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Task Force 05

INCLUSIVE DIGITAL TRANSFORMATION

5G EMERGENCE IN THE GLOBAL SOUTH: CHALLENGES AND POLICIES TO OVERCOME THE DIGITAL INFRASTRUCTURE GAP

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Abstract

Since 2016 G20 has focused on digital connectivity as an economic prosperity driver and the overcoming of multiple social inequalities. Currently, 5G is playing a prominent role in foreign policy, productive and science, technology and innovation (STI) agendas of Global North. Full deployment of 5G will imply improvements in bandwidth, speed and latency enabling the emergence of new Internet of Things business models involving massive data exchange. The shaping and property of network infrastructure, production capabilities, STI linkages, patents, standards and market regulations will directly affect Global South, which is making progress in the matter in spite of geopolitical, domestic and financial constraints. Alternatives for Global South countries to ride this wave are not black or white (subordination or exclusion): mixed strategies can be implemented, involving complementary targets and efforts between public and private stakeholders. The cases of India, Brazil and Argentina indicate that Global South countries hold assets (market size, accumulated capabilities, territorial enclave) to negotiate better terms for technology transfer and financing, nodes in telecommunications value chains, training of human resources, local R&D efforts. The main objective of the recommended policies is to accelerate 5G deployment in Global South promoting a multi-actor/hybrid network strategy tending to reduce regional infrastructure gaps -global and internal- by stimulating domestic capabilities. G20 can play an important role in turning 5G deployment into a window of opportunity for Global South catch-up by pushing certain policy initiatives oriented to STI systemic consolidation, harnessing the involvement of global actors, support domestic actors to reduce connectivity gap and encourage the development of downstream digital technologies, increase South–South and North–South international cooperation efforts.

Keywords: 5G; Global South; Digital Infrastructure Gap, G20

Diagnosis of the Issue

Advances in wireless technology, from 2G standard in the early 1990s (with a speed of 0.064 Mbps) through 4G (up to 200 Mbps), have been accumulative but more than incremental (CRS, 2023). Each new generation provided dramatic improvements not only in transmission speed but also on service and signal quality, congestion management and cell hand-over. The full deployment of 5G will imply improvements in bandwidth, speed,

and latency, enabling the emergence of new Internet of Things business models involving massive quantities of data (CRS, 2023). As a result, products that were once separate are now more easily integrated, abolishing borders among telephones, music players, the Web, TVs, cameras, etc. In fact, 5G development will have several implications in terms of the development of dual-use technologies, smart cities, robotization and automatization, IA, among others.

Deploying 5G networks in Global South countries will require significant infrastructure expenditure and technological efforts: 5G towers, equipment, semiconductors, fiber optics, satellite broadband, and more. In this sense, our proposal is based on the recognition of the slow pace of deployment of 5G networks in the Global South in the context of geopolitical tensions between the US and China (Balbo, 2022; Majerowicz, 2019). In this context, we recognize two main relevant gaps that persist in Global South countries and can be addressed by the G20: an external gap (significant lag in network deployment with respect to the G7+China countries) and an internal connectivity gap in countries with large territories, dense urban agglomerations and limited socio-economic development (Gonzalo et al, 2023; Sharma, 2019).

Based on the Brazilian, Indian and Argentinian cases, we infer that some Global South countries can aspire to a more indigenous and complete development of 5G

infrastructures based on some critical assets such as their huge domestic markets, accumulated capabilities in the telecommunications sector, the presence of both relevant domestic and multinational players, their manpower. At the same time, we identify some main challenges for the full 5G deployment in Global South (Sharma, 2018, 2019; De Sousa et al, 2021; Gonzalo et al, 2023; Borrastero, 2022, 2024):

- Minor position of domestic actors in the value chain of technological production associated with connectivity (mobile and fixed): components and devices, satellite industry, and software, among other critical areas.
- Incomplete deployment of 4G and heterogeneous development of broadband connectivity: large territories without coverage and poor coverage in densely populated areas.
- Oligopolisation and foreignisation of telecommunications sector which hinders the entry of local players along the supply chain (v.g. "last mile" providers).
- Basic infrastructure deficits associated with the viable expansion of internet infrastructure: shortages of shared infrastructure (e.g. shafts, tunnels and buildings with space for laying terrestrial connectivity cables); satellite position and radio spectrum allocation problems.
- Untapped public and private research, development and innovation (R&D&I) capacities, which could be used to develop telecommunications and applications according to local needs (development of energy sources, hardware and devices, new materials, study of consumption patterns and needs, among other areas).
- Relatively weak and incomplete national and regional systems of innovation.

We frame our proposal from a broad innovation system perspective, particularly interested in the regional and technological linkages of the deployment and massification of 5G networks (Cassiolato and Lastres, 2005; Gonzalo, 2022). The policy

recommendations for G-20 aim to promote an acceleration of the 5G adoption process in Global South countries with accumulated technological capabilities, which will boost the economic impacts, enabling the reduction of productive, regional and technological inequalities. In order to achieve this objective, we understand that the development of hybrid networks, with multiple actors, is a feasible and potential option for 5G development in the Global South.

Recommendations

Alternatives for countries in the Global South to ride the 5G wave are not black or white. Mixed strategies can be implemented, which involve complementarity of targets and efforts between public and private stakeholders and the promotion of technological transference. However, strong interventions will be needed, both in terms of public and private expenditures and in terms of institutional efforts. In this context, the G20 can play an important role in turning 5G deployment into a window of opportunity for Global South catch-up by pushing some policy initiatives suggested below around four main areas:

1. **STI systemic consolidation.** Global South national and regional systems of innovation still need to be consolidated both in terms of resources and in terms of institutional building and articulation. Most of the Global South countries, particularly in Latin America and Africa, are investing less than 1% of their GDP in R&D (in Latin America, only Brazil is investing more than 1% in R&D, concentrating more than half of the total Latin American R&D expenditure) (Mazzucato, 2023). G-20 should encourage and promote STI financing oriented to digital telecommunications, infrastructures and

energy supply sources R&D programs. For instance, India is pushing an interesting agenda of creation and strengthening of Centre of Excellence (CoE) in different sectors oriented to specific thematic and challenges. This could be a good initiative, among many others. In addition to R&D financing, institutional building and articulation is needed. G-20 can support initiatives to learn from the international experience in terms of 5G regulation, interoperability, testing, securitization, etc. The main objective here should be to complete the institutional setting in order to absorb, learn, and regulate 5G deployment, promoting the development of "downstream" technologies and the associated human resources (e.g. cybersecurity developers and testers).

2. **Harnessing the necessary involvement of global actors.** Multinational enterprises have a main role in 5G development. Intel, Huawei, Nokia, Eriksson, etc. have already been involved in 4G networks development all around the world and they will also have a main relevance in 5G technologies deployment, in terms of core equipment, semiconductors and devices (See Appendix). G-20 should stimulate initiatives to promote the technological transference from multinational firms to domestic actors oriented to develop better telecommunications supply chains in the Global South. For instance, both Brazil and India are trying to produce semiconductors. This development will necessarily be done through the association between domestic and multinational firms. Strong incentives to consolidate these links are needed. Public procurement mechanisms, R&D grants, entrepreneurial programs, IP sharing contracts and many other initiatives are essential to develop domestic actors and supply chains.

3. **Support domestic actors to reduce connectivity gap and encourage the development of downstream digital technologies.** G-20 could help Global South countries to create domestic capabilities and actors around internet infrastructures development, including 5G, in order to indigenize technical progress and reduce external and internal digital gaps. For example, according to the Fiber Broadband Association, per each square mile occupied by 5G small cells, operators will need to deploy 8 miles of optical fibre as well as strengthen investments in 4G, 3G and 2G where it is still the only available technology. There are many channels and instruments to contribute to the objective of strengthening terrestrial and satellite connectivity infrastructures. Defining an agenda on innovative public procurement, promoting and financing domestic entrepreneurs, startups and small and medium enterprises (SMEs), developing the domestic supply chain, promoting the development of shared infrastructures, using State Owned Enterprises (SOEs) to assure the regional development of 5G by reaching regions that are not of interest of private sector. Some of these initiatives are already underway. For instance, BSNL, the Indian state-owned company, is mainly oriented to the extension of 4G in rural India, contributing to reduce the digital gap (Gonzalo et al, 2023). In Argentina, there are Universal Service Funds, for public use with private contributions from teleoperators to finance connectivity in remote areas. In addition, the development of software and IT services will be essential to address the mounting of devices and applications, and critical issues such as cybersecurity (which according to the World Economic Forum is considered the 3rd worst risk to humanity, only behind climate change and global warming).

4. **Increase South–South and North–South international cooperation efforts.** Both North–South and South-South technical cooperation efforts and knowledge

networks development are needed in relation to 5G. G-20 can stimulate Global North countries and companies to increase their links and technical cooperation with Global South countries around 5G. Funding to consolidate scientific and technical networks is needed. The promotion of industry and scholars international associations is a must. However, in some cases, Global South countries do not have enough resources to participate and have a voice in this type of networks. For the G-20 countries, it is not such a big effort to contribute to the consolidation of different technical forums on 5G and the digital agenda, oriented both to the challenges of the South and to North-South technology exchange and transfer.

Scenario of Outcomes

The main objective of our policy recommendations is to accelerate 5G deployment in Global South countries promoting a multi-actor / hybrid network strategy, which tends to reduce regional infrastructure gaps by stimulating domestic capabilities. In order to advance in this trajectory, some steps should happen: 1) vendors should enter Global South markets and the big telecommunications companies should choose according to interoperability of their installed systems and associated sunk costs (this is indeed happening nowadays), 2) regional terrestrial and satellite broadband providers (neutral, cooperative, last mile) should be developed, and 3) domestic and multinational actors should develop the software and technical solutions needed to connect remote populated territories, to be able to use more devices uploaded to networks. What are the main problems, contradictions and trade-offs that arise along the way?

First, the scenario of US-China geopolitical tensions and the eventual deepening of the fragmentation of global supply chains includes the possibility of lock-ins (through sanctions and restrictions to foreign and domestic providers, taxe increases, exclusivity clauses, withdrawal of funding, among many other possibilities) due to a lack of access to key technologies which, given the position of the countries of the Global South in technological value chains, would impact even more strongly on them.

Secondly, there are certain restrictions on the economic viability of extending connectivity networks in national territories. In addition to the public and private expenditure required for the installation of 5G networks, some time ago it was the incumbent operators (private or state) who made the major investments in fibre optics and a large part of the financing was provided by the capital market. However, since the pandemic, the capital market has focused on digital technologies financing instead of ICT infrastructure financing. ICT infrastructure is capital intensive and needs continuous upgrading and investment flows over time. Global South countries are currently unable to afford most of these expenditures. G-20 should promote the direction of global investment flows towards the telecommunications sector again, and probably a scenario in which it is necessary to induce and support the financing -at least initially- of the installation of private 5G networks in the industries that demand the most connectivity (within production plants or complexes, e.g. automotive).

Thirdly, there are challenges associated with the institutional weaknesses of Global South countries, such as *a)* constraints linked to geopolitical positioning (moreover, diverse among Global South countries) which often - because of the very technical and market characteristics of 5G - hinders sovereign decision-making on the type of core technologies to adopt; *b)* weaknesses linked to the internal strength of states to deal with interest groups -both multinational and local- around the process of adopting 5G and all

the dimensions of technological development associated with it that have been mentioned; and *c)* low institutional density of the whole chain of the telecommunication sector.

Finally, it should be noted that the risk of deepening inequalities in access to connectivity if 5G development is not massive in an already unequal national territory is latent, even in the scenario of early deployment of this type of network in the countries of the Global South.

This set of problems can be addressed by G-20 by promoting public and private investments, associations and skills building at local and regional levels, as expressed in the diagnosis and recommendations outlined in this policy brief.

References

Balbo, G. *5G: La guerra tecnológica del siglo: Posicionamiento geopolítico, seguridad internacional y negocios en pugna* (Buenos Aires: Almaluz Editorial, 2022).

Borrastero, C. "5G y territorialización de la disputa tecnológica global: EEUU, China, América Latina", in Versino and Elinbaum (Comp.) *Nuevas configuraciones territoriales y paradigmas tecno-económicos en América Latina*, pp. 265-288 (2022), CEUR - Zeta Ediciones.

Borrastero, C. "Estado, empresas y factores geopolíticos en el sendero de desarrollo de las redes 5G en Argentina", *Estudios Sociales del Estado*, 19, (2024) *(forthcoming).*

Cassiolato, J. E., and Lastres, H. M. M. "Sistemas de inovação e desenvolvimento: as implicações de política". *São Paulo em perspectiva*, 19, (2005), 34-45.

Congressional Research Service, "National Security Implications of Fifth Generation (5G) Mobile Technologies", In FOCUS (2023).

De Sousa, A., Ferreira Abrão, R. and Dos Santos, V. "Entre a subserviência e o pragmatismo: o Brasil perante o 5G." Oikos 20 (1) (2021), 71-92.

Gonzalo, M. "Freeman's broadening contribution revisited: reasoned-history and systemic STI policies from South America to the Global South". Innovation and Development, 12 (1), (2022) 43-50.

Gonzalo, M., Harfuch, M., Haro Sly, M. and Lavarello, P. "5G Kick-off in India and Brazil: InterState Competition, National Systems of Innovation, and Catch-Up Implications for the Global South" (February 28, 2023). Seoul Journal of Economics, 36(1).

Majerowicz, E. "A China e a Economia Política Internacional das Tecnologias da Informação e Comunicação". Discussion Paper 001 – 2019, Departamento de Economia, Universidade federal do Rio Grande do Norte (2019).

Mazzucato, M. “Cambio transformacional en América Latina y el Caribe: un enfoque de política orientada por misiones”. CEPAL, 2023.

Sharma M. “India’s Tryst with 5G, Institute for Defense Studies and Analyses”, (March 20, 2019). Delhi, India.

Sharma S. “Problems in implementing 5G in India and solutions for it,” International Journal of Management and Applied Science 4 (No. 5 2018).

Appendix: Supply strategy for telecommunications core technologies by country and operator

Country	Operator	Vendors / Supply strategy
India*	Jio Platforms	Western suppliers
	Vodafone Idea	Multivendor (including China companies)
	Bharti Airtel	Multivendor (including China companies)
	BSNL	ZTE and Huawei
Brasil*	Vivo	Ericsson
	Tim	Ericsson
	Claro	Ericsson and Nokia Siemens
	Oi	Nokia Siemens
	CTB	Huawei
	Sercomtel	Huawei
Argentina**	Personal – Telecom	Huawei and Nokia
	Telefónica	Ericsson
	Claro - América Móvil	Replacement investments under review

* Source: Gonzalo et al. (2023).

** Source: Borrastero (2024, forthcoming).

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