Appendix A: **List of Countries**

The countries comprise Afghanistan, Algeria, Angola, Bangladesh, Benin, Bhutan, Bolivia, Burkina Faso, Burundi, Cabo, Verde, Cambodia, Cameron, Central African Republic, Chad, Comoros, Congo Democratic Republic, Congo Republic, Cote d'Ivoire, Djibouti, Egypt Arab Republic, El Salvador, Eretria, Eswatini, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Haiti, Honduras, India, Kenya, Kiribati, Korea Democratic Republic, Kyrgyz Republic, Lao PDR, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Micronesia, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Papua New Guinea, Philippines, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, South Sudan, Sri Lanka, Sudan, Syrian Arab Republic, Tajikistan, Tanzania, Timor-Leste, Togo, Tunisia, Uganda, Ukraine, Uzbekistan, Vanuatu, Vietnam, West Bank and Gaza, Yemen Republic, Zambia, and Zimbabwe.

Appendix B: Derivation of the Composite Index of ICT Infrastructure Using PCA

Table B.1, Part A shows a maximum eigen value for the CIC index of 4.244 for the first factor, 0.655 for the second factor, 0.511 for the third factor, 0.250 for the fourth factor, and 0.203 and 0.138 for the fifth and sixth factors, separately. The proportional variation of the first factor is 70.7%. For the residual factors, the proportional variations are 10.9%, 8.5%, 4.2%, 3.4%, and 2.3%, respectively.

Table B.2, Part B, shows eigen vectors for the six principal component factors loading, PC1 to PC6. Other than PC1, all the PCs' factor loadings have negative values and have significantly low values. Therefore, PC1's factor loadings were used in constructing the CIC index, a procedure demonstrably validated by the variables loading plots (see Figures B.1 and B.2).

Table B.1: Originating the ICT infrastructure composite index (CIC)

Part A: The Eigen Value Analysis

PCs	Eigen Value	Proportion	Cumulative Value	Cumulative Proportion
1	4.244	0.707	4.244	0.707
2	0.655	0.109	4.899	0.816
3	0.511	0.085	5.409	0.902
4	0.250	0.042	5.659	0.943
5	0.203	0.034	5.862	0.977
6	0.138	0.023	6.000	1.000

Part B: The Eigen Vectors Analysis

Variables		PC1	PC2		PC3	PC4		PC5	PC6
TEL		0.374	-0.679		0.330	0.228		-0.180	0.453
MOB	0.358	0.567		0.656	0.201		0.269	0.083	
INU		0.433	0.236		0.001	-0.579		-0.648	0.031
INS		0.403	0.246		-0.647	0.155		0.244	0.524
FIB		0.430	-0.316		-0.013	-0.495		0.599	-0.332
ATM	0.444	-0.031		-0.206	0.550		-0.237	-0.634	

Part C: Correlations

Variables		TEL	MOB	INU	INS	FIB	ATM
TEL		1.000					
MOB	0.434	1.000					
INU		0.575	0.681	1.000			
INS		0.455	0.515	0.726	1.000		
FIB		0.751	0.536	0.733	0.677	1.000	
ATM	0.684	0.601	0.759	0.786	0.750	1.000	

Note 1: PCs refer to a principal component.
Note 2: Variables are defined in Table 1.

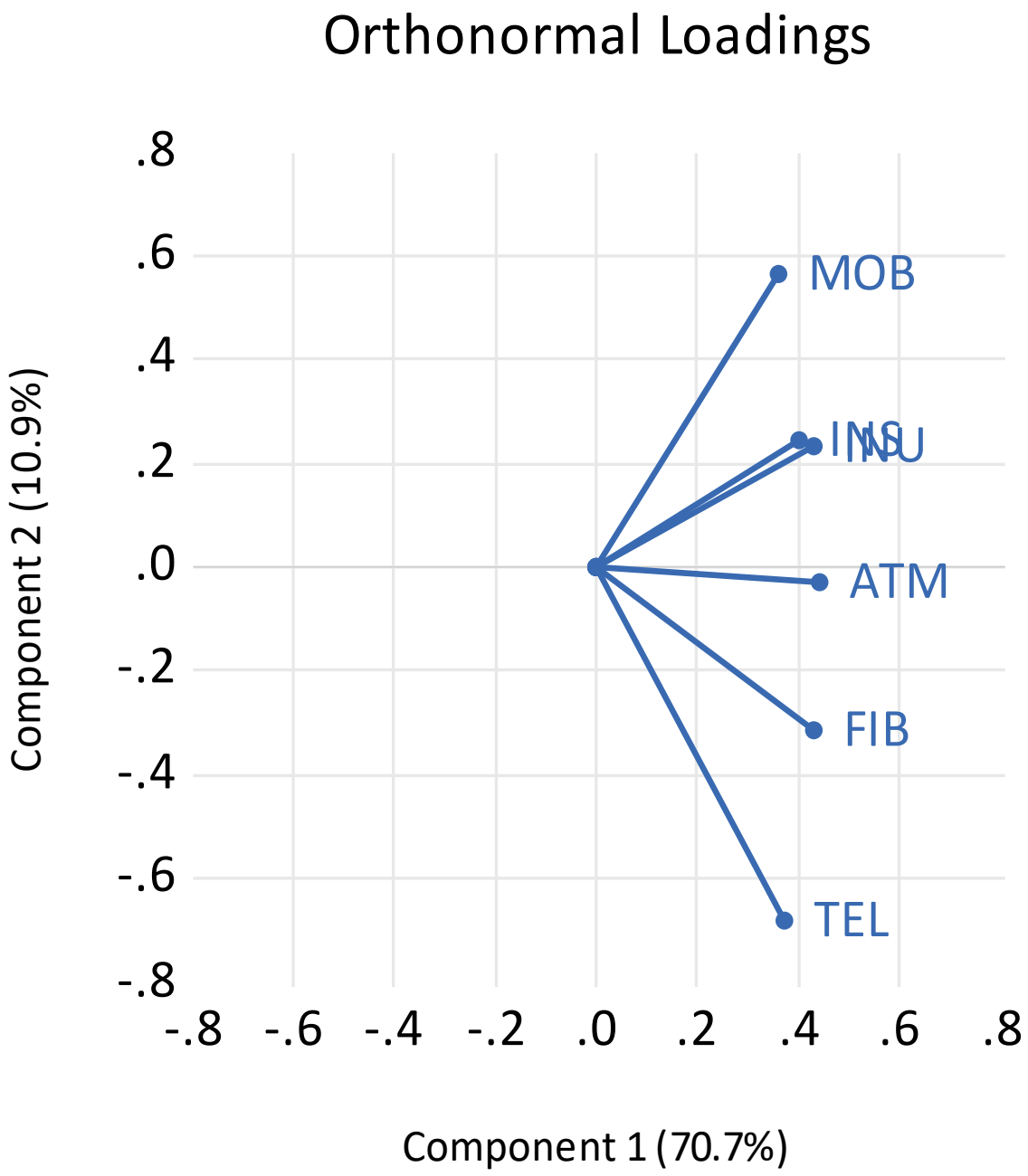

Figure B.1: Loading plots for deriving CIC

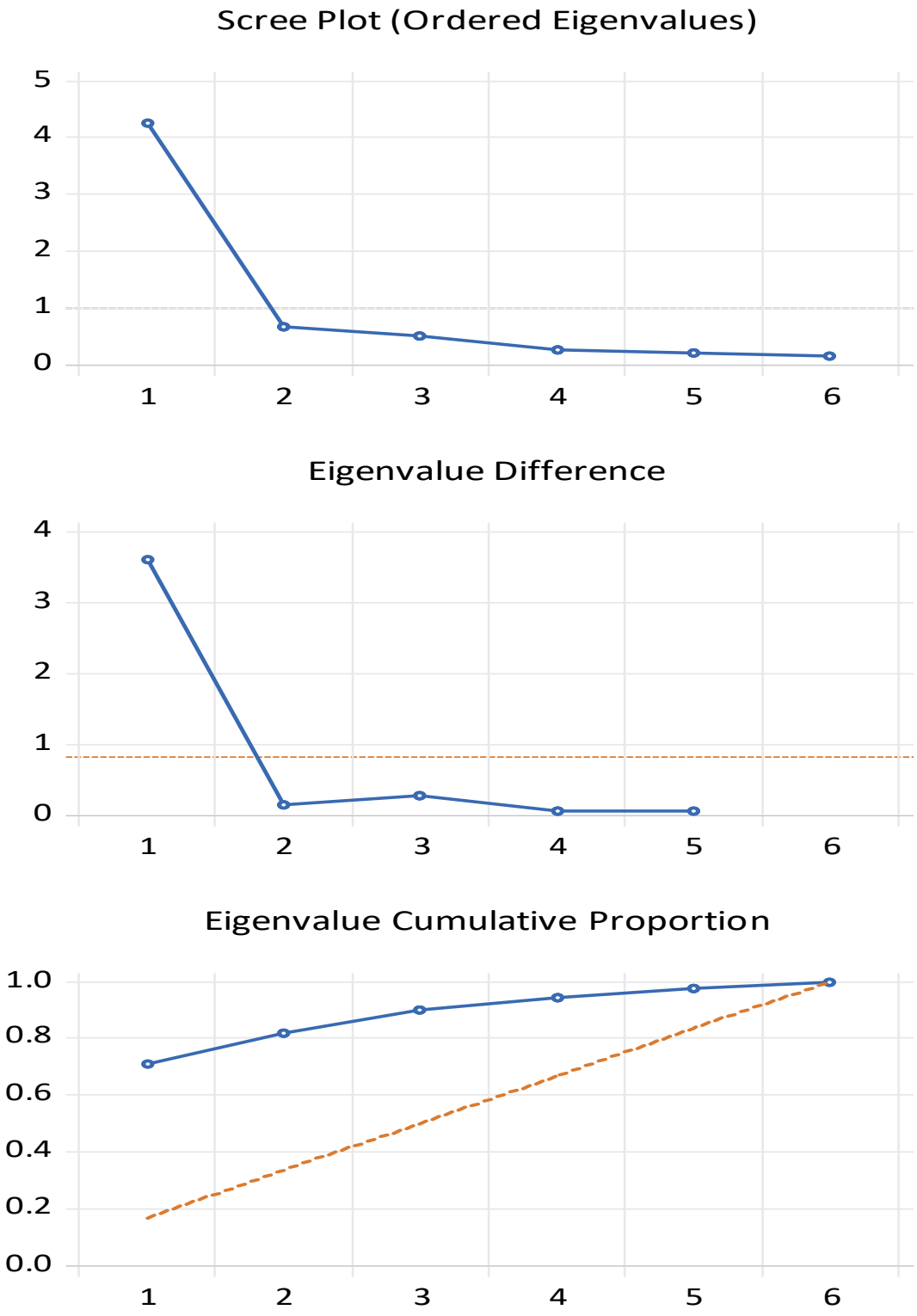

Figure B.2: Scree Plot and Plots of Eigenvalue Difference, and Eigenvalue Cumulative Proportion for deriving CIC

Appendix C: Derivation of the Composite Index of Institutional Quality Using PCA

Table C.1, Part A shows that a maximum eigen value for the CIQ index of 5.382 for the first factor, 0.853 for the second factor, 0.631 for the third factor, 0.426 for the fourth factor, 0.351 for the fifth factor, 0.244 for the sixth factor, and 0.071 and 0.042 for the seventh and eighth factors, separately. For the first factor, the proportional variation is 67.3%, while for the residual factors, the proportional variations are 10.7%, 7.9%, 5.3%, 4.4%, 3.1%, 0.09% and 0.04%, respectively.

Table C.1, Part B illustrates the eigen vectors for the eight principal component factors loading, PC1 to PC8. Other than PC1's factor loading, all the principal component factor loadings have negative values and their values are noticeably low. For this reason, we chose to use PC1's factor loadings to construct the CIQ index. This procedure is validated by the variables' loading plots (see Figures C.1 and C2).

Table C.1: Originating the institutional quality composite index (CIQ)

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Part A: The Eigen Analysis

PCs	Eigen Value	Proportion	Cumulative Value	Cumulative Proportion
1	5.382	0.673	5.382	0.673
2	0.853	0.107	6.235	0.780
3	0.631	0.079	6.866	0.859
4	0.426	0.053	7.292	0.912
5	0.351	0.044	7.643	0.956
6	0.244	0.031	7.887	0.987
7	0.071	0.009	7.958	0.996
8	0.042	0.004	8.000	1.000

Part B: The Eigen Vectors Analysis

Variables		PC1	PC2	PC3	PC4		PC5	PC6	PC7	PC8
CBH	0.322	-0.274	0.537	-0.437		0.550	0.189	0.029	0.048	
CBR	0.329	0.048	0.451	0.820		0.011	0.074	-0.007	0.088	
CEM	0.367	0.508	-0.101	-0.113		0.113	-0.049	-0.746	-0.111	
CMM	0.339	0.608	-0.141	-0.079		0.200	-0.170	0.648	0.034	
CPM	0.405	-0.278	-0.144	0.023		-0.160	0.033	0.122	-0.834	
CQB	0.371	0.049	0.087	-0.265		-0.681	0.474	0.065	0.300	
CQP	0.369	-0.327	0.008	-0.091		-0.211	-0.787	-0.052	0.286	
CTA	0.318	-0.329	-0.671	0.195		0.332	0.289	-0.024	0.329	

Part C: Correlations

Variables		CBH	CBR	CEM	CMM	CPM	CQB	CQP	CTA
CBH	1.000								
CBR	0.563	1.000							
CEM	0.521	0.600	1.000						
CMM	0.445	0.554	0.922	1.000					
CPM	0.682	0.668	0.677	0.598	1.000				
CQB	0.602	0.598	0.723	0.640	0.819	1.000			
CQP	0.659	0.596	0.593	0.523	0.876	0.698	1.000		
CTA	0.442	0.433	0.527	0.473	0.805	0.521	0.637	1.000	

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Note 1: PCs refer to principal components.

Note 2: Variables are defined in Table 1.

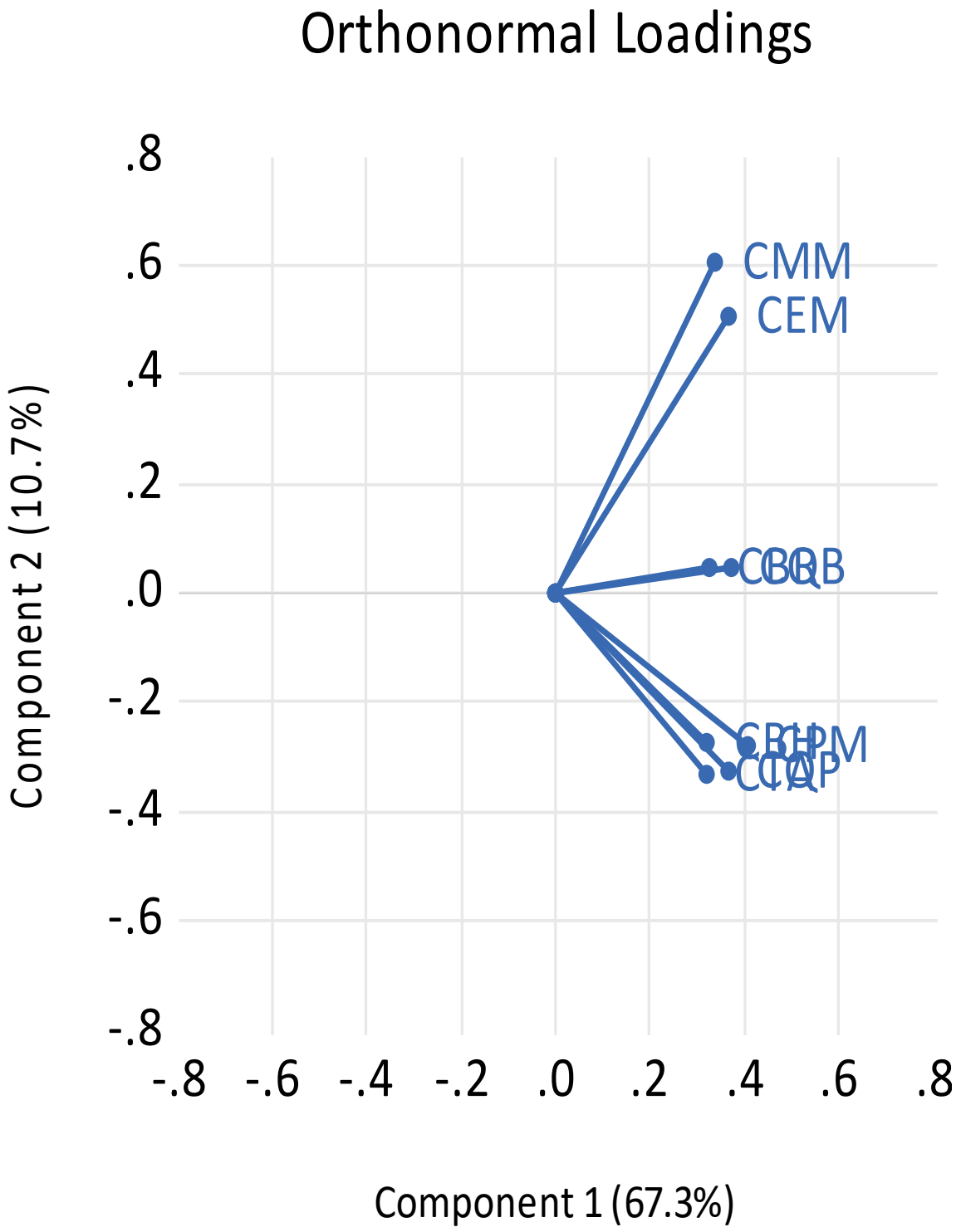

Figure C.1: Loading plots for deriving CIQ

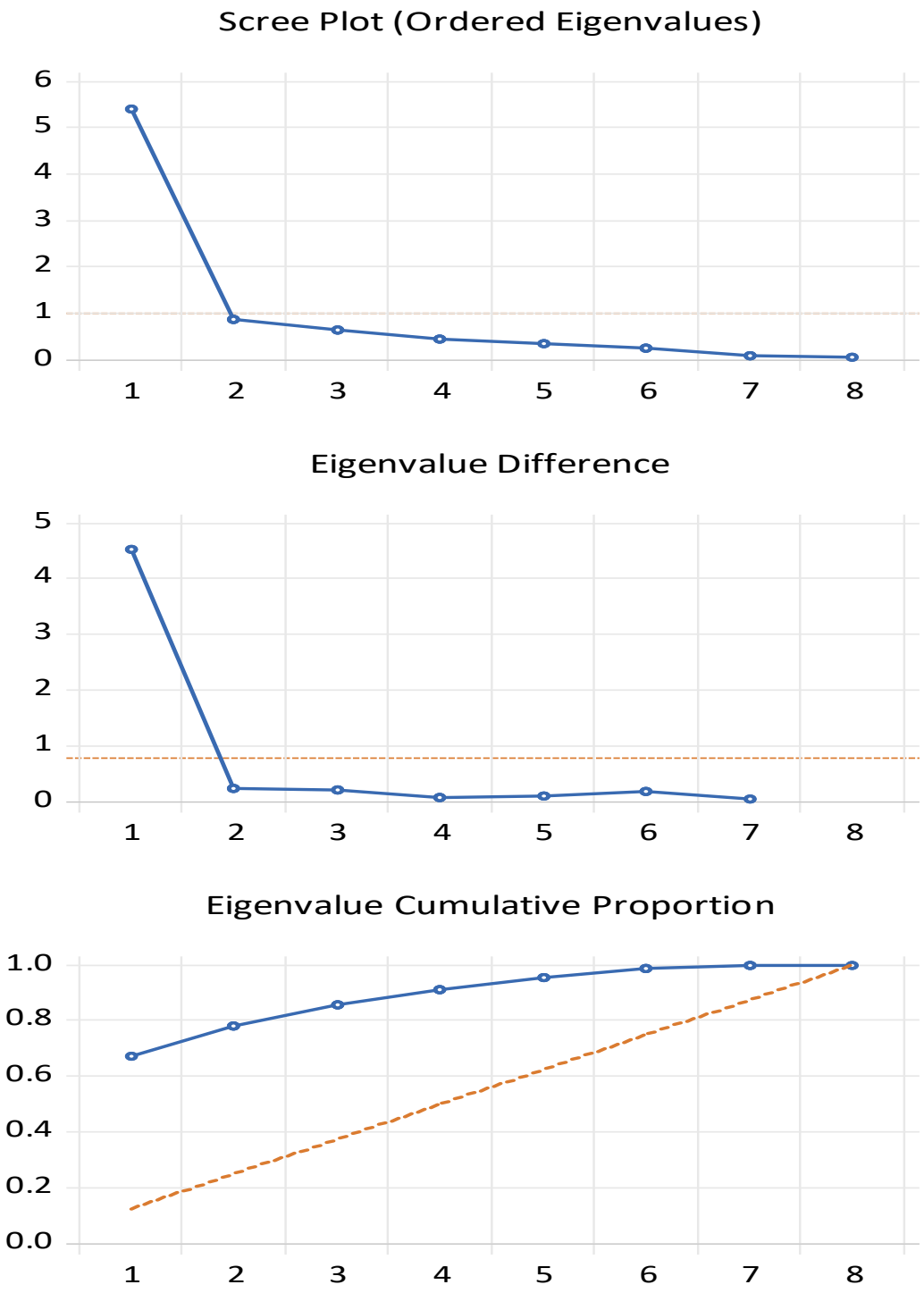

Figure C.2: Scree Plot and Plots of Eigenvalue Difference, and Eigenvalue Cumulative Proportion for deriving CIQ

Appendix D: Additional Tables of Results

Table D.1. Summary Statistics and Unit Root Statistics

Variables	Statistics							Unit Root Statistics	
Inference	1	2	3	4	5	6	7	Level	First Difference
CBH	0.55	0.65	0.18	0.07	-0.98	4.65	113.7*	O.40	-8.07*
I [1]									
CBR	0.49	0.65	0.18	0.09	-1.14	4.79	145.5*	2.25	-5.92*
I [1]									
CEM	0.54	0.65	0.22	0.07	-1.00	4.06	89.0*	-0.77	-7.20*
I [1]									
CMM	0.56	0.65	0.30	0.07	-0.88	3.72	63.1*	1.07	-2.96*
I [1]									
CPM	0.48	0.61	0.32	0.06	-0.49	2.96	16.9*	0.38	-7.23*
I [1]									
CQB	0.51	0.65	0.30	0.07	-0.85	3.66	57.7*	-0.23	-5.84*
I [1]									
CQP	0.46	0.60	0.30	0.07	-0.50	3.22	18.2*	1.28	-4.31*
I [1]									
CTA	0.44	0.65	0.18	0.10	-0.54	3.39	23.1*	0.77	-5.46*
I [1]									
CIQ	1.20	1.29	0.93	0.05	-1.23	5.60	22.5*	-0.31	-7.54*
I [1]									
TEL	0.17	1.48	-1.38	0.60	-0.14	2.55	4.79**	3.23	-8.62*
I [1]									
MOB	1.83	2.17	0.89	0.20	-0.92	4.16	82.4*	-0.17	-8.04*
I [1]									
INU	1.06	1.88	-0.12	0.40	-0.61	2.98	25.9*	0.65	-5.97*
I [1]									

INS	0.58	3.56	-1.47	0.84	0.45	3.21	14.8*	5.29	-7.37*
I [1]									
FIB	-0.60	1.16	-2.80	0.81	-0.05	2.59	5.11**	-0.99	-7.85*
I [1]									
ATM	0.84	2.17	-0.52	0.46	-0.21	3.19	5.83*	-1.09	-5.84*
I [1]									
CIC	0.99	1.18	0.62	0.09	-0.83	4.17	71.9*	5.02	-4.39
I [1]									
PCG	3.08	3.64	2.34	0.26	-0.13	2.71	27.1*	2.59	-6.61*
I [1]									

Note 1: Variables are defined in Table 1.
Note 2: Columns labelled 1-7 represent maximum, minimum, standard deviation, skewness, Kurtosis, and Jarque-Bera statistics, respectively.
Note 3: The table reports on the variables' natural log-transformed values.
Note 4: The cross-sectional Im-Pesaran-Shin statistics are reported in the table at level/first difference levels. I [1] is integration of order one.
Note 5: * and ** represent significance at the 1% and 5% levels, respectively.

Table D.2. Panel Cointegration Test Results between ICT, INQ, and PCG

Specification 1: PCG, INQ, TEL

	CBH	CBR	CEM	CMM	CPM	CQB	CQP	CTA	CIQ
Panel υ	-11.1	-7.36	-6.03	-5.49	-2.62	-6.20	-1.39	-6.56	-5.21
Panel ρ	-0.91	1.23	0.83	0.32	0.73	1.09	-1.23***	0.79	0.46
Panel PP	-2.67*	-1.96*	-1.68*	-1.59***	-1.48*	-3.57*	-3.94*	-2.04**	-2.34*
Panel ADF	-3.89*	-3.19*	-3.82*	-2.96*	-1.85***	-2.31*	-3.10*	-1.68**	-2.36*
Group ρ	2.03	2.95	3.69	3.62	3.56	1.93	0.99	3.10	4.64
Group PP	-5.31*	-3.38*	-3.64*	-2.91*	-2.73*	-5.10*	-8.25*	-2.76*	-3.04*
Group ADF	-4.38*	-4.14*	-4.51*	-2.91*	-1.88**	-1.94***	-4.75*	-3.46*	-3.24*

Specification 2: PCG, INQ, MOB

	CBH	CBR	CEM	CMM	CPM	CQB	CQP	CTA	CIQ
Panel υ	-6.63	-8.69	-6.09	-6.64	-5.94	-4.36	-11.5	-5.88	-5.54
Panel ρ	0.37	0.74	-0.29	0.12	2.62	1.68	-0.06	0.63	-0.53
Panel PP	-2.91*	-2.94*	-3.81*	-2.98*	-1.73**	-1.53***	-4.80*	-3.97*	-2.26*
Panel ADF	-1.51***	-1.50***	-3.51*	-3.00*	-2.44*	-1.90**	-2.40*	-2.29*	-2.26*
Group ρ	2.03	1.38	2.39	1.47	3.29	2.51	0.46	2.58	4.82
Group PP	-4.99*	-4.54*	-5.47*	-6.14*	-6.51*	-3.97*	-8.13*	-5.44*	-4.94*
Group ADF	-2.48*	-3.86*	-3.38*	-3.93*	-6.53*	-2.58*	-5.56*	-3.18*	-4.98*

Specification 3: PCG, INQ, INU

	CBH	CBR	CEM	CMM	CPM	CQB	CQP	CTA	CIQ
Panel υ	-5.32	-6.26	-9.38	-5.34	-2.42	-3.77*	-9.66	-5.49	-5.69
Panel ρ	3.59	3.32	3.64	0.48	-0.82	0.82	-0.31	0.88	-1.53***
Panel PP	-3.79*	-3.62*	-3.67*	-1.55***	-2.90*	-1.87**	-3.47*	-2.56*	-3.97*
Panel ADF	-1.11	-1.90*	-1.48*	-1.33***	-2.60*	-1.74***	-1.71**	-1.67***	-2.59*
Group ρ	7.04	6.54	6.74	1.90	2.23	2.31	0.25	2.35	3.21
Group PP	-4.25*	-4.67*	-5.68*	-5.48*	-5.67*	-5.19*	-9.18*	-4.46*	-3.62*
Group ADF	-3.08*	-1.66**	-1.62**	-4.63*	-5.09*	-3.85*	-5.67*	-1.54***	-4.42*

Specification 4: PCG, INQ, INS

	CBH	CBR	CEM	CMM	CPM	CQB	CQP	CTA	CIQ
Panel υ	-12.5	-10.1	-13.6	-7.79	-5.73	-8.28	-11.9	-6.10	-3.90
Panel ρ	-1.53***	-0.36	0.52	0.01	-0.12	-0.47	-1.33	-0.46	0.12
Panel PP	-5.16*	-3.49*	-2.26*	-2.18*	-2.95*	-3.32*	-5.72	-3.81*	-3.47*
Panel ADF	-3.42*	-3.11*	-5.32*	-4.65*	-5.55*	-4.55*	-3.17*	-1.84**	-7.33*
Group ρ	1.03	2.19	3.65	3.04	3.07	2.27	1.36	1.95	3.29
Group PP	-11.9*	-6.64*	-6.47*	-4.77*	-5.39*	-4.80*	-7.47*	-6.93*	-7.55*
Group ADF	-5.62*	-3.38*	-6.82*	-7.30*	-11.3*	-7.65*	-9.09*	-4.60*	-10.9*

Specification 5: PCG, INQ, FIB

	CBH	CBR	CEM		CMM	CPM	CQB		CQP	CTA	CIQ
Panel υ	-10.5	-17.9	-5.91		-4.02	-2.39	-5.33		-9.49	-5.37	-4.78
Panel ρ	-0.71	-1.46	0.81		0.82	0.84	0.03		-1.07	-0.99	-0.37
Panel PP	-2.90*	-5.14*	-1.91**		-1.89*	-1.84***	-1.41***	-3.13*	-2.83*	-2.84*	
Panel ADF	-4.51*	-1.82**	-1.24***	-1.70**	-2.77*	-2.59*		-2.10*	-1.58**	-9.18*	
Group ρ	1.54	3.61	3.77		2.95	3.27	2.60		1.33	2.08	4.15
Group PP	-5.71*	-5.74*	-1.49***	-3.46*	-1.77**	-2.73*		-4.52*	-3.18*	-3.04*	
Group ADF	-5.33*	-1.33**	-3.35**		-4.50*	-4.73*	-1.97**		-1.49**	-2.48*	-4.85*

Specification 6: PCG, INQ, ATM

	CBH	CBR	CEM		CMM	CPM	CQB		CQP	CTA	CIQ
Panel υ	-13.9	-6.56	-5.98*		-11.0	-5.76	-6.94*		-11.9	-8.11	-4.51
Panel ρ	-0.61	-1.27	-0.42		-0.64	-0.31	-0.79		-1.81*	-1.86**	-0.67
Panel PP	-3.36*	-5.27*	-2.77*		-2.93*	-2.19*	-2.80*		-5.41*	-4.56*	-2.67*
Panel ADF	-2.13*	-2.31*	-3.47*		-2.14*	-1.71**	-2.24*		-2.56*	-2.8047	-2.89*
Group ρ	1.60	4.56	3.14		1.87	2.37	2.27		0.32	1.97	3.28
Group PP	-7.97*	-3.64*	-3.51*		-6.55*	-3.69*	-5.53*		-7.50*	-4.38*	-5.10*
Group ADF	-4.30*	-5.18**	-2.96*		-4.54*	-1.91**	-3.23*		-3.83*	-1.34**	-2.39*

Specification 7: PCG, INQ, CIC

	CBH	CBR	CEM		CMM	CPM	CQB		CQP	CTA	CIQ
Panel υ	-12.4	-14.7	-5.83		-12.2	-5.59	-9.81		-2.48	-13.5	-3.97
Panel ρ	0.40	-0.22	0.47		0.54	1.22	-0.19		-1.02	-0.36	0.83
Panel PP	-2.13**	-2.32*	-1.39***	-1.70**	-1.78**	-3.57*		-4.10*	-2.84*	-2.59*	
Panel ADF	-2.89**	-2.22*	-1.34***	-1.51***	-1.52***	-4.26*	-4.33*	-1.66***	-2.02*		
Group ρ	3.30	2.05	3.40		2.61	3.84	2.69		1.38	2.73	6.02
Group PP	-3.12*	-3.56*	-2.08*		-3.50*	-3.39*	-4.42*		-5.93*	-4.72*	-4.47*
Group ADF	-3.87*	-3.36*	-2.52*		-3.44*	-3.22**	-3.13*		-3.94*	-3.35	-4.76*

Note 1: Variables are defined in Table 1.
Note 2: *, ** and *** represent significance at the 1%, 5%, and 10% levels, respectively.

Table D.3. Results of FMOLS Estimation

	Dependent Variable: PCG									
IVs:	**CBH**	**CBR**	**CEM**		**CMM**	**CPM**	**CQB**		**CQP**	**CTA**	**CIQ**
Specification 1: PCG, INQ, TEL											
INQ	2.99*	3.10*	2.86*		2.67*	3.48*	2.99*		3.42*	3.03*	3.42*
TEL	0.42*	0.25*	0.17*		0.24*	0.21*	0.42*		0.28*	0.53*	0.11*
Specification 2: PCG, INQ, MOB											
INQ	3.17*	2.89*	2.74*		2.48*	3.60*	2.75*		3.16*	2.78*	3.44*
MOB	0.01*	0.18*	0.15*		0.19*	0.01**	0.19*		0.17*	0.27*	0.04*
Specification 3: PCG, INQ, INU											
INQ	3.40*	3.58*	3.04*		2.89*	3.77*	3.45*		3.87*	3.70*	3.46*
INU	0.13*	0.13*	0.20*		0.22*	0.03**	0.08*		0.034*	0.13*	0.07*
Specification 4: PCG, INQ, INS											
INQ	3.30*	3.56*	3.22*		3.11*	3.75*	3.41*		3.89*	4.09*	3.46*
INS	0.07*	0.03*	0.05*		0.04*	0.01**	0.02**		0.06*	0.07*	0.01**
Specification 5: PCG, INQ, FIB											
INQ	3.17*	3.48*	2.98*		2.75*	3.43*	3.11*		3.53*	3.78*	3.40*
FIB	0.09*	0.04**	0.08*		0.08*	0.06*	0.11*		0.08*	0.04*	0.03*
Specification 6: PCG, INQ, ATM											
INQ	3.10*	3.41*	3.08*		2.89*	3.67*	3.32*		3.61*	3.69*	3.44*
ATM	0.03*	0.07*	0.02*		0.11*	0.10*	0.01*		0.04*	0.06*	0.03*
Specification 7: PCG, INQ, CIC											
INQ	2.39*	2.26*	2.04*		2.67*	3.18*	2.79		3.03*	2.66*	3.45*
CIC	0.37*	0.59*	0.61*		0.80*	0.20*	0.81*		0.81*	0.95*	0.90*

Note 1: INQ is used as a proxy for CBH, CBR, CEM, CMM, CPM, CQB, CQP, CTA, and CIQ.
Note 2: Variables are defined in Table 1.
Note 3: * and ** indicate significance at the 1% and 5% levels, respectively.

Table D.4. Results of DOLS Estimation

Dependent Variable: PCG										
IVs:	**CBH**	**CBR**	**CEM**	**CMM**	**CPM**	**CQB**	**CQP**	**CTA**	**CIQ**	
Specification 1: PCG, INQ, TEL										
INQ	2.93*	3.14*	2.85*	2.64*	3.18*	2.93*	3.42*	3.02*	3.39*	
TEL	0.43*	0.14*	0.06*	0.16*	0.40*	0.56*	0.03*	0.43*	0.09*	
Specification 2: PCG, INQ, MOB										
INQ	2.36*	1.95*	1.88*	1.12*	2.00*	1.74*	2.19*	1.60*	2.31*	
MOB	0.20*	0.39*	0.36*	0.58*	0.39*	0.44*	0.40*	0.52*	0.70*	
Specification 3: PCG, INQ, INU										
INQ	3.48*	2.98*	2.48*	2.85*	3.49*	3.13*	4.79*	3.25*	3.60*	
INU	0.20*	0.17*	0.19*	0.06*	0.02*	0.20*	-0.32**	0.15**	0.20*	
Specification 4: PCG, INQ, INS										
INQ	3.20*	3.48*	3.10*	3.05*	3.61*	3.43*	3.83*	4.03*	3.42*	
INS	0.07*	0.03**	0.07*	0.03**	0.01*	0.01**	0.05*	0.08*	0.02*	
Specification 5: PCG, INQ, FIB										
INQ	2.78*	3.25*	2.66*	2.97*	3.27*	3.13*	3.88*	4.25*	3.41*	
FIB	0.19*	0.09*	0.53*	0.35*	0.17*	0.04**	0.04*	0.05*	0.19*	
Specification 6: PCG, INQ, ATM										
INQ	2.89*	3.53*	3.02*	2.876*	3.61*	3.29*	3.52*	3.87*	3.43*	
ATM	0.05**	0.09*	0.03*	0.06*	0.03*	0.03*	0.04*	0.06*	0.03*	
Specification 7: PCG, INQ, CIC										
INQ	2.34*	2.40*	2.10*	2.89*	3.15*	2.03*	2.41*	2.14*	2.42*	
CIC	0.46*	0.58*	0.61*	0.70*	0.24*	0.72*	0.62*	0.77*	0.72*	

Note 1: INQ is used as a proxy for CBH, CBR, CEM, CMM, CPM, CQB, CQP, CTA, and CIQ.

Note 2: Variables are defined in Table 1.

Note 3: * and ** indicate significance at the 1% and 5% levels, respectively.