Regional Economic Integration in Asia and the Pacific

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ADB-KIEA-UNESCAP Conference
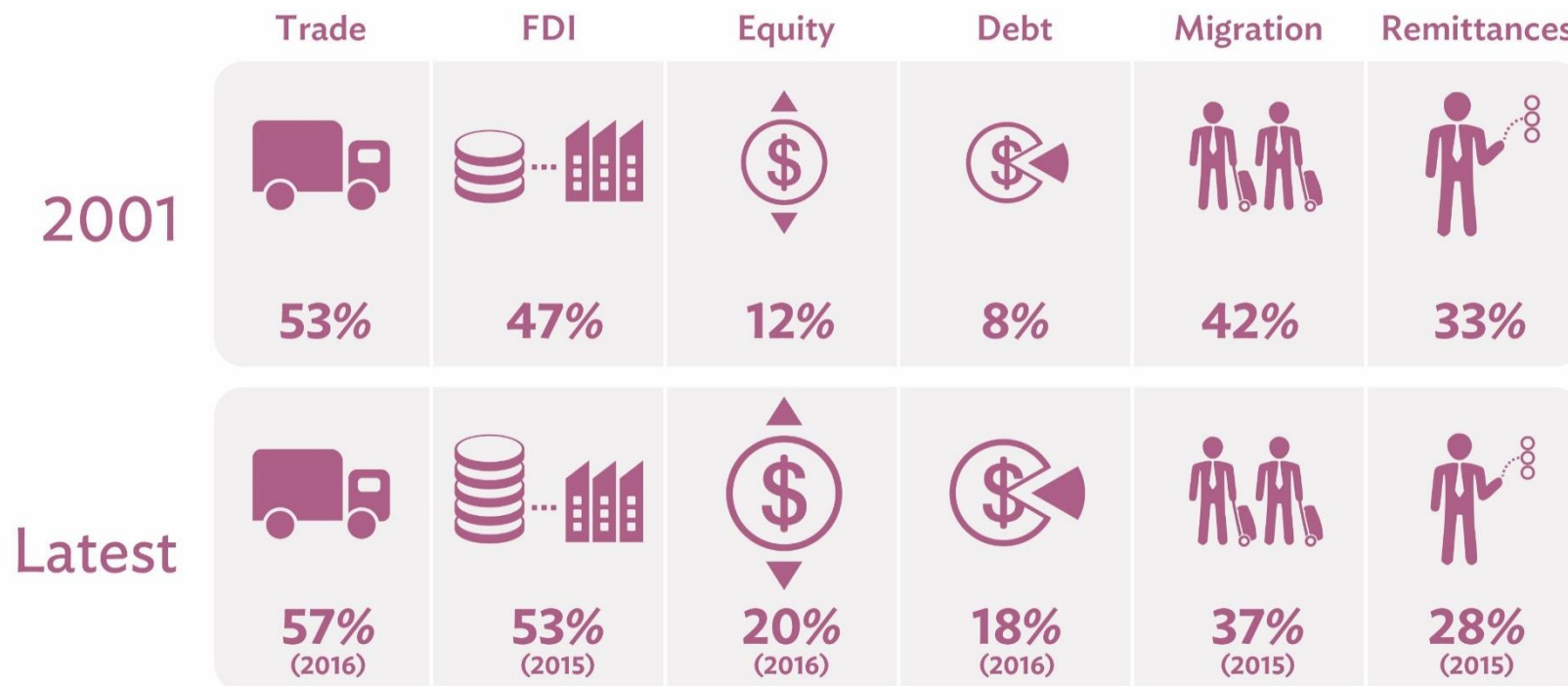13-14 June 2017 | Seoul, Korea

Outline

- Regional Economic Integration: Progress and Challenges

- Asia-Pacific Regional Integration Index

  - Construction

  - Interpretation

  - Comparison with other regions

  - Key findings

- Summary

Regional integration continue to deepen

Intraregional shares as % of total

	Trade	FDI	Equity	Debt	Migration	Remittances
2001	53%	47%	12%	8%	42%	33%
Latest	57% (2016)	53% (2015)	20% (2016)	18% (2016)	37% (2015)	28% (2015)

FDI = based on inward foreign direct investment (flows data); Equity = based on equity asset holdings (stock data); Debt = based on debt asset holdings (stock data).

Notes:
1. Trade, equity and debt data as of January to June 2016 (H1 2016).
2. Migration data in 2001 and 2015; available every 5 years.
3. Remittance data only available starting in 2010.

Source: ADB calculations using data from Association of Southeast Asian Nations (ASEAN) Secretariat, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, World Bank, and national sources.

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Regional Integration

- Deeper regional integration offers economic and non-economic benefits

  - Economic gains by expanding markets, boosting industrialization, enhancing market structure, fostering productivity and investment opportunities

  - Non-negligible non-economic gains by improving political/security stability and socio-cultural harmonization

- Asia-Pacific made significant progress in regional economic integration—but the degree of regional integration remains illusive

- Policy needs for a tool to monitor and evaluate progress against set goals

Asia-Pacific Regional Integration Index

Why a Composite Index?

- Regional integration is a multidimensional phenomenon and may not be captured by a single variable alone

- A composite index is constructed from compiling various indicators into a single index and allows for summarizing complex and multidimensional issues

- The index can assist in decision-making; improve accountability; and facilitate communication with general public

Introducing Asia-Pacific Regional Integration Index (APRII)

- Aims to assess the degree of integration in Asia-Pacific and its subregions; identify strengths and weaknesses of regional integration across different regions and different dimensions; and monitor progress over time and against the set goals

- Most comprehensive dataset: constructed from 26 indicators based on bilateral data, expressed as a ratio of intra-regional sum (or average) to total sum (or average)

- Design of composite index: (OECD, 2008)

  - Creation of six dimensional indexes and their overall index

  - All indexes constructed by weight-averaging their respective components, with weights determined by principal component analysis (PCA)

Benefits of PCA

- Reduction of data dimensionality
  (e.g., TV 2-dimensional, the subjects 3-dimensional)

- PCA summarizes a dataset into a smaller number of dimensions while preserving the variation in the data to the maximum extent possible

- Suppose a vector of two variables, X_1, and X_2

$$Z_1 = a_{11}X_1 + a_{21}X_2 \qquad Z_2 = a_{12}X_1 + a_{22}X_2$$

- PCA chooses the weights that maximize the variance of Z

- Amount to solving eigenvalues/eigenvectors of $E(X'X)$

- $\text{Var}(Z_1) \geq \text{Var}(Z_2)$, and Z_2 is orthogonal to Z_1

Structure of APRII

R1. Trade and Investment Integration	R11	Proportion of intra-regional goods exports to total goods exports
	R12	Proportion of intra-regional goods imports to total goods imports
	R13	Intra-regional trade intensity index
	R14	Proportion of intra-regional FDI inflows to total FDI inflows
	R15	Proportion of intra-regional FDI inflows plus outflows to total FDI inflows plus outflows
R2. Money and Finance Integration	R21	Proportion of intra-regional cross-border equity liabilities to total cross-border equity liabilities
	R22	Proportion of intra-regional cross-border bond liabilities to total cross-border bond liabilities
	R23	Pair-wise dispersion of deposit rates averaged regionally relative to that averaged globally
	R24	Pair-wise correlation of equity returns averaged regionally minus that averaged globally
R3. Regional Value Chain	R31	Ratio between the averaged trade complementarity index over regional trading partners and the averaged trade complementarity index over all trading partners
	R32	Ratio between the averaged trade concentration index over regional trading partners and the averaged trade concentration index over all trading partners
	R33	Proportion of intra-regional intermediate goods exports to total intra-regional goods exports
	R34	Proportion of intra-regional intermediate goods imports to total intra-regional goods imports
R4. Infrastructure and Connectivity	R41	Ratio between the averaged trade cost over regional trading partners and the averaged trade cost over all trading partners
	R42	Ratio between the averaged liner shipping connectivity index over regional trading partners and the averaged liner shipping connectivity index over all trading partners
	R43	Logistics performance index (overall)
	R44	Doing Business Index (overall)
R5. Free Movement of People	R51	Proportion of intra-regional outbound migration to total outbound migration
	R52	Proportion of intra-regional tourists to total tourists (inbound plus outbound)
	R53	Proportion of intra-regional remittances to total remittances
	R54	Proportion of other Asian countries that do not require an entry visa
R6. Institutional and Social Integration	R61	Proportion of other Asian countries that have signed FTAs with
	R62	Proportion of other Asian countries that have an embassy
	R63	Proportion of other Asian countries that have signed business investment treaties with
	R64	Proportion of other Asian countries that have signed double taxation treaties with
	R65	Cultural proximity with other Asian countries relative to that with all other countries

Normalization

- Normalization to avoid adding up apples and oranges prior to data aggregation
  - Adjust for different units of measurement
  - Adjust for different range of variation

- Cast indicators into a same standard

- Min-Max rescaling normalizes the indicators such that they all range between 0 and 1
  - $\frac{X_j - X_{j,min}}{X_{j,max} - X_{j,min}}$, if higher values of the indicator denote greater regional integration
  - $1 - \frac{X_j - X_{j,min}}{X_{j,max} - X_{j,min}}$, if higher values of the indicator denote lesser regional integration

- All normalized indicators have the same range of variation (0, 1)

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Weighting

- Importance of a weighting scheme to combine indicators into a single index

- Weighted average via PCA

- EC recommends PCA as a useful tool, especially when each dimension has few indicators (3-10)

- Other indexes using PCA weighting scheme

  KOF Index of Globalization, Economic Freedom of the World Index, Chicago Fed National Activity Index, Logistic Performance Index, General Indicator of Science and Technology, Environmental Performance Index, Internal Market Index, Business Climate Indicator, to name a few
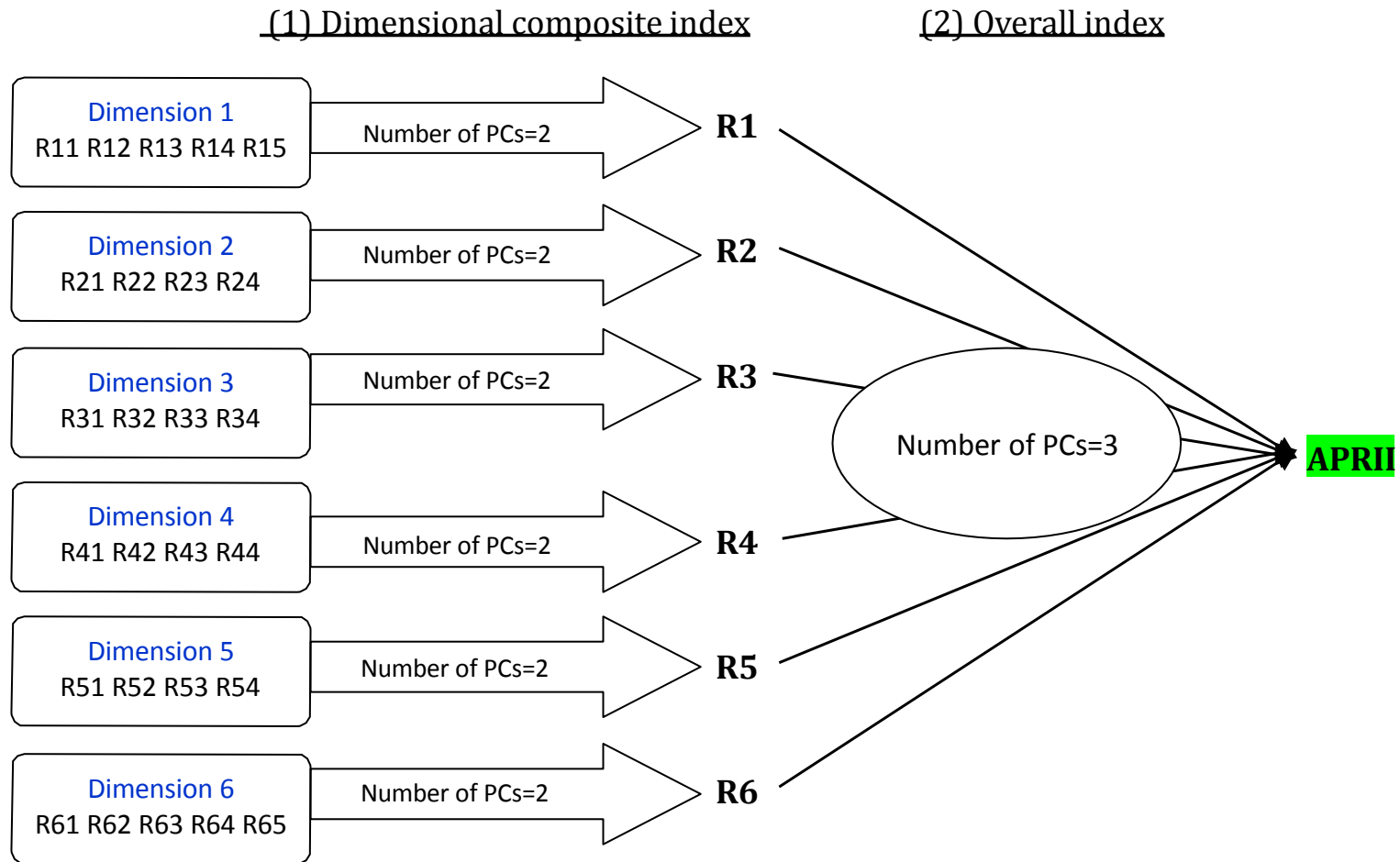
Comparison with Other Regional Integration Indexes

- **African Regional Integration Index:** African Union Commission, African Development Bank, UN Economic Commission for Africa

  - First edition in 2016

  - Min-Max rescaling

  - Five dimensions and a total of 16 indicators

  - No account for possible roles of the financial market in promoting regional integration

  - Weighting by arithmetic average (i.e., equal weighting)
    - Justifiable when many indicators (50-100) with a lack of consensus on weighting
    - A problem of double counting if indicators are highly correlated
    - May assign a higher weight to the dimension that contains more indicators

  - PCA
    - Correct for overlapping information between correlated indictors (No double counting)
    - No problem with different number of indicators in dimensions

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Comparison with Other Asian Regional Integration Indexes

- Naeher, 2015, ADB Working Paper No. 445

  - Measuring untapped potential of Asian countries for further integration

  - Data Envelopment Analysis (efficiency frontier)

  - Three dimensions of trade and investment, monetary and financial, and cross-border mobility, with a total of 8 indicators

  - A simple average used to yield an overall index of regional integration

- Madhur, 2016, UN-ESCAP

  - Regional integration in terms of geography, infrastructure, connectivity, economic policies, institutions, governance and rules of law

  - Rankings (1 to 5) for Asia's sub-regions based on expert judgment

  - No country-level analysis

- Albis, ADB, Manuscript

  - A dynamic factor model is estimated for each dimension of trade, finance, and investment

  - A simple average used to produce an overall index of regional integration

Construction

(1) Dimensional composite index   (2) Overall index

Dimension 1 R11 R12 R13 R14 R15	Number of PCs=2 → R1
Dimension 2 R21 R22 R23 R24	Number of PCs=2 → R2
Dimension 3 R31 R32 R33 R34	Number of PCs=2 → R3
Dimension 4 R41 R42 R43 R44	Number of PCs=2 → R4
Dimension 5 R51 R52 R53 R54	Number of PCs=2 → R5
Dimension 6 R61 R62 R63 R64 R65	Number of PCs=2 → R6

Number of PCs=3 → APRII

PCA Results

| | Number of principal components | | | | | | | | | | | | | | | | | |
| | Dimension I | | | | | Dimension II | | | | Dimension III | | | | Dimension IV | | | |
	1	2	3	4	5	1	2	3	4	1	2	3	4	1	2	3	4
Eigenvalue	3.04	1.32	0.54	0.08	0.02	1.40	1.22	0.82	0.57	2.08	0.92	0.70	0.31	1.86	1.39	0.54	0.21
Prop.	0.61	0.26	0.10	0.02	0.01	0.35	0.30	0.21	0.14	0.52	0.23	0.17	0.08	0.47	0.34	0.13	0.06
Cum Prop	0.61	0.87	0.97	0.99	1.00	0.35	0.65	0.86	1.00	0.52	0.75	0.92	1.00	0.47	0.81	0.94	1.00

| | Dimension V | | | | Dimension VI | | | | | Overall | | | | | |
	1	2	3	4	1	2	3	4	5	1	2	3	4	5	6
Eigenvalue	1.90	1.05	0.66	0.39	3.00	1.27	0.43	0.19	0.12	2.53	1.32	1.10	0.45	0.40	0.20
Prop.	0.48	0.26	0.16	0.10	0.60	0.25	0.09	0.04	0.02	0.42	0.22	0.18	0.08	0.07	0.03
Cum Prop	0.48	0.74	0.90	1.00	0.60	0.85	0.94	0.98	1.00	0.42	0.64	0.82	0.90	0.97	1.00

- No universal rules as to how many principal components should be retained
- The standard practice is to choose components that
  - (1) have associated eigenvalues exceeding one (Kaiser criterion);
  - (2) contribute individually to the explanation of total variance by at least 10%;
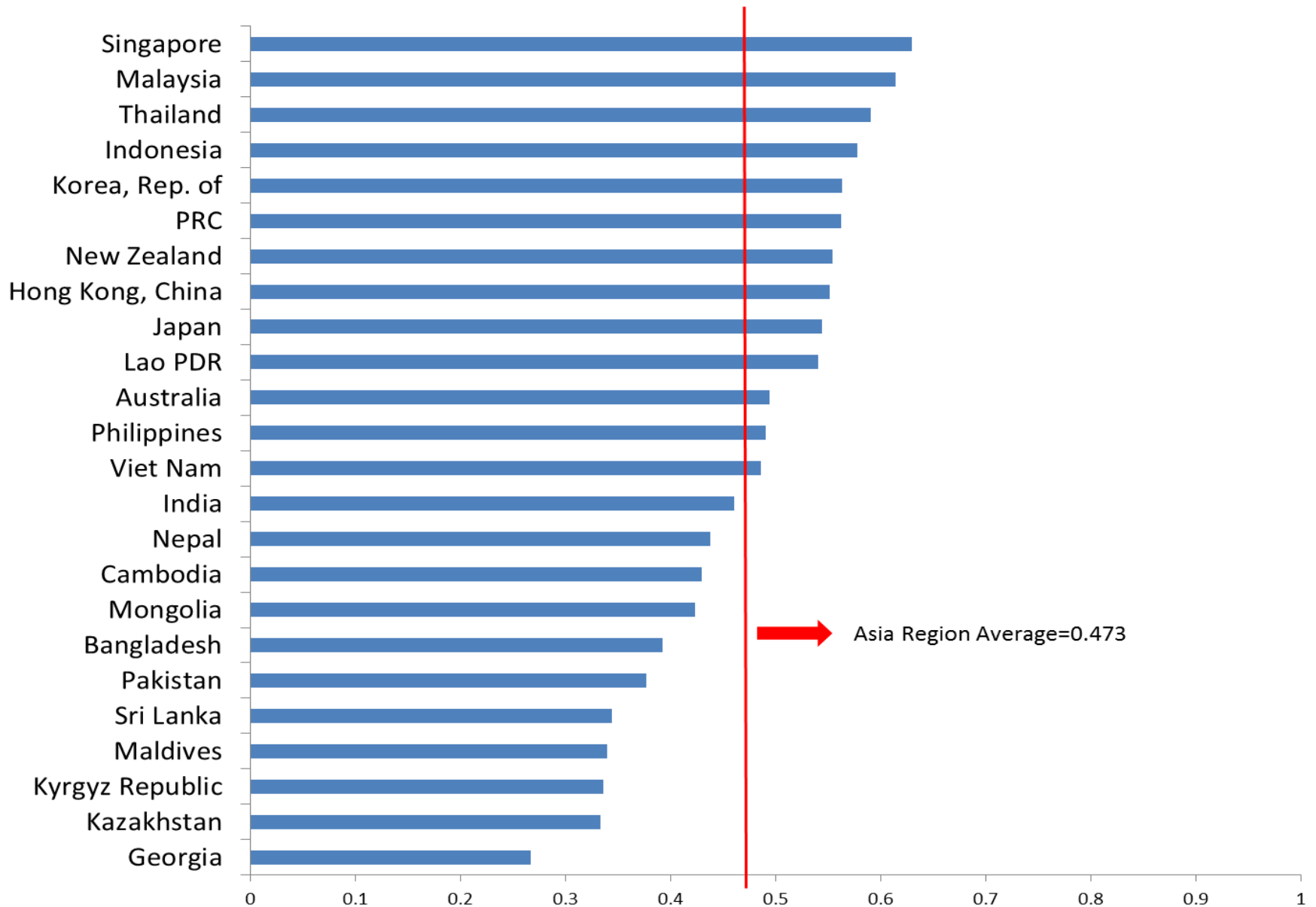 - (3) contribute cumulatively to explain more than 60% of total variance

ADB

Weighting

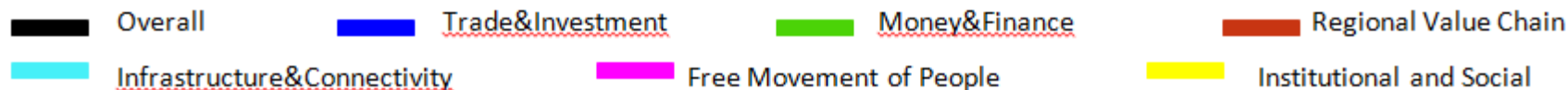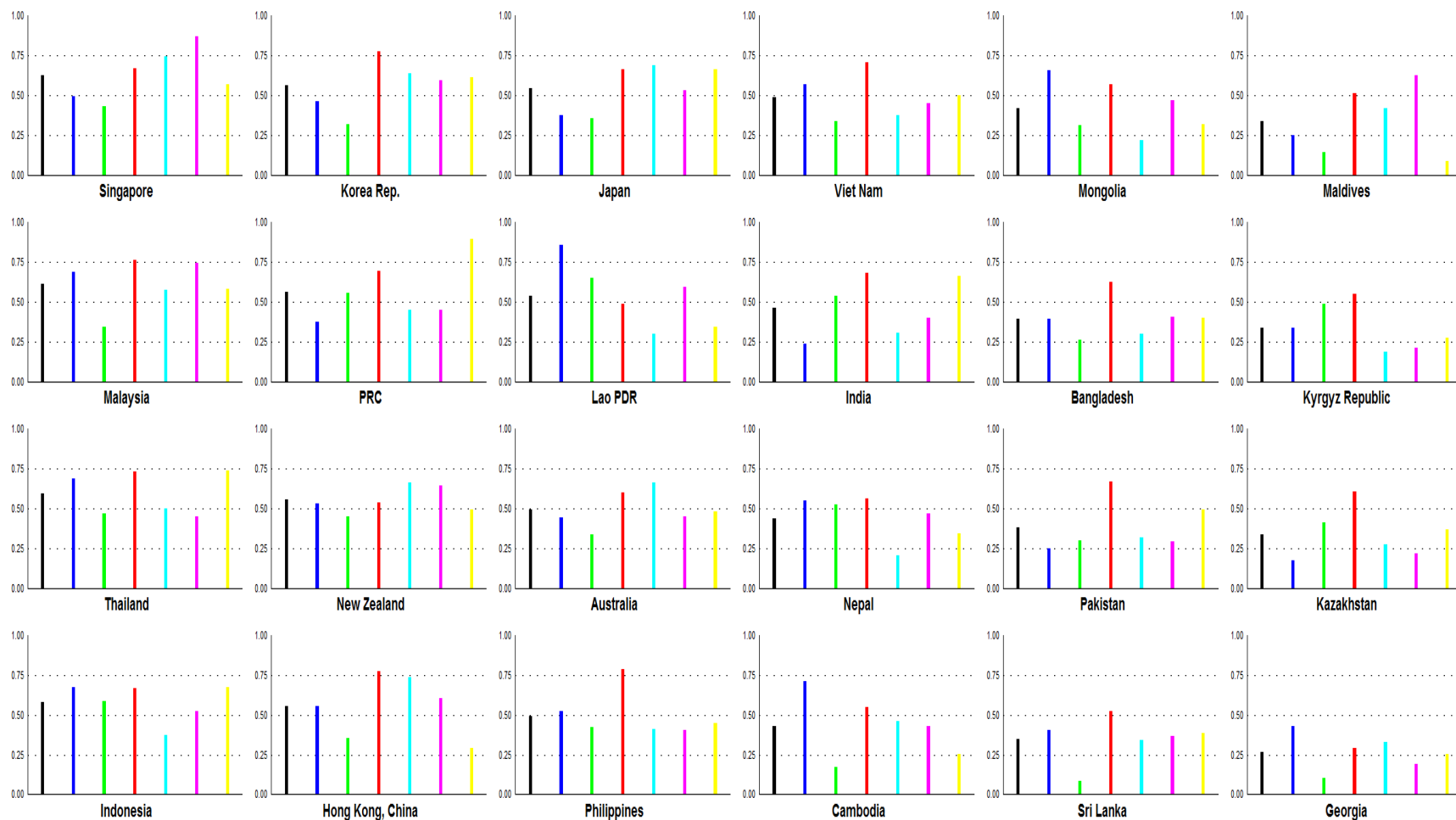- In each step, the components are weight-averaged, with weights determined by PCA

Weights for composite indexes, Asia																	
Indicator	R11	R12	R13	R14	R15	R21	R22	R23	R24	R31	R32	R33	R34	R41	R42	R43	R44
Weight	0.156	0.177	0.226	0.221	0.220	0.280	0.202	0.294	0.224	0.241	0.324	0.175	0.260	0.229	0.222	0.274	0.275
Indicator	R51	R52	R53	R54	R61	R62	R63	R64	R65		R1	R2	R3	R4	R5	R6	
Weight	0.229	0.259	0.206	0.306	0.177	0.199	0.212	0.210	0.202		0.175	0.171	0.146	0.178	0.169	0.161	

- The indicators appear to be given quantitatively different weights across dimensions. This is consistent with our strategy of not using the arithmetic average (i.e., equal weighting)
- Nardo et al. (2011) recommend a positive correlation of 0.4 to 0.8 between the dimensional and overall indexes. Our results coincide with their criterion, as the corresponding cross correlations range from 0.53 to 0.76
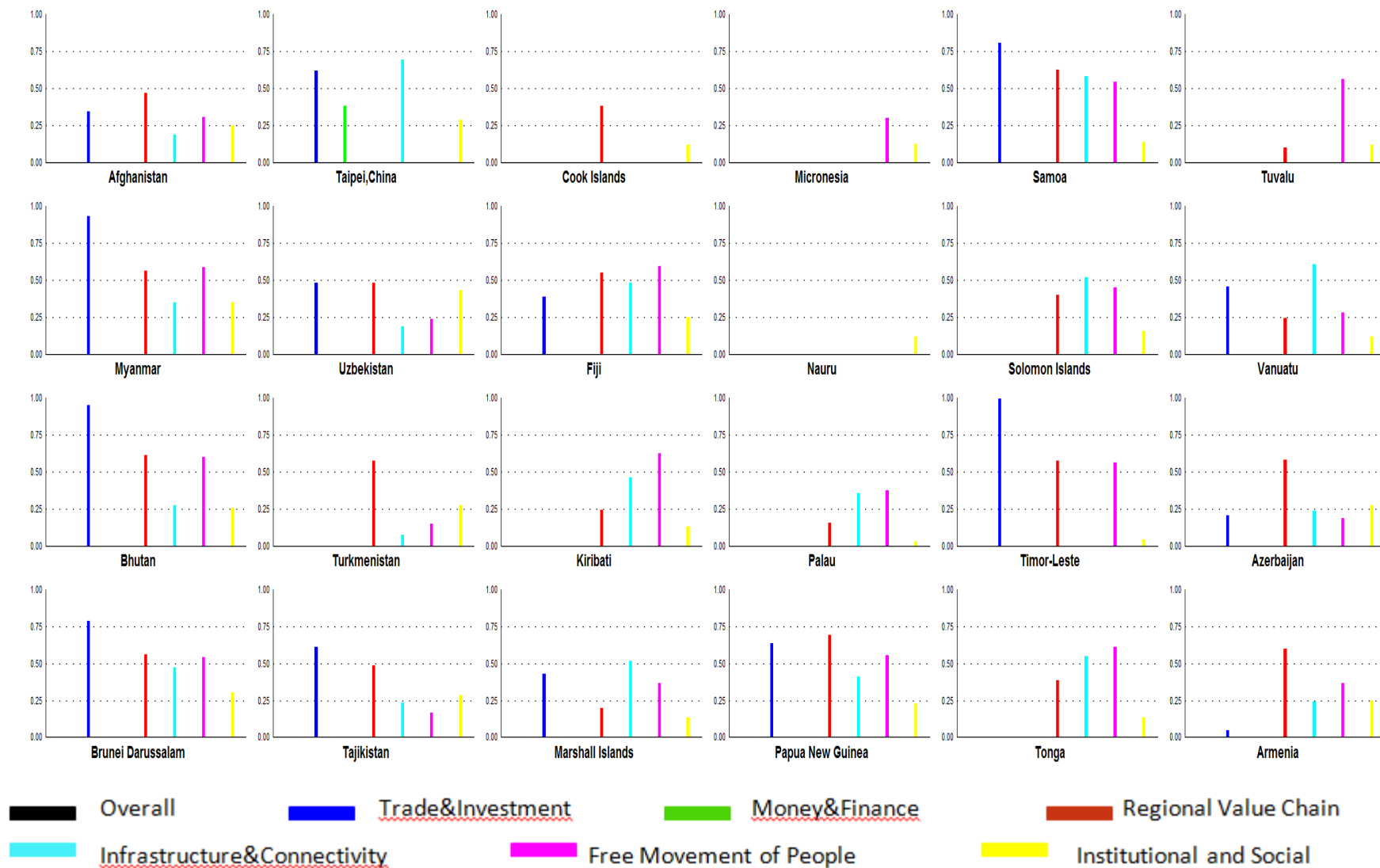
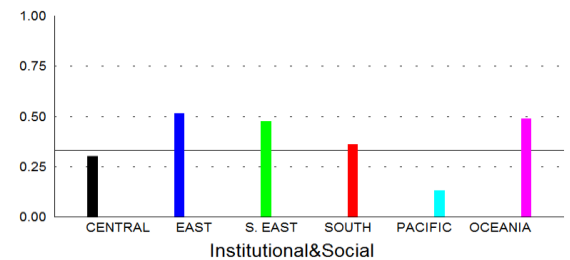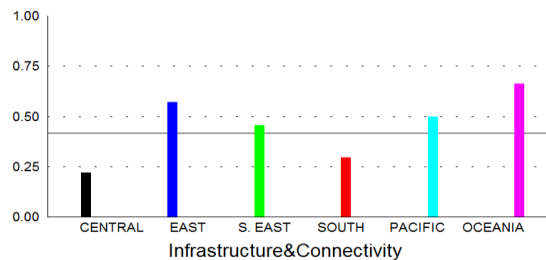**ADB**

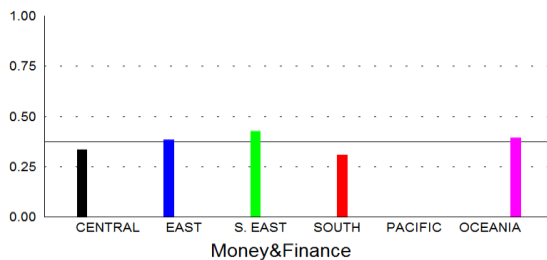# Asia Regional Integration Index: Overall

Singapore
Malaysia
Thailand
Indonesia
Korea, Rep. of
PRC
New Zealand
Hong Kong, China
Japan
Lao PDR
Australia
Philippines
Viet Nam
India
Nepal
Cambodia
Mongolia
Bangladesh
Pakistan
Sri Lanka
Maldives
Kyrgyz Republic
Kazakhstan
Georgia

Asia Region Average=0.473

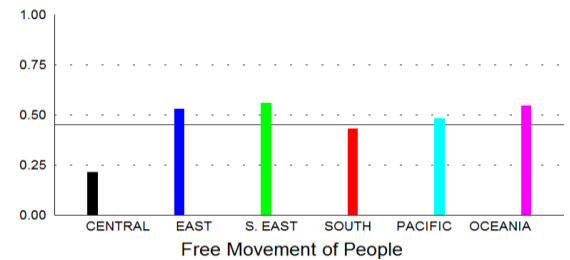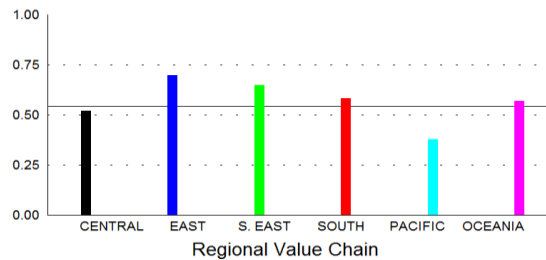0   0.1   0.2   0.3   0.4   0.5   0.6   0.7   0.8   0.9   1

Asia regional integration index: Dimensions (in order of overall ranking)

Asia regional integration index: Dimensions (in order of overall ranking)

Legend: Overall (black), Trade&Investment (blue), Money&Finance (green), Regional Value Chain (red), Infrastructure&Connectivity (cyan), Free Movement of People (magenta), Institutional and Social (yellow)

Performance of sub-regions

Asia-Pacific Regional Integration Index

Source: ADB estimates.
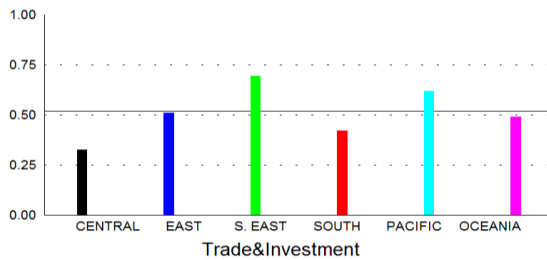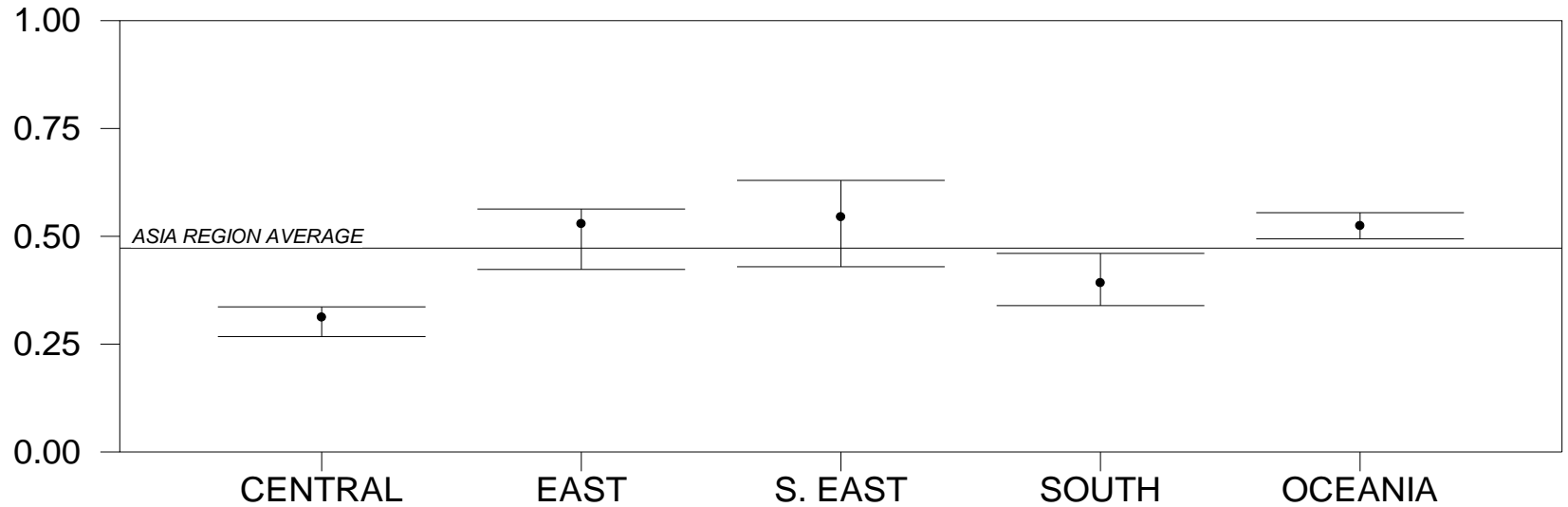
Asia regional integration index: Subregions (1)

Southeast Asia
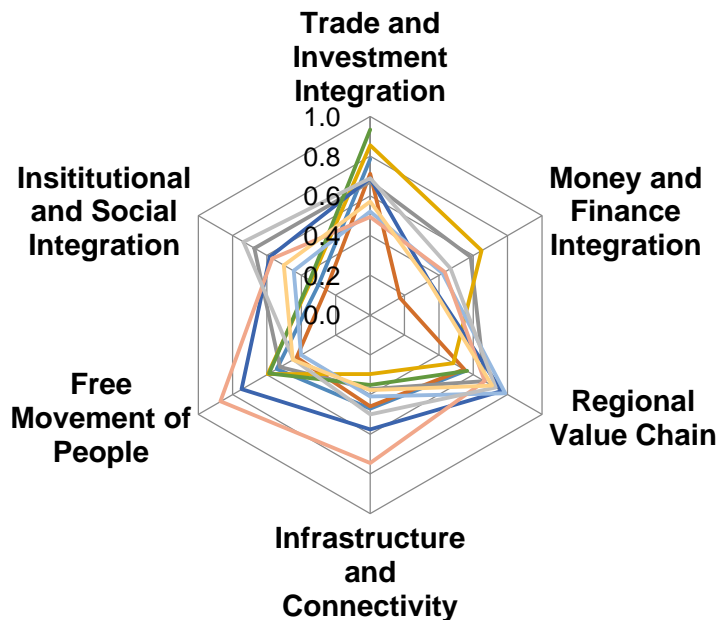
East Asia
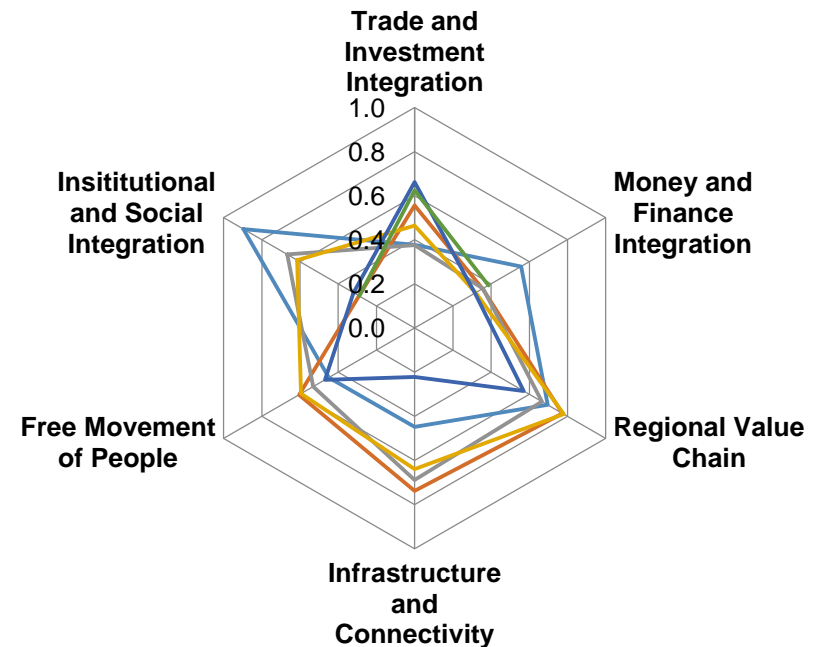
Asia regional integration index: Subregions (2)

South Asia

Legend:
- Afghanistan
- Bangladesh
- Bhutan
- India
- Maldives
- Nepal
- Pakistan
- Sri Lanka

Central Asia

Legend:
- Armenia
- Azerbaijan
- Georgia
- Kazakhstan
- Kyrgyz Republic
- Tajikistan
- Turkmenistan
- Uzbekistan
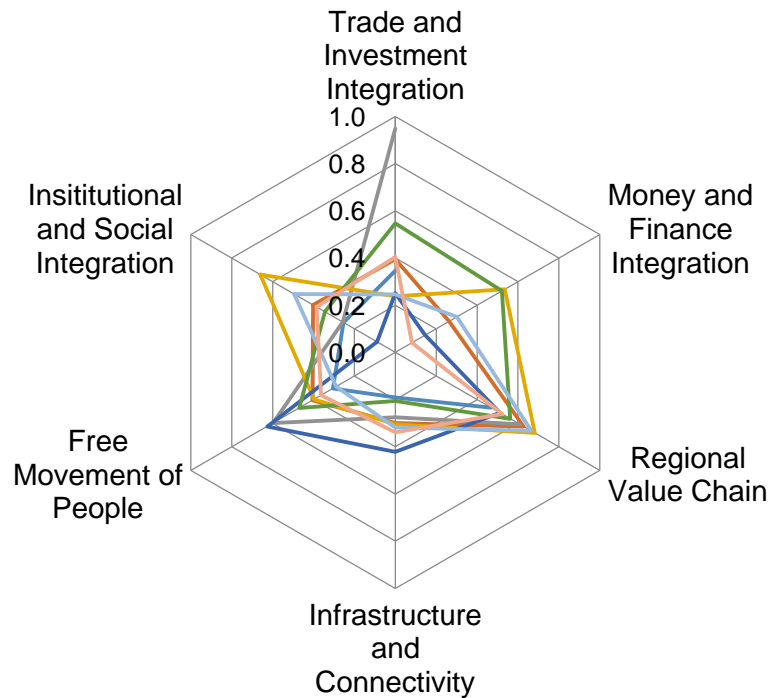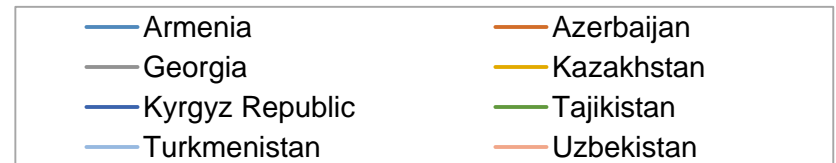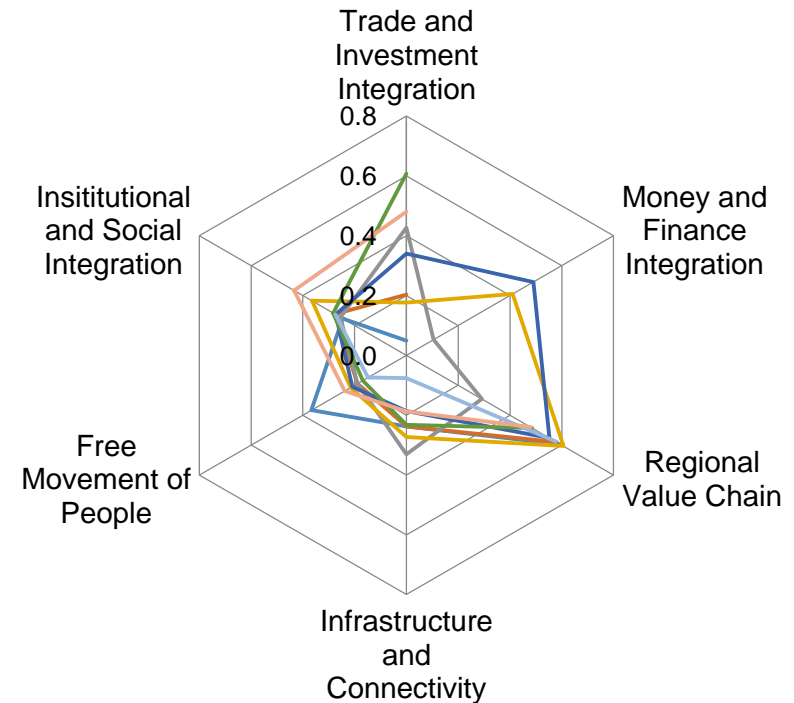
Asia regional integration index: Subregions (3)

Oceania
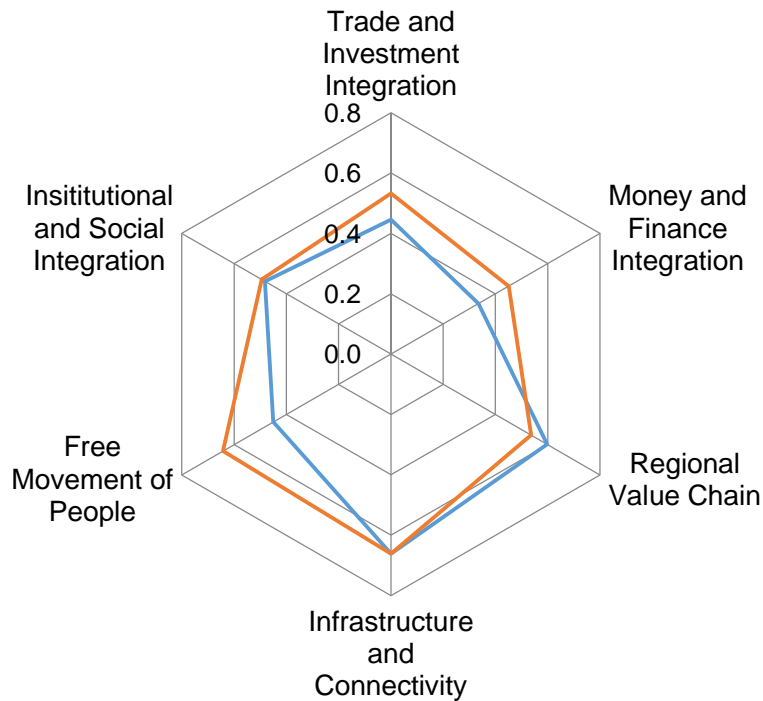
Pacific
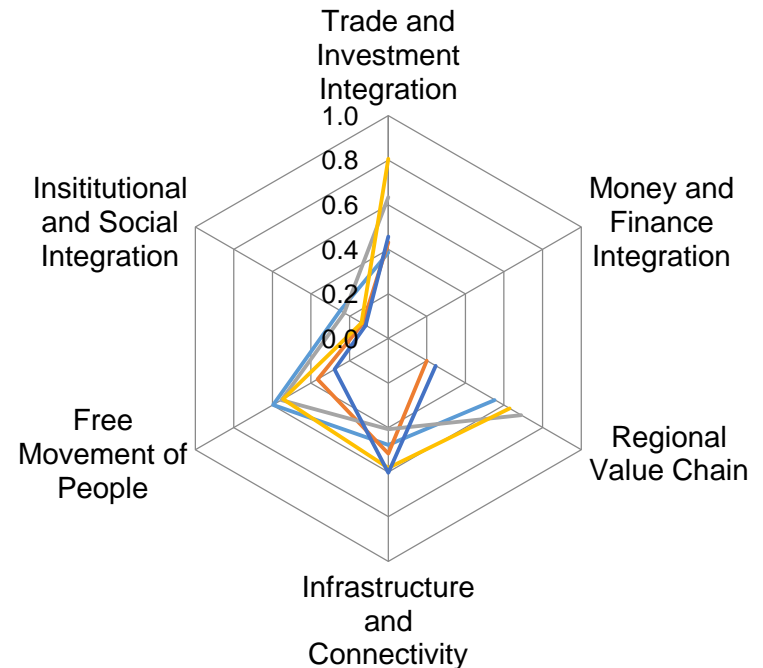
Comparison with Other Regions: World-wise normalization

- Normalize data based on world maximum and minimum values for all regions
- The indexes can be compared at the same base
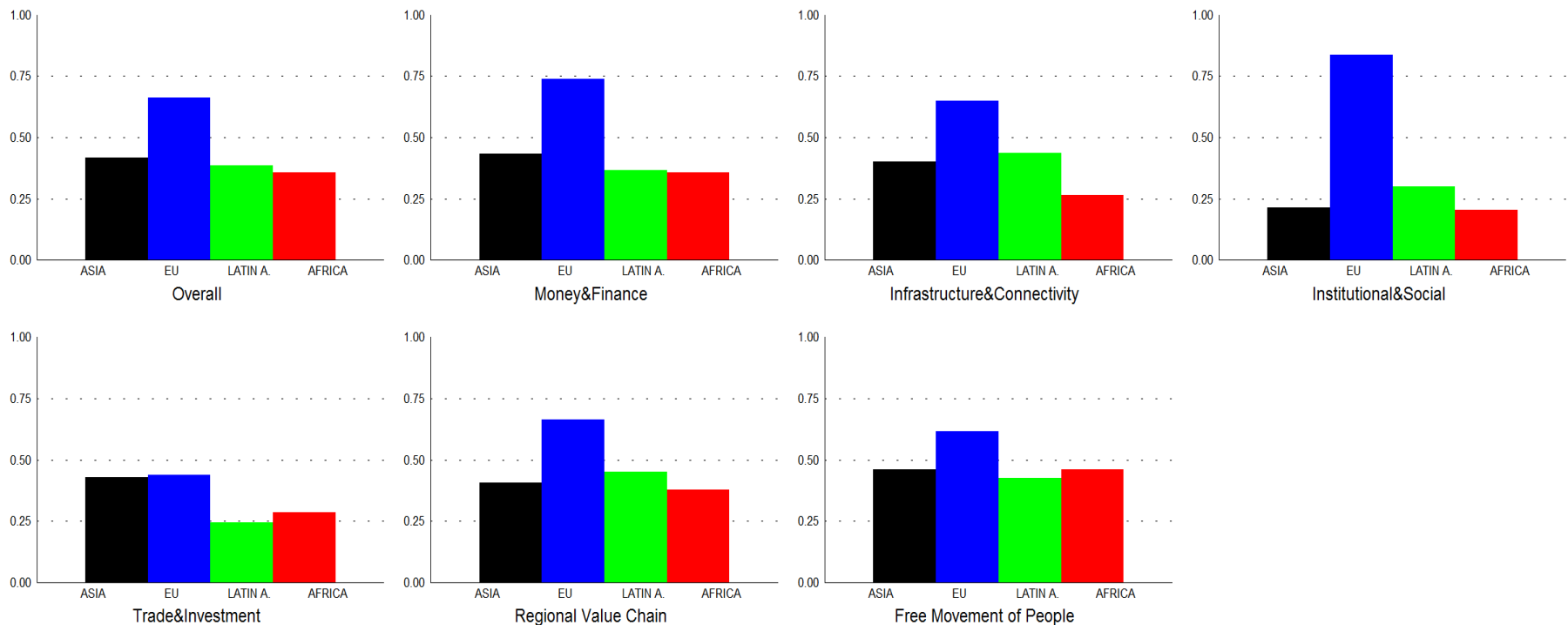
World-wise normalization: APRII estimates

Asia vs Other Regions

World rankings of the overall regional integration index

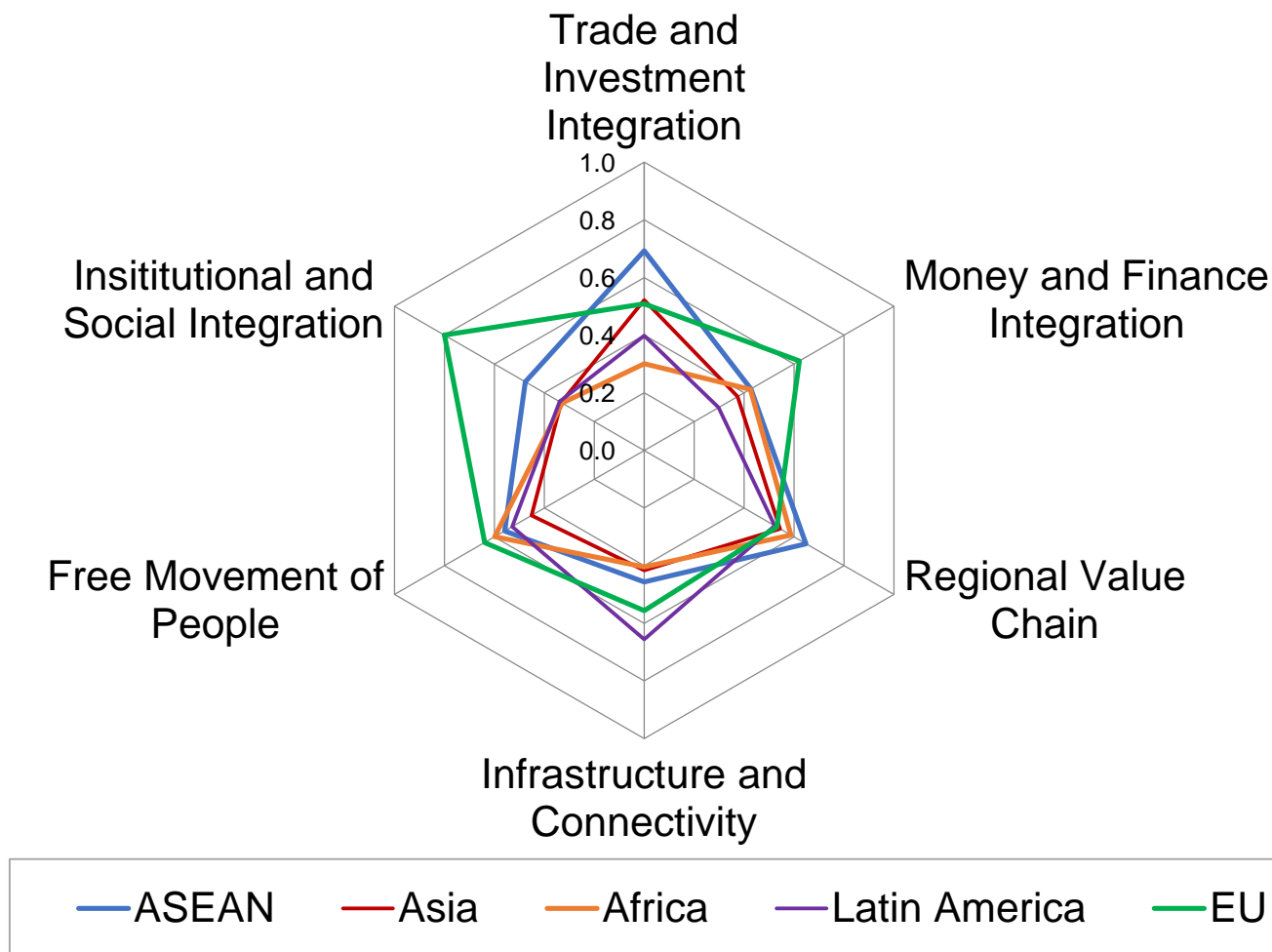| Rank	Country	Score	Rank	Country	Score	Rank	Country	Score
1	Poland	0.728	32	Lao PDR	0.495	63	Mongolia	0.383
2	Czech Republic	0.725	33	Korea, Rep. of	0.491	64	Venezuela	0.380
3	Austria	0.721	34	New Zealand	0.486	65	Nepal	0.379
4	Portugal	0.703	35	PRC	0.483	66	Botswana	0.376
5	Belgium	0.699	36	Hong Kong, China	0.481	67	Trinidad and Tobago	0.374
6	Slovak Republic	0.696	37	Indonesia	0.478	68	Mexico	0.373
7	Germany	0.693	38	Paraguay	0.460	69	Mozambique	0.365
8	Finland	0.686	39	Japan	0.458	70	Ecuador	0.362
9	Romania	0.684	40	Chile	0.433	71	Bangladesh	0.361
10	Netherlands	0.677	41	Australia	0.431	72	Uganda	0.360
11	Denmark	0.677	42	Benin	0.427	73	South Africa	0.351
12	Luxembourg	0.673	43	St. Lucia	0.426	74	Jamaica	0.349
13	Sweden	0.670	44	Viet Nam	0.426	75	Kenya	0.348
14	Spain	0.669	45	Zambia	0.425	76	Mali	0.345
15	Ireland	0.665	46	Uruguay	0.425	77	Brazil	0.342
16	Latvia	0.663	47	Colombia	0.423	78	Grenada	0.331
17	Italy	0.661	48	Costa Rica	0.422	79	Pakistan	0.330
18	Slovenia	0.655	49	Togo	0.421	80	Sri Lanka	0.330
19	France	0.650	50	Argentina	0.419	81	Senegal	0.324
20	Lithuania	0.647	51	Philippines	0.414	82	Tanzania	0.322
21	Hungary	0.645	52	Peru	0.410	83	Maldives	0.317
22	Estonia	0.642	53	Rwanda	0.409	84	Kyrgyz Republic	0.307
23	Bulgaria	0.623	54	Ghana	0.407	85	Nigeria	0.300
24	United Kingdom	0.614	55	Niger	0.406	86	Kazakhstan	0.294
25	Greece	0.590	56	Malawi	0.406	87	Mauritius	0.291
26	Malta	0.555	57	Panama	0.405	88	Georgia	0.284
27	Cyprus	0.544	58	Nicaragua	0.400	89	Seychelles	0.265
28	Singapore	0.542	59	India	0.399	90	Morocco	0.258
29	Malaysia	0.536	60	Cambodia	0.395	91	Bahamas, The	0.234
30	Swaziland	0.507	61	Namibia	0.389	92	Algeria	0.222
31	Thailand	0.497	62	Cote d'Ivoire	0.389	93	Sudan	0.218

Key Findings

- Large variations in regional integration across subregions and six dimensions

    - Regional integration in Southeast Asia is most advanced

    - Trade and investment/regional value chains drive regional integration in Asia-Pacific

- Regional integration is multidimensional process; lagging areas (especially, money and finance/institutional and social framework) require greater attention to promote regional integration

- Asia's current level of overall regional integration fares better than those of Latin America and Africa; but lags behind EU

    - Trade and investment integration in Asia-Pacific is as advanced as that in EU

    - Institutional and social dimension of regional integration lags in developing regions

Summary

- **Regional integration in Asia-Pacific:** Significant progress has been made, but the degree of regional integration varies across different subregions and socioeconomic dimensions

- **Advanced trade and investment integration:** Asian regional integration has been largely driven by trade and investment integration which is as advanced as that in EU; but progress has been slow in institutional and social dimension

- **Regional integration is multidimensional process:** Some dimensions (especially, money and finance/institutional and social framework) require greater attention to promote regional integration

Thank you!

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Extra slides

World rankings of the overall regional integration index

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12	Luxembourg	0.673	43	St. Lucia	0.426	74	Jamaica	0.349
13	Sweden	0.670	44	Viet Nam	0.426	75	Kenya	0.348
14	Spain	0.669	45	Zambia	0.425	76	Mali	0.345
15	Ireland	0.665	46	Uruguay	0.425	77	Brazil	0.342
16	Latvia	0.663	47	Colombia	0.423	78	Grenada	0.331
17	Italy	0.661	48	Costa Rica	0.422	79	Pakistan	0.330
18	Slovenia	0.655	49	Togo	0.421	80	Sri Lanka	0.330
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Asia regional integration index, overall:
Excluding Dimension 2 (Money and Finance)

Asia Region Average=0.469
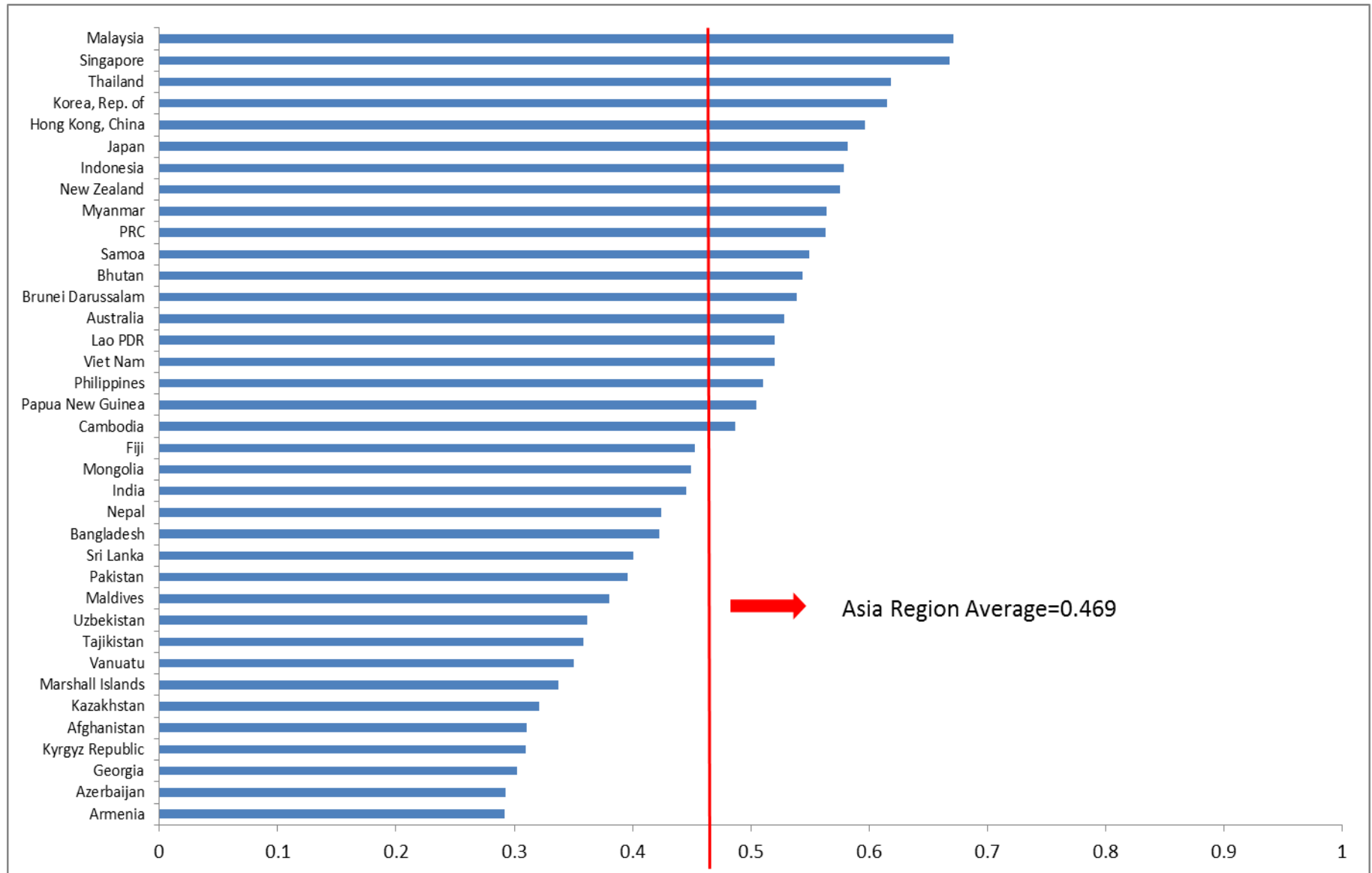
Performance of sub-regions, overall:
Excluding Dimension 2 (Money and Finance)
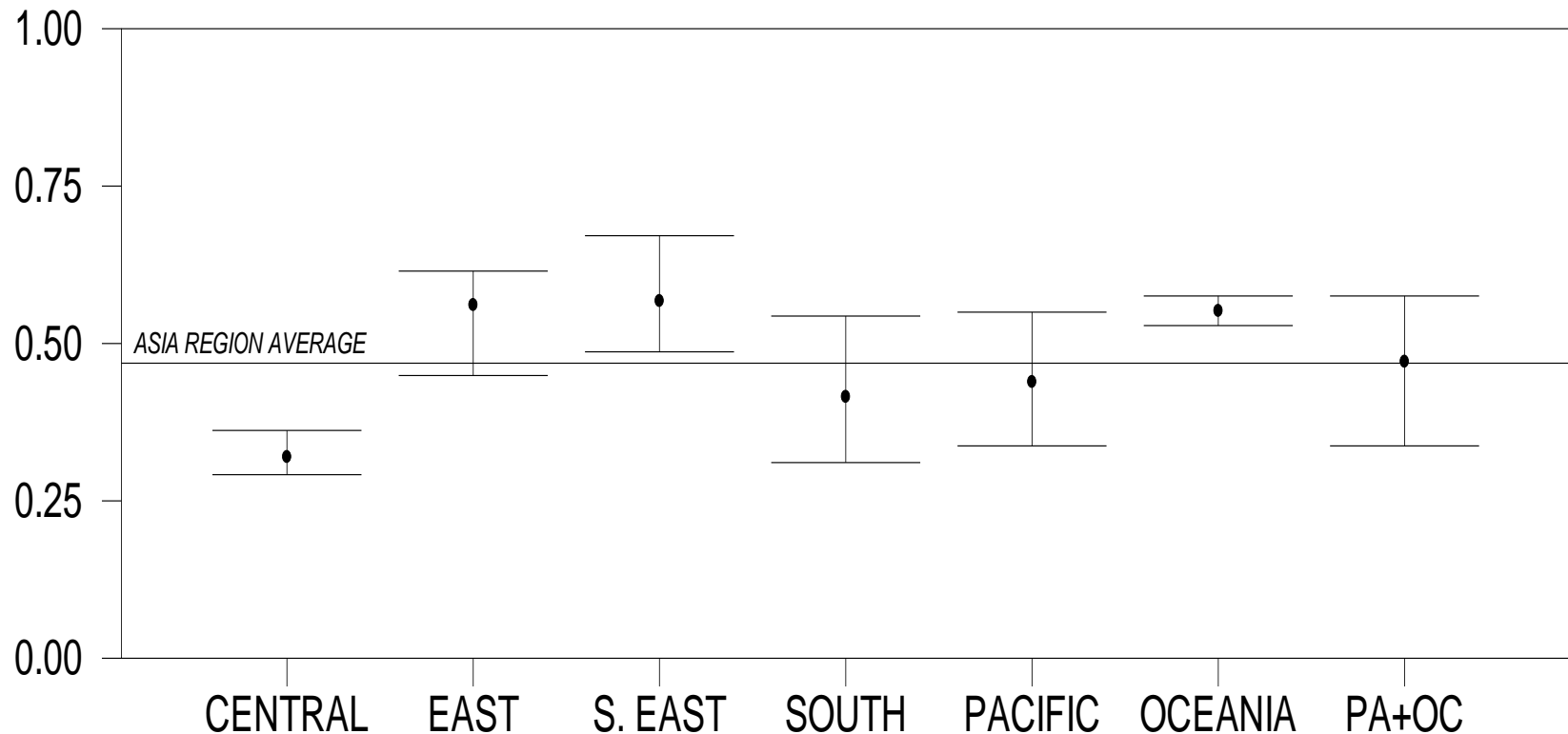
World rankings of the overall RII:
Excluding Dimension 2 (Money and Finance)

Rank	Country	Score	Rank	Country	Score	Rank	Country	Score
1	Poland	0.727	32	Thailand	0.501	63	Togo	0.413
2	Czech Republic	0.708	33	Hong Kong, China	0.489	64	Philippines	0.410
3	Austria	0.697	34	New Zealand	0.482	65	Namibia	0.404
4	Germany	0.693	35	Indonesia	0.475	66	Congo, Democratic Republic	0.403
5	Romania	0.688	36	Japan	0.472	67	Trinidad and Tobago	0.399
6	Slovak Republic	0.682	37	Chile	0.469	68	Niger	0.397
7	Portugal	0.677	38	Myanmar	0.467	69	Guatemala	0.394
8	Belgium	0.676	39	Samoa	0.467	70	Mongolia	0.393
9	Finland	0.668	40	Bhutan	0.466	71	Mexico	0.389
10	Denmark	0.664	41	Bolivia	0.462	72	Ghana	0.389
11	Netherlands	0.659	42	Paraguay	0.455	73	Rwanda	0.387
12	Sweden	0.659	43	Brunei Darussalam	0.455	74	El Salvador	0.385
13	Luxembourg	0.643	44	PRC	0.454	75	South Africa	0.385
14	France	0.638	45	Colombia	0.452	76	Cote d'Ivoire	0.382
15	Hungary	0.637	46	Lao PDR	0.445	77	St. Lucia	0.377
16	Ireland	0.636	47	Costa Rica	0.444	78	India	0.376
17	Latvia	0.635	48	Argentina	0.438	79	Ecuador	0.375
18	Spain	0.633	49	Uruguay	0.437	80	Fiji	0.367
19	Italy	0.621	50	Australia	0.434	81	Malawi	0.367
20	Slovenia	0.617	51	Peru	0.434	82	Brazil	0.364
21	United Kingdom	0.607	52	Panama	0.433	83	Mozambique	0.355
22	Lithuania	0.607	53	Burundi	0.428	84	Bangladesh	0.354
23	Bulgaria	0.598	54	Viet Nam	0.428	85	Botswana	0.352
24	Estonia	0.591	55	Papua New Guinea	0.425	86	Uganda	0.352
25	Greece	0.561	56	Venezuela	0.424	87	Nepal	0.349
26	Malaysia	0.555	57	Honduras	0.422	88	Gambia, The	0.345
27	Singapore	0.553	58	Nicaragua	0.421	89	Kenya	0.343
28	Cyprus	0.542	59	Benin	0.420	90	Burkina Faso	0.343
29	Malta	0.530	60	Cambodia	0.419	91	Sri Lanka	0.343
30	Korea, Rep. of	0.507	61	Zimbabwe	0.416	92	Dominican Republic	0.341
31	Swaziland	0.502	62	Zambia	0.414	93	Belize	0.340

World rankings of the overall RII:
Excluding Dimension 2 (Money and Finance)

Rank	Country	Score	Rank	Country	Score	Rank	Country	Score
94	Mali	0.337	125	Morocco	0.254		Lesotho	
95	Grenada	0.337	126	Ethiopia	0.252			
96	Pakistan	0.333	127	Liberia	0.238			
97	Maldives	0.327	128	Bahamas, The	0.225			
98	Barbados	0.326	129	Sao Tome and Principe	0.224			
99	Tanzania	0.324	130	Madagascar	0.223			
100	Cape Verde	0.324	131	Algeria	0.221			
101	Uzbekistan	0.319	132	Sudan	0.218			
102	Senegal	0.318	133	Suriname	0.216			
103	Tajikistan	0.312	134	Djibouti	0.200			
104	Jamaica	0.310	135	Congo, Republic of	0.176			
105	Guyana	0.309		Turkmenistan				
106	Cameroon	0.309		Taipei,China				
107	Mauritius	0.293		Cook Islands				
108	Georgia	0.292		Kiribati				
109	Nigeria	0.288		Micronesia, Fed. States.				
110	Guinea	0.288		Nauru				
111	Kazakhstan	0.281		Palau				
112	Vanuatu	0.281		Solomon Islands				
113	Angola	0.277		Timor-Leste				
114	Armenia	0.272		Tonga				
115	Azerbaijan	0.271		Tuvalu				
116	Tunisia	0.270		Antigua and Barbuda				
117	Marshall Islands	0.270		Dominica				
118	Haiti	0.267		St. Kitts and Nevis				
119	Sierra Leone	0.265		St. Vincent and the Grenadines				
120	Chad	0.263		Central African Republic				
121	Gabon	0.259		Comoros				
122	Afghanistan	0.258		Equatorial Guinea				
123	Kyrgyz Republic	0.256		Eritrea				
124	Seychelles	0.254		Guinea-Bissau				