

# DIGITIZATION: A RESILIENCY PLAN FOR DEVELOPING COUNTRIES FACING PANDEMICS

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## THIS STUDY WAS PREPARED TO FIND ANSWERS TO SIX QUESTIONS

- Can digitization mitigate the disruption caused by the COVID-19 pandemic?
- To what degree are digital platforms adopted by consumers distributing health care information, facilitating e-commerce transactions, and educating students under quarantine conditions in the developing world?
- Can digital information flows efficiently support supply chains and production systems in developing countries?
- Can telecommunications networks sufficiently support the massive surge in telecommuting?
- Can developing country governments continue to operate effectively as they digitize administrative and management systems?
- What are the implications of these answers for public and private intervention to address ongoing and future threats?

**IN THIS CONTEXT, THE PURPOSE OF THE STUDY WAS TO EXAMINE THE LEVEL OF DIGITIZATION IN THE DEVELOPING WORLD AS A MITIGATING FACTOR OF THE COVID-19 PANDEMIC**

## OBJETIVES OF THE STUDY

- Empirical analysis of the link between highly-developed digital ecosystems and preparedness to face pandemics
- Explore the role of digitization to increase resilience of households, production and State operations
- Evaluate how are developing countries positioned to face this threat

## METHODOLOGIES

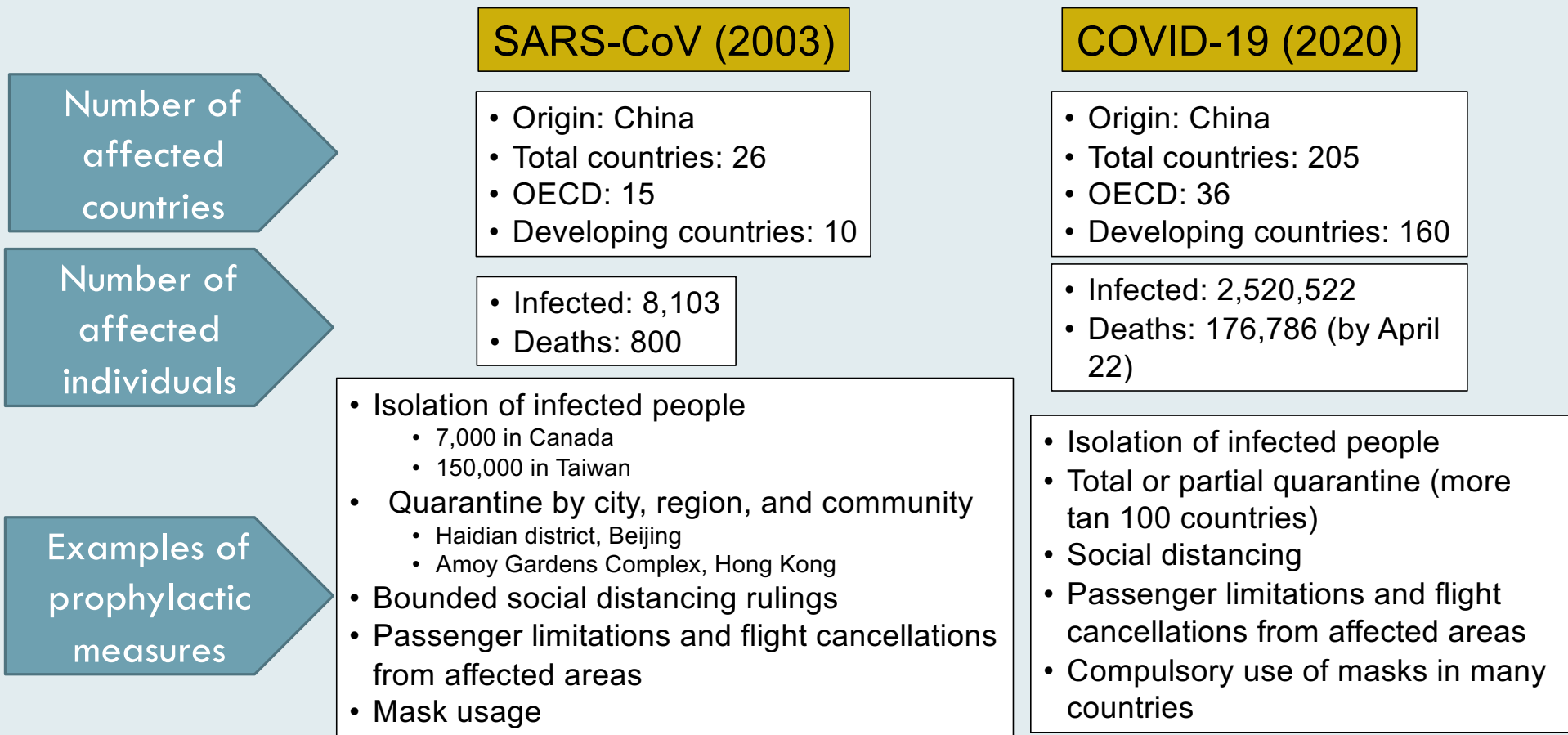
- Econometric analysis of digitization and resilience facing pandemics
- Development of resiliency indices of digital households, production, and the State
- Draw conclusions and policy implications for developing countries to face the COVID-19 and future pandemics

## AGENDA

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- Digitization and socio-economic resilience facing pandemics
  - The state of digitization in developing countries
  - Resilience of digital infrastructure
  - Resilience of digital households
  - Resilience of digital production
  - Resilience of the State
  - Digitization and social resilience
  - Policy implications

**TO UNDERSTAND THE ROLE OF DIGITIZATION AS A MITIGATING FACTOR OF PANDEMICS WE STUDIED THE IMPACT OF SARS-CoV IN 2003, A PANDEMIC WITH ORDERS OF MAGNITUDE LESS IMPACTFUL THAN COVID-19**



Sources: *European Center for Disease Prevention and Control*; Keogh-Brown, M. R., & Smith, R. D. (2008). The economic impact of SARS: how does the reality match the predictions? *Health policy*, 88(1), 110-120.

**OUR OBJECTIVE WAS TO DETERMINE WHETHER ADVANCED DIGITIZATION COUNTRIES WERE BETTER PREPARED TO FACE THE NEGATIVE ECONOMIC IMPACT OF SARS-CoV**

- Economic losses: US\$ 30-100 billion
- Most affected sectors: Health, tourism, Airlines, retail trade, leisure and entertainment



**Hypothesis:** countries with higher fixed broadband adoption could mitigate partially the pandemic negative effects



$$\log(Y_{it}) = \mu_i + \alpha \log(K_{it}) + \beta \log(L_{it}) + \phi \log(BB_{it}) + \gamma SARS_{it} + \zeta BB_{MED} * SARS_{it} + \epsilon_{it}$$



GDP



Capital



Labor



Fixed  
Broadband



Affected  
by SARS



Sample: 178 countries for the period 2000-2017

**COUNTRIES WITH HIGHER FIXED BROADBAND PENETRATION WERE ABLE TO PARTIALLY MITIGATE THE EFFECTS OF THE PANDEMIC**

**Economic Impact of SARS CoV**

	(i)	(ii)	(iii)	(iv)
$\log(K)$	0.387*** [0.055]	0.387*** [0.055]	0.388*** [0.055]	0.365*** [0.058]
$\log(L)$	0.345*** [0.091]	0.347*** [0.091]	0.347*** [0.091]	0.352*** [0.091]
$\log(BB)$	0.027*** [0.005]	0.027*** [0.005]	0.026*** [0.005]	0.040*** [0.011]
<i>SARS</i>		-0.039** [0.016]	-0.086*** [0.031]	-0.099** [0.046]
$BB_{MED} * SARS$			0.065* [0.036]	0.086* [0.052]
Country Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes

Fixed broadband has a positive contribution to GDP

SARS has a negative impact on GDP

Fixed broadband in countries affected by SARS mitigates its negative economic impact

## IN ADDITION TO ECONOMETRIC MODELS, THERE IS PLENTY OF EVIDENCE CONFIRMING THE CONTRIBUTION OF DIGITIZATION TO LESSENING THE IMPACT OF SARS-CoV

Videoconferencing  
contributed to  
enterprise resilience

- Nokia, Sun Microsystems, Intel, HP and IBM cancelled regional conferences and replaced them with videoconference
- InterCall, a Chicago-based teleconference platform increased its Honk Kong subscribers by 200%, and global subscribers by 30%
- Integrated Vision, an Australian-based teleconference systems integrator, reported a 44% increase in sales
- Singapore Telecom registered 20% increase in videoconferencing demand, and 50% in the use of its videoconferencing facilities
- StarHub underwent 50% increase in audioconferencing traffic in March 2003

Use of video and  
audio conferencing in  
financial services

- JP Morgan in Hong Kong used audio and video conferencing to pitch a stock sale of \$28.2 million during the SARS pandemic

Pandemic was a  
trigger for e-  
commerce  
development in China

- Faced by the need to close all (except one) outlets for sales of consumer electronics, JD.com deployed an e-commerce channel, based first on instant messaging and then through Internet
- SARS contributed to the transition of Alibaba from a small B2B e-commerce site to the Chinese (and then worldwide) e-commerce leader

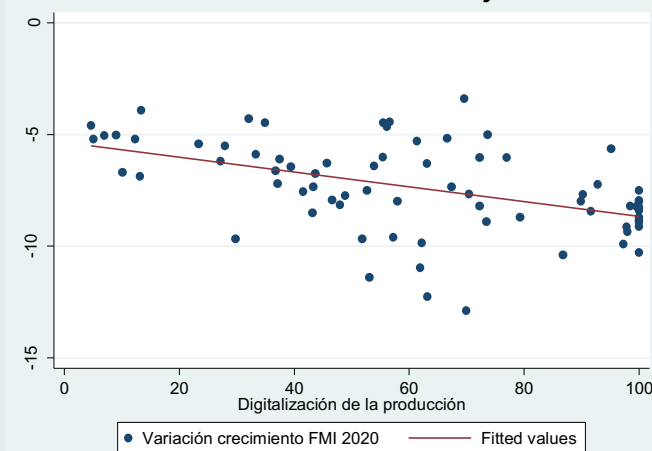


**FINALLY, PRELIMINARY ECONOMIC FORECAST DATA ON THE COVID-19 PANDEMIC EFFECT PROVIDES FURTHER SUPPORT TO THE HYPOTHESIS THAT DIGITIZATION CONTRIBUTES TO MITIGATE THE IMPACT OF PANDEMICS**

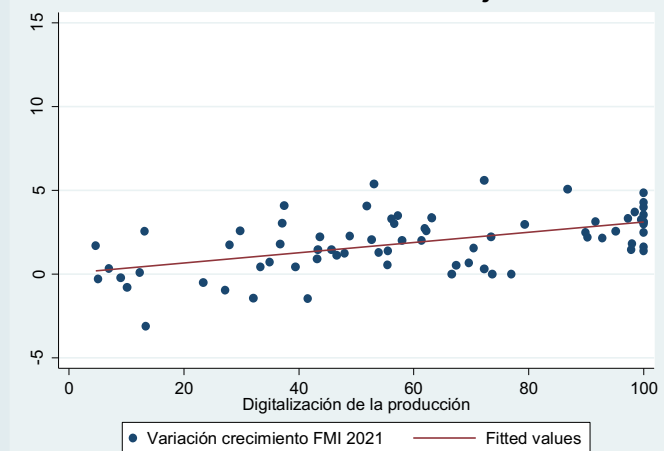
**Hypothesis:** countries with higher digitization of production will have less negative downward effect of COVID-19

**Data:** IMF downward GDP forecast for 2020 and 2021 (192 countries); TAS digitization of production (2018) (75 countries)

Digitization of Production Index vs. 2020 GDP downward adjustment



Digitization of Production Index vs. 2021 GDP downward adjustment

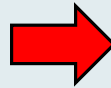


**Evidence:** Countries with higher digitization of production undergo a lower GDP downward adjustment as a result of COVID-19 over the long run

**IF DIGITIZATION CAN ENHANCE SOCIAL AND ECONOMIC RESILIENCE IN THE FACE OF COVID-19, WHAT IS ITS CURRENT LEVEL IN THE DEVELOPING WORLD?**

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**First conclusion:**  
Digitization  
contributes to  
partially mitigate the  
effects of pandemic

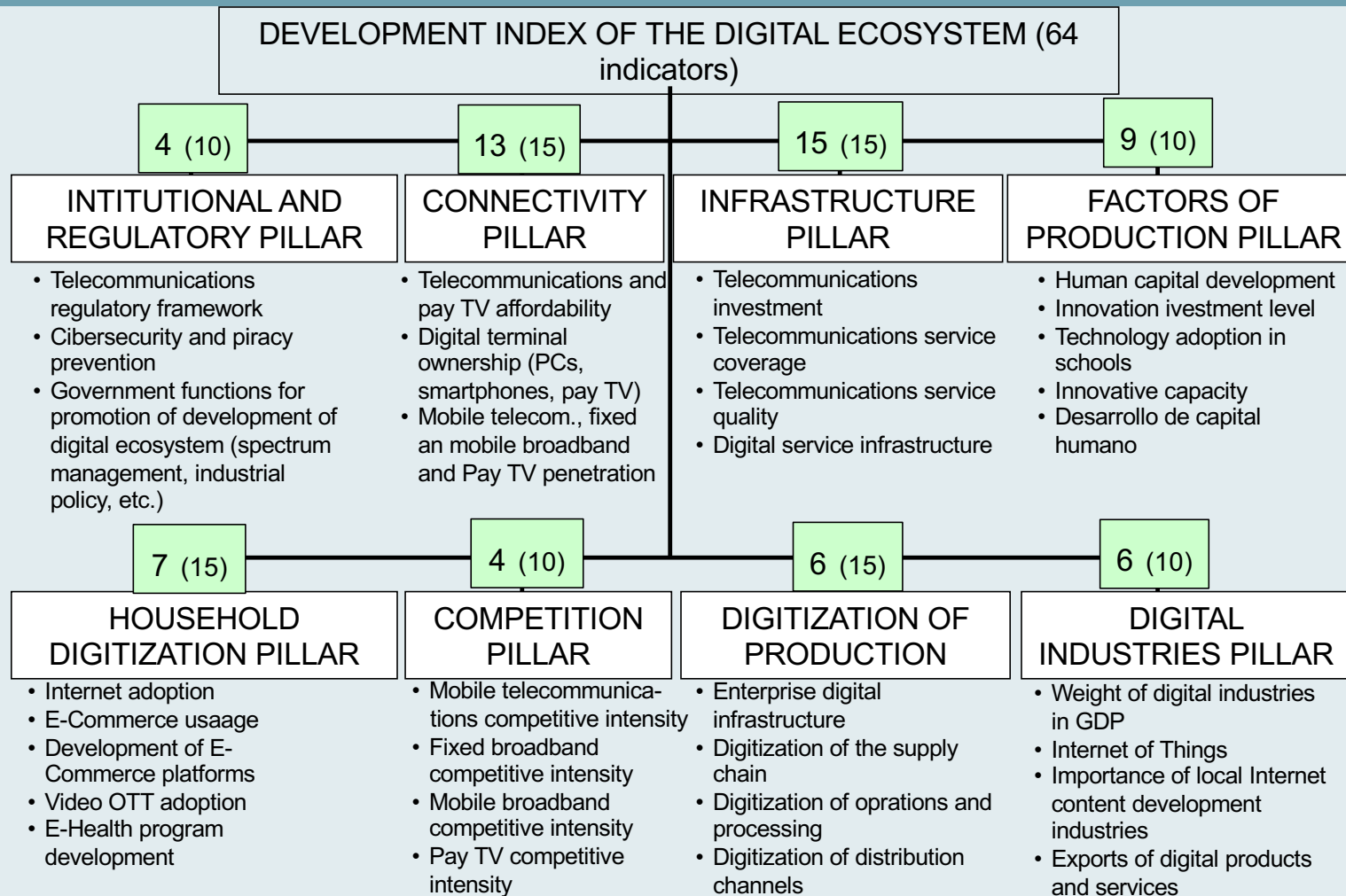


**Second question:** If digitization is a mitigant  
factor of pandemics, developing countries  
with advanced digitization development will  
be better prepared to tackle the implicit social  
and economic disruption

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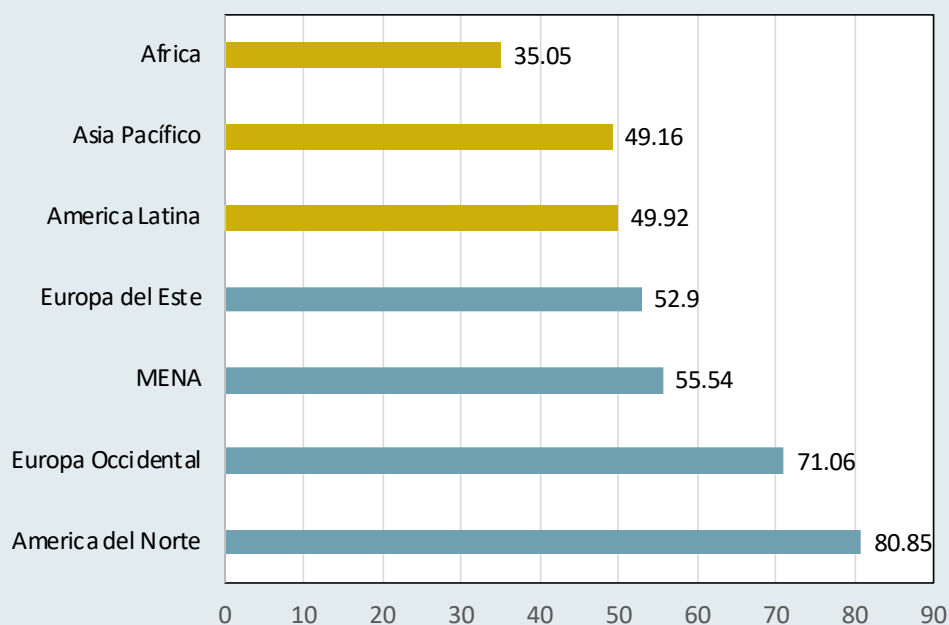
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## WE MEASURE DIGITIZATION BASED ON AN INDEX COMPOSED OF EIGHT PILLARS AND SIXTY-FOUR INDICATORS

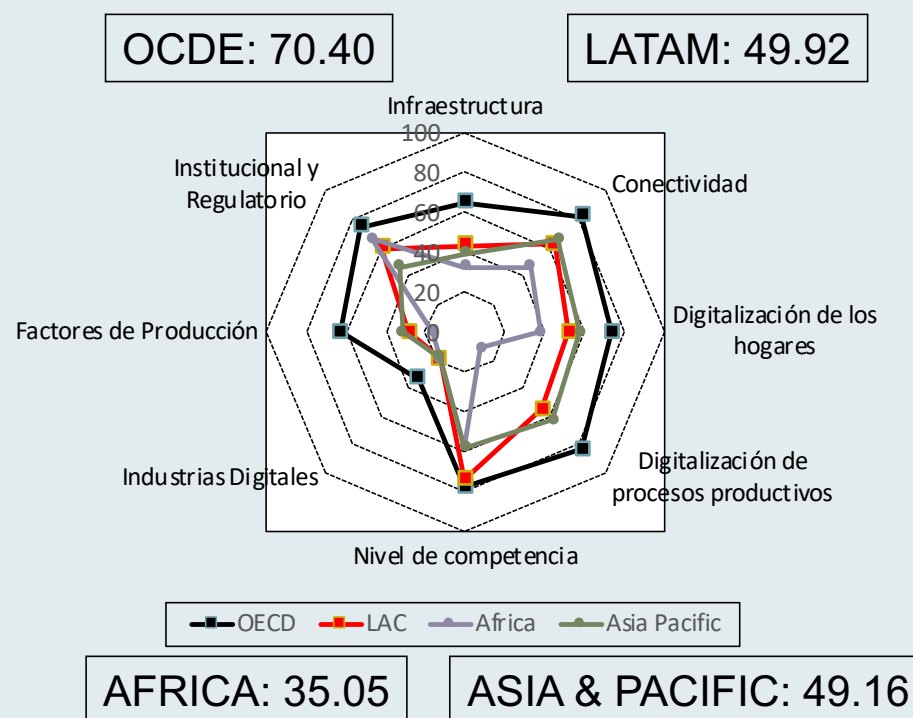


## DEVELOPING COUNTRIES ARE AT AN INTERMEDIATE TO LOW LEVEL OF DIGITIZATION

Digitization Development Index (2018)  
(1-100)



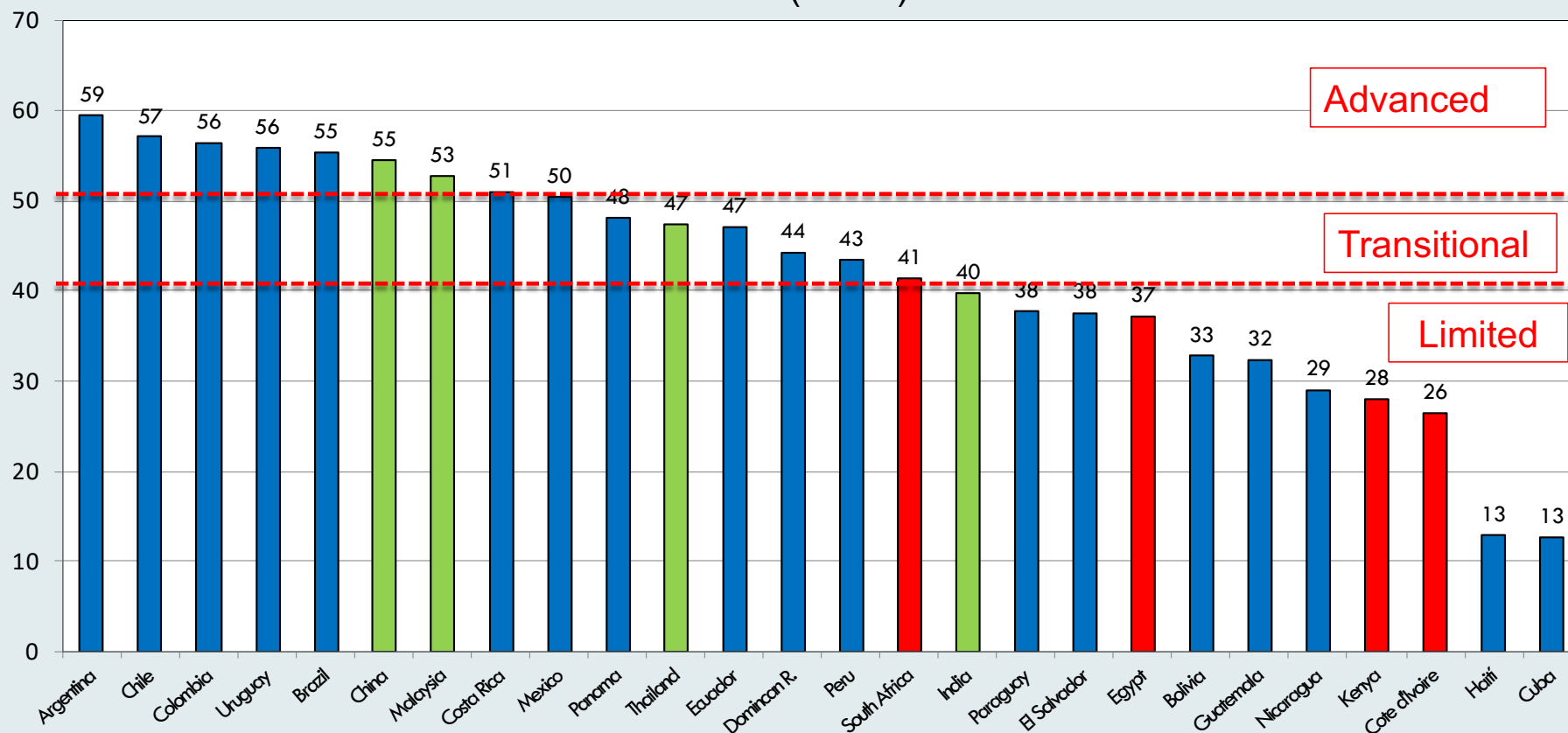
Digitization Development Index (2018)  
Developing Countries vs. OCDE



Sources: Katz, R. and Callorda, F. (2018). "Accelerating the development of Latin American digital ecosystem and implications for broadband policy", *Telecommunications Policy* 42 (2018), pp. 661-681; Katz, R. et al. (2020). *El ecosistema digital y la digitalización de la producción en América Latina y el Caribe: Medición e Impacto Económico. Informe elaborado para CEPAL.*

## REGIONAL INDICES HIDE IMPORTANT DIFFERENCES AMONG COUNTRIES

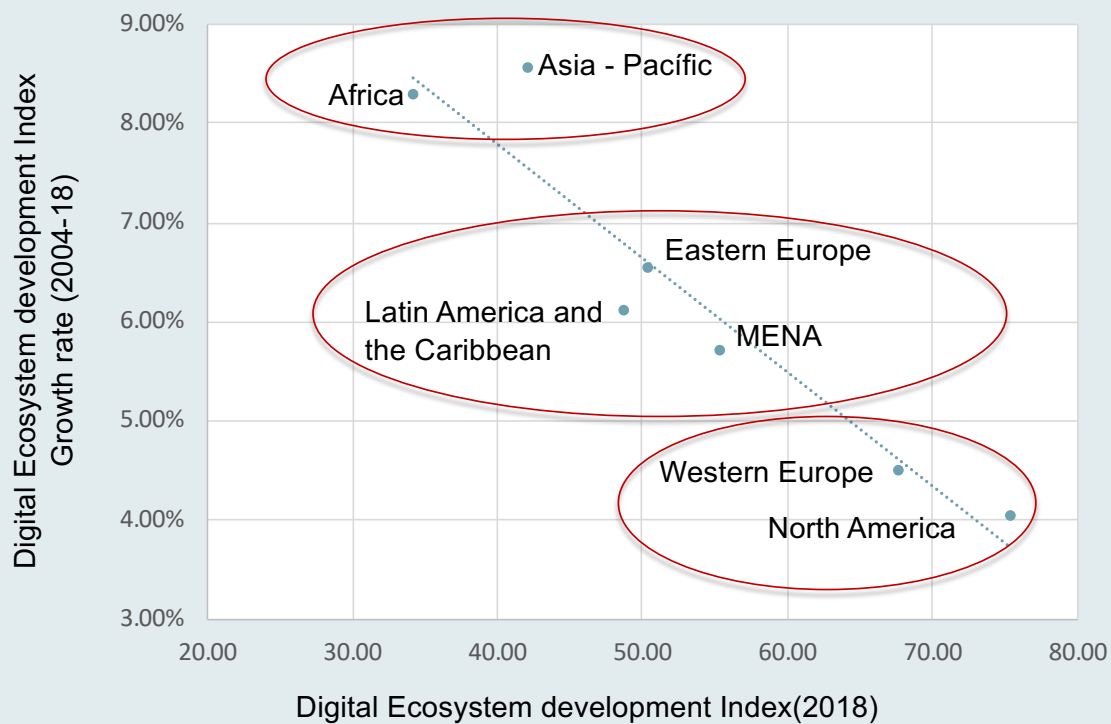
### Developing Countries. Digitization Index (2018) (1-100)



Source: Katz, R. et al. (2020). *El ecosistema digital y la digitalización de la producción en América Latina y el Caribe: Medición e Impacto Económico. Informe elaborado para CEPAL.*

**AS EXPECTED. DIGITIZATION IS GROWING AT A FASTER RATE IN DEVELOPING COUNTRIES THAN IN ADVANCED ECONOMIES**

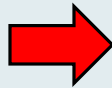
Digitization Index (2018) vs. Growth rate (2004-18)



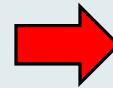
Source: Katz, R. et al. (2020). *El ecosistema digital y la digitalización de la producción en América Latina y el Caribe: Medición e Impacto Económico. Informe elaborado para CEPAL.*

**UNDER THESE CONDITIONS, WHAT WOULD THE CONTRIBUTION OF DIGITIZATION BE TO ENHANCE SOCIAL AND ECONOMIC RESILIENCE IN THE FACE OF COVID-19?**

**First conclusion:**  
Digitization contributes to partially mitigate the effects of pandemic



**Second conclusion:**  
Developing countries exhibit an intermediate to low level of digitization



**Questions:**

- What is the level of resilience of networks to accommodate the increase in traffic?
- Is the digitalization of households sufficient to mitigate the effect of quarantine?
- Can the digitization of production mitigate the disruption in supply chains?
- What is the level preparedness of the State to continue delivering public services?

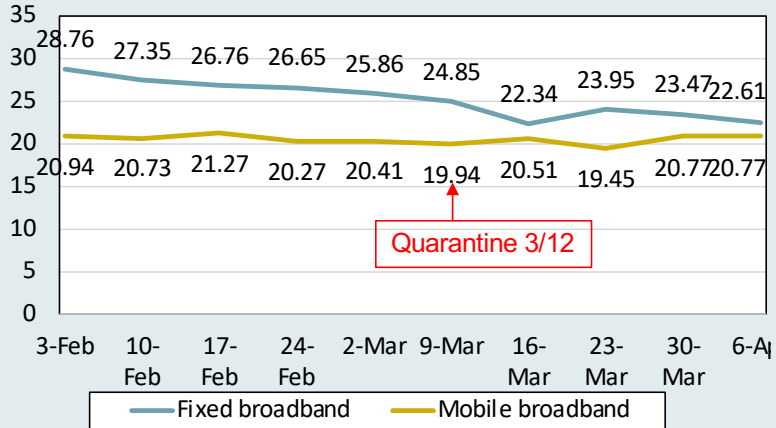


## AGENDA

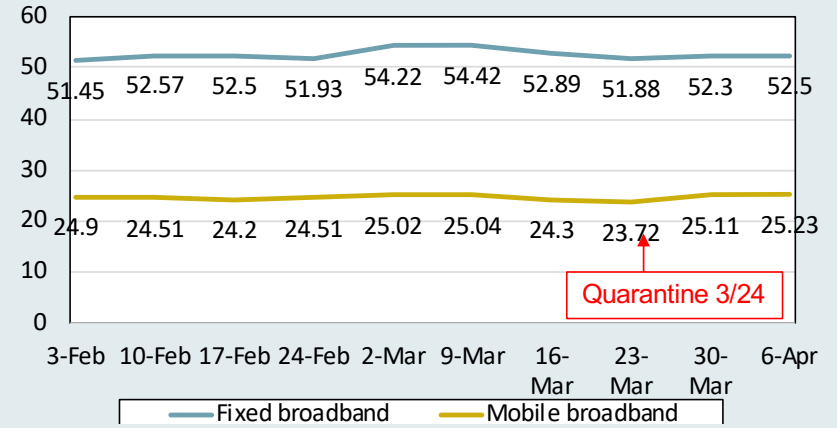
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**SOCIAL ISOLATION AND QUARENTINE HAS RESULTED IN AN INCREASE IN TRAFFIC, WITH A REDUCTION OF DOWNLOAD SPEEDS (AS MEASURED IN MBPS) (I)**

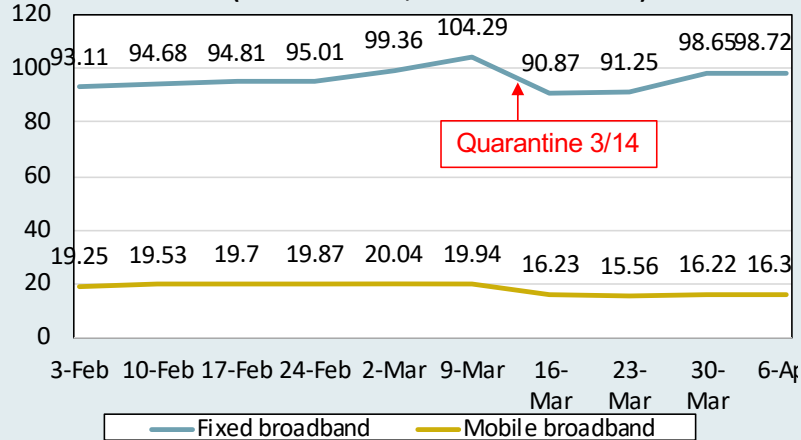
**Ecuador (Fixed: -13%, Mobile: +2%)**



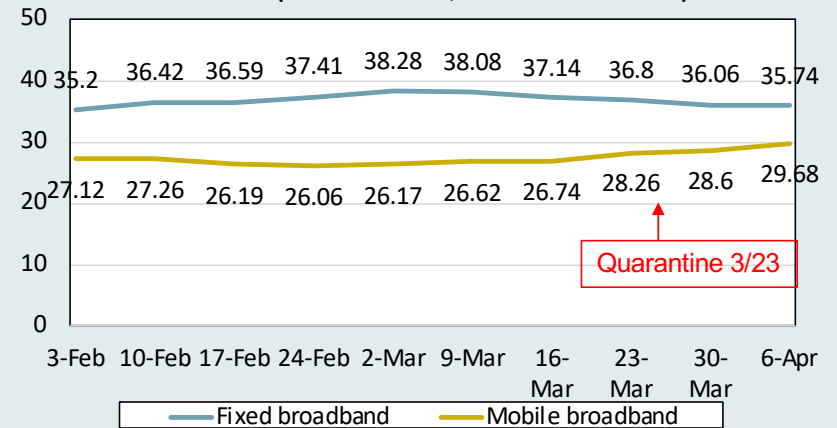
**Brazil (Fixed: -3%, Mobile +1%)**



**Chile (Fixed: -1%, Mobile: -19%)**



**México (Fixed: -7%, Mobile +13%)**

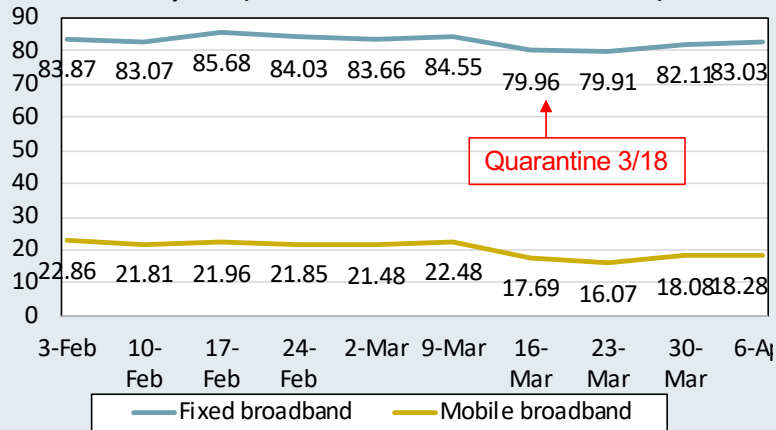


Note: The percentages indicate the change in average speed in the last month

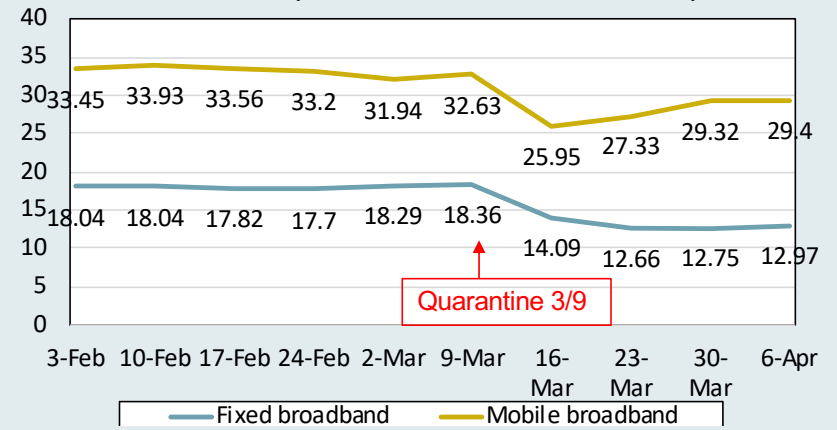
Source: Ookla/Speedtest

## SOCIAL ISOLATION AND QUARENTINE HAS RESULTED IN AN INCREASE IN TRAFFIC, WITH A REDUCTION OF DOWNLOAD SPEEDS (AS MEASURED IN MBPS) (II)

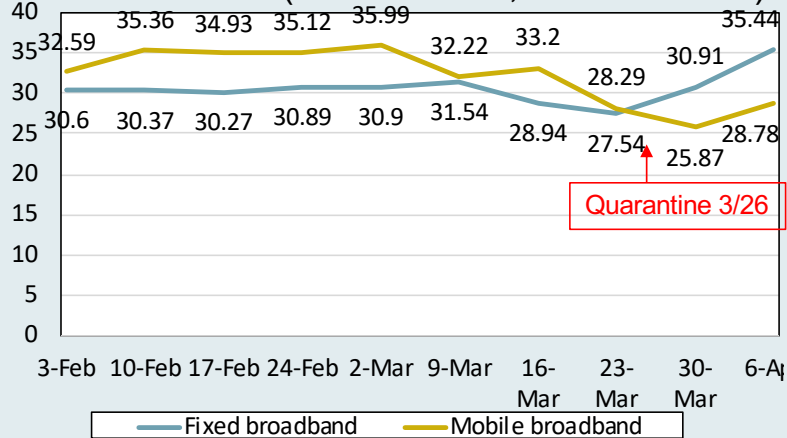
Malaysia (Fixed: +1%, Mobile: -15%)



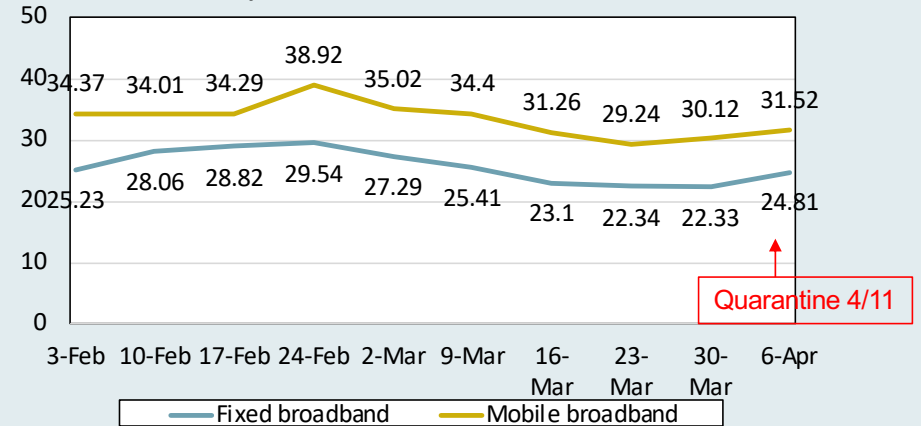
Morocco (Fixed: -29%, Mobile -8%)



South Africa (Fixed: +15%, Mobile: -20%)



Turkey (Fixed: -9%, Mobile -10%)

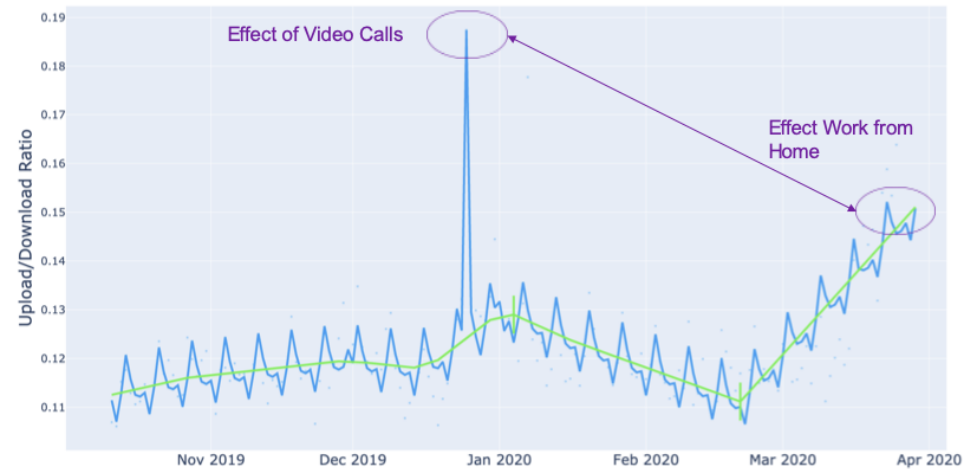
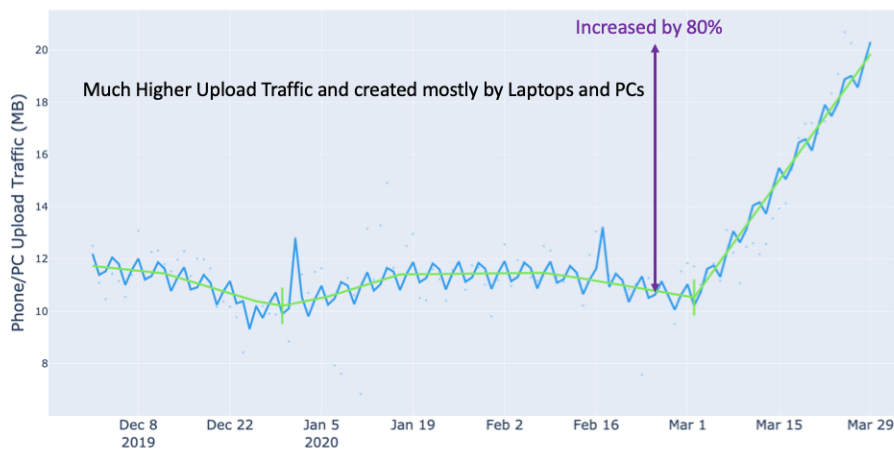


Note: The percentages indicate the change in average speed in the last month

Source: Ookla/Speedtest

**IN ADDITION, THE INCREASE IN THE NUMBER OF DEVICES CONNECTED IN THE HOUSEHOLD HAS CREATED A CONGESTION WITHIN THE WI-FI ROUTERS OPERATING IN UNLICENSED SPECTRUM**

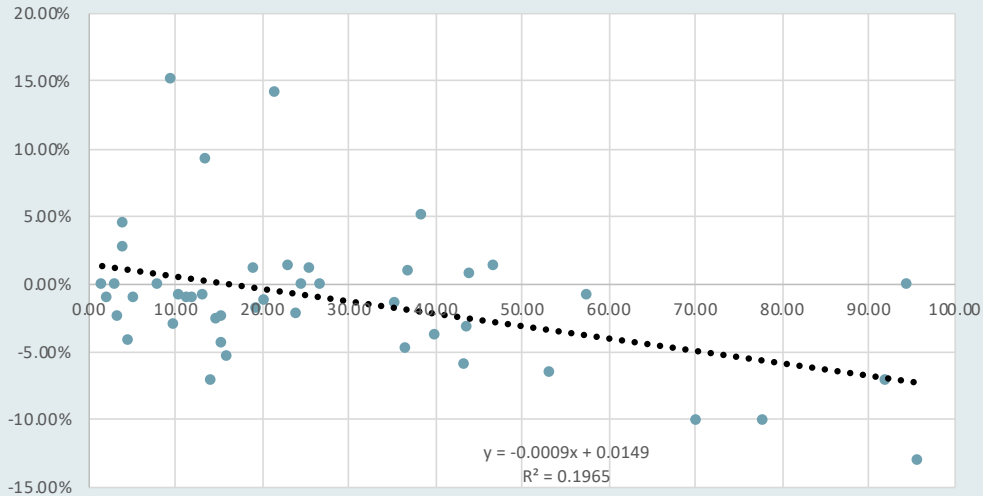
**Global: Increase in Wi-Fi Traffic (December 2019-April 2020)**



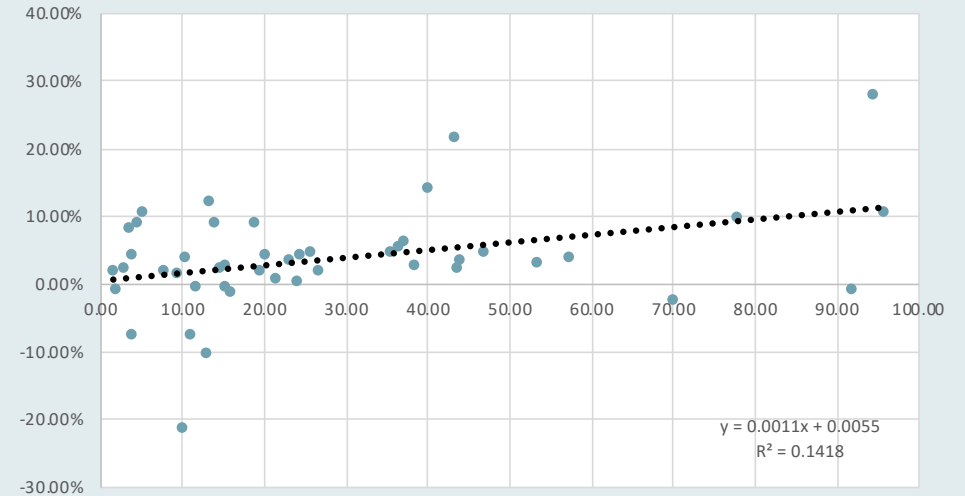
Source: Assia (2020)

**THE COUNTRIES THAT HAVE A HIGHER LEVEL OF ULTRABROADBAND INFRASTRUCTURE (FTTH, DOCSIS 3.0) DEPLOYED APPEAR TO BE HANDLING BETTER THE INCREASE IN TRAFFIC**

**Impact of COVID-19 Induced Traffic Increase on Latency and Speed**



Horizontal axis: Ultrabroadband subscribers/households (2018)  
Vertical axis: Change between average latency Nov 2019-Jan 2020 and March 2020



Horizontal axis: Ultrabroadband subscribers/households (2018)  
Vertical axis: Change between average speed Nov 2019-Jan 2020 and March 2020

The higher ultrabroadband penetration the less increase in latency from the level before the pandemic

The higher ultrabroadband penetration the less decline in download speed from the level before the pandemic

Sources: Ookla/Speedtest; IDATE; Telecom Advisory Services analysis

## THE DIGITAL INFRASTRUCTURE OF DEVELOPING COUNTRIES HAS TO UNDERGO SOME INFRASTRUCTURE AND SPECTRUM CHANGES TO HANDLE THE INCREASE IN TRAFFIC

The backbone and distribution networks have the capacity to adapt to increase in traffic

- There is enough backbone unlit fiber and the possibility of upgrading electronics equipment to accommodate the growth in traffic
- However, over time countries should accelerate deployment in distribution

Temporary assignment of spectrum coupled with a relaxation of base station deployment permits are necessary steps to handle peaks

- Mobile operators have experience in deploying base stations to respond to peaks in traffic
- However, It is important to relax the municipal permit regime to allow operators to respond to surges in a timely manner
- Temporary spectrum assignment help address traffic congestion

It is important to consider the assignment of additional unlicensed spectrum to handle Wi-Fi congestion

- The increase in household traffic creates congestion at the Wi-Fi router which requires an increase in unlicensed spectrum assignment

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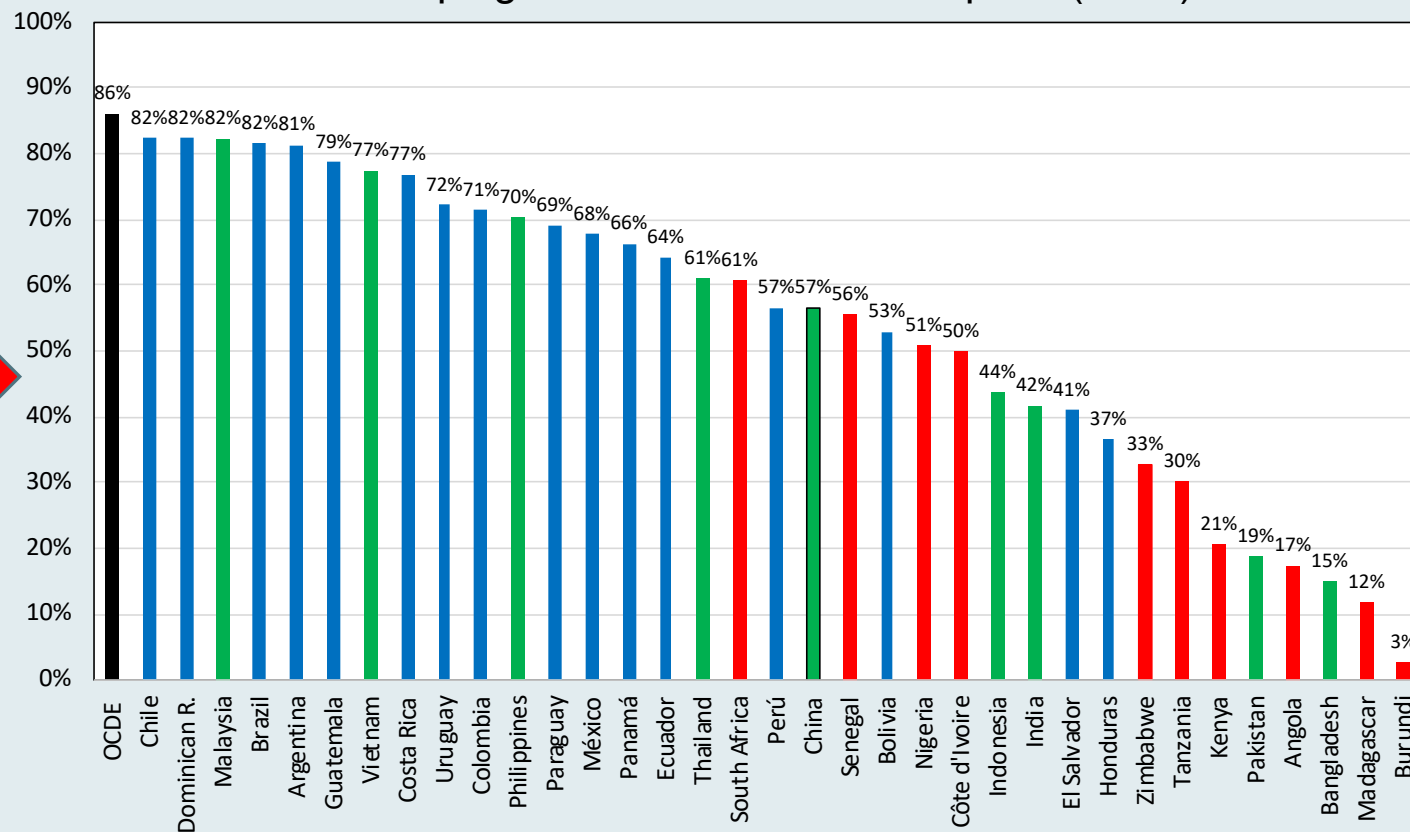
## THE INTERNET IS ONE OF THE FUNDAMENTAL LEVERS TO FACE THE PANDEMIC IN DEVELOPING COUNTRY HOUSEHOLDS

### Internet use under pandemic conditions

- Massive shift to telecommuting
- Distance learning to face schools closings
- Isolation mitigant to face quarantine
- Possibility of acquiring goods via e-commerce
- Access to health care information



Developing Countries: Internet Adoption (2019)



Note: The latest data provided by the ITU are from 2017 or 2018 depending on the country. The data from 2019 have been extrapolated based on last year's growth rate with information from the ITU.

Source: International Telecommunications Union; Telecom Advisory Services analysis



## HOWEVER, HIGH INTERNET ADOPTION IN THE DEVELOPING WORLD DOES NOT INDICATE A HIGH LEVEL OF HOUSEHOLD RESILIENCE

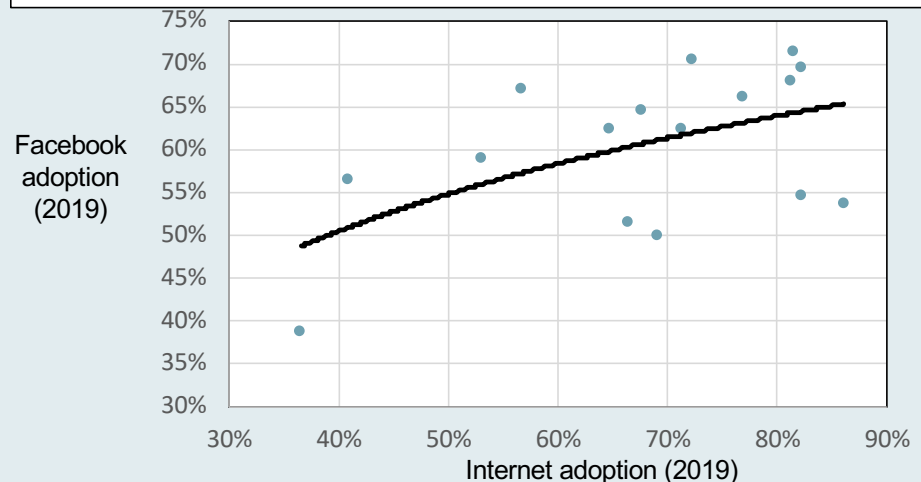
The digital divide indicates that a portion of the population cannot benefit from the Internet to mitigate the effects of the pandemic

In those countries that have adopted the Internet, limited penetration of devices (e.g. PCs) represent a usage barrier

Internet use in the developing world is primarily linked to social network Access and communications

- In some countries, Internet adoption is much lower than the regional prorated average
- National statistics hide important rural digital divide (Brazil-2017: urban: 65.1%, rural: 33.6%)

- PC adoption per household in Latin America is 44.89%, in Africa 8.45% and in Asia Pacific 37.35% (source: UIT)
- In its majority, this represents one PC per household (which limits simultaneous use by parents and children)



## MOST COUNTRIES IN THE DEVELOPING WORLD DEPICT A LOW LEVEL OF DIGITAL HOUSEHOLD RESILIENCE, WHICH WILL REQUIRE A LONG TERM EMPHASIS IN USAGE TRAINING

### Digital Household Resilience Index

- Composite index
- Min-max normalization
- 30% weight for each indicator and 10% fintech

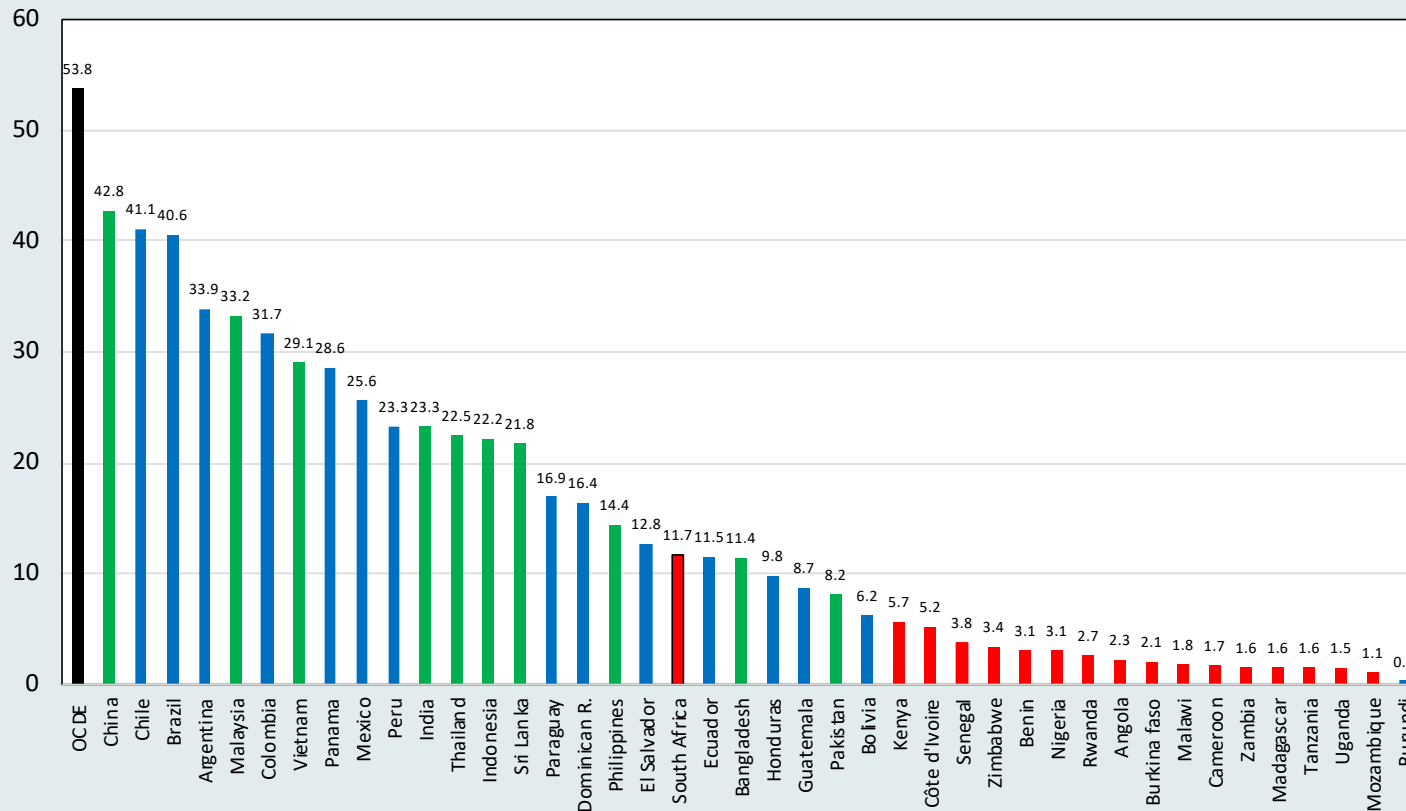
Number of Healthcare apps downloaded per population (Source: App Annie)

Number of Educational apps downloaded per population (Source: App Annie)

Number of Fintech platforms per 1,000,000 population (Source: Crunchbase)

E-commerce as percentage of total retail trade (Source: Euromonitor)

### Developing Countries: Digital Household Resilience Index (2019)



Source: Telecom Advisory Services analysis

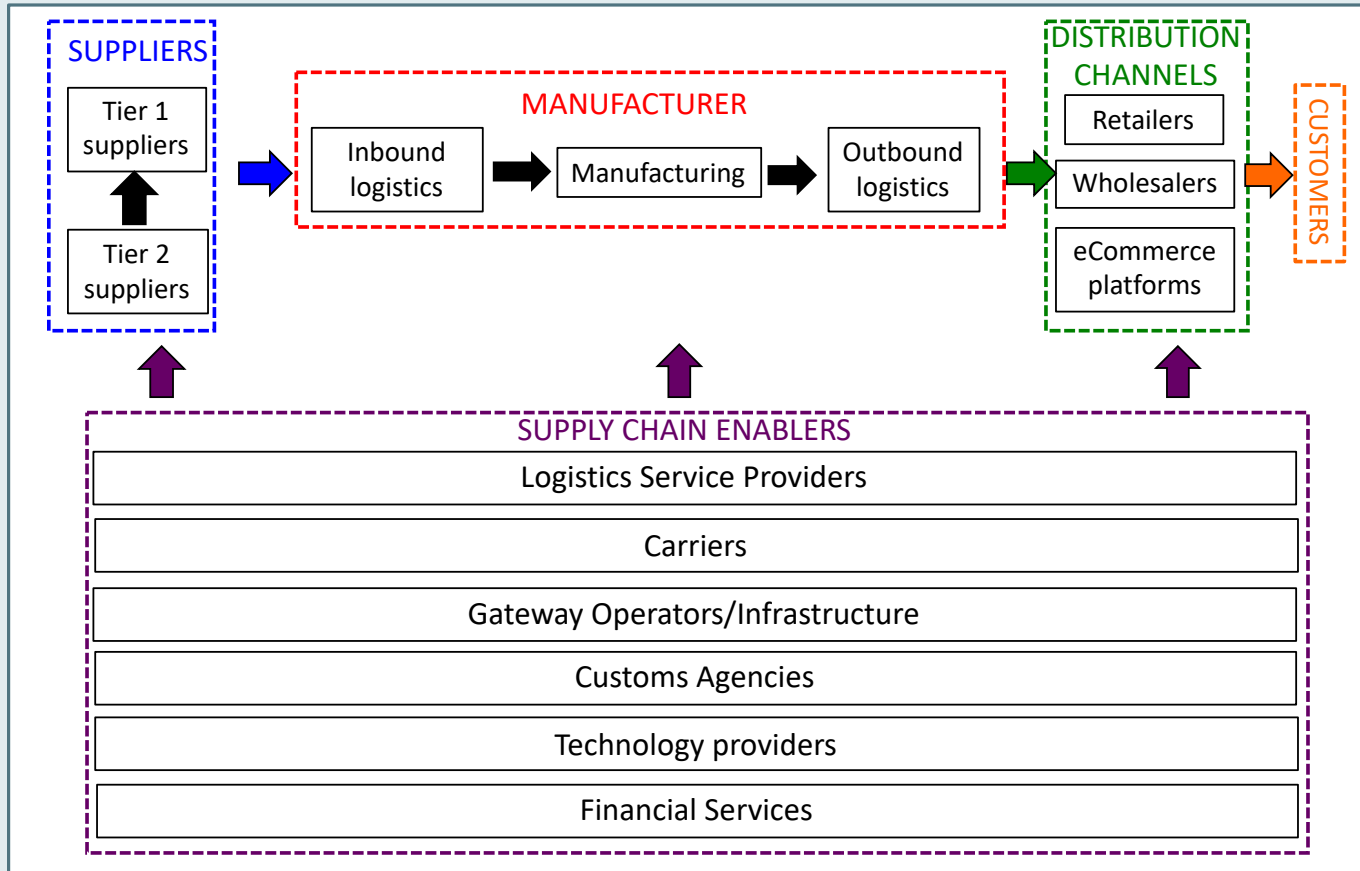
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**THE SUPPLY CHAIN IS THE FOUNDATION OF THE PRODUCTION SECTOR – ITS EFFICIENT FUNCTIONING IS DEPENDENT UPON THE INTERACTION OF MULTIPLE STAKEHOLDERS**

**Main stakeholders of a logistics chain**



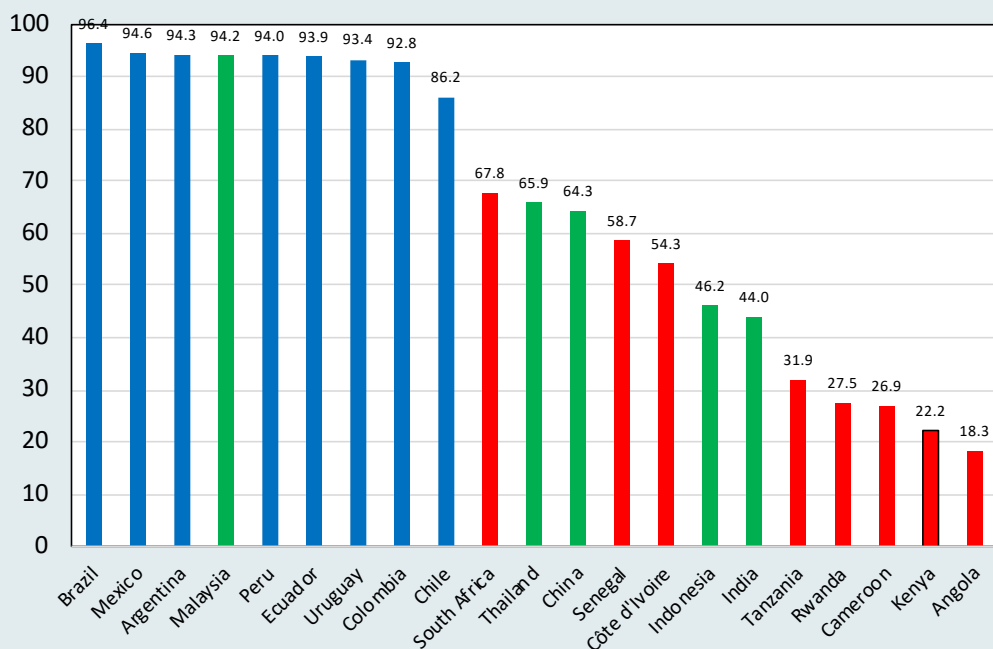
Source: Calatayud, A. y Katz, R. (2019). *Cadena de Suministro 4.0: Mejores prácticas internacionales y Hoja de Ruta para América Latina*. Banco Interamericano de Desarrollo y Foro Economico Mundial

## **DIGITIZATION IS A CRITICAL COMPONENT OF THE EFFICIENT OPERATION OF A SUPPLY CHAIN**

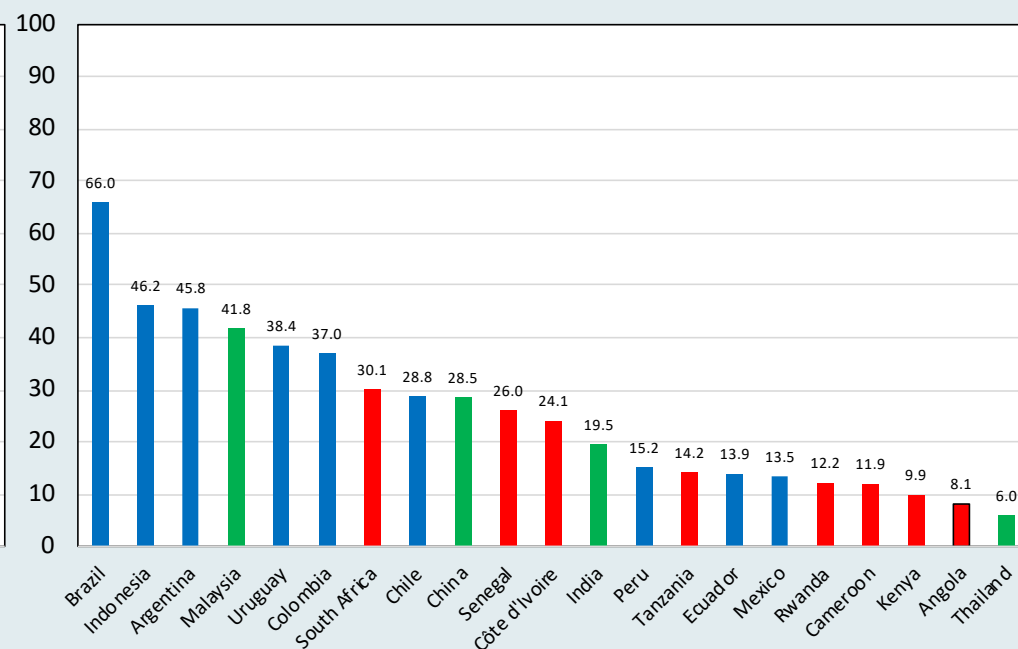
- Manufacturers need have conducted their digital transformation to handle digital purchase orders of inputs and they have to be ready to interact with logistics firms for the for their delivery
- Transportation firms need to dispose of tracking information to monitor cargo in transit
- Logistics freighters have to be ready to interact with port operators and customs agencies to handle the automated processing of foreign trade documentation, inspection, etc.
- Port operations have to be sufficiently digitized to be have to route trucks and speed up upload and download operations
- The last mile of urban distribution has to have the capacity of addressing traffic congestion
- In sum, all stakeholders in the logistics chain have to have and advanced level of digitization to be able to interact among themselves

## ENTERPRISE TECHNOLOGY ADOPTION IS HIGH RELATIVE TO ASSIMILATION OF TECHNOLOGY IN SUPPLY CHAIN OPERATIONS

### Developing Countries: Percent of Enterprises connected to the Internet (2018)



### Developing Countries: Percent of Enterprises using the Internet to acquire inputs (2018)

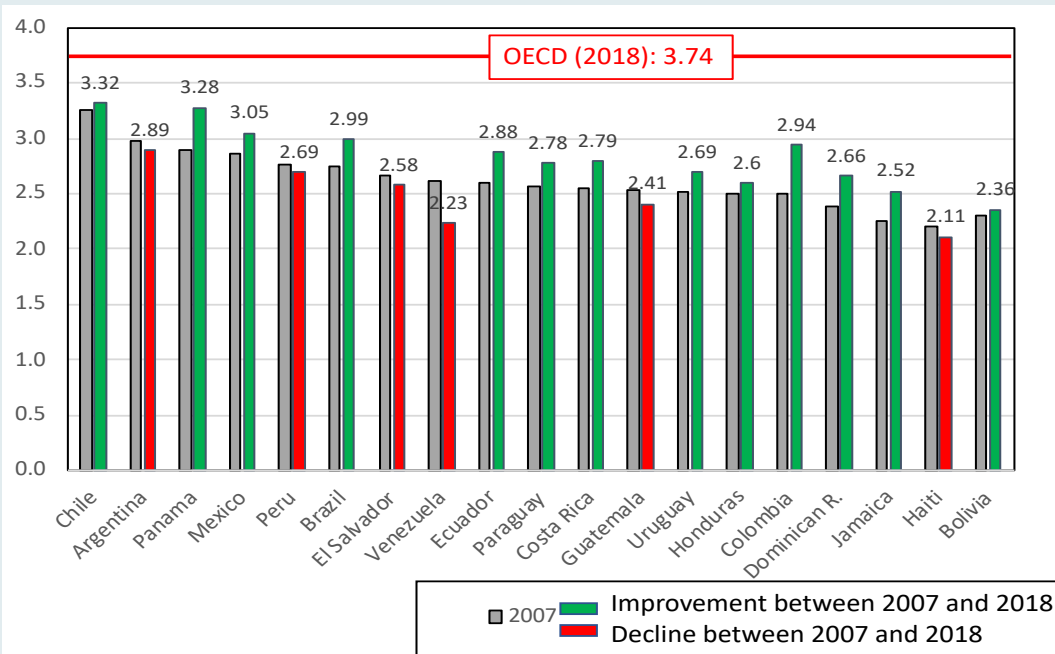


Note: The difference between countries is mainly due to differences in survey sampling approaches (e.g. inclusion or not of microenterprises)

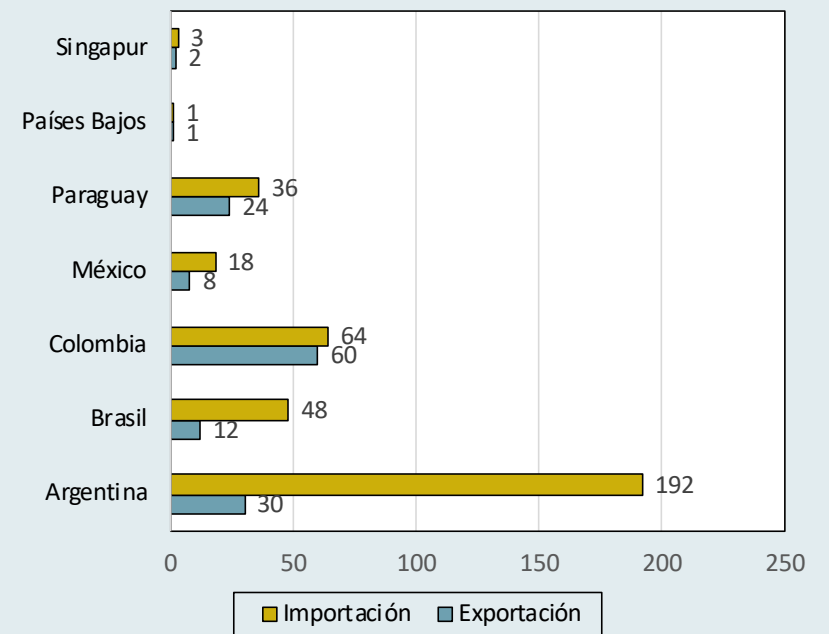
Sources: Argentina. INDEC; Brasil. CETIC.; Chile. Ministerio de Economía, Fomento y Turismo. División de Política Comercial e Industrial; Colombia. Ministerio TIC y Cámara de Comercio de Bogotá; Ecuador. Instituto Nacional de Estadística y Censos. Perú: Instituto Nacional de Estadística e Informática; Estimación TAS en base a datos de Eurostat and UNCTAD; Telecom Advisory Services analysis.

## WHILE MOST COUNTRIES HAVE IMPROVED THEIR LOGISTICS PERFORMANCE, THEIR LEVEL LAGS THAT OF ADVANCED ECONOMIES

Latin America and the Caribbean: Index of Latin America Logistics Performance (2007 – 2018)



Time required to process foreign trade documentation (2018, in hours)



Source: World Bank. Logistics Performance Index (2007-18)

Source: World Bank. Doing Business 2018

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# STATE DIGITAL RESILIENCE IS CONCENTRATED AROUND LARGE DEVELOPING COUNTRIES

## State Digital Resilience Index

- Composite index
- Min-max normalization
- 50% weight for each pillar

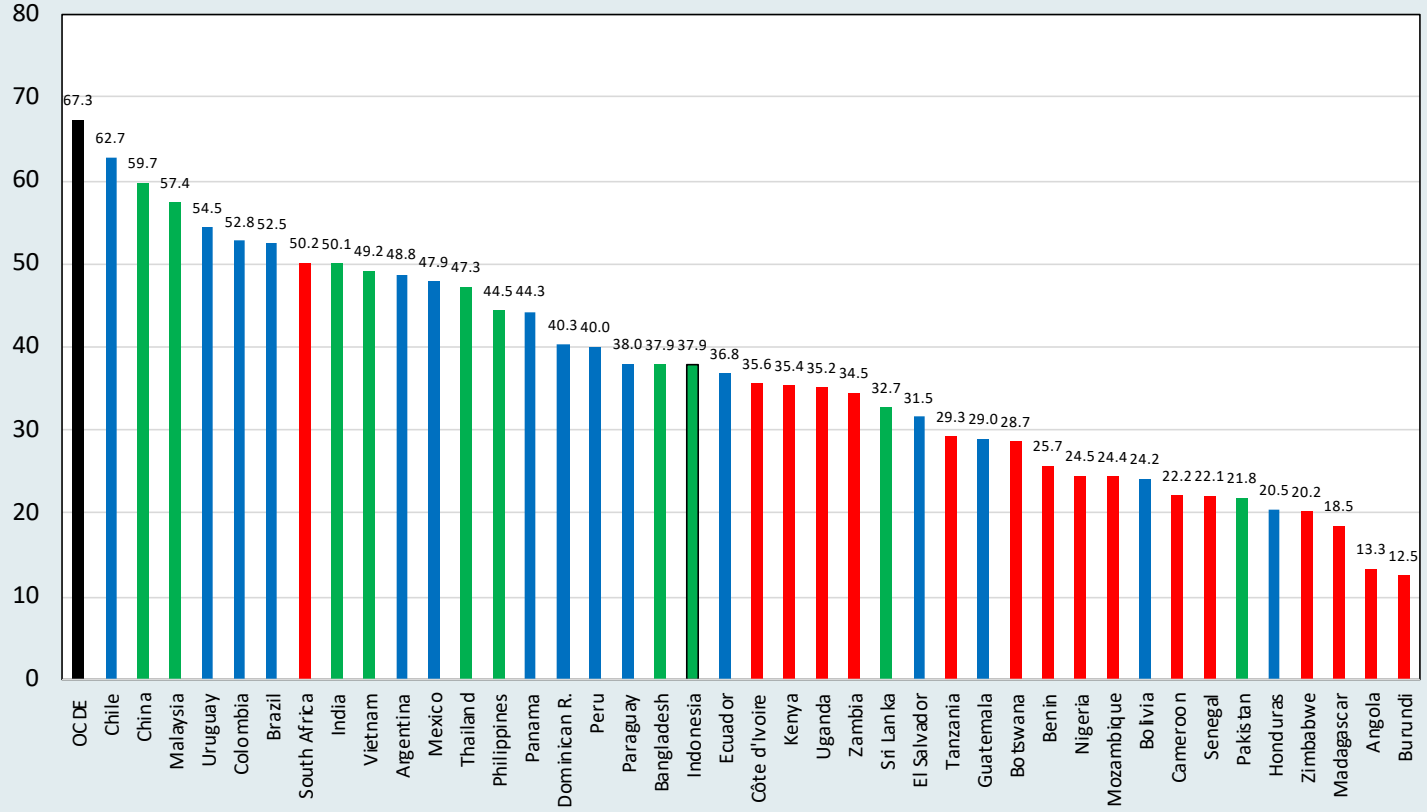
**State administration**

- Ease of doing business
- Ease to conduct foreign trade
- Logistics Performance
- (Source: World Bank)

**Public service platforms**

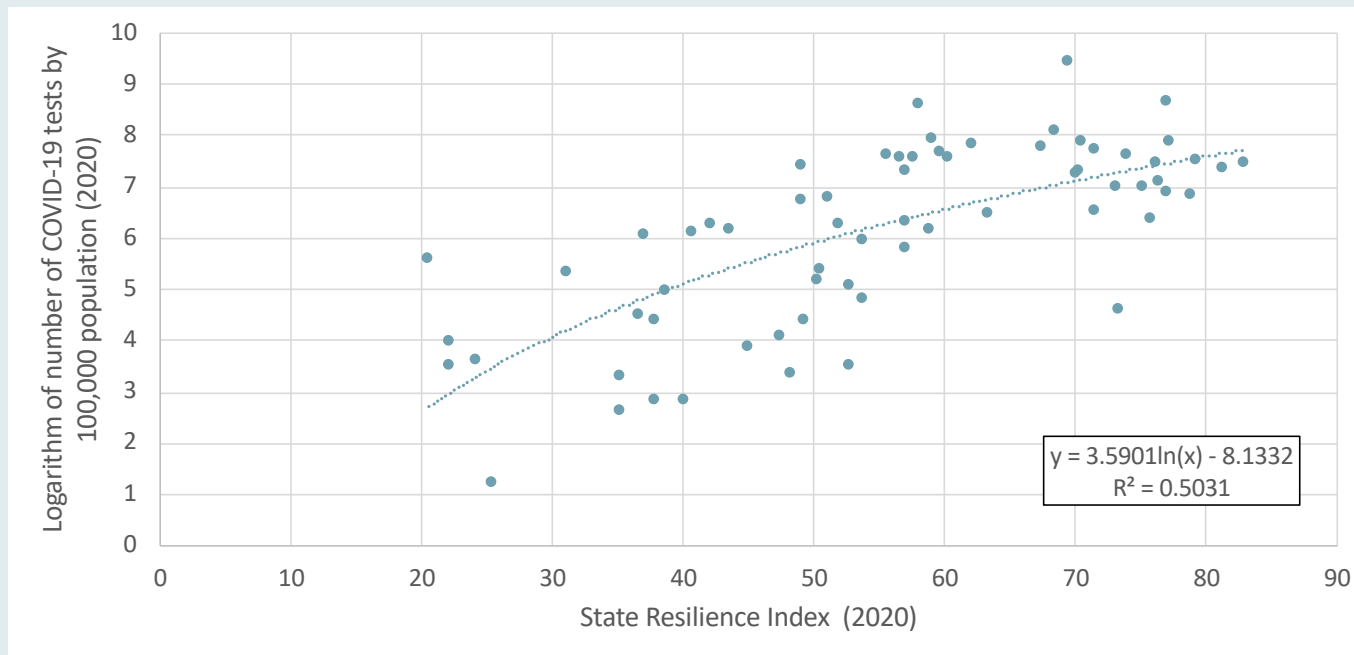
- E-government development Index
- Quality of Government sites
- National Telemedicine Plan
- (UNDP, WHO)

### Developing Countries: State Digital Resilience Index (2019)



## HIGH STATE RESILIENCE INDEX IS CORRELATED WITH THE CAPACITY TO IMPLEMENT A WIDE COVID-19 TESTING PROGRAM

Correlation between the State Resilience Index and logarithm of number of COVID-19 tests by 100,000 population (2020)



Source: [Ourworldindata.org](https://ourworldindata.org); Telecom Advisory Services analysis

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## THE ESTIMATION OF THE EFFECT OF THE PANDEMIC ON THE LABOR FORCE IS CRITICAL TO UNDERSTAND COVID-19 SOCIAL IMPACT

- What is the magnitude of the changes caused by the pandemic as measured by the number of workers who now work from home?
- Which sectors are most- and least-affected?
- How many workers can continue working through telecommuting?
- What does this situation look like in developing countries?

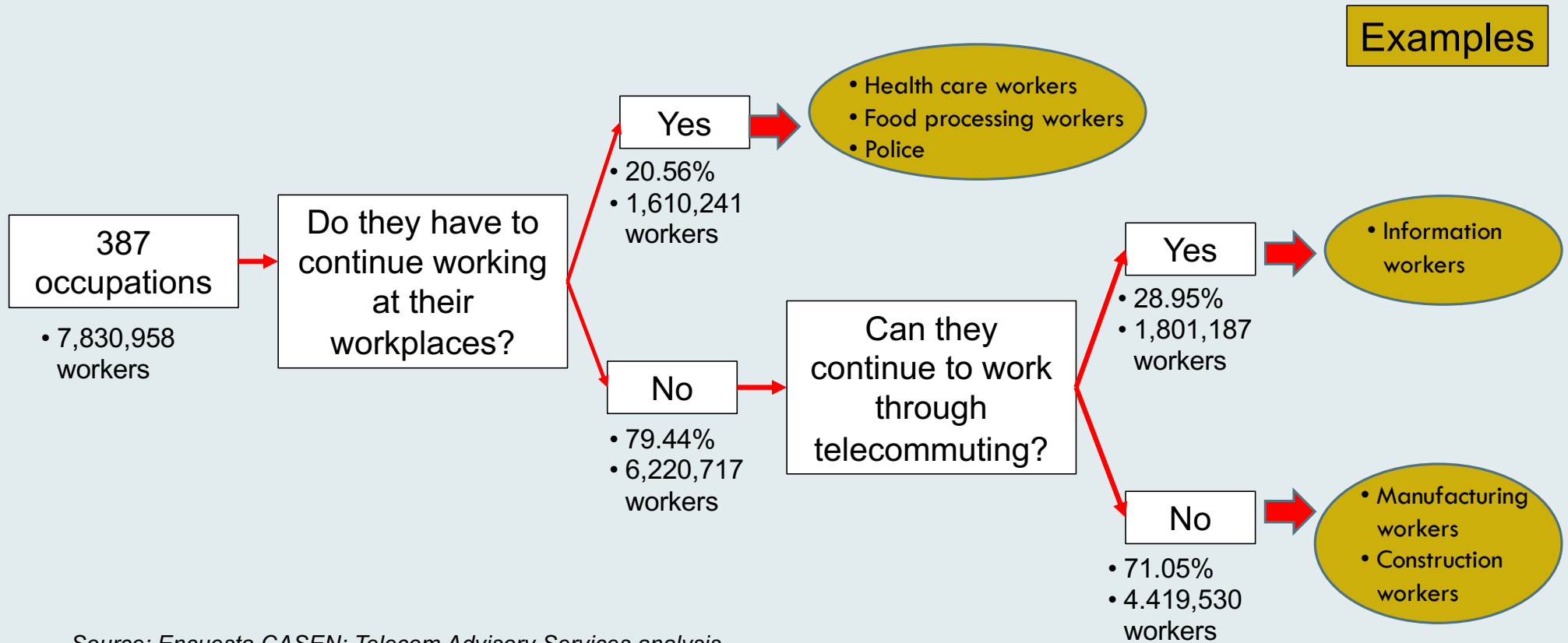


### Analysis of Statistics from Chile

- Chile's National Socioeconomic Characterization Survey (CASEN) carried out by the Ministry of Social Development in 2017
- The survey provides a dataset of more than 200,000 which represent (through expansion codes) the total Chilean workforce, classified according to 387 occupations

**THE ANALYSIS DEFINES A PROBABILITY THAT EACH OCCUPATION HAS TO CONTINUE WORKING AT ITS WORKPLACE OR NOT, AND FROM THOSE THAT CANNOT, WHETHER THEY CAN WORK THROUGH TELECOMMUTING**

Telecommuting impact analysis methodology



Source: Encuesta CASEN; Telecom Advisory Services analysis

**THE ANALYSIS BY EDUCATIONAL AND INCOME LEVELS INDICATES THE DISPROPORTIONATE IMPACT OF THE PANDEMIC ON THE MOST VULNERABLE SOCIAL GROUPS**

	Total	By educational level				By income level				
		No education	Primary education	Secondary education	Tertiary education	1st quintile	2nd quintile	3rd quintile	4th quintile	5th quintile
Workers that to continue work at heir workplaces	1,610,241	169,614	384,599	676,925	369,701	192,495	342,862	392,459	407,535	274,586
Workers that do not work at their workplace but can telecommute	1,801,187	29,828	98,872	429,245	1,234,063	61,732	149,758	267,170	436,918	885,610
Workers that do not work at their workplace and cannot telecommute	4,419,530	516,194	1,098,905	1,819,559	957,042	604,999	985,042	1,080,271	1,056,496	673,520

Source: Encuesta CASEN; Telecom Advisory Services analysis

## AGENDA

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- Digitization and socio-economic resilience facing pandemics
- The state of digitization in developing countries
- Resilience of digital infrastructure
- Resilience of digital households
- Resilience of digital production
- Resilience of the State
- Digitization and social resilience
- Policy implications

**IN SUM, THE RESILIENCE OF DEVELOPING COUNTRIES FACING THE PANDEMIC BASED ON THEIR DIGITIZATION LEVEL INDICATES SOME STRENGTHS AND WEAKNESSES**

**Strengths**

**Weaknesses**

Network resilience

- Enough unlit fiber in backbones
- Operators can address traffic peaks by surgical deployment of base stations
- Temporary assignment of spectrum helps address congestion problems

- Need to reduce infrastructure deployment regulation to increase response capability
- Increase unlicensed spectrum assignment to reduce Wi-Fi congestion
- Emphasize ultrabroadband deployment in distribution

Household resilience

- High adoption of Internet in individuals and households, with a preponderant use for social networking and communications

- Digital divide in rural areas
- Limited PC adoption
- Limited use of educational apps and e-commerce

Production resilience

- High adoption of Internet in enterprises

- Limited technology adoption in business processes
- Limited digitization in the supply chains

State resilience

- High resilience of public sector

- Lag in state resilience in nations with limited digitization

Social impact

- Telecommuting capacity concentrated in population with secondary and tertiary education and higher income quintiles

- High potential unemployment due to the lack of telecommuting concentrated in lower income social groups



**PUBLIC AND PRIVATE SECTORS, WITH THE SUPPORT OF CIVIL SOCIETY, MUST COLLABORATE AND WORK TOGETHER TO PROMOTE THE ENHANCEMENT OF CERTAIN COMPONENTS OF THE DIGITAL ECOSYSTEM**

- Accelerate the deployment of a large number of base stations for mobile broadband, reducing the permit requirements for the deployment of antennas
- Temporarily allocate additional spectrum to mobile operators to face traffic spikes.
- Require video streaming service providers to reduce traffic volume generated from high definition content.
- Consider the need to increase unlicensed spectrum in the upper 5 GHz and 6 GHz bands in order to resolve Wi-Fi router bottlenecks.
- Promote platform development innovation in order to improve supply chains. Key activities include stimulating technology companies to develop platforms that can improve the efficiencies between logistics providers and transportation service providers
- Encourage enterprises to further digitize business processes in order to increase the percentage of the workforce that can work remotely
- Invest in the training of the most vulnerable population groups in order to decrease unemployment rates
- Address some of the digital divide factors by providing devices (PCs, tablets, Wi-Fi modems, subsidized broadband service) to vulnerable consumers, and combine with distance learning training on e-education and telemedicine

## IT IS CRITICAL THAT COUNTRIES BEGIN IMMEDIATE WORK ON A DIGITAL RESILIENCE PLAN TO ADDRESS FUTURE PANDEMIC DISRUPTION

- Conduct a comprehensive diagnostic of country resilience
  - Infrastructure (deployment, service quality, Stress testing of current infrastructure deployed)
  - Components of digital divide (urban vs. rural, income groups, large enterprises vs. SMEs)
  - Assessment of applications and usage levels across social groups
  - Evaluation of level of digitization of production (by sector and enterprise size, entailing both technology adoption and assimilation in business processes)
  - Resilience of state operations (administrative processes and delivery of public services)
- Develop a plan to address shortfalls at each potential points of failure
  - Infrastructure deployment (backbone and distribution networks, spectrum availability – licensed and unlicensed)
  - Initiatives to address all components of digital divide
  - Training and stimulation of consumer apps
  - Concurrent efforts with private sector to stimulated digital transformation of production
  - Initiatives to address shortfalls in state operations

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