

Annex A: Knowledge Assessment Methodology

Table A1 KEI Scores

	Country	KEI	Econ. Incentive Regime	Innovation	Education	Information Infrastructure
Group I	Tajikistan	2.18	1.71	1.22	5.36	0.43
	Albania	2.99	2.66	1.65	4.81	2.82
	Bosnia and Herzegovina	3.02	2.62	1.02	4.00	4.45
	Uzbekistan	3.26	1.40	3.77	5.64	2.23
	Kyrgyz Republic	3.53	3.09	1.79	6.53	2.70
	Kazakhstan	3.92	1.47	4.07	7.11	3.05
Group II	Georgia	4.39	1.75	6.07	6.43	3.30
	Moldova	4.43	3.91	4.43	5.40	3.97
	Serbia and Montenegro	4.55	2.15	5.17	5.93	4.94
	Turkey	4.73	4.50	4.89	4.19	5.35
	Belarus	5.02	1.40	5.83	7.64	5.20
	Armenia	5.10	4.90	5.72	6.00	3.77
	Ukraine	5.23	2.83	5.82	7.98	4.31
	Romania	5.27	4.37	5.20	5.60	5.93
	World	5.63	4.80	7.15	4.26	6.33
	Europe and Central Asia	6.02	4.62	6.52	6.67	6.27
Group III	Russia	6.05	3.01	7.47	7.85	5.88
	Bulgaria	6.19	6.05	5.94	6.73	6.03
	Croatia	6.22	4.31	7.12	6.55	6.91
	Slovak Republic	6.70	5.96	6.70	6.65	7.47
	Poland	6.86	6.36	6.15	8.32	6.60
	Greece	6.97	6.75	6.73	7.61	6.77
	Latvia	6.98	6.65	6.12	8.11	7.02
	Czech Republic	7.00	6.01	6.92	7.10	7.96
	Hungary	7.01	6.42	7.00	7.65	6.98
	Lithuania	7.17	6.91	6.46	8.32	7.01
	Portugal	7.30	7.35	7.07	7.37	7.42
	Spain	7.68	7.30	7.65	8.10	7.68
	Israel	7.72	6.70	8.37	6.93	8.90
	Slovenia	7.88	7.01	7.91	8.58	8.00
	Estonia	8.26	8.77	7.29	8.14	8.83
Western Europe	8.27	7.58	8.77	8.14	8.57	
Finland	9.02	8.44	9.73	9.21	8.71	

Variables used in the KEI:

Economic incentive and institutional regime

- Tariff and nontariff barriers
- Regulatory quality
- Rule of law

Education and human resources

- Adult literacy rate (15% and above)
- Secondary enrollment
- Tertiary enrollment

Innovation system

- Researchers in R&D, per million population
- Patent applications granted by the USPTO, per million population
- Scientific and technical journal articles, per million population

Information infrastructure

- Telephones per 1,000 persons (telephone mainlines + mobile phones)
- Computers per 1,000 persons
- Internet users per 1,000 persons

Annex B: Comparison S&T Indicators

In addition to the KAM used in this study, an increasing number of indexes are used to assess a country's readiness for the knowledge economy.

Among the most widely cited indexes that try to assess the innovative capacity of a country we can find the Technology Achievement Index from UNDP, the Competitive Industrial Performance Index from UNIDO, the National Innovative Capacity Index from WEF, and the Innovation Capability Index from UNCTAD. In a recent paper (still in draft form) by Soubbotina (2005), a comparison and assessment of these indexes are attempted. The different indexes put the emphasis on different aspects of the S&T realm—some, such as UNIDO's, put the emphasis on outcome indicators, whereas others, such as UNCTAD's, place more emphasis on inputs into R&D. The rankings are therefore not always the same, and countries such as Singapore with low inputs and high outputs rank relatively high on UNIDO's and lower on UNCTAD's. Table B1 shows a comparison of the scores (although not directly comparable) and rankings produced by these indexes for our sample of countries.

The EU has developed a similar methodology called the European Innovation Score-

board to assess and compare the innovation performance of its member countries. The EU has constructed a composite index (the Summary Innovation Index [SII]), which includes a number of variables similar to that of the KAM. Importantly, the ranking of countries according to the SII in 2005 produced results very similar to that of the KAM (for the countries included). Table B2 shows the scores of the KAM and the SII for a number of countries and compares the rankings they produce, which are fairly similar.

The comparison across indexes is made more difficult by the fact that some of the indexes do not have any data for more than half of our sample of countries. The economic incentives included in the KEI are reflected in a lower score, in comparison with other indexes, for countries such as Belarus, Georgia, or Ukraine. UNIDO's index emphasizes outcome indicators (or revealed technological capacity), as shown in the high rankings of countries such as Portugal, Hungary, and Turkey, whereas UNCTAD's index—ICI—puts more emphasis on the inputs into innovation (underlying technological capacity) and therefore shows higher rankings for countries with well-functioning education systems. However, that somehow failed to translate the higher education into innovation—especially in Russia but also Ukraine and Belarus.

Table B1 Comparison of KEI with Other S&T Indicators

Country	KEI	Rank. KEI	TAI	Rank. TAI	CIP	Rank CIP	ICI	Rank. ICI	NICI	Rank. NICI
Finland	9.02	1	0.744	1	6	1	0.977	1	35.96	1
Estonia	8.26	2	n.a.	n.a.	n.a.	n.a.	0.775	6	28.42	4
Slovenia	7.88	3	0.458	6	24	5	0.801	4	28.16	6
Israel	7.72	4	0.514	2	22	4	0.804	3	32.64	2
Spain	7.68	5	0.481	3	20	3	0.819	2	29.77	3
Portugal	7.30	6	0.419	9	19	2	0.746	7	26.90	10
Lithuania	7.17	7	n.a.	n.a.	n.a.	n.a.	0.742	8	27.08	8
Hungary	7.01	8	0.464	5	31	7	0.725	11	26.00	13
Czech Rep.	7.00	9	0.465	4	26	6	0.690	15	27.27	7
Latvia	6.98	10	n.a.	n.a.	n.a.	n.a.	0.705	12	28.17	5
Greece	6.97	11	0.437	8	33	8	0.737	9	27.01	9
Poland	6.86	12	0.407	11	36	9	0.732	10	26.87	11
Slovak Rep.	6.70	13	0.447	7	n.a.	n.a.	0.626	17	26.12	12
Croatia	6.22	14	0.391	12	n.a.	n.a.	n.a.	n.a.	25.23	15
Bulgaria	6.19	15	0.411	10	n.a.	n.a.	0.665	16	23.62	17
Russia	6.05	16	n.a.	n.a.	40	11	0.788	5	25.59	14
Romania	5.27	17	0.371	13	47	12	0.554	20	22.97	19
Ukraine	5.23	18	n.a.	n.a.	n.a.	n.a.	0.705	13	24.51	16
Armenia	5.10	19	n.a.	n.a.	n.a.	n.a.	0.526	21	n.a.	n.a.
Belarus	5.02	20	n.a.	n.a.	n.a.	n.a.	0.697	14	n.a.	n.a.
Turkey	4.73	21	n.a.	n.a.	39	10	0.390	25	23.23	18
S & M	4.55	22	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Moldova	4.43	23	n.a.	n.a.	n.a.	n.a.	0.413	24	n.a.	n.a.
Georgia	4.39	24	n.a.	n.a.	n.a.	n.a.	0.593	18	n.a.	n.a.
Kazakhstan	3.92	25	n.a.	n.a.	n.a.	n.a.	0.525	22	n.a.	n.a.
Kyrgyz Rep.	3.53	26	n.a.	n.a.	n.a.	n.a.	0.500	23	n.a.	n.a.
Uzbekistan	3.26	27	n.a.	n.a.	n.a.	n.a.	0.564	19	n.a.	n.a.
B & H	3.02	28	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Albania	2.99	29	n.a.	n.a.	62	13	n.a.	n.a.	n.a.	n.a.
Tajikistan	2.18	30	n.a.	n.a.	n.a.	n.a.	0.362	26	n.a.	n.a.

Note: TAI = Technology Achievement Index, from UNDP; CIP = Competitive Industrial Performance, from UNIDO; ICI = Innovation Capability Index, from UNCTAD; NICI = National Innovation Capacity Index, from WEF.

Table B2 Comparison between the KAM and SII 2005

Country	SII Score	Ranking	KEI Score	Ranking
Sweden	0.72	1	9.17	1
Switzerland	0.71	2	8.75	5
Finland	0.68	3	9.02	2
Denmark	0.60	4	9.00	3
United States	0.60	5	8.50	9
Germany	0.58	6	8.33	10
Austria	0.51	7	8.08	13
Belgium	0.50	8	8.25	12
United Kingdom	0.48	9	8.72	6
Netherlands	0.48	10	8.62	7
France	0.46	11	7.98	16
Iceland	0.45	12	8.83	4
Luxemburg	0.44	13	8.08	14
Ireland	0.42	14	8.05	15
Norway	0.40	15	8.56	8
Italy	0.36	16	7.48	19
Estonia	0.32	17	8.26	11
Slovenia	0.32	18	7.88	17
Hungary	0.31	19	7.01	22
Spain	0.30	20	7.68	18
Portugal	0.28	21	7.30	20
Cyprus	0.28	22	6.66	28
Lithuania	0.27	23	7.17	21
Czech Republic	0.26	24	7.00	23
Bulgaria	0.24	25	6.19	29
Poland	0.23	26	6.86	26
Greece	0.21	27	6.97	25
Slovak Republic	0.21	28	6.70	27
Latvia	0.20	29	6.98	24
Romania	0.16	30	5.27	30
Turkey	0.06	31	4.73	31

Annex C: Sensitivity Analysis of the KEI

Figures A2 through A5 in annex A illustrate how countries score in the different knowledge economy pillars. Although in general, countries score similarly in all four pillars (or at least they would appear to group equally in the KEI as well as in the four pillar indicators), there are important exceptions. Table C1 illustrates that fact by including the scores and rankings of our sample of countries for all four pillars (along with the KEI).

A quick look at some of the countries shows the differences in the rankings. Belarus is ranked 11th on education, although it is one of the worst ranked in the economic incentives regime. Israel, with a fairly high KEI score, is ranked 2nd in its innovation system and 1st in information infrastructure, but only 16th in education. Russia, for example, which has a medium score in the KEI, has one of the highest scores for the innovation system and a fairly high score in education (similar situation with Ukraine in education). A different weighting (giving education and the innovation system a higher weight than the economic incentives regime) would probably make Russia look very different and ready to

engage in a program to finance innovation with public funds. Similarly, a country such as Belarus, with a dismal economic situation, would score very high if more weight were given to education. Countries such as Turkey or Armenia, with fairly low innovation systems and human capital levels, have a much more conducive economic regime, which means that a weighting that gives more emphasis to the country's economic situation might show fairly different results. To illustrate those effects, we undertook a sensitivity analysis changing the weights and giving a stronger weight to one indicator at a time.

In table C2 and figures A6 through A9 in annex A, we present the results of this exercise, in turn attributing a weight of 50 percent to one pillar with the other three pillars sharing the remaining 50 percent equally. We can see that Russia scores fairly high on innovation, and its ranking rises significantly when more weight is given to this indicator; similarly, Belarus's score drops when the economic regime is given more weight. Another interesting case is Ukraine (education and innovation system). Although obviously scores do change, there is sufficient consistency in the rankings and scores of the countries to warrant the use of an equal weighting of the pillar indicators.

Table C1 Comparison of Rankings of Countries according to KEI and the Four NIS Pillars

Country	KEI	Rank KEI	Econ. Incentive Regime	Rank Econ	Innovation	Rank Inn	Education	Rank Educ	Information Infrastructure	Rank Inf
Albania	2.99	29	2.66	23	1.65	28	4.81	28	2.82	27
Armenia	5.10	19	4.90	15	5.72	20	6.00	22	3.77	24
Belarus	5.02	20	1.40	29	5.83	18	7.64	11	5.20	19
B & H	3.02	28	2.62	24	1.02	30	4.00	30	4.45	21
Bulgaria	6.19	15	6.05	12	5.94	17	6.73	17	6.03	15
Croatia	6.22	14	4.31	18	7.12	7	6.55	19	6.91	12
Czech Rep.	7.00	9	6.01	13	6.92	10	7.10	15	7.96	5
Estonia	8.26	2	8.77	1	7.29	6	8.14	5	8.83	2
Finland	9.02	1	8.44	2	9.73	1	9.21	1	8.71	3
Georgia	4.39	24	1.75	26	6.07	16	6.43	21	3.30	25
Greece	6.97	11	6.75	7	6.73	11	7.61	12	6.77	13
Hungary	7.01	8	6.42	10	7.00	9	7.65	10	6.98	11
Israel	7.72	4	6.70	8	8.37	2	6.93	16	8.90	1
Kazakhstan	3.92	25	1.47	28	4.07	25	7.11	14	3.05	26
Kyrgyz Rep.	3.53	26	3.09	20	1.79	27	6.53	20	2.70	28
Latvia	6.98	10	6.65	9	6.12	15	8.11	6	7.02	9
Lithuania	7.17	7	6.91	6	6.46	13	8.32	3	7.01	10
Moldova	4.43	23	3.91	19	4.43	24	5.40	26	3.97	23
Poland	6.86	12	6.36	11	6.15	14	8.32	4	6.60	14
Portugal	7.30	6	7.35	3	7.07	8	7.37	13	7.42	8
Romania	5.27	17	4.37	17	5.20	21	5.60	25	5.93	16
Russia	6.05	16	3.01	21	7.47	5	7.85	9	5.88	17
S & M	4.55	22	2.15	25	5.17	22	5.93	23	4.94	20
Slovak Rep.	6.70	13	5.96	14	6.70	12	6.65	18	7.47	7
Slovenia	7.88	3	7.01	5	7.91	3	8.58	2	8.00	4
Spain	7.68	5	7.30	4	7.65	4	8.10	7	7.68	6
Tajikistan	2.18	30	1.71	27	1.22	29	5.36	27	0.43	30
Turkey	4.73	21	4.50	16	4.89	23	4.19	29	5.35	18
Ukraine	5.23	18	2.83	22	5.82	19	7.98	8	4.31	22
Uzbekistan	3.26	27	1.40	30	3.77	26	5.64	24	2.23	29

Table C2 Comparison of KEI Scores with Different Weightings

Country	KEI	KEI Econ	KEI Inn	KEI Educ	KEI Inf
Albania	2.99	2.88	2.54	3.59	2.93
Armenia	5.10	5.03	5.31	5.40	4.66
Belarus	5.02	3.81	5.29	5.89	5.08
Bosnia and Herzegovina	3.02	2.89	2.36	3.35	3.50
Bulgaria	6.19	6.14	6.11	6.37	6.14
Croatia	6.22	5.59	6.52	6.33	6.45
Czech Republic	7.00	6.67	6.97	7.03	7.32
Estonia	8.26	8.43	7.94	8.22	8.45
Finland	9.02	8.83	9.26	9.09	8.92
Georgia	4.39	3.51	4.95	5.07	4.03
Greece	6.97	6.89	6.89	7.18	6.90
Hungary	7.01	6.82	7.01	7.23	7.00
Israel	7.72	7.38	7.94	7.46	8.12
Kazakhstan	3.92	3.11	3.97	4.99	3.63
Kyrgyz Rep.	3.53	3.38	2.95	4.53	3.25
Latvia	6.98	6.87	6.69	7.35	6.99
Lithuania	7.17	7.09	6.94	7.56	7.12
Moldova	4.43	4.26	4.43	4.75	4.28
Poland	6.86	6.69	6.62	7.35	6.77
Portugal	7.30	7.32	7.23	7.33	7.34
Romania	5.27	4.97	5.25	5.38	5.49
Russia	6.05	5.04	6.53	6.65	6.00
Serbia and Montenegro	4.55	3.75	4.76	5.01	4.68
Slovak Republic	6.70	6.45	6.67	6.68	6.95
Slovenia	7.88	7.59	7.89	8.11	7.92
Spain	7.68	7.56	7.67	7.82	7.68
Tajikistan	2.18	2.02	1.86	3.24	1.60
Turkey	4.73	4.66	4.79	4.55	4.94
Ukraine	5.23	4.43	5.43	6.15	4.93
Uzbekistan	3.26	2.64	3.43	4.05	2.92

Note:

KEI = equal weighting of all pillars, $KEI = 0.25 \cdot Econ + 0.25 \cdot Educ + 0.25 \cdot Inn + 0.25 \cdot Inf$,

KEI Econ = $0.5 \cdot Econ + 1/6 \cdot Educ + 1/6 \cdot Inn + 1/6 \cdot Inf$,

KEI Educ = $0.5 \cdot Educ + 1/6 \cdot Econ + 1/6 \cdot Inn + 1/6 \cdot Inf$,

KEI Inn = $0.5 \cdot Inn + 1/6 \cdot Econ + 1/6 \cdot Educ + 1/6 \cdot Inf$,

KEI Inf = $0.5 \cdot Inf + 1/6 \cdot Econ + 1/6 \cdot Educ + 1/6 \cdot Inn$

Annex D: Analysis of Bottlenecks

Table D1 Bottlenecks in the NIS according to Pillar Indicators

Country	KEI	Econ. Incentive Regime	Innovation	Education	Information Infrastructure
Tajikistan	2.18	1.71	1.22	5.36	0.43
Albania	2.99	2.66	1.65	4.81	2.82
Bosnia and Herzegovina	3.02	2.62	1.02	4.00	4.45
Uzbekistan	3.26	1.40	3.77	5.64	2.23
Kyrgyz Rep.	3.53	3.09	1.79	6.53	2.70
Kazakhstan	3.92	1.47	4.07	7.11	3.05
Georgia	4.39	1.75	6.07	6.43	3.30
Moldova	4.43	3.91	4.43	5.40	3.97
Serbia and Montenegro	4.55	2.15	5.17	5.93	4.94
Turkey	4.73	4.50	4.89	4.19	5.35
Belarus	5.02	1.40	5.83	7.64	5.20
Armenia	5.10	4.90	5.72	6.00	3.77
Ukraine	5.23	2.83	5.82	7.98	4.31
Romania	5.27	4.37	5.20	5.60	5.93
Russia	6.05	3.01	7.47	7.85	5.88
Bulgaria	6.19	6.05	5.94	6.73	6.03
Croatia	6.22	4.31	7.12	6.55	6.91
Slovak Republic	6.70	5.96	6.70	6.65	7.47
Poland	6.86	6.36	6.15	8.32	6.60
Greece	6.97	6.75	6.73	7.61	6.77
Latvia	6.98	6.65	6.12	8.11	7.02
Czech Republic	7.00	6.01	6.92	7.10	7.96
Hungary	7.01	6.42	7.00	7.65	6.98
Lithuania	7.17	6.91	6.46	8.32	7.01
Portugal	7.30	7.35	7.07	7.37	7.42
Spain	7.68	7.30	7.65	8.10	7.68
Israel	7.72	6.70	8.37	6.93	8.90
Slovenia	7.88	7.01	7.91	8.58	8.00
Estonia	8.26	8.77	7.29	8.14	8.83
Finland	9.02	8.44	9.73	9.21	8.71

Note: In this table bottlenecks are defined as individual pillar scores below 2.5 (or ¼ of the maximum score of 10). Alternative approaches using the deviation from the ECA mean in the individual pillars as a measure of these bottlenecks offer very similar results.

Table D2 Main Problem Areas in Relation to the KEI

Country	KEI	ECON	ECONj- ECONav	DevECON	INN	INNj- INNav	DevINN	EDU	EDUj- EDUav	DevEDU	INF	INFj- INFav	DevINF
TJK	2.18	1.71	-2.54	-116%	1.22	-4.05	-186%	5.36	-1.30	-60%	0.43	-4.82	-221%
ALB	2.99	2.66	-1.59	-53%	1.65	-3.62	-121%	4.81	-1.85	-62%	2.82	-2.43	-81%
BIH	3.02	2.62	-1.63	-54%	1.02	-4.25	-141%	4.00	-2.66	-88%	4.45	-0.80	-26%
UZB	3.26	1.40	-2.85	-87%	3.77	-1.50	-46%	5.64	-1.02	-31%	2.23	-3.02	-93%
KGZ	3.53	3.09	-1.16	-33%	1.79	-3.48	-99%	6.53	-0.13	-4%	2.70	-2.55	-72%
KAZ	3.92	1.47	-2.78	-71%	4.07	-1.20	-31%	7.11	0.45	11%	3.05	-2.20	-56%
GEO	4.39	1.75	-2.50	-57%	6.07	0.80	18%	6.43	-0.23	-5%	3.30	-1.95	-44%
MDA	4.43	3.91	-0.34	-8%	4.43	-0.84	-19%	5.40	-1.26	-29%	3.97	-1.28	-29%
YUG	4.55	2.15	-2.10	-46%	5.17	-0.10	-2%	5.93	-0.73	-16%	4.94	-0.31	-7%
TUR	4.73	4.50	0.25	5%	4.89	-0.38	-8%	4.19	-2.47	-52%	5.35	0.10	2%
BLR	5.02	1.40	-2.85	-57%	5.83	0.56	11%	7.64	0.98	19%	5.20	-0.05	-1%
ARM	5.10	4.90	0.65	13%	5.72	0.45	9%	6.00	-0.66	-13%	3.77	-1.48	-29%
UKR	5.23	2.83	-1.42	-27%	5.82	0.55	11%	7.98	1.32	25%	4.31	-0.94	-18%
ROM	5.27	4.37	0.12	2%	5.20	-0.07	-1%	5.60	-1.06	-20%	5.93	0.68	13%
RUS	6.05	3.01	-1.24	-20%	7.47	2.20	36%	7.85	1.19	20%	5.88	0.63	10%
BGR	6.19	6.05	1.80	29%	5.94	0.67	11%	6.73	0.07	1%	6.03	0.78	13%
HRV	6.22	4.31	0.06	1%	7.12	1.85	30%	6.55	-0.11	-2%	6.91	1.66	27%
SVK	6.70	5.96	1.71	26%	6.70	1.43	21%	6.65	-0.01	0%	7.47	2.22	33%
POL	6.86	6.36	2.11	31%	6.15	0.88	13%	8.32	1.66	24%	6.60	1.35	20%
LVA	6.98	6.65	2.40	34%	6.12	0.85	12%	8.11	1.45	21%	7.02	1.77	25%
CZE	7.00	6.01	1.76	25%	6.92	1.65	24%	7.10	0.44	6%	7.96	2.71	39%
HUN	7.01	6.42	2.17	31%	7.00	1.73	25%	7.65	0.99	14%	6.98	1.73	25%
LTU	7.17	6.91	2.66	37%	6.46	1.19	17%	8.32	1.66	23%	7.01	1.76	25%
SVN	7.88	7.01	2.76	35%	7.91	2.64	34%	8.58	1.92	24%	8.00	2.75	35%
EST	8.26	8.77	4.52	55%	7.29	2.02	24%	8.14	1.48	18%	8.83	3.58	43%

Note: ECONj = score of the economic incentives pillar for country j; ECONAv = ECA average for the economic incentives pillar; DevECON = measure of the deviation in the pillar score relative to the KEI score (Econ-EconAv)/KEI

Table D3 Bottleneck Analysis—Economic Incentives Regime Indicators

	TNTB	IPR	BANK	INTR	COMP	CR/GDP	REGQ	RULELAW	GOVEFF	CORR
Albania	1.59	0.45	3.00	5.38	1.00	1.04	4.38	2.03	3.67	2.66
Armenia	6.03	0.55	2.09	1.15	0.18	0.48	5.00	3.67	3.83	3.44
Belarus	3.57	n/a	n/a	7.40	n/a	1.76	0.16	0.47	1.09	1.17
B & H	3.57	0.36	2.82	4.04	2.18	6.00	1.95	2.34	2.89	3.36
Bulgaria	6.03	1.91	3.91	4.33	1.55	5.52	6.56	5.55	4.92	5.47
Croatia	1.59	4.00	5.36	2.60	3.82	6.80	5.70	5.62	5.86	5.70
Czech Rep.	3.57	5.45	3.27	6.35	6.55	4.88	7.50	6.95	6.64	6.33
Estonia	9.52	6.82	7.64	8.37	8.18	5.84	8.98	7.81	7.66	7.81
Finland	6.03	9.09	8.36	8.56	8.45	7.12	9.61	9.69	9.53	9.92
Georgia	1.59	0.82	3.27	0.48	2.18	1.04	2.03	1.64	1.80	1.17
Greece	6.03	6.36	6.09	7.21	5.73	7.28	7.03	7.19	6.95	6.95
Hungary	3.57	6.36	5.55	7.98	7.64	6.16	8.12	7.58	6.80	7.11
Israel	6.03	8.09	6.82	7.88	9.18	8.08	6.80	7.27	7.58	7.58
Kazakhstan	1.59	4.00	3.91	n/a	3.18	4.00	1.48	1.33	2.58	0.55
Kyrgyz Rep.	3.57	0.82	0.18	0.77	2.18	0.4	4.61	1.09	1.56	1.09
Latvia	6.03	4.55	5.55	7.4	3.82	5.92	7.66	6.25	6.48	6.09
Lithuania	6.03	3.36	6.09	6.73	6.55	3.68	8.05	6.64	6.88	6.56
Moldova	6.03	1.91	4.27	4.33	0.09	3.04	2.81	2.89	1.95	1.72
Poland	6.03	5.36	3.27	7.98	5.73	3.76	6.64	6.41	6.02	5.86
Portugal	6.03	7.73	7.64	n/a	6.00	9.36	7.89	8.12	7.42	8.12
Romania	3.57	3.09	3.27	n/a	2.64	1.20	4.61	4.92	4.77	4.77
Russia	3.57	0.82	1.00	3.37	3.45	3.52	2.73	2.73	4.38	2.66
S & M	n/a	0.55	1.00	n/a	2.64	n/a	1.80	2.50	4.38	3.98
Slovak Rep.	3.57	6.00	7.27	5.96	5.27	4.56	7.97	6.33	6.72	6.64
Slovenia	6.03	7.18	4.91	6.25	5.27	6.08	7.11	7.89	7.81	7.97
Spain	6.03	7.18	7.82	9.71	7.64	8.96	7.81	8.05	8.36	8.44
Tajikistan	3.57	2.36	0.45	2.21	0.82	2.48	0.86	0.70	0.55	0.39
Turkey	3.57	3.36	0.27	n/a	6.55	2.32	4.45	5.47	5.31	4.92
Ukraine	3.57	1.91	1.36	2.79	3.45	3.6	3.12	1.80	2.34	1.41
Uzbekistan	3.57	n/a	n/a	n/a	n/a	n/a	0.08	0.55	0.70	0.16

Note: See table D7 for explanation of variables.

Table D4 Bottleneck Analysis—Innovation System

	FDI/ GDP	ROY	ROY/ POP	RESR&D	RESR&D /POP	R&D/ GDP	UNIPS	JOUR/ POP	PAT/ PAT	POP
Albania	3.85	3.20	4.37	n/a	n/a	n/a	0.09	3.31	0.00	0.00
Armenia	5.9	n/a	n/a	3.37	5.93	2.17	2.18	6.14	2.39	5.08
Belarus	1.88	2.82	2.62	6.28	6.51	4.70	n/a	6.38	3.63	4.61
B & H	4.79	n/a	n/a	n/a	n/a	n/a	2.91	2.05	0.00	0.00
Bulgaria	6.41	4.47	4.66	4.65	4.88	3.86	2.18	7.09	4.60	5.86
Croatia	6.84	5.92	7.18	4.07	6.63	6.51	4.36	7.40	5.31	7.34
Czech Rep.	7.86	6.21	6.8	5.93	5.23	7.23	7.55	7.87	6.90	7.66
Estonia	8.55	4.08	6.41	2.79	6.98	5.54	6.82	7.80	3.63	7.11
Finland	9.32	7.77	9.03	7.67	9.88	9.64	9.82	9.69	8.67	9.61
Georgia	7.18	3.40	3.98	5.47	7.09	2.89	1.18	4.72	4.60	6.41
Greece	1.62	6.89	7.38	5.70	5.12	4.82	4.91	8.03	5.66	7.03
Hungary	8.38	7.48	7.67	5.81	5.47	6.02	6.55	7.72	7.08	7.81
Israel	4.87	7.28	8.25	4.42	5.81	9.88	8.82	9.76	8.76	9.53
Kazakhstan	8.46	4.27	3.5	4.53	4.07	1.93	4.91	3.78	3.63	4.38
Kyrgyz Rep.	5.56	2.43	2.91	2.67	3.49	1.81	0.36	1.89	0.00	0.00
Latvia	7.44	3.69	5.34	2.91	5.58	3.73	4.36	6.61	3.63	6.17
Lithuania	5.38	4.17	5.63	3.84	6.28	5.18	5.55	6.85	4.16	6.25
Moldova	6.58	2.23	3.01	1.63	2.09	4.46	1.64	4.57	4.60	6.64
Poland	5.04	7.96	6.89	8.02	5.35	4.10	6.00	7.32	6.11	5.78
Portugal	8.97	6.70	7.09	6.51	6.40	5.90	7.09	7.56	5.93	7.27
Romania	3.16	5.53	5.15	6.74	4.53	3.13	1.64	5.67	5.31	5.39
Russia	2.39	7.86	5.53	9.53	8.37	7.11	6.00	7.17	7.61	6.88
S & M	n/a	n/a	n/a	5.35	5.00	n/a	4.91	6.22	2.39	4.30
Slovak Rep.	7.01	5.73	6.7	4.77	6.05	4.1	7.09	7.48	5.13	6.56
Slovenia	3.33	5.63	7.77	3.26	7.33	7.35	7.09	8.43	6.73	7.97
Spain	7.95	8.93	7.96	8.72	6.86	6.14	6.55	8.19	7.96	7.89
Tajikistan	2.91	1.17	1.36	n/a	n/a	n/a	2.18	2.44	n/a	0.00
Turkey	1.03	6.12	4.08	6.86	3.14	4.94	5.55	6.54	6.11	5.00
Ukraine	2.14	6.80	6.02	8.49	6.16	6.75	5.55	5.83	6.28	5.47
Uzbekistan	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3.86	2.39	3.67

Note: See table D7 for explanation of variables.

Table D5 Bottleneck Analysis—Education

	LIT	YEASCH	SECENR	TERENR	EDUCEXP/ GDP	8MATHS	QMATHED
Albania	7.09	n/a	4.30	3.04	n/a	n/a	4.55
Armenia	7.40	n/a	5.47	5.12	2.35	4.58	6.64
Belarus	7.87	n/a	6.41	8.64	8.17	n/a	n/a
B & H	5.20	n/a	3.36	3.44	n/a	n/a	5.27
Bulgaria	7.01	8.04	6.88	6.32	3.13	4.17	8.18
Croatia	6.77	4.46	6.25	6.64	5.13	n/a	6.64
Czech Rep.	8.19	8.26	7.34	5.76	4.52	7.29	9.45
Estonia	8.03	n/a	7.42	8.96	7.22	7.92	8.18
Finland	8.19	8.8	9.53	9.92	8.52	7.29	9.64
Georgia	8.19	n/a	4.69	6.40	0.61	n/a	4.55
Greece	6.38	6.63	7.27	9.20	3.83	n/a	6.82
Hungary	7.32	7.17	8.52	7.12	6.52	7.71	8.73
Israel	5.59	8.48	6.95	8.24	9.30	5.21	7.45
Kazakhstan	7.48	n/a	6.48	7.36	2.00	n/a	4.55
Kyrgyz Rep.	6.14	n/a	6.56	6.88	2.09	n/a	3.27
Latvia	8.03	n/a	7.03	9.28	7.22	6.46	5.73
Lithuania	7.72	n/a	8.20	9.04	7.91	5.83	8.18
Moldova	7.17	n/a	3.83	5.20	6.09	3.33	5.73
Poland	8.19	8.7	8.28	8.48	7.48	n/a	7.73
Portugal	5.12	3.7	9.22	7.76	7.91	n/a	2.64
Romania	6.30	8.37	5.23	5.28	2.70	3.96	9.09
Russia	7.56	8.91	6.64	9.36	2.09	6.46	7.73
S & M	n/a	n/a	5.86	6.00	2.70	4.38	7.45
Slovak Rep.	8.19	7.39	6.17	5.6	3.91	6.46	8.18
Slovenia	7.72	5.54	8.91	9.12	n/a	9.58	6.27
Spain	6.61	5.87	9.30	8.40	5.04	n/a	4.09
Tajikistan	7.24	n/a	5.31	3.52	1.39	n/a	0.73
Turkey	3.78	2.83	4.06	4.72	3.57	2.71	5.27
Ukraine	7.64	n/a	7.58	8.72	7.13	n/a	6.82
Uzbekistan	6.46	n/a	7.11	3.36	n/a	n/a	n/a

Note: See table D7 for explanation of variables.

Table D6 Bottleneck Analysis—Information Infrastructure

	TEL/POP	COMP/POP	INTER/POP	COMCOST	ICTEXP/GDP
Albania	4.77	1.58	2.11	3.42	n/a
Armenia	3.28	4.67	3.36	n/a	n/a
Belarus	4.45	n/a	5.94	4.21	n/a
Bosnia and Herzegovina	5.31	n/a	3.59	2.63	n/a
Bulgaria	6.64	4.42	7.03	6.97	2.03
Croatia	6.80	6.75	7.19	n/a	n/a
Czech Republic	8.52	7.25	8.12	7.76	n/a
Estonia	7.97	9.92	8.59	8.42	n/a
Finland	8.75	8.17	9.22	7.5	6.38
Georgia	3.59	3.50	2.81	8.55	n/a
Greece	9.06	5.17	6.09	8.82	2.61
Hungary	7.73	6.42	6.80	8.03	5.65
Israel	9.14	9.50	8.05	n/a	8.55
Kazakhstan	3.83	n/a	2.27	n/a	n/a
Kyrgyz Republic	2.34	2.33	3.44	0.00	n/a
Latvia	6.56	7.08	7.42	5.00	n/a
Lithuania	7.58	6.5	6.95	3.95	n/a
Moldova	4.06	2.83	5.00	4.34	n/a
Poland	6.48	6.83	6.48	5.92	2.75
Portugal	8.83	6.33	7.11	7.63	2.46
Romania	5.94	5.67	6.17	5.66	0.72
Russia	6.33	6.08	5.23	n/a	1.45
Serbia and Montenegro	6.09	3.42	5.31	4.87	n/a
Slovak Republic	6.95	7.5	7.97	8.03	3.77
Slovenia	7.81	7.92	8.28	9.08	n/a
Spain	8.36	7.33	7.34	n/a	1.88
Tajikistan	0.86	n/a	0.00	0.39	n/a
Turkey	6.17	4.08	5.78	4.74	7.54
Ukraine	5.55	3.00	4.38	n/a	7.1
Uzbekistan	1.80	n/a	2.66	n/a	n/a

Note: See table D7 for explanation of variables.

Table D7 Explanation of Variables

TNTB	Tariff and nontariff barriers
IPR	Intellectual property is well protected
BANK	Soundness of banks
INTR	Interest rate spread (lending rate minus deposit rate)
COMP	Local competition
CR/GDP	Domestic credit to private sector (% of GDP)
REGQ	Regulatory quality
RULELAW	Rule of law
GOVEFF	Government effectiveness
CORR	Control of corruption
FDI/GDP	Gross foreign direct investment as percent of GDP
ROY	Royalty and license fees payments (\$ mil)
ROY/POP	Royalty and license fees payments/mil. pop.
RESR&D	Researchers in R&D
RESR&D/POP	Researchers in R&D/million
R&D/GDP	Total expenditure for R&D as percent of GDP
UNIPS	University–company research collaboration
JOUR/POP	Scientific and technical journal articles/mil pop.
PAT	Patent applications granted by the USPTO
PAT/POP	Patent applications granted by the USPTO/mil pop.
LIT	Adult literacy rate (15 percent and above)
YESCH	Average years of schooling
SECENR	Secondary enrollment
TERENR	Tertiary enrollment
EDUCEXP/GDP	Public spending on education as percent of GDP
8MATHS	8th grade achievement in mathematics
QMATHED	Quality of science and math education
TEL/POP	Telephones per 1,000 people
COMP/POP	Computers per 1,000 people
INTER/POP	Internet users per 10,000 people
COMCOST	International telecommunications, cost of call
ICTEXP/GDP	ICT expenditure as percent of GDP

Annex E: Analysis of Grouping Using the Median

Table E1 Comparison of ECA Average and ECA Median

Country	KEI	KEI—Median	KEI—ECA Average
Tajikistan	2.18	-3.05	-3.18
Albania	2.99	-2.24	-2.37
Bosnia and Herzegovina	3.02	-2.21	-2.34
Uzbekistan	3.26	-1.97	-2.10
Kyrgyz Rep.	3.53	-1.7	-1.83
Kazakhstan	3.92	-1.31	-1.44
Georgia	4.39	-0.84	-0.97
Moldova	4.43	-0.8	-0.93
Serbia and Montenegro	4.55	-0.68	-0.81
Turkey	4.73	-0.5	-0.63
Belarus	5.02	-0.21	-0.34
Armenia	5.10	-0.13	-0.26
Ukraine	5.23	0.00	-0.13
Romania	5.27	0.04	-0.09
Russia	6.05	0.82	0.69
Bulgaria	6.19	0.96	0.83
Croatia	6.22	0.99	0.86
Slovak Republic	6.70	1.47	1.34
Poland	6.86	1.63	1.50
Latvia	6.98	1.75	1.62
Czech Republic	7.00	1.77	1.64
Hungary	7.01	1.78	1.65
Lithuania	7.17	1.94	1.81
Slovenia	7.88	2.65	2.52
Estonia	8.26	3.03	2.90
<i>ECA Median</i>	5.23		
<i>ECA Average</i>	5.36		
<i>Standard Deviation KEI-Median</i>	0.89		

 KEI Score below 1 standard deviation from median, NIS very undeveloped

 KEI Score within 1 standard deviation from median, NIS in need of some reform

 KEI Score above 1 standard deviation from median, NIS fairly developed

The median is to a certain extent a more appropriate measure than the average because it is less sensitive to extreme scores than is the average. We undertook a small exercise to assess whether the median would provide us with very different results than using the ECA average as a threshold. Table E1 shows the results of grouping the countries according to the difference between the individual scores and the median. We construct one group of countries around the median (1 standard deviation above and below the median, the middle group) and those above and below 1 standard deviation from the median. As we can see, both the previous methodology using individual pillar scores and this one result in a very similar group of countries.

Countries with the most (least) developed NIS, have the highest (lowest) KEI scores. Countries in the middle of the distribution pose a more interesting question. Is Ukraine, as the

threshold country, ready for the instruments we are proposing? If so, are the countries just above and below it (Romania and Armenia, respectively) equally ready?

We would argue, that in the middle region, the devil is in the details, and we would have to look at the individual KEI pillar scores as well as individual characteristics of the country (such as size, commitment of the government, etc.) to make a more nuanced assessment. In fact, the World Bank is already engaged in a knowledge economy project in Romania and has undertaken knowledge economy advisory activities in both Poland and the Slovak Republic. It would appear that both methodologies identify as ready those countries in which in praxis governments and the World Bank are already working together to facilitate the countries' transition to a knowledge-based economy.

Annex F: Country Abbreviations

Abbreviation	Country	Abbreviation	Country
ALB	Albania	KAZ	Kazakhstan
ARM	Armenia	KGZ	Kyrgyz Republic
AZE	Azerbaijan	LAC	Latin America & Caribbean
BGR	Bulgaria	LTU	Lithuania
BIH	Bosnia and Herzegovina	LVA	Latvia
BLR	Belarus	MDA	Moldova
BRA	Brazil	MIC	Middle income
CHL	Chile	MKD	Macedonia, FYR
CHN	China	OEC	High income: OECD
CZE	Czech Republic	POL	Poland
EAP	East Asia & Pacific	PRT	Portugal
ECA	Europe & Central Asia	ROM	Romania
ESP	Spain	RUS	Russian Federation
EST	Estonia	SAS	South Asia
FIN	Finland	SVK	Slovak Republic
GEO	Georgia	SVN	Slovenia
GRC	Greece	TJK	Tajikistan
HRV	Croatia	TUR	Turkey
HUN	Hungary	UKR	Ukraine
IND	India	USA	United States
ISR	Israel	UZB	Uzbekistan
JPN	Japan	YUG	Serbia and Montenegro
		WLD	World

Annex : Figures

Figure A1. Knowledge Economy Index

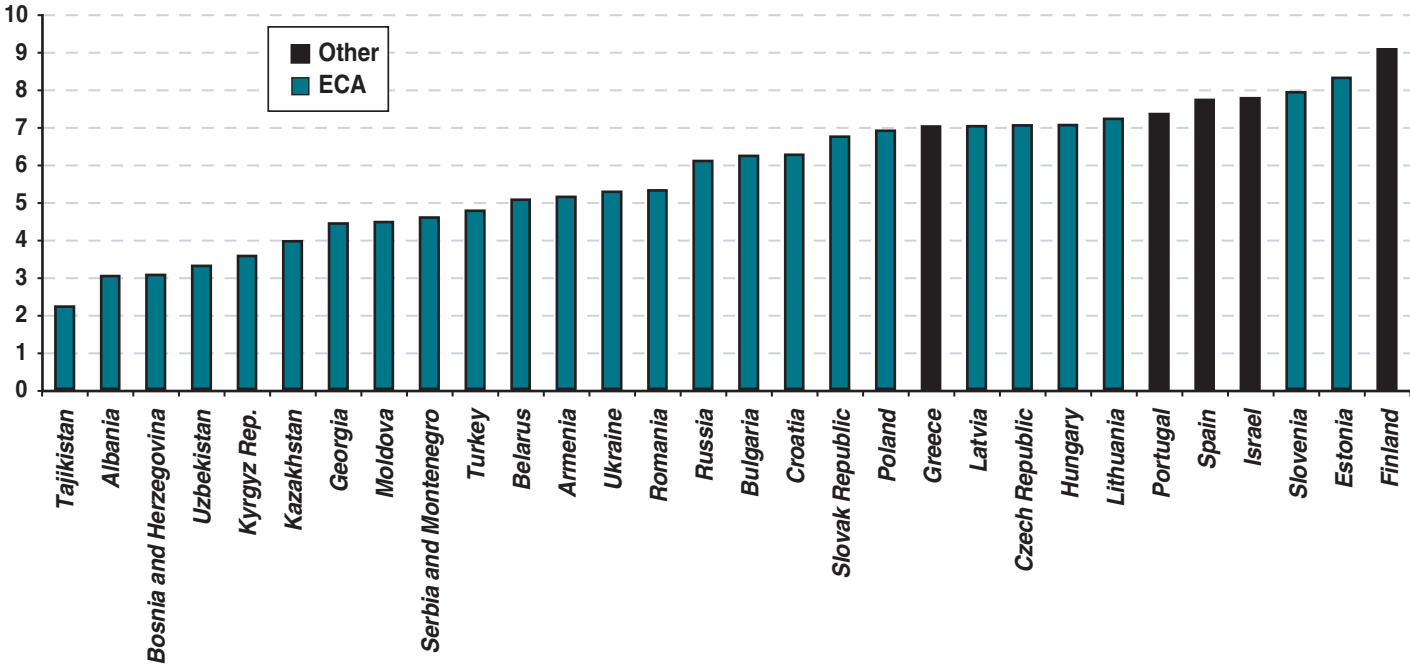


Figure A2. KE Pillar: Economic Incentives Regime

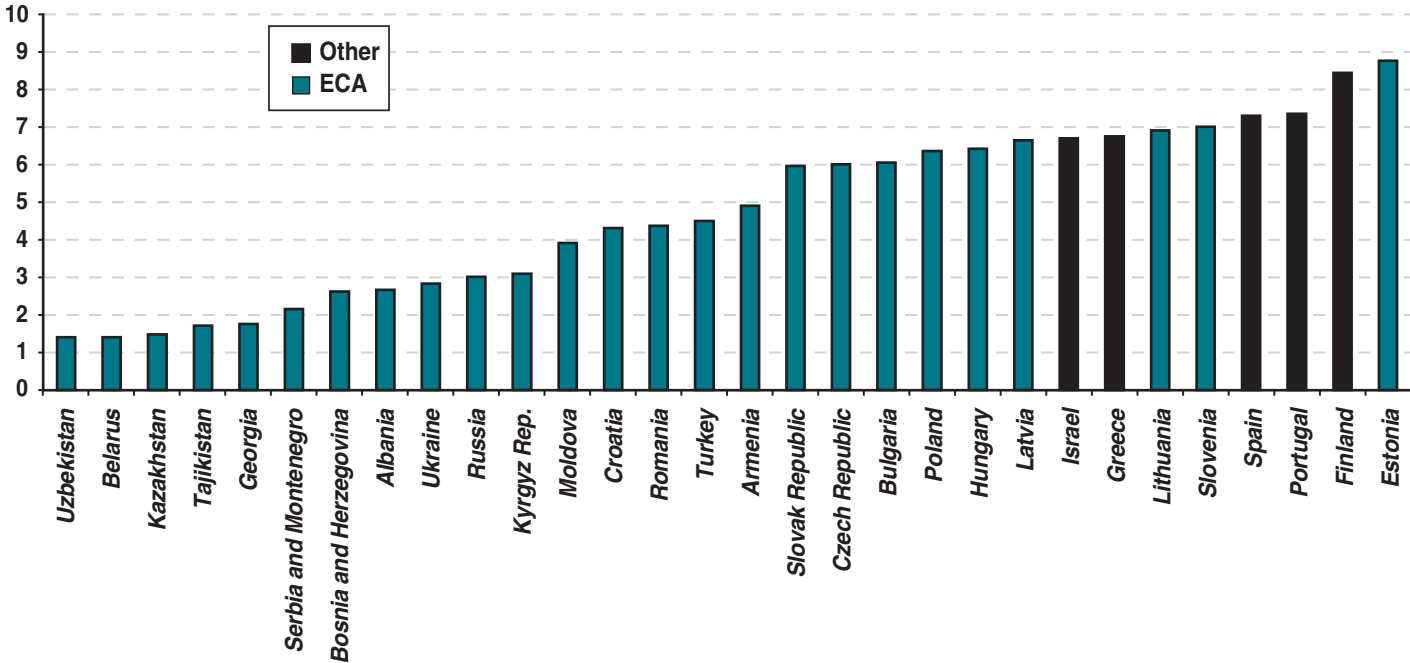


Figure A3. KE Pillar: Innovation

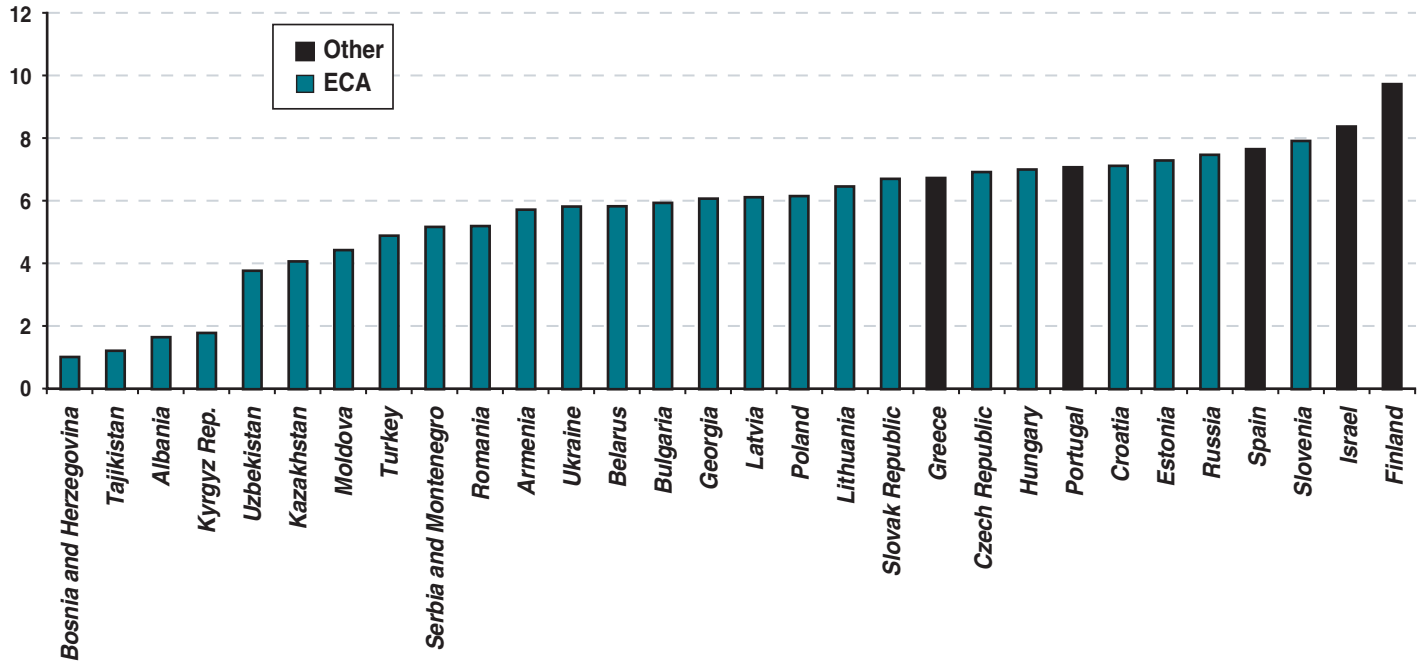


Figure A4. KE Pillar: Education

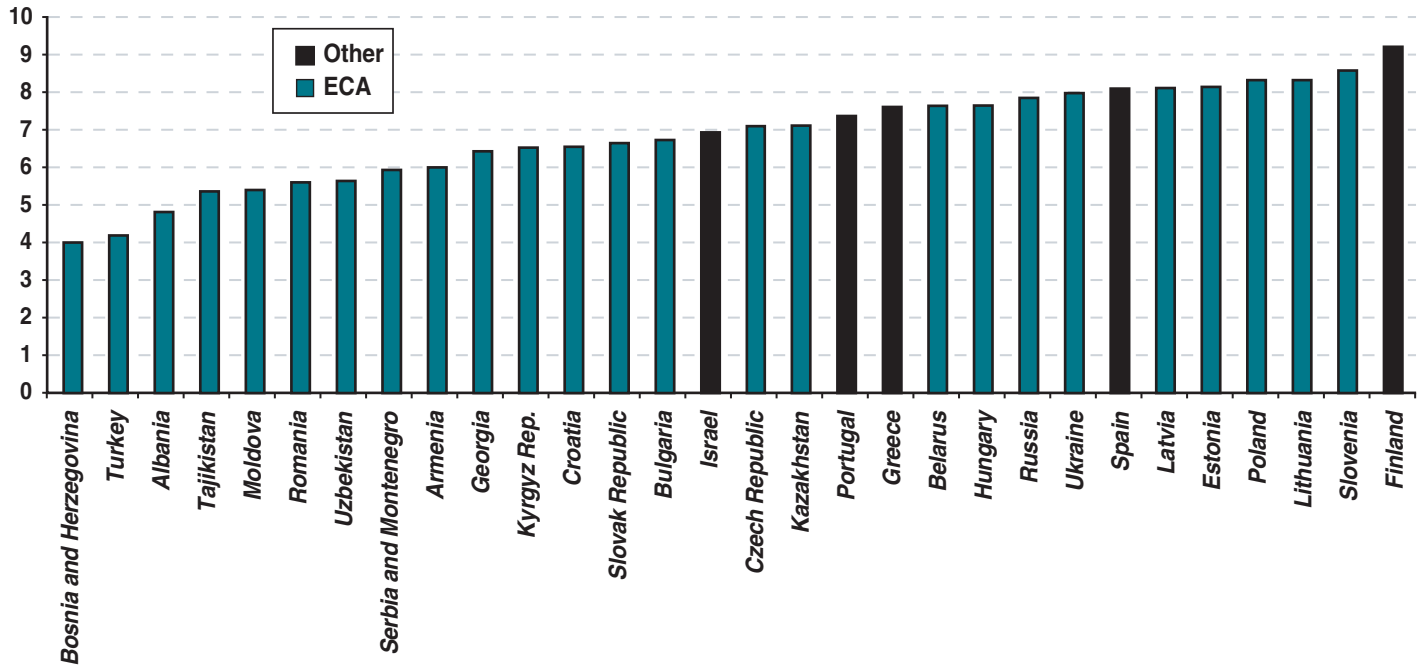


Figure A5. KE Pillar: Information Infrastructure

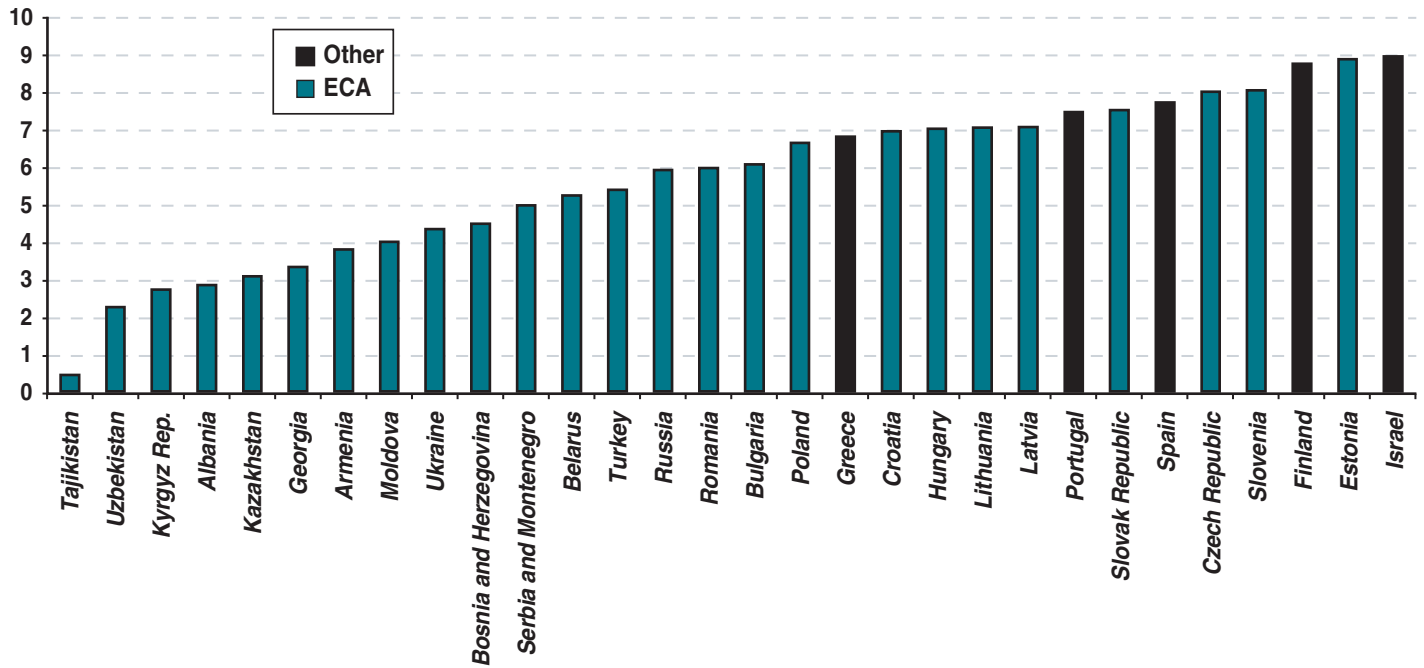


Figure A6. LGDP (2004) on KEIECON

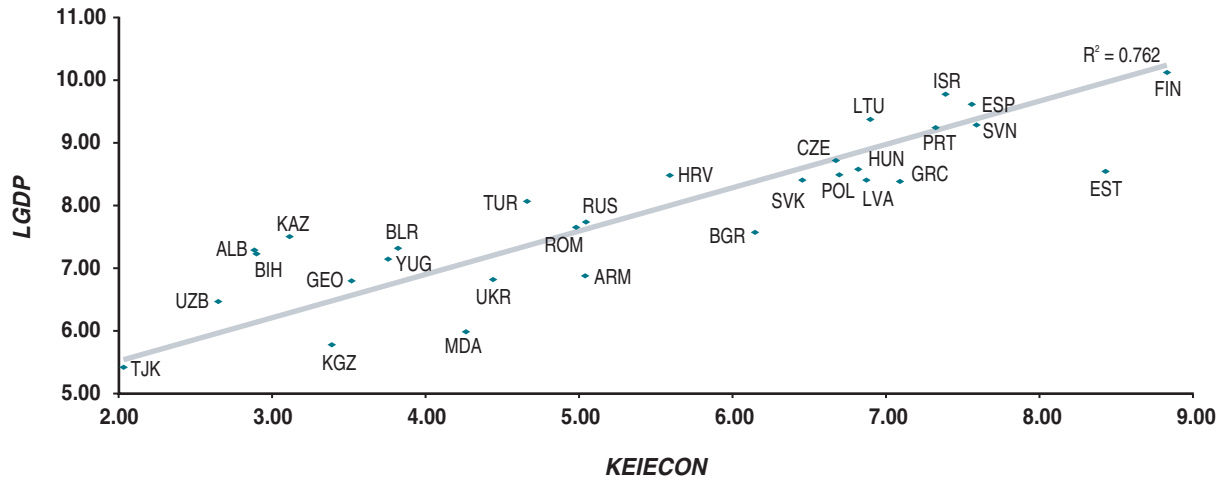


Figure A7. LGDP (2004) on KEIINN

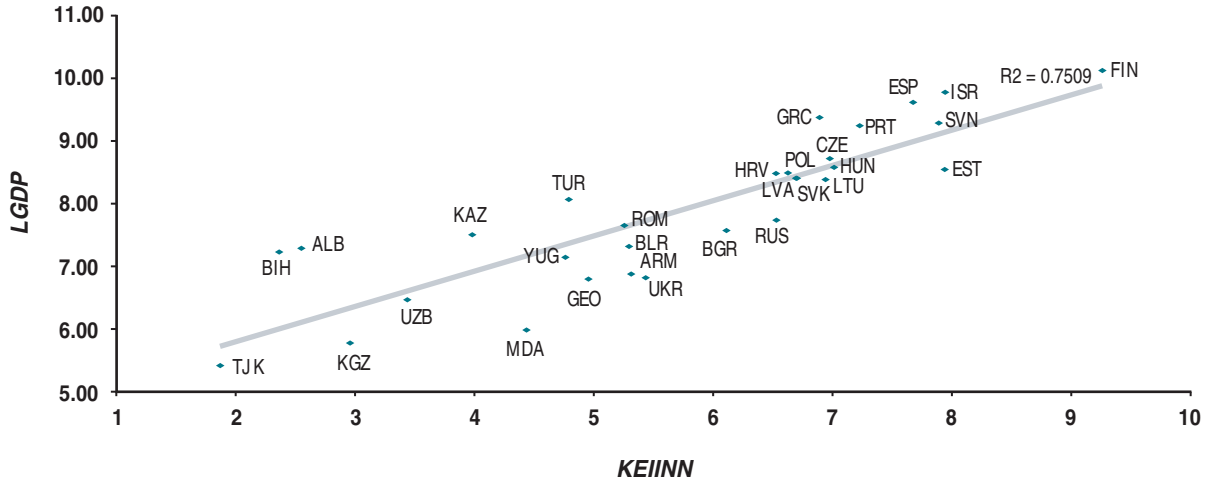


Figure A8. LGDP (2004) on KEIEDU

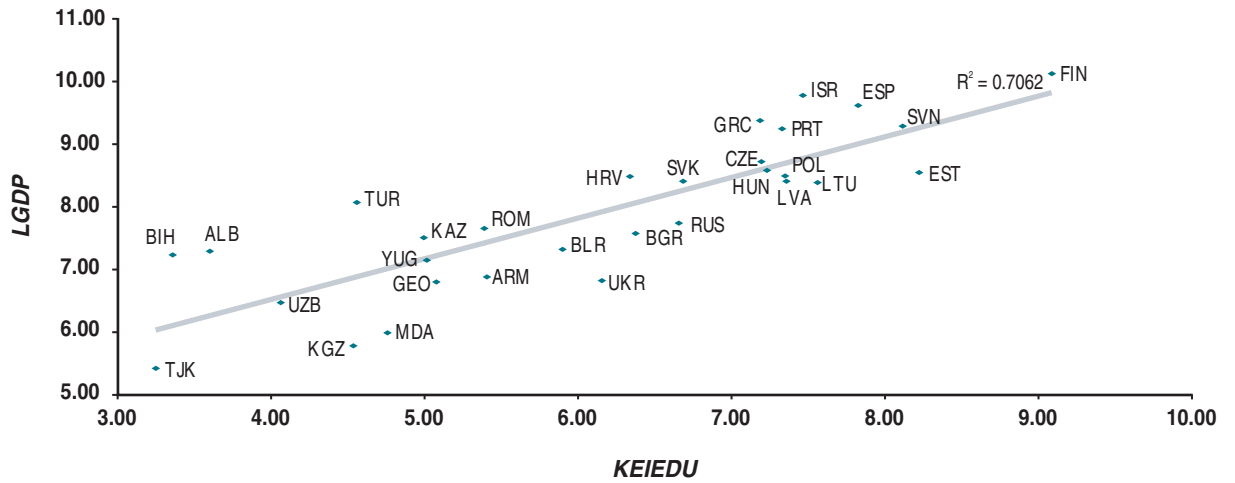


Figure A9. LGDP (2004) on KEINF

