DIGITAL CAREC: ANALYSIS OF THE REGIONAL DIGITAL GAP (PHASE I)

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Project Team

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Section 1 (Dr. Tofig Babyev)

- Objective and Purpose of the Assignment

- Methodologies: Methodology for Primary analysis

- Questionnaire for the analysis of the regional digital gap (1)

- Analysis of questionnaires & description of results

- Key findings

- Graphical Representation of Key findings by countries

- Digital Economy gaps

Objective and Purpose of the Assignment

The specific objectives of the study are:

❖ To provide a comparative analysis of the current situation of the digital economy with the potential in selected CAREC countries and to identify gaps for development and action.

❖ To analyze the "digital divide" among the selected CAREC countries and to provide a comparison with the rest of CAREC member countries and other regions.

❖ To identify major gap areas and opportunities for bridging the digital gap in the region.

Methodologies

- This study primarily contains two sections that used both primary (questionnaire-based) and secondary data analysis.

  - ❖ The first segment includes a questionnaire, which explores detailed attributes of digital divide in terms of *Digital Infrastructure, Digital Payments, eCommerce, Internet Access, and Digital Economy* using questionnaire-based data collected from six CAREC countries, i.e., *Afghanistan, Azerbaijan, Kyrgyzstan, Pakistan, Tajikistan, and Uzbekistan.*

  - ❖ The second section proposes the construction of a composite/cumulative digital divide index (CDDI) through Principal Component Analysis using secondary data from 2016 to 2020. CDDI integrates multidimensional aspects of the digital gap considering *Cost and Affordability, Access and Infrastructure, Internet Quality, Digital Security, Regulations, Digital FDI, and ICT output*. For CDDI, this study includes eight countries; *Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, and Uzbekistan*, while Afghanistan, Turkmenistan, and China were dropped due to data limitations.

Methodology for Primary analysis

- Primary data collection for quantitative measurement of the current situation in the digital economy within a given country:

  - ❖ questionnaire for examining the digital gap of selected CAREC countries

  - ❖ Analysis of the questionnaires and description of the results on the digital divide in the selected countries

  - ❖ Visualization of results through graphs, radars and charts describing each indicator by countries

- Identification of gaps based on the results of analysis

- Preparation of policy recommendations

Questionnaire for the analysis of the regional digital gap (1)

Two types of questionnaires were designed – a comprehensive and a short version with the most important indicators to cover 4 main sections and subsections:

1. Digital infrastructure
    - Digital Public Services
    - Integration of Digital Technology
    - Access to Digital Financial Services
2. Digital payments
3. eCommerce
    - eCommerce ecosystem
    - Trust, Security and Privacy
4. Internet access
    - Use of Internet

Questionnaire for the analysis of the regional digital gap (1)

1	2	3	4	5
#	Indicator/Questions	Choose appropriate option(s) and add explanation wherever asked for it	Source of data (name the publication and URL)	Comments (can also be described separately in additional Annex)
1. Digital Infrastructure				
		1. Digital Public Services		
1.	Are there any specific national strategy for digital infrastructure development?	Yes (pl. Provide details): No (pl. Explain why not:		
2. Digital payments				
1.	Amount of DFDI (in million USD) in the last 5 years in digital infrastructure (including digital payments).	_____		
3. eCommerce				
1.	Can SMEs as companies directly register on global marketplaces (such as Amazon, Alibaba, eBay, WISH etc., available in your country) to sell cross-border?	a) Yes available (pl. provide name of all those that are available. b) Not available (pl. provide reasons of unavailability:		
4. Internet Access				
1.	List recent major projects introduced or underway in the mentioned sector	a) _____ b) _____ c) _____ d) _____		

Questionnaire for the analysis of the regional digital gap (1)

***Interviewees*:**

- Ministry of Information Technologies (MIT)

- Statistical authority

- National postal operator

- Customs authority (agency)

- Tax/Fiscal Ministry or corresponding divisions of the Ministry of Finance

- Ministry of Economy (Trade)

- National (Central) Bank

- Cyber Security Authorities

- Local parcel delivery services

- Marketplaces available in selected countries selling cross-border

Analysis of questionnaires & description of results

- The most important indicators in each area of study selected or grouped into one general sub-indicator for assessment
- All the indicators are given in a single unit of measurement, i.e., percentage, between 0, 25, 50, 75 and 100.

0	25	50	75	100
The weakest indicator	Weak indicator	Medium indicator	Good indicator	The best indicator

# Key findings: Digital infrastructure

Indicators	Afghanistan	Azerbaijan	Kyrgyzstan	Pakistan	Tajikistan	Uzbekistan	Countries Average
1.1. National framework / availability of any specific national strategies for digital infrastructure development	100	100	100	100	100	100	100.0
1.2. Citizens using online public services	25	25	25	25	25	25	25.0
1.3. Amount of FDI in digital infrastructure	25	75	75	75	50	75	62.5
1.4. Country coverage with 4G network	50	100	100	75	100	75	83.3
1.5. Usage of new technologies in digital infrastructure	50	75	50	75	50	50	58.3
1.6. Availability of micro small and medium enterprise (MSMEs) innovation and digitalization hubs (techno parks, SEZs)	50	75	75	75	25	75	62.5
1.7. Availability of any eHealth methods	50	75	75	75	75	75	70.8
Average indicators	50	75	71.4	71.4	60.7	67.9	66.1
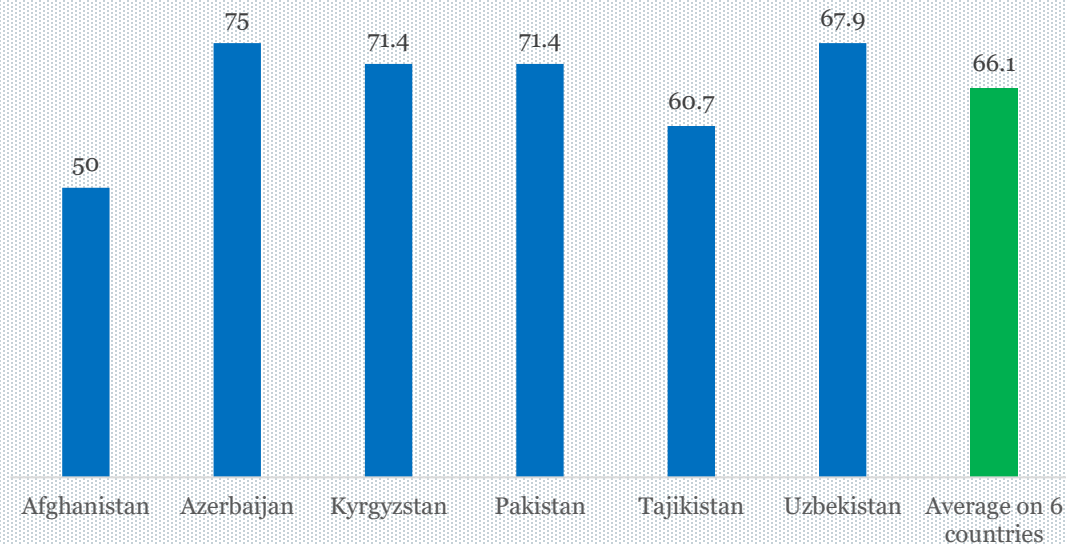
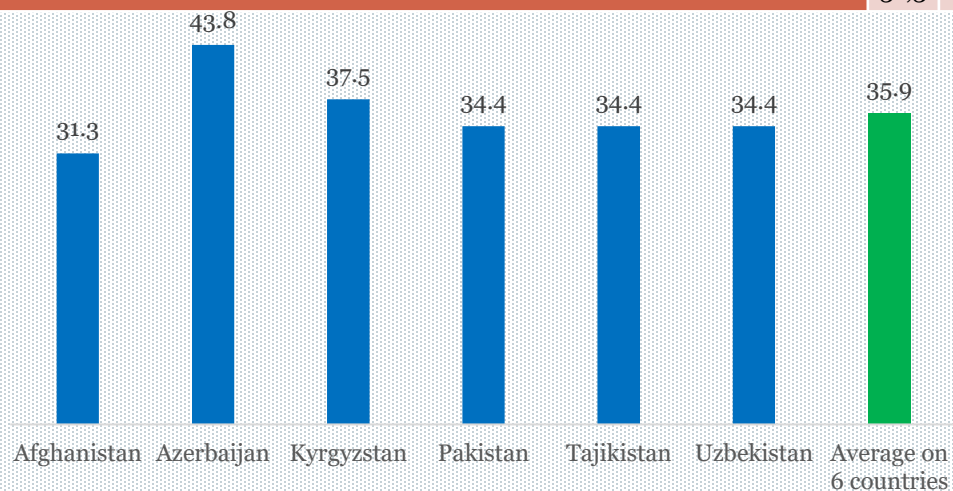# Key findings: Digital payments

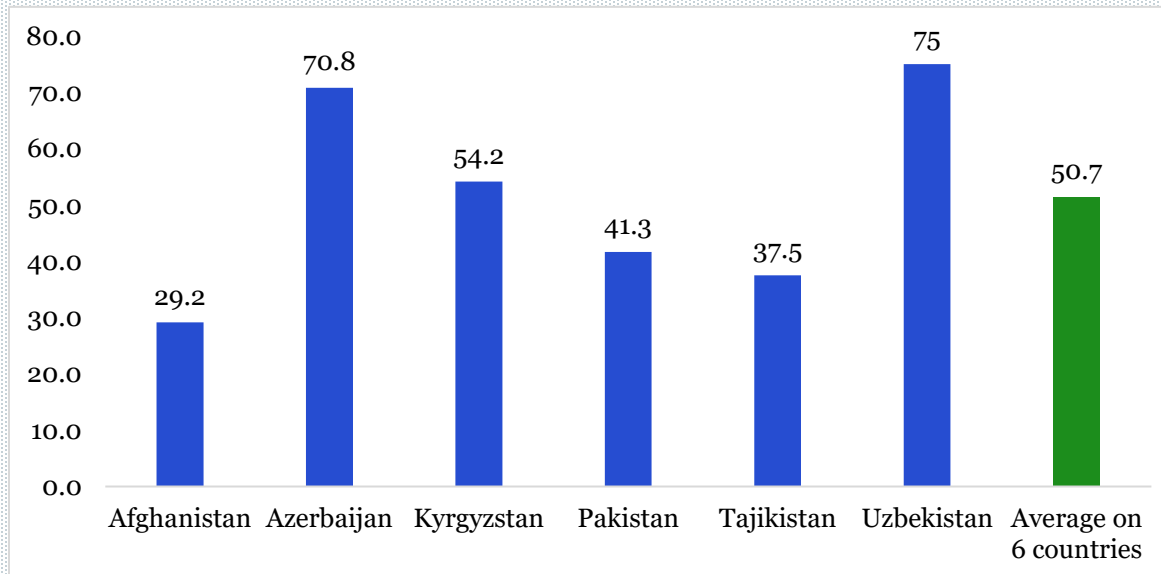| Indicators	Afghanistan	Azerbaijan	Kyrgyzstan	Pakistan	Tajikistan	Uzbekistan	Average on 6 countries
2.1. Volume of cashless payments	25	25	25	50	25	50	33.3
2.2.Digital financial products offered by financial service providers	50	50	50	50	50	50	50
2.3. Programs for increasing the volume of cashless payments	50	50	50	50	50	50	50
2.4. Availability of major payment methods used worldwide to sell and pay for goods on the major marketplaces	50	50	50	50	50	50	50
2.5. Digital banking services that help to process financial transactions and activities	50	75	75	75	75	75	70.8
2.6. Availability of specific programs or policies aimed at increasing the cashless payment volume	50	50	50	50	50	50	50
Average indicators	45.8	50	50	54.2	50	54.2	50.7
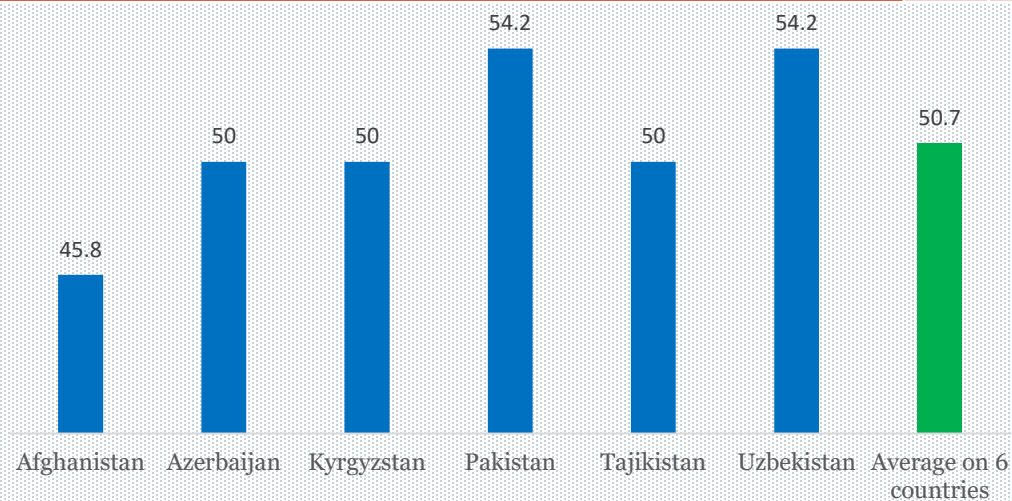
Key findings: E-commerce

Indicators	Afghanistan	Azerbaijan	Kyrgyzstan	Pakistan	Tajikistan	Uzbekistan	Average on 6 countries
3.1. Enterprises having a website with eCommerce functions	25	50	25	25	25	50	33,3
3.2. Can SMEs directly register on International marketplaces to sell cross-border	0	0	0	0	0	0	0
3.3. Key marketplaces in the country that allow to buy and sell cross-border	25	50	50	25	25	25	33,3
3.4. Individuals purchasing goods, services, or content over the Internet	25	25	25	25	25	25	25
3.5. Usage of advanced technologies in online sales	50	75	75	75	75	50	66,7
3.6. Legal framework for cross-border electronic data exchange between customs	50	50	50	50	50	50	50
3.7. What are the most common parcel delivery services used for cross-border & local parcels	75	75	75	75	75	75	75
3.8. Usage of E-Signature for cross-border operations	0	25	0	0	0	0	4,2
Average indicators	31,3	43,8	37,5	34,4	34,4	34,4	35,9

Key findings: Internet Access

Indicators	Afghanistan	Azerbaijan	Kyrgyzstan	Pakistan	Tajikistan	Uzbekistan	Average on 6 countries
4.1. Households using a fixed broadband Internet connection at home	0	100	75	50	25	100	58.3
4.2. Individuals using mobile devices to access the Internet away from home or work	50	75	50	50	50	75	58,3
4.3. Schools with internet Access (e-skills)	25	100	75	25	25	100	58,3
4.4. Share of enterprises with Internet access in total number of all enterprises	50	100	75	75	75	100	79,2
4.5. Individuals using the Internet for Internet Banking	25	25	25	25	25	50	29,2
4.6. Individuals using the Internet for selling of goods or services	25	25	25	25	25	25	25
Internet Access	29.2	70.8	54,2	41.3	37,5	75	50,7

Key findings and summary of results: Digital Economy

Area/indicator	Afghanistan	Azerbaijan	Kyrgyzstan	Pakistan	Tajikistan	Uzbekistan	Average for 6 countries
Digital infrastructure	50	75	71,4	71,4	60,7	67,9	**66,1**
Digital payments	45,8	50	50	54,2	50	54,2	**50,7**
E-commerce	31,3	43,8	37,5	34,4	34,4	34,4	**35,9**
Internet Access	29,2	70,8	54,2	41,7	37,5	75	**51,4**
Digital Economy	**39**	**59,9**	**53,2**	**50,4**	**45,6**	**57,8**	**51**

Digital economy
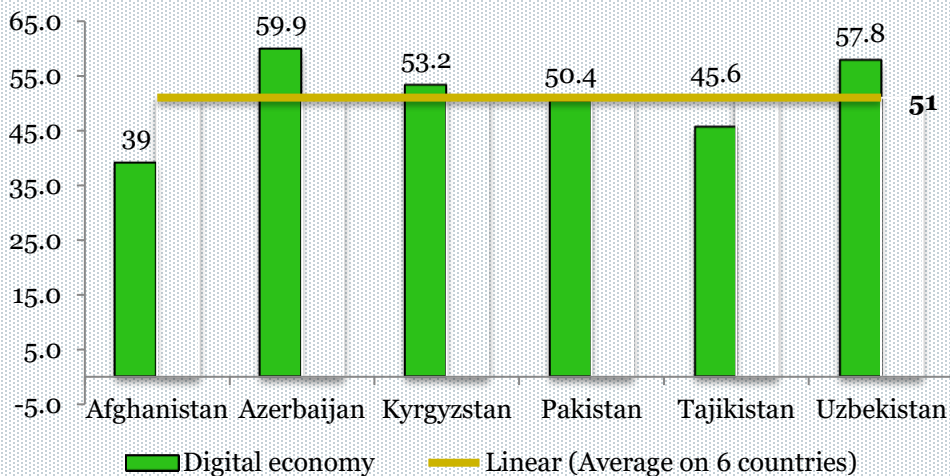
Graphical Representation of Key findings by countries

Average on 6 countries — Afghanistan

Average on 6 countries — Azerbaijan

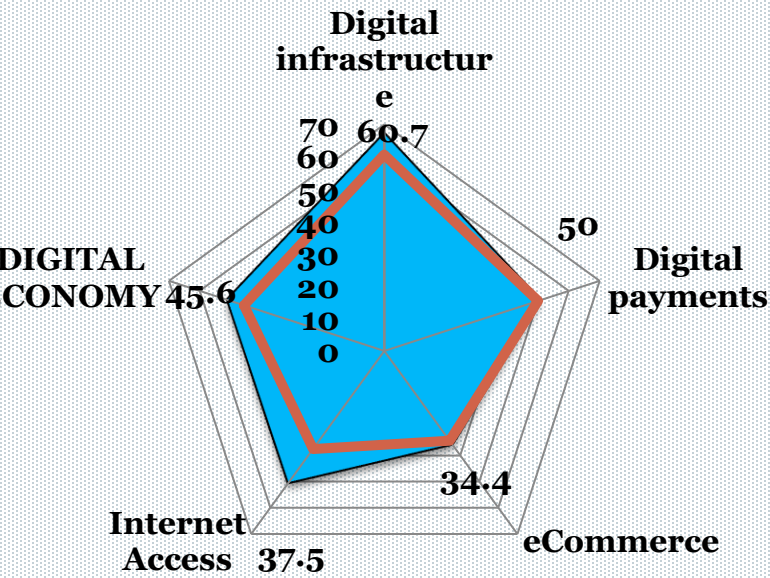# Graphical Representation of Key findings by countries

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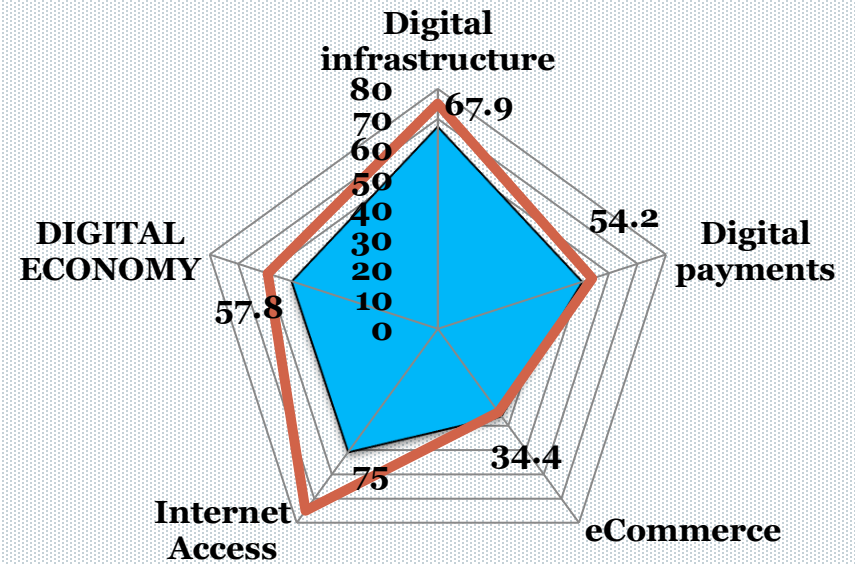
Digital Economy gaps

Digital Infrastructure	Internet access
• Lack of e-skills and cultural issues for use of online services • Low-level of public confidence in digital documents and services • Security concerns and Internet shutdowns • Most of remote areas do not have access to digital infrastructure • No precise data on the amount of FDI on different sectors/areas • Low-level use of digital technologies in the social sphere	• Lack of e-skills for using the Internet • No access to digital infrastructure due to poor connectivity or instability of electricity supply • High Internet costs • Problems with Internet accessibility in remote areas
E-commerce	**Digital Payments**
• Absence of e-commerce platforms to carry out cross-border trade • Inability to directly register on international marketplaces to sell cross-border. • Lack of institutional mechanisms for regulating e-commerce • Imperfect and insecure systems of online payments and lack of systems for delivery of goods and services • Slow or poor adaptation of the mobile or online payments. • Poor after-sales service & Consumer protection issues • Cases of counterfeit product sales. Unauthentic websites. • Poor marketing among the population • Lack of confidence in buying online, cyber security concerns • Lack of e-skills and trust in government structures. • In 2 out of 6 countries, the "green transport corridor" has not been introduced (this hinders the increase in cross-border trade) • Absence of a legal framework for cross-border electronic data exchange • Absence of e-signature use for cross-border transaction	• Lack of awareness on the use of cashless payment methods. • Lack of trust in online payments • Low level of cashless transactions • Limited digital banking services • Rapidly growing services require investment in infrastructure and legislative support • High restrictions on the transfer of money abroad, high threshold of the minimum service fee • Impossibility to register on international payment systems for receiving payments

Methodology for CDDI

- This study uses PCA to construct a cumulative digital divide index using several socio-economic factors for six CAREC countries *(Azerbaijan, Kazakhstan, Kyrgyz Republic, Pakistan, Tajikistan, and Uzbekistan).* These countries are selected based on the data availability of relevant indicators.

- Principal components (PC) approach reduces a large number of variables of interest into more meaningful (fewer) components or constructs, known as PCs, and picks only the first PC that explains the maximum proportion of variation in data relative to other component.

- This first PC is generally used as an index after being scaled by taking a deviation from the minimum value of this first PC and dividing this difference with the range (maximum minus the minimum value) of this selected PC to get the index in the range of 0 to 1 (see Razzaq et al. 2021; Razzaq et al. 2021a; Razzaq et al. 2021b for details).

Methodology for CDDI

Dimension	Abbr.	Explanation	Indicators
Cost and Affordability	COST&AFFORD	This covers cost and affordability of internet devices. The variables such as per capita GNI are measured considering the purchasing power parity.	Fixed broadband basket as % of GNI Per Capita Mobile-cellular basket % of GNI Per Capita Mobile broadband basket as a % of GNI Per Capita
Access and Infrastructure	ACC&INFR	This covers the two main aspects of digital divide, such as digital access and infrastructure.	Fixed broadband Subscriptions Fixed-telephone subscriptions Mobile Subscriptions Households with a computer at home (%) Households with Internet access at home (%) Individuals owning a mobile phone (%) Individuals using the Internet, total (%) Population covered by at least a 3G/4G mobile network (%)
Internet Quality	QUALITY	Quality of internet includes internet speed using different devices.	International bandwidth per Internet user (kbit/s) Monthly fixed broadband Internet traffic per fixed broadband subscription (MB) Monthly mobile broadband Internet traffic per mobile broadband subscription (MB)
Digital security	DIGSEC	Level of digital security and implementation and efficacy of regulations.	e-Commerce safety Trust in government websites and apps Trust in information from social media Trust in non-government websites and apps Trust in online privacy
Regulations	REGULATIONS	It covers the social, political, environmental and economic conditions in a country.	Institutional Quality index Ease of doing business index
ICT output	ICTOUTPUT	It indicates the trade associated with ICT and high-tech goods.	High-tech & ICT exports % of manufacturing exports
Digital Foreign Direct Investment	DFDI	Foreign direct investment flows from China to CAREC countries in ICT sector.	FDI in the ICT sector of CAREC countries

Section 2 (Asif Razzaq)

- Key Objectives

- Key Results

- Summary of CDDI

- Graphical Representation of Key indicator

- Graphical Representation of CDDI by countries

- Identified Digital Gap

- Comparison of Digital Gaps

Key Objectives

- The key objective of this section is to construct a composite/cumulative digital divide index (CDDI) through Principal Component Analysis using secondary data from 2016 to 2020.

- CDDI integrates multidimensional aspects of the digital gap considering ***Cost and Affordability, Access and Infrastructure, Internet Quality, Digital Security, Regulations, Digital FDI, and ICT output***.

- For CDDI, this study includes eight countries; ***Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, and Uzbekistan***, while Afghanistan, Turkmenistan, and China were dropped due to data limitations.

Key Results

- A lower CDDI score specifies a higher digital divide and vice versa.

- The average CDDI score exhibit that Kazakhstan and Georgia are the least digitally divided countries in the selected CAREC region with a cumulative average score of 0.868 and 0.798

- Azerbaijan and Mongolia are moderately divided in the digital spectrum with an average score of 0.562 and 0.480, respectively.

- Uzbekistan (0.306), Kyrgyz Republic (0.276), Pakistan (0.196), and Tajikistan (0.078) are the least performing countries in CDDI, confirming a higher digital divide.

- The sub-indicators results substantially varied across countries.

- Although Kazakhstan and Georgia secured the highest score in selected CAREC countries, however, demonstrate a substantial digital divide compared with other developed regions i.e., European Union, or China.

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Key Results

- Highest rank/Green highlighted cells show lower digital divide while lowest rank/Red highlighted cells indicate higher digital divide

Indicators	Azerbaijan	Georgia	Kazakhstan	Kyrgyz Republic	Mongolia	Pakistan	Tajikistan	Uzbekistan
Cost and Affordability	5	7	8	2	6	3	1	4
Access and Infrastructure	7	6	8	3	4	1	2	5
Internet Quality	3	8	6	7	2	5	4	1
Regulations	4	8	6	5	7	2	1	3
Digital Security	7	6	8	3	2	4	1	5
ICT Output	6	3	8	5	7	4	2	1
Digital FDI	1	2	8	3	6	7	4	5
`CDDI	6	7	8	3	5	2	1	4

Summary of Results

Country	Indices	Mean	SD	Median	IQR	Min	Max
Azerbaijan	Cost and Affordability	0.859	0.016	0.858	0.007	0.840	0.885
	Access and Infrastructure	0.902	0.013	0.903	0.019	0.887	0.919
	Internet Quality	0.236	0.039	0.236	0.022	0.175	0.279
	Digital security	0.276	0.039	0.265	0.043	0.231	0.331
	Regulations	0.663	0.278	0.660	0.381	0.279	0.951
	ICT output	0.112	0.041	0.109	0.058	0.067	0.168
	Digital FDI	0.001	0.002	0.000	0.003	0.000	0.003
	CDDI	0.562	0.043	0.550	0.050	0.510	0.620
Georgia	Cost and Affordability	0.811	0.077	0.856	0.133	0.724	0.882
	Access and Infrastructure	0.826	0.038	0.820	0.056	0.790	0.879
	Internet Quality	0.900	0.101	0.939	0.139	0.761	1.000
	Digital security	0.984	0.012	0.983	0.017	0.970	1.000
	Regulations	0.850	0.038	0.845	0.011	0.797	0.905
	ICT output	0.069	0.021	0.078	0.022	0.037	0.089
	Digital FDI	0.082	0.009	0.084	0.014	0.072	0.092
	CDDI	0.798	0.059	0.820	0.100	0.730	0.860
Kazakhstan	Cost and Affordability	0.975	0.032	0.990	0.022	0.920	1.000
	Access and Infrastructure	0.942	0.039	0.928	0.049	0.904	1.000
	Internet Quality	0.624	0.158	0.644	0.179	0.400	0.805
	Digital security	0.530	0.038	0.532	0.043	0.478	0.575
	Regulations	0.592	0.437	0.803	0.637	0.000	1.000
	ICT output	0.805	0.150	0.823	0.222	0.646	1.000
	Digital FDI	0.919	0.114	0.959	0.023	0.718	1.000
	CDDI	0.868	0.102	0.870	0.140	0.750	1.000

Summary of Results

Country	Indices	Mean	SD	Median	IQR	Min	Max
Kyrgyz Republic	Cost and Affordability	0.202	0.161	0.262	0.277	0.000	0.345
	Access and Infrastructure	0.401	0.087	0.425	0.103	0.274	0.492
	Internet Quality	0.533	0.218	0.522	0.309	0.290	0.820
	Digital security	0.408	0.009	0.407	0.013	0.398	0.421
	Regulations	0.230	0.128	0.166	0.103	0.133	0.443
	ICT output	0.312	0.188	0.213	0.305	0.141	0.547
	Digital FDI	0.189	0.025	0.184	0.033	0.163	0.225
	CDDI	0.276	0.112	0.280	0.180	0.150	0.410
Mongolia	Cost and Affordability	0.847	0.017	0.849	0.004	0.820	0.868
	Access and Infrastructure	0.447	0.160	0.476	0.262	0.273	0.636
	Internet Quality	0.138	0.086	0.119	0.101	0.038	0.258
	Digital security	0.683	0.028	0.691	0.015	0.636	0.707
	Regulations	0.180	0.155	0.143	0.156	0.000	0.403
	ICT output	0.418	0.336	0.450	0.392	0.084	0.911
	Digital FDI	0.540	0.126	0.462	0.158	0.445	0.730
	CDDI	0.480	0.102	0.470	0.150	0.380	0.620
Pakistan	Cost and Affordability	0.476	0.078	0.498	0.084	0.379	0.578
	Access and Infrastructure	0.058	0.044	0.063	0.042	0.000	0.118
	Internet Quality	0.419	0.232	0.428	0.378	0.189	0.715
	Digital security	0.122	0.056	0.116	0.080	0.063	0.197
	Regulations	0.408	0.145	0.380	0.106	0.256	0.638
	ICT output	0.049	0.005	0.048	0.004	0.042	0.055
	Digital FDI	0.657	0.076	0.634	0.078	0.561	0.756
	CDDI	0.196	0.098	0.140	0.140	0.110	0.330

Summary of Results

| Country	Indices	Mean	SD	Median	IQR	Min	Max
Tajikistan	Cost and Affordability	0.197	0.200	0.082	0.332	0.004	0.423
	Access and Infrastructure	0.185	0.021	0.185	0.026	0.159	0.211
	Internet Quality	0.406	0.178	0.395	0.257	0.214	0.642
	Digital security	0.060	0.046	0.053	0.041	0.000	0.123
	Regulations	0.135	0.079	0.145	0.092	0.027	0.230
	ICT output	0.024	0.026	0.015	0.025	0.000	0.064
	Digital FDI	0.228	0.045	0.257	0.044	0.154	0.257
	CDDI	0.078	0.079	0.080	0.130	0.000	0.180
Uzbekistan	Cost and Affordability	0.638	0.229	0.759	0.299	0.302	0.831
	Access and Infrastructure	0.558	0.120	0.565	0.115	0.381	0.698
	Internet Quality	0.088	0.082	0.074	0.112	0.000	0.201
	Digital security	0.132	0.079	0.118	0.115	0.056	0.242
	Regulations	0.464	0.310	0.660	0.515	0.090	0.729
	ICT output	0.024	0.026	0.015	0.025	0.000	0.064
	Digital FDI	0.310	0.168	0.370	0.290	0.124	0.488
	CDDI	0.306	0.153	0.400	0.200	0.090	0.440
Overall CAREC Region	Cost and Affordability	0.626	0.310	0.779	0.468	0.000	1.000
	Access and Infrastructure	0.540	0.321	0.536	0.641	0.000	1.000
	Internet Quality	0.418	0.290	0.326	0.467	0.000	1.000
	Digital security	0.399	0.306	0.365	0.485	0.000	1.000
	Regulations	0.440	0.319	0.355	0.605	0.000	1.000
	ICT output	0.227	0.293	0.081	0.287	0.000	1.000
	Digital FDI	0.366	0.308	0.257	0.512	0.000	1.000
	CDDI	0.446	0.283	0.405	0.495	0.000	1.000

Graphical Representation of Key Indicators
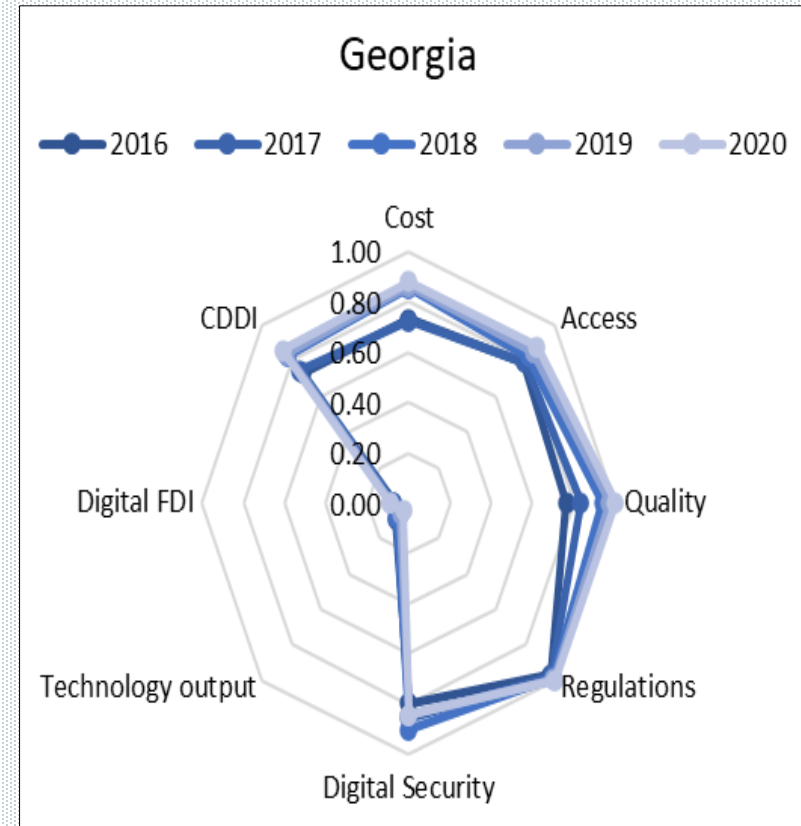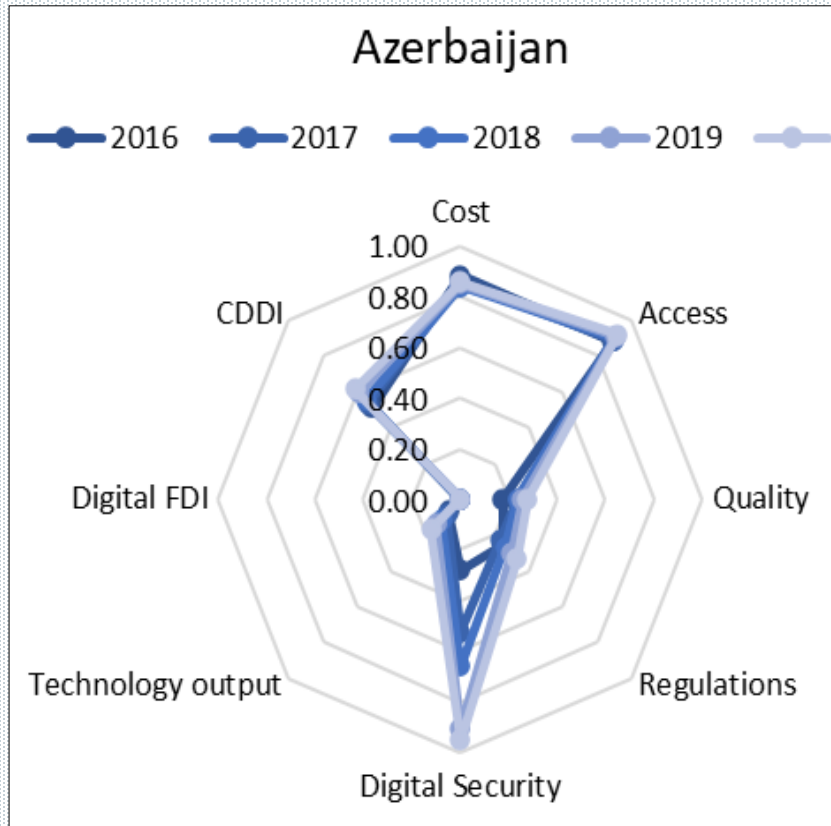
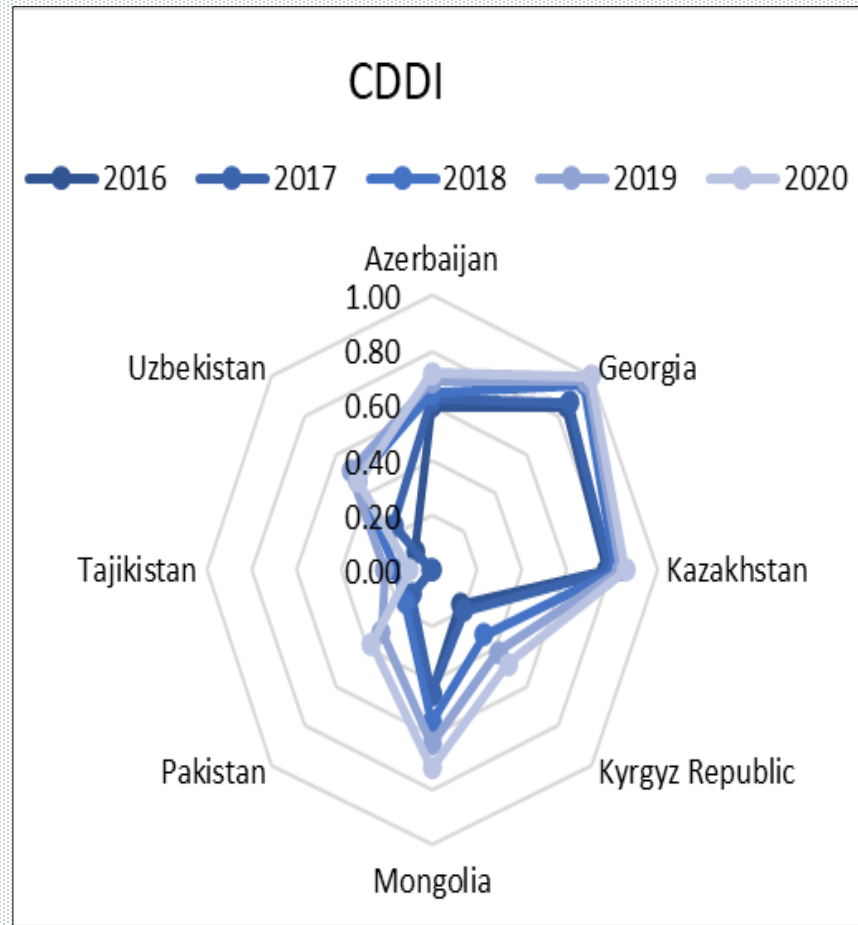# Graphical Representation of Key Indicators
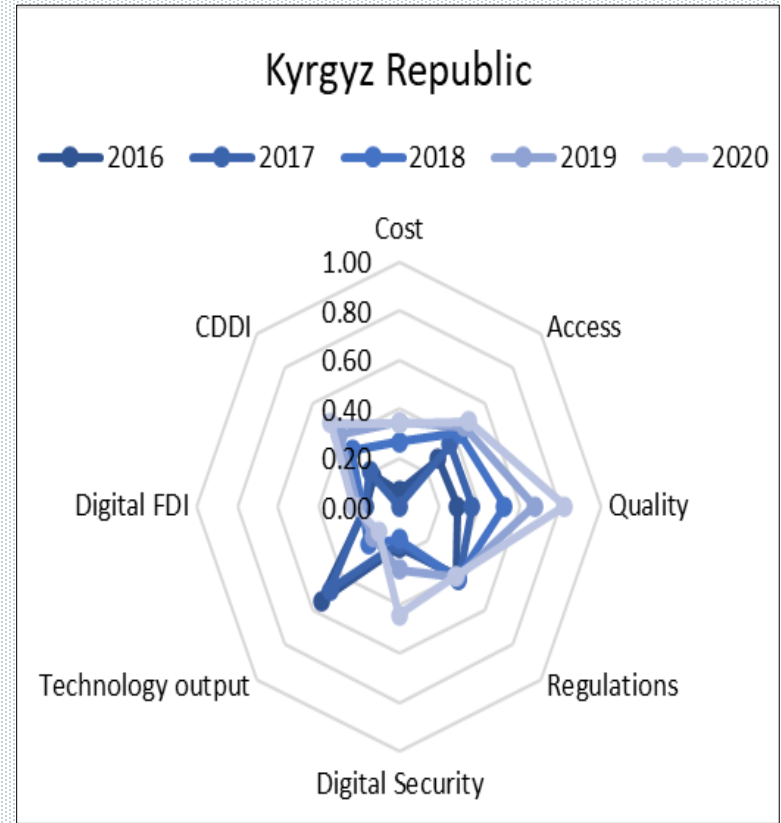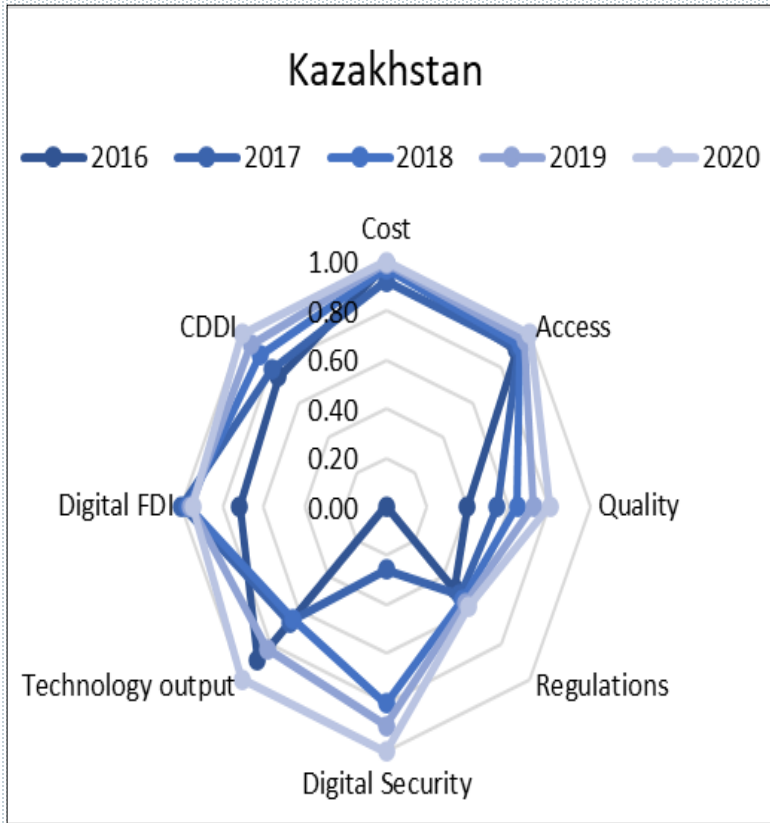
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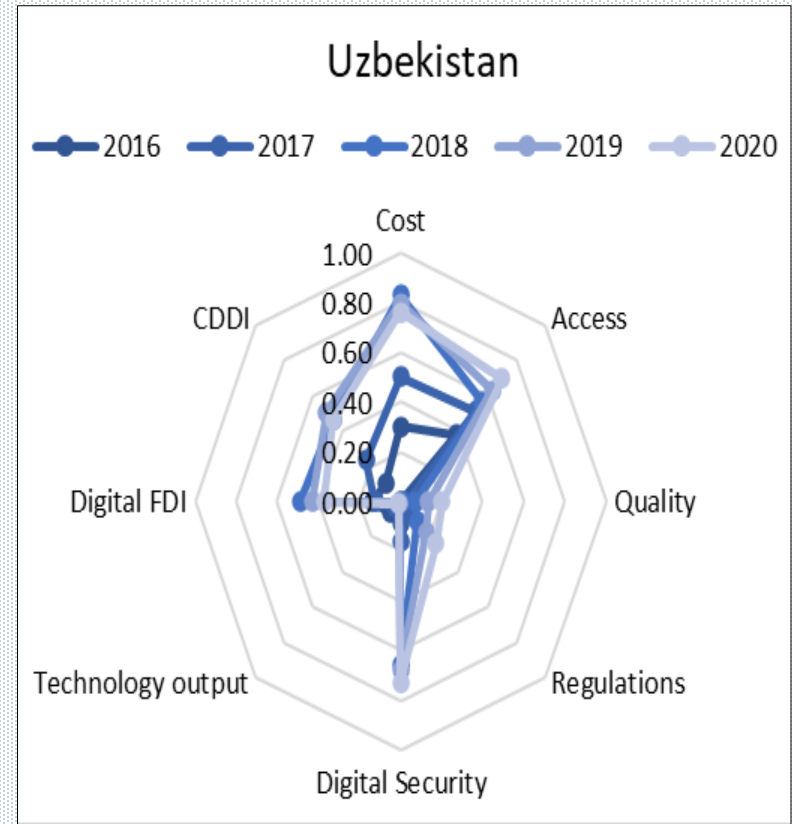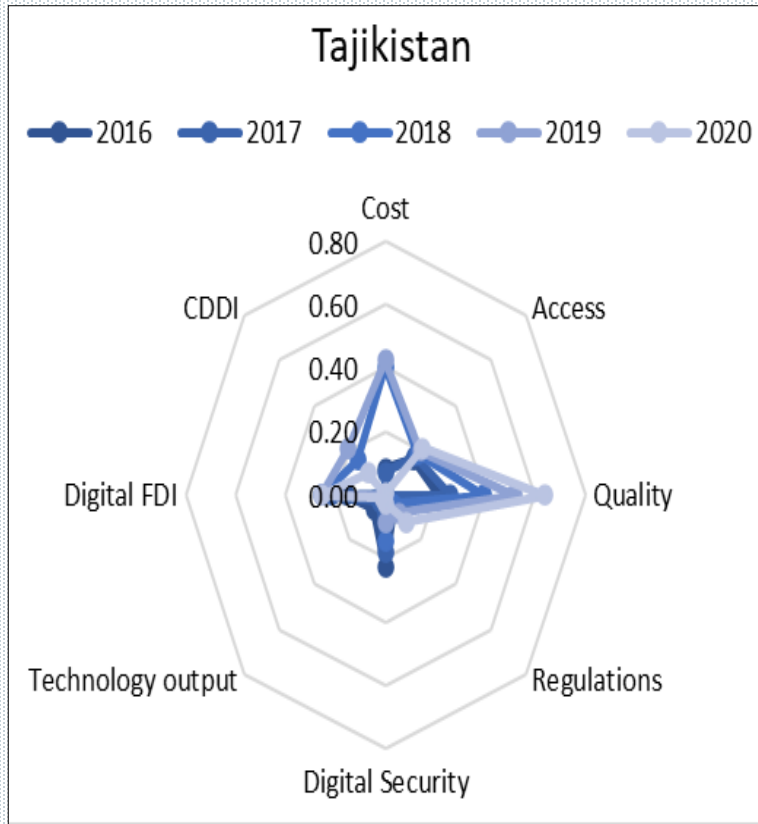
Graphical Representation of Key Indicators
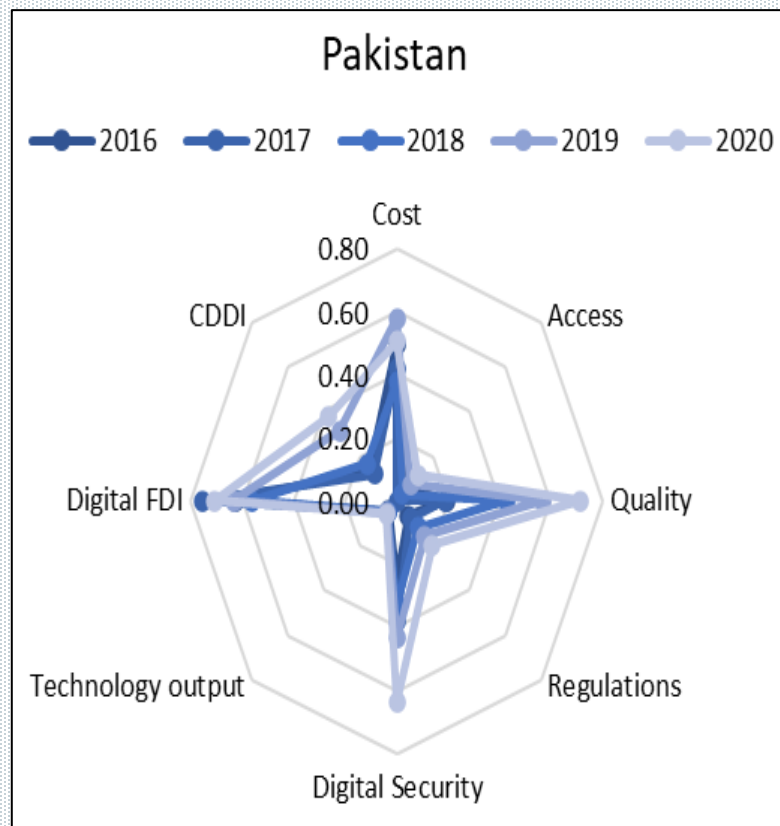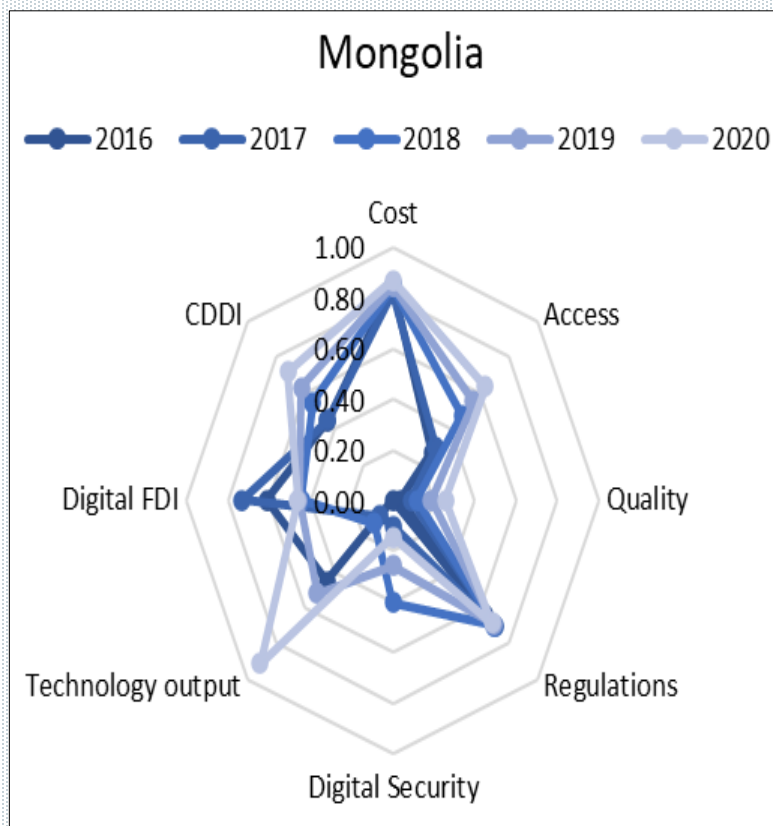
Graphical Representation of CDDI across Countries

Identified Digital Gaps

Tajikistan, Pakistan, and Kyrgyz Republic

- Higher cost of internet limits a large segment of society to remain digitally disconnected. Affordability is one of the imperious factors that reduce internet penetration. It has the lowest score in "cost of internet" compared to other CAREC countries.
- Weak access and infrastructure are the most vulnerable segment of digital divide, which requires a substantial amount of fixed asset investment from domestic and foreign sources.
- Weak institutional quality and business regulations failed to create a conducive environment for individuals and businesses to adopt and disseminate digital technologies at a national scale.
- Digital security is another lagging area, particularly in Tajikistan, which caused eCommerce failure, bad reputation, consumer mistrust, reputational damages, cyber-attacks, financial burglaries, and so on.
- No export diversification and almost zero ICT related output, which indicates lack of basic education, industrial structure and absorption capacity to adopt, imitate and produce digital technologies.

Identified Digital Gaps
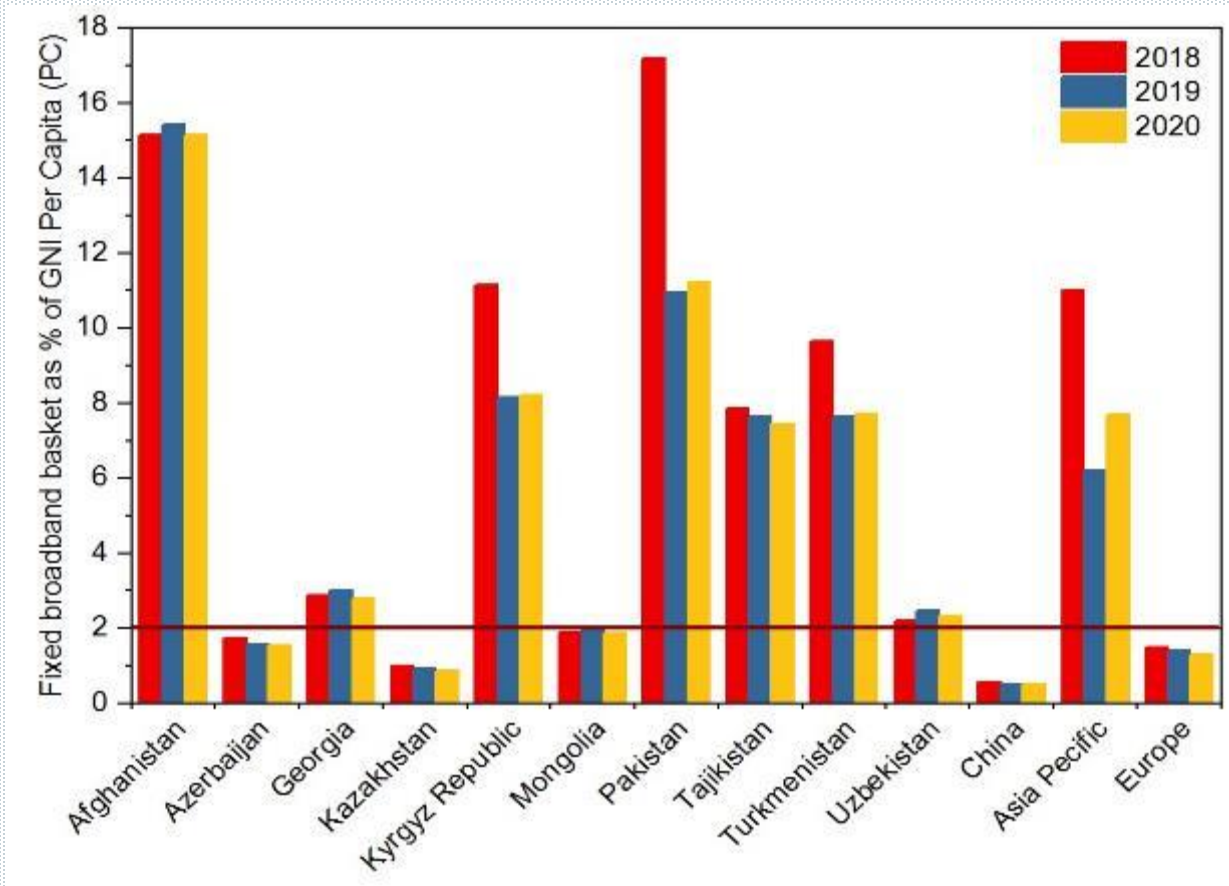
Uzbekistan, Mongolia, and Azerbaijan

- Lower internet quality leads to poor service deliveries in eCommerce, inefficient logistics, and disruption in daily business operations. Failed to effectively integrate with virtual education, learning, and reverse technology spillovers.
- Digital security is another gray area in Mongolia, while Azerbaijan and Uzbekistan possess a moderate level of digital security.
- Weak institutional framework of these countries is one of the key socio-economic challenges, which create bottlenecks for business operations, encourage rent-seeking behavior and corruption, discourage innovation and adoption of digital technologies.
- Uzbekistan and Mongolia are lagging in Access and infrastructure and failed to embrace reasonable digital FDI inflows and consequently higher ICT infrastructure gaps.
- ICT-related industrial output is imperious to transform an industry from primary exports (natural resources) to technology exports. Many CAREC countries are rich in natural resources and less diversified in exports, translating into lower demand for ICT skills and the job market.

Identified Digital Gaps

Kazakhstan and Georgia

- Although these countries are the best performing countries in the CAREC region and report a lower digital divide than their counterparts. However, if we compare with other emerging countries such as China or the EU, there is significant potential for digital improvement in digital access, infrastructure, quality, and security.

- Also, Kazakhstan is lagging in institutional quality score, while Georgia is the only exception and best performing county in institutional governance in the CAREC region. However, it has the lowest score in technology-related output.

- Thus, best-performing countries in the CAREC region are also lagging in certain dimensions compared to other developed regions.
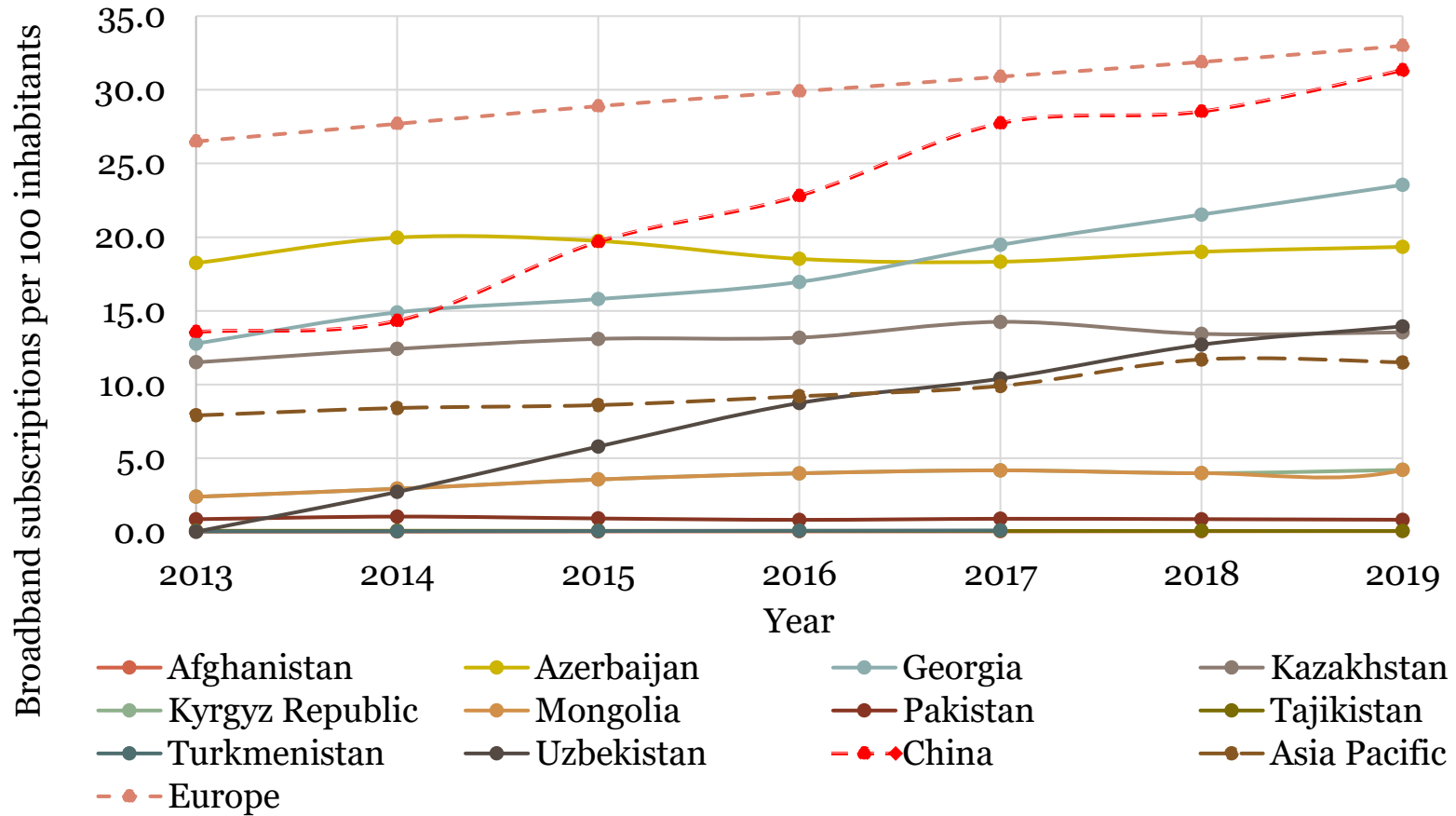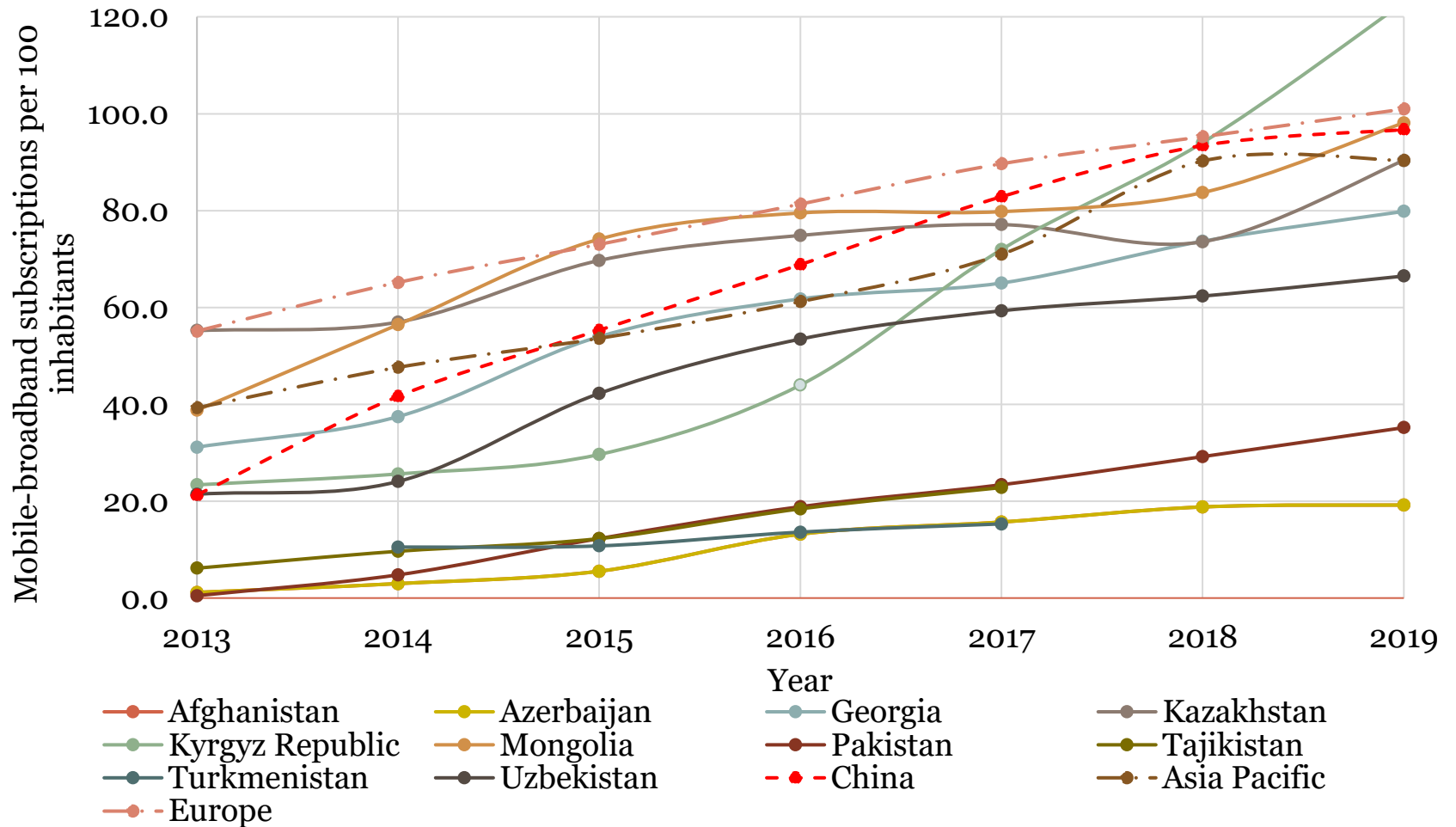
Comparison of Digital Gaps
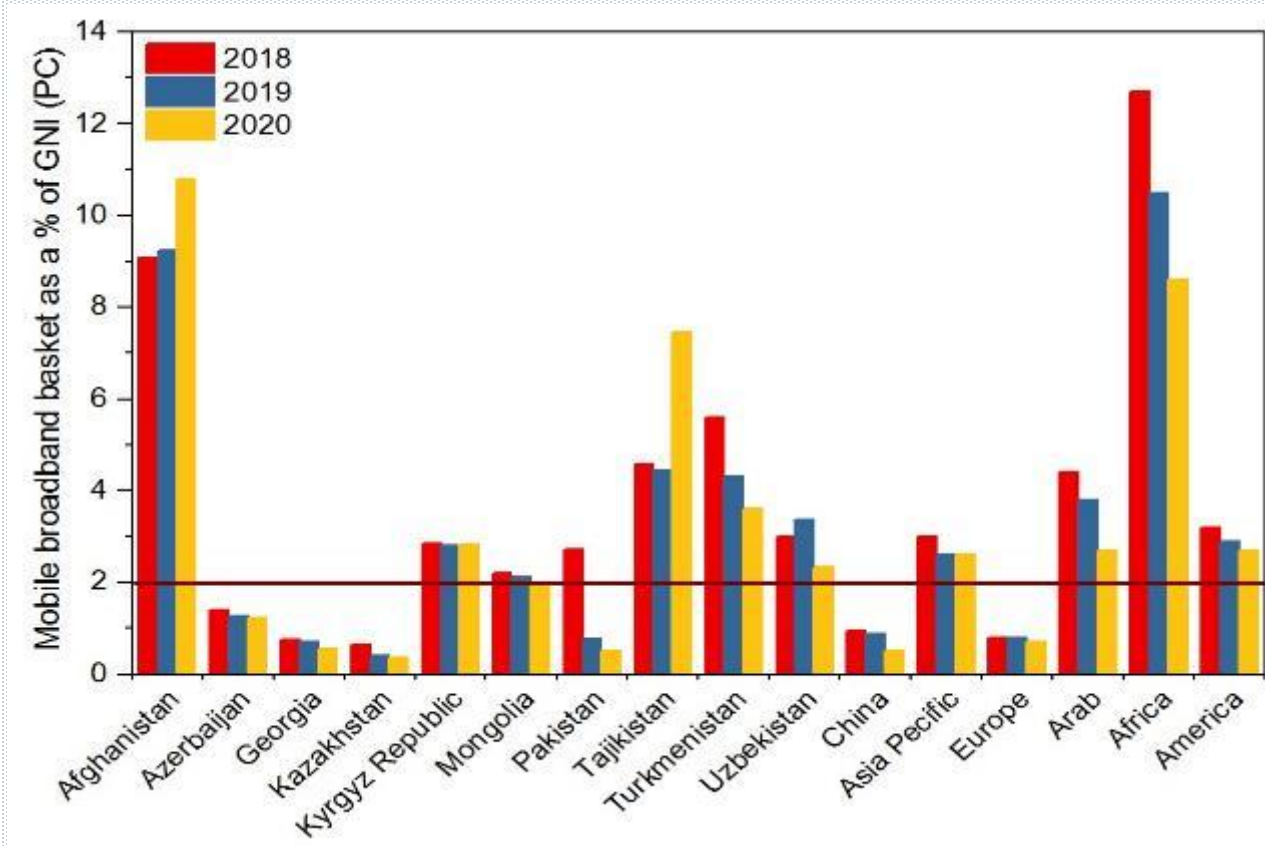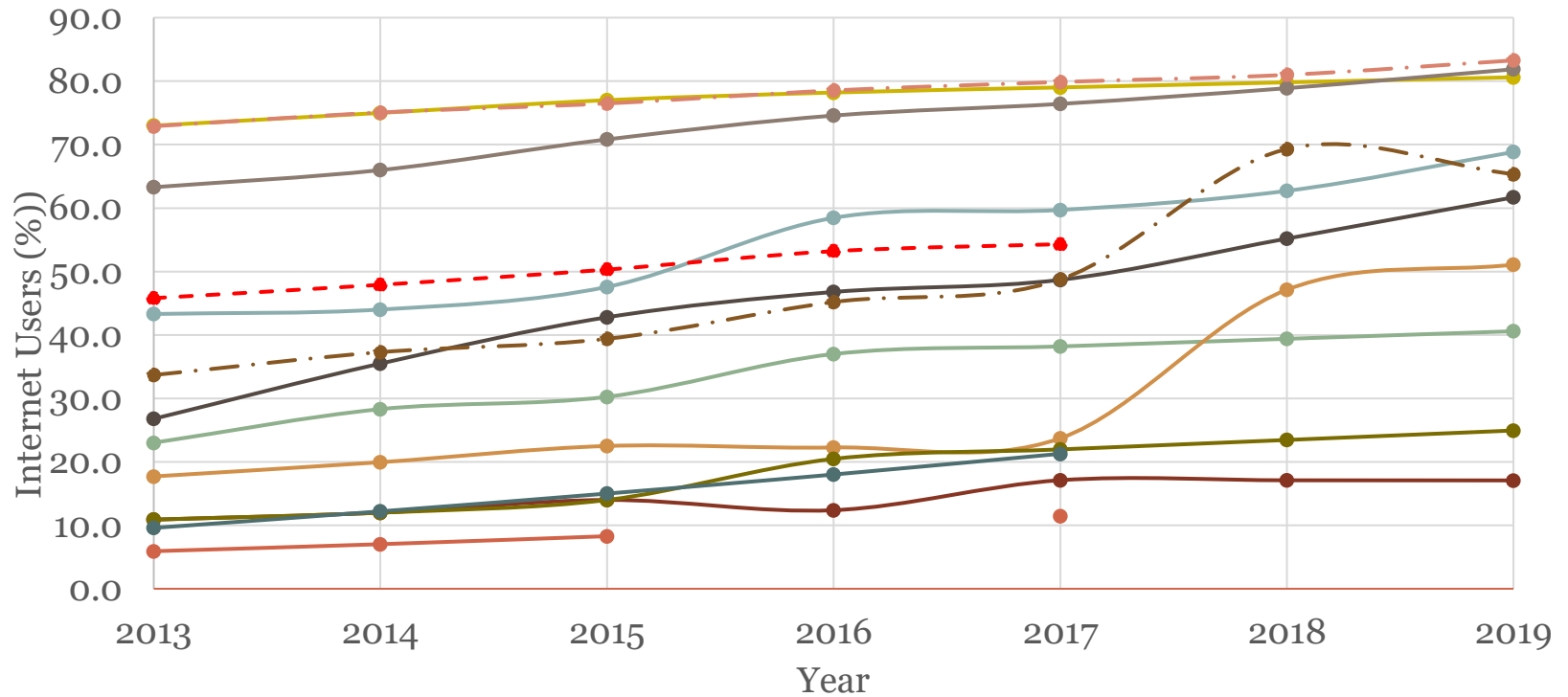
Comparison of Digital Gaps

Comparison of Digital Gaps

Comparison of Digital Gaps

Comparison of Digital Gaps

Comparison of Digital Gaps
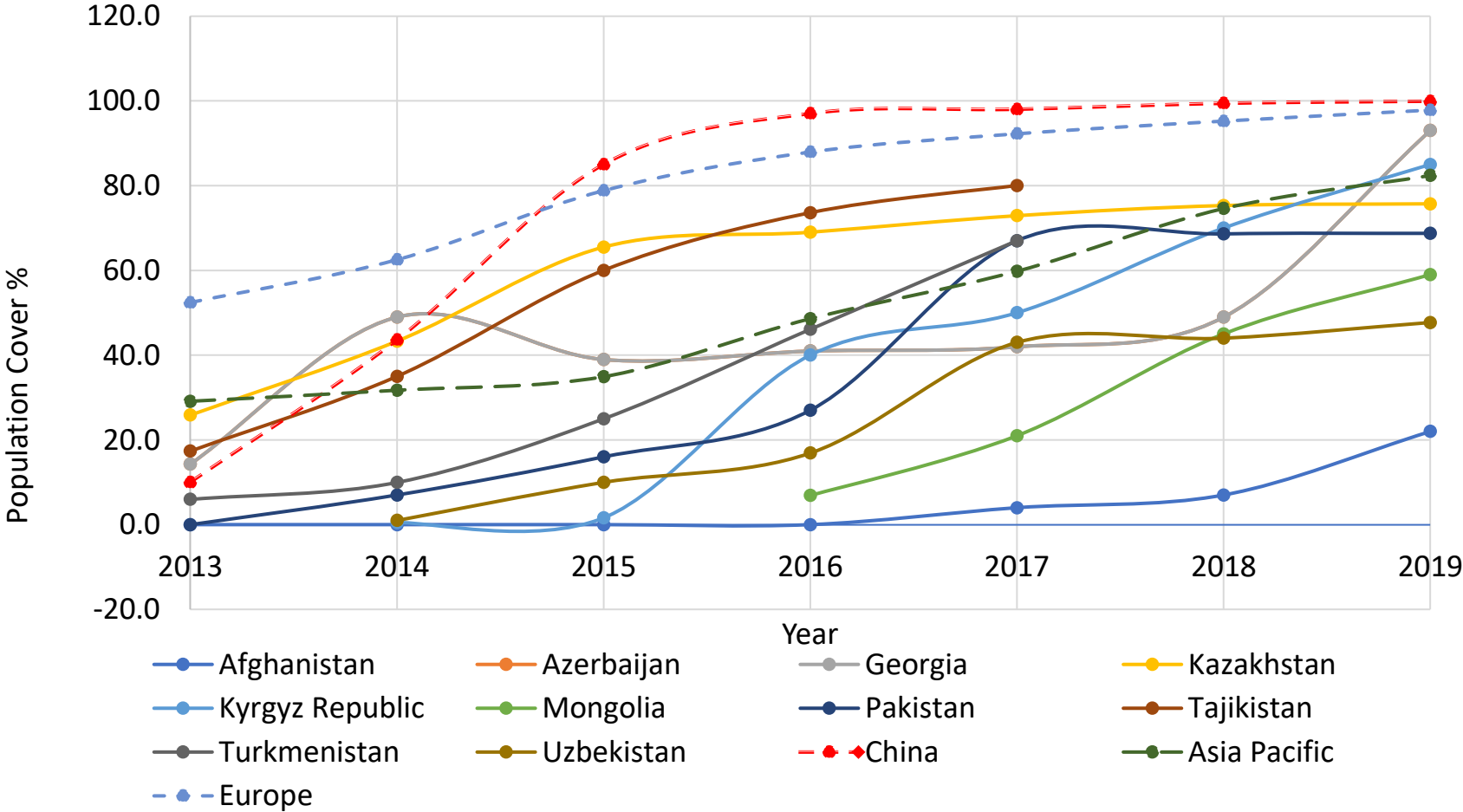
Section 3 (Dr. Qaisar Abbas)

- Policy Recommendations

- Limitations and Future Directions

Policy Recommendations

Digital Infrastructure
- Digital infrastructure is a basic foundation of the digital divide on which subsequent gaps formed. Thus, expansion of internet (4G) coverage across the whole territory and test the launch of 5G networks. For this, Public-Private Partnership is an optimal solution to fund and manage infrastructure expansion projects. Afghanistan, Turkmenistan, Mongolia, Uzbekistan, and Pakistan are falling behind their peer countries in 4G network coverage. Although the gap is squeezing, however, needs substantial investment to speed up the process.
- Government needs to allocate dedicated funds or subsidize ICT industries to develop business-oriented infrastructure for e-commerce development. i.e., transmissions lines, network stations, and compatibility with the existing digital network (All countries).
- Establish backbone networks, Internet exchange points, data centers, and the cloud (All countries).
- Replace conventional cable-based transmissions with fiber optic to increase internet (upload/download) speed (Mbps) (Afghanistan, Pakistan, Tajikistan).
- Encourage Multinational firms to invest in the (digital FDI) ICT sector by offering lucrative tax rebates and swift approvals for new ventures from respective ministries through one-window operations (All countries).

Policy Recommendations

Internet access

- Weak access and infrastructure are the most vulnerable segment of the digital divide, which requires a substantial amount of fixed asset investment from domestic and foreign sources. It also relies upon consumer buying capacity, basic education, and skills to learn, adapt and utilize IOTs. Afghanistan, Pakistan, Tajikistan, Kyrgyz Republic, Uzbekistan, and Mongolia have a higher divide in internet access and infrastructure, which entails effective government intervention to tackle.
- Increase the access to computers at the household level. For this, financial institutions may offer consumer loans and provide computers, laptops, smart phones, printers in easy installments. Besides laptops and computers, ICT equipment can be zero-taxed to decrease retail prices or promote local assembling.
- Introduced lucrative household internet packages. Particularly in those areas, where exiting digital infrastructure is underutilized as a major cost of internet service providers has pertained to fixed capital investment.
- Conduct wide awareness-raising campaigns to:
  - Educate people (consumer and businesses) on the use of the Internet, online services, payment procedures, make online transactions, and enable trust in virtual trading.
  - Increase the level of public confidence in digital transactions
- Review and reduce Internet tariffs to increase Internet usage and number of active Internet users.

Policy Recommendations

Internet Cost and Affordability

- Regularization of internet cost (less than 2 % threshold of Gross National Income) as per target of UN Broadband Commission. Notably, the cost of the internet is too high in Afghanistan, Kyrgyz Republic, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan. In CAREC regions, only China, Georgia, and Azerbaijan are exceptional countries where internet costs are within the accepted threshold.
- Sales tax waiver for consumers on recharge of mobile and broadband internet packages can help to reduce internet cost.
- A national blanket policy for affordable internet is required to achieve low-cost internet targets.

Policy Recommendations

Digital Payments
- Ensure the wide range of major payment methods used worldwide to sell and pay for goods on the major marketplaces (All countries).
- Strengthen the legal framework for cashless payments, implement programs and marketing campaigns to increase the volume of cashless payments (All countries).
- Increase the use of digital technologies in social spheres (All countries).
- Introduced the drive of virtual economy across the whole supply chain (manufacturing, wholesaling, retailing), where each transaction pair will be connected through a digital framework.
- Government may follow the famous quote "charity begins with home" to expand digital penetration by restricting all public offices to make virtual payments, documents submissions, clearance of contracts, salaries disbursements, financial appraisals, claims, etc.

Policy Recommendations

eCommerce

- Develop a dedicated eCommerce framework (development strategy, programs) aligned with SDG 9c (All countries).
- Support funding for startups and small businesses especially engaged in e-trade activities (All countries).
- Developing a digital e-commerce platform meeting the international standards for cross-border trade (All countries).
- **Work on strengthening consumer protection issues (All countries):**
  - ❖ Return of goods purchased online
  - ❖ Introduce e-court system in charge of e-trade disputes
- Further development of e-commerce infrastructure:
  - ❖ Implementation of the pilot project EU4Digital Virtual warehouse in CAREC countries to develop cross-border trade between CAREC and European countries.
  - ❖ Make appropriate measures in legislation to ensure the use of international payment methods and cards (All countries).
- Introduce cross-border electronic data exchange between customs agencies (Kyrgyzstan, Tajikistan, Uzbekistan)
- Introduce "green transport corridor" system/approach (Afghanistan, Uzbekistan).
- Ensure the use of digital services, especially e-signature for cross-border transactions All countries except for Azerbaijan)

Policy Recommendations

Digital Security
- On legal grounds, cyber security regulations need to be implemented and updated regularly. Most of the CAREC countries secured the lowest score in digital security. Particularly, Afghanistan, Kyrgyz Republic, Mongolia, Tajikistan, Turkmenistan are the most vulnerable countries in e-Commerce safety, trust in government websites and apps, trust in information from social media, trust in non-government websites and apps, and trust in online privacy. Therefore, it is recommended an inclusive digital security policy that adheres to all of these concerns.
- On technical grounds, Increase the number of secured internet servers.
- At the organizational level, implementation of the company's cyber security framework.
- Established dedicated hierarchy of cyber security under IT ministry for evaluations.
- Increase awareness of cyber security to control scams, hacking, and digital frauds.
- Public-Private Partnership is imperious in designing and implementing national cyber security framework and their implementations.

Policy Recommendations

Regulations and governance

- The CAREC region is more susceptible to overall regulations and governance. None of the country secured a positive score in the institutional regulation index (-2.5 + 2.5 worse to best) except Gregoria. Afghanistan, Turkmenistan, Tajikistan, Pakistan, Uzbekistan and Kyrgyz Republic have the poorest institutional quality and business regulations, thus failing to create a conducive environment for individuals and businesses to adopt and disseminate digital technologies.
- Encourage conducive environment for individuals and businesses through:
  - ❖ Efficient legal system and property rights protection.
  - ❖ Consistent policies and inclusive digital regulations for the continuation of long-term digital development.
  - ❖ Legal provision for continuation and implementation of digital development projects.
  - ❖ A certain percentage of the annual public budget may allocate to digital infrastructure and access across underdeveloped (rural) and digital backward areas and industries.

Policy Recommendations

Regional Integration

- Regional integration is one of the imperious factors that help countries overcome divisions that impede the flow of people, technology, ideas, goods, and services. Disintegration leads to a higher digital divide, particularly in developing economies. Thus, sequester measures are required to integrate CAREC countries with other technology leading countries. For this, harmonization of regulatory policies is a stepping stone to promote and establish an inclusive connectivity network for virtual and physical technology transfer.

- Regional integration helps to increase export diversification through technology spillovers from source to host countries. Most CAREC countries are less diversified, embodied with lower technological levels, operating at lower-end economic models, a heavy reliance on natural resources, and exports of primary products. Therefore, regional integration in trade, investment, connectivity, institutional, and social aspects help to remove these bottlenecks, leading to higher technology spillovers from technology leaders and resultantly lower digital backwardness.

Limitations and Future Directions

Although this study attempts to estimate possible dimensions of digital divide in selected countries, however there are following limitations that can be considered for future projects/studies:

- The study was conducted within a limited time and due to higher stringency measures and limited data availability, only selected CAREC countries are evaluated. Future projects may expand to all CAREC countries and a comparative analysis would be performed with digitally advanced countries.
- Although the questionnaire included over 80 questions in multiple domains, however, only 37 of them were collected for digital gap assessment. Future studies may consider those remaining uncollected indictors or introducing new indicators (replacing some indicators) to fully reflect the digital gap situation in CAREC region.
- Digital divide is a multidimensional phenomenon and includes various dimensions and socio-economic indicators that are not evaluated in this study, such as poverty, income inequality, gender inequality, household income, human capital development, budgetary allocations in ICT sector, R&D allocations, global FDI in ICT industry, education and skills level of inhabitants, and taxation policies of ICT sector etc. Therefore, future projects may expand the cumulative digital divide index considering new dimensions of digital divide.

Limitations and Future Directions

- This study is estimated digital divide using national level aggregate indicators and do not incorporate digital gap within a country considering income inequality, gender inequality, and rural urban inequality. Future projects may study sub-national or regional digital differences within a country based on suggested indicators.

- It would be advisable to provide an instrument (program) implementing the proposed method (for questionnaire data processing and cumulative digital divide index) so that this would not be a single-use study but could be used when new data is acquired (for example, next year), and so that the list of sub-indicators could be altered and new indicators could be taken into account if necessary. Moreover, the proposed digital divide index can be estimated yearly to evaluate the increase or decrease in digital development.

- Although this study highlight the overall score of key indicators such as digital FDI, which can derive and be driven by other factors of digital economy. However, there is a need of in-depth analysis to identify enabling factors, regulations, and strategies to maximize digital FDI across all sectors of digital economy. Digital enterprises have distinct business models than traditional FDI enterprises, thus attracting digital FDI may necessitate specific policies, regulations, and actions. Therefore, future research could be directed to develop an inclusive digital investment framework for CAREC region.

Thank You!