the public sector and governments in the future development of the ICT sector and was structured around two panels:

- The first panel focused on analysing the current role of government and the public sector in the ICT industry. The main objective was to understand why so many countries continue to host state-owned service providers despite the shared understanding and empirical evidence on the benefits of privatization and liberalization.
- The second panel addressed the role of government in the management of ICT infrastructure, such as national telecommunication backbones and what can be done when state ownership of infrastructure is unsuccessful.

The discussions of both panels were framed within the difficult economic conditions brought on by the COVID-19 pandemic. Economic contraction, slower growth and rising unemployment have resulted in significant economic challenges across users of digital services that have extended the digital divide. The pandemic has also widened the divide in the availability and quality of connectivity between markets, and just as significantly, within individual markets (between urban and rural, primary vs. secondary cities, etc.). The reduction of telecommunication capital spending because of the COVID-19 induced economic downturn is also having a negative impact on the rate of network expansion, particularly in rural and isolated areas.

Despite the research findings and best practices formulated around the need to privatize and liberalize the telecommunication/ICT industry, the main fixed-broadband operator in about 35 per cent of 189 countries remains under state ownership, out of which around 7 per cent operate as a monopoly[1]. The economic experts offered insights to this situation:

- Privatization is a complex process, requiring changes in primary legislation and regulatory frameworks that take time to materialize. For example, the recent restructuring of the telecommunications industry in Ethiopia is expected to take at least four years.
- Policy-makers are sometimes reluctant to proceed with the privatization of the state-owned telecommunication operator since in many countries this entity remains an important source of public income and employment.
- The persistence of state-owned telecommunication operators in fixed-line markets limits private investor interest.

Barriers to privatization and liberalization

Analysis of the current role of government and the public sector in the ICT industry leads to an understanding of some of the barriers to the move towards privatization and liberalization:

- The capacity gap in policy-making and regulatory institutions. Even some countries with more mature regulatory agencies and policy-making institutions can undergo a technical capacity shortfall partly due to the continuous rotation of staff driven by the political electoral cycle and more attractive offerings by the private sector.
- Privatization and liberalization have often been held back by government concerns over assets of strategic or national interest. Some national regulatory authorities perceive loss

[1] ITU ICT Regulatory Tracker.

of control of telecommunication backbones and facilities a risk, and this perception of risk is even greater for 5G networks.

- Beyond privatization of state-owned operators, governments continue to play a role in the ownership and management of wholesale backbone networks.

That being said, there is no one-size-fits-all for privatization and liberalization, nor can it be considered as an all-encompassing panacea. Some cases of unsuccessful privatization of incumbent operators occurred before liberalization or the establishment of an independent regulator, and elsewhere, short-term gains led governments to maximize short-term benefits rather than achieving the best value in terms of getting the right acquirer to lead the privatized company.

Government ICT infrastructure management

The solution to privatization and liberalization might lie in not considering it as a state-versus-market option. In fact, the COVID-19 pandemic has helped find alternative strategies that combine the resources and capabilities of the public and private sectors:

- The private sector has been able to deploy initiatives focused on helping communities deal with the COVID-19 pandemic, with operators coming together to provide service in a common network that allows access to everyone, regardless of their provider.
- On the government side, some regulators have understood that private operators have been supportive during this emergency and to transform this outcome into a more viable set of alternatives, regulators have become less punitive and eased some areas of regulatory pressure on operators.
- The increased collaboration between the public and private sectors appears to be the most favoured institutional framework, maximizing the development of the digital economy and strengthening network resilience to reduce the impact of the COVID-19 pandemic.

Going forward, some practices are emerging that could prove useful in defining the future role of government and the public sector:

- Governments need to create a collaborative and innovation-friendly regulatory environment, where new products and services can be tested to help foster innovation.
- Regulators need to ensure decisions are made solely in the interest of ICT development, detached from the political environment and not subject to a change of government.
- The public sector needs to create profit incentives where none previously existed, such as funding for key technologies, targeted tax breaks, or investment that does not need to directly touch the private sector.
- When it comes to rural and isolated areas where the private sector is reluctant to invest, government should not only participate by investing to address this market failure, but also by stimulating the market through initiatives that expose private operators to the forces of competition. Concession models can work very well, provided that an enabling policy and regulatory environment is in place, and that the assets of investments are protected.
- Governments should aim to develop the capacity of national regulatory authorities and a fit-for-purpose, flexible and future-proof regulatory framework: regulatory credibility is a pre-condition for private capital to flow in a country. International bodies, such as ITU, can play a key role in building the regulatory capacity.
- If governments bolster their investments in non-telecommunication sector infrastructure, entities such as power, gas and railways, they should do it under a clearly defined "open access" policy.
- For infrastructure owned by multiple public sector agencies, a cross-sector sharing policy should unify all fibre-optic assets to create a fail-proof nationwide transmission network.

- Infrastructure sharing should be stimulated, particularly with the objective of promoting the development of capital-intensive infrastructure, such as 5G networks.
- Governments should recognize that when it comes to wholesale networks and international gateways, private investment appears to be the most convenient option. If there is an operator that is willing to invest in infrastructure, that operator should not be denied a licence, and licences should not entail excessively onerous conditions and administrative burdens.

List of acronyms and abbreviations

ANTEL	Administración Nacional de Telecomunicaciones de Uruguay
CAPEX	Capital expenditure
ESCAP	Economic and Social Commission for Asia and the Pacific
FTTH	Fibre-to-the-home
ICE	Instituto Costarricense de Electricidad
ICT	Information and communication technology
IFC	International Finance Corporation
ISP	Internet service provider
ITU	International Telecommunication Union
LTE	Long-term evolution
OECD	Organisation for Economic Co-operation and Development
PPP	Public-private partnership
RAN	Radio access network

1 Introduction

The COVID-19 pandemic has underscored how important reliable broadband and connectivity are to people, governments, and businesses, and how ICTs contribute to increasing a country's economic resilience during the emergency: the faster a country deploys and upgrades ICT networks, the greater the economic impact will be, the stronger its economic resilience in the face of a pandemic will be, and the faster it will address the digital divide.[1]

Capital investment to upgrade infrastructure is crucial to deploy superfast broadband networks. It is not just about meeting future needs, it is also about the current needs of ensuring affordable, accessible, meaningful connectivity to all, and expanding digitalization for social and economic well-being.

It is therefore essential to determine the conditions under which countries can accelerate the deployment of ICT networks and the modernization of technology. Privatization and competition in the telecommunication sector have long been linked to network development and recent ITU research has shown that privatization of telecommunication/ICT operators can be linked to higher capital spending in network roll-out, both in fixed and mobile broadband.[2]

And yet, despite the worldwide trend towards privatization and liberalization of the sector, in about 35 per cent of 189 countries surveyed by the ITU Regulatory Tracker[3], the main fixed broadband operator is under state ownership, out of which about 7 per cent operate as a monopoly. This situation, and considering the persistent digital divide, raises a number of questions:

- How should governments accelerate towards privatization and liberalization?
- What are the barriers to privatization and liberalization?
- What are the conditions under which successful state-owned operators exist and thrive?
- What is the role for the state in the ICT sector?
- Why should the private sector address this market failure?

This report focuses on these critical issues, summarising roundtable discussions, as well as responses to the expert survey prior to the meeting and published research. The analysis and conclusions provide an assessment of the role of government in the ICT sector, not only in terms of ownership of telecommunication/ICT operators but also regarding management of telecommunication/ICT infrastructure. Section two of this report focuses on why so many countries have state-owned service providers despite the proven benefits of privatization and liberalization, and the positive role the public sector might contribute to industry performance. Section three assesses the role of governments in the management of ICT networks, state ownership of infrastructure and the options available for governments, as well as the role of multilateral international institutions, such as ITU or development finance banks, in supporting the public sector.

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1 See research reviewed in International Telecommunication Union (2021). The economic impact of broadband and digitization through the COVID-19 pandemic: Econometric modelling. Geneva.

2 International telecommunication Union (2021). The impact of policies, regulation, and institutions on ICT sector performance. Geneva.

3 ITU ICT Regulatory Tracker.

2 The role of the state in the ICT sector

> *"Connectivity is the national critical infrastructure that is now as important as water, electricity and food to a nation. After clinical treatments, connectivity will be the single most important industry that will drive business and society out of lockdown".*
>
> *Roundtable expert comment*

The COVID-19 pandemic has exposed the access and connectivity limitations that digital infrastructure faces in less developed countries. These limitations exist both in terms of supply (such as network coverage) and demand (including literacy, affordability, and lack of relevant Internet local content).

Historically, governments have played an almost exclusive role in the provision of telecommunication services. However, since the mid-1980s, most countries have been gradually privatizing telecommunication utilities and opening the sector to competition, an approach that maximizes social and economic benefits of ICTs. Yet, according to the ITU Regulatory Tracker[4], the main fixed telecommunication/ICT operator in 67 countries continues to be state-owned. What explains this situation? This section explores the persistence of state-owned telecommunication operators and the barriers to privatization and liberalization.

2.1 Persistent role of government

Privatization is a complex process, requiring changes in primary legislation and regulatory frameworks. It can take many years from a publication of a liberalization policy to its implementation. The Ethiopia Government, for example, committed to introducing changes in the telecommunication market and regulatory environment, in June 2018. The process of privatization and liberalization started after a new telecommunication law was passed, creating a sector-specific regulator, in September 2019. This culminated in the award of a mobile licence to an international consortium, which was expected to launch services towards the end of 2021, over three years from the announcement of the policy. The government has since committed to a third mobile licence and to the future partial privatization of the fixed-line operator.

This also shows that privatization of state-owned utilities needs strong and farsighted political will to bring about change and overcome institutional inertia.

In addition, policy-makers are sometimes reluctant to proceed with the privatization of the incumbent telecommunication operator since in many countries such state-owned entities are often an important source of public income and employment. Privatization could, therefore,

[4] ITU ICT Regulatory Tracker.

entail major political risk since it could lead to a significant number of job losses and potential union resistance.[5]

The persistent role of government in the telecommunication industry could also be associated with factors that are external to the industry. Most state-owned telecommunication operators exist in countries that currently score very low in rankings such as the World Economic Forum Competitiveness Index[6] and/or operate in relatively closed economies. These factors have a detrimental impact on investors who could be potentially interested in acquiring a state-owned enterprise.

However, even if a government was to show an interest in privatizing the telecommunication service provider, they might have difficulty in attracting potential investors, and despite privatization being the generally accepted way to maximize social and economic benefits of ICTs, it was probably much easier in the 1990s and early 2000s than it is now since the interest of potential private investors has significantly declined.

In addition, countries having a persistent role of state-owned telecommunication operators in the fixed-line market, although limiting interest on the part of private investors,[7] can still succeed in deploying a vibrant mobile sector. In other words, the social and economic benefits in those countries are driven through competition in the mobile segment, not necessarily from fixed networks.

Although the reasons why state-owned main fixed-line operators continues in 67 countries may range from political to regulatory and financial factors, it is not least because competition in the mobile sector has been delivering some important socio-economic benefits.

2.2 Barriers to privatization and liberalization

> *"It is very easy for us to fall under the misimpression that ICT digital infrastructure is all the rage, and we try to base our impressions from the countries that we are living in without understanding the actual economic and regulatory priorities of those countries that do not seem to be pushing the privatization and/or liberalization agenda…"*
>
> *Roundtable expert comment*

Some countries keep entry barriers to privatization and liberalization that resist reform. In some regions, despite the importance of ICTs, the ICT industry is not at the top of the list of public policy priorities. Countries with persistent infrastructure gaps in electricity, water and

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5 See as an example in point, the reaction to the privatization of the fixed line operator in Bogota, Empresa de Telecomunicaciones de Bogotá, where twice the workers union did not allow the privatization process to be implemented. (See Acosta, R. (2017). "Acción popular pone en jaque privatización de ETB", *Bogotá Social* (May 8). Retrieved at: http://bogotasocial.org/servicios-sociales/servicios-publicos/accion-popular-pone-en-jaque-privatizacion-de-etb-2715.

6 https://www.weforum.org/reports/the-global-competitiveness-report-2020.

7 According to one panelist, some incumbent operators are "unsaleable" from a financial perspective. In some cases, there have been efforts to sell these companies but there has been no commercial interest. This is often related to high level of indebtedness and overstaffing, as well as low market share in those parts of the market where there is competition.

transportation focus on meeting these basic needs. Therefore, some barriers might simply be due to different policy priorities.

Beyond different policy priorities, one of the barriers to privatization and liberalization in some countries is related to a capacity gap in policy-making bodies and regulatory institutions. For example, the telecommunication regulator in Ethiopia was created once the country announced its decision to move towards liberalizing the sector. Since then, the newly created National Regulatory Authority has been confronted with shortages in skilled staff and financial resources while it had to make critical decisions impacting the future of the industry, and this situation is not uncommon elsewhere. Djibouti, for example, launched its telecommunication regulatory authority in 2021, and Somalia created one in 2019. Even some countries with more mature regulatory agencies and policy-making institutions undergo a technical capacity shortfall partly due to the continuous rotation of staff driven by the political electoral cycle and more attractive offerings by the private sector. In a wider context, it is difficult to achieve strong telecommunication regulation and policy-making bodies operating in states that lack strong institutions generally nor have the human capacity to base their operations on.

There is general consensus that a great need for regulatory support exists in many parts of the developing world, which would benefit from more experienced regulatory agencies and from ITU.

Privatization and liberalization have been often held back by concerns on loss of control over strategic assets considered of national interest by governments. Certain national agencies perceive a risk in releasing control of backbone networks: this becomes more important for 5G telecommunication networks that are considered even more strategic. In some markets, the rollout of 5G networks have followed a model where the state maintains a "golden share" of the domestic operator to ensure it remains in control for national security and political reasons. This is a popular model for governments to ensure control of critical national infrastructure, control of network expansion, and control of the security of data carried on those networks.

2.3 Approaches to privatization and liberalization

> *"We know that the kind of reforms we have been introducing for three decades in developing countries did not bring telecommunication services to certain parts of the population, first with voice and then with broadband. We have to do something differently…"*
>
> *Roundtable expert comment*

Even if research and best practices concur on the benefits associated with privatization and liberalization, it is relevant to explore what the role of government should be going forward, and analysis should be guided by an examination of what the role of government has been in the drive towards universal, affordable, and meaningful broadband access.

As a starting point, there is an assumption that privatization and liberalization have always produced positive socio-economic outcomes, for example, in countries where privatization of a state-owned telecommunication operator occurred before the establishment of an independent

regulator or before liberalization. In South Africa for instance, by the end of the privatization period, broadband penetration was less than what it was at the beginning of the process.

One issue lies in some of the privatization processes themselves. For example, in some cases, the short-term gains governments saw (for example, within an electoral cycle, or resulting from highly priced transactions) led governments to maximize short-term benefits rather than the best value in terms of getting the right acquirer to lead the privatized company. In some cases, privatization was prioritized over liberalization to maximize the selling price under monopoly conditions.

A second problem results from the political pressure to set up regulatory authorities, which in many cases were neither independent nor empowered to effectively monitor markets and ensure positive consumer outcomes. In some cases, these institutions bred other types of patronage and generated ineffectual regulation, and elsewhere, universal access strategies, and universal access funds have been used as parts of systems of patronaging or dysfunctionality.

Few governments can put forward the kind of investments needed to provide universal connectivity. Part of the problem lies perhaps in the way that universal connectivity has been approached as a state-versus-market option.

> *"Either the markets run, operators run with it, unhindered by effective regulation and fair competition and therefore outcomes or the state has been heavy-handed in not creating an enabling environment. It is essential now to find alternative strategies that can deliver these services in a different manner".*
>
> *Roundtable expert comment*

2.4 Best practices and lessons learned

> *"They came out of these last eighteen months for the most part with their reputations at least intact and in many parts enhanced. Some of that was about the compassion that they showed for the hard to connect, hard to afford, hard to access, individuals and organizations and communities, who required connectivity and access to the Internet, via mobile or via the fibre or copper in the ground just to survive, for health, education, and information…"*
>
> *Roundtable expert comment*

Paradoxically, the pandemic has helped governments and the private sector to find alternative strategies.

The issue of broadband access, which existed before COVID-19, was worsened by a migration to rural areas, which increased the demand in areas with a different type of network topography. This has given governments and private operators the opportunity to implement initiatives that

have facilitated broadband access not only in rural and isolated areas but to other vulnerable groups.[8]

In addition to the many approaches, such as emergency 4G and 5G access, zero rate plans offered to vulnerable groups, and devices being provided to schools and health centres, it is worth mentioning that the response to the COVID-19 emergency has highlighted a capacity to deal with future emergencies.

On the government side, regulators reacted positively to private operator initiatives during the emergency by easing regulatory pressures in some areas and becoming less punitive in others. This approach reflected an alternative to the state-versus-market option.

Partly in reaction to this combination of effects, the introduction of new technologies and business models has addressed the problem of difficult to reach communities and individuals. Along these lines, innovation accelerated dramatically in the last twelve months. For example, ICT infrastructure sharing has intensified. In some countries, operators have created a common network to provide user access regardless of the service provider or provider of choice rather than compete to deliver service, as reported in the ITU REG4COVID platform.

2.5 Public and private sector collaboration

> *"Tens of millions of phones, even in developed countries … still lack appropriate fixed-line service above an acceptable threshold; on the cellular side, swathes of geographies are untouched by LTE to this day while operators are pouring CAPEX in 5G cells in the city. You can see where the priority drives …"*
>
> *Roundtable expert comment*

The increase in public and private sector collaboration, which emerged because of the pandemic, belies obvious issues that will determine the role of the public sector going forward. Should government continue or withdraw from offering service and let the private sector take the lead?

The need for public sector involvement is obvious: it can occupy gaps in the market that the private sector does not fill but does this mean that it should build out networks itself and manage and deploy infrastructure?

Unfortunately, government- or municipal-owned networks, while politically popular, are rarely successful, and failure can lead to networks being sold for significantly less money than was originally invested by the public sector.

If the private sector will not assist the underserved, and the public sector cannot do it efficiently, then this leaves approaches based on technology and innovation, however, this will not be a quick fix, in the opinion of one panellist, "it is difficult to innovate our way out of this problem".

[8] In the ITU Global Network Resiliency Platform (#REG4COVID) ICT regulators, policy-makers and other interested stakeholders can share information and view what initiatives and measures had been introduced around the world designed to help ensure communities remain connected, during the COVID-19 crisis.

In a few countries, state-owned enterprises appear to be performing adequality (e.g.: deploying modern technology, offering affordable services, etc.). For example, in some markets in the Asia-Pacific region state-owned enterprises are deploying state-of-the-art technology at affordable prices. This is being enabled by large local markets, which increase bargaining power with suppliers; large local manufacturing, which reduces costs of equipment; healthy competition with other state-owned enterprises or private firms, and an appropriate incentive structure for management to drive focus on competitiveness.

Notwithstanding these counterfactual examples, the cases of successful state-owned telecommunication sectors are sparse.[9]

How can government involvement be complementary to the private sector to fill gaps in the market rather than a competitor of the private sector?

Firstly, the public sector needs to create a collaborative and innovation-friendly regulatory environment, where new products and services can be tested with few limitations to help foster innovation.

Secondly, the regulator needs to detach more from the political environment to ensure that decisions are made solely in the interest of development, and that they are not subject to a change of government.

Third, the public sector needs to create profit incentives where none previously existed, such as funding for key technologies, targeted tax breaks, or investment that does not need to touch the private sector.

The public sector is uniquely positioned to give unserved and underserved communities the skills or devices they need to take advantage of being connected, but it needs to create an environment for the private sector to thrive first and then use the private sector as a tool to address government strategic connectivity objectives, only considering public networks as a last resort approach.

[9] See, for example, the ICE in Costa Rica, ANTEL in Uruguay, and Djibouti Telecom.

3 The role of government in infrastructure management

Even if the state-owned monopoly structure is gradually disappearing in the ICT sector, this does not mean a total exit of government from ownership and management of telecommunication infrastructure and there are many countries where government retains a partial ownership in the fixed operator.

Some government owned wholesale networks have addressed connectivity in rural and isolated areas where the private sector might not be interested in investment, but not all results have not met original targets:

- In Mexico, the government created a thirty-year concession for the development of a backbone network aimed at increasing fibre-optic coverage by leveraging the electricity network. The project was cancelled in 2019, and the responsibility of deployment was transferred to a subsidiary of the government electricity provider. Furthermore, the private company assigned to develop and operate the wholesale 700 MHz shared network (Red Compartida) has filed for bankruptcy.
- In Peru, Red Azteca, a backbone network of 13 200 kms operated through a government concession to a private operator, remained at 3.2 per cent utilization of capacity, after four years of operation and USD 265 million investment of government funds. Partly because of high wholesale pricing, private operators have mostly chosen to develop their own infrastructure. The process of restructuring started when the private operator suggested exiting the joint venture in 2020. The government has decided to cancel the concession contract and assume temporary responsibility of operations.
- In Rwanda, KTRN has reached 23.94 per cent Internet adoption (the sub-Sahara average), fixed broadband is practically nil (0.46% of households), and mobile broadband has reached only 34.74 per cent of users. Part of this lag can be explained by Rwanda's level of economic development. However, when comparing mobile broadband penetration against 4G coverage, Rwanda's lag is most noticeable.

Additionally, in some countries around the world, governments have deployed national backbone networks through investment in technology agencies or government owned infrastructure companies, for example in Senegal and in many countries in the Arab States region. The experience in these cases is mixed.

The following section reflects on whether governments should remain infrastructure owners and/or managers, the conditions that lead to successful state participation, the options available for government efforts that fail, and the role multilateral institutions, such as ITU and/or development banks, could play in support of the public sector.

3.1 Public sector promotion of advanced digital technologies

In general terms, commercial network operators do not perceive a financial value in deploying networks into rural and isolated regions. However, this does not mean that investment in many of those locations is not profitable. Deploying networks to less populated and less profitable areas may mean that operator aggregate profits will deteriorate, and some locations are clearly not attractive from a commercial business case standpoint. This is where the role of government is fully justified, and participation of state-owned infrastructure can be achieved in various ways.[10]

A very positive example is the *Plan de très haut débit* in France. At the beginning of the decade, France was one of the countries with the lowest fibre-to-the-home (FTTH) penetration rates in Europe. Initially the planned budget was 30 billion euros, with the objective to structure public-private partnerships whenever possible. In the initial stage, the first programme concessions required significant public financing, and the main operators chose not to participate. However, competition played a positive role in terms of the provision of financing. Commercial banks were quite attracted to this opportunity particularly considering that there was market liquidity, and the telecommunication industry was attractive to long term investors, which resulted in extremely low government financing, ranging between 10 to 15 per cent. This was quite surprising given that the government was expecting to invest at least 30 per cent.

The lesson learned is that government can address perceived market failure by investing directly in the sector as well as by stimulating the market through initiatives that expose operators to the forces of competition. Recent FTTH deployment statistics for France are very good: the country exhibits the fastest development of FTTH in Europe. This kind of concession model can work very well, provided that an enabling policy and regulatory environment is in place, and that the protection of the assets of the investments is secure.

3.2 Underutilized government-owned networks

Underutilized government-owned backbone networks exist today in many countries. A recent analysis of fibre-optic networks in the Africa region, conducted by the International Finance Corporation (IFC), concluded that the continent has over one million kilometres of optical fibre on the ground, and about 40 per cent of all that is either directly owned by government as part of a state-owned telecommunication service provider, or owned by a utility provider.[11] Beyond this share, 45 per cent of optical fibre is owned by privately held mobile network operators, while the remainder is owned by independent fibre-optic companies and Internet service providers (ISPs) that have the right to their own infrastructure. In sum, government is a very important owner of the telecommunication infrastructure in the Africa region.

Unfortunately, the study[12] detected systematic underutilization, compounded by very high wholesale prices, and as expected, this is reflected in high prices to the end-user.

A lot of approaches have been tried help address this situation, from full privatization of assets to public-private partnerships, and concessions. Some have worked better than others. For

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10 See European Investment Bank (2021). *Rural connectivity toolkit: Improving digital coverage with innovative financing* (May).

11 See International Finance Corporation (IFC) (2021). One Million Kilometers of Fibre Optic Cables for Development https://ifc-org.medium.com/one-million-kilometers-of-fiber-optic-cables-for-development-6e80f0f5dab9.

12 IFC One Million Kilometers of Fibre Optic Cables for Development (March 2021) https://ifc-org.medium.com/one-million-kilometers-of-fiber-optic-cables-for-development-6e80f0f5dab9.

example, the concession to a private operator of state-owned optical fibre in Gabon has worked well, and it has succeeded in Bhutan, Nepal and Pakistan. In other cases, partnerships between government and a private operator still resulted in underutilization of the network, such as in Peru and Rwanda.

The private sector is interested in investing in wholesale networks. For example, new privately held submarine cables have been deployed in many regions, and countries that had little choice for international connectivity ten years ago, will now benefit from plenty of competition. Some operators such as Liquid Telecom, Global Connect, and C Square in Africa could become regional wholesale broadband players, but in many cases, such operator ambitions face the challenge of obtaining a licence or an authorization to enter a country despite the interest in making the necessary investment.

Governments should recognize that when it comes to wholesale networks and international gateways, private investment is the most convenient option. If an operator is willing to invest in infrastructure, there seems little reason to deny a licence or impose excessively onerous conditions and administrative burdens.[13] Industry liberalization should not be curtailed. For example, in some countries in the Asia-Pacific region, international gateways are not open to competition because of security concerns. In fact, an analysis of the international gateway market conducted by the IFC indicated that the countries that are reluctant to open certain segments of the telecommunication market in 2021 are by and large the same countries that were not willing to open in 2005. Similarly, 90 per cent of the countries listed as not have open data and international gateways in 2021 are on the 2005 list. This calls for an in-depth examination of some available options:

- The telecommunication sector should not have to face excessive taxation resulting from very high taxes on revenues, such as on equipment import duties. Excessive taxation is crippling the competitiveness of the telecommunication industry in many emerging regions.
- Countries should aim to develop a fit-for-purpose, flexible and future-proof regulatory framework and capacity of the regulatory authority: regulatory credibility is a pre-condition for private capital to flow in a country.
- If government non-telecommunication entities such as power, gas and railway bolster their investments in infrastructure, they should do it under a clearly defined "open access" policy.
- If other infrastructure exists owned by multiple parties/agencies, a cross-sector sharing policy should unify all the fibre-optic assets to create a fail-proof nationwide transmission network.
- Funding should not be targeted to government-owned telecommunication ventures but shifted as a priority to the private sector.
- The public private partnership model should be deprioritized. While remaining a viable option, there are other privatization solutions, such as simple asset sale, bringing an operator in to acquire the assets for the long run under a licence that are better approaches than a public-private partnership. A public-private partnership requires a long time to be built and administer, it needs a very good regulatory framework and incentives aligned between partners. In fact, some cases exist where following the failure of a public-private partnership, the country nationalized the asset.[14]

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13 See Khan, Abu Saeed (2020). *Policy responses to COVID-19: repurposing National Highways for Good: Intelligent Transport Systems merging road and data traffic*. Asia-Pacific Information Superhighways Working Paper Series. United Nations ESCAP.

14 Such is the case of TTCL in Tanzania, BBS in Burundi, which started as a public-private partnership but was later nationalized.

3.3 Government promotion of infrastructure sharing

"There is simply no 5G without fibre".

Roundtable expert comment

The promotion of infrastructure sharing is an area where government should still play a role. This approach is one among several measures taken in OECD countries to foster the deployment of the next evolution of networks. This includes efficient spectrum management, easing of network rollout and facilitating access to backbone facilities.

As mobile networks become the core of further extension of fixed networks, these key regulatory issues become fundamental to deploy and operate networks. Infrastructure sharing has been promoted as a potential approach to tackle obstacles of 5G network deployment. The 5G network specification require cell sites to be closer to users and consequently a lot of investment. In sum, a fixed network to support wireless delivery is very important.

What should the role of government be, if any, to promote infrastructure sharing? Infrastructure sharing agreements between operators can be of two forms: passive infrastructure sharing (e.g.: mass towers and sites) or active mobile infrastructure sharing (e.g.: the radio access network (RAN) part of the network and other software elements).

In OECD countries, operators are engaging in both types of infrastructure sharing agreements for 5G deployment. The European electronics communication code highlights the benefits of infrastructure sharing, and although it endorses mainly passive sharing, it also on occasion highlights the benefits of active sharing for the efficient use of radio spectrum in compliance with coverage obligations.[15] These agreements should be encouraged, provided that the benefits do not outweigh the potential concerns of anticompetitive behaviour. As expected, the main benefits of infrastructure sharing include the reduction of capital and operating expenditures and increased geographical coverage. In some cases, these agreements are allowed for certain geographical areas, especially for the active part of the network.

Regulators have had some concerns that infrastructure sharing might lead to less incentive to invest in those operator networks that allow end-to-end infrastructure competition. Another regulatory concern is that infrastructure sharing may potentially increase the amount of information shared between competitors in the same market, which could lead to collusion, although the benefits may outweigh the concerns.

Despite such concerns, infrastructure sharing is becoming widely accepted across OECD countries, particularly to promote deployment of 5G.[16] For example, some operators in Denmark are conducting bids for joint deployment of 5G networks, and in the Republic of Korea, three major ISPs expect to save approximately USD 533 million over the next decade with a 5G infrastructure sharing agreement that also allows shared access of their respective 5G networks

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15 See Official Journal of the European Union. *DIRECTIVE (EU) 2018/1972 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 establishing the European Electronic Communications Code.* Retrieved at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L1972.

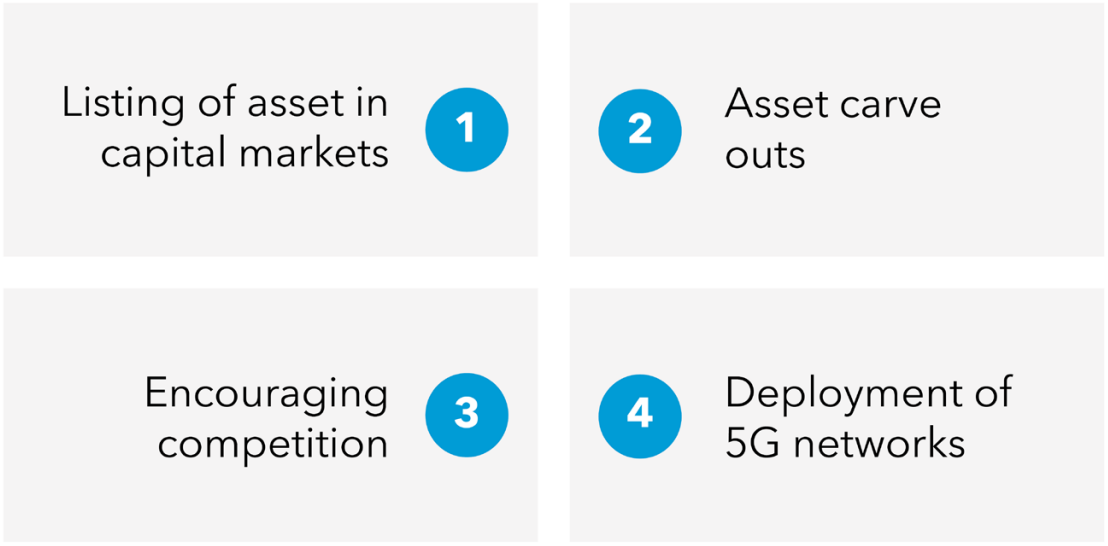
16 See Sharma, R. and Sullivan, J. (2020). *5G and the inevitable industry restructuring*. JP Morgan Asia Pacific Equity Research (July).

in rural locations. Radio access network agreements have also been signed in Denmark, France, and Sweden.

3.4 Privatization, liberalization, and development banks

If privatization and liberalization are the right path to maximizing ICT performance and welfare effects, what should the role of development banks and multilateral institutions be to facilitate the full transition to such a state?

Figure 1: Four different financing approaches to achieve privatization



Privatization options include a sale to a strategic partner, to a third-party investor or to employees or members of the public.[17] As described in Figure 1, different financing structures exist to achieve privatization: one approach is to list the asset in capital markets; a second approach is based on asset carve outs, financed by investment trusts or a public-private-partnership; another involves privatization by encouraging competition; and the deployment of 5G networks adding a new privatization approach.

- Privatization by listing is common practice, applied to a range of monopolies from telecommunication service providers. Saudi Telecom (STC) in Saudi Arabia, and Telekom Malaysia are examples of listings in capital markets that continue state control of strategic assets, and maintain control over pricing to fulfil affordability objectives, while also raising external capital. In many markets, the state-owned operators have a lead on coverage and availability over private operators, which may have entered the market later. Under this model, development finance institutions can invest in specific projects or equity stakes to fulfil previous obligations.
- Successful carve-outs can be seen with the creation of a utility providing open access to fibre-optic broadband, such as the national broadband network in Australia or Singapore. Financing of these projects, which provide universal access, can be carried out through bonds underwritten by the state or infrastructure investment, which can be aligned to project objectives.

[17] An alternative (or complement) to privatization is outsourcing of functions, and this may be an alternative where some parts of the operator are unsaleable. Another possibility is to allow the incumbent to enter bankruptcy and to exit the market that way, as happened with NITEL in Nigeria, although this is only a last resort.

- Combining the privatization of the state monopoly with market liberalization. One of the roles development finance companies can play in this case is to partner with shared infrastructure companies around towers, optical fibre, and proactive infrastructure to drive efficient utilization of funds.
- Lastly, under the fourth option where operators are exploring active infrastructure sharing for 5G, development finance institutions can drive more scale for infrastructure projects across countries to make radio access networks more successful.

4 Conclusions

The 8th Economic Experts Roundtable explored the reasons why the public sector continues to play an active role in the ownership of assets of the telecommunication industry. The ongoing role of governments can be attributed to the legal complexity, to the implicit institutional inertia of privatization processes, and the reluctance to relinquish control of an important source of income and employment.

While the experts backed the conclusions of the significant volume of research in support of privatization and liberalization, they also recognized that for these policies to be successful, they need to be accompanied by the establishment of an independent regulator staffed with technically capable professionals. Furthermore, they also acknowledge that in some very specific cases, state-owned operators continue to be successful infrastructure contributors.

In light of these conclusions, the experts outlined some practices that governments should follow going forward in terms of outlining their future role in the industry. Governments should create conditions that increase the ability of the private sector to continue investing in deploying networks especially in rural areas. If wholesale telecommunication infrastructure is in government hands, they should abide by clearly defined open access principles. That being said, privatization of wholesale infrastructure should continue to be explored in the context of a regulatory framework that stimulates capital to flow in the country. Finally, looking at the deployment of 5G networks, infrastructure sharing continues to be the most appropriate way to facilitate investment by the private sector.

References

Boyle G., Howell B., & Zhang W. (2008). Catching Up in Broadband Regressions: Does Local Loop Unbundling Really Lead to Material Increases in OECD Broadband Uptake? NZ Institute for the Study of Competition and Regulation

Cava-Ferreruela I., & Alabau-Munoz A. (2006). Broadband policy assessment: A cross-national empirical analysis. Telecommunications Policy 30, 445-463

Distaso, W., Lupi, P., & Manenti, F. (2006). Platform competition and broadband uptake: Theory and empirical evidence from the European Union. Information Economics and Policy 18, p87–106

European Investment Bank (2021). Rural connectivity toolkit: Improving digital coverage with innovative financing (May)

European Union (2018). DIRECTIVE (EU) 2018/1972 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 establishing the European Electronic Communications Code. Retrieved at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L1972

Grzybowski L. (2005). Regulation of mobile Telephony across the European Union: An Empirical Analysis, Journal of Regulatory Economics; 28:1 47-67

International Finance Corporation (IFC) (2021). One Million Kilometers of Fibre Optic Cables for Development https://ifc-org.medium.com/one-million-kilometers-of-fiber-optic-cables-for-development-6e80f0f5dab9

International telecommunication Union (ITU) (2021). Economic Impact of Broadband, Digitization and ICT Regulation Portal. Geneva

International Telecommunication Union (ITU) (2021). The economic impact of broadband and digitization through the COVID-19 pandemic: Econometric modelling. Geneva

International telecommunication Union (ITU) (2021). The impact of policies, regulation, and institutions on ICT sector performance. Geneva

International telecommunication Union (ITU) (2020). Report for the 6th Economic Experts Roundtable on COVID-19 and the Digital Economy (Online, 26 June 2020). Geneva

International telecommunication Union (ITU) (2021). Report for the 7th Economic Experts Roundtable on the telecommunications industry in the post-COVID 19 world (Online, 04 February 2021). Geneva

International telecommunication Union (ITU) ICT Regulatory Tracker

International telecommunication Union (ITU) Global Network Resiliency Platform (#REG4COVID)

Katz, R.; Flores-Roux, E. & Callorda, F. (2012). Assessment of the economic impact of taxation on communications investment in the United States. A report to the Broadband Tax Institute. Telecom Advisory Services

Katz, R. & Callorda, F. (2019). Assessment of the economic impact of taxation on communications investment in the United States. A report to the Broadband Tax Institute. Telecom Advisory Services

Khan, Abu Saeed (2020). Policy responses to COVID-19: repurposing National Highways for Good: Intelligent Transport Systems merging road and data traffic. Asia-Pacific Information Superhighways Working Paper Series. United Nations ESCAP

Li, W., & Xu, L. C. (2004). The impact of privatization and competition in the telecommunications sector around the world. The Journal of Law and Economics, 47(2), 395-430

Ros, A. J. (1999). Does ownership or competition matter? The effects of telecommunications reform on network expansion and efficiency. Journal of regulatory economics, 15(1), 65-92

Sharma, R. and Sullivan, J. (2020). 5G and the inevitable industry restructuring. JP Morgan Asia Pacific Equity Research (July)

Wallsten S. (2001). An Econometric Analysis of Telecom Competition Privatization Competition Privatization and Regulation in Africa and Latin America" The Journal of Industrial Economics, XLIX, (March)

Annex: ITU Economic Experts Roundtable - Survey

As anticipated in the concept note, the purpose of the upcoming Roundtable is to take stock further on the role of public policy, regulation, and public sector participation in the post-COVID-19 digital world. (a) What are the implications of the growing importance of the digital economy for regulatory models, frameworks, and institutions? and (b) Should governments continue to play a role in the ownership and management of ICT infrastructure, or should privatization and spin-off of public assets be emphasized?

In preparation for the session, we would appreciate it if you could answer a short survey. The compiled responses will help frame the session discussion and preparation of the outcome report. In addition to the survey response, we would appreciate it if you can share with us any relevant piece of research you or your organization has produced on the topic.

Despite the worldwide trend towards privatization and liberalization, in 35 per cent of 189 countries surveyed by the ITU Regulatory Tracker the fixed broadband operator remains under state ownership, out of which 7 per cent operate as a monopoly. Furthermore, in 30 per cent of all countries surveyed, telecommunications international gateways remain a monopoly.

Q1: In your opinion, what do you believe the source/nature of barriers to privatization and liberalization are?

Institutional/policy resistance

Description of the Topic	The slow pace of sector reform toward privatization and liberalization is driven by difficulties in implementing sector changes that entail changes in public sector participation
Trends and/or Issues on the spot	While there is some agreement that the State should proceed in fully privatizing the state-owned carrier and opening the market to full competition, there is concern in some agencies as to the impact on ICT employment and erosion of affordable service
Economic Impact	Government participation in delivery of broadband service results in certain inefficiencies in network deployment and operations with consequent negative impact in ICT adoption
Long term outlook	Widening of social inequality
Preferred quotation: (if you have one)	"Governments that continue supporting state-owned telecommunication operators operating in quasi monopolistic market conditions could have a long-term negative impact on the ability to deliver universal broadband service"

#1: Table to be completed

Description of the topic	•
Trends and/or Issues on the spot	•
Economic Impact	•
Outlook for 2021	•
Preferred quotation: (if you have one)	•

Q2: In some countries, state-owned enterprises appear to be performing appropriately (e.g., deploying modern technology, offering affordable services, etc.). What are the conditions under which such examples exist and thrive?

Q3: In many countries wholesale mobile and backbone networks with full and/or partial government participation have been applied, which other approaches should be recommended to be implemented?

Q4: If it is assumed that governments should limit themselves to formulate policy and regulate the sector, and exit the operation of infrastructure, what are the potential options available for such a change under the current circumstances?

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