Key enablers for IMT-2020 adoption among Asia-Pacific countries

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Summary

- **5G** is the latest generation of mobile network technology, offering exponentially faster data transmission speeds, lower latency, increased network capacity, energy efficiency, and the ability to connect a massive number of devices simultaneously.
- There is enormous diversity in APAC region in terms of its status on 5G adoption where a wide variety of network deployments and technologies remain. While the majority of countries are beginning to invest in 5G networks, there is still a lot of LTE investment.
- The report provides results and discussion of a study on the **5G enablers for Asia-Pacific (APAC) ITU member states** aimed at better understanding the regions readiness and preparedness for the next generation of wireless communication technology, as well as providing valuable insights and suggestions for improvements needed for 5G mobile development and adoption.

Launch of the 5G Enablers Report

Enablers and Data Source

- The report addresses three broad categories of 5G enablers, namely:

- **Technical and Infrastructure Readiness:**
  - Infrastructure & Network, Spectrum & Bandwidth, Security & Legislation, and Geographical & Environmental Factors
- **Socio-Cultural and Political Factors:**
  - Consumer & Ownership, Content & Services, and Governance & Stability.
- **Economic and Regulatory Factors:**
  - Affordability & Costs, Economic & Development Indicators, and Regulatory & Policy Environment

- The primary data sources for analysis include the **ITU DataHub**, as well as other relevant country-level data from sources like GSMA, WDI (World Development Indicators), WGI (Worldwide Governance Indicators), EGDI (Government Development Index), etc.

Main Findings

Technical and Infrastructure Readiness

- Robust infrastructure, including network coverage and performance, significantly influences 5G adoption globally and in the APAC region.
- Allocation of spectrum below 1 GHz to mobile operators positively correlates with 5G population coverage, emphasizing the crucial role of spectrum resources.
- Cybersecurity is pivotal, ensuring data security and resilience, fostering trust and innovation amid increasing connectivity.
- Geographical and environmental factors like access to electricity, population size, and density shape 5G adoption, contributing to a more connected and inclusive digital future.

Economic and Regulatory Factors

- Affordability may not be as crucial in APAC as expected, as data and handset affordability show limited statistical significance, possibly due to the region's unique dynamics, rapid economic growth, and digitalization levels that facilitated technology adoption.
- Globally, economic and development indicators like income per capita and high-technology exports play a vital role in 5G adoption, but some factors like high-technology exports are less significant in APAC, underlining the need to align industry digital development with 5G adoption.
- In the regulatory and policy environment, e-government and regulatory quality are essential for 5G adoption, with the potential to transform governance and public services, fostering transparency, efficiency, and citizen engagement when combined with 5G capabilities.

Socio-Cultural and Political Factors

- While the GSMA consumer readiness index may not be statistically significant, mobile ownership and consumer characteristics like basic skills, literacy, and internet usage play a highly significant role in 5G adoption, fostering a symbiotic relationship between consumer demand and innovation.
- Availability of secure online content and locally tailored services does not have a positive impact on 5G adoption, possibly because these services are still geared towards previous generations of mobile technology.
- Gender equality emerges as a critical factor, fostering diversity, innovation, and inclusivity in the technology sector, bridging the digital divide and ensuring that everyone can benefit from the transformative capabilities of 5G technology.

Policy Recommendations

Technical and Infrastructure Readiness

- Prioritize substantial investments in communication infrastructure.
- Expand high-speed network coverage in both urban and rural areas.
- Implement clear spectrum allocation policies and licensing models.
- Focus on infrastructure accessibility, especially access to reliable electricity in underserved regions.
- Optimize network coverage based on population density.
- Establish robust quality monitoring mechanisms to stimulate market competition and enhance the user experience for consumers.
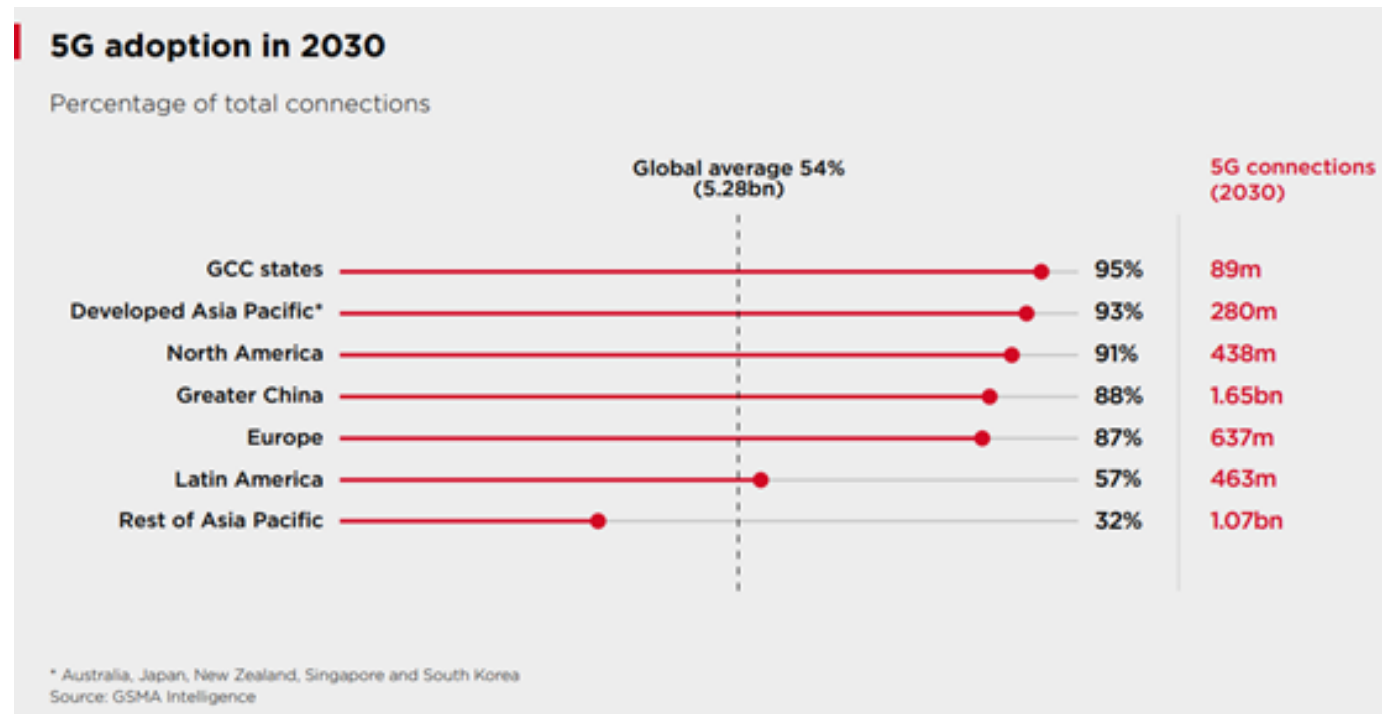
Economic and Regulatory Factors

- Foster economic growth and equitable wealth distribution to support 5G adoption.
- Develop robust e-governance strategies and regulatory reforms to support 5G deployment and innovation.
- Formulate national MBB plans and industry digital development policies based on experiences of leading 5G countries.
- Support industries driving high-technology exports of manufactured goods to contribute to economic growth and technological advancement.
- Address affordability concerns by designing initiatives to make 5G services more affordable in relevant regions.

Socio-Cultural and Political Factors

- Implement consumer readiness programs to enhance digital literacy and awareness, boosting adoption rates and bridging the digital divide.
- Promote gender equality in the technology sector for a diverse and innovative workforce.
- Rethink content and services strategies to ensure they are relevant and innovative.
- Ensure robust cybersecurity measures are in place to bolster trust in technology and ensure data security.

Deep Dive

The Future is 5G

- 5G is revolutionizing the mobile network landscape, driving digital transformation across industries globally and in the Asia-Pacific region.
- Estimations vary, but 5G is expected to enable USD13.2 trillion of global economic output by 2035 and support over 22 million jobs!

5G adoption in 2030

Percentage of total connections

Global average 54% (5.28bn)

	Percentage	5G connections (2030)
GCC states	95%	89m
Developed Asia Pacific*	93%	280m
North America	91%	438m
Greater China	88%	1.65bn
Europe	87%	637m
Latin America	57%	463m
Rest of Asia Pacific	32%	1.07bn

* Australia, Japan, New Zealand, Singapore and South Korea
Source: GSMA Intelligence

Advancements in Mobile Network Technology

From 4G to 5G
Do we need the latest generation of mobile network technology and its improvements in speed, latency, and capacity?

Speed and Performance
Ultra-fast download/upload speeds of up to 20 Gbps (100x faster than 4G LTE) and seamless streaming with 5G.

Ultra-Low Latency
Near-instantaneous communication with ultra-low latency (as low as 1 millisecond), benefiting **autonomous vehicles**, **remote surgery, industrial automation,** etc.

Massive Device Connectivity
5G provides increased network capacity that can **connect billions of devices concurrently**, enabling innovative **IoT** applications for **smart cities** and homes.

Driving the Future of Communications

Energy Efficiency
5G minimizes energy consumption while delivering superior network performance.

Diverse Use Cases
There are limitless possibilities of 5G beyond mobile broadband, empowering mission-critical communications, massive IoT, VR, AR, and AI.

Challenges and Considerations
Address key factors such as infrastructure investment, cost considerations, regulatory hurdles, and (cyber)security concerns for successful 5G adoption, as well as risk of exacerbating the digital divide.

5G Population Coverage in APAC 2022
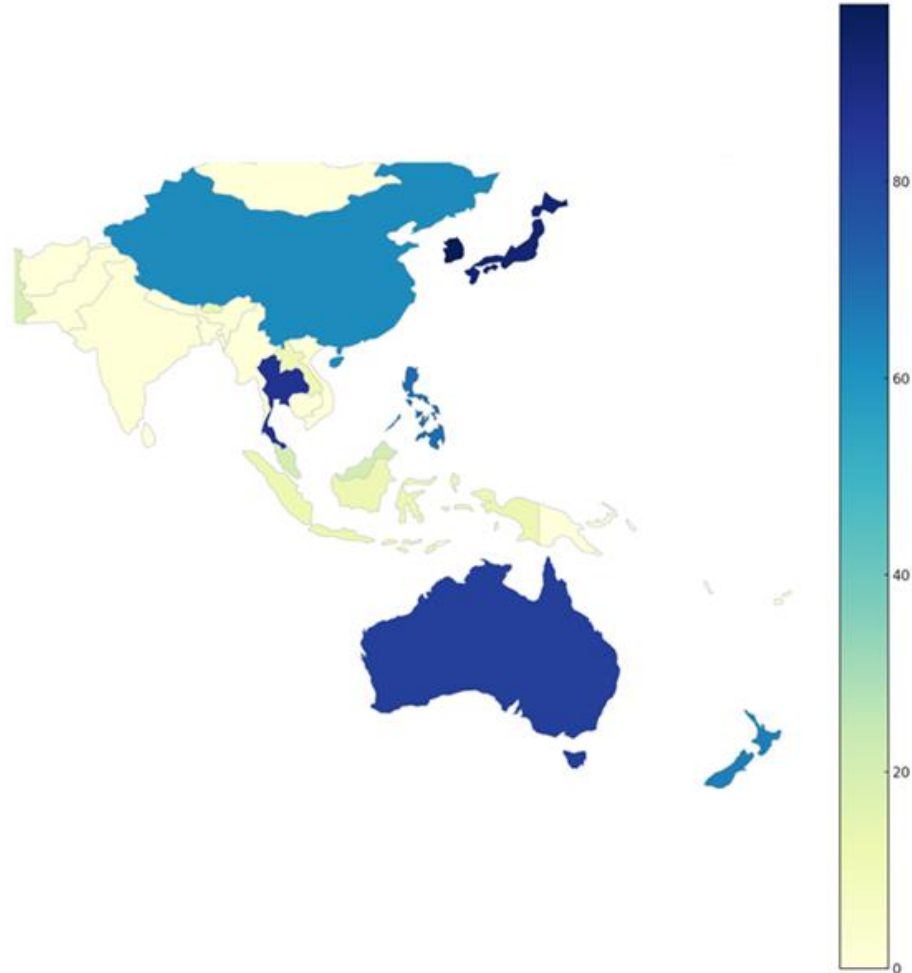
- **24 APAC Cs**
Korea … 98%
Japan … 92
Thailand … 86
Australia … 82
Singapore … 77
Philippines … 70
China … 63

…

Indonesia, Lao PDR … 12%
India … 1

…

- **8 SIDS Cs**
Maldives … 51 %

…

Assessment of 5G Enablers for Asia and the Pacific

Evaluation performed in line with the ITU-T or the Telecommunication Standardization Sector (as well as ITU-R and ITU-D) of the International Telecommunication Union (ITU), which coordinates with all entities involved with creating standards in the telecommunications industry.

Data-Driven Analysis

Explore **over 150 variables** from **ITU DataHub**, GSMA, and national statistical office, for **2014-2022.**
Examine the readiness and progress of 5G enablers in the 32 APAC region & identify areas for further improvement and/or strategic intervention.

Variables selection

- Over 150 variables are grouped into 10 different measures: (1) infrastructure & network, (2) affordability & costs, (3) consumer & ownership, (4) contents & services, (5) spectrum & bandwidth, (6) security & legislation, (7) economic & development indicators, (8) regulatory & policy, (9) geographical & environmental factors, and (10) governance & stability.

- Within each of the measures, the correlation of each variable with 5G coverage was measured. The variables in each measure were also clustered using dendograms to enable us to identify the most appropriate variables for the regression analysis.

- Ultimately, about 30 variables were used in various regressions and interpretation and policy recommendations provided under 3 broad categories, (1) technical and infrastructure readiness, (2) socio-cultural and political factors, and (3) economic and regulatory factors.

Statistical & Econometric Method

Step 1: Various variables were identified for each Enabler, and the best measure were identified by correlations and dendograms.

Basically, we select the best variables (highly correlated with 5G coverage) among a set of highly correlated variables indicated by the dendograms, as well as data availability for the final regression analysis.
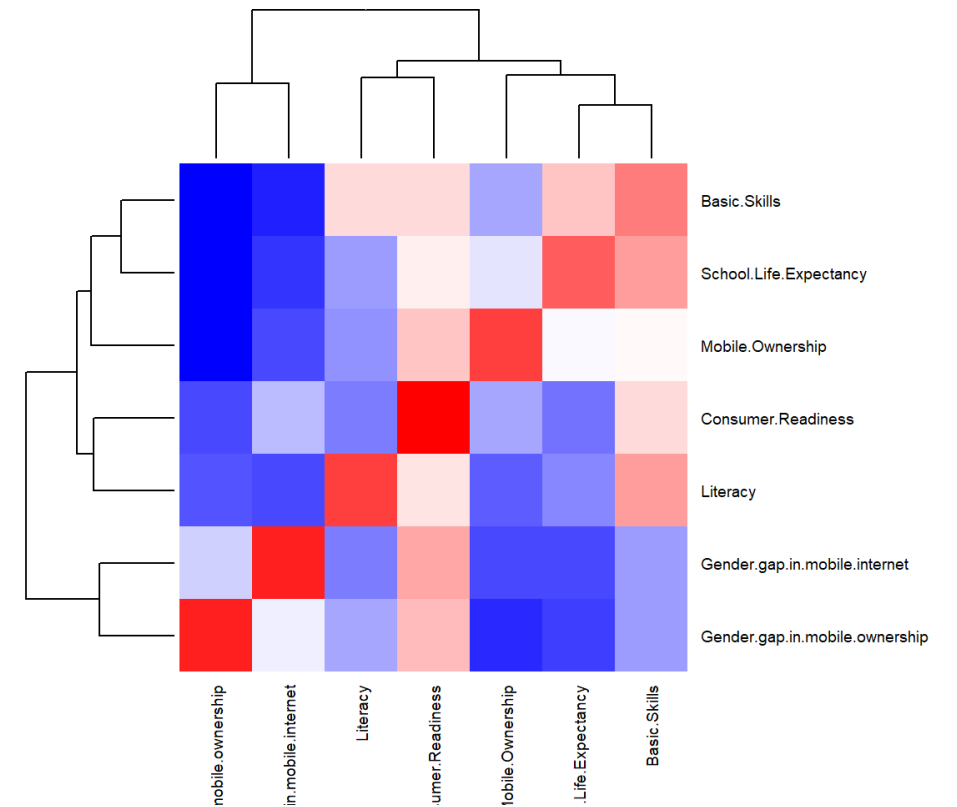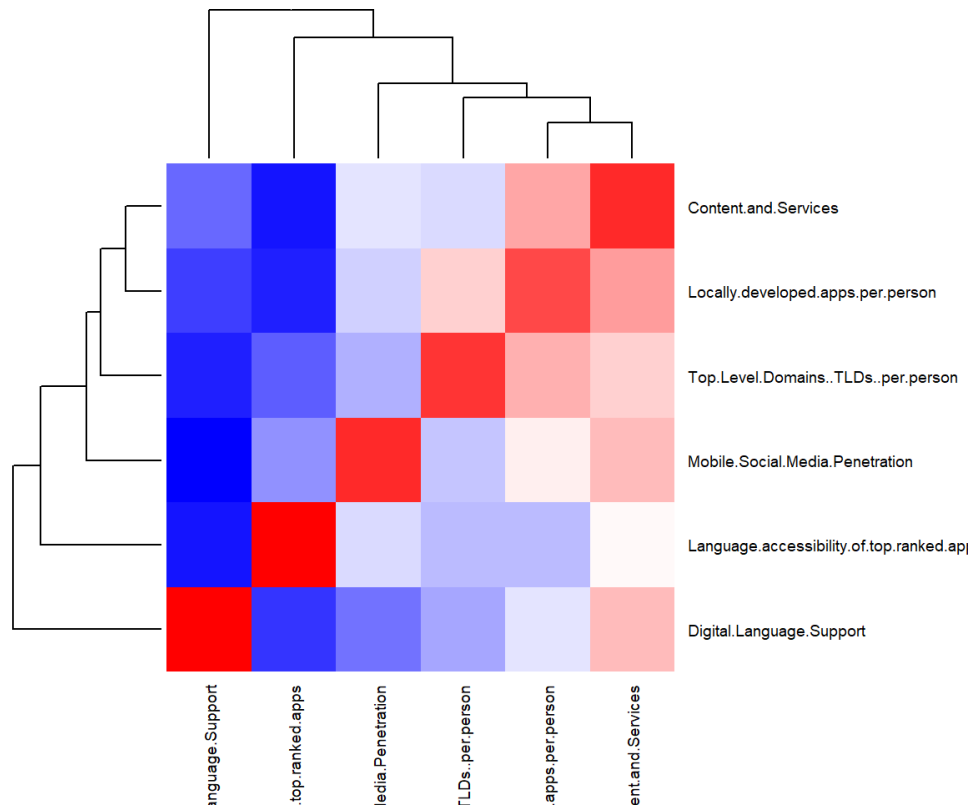
Measure. 1. Infrastructure & Network
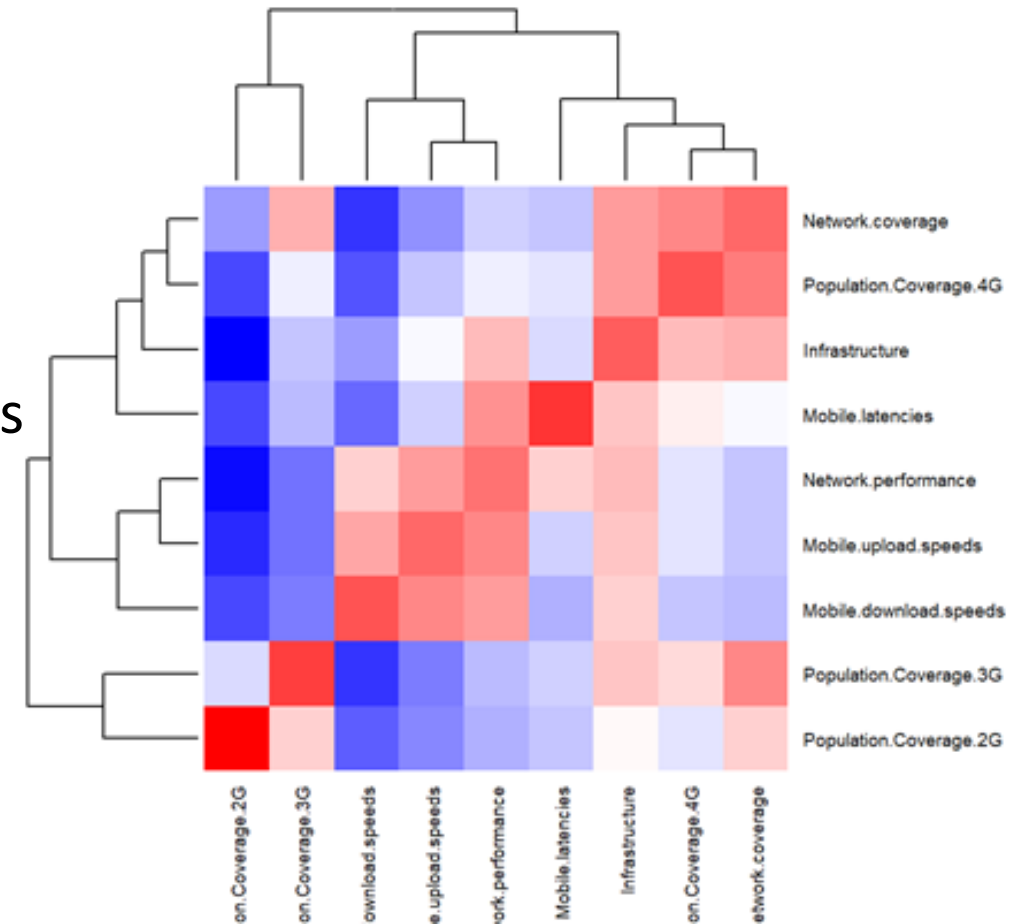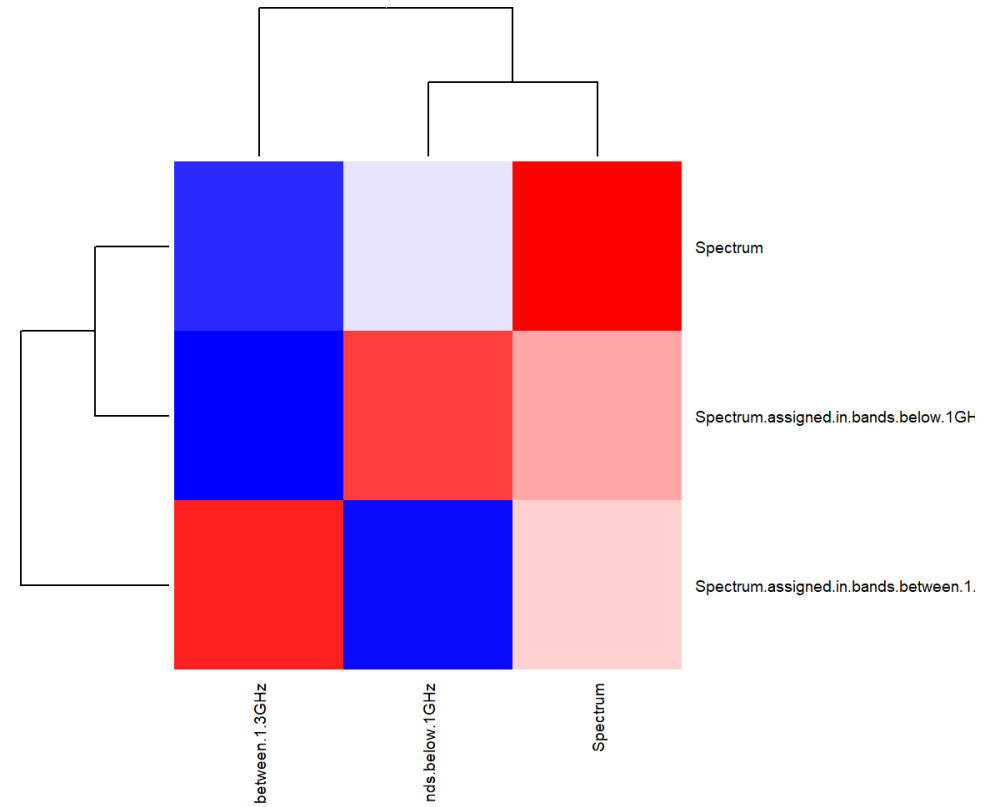
Measure. 2. Affordability & Costs
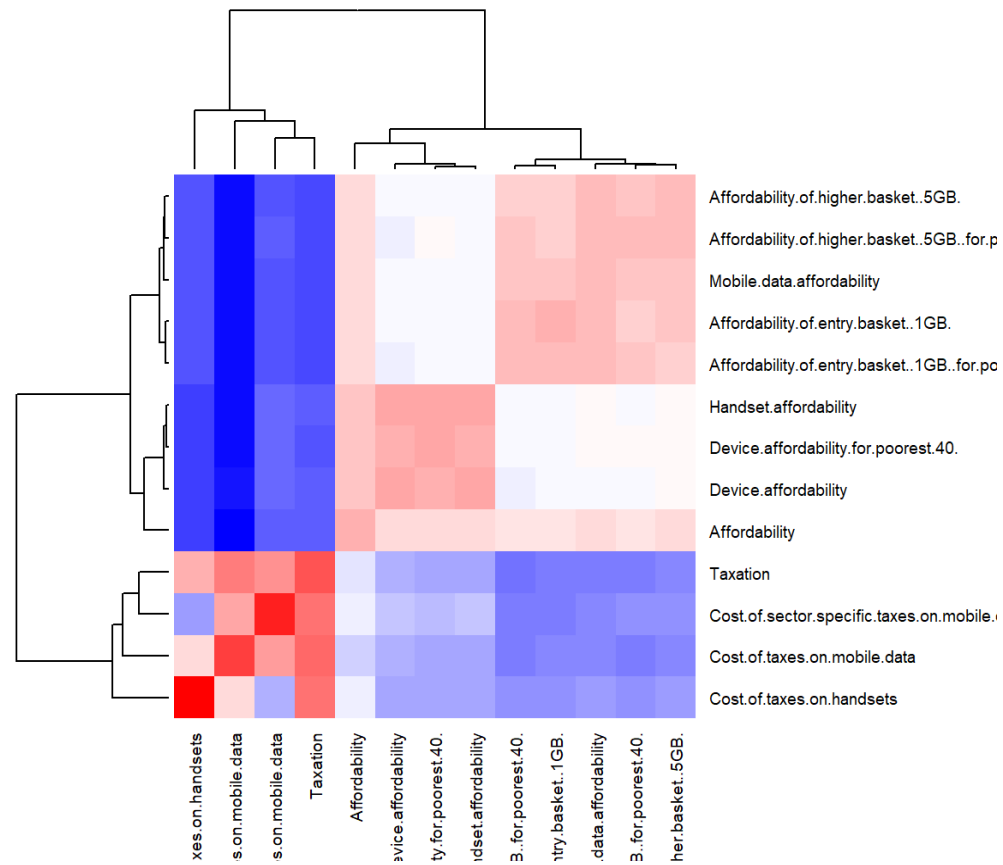
Measure. 3. Consumer & Ownership

Measure. 4. Contents & Services

Measure. 5. Spectrum & Bandwidth

Other measures

Measure. 6. Security & Legislation
 - Cybersecurity / ICT consumer protection
Measure. 7. Economic & Development Indicators
 - Per Capita GDP, Inflation, GINI, HCI, High-tech exports, ICT goods imports/exports, PPP in ICT, interest rates, exchange rate, tax revenue, trade, etc.
Measure. 8. Regulatory & Policy
 - e-government score, regulatory quality
Measure. 9. Geographical & Environmental
 - Land area, population, population density, access to electricity, etc.
Measure. 10. Governance & Stability
 - Gender equality, CPI, government effectiveness, political stability, rule of law, etc.

Step 2: Regression analysis (Panel data FE model):

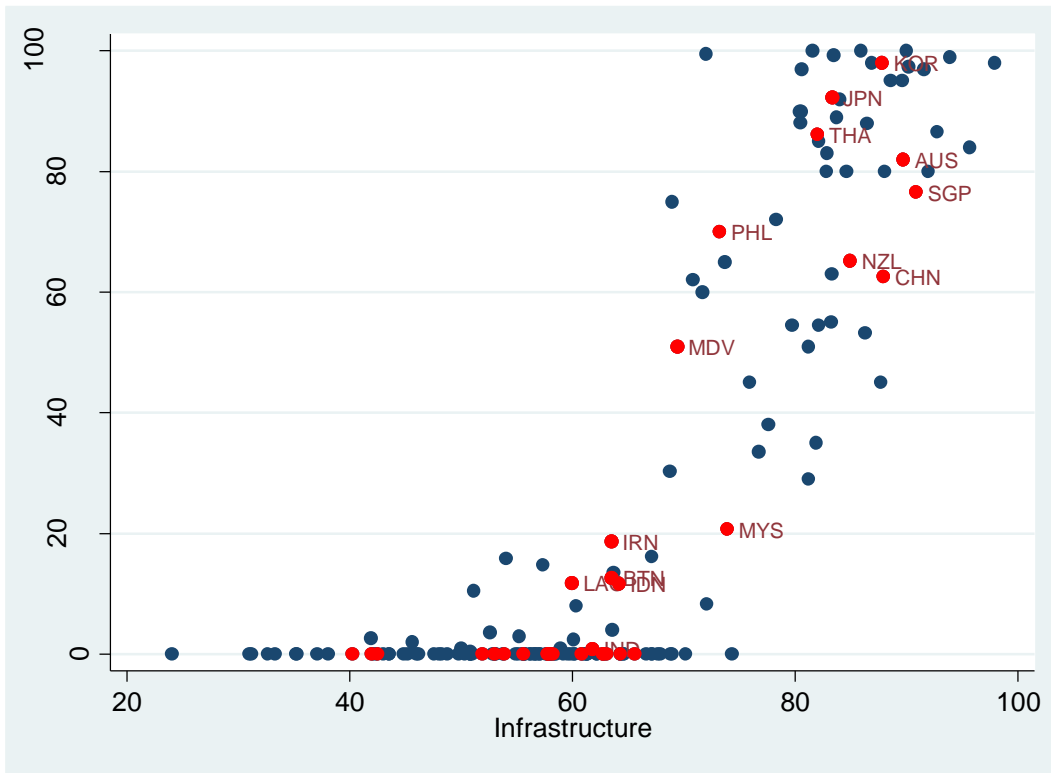$$5G \text{ Population Coverage}_{i,t} = X_{i,t}\beta + \alpha_i + u_{i,t}$$

where X are potential 5G enablers, and typically t = 2021 and 2022.

Fixed-effects (within estimation) is preferred to OLS when data is available to control for individual fixed-effects.

Estimated coefficients are then interpreted (sign, significance and size).

Technical and Infrastructure Readiness:

(1) Infrastructure & Network

All 170 Cs	Coef.	P-value	32 APAC	Coef.	P-value
networkcoverage	1.6159	0.008	networkcoverage	.83405	0.070
networkperformance	.37366	0.043	networkperformance	.37366	0.043

All 170 Cs	Coef.	P-value	32 APAC	Coef.	P-value
popcoverage4G	.07345	0.050	popcoverage4G	.08647	0.329
mobilelatencies	.03511	0.210	mobilelatencies	.01445	0.317

All 170 Cs	Coef.	P-value	32 APAC	Coef.	P-value
mobileuploadspeeds	.18577	0.255	mobileuploadspeeds	.08440	0.577
mobiledownloadspeeds	.48257	0.006	mobiledownloadspeeds	.44032	0.058

infrastructure	Coef.	P-value		Coef.	P-value
All 170 Cs	2.2262	0.000	32 APAC	1.1129	0.010

Technical and Infrastructure Readiness:

(2) Spectrum & Bandwidth
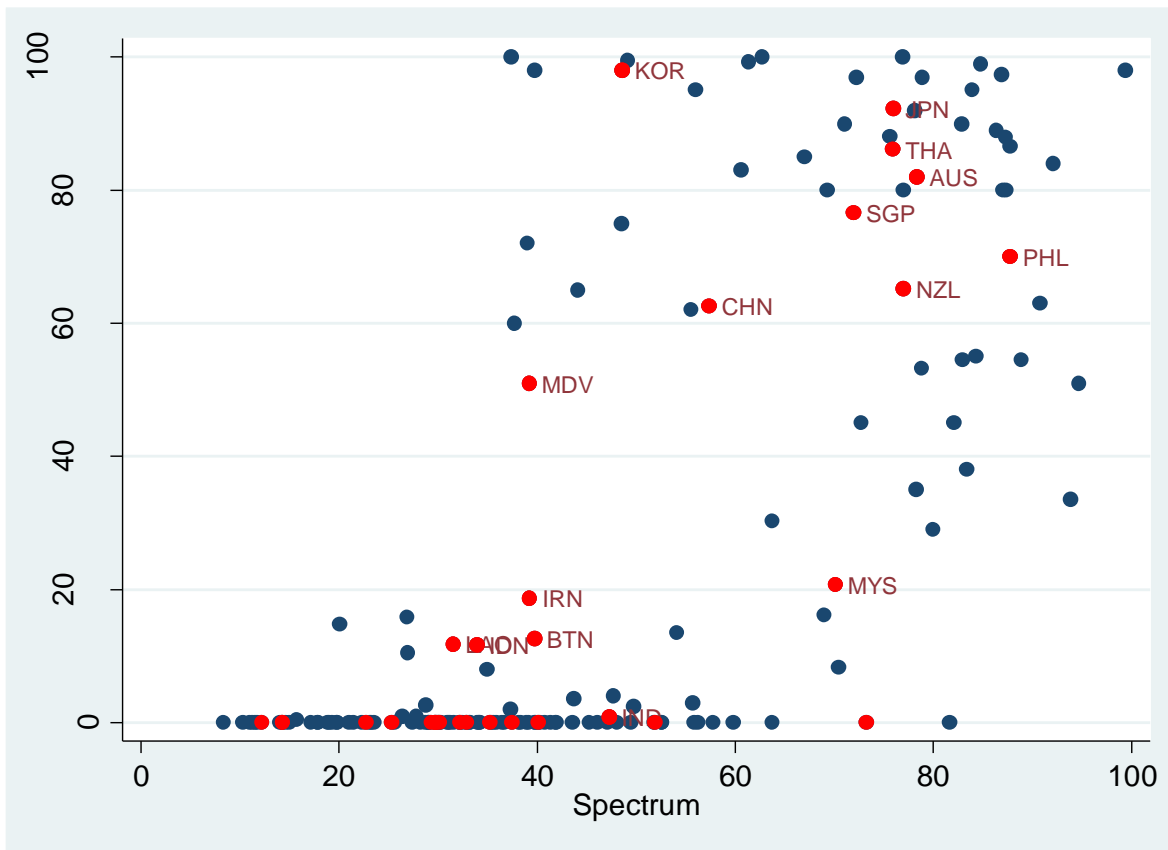
spectrum	Coef.	P-value		Coef.	P-value
ALL 170 Cs	0.98645	0.001	32 APAC	0.62399	0.024

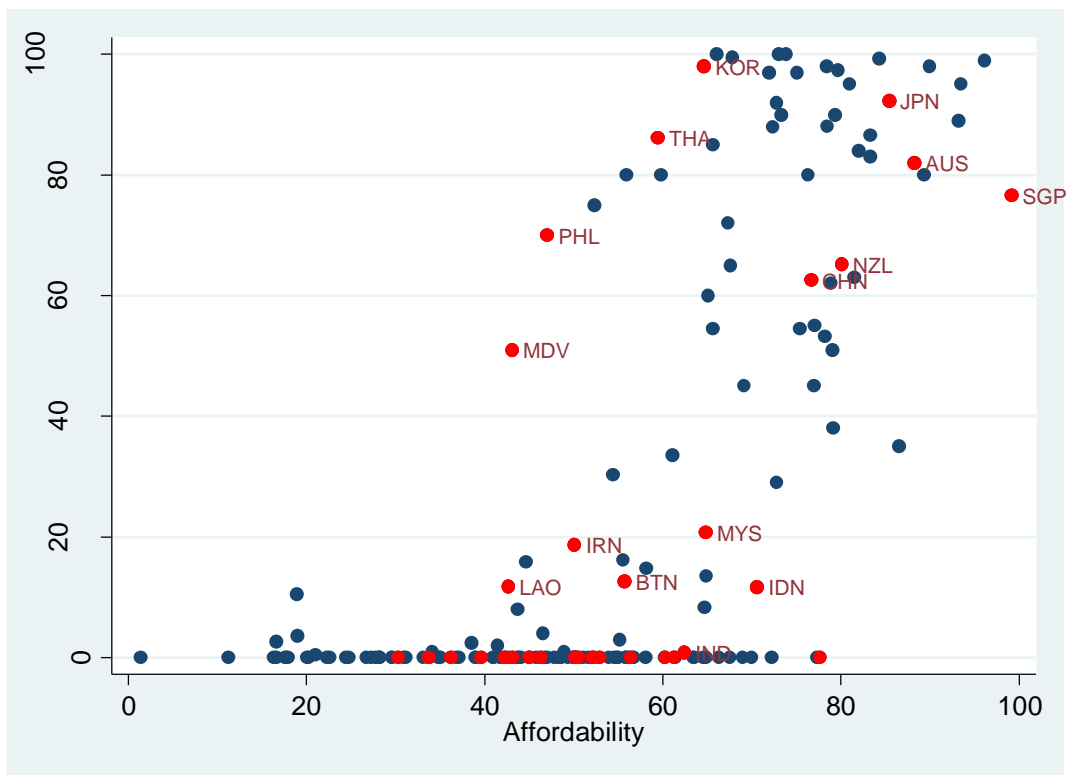| ALL 170 Cs	Coef.	P-value	32 APAC	Coef.	P-value
spectrumassignedinbandsbelow1ghz	.59	0.020	spectrumassignedinbandsbelow1ghz	.61	0.016
spectrumassignedinbandsbetween13	-.10	0.621	spectrumassignedinbandsbetween13	.032	0.401
spectrumassignedinbandsbetween36	.29	0.029	spectrumassignedinbandsbetween36	.18	0.303
spectrumassignedinmmwavebands	-.086	0.524	spectrumassignedinmmwavebands	-.103	0.382

(3) Cybersecurity
(4) Geographical & Environment
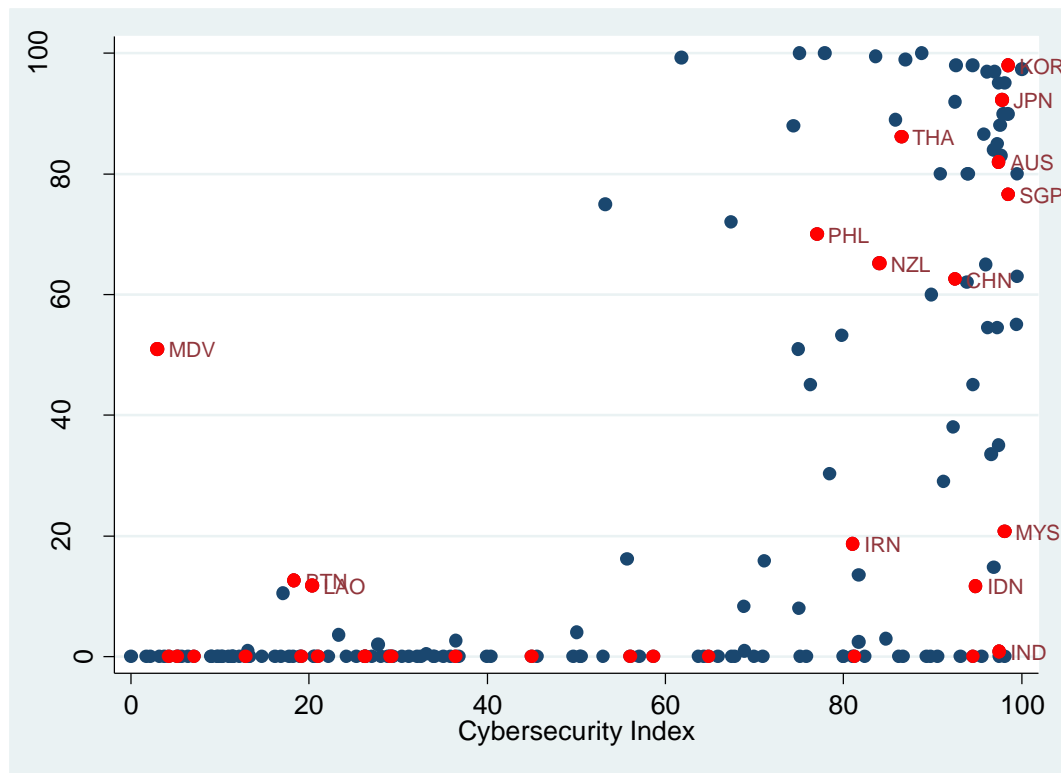
ALL 170 Cs	Coef.	P-value	32 APAC	Coef.	P-value
cybersecurityindex	.52016	0.000	cybersecurityindex	.49827	0.003

ALL 170 Cs	Coef.	Std. Err.	P-value	32 APAC	Coef.	Std. Err.	P-value
accesstoelectricityofpopulation	2.81	.3042143	0.000	accesstoelectricityofpopulation	2.7	.418065	0.000
populationtotal	1.1e-06	5.04e-07	0.030	populationtotal	8.2e-07	3.79e-07	0.037
populationdensitypeoplepersqkmof	.11	.0347568	0.002	populationdensitypeoplepersqkmof	.09	.0356331	0.016

Economic and Regulatory Factors:

(1) Affordability & Costs

All 170 Cs	Coef.	P-value	32 APAC	Coef.	P-value
affordability 5gb	.290	0.033	affordability 5gb	.485	0.098
affordability 1gb	.061	0.695	affordability 1gb	-.226	0.399

All 170 Cs	Coef.	P-value	32 APAC	Coef.	P-value
handsetaffordability	2.976	0.001	handsetaffordability	2.330	0.081
deviceaffordability	-2.612	0.001	deviceaffordability	-2.235	0.069

All 170 Cs	Coef.	P-value	32 APAC	Coef.	P-value
affordability 5gbfor~40p	.313	0.038	affordability 5gbfor~40p	.486	0.097
affordability 1gbfor~40p	.060	0.704	affordability 1gbfor~40p	-.226	0.399

affordability	Coef.	P-value		Coef.	P-value
All 170 Cs	.71667	0.005	32 APAC	.21182	0.293

(2) Economic & Development Indicators
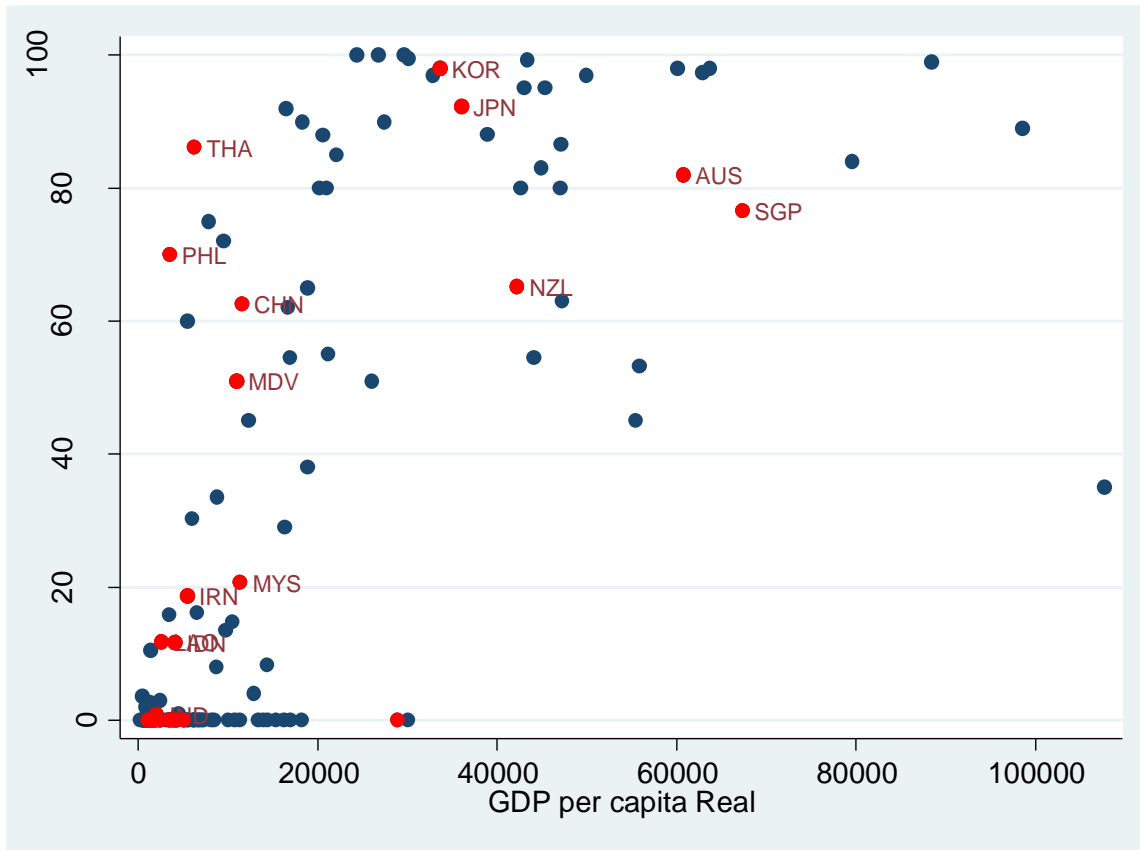
94 Cs	Coef.	P-value	15 APAC	Coef.	P-value
gdppercapitareal	.001	0.000	gdppercapitareal	.001	0.001
hightechnologyexportsofmanufactu	.68	0.010	hightechnologyexportsofmanufactu	.54	0.212

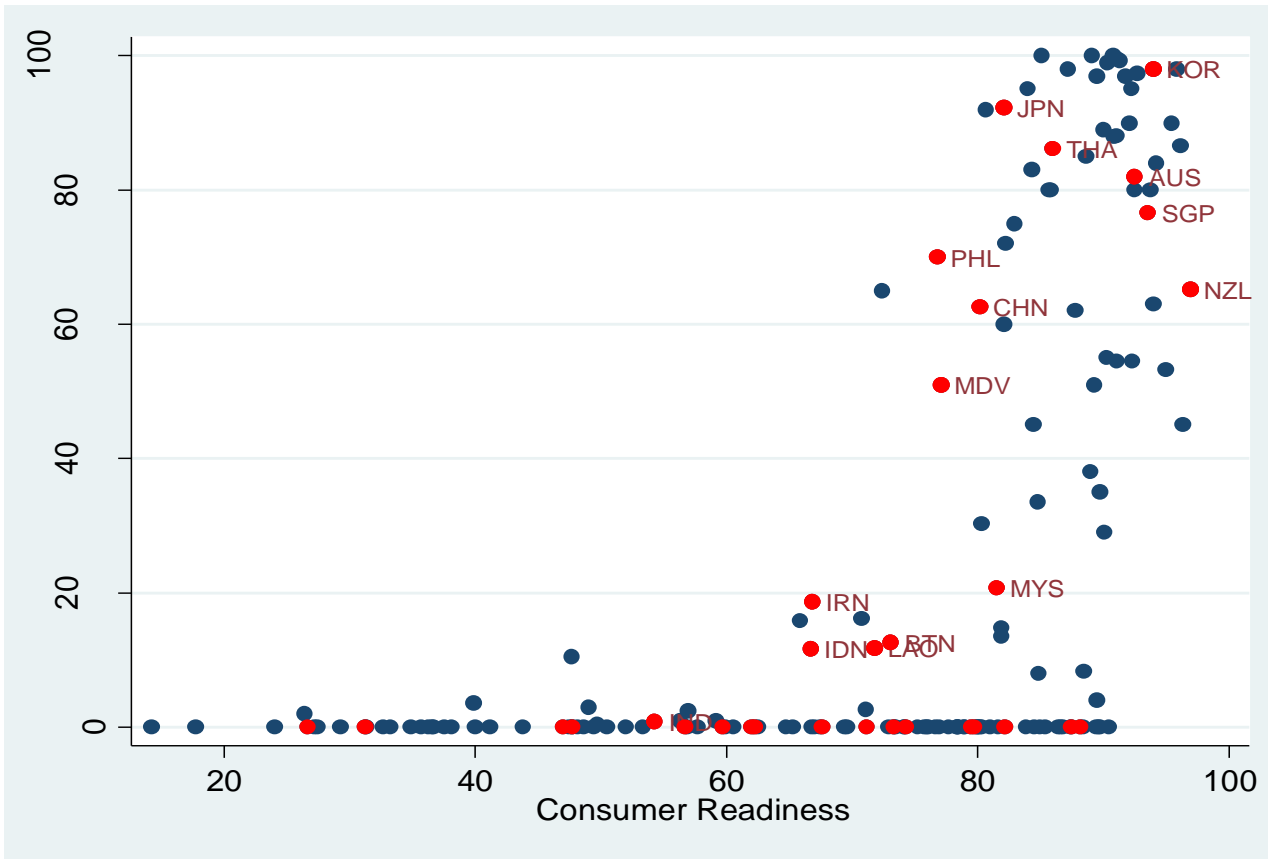| 115 Cs	Coef.	P-value	20 APAC	Coef.	P-value
gdppercapitareal	.001	0.000	gdppercapitareal	.001	0.039
ictgoodsexportsoftotalgoodsexpor	1.386	0.003	ictgoodsexportsoftotalgoodsexpor	1.35	0.108
ictgoodsimportstotalgoodsimports	-.40	0.582	ictgoodsimportstotalgoodsimports	-.70	0.725
ictserviceexportsofserviceexport	-.11	0.510	ictserviceexportsofserviceexport	-.43	0.290

(3) Regulatory & Policy
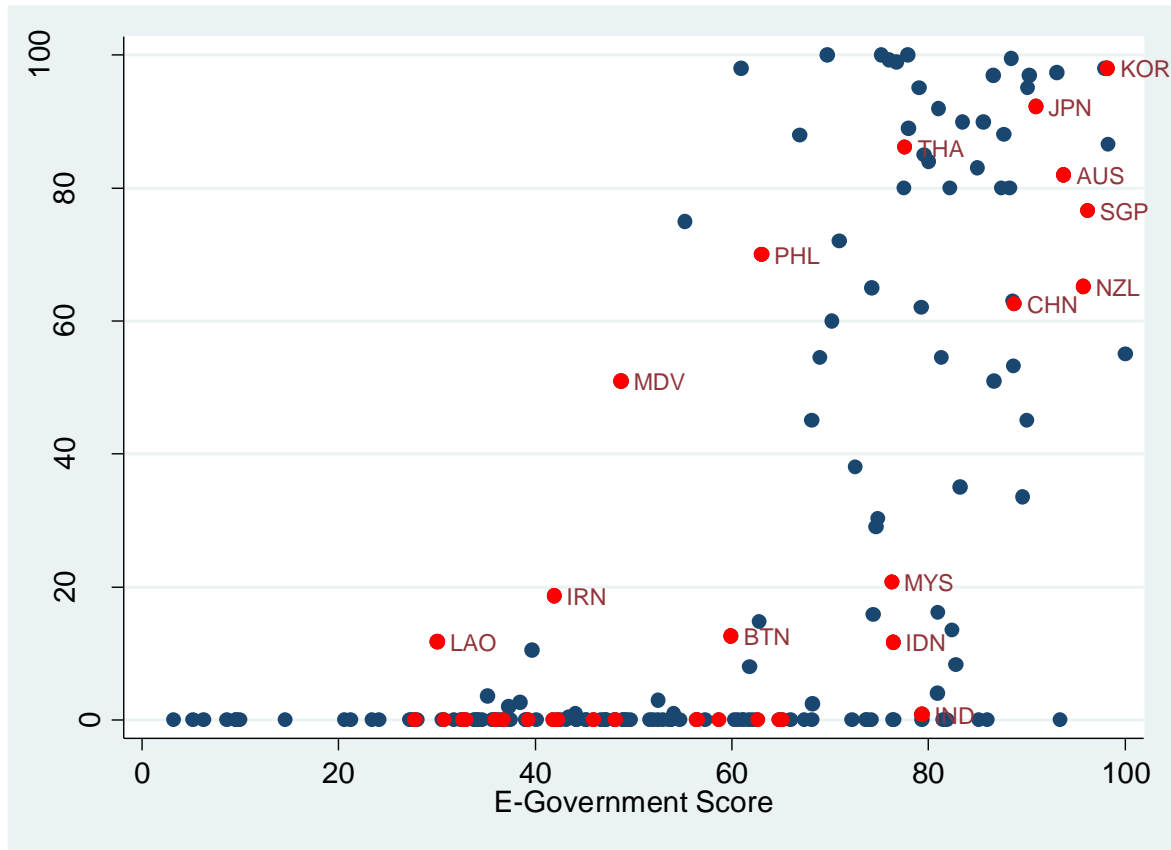
ALL 170 Cs	Coef.	P-value	32 APAC	Coef.	P-value
egovernmentscore	.249	0.049	egovernmentscore	.721	0.013
regulatoryqualityestimate	17.42	0.000	regulatoryqualityestimate	8.85	0.139

Socio-Cultural and Political Factors:

(1) Consumer & Ownership

consumerr eadiness	Coef.	P-value		Coef.	P-value
All 170 Cs	.31250	0.162	32 APAC	-.01478	0.949

mobileow nership	Coef.	P-value		Coef.	P-value
All 170 Cs	2.7902	0.000	32 APAC	2.1328	0.001

Socio-Cultural and Political Factors:

(2) Content & Services
(3) Governance & Stability
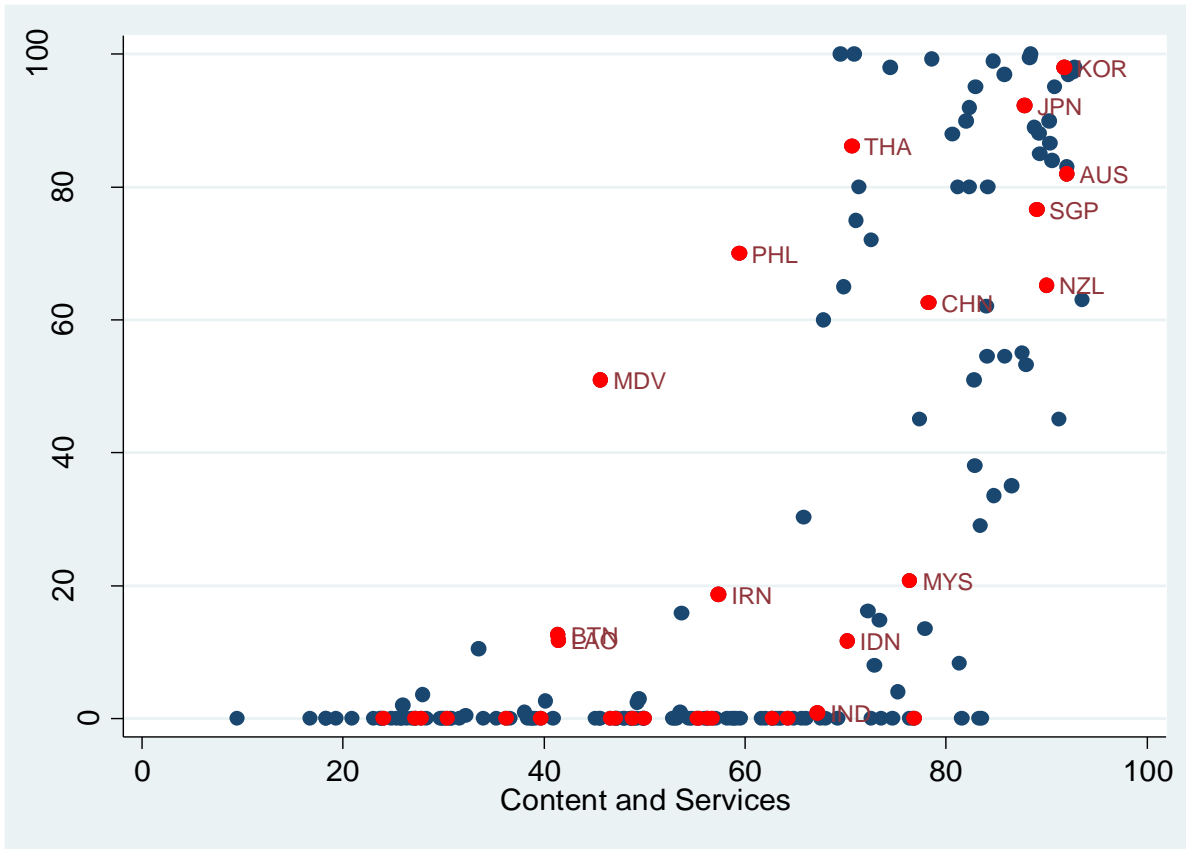
ALL 170 Cs	Coef.	P-value	32 APAC	Coef.	P-value
contentand services	-1.73	0.023	contentand services	-2.22	0.004
topleveldo mainstldsp erperson	1.57	0.082	topleveldo mainstldsp erperson	.67	0.264

ALL 170 Cs	Coef.	P-value	32 APAC	Coef.	P-value
genderequa lity	.56	0.000	genderequa lity	.53	0.042
governmen teffectivene ssestimate	7.07	0.482	governmen teffectivene ssestimate	-2.00	0.872
ruleoflawes timate	-14.98	0.266	ruleoflawes timate	67.97	0.005

Thank you!

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