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The Global Innovation Index 2012

Stronger Innovation Linkages for Global Growth

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Editor



The Global Innovation Index 2012: policy insights for Belarus

UN ECE Workshop, Minsk, 15 November 2012

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The GII is a collaborative effort

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EUROPEAN COMMISSION

Statistical audit by the Joint Research
Centre of the European Commission

Global coverage and broad scope

- 141 country profiles (16 added in 2012, Belarus among them)
- 84 indicators (62 hard data, 16 indices, 6 survey questions)

Effort to capture innovation in emerging markets

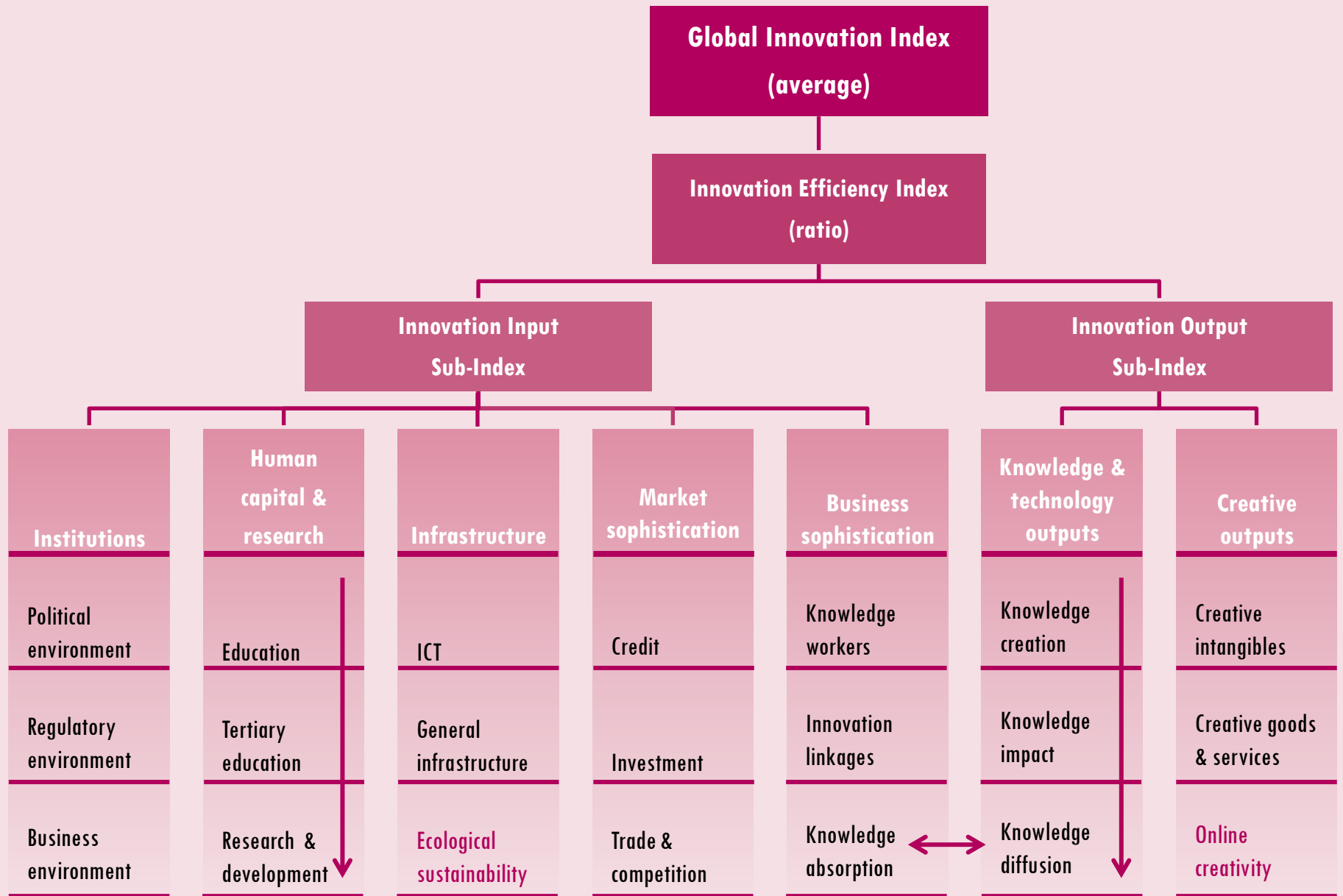
- Indicators are scaled (increased comparability)
- Strengths and weaknesses (signal for policy priorities)
- Performance presented by GDP per capita

Transparent methodology

- Year-on-year comparability (Belarus not included in 2011)
- Statistical audit (confidence intervals for rankings)
- Detailed sources and technical notes

Framework adjusted for relevance and timeliness

- New data in 2012 (ISO, WTO, GMAT, ZookNIC, Google)
- 91% of the data points are from 2009 or earlier (35% from 2011, 35% from 2010)



Top 10 and Belarus

Input Sub-Index	Output Sub-Index	Efficiency ratio	Global Innovation Index
<ol style="list-style-type: none">1. Singapore2. Hong Kong (China)3. Sweden4. Switzerland5. UK6. Finland7. Ireland8. Denmark9. USA10. Canada80. Belarus	<ol style="list-style-type: none">1. Switzerland2. Sweden3. Netherlands4. Malta5. Finland6. UK7. Germany8. Estonia9. Denmark10. Luxembourg75. Belarus	<ol style="list-style-type: none">1. China2. India3. Republic of Moldova4. Malta5. Switzerland6. Paraguay7. Serbia8. Estonia9. Netherlands10. Sri Lanka66. Belarus	<ol style="list-style-type: none">1. Switzerland2. Sweden3. Singapore4. Finland5. UK6. Netherlands7. Denmark8. Hong Kong (China)9. Ireland10. USA78. Belarus

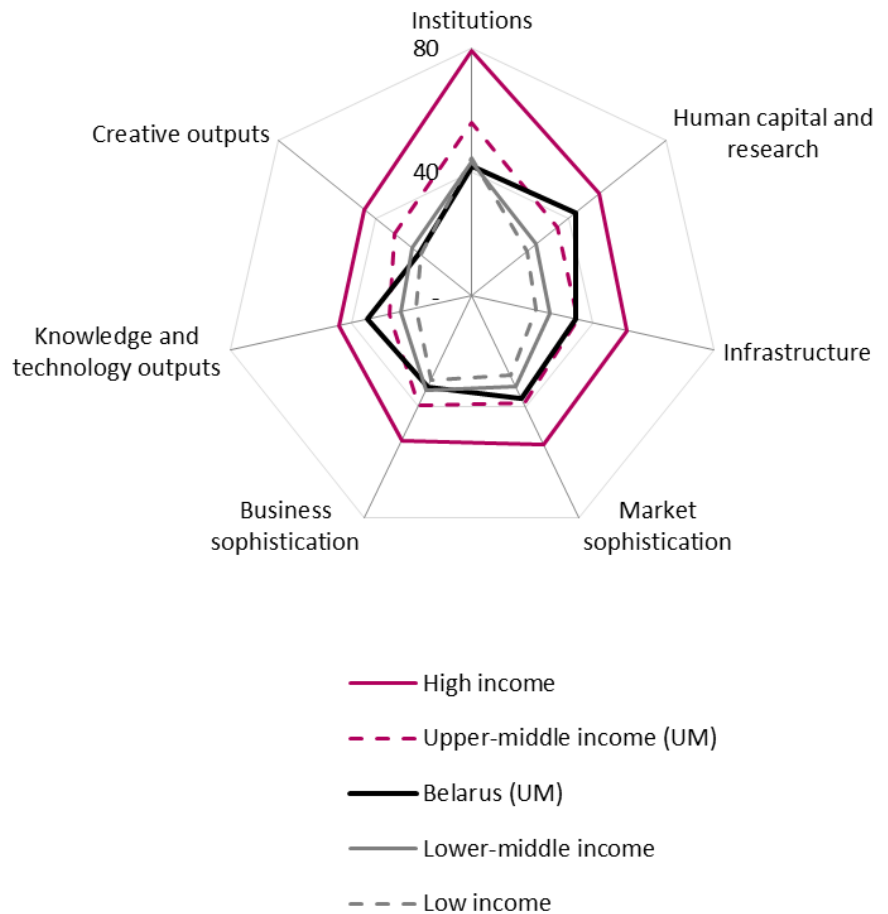
GLOBAL RESULTS

TAKE-AWAYS FOR BELARUS

(1) Deep and persistent innovation divides by region and income group

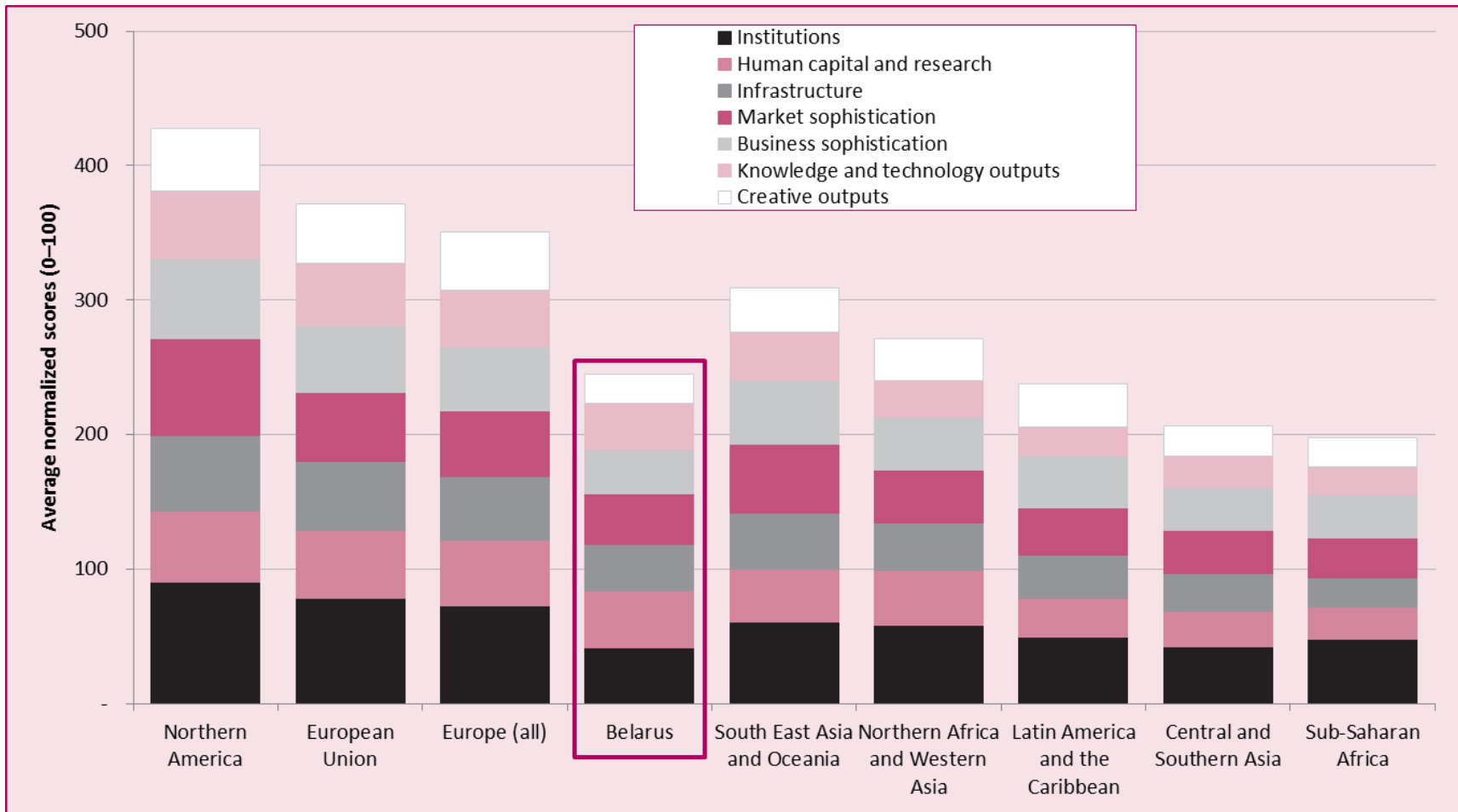
Belarus (UM) shows a **comparative advantage** in Human capital and research (45) and Knowledge and technology outputs (44); **average scores** in Infrastructure (66) and Market sophistication (75); and **weaknesses** in Institutions (109), Business sophistication (105), and Creative outputs (117).

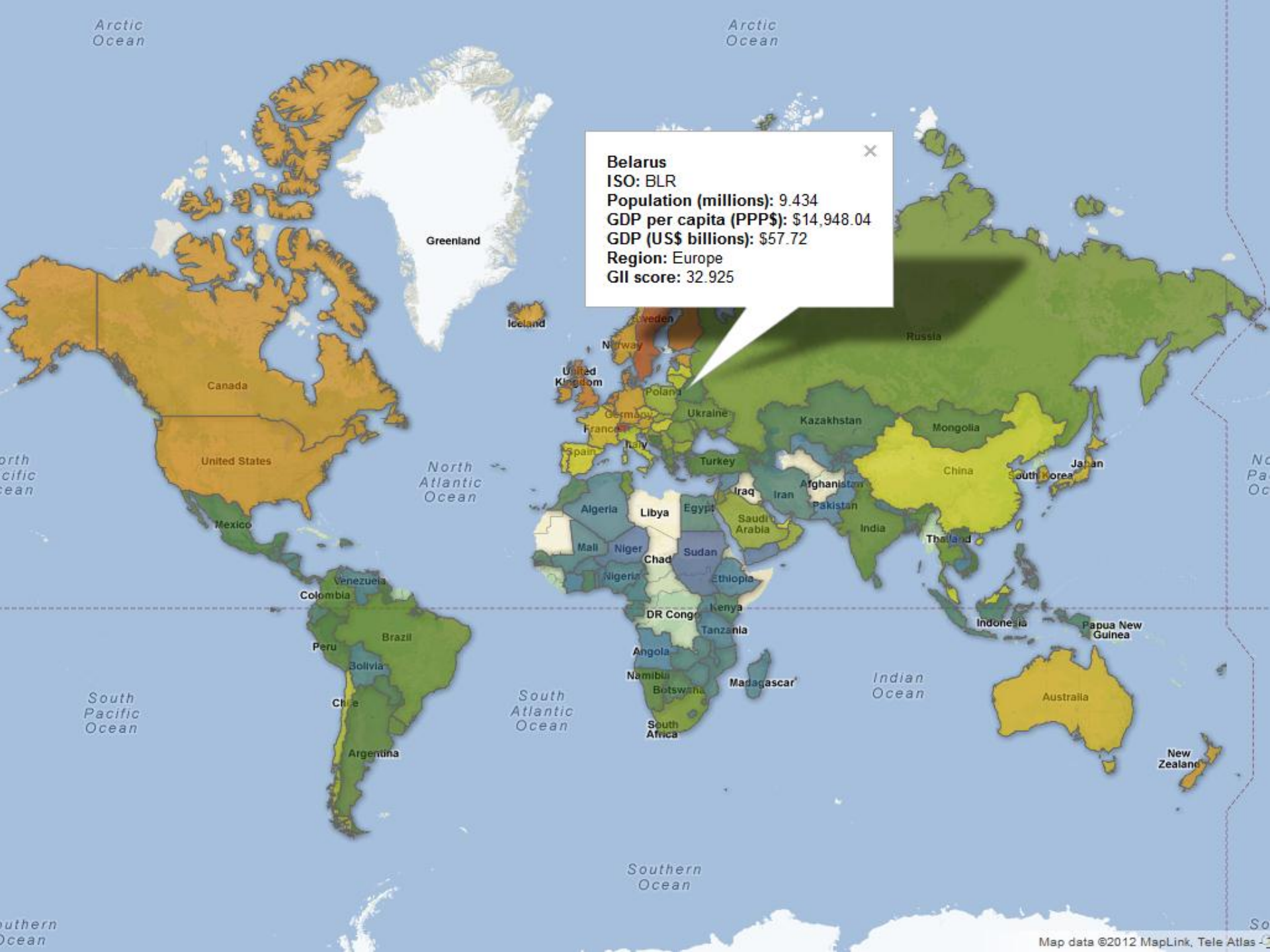
The income divide and Belarus
Average scores by income group



Regional divides (average scores, stacked)

Belarus below-par in the European contest





Belarus

ISO: BLR

Population (millions): 9.434

GDP per capita (PPP\$): \$14,948.04

GDP (US\$ billions): \$57.72

Region: Europe

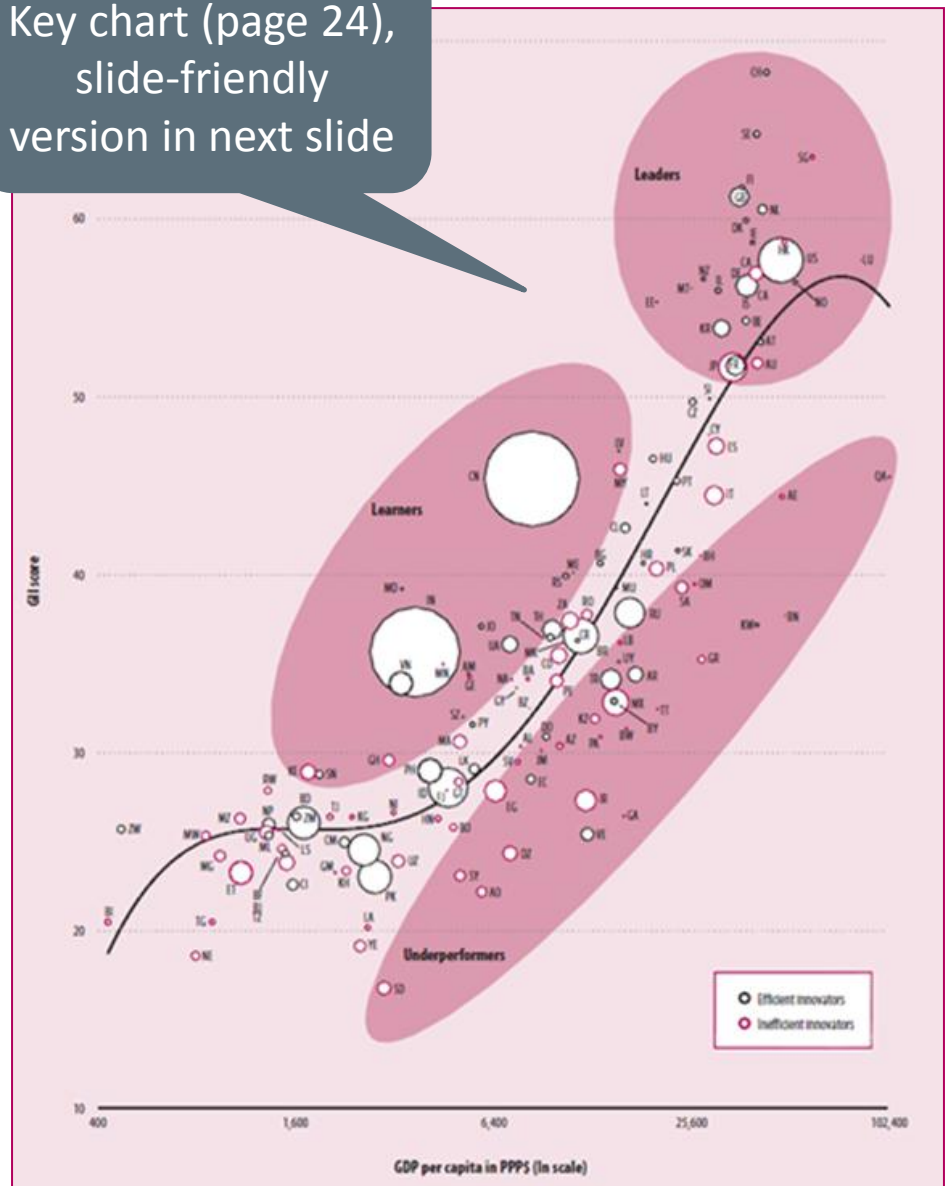
GII score: 32.925

(2) A new dynamic of innovation reveals leaders, learners, and underperformers

Belarus is not performing at the level expected from its income level; it ranks 78th in the GII and 57th in GDP per capita (PPP\$).

To avoid the **middle-income trap** (inability to compete with high-skill or low-wage economies), a knowledge-based growth strategy is required, where innovation and creativity are encouraged.

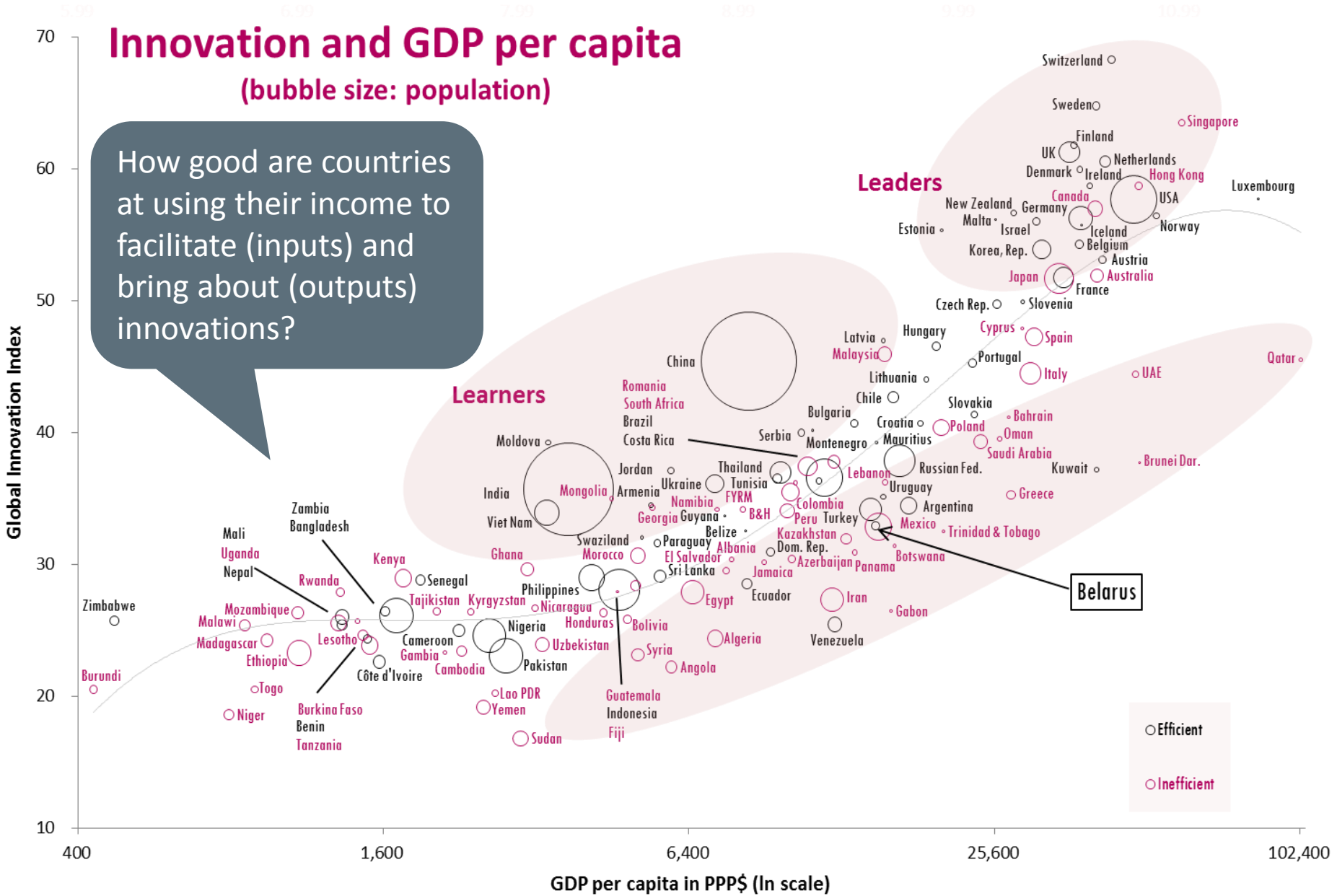
Key chart (page 24),
slide-friendly
version in next slide



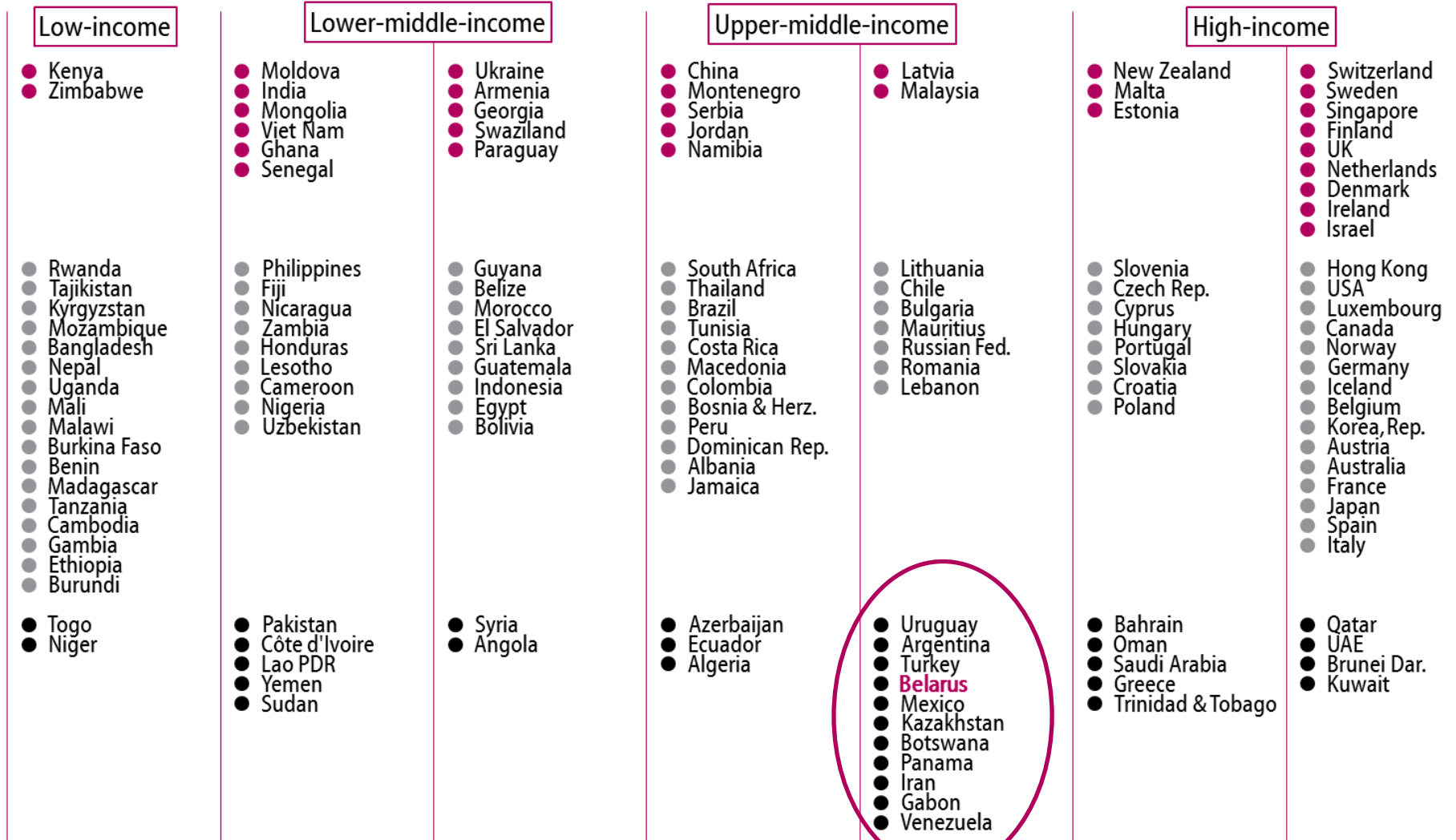
Innovation and GDP per capita

(bubble size: population)

How good are countries at using their income to facilitate (inputs) and bring about (outputs) innovations?



The middle-income trap: a risk for Belarus



● 10% or more above trend line

● within ±10% of trend line

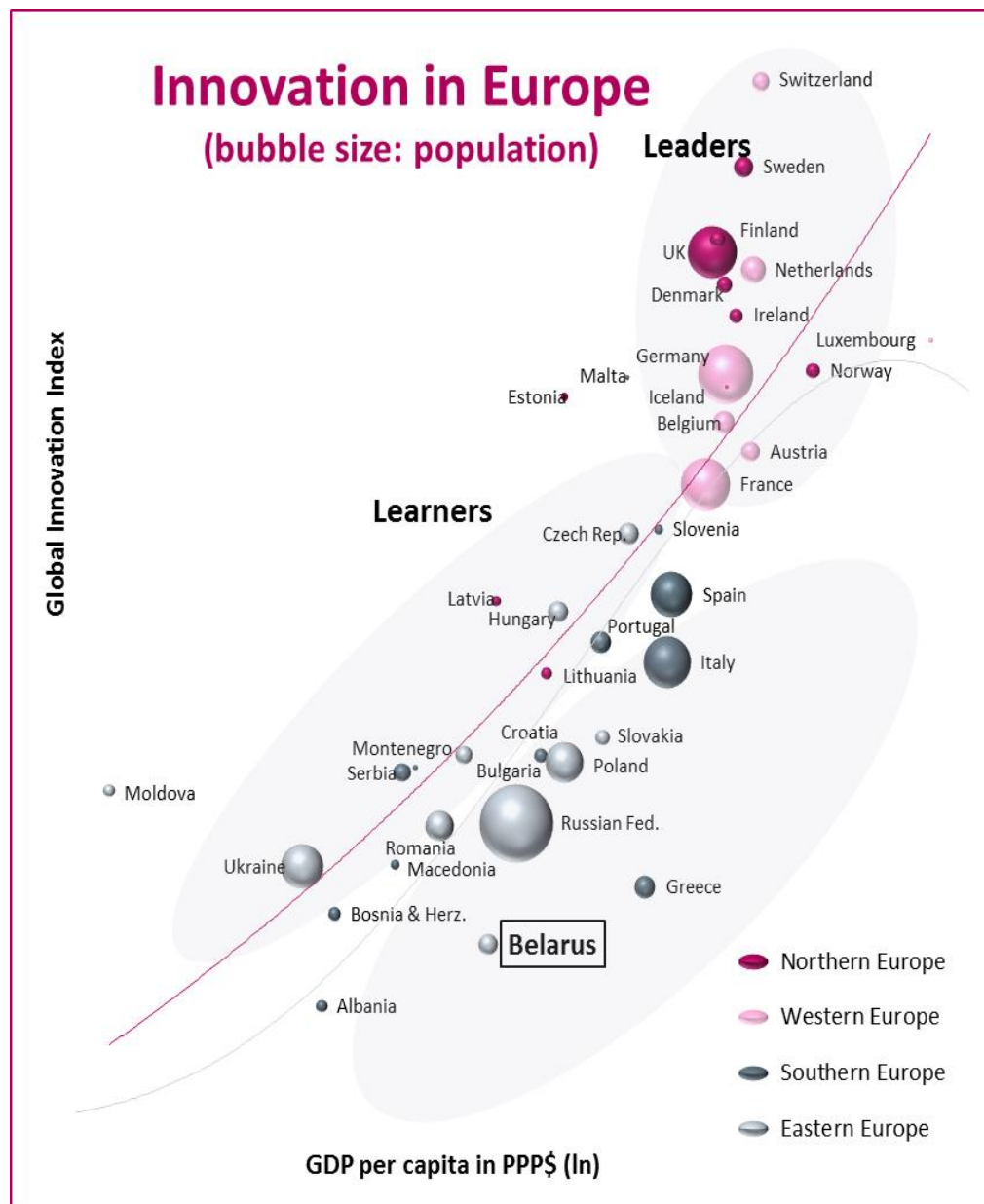
● 10% or more below trend line

(3) Innovation gaps in a multi-speed Europe need to be bridged

Northern and Western Europe are well positioned, Southern Europe losing its edge.

Eastern European countries are catching up fast, particularly Baltic countries.

Belarus is still behind however, ranked 38 among 40 European countries, 38 in inputs, 36 in outputs.





Strengths and weaknesses of Belarus

(percent ranks cutoffs at 84.6% and 21.6%)

Strengths

- 1.3.1 Ease of starting a business (95.6)
- 2.1.5 Pupil-teacher ratio, secondary (92.3)
- **2.2 Tertiary Education (89.2)**
- 2.2.1 Tertiary enrolment (96.2)
- 2.2.2 Graduates in science and engineering (84.6)
- 2.2.4 Gross tertiary outbound enrolment (87.0)
- 3.2.4 Gross capital formation (97.8)
- **4.3 Trade and Competition (90.7)**
- 6.1.1 National office patent applications (91.7)
- 6.1.3 National office utility model applications (90.1)
- 6.2.1 Growth rate of GDP per person engaged (94.8)
- 7.2.3 Daily newspapers circulation (88.1)

Weaknesses

- **1.1 Political Environment (7.1)**
- 1.1.2 Government effectiveness (3.5)
- 1.1.3 Press freedom (5.0)
- **1.2 Regulatory Environment (14.2)**
- 1.2.1 Regulatory quality (3.5)
- 1.2.2 Rule of law (10.0)
- 1.3.3 Ease of paying taxes (0.0)
- 3.3.3 ISO 14001 environmental certificates (21.6)
- 4.2.4 Venture capital deals (0.0)
- **5.2 Innovation Linkages (3.5)**
- 5.3.2 High-tech imports (10.0)
- 6.2.4 ISO 9001 quality certificates (21.4)
- **7 Creative Outputs (17.1)**
- **7.1 Creative Intangibles (7.4)**
- 7.3.2 Country-code top level domains (ccTLDs) (17.2)

Note: The cutoffs are calculated for each country, on the basis of the 10th highest and 10th lowest percent rank for that country, at the indicator level, although these cutoffs are also applied to pillars, sub-pillars and indices. 96.2% of the countries in GII have a lower gross tertiary enrolment than Belarus. Switzerland (GII #1) has cutoffs at 99.2% and 59.6%; Sudan (GII #141) at 45.0% and 2.1%.

(4) Due to hysteresis effects in innovation, investing in human capital and research is essential

In Belarus, all **qualitative and headcount series are improving** in elementary and tertiary education, with encouraging results in research and business education (in grey) and relatively good rankings ... **but**

Series GII 2000 - 2011			Belarus
	[min; max], ● = strength	Rank	00 01 02 03 04 05 06 07 08 09 10 11
2.1.3	School life expectancy, years [13.9; 14.7]	41	
2.1.5	Pupil-teacher ratio, secondary b [8.1; 9.5]	11 ●	
2.2.1	Tertiary enrolment, % gross [53.7; 83.0]	6 ●	
2.2.2	Graduates in science & engineering, % [24.7; 26.6]	17 ●	
2.2.3	Tertiary inbound mobility, % [0.0; 1.4]	66	
2.2.4	Gross tertiary outbound enrolment, % [0.8; 3.9]	19 ●	
2.3.1	Researchers, headcounts/mn pop. [1,725.5; 2,134.8]	38	
5.1.5	GMAT mean score [506.0; 579.5]	32	
5.1.6	GMAT test takers/mn pop. 20-34 [19.3; 58.6]	78	

Researchers require means, laboratories , funding



(5) Knowledge absorption is a platform for knowledge creation and diffusion

Belarus shows low levels of absorption of foreign knowledge (ranked 105th), even compared to regional trade partners and neighboring countries.

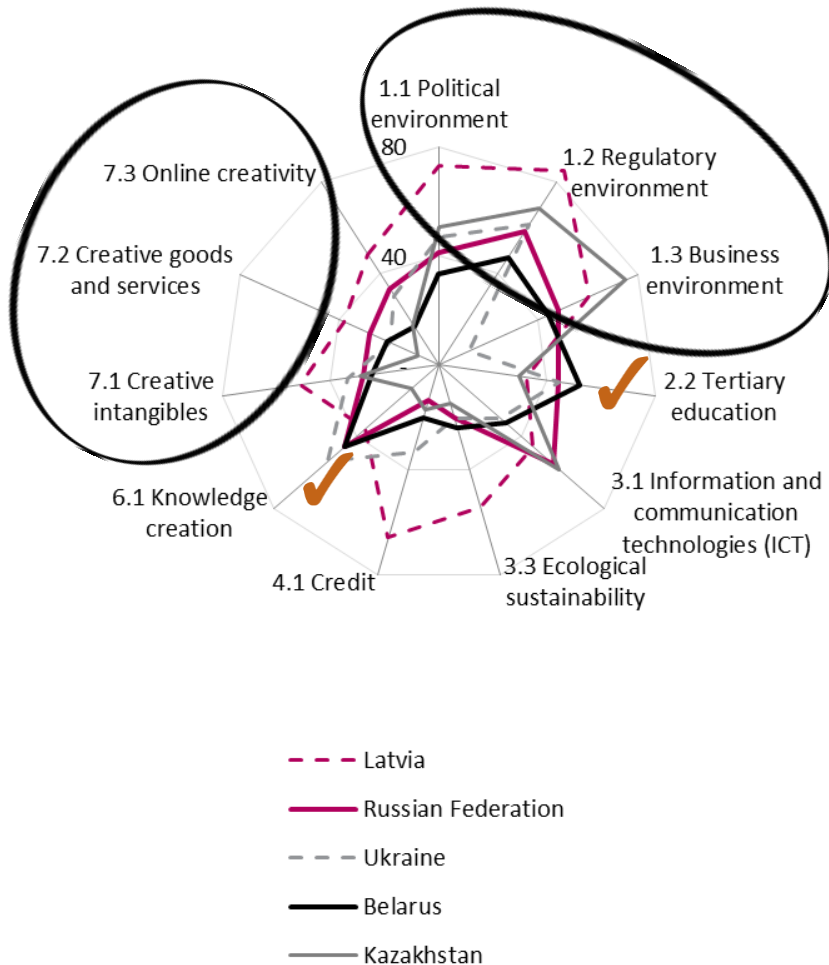
An innovation is new to the world, new to a sector, or new to a firm. The commercial introduction of innovations developed elsewhere constitutes an innovation.

Belarus ranks 98th in knowledge diffusion.

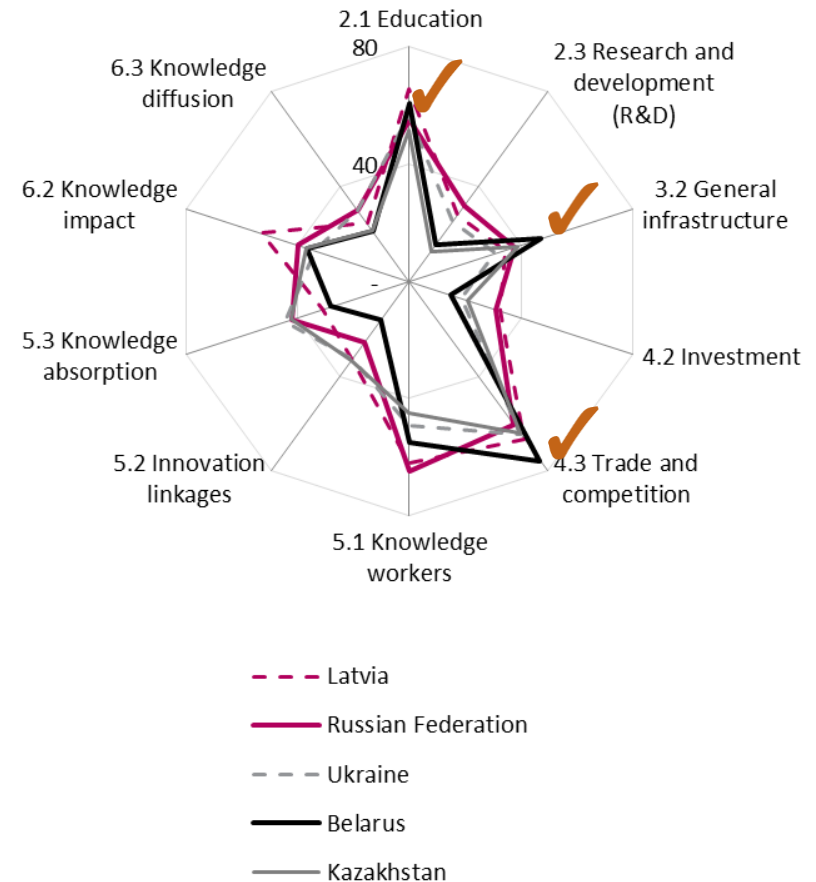
Series GII 2000 - 2011		Latvia (30)	Russian Fed. (51)	Ukraine (63)	Belarus (78)	Kazakhstan (83)
[min; max]		00 02 04 06 08 10	00 02 04 06 08 10	00 02 04 06 08 10	00 02 04 06 08 10	00 02 04 06 08 10
5.3	Knowledge Absorption					
5.3.1	Royalty & license fees payments/th GDP [0.0; 5.8]					
5.3.2	High-tech imports less re-imports, % [4.2; 11.2]					
5.3.3	Computer & comm. service imports, % [20.9; 71.0]					
5.3.4	FDI net inflows, % GDP [0.4; 12.8]					
6.3	Knowledge Diffusion					
6.3.1	Royalty & license fees receipts/th GDP [0.0; 1.0]					
6.3.2	High-tech exports less re-exports, % [1.2; 5.2]					
6.3.3	Computer & comm. service exports, % [6.9; 43.6]					
6.3.4	FDI net outflows, % GDP [-3.0; 5.3]					

Several bright areas but Institutions and Creative outputs need to improve

**Comparative advantages (11 sub-pillars)
Belarus and selected countries**



**Similar performances (10 sub-pillars)
Belarus and selected countries**



Conclusions

- Measuring innovation is a moving target. The GII is concerned with improving the 'journey' to better measuring and understanding innovation; and with identifying targeted policies, good practices, and other levers of innovation.
- The GII creates environment in which innovation factors are under continual evaluation; important reminder of the importance of innovation in the current economic policy discussions.
- To become a knowledge economy, Belarus must improve its innovation drivers and strengthen the linkages between stakeholders and agents of innovation.
- The middle-income trap is a real risk for Belarus (inability to compete with high-skill or low-wage economies).
- Although Belarus shows encouraging results in education, research and knowledge creation, recent shortages in funding need to be monitored and reversed (hysteresis effects)
- Gaps in Institutions and Creative outputs need to be bridged.

**TECHNICAL APPENDIX
(IF TIME ALLOWS)**

GII Report structure

- Chapter 1: Discussion of results
 - Annex 1: Conceptual framework
 - Annex 2: Adjustments in 2012 and year-on-year comparability of results
 - Annex 3: Report of the statistical audit
- 10 analytical chapters (Chapters 2 to 11)
- Appendices:
 - Appendix I: Country/economy profiles (141 economies)
 - Appendix II: Data tables (84 indicators)
 - Appendix III: Sources and definitions
 - Appendix IV: Technical notes
 - Appendix V: About the authors

Annex 1: Conceptual framework

- Predilection for hard data (62 of 84 indicators)
 - Statistical treatment of outliers, proper scaling, and min-max normalization
 - Tightly defined indices extensively used (16), survey questions added only when data are not available (6)
- Private data used when official data is not available, from 28 sources:
 - WB, UNESCO, OECD, ITU, UNPAN, IEA, ISO, IMF, WTO, ILO, IFC, WIPO, COMTRADE, US NSF, UN, UNCTAD, RSF, WEF,
 - Yale/Columbia, MixMarket, Standard & Poor's, Thomson Reuters, GMAC, WITSA, Euromonitor, WAN, ZookNIC, Wikimedia, Google
- Adjustments for timeliness and relevance
 - 13.3% of missing data points, for non-missing: 35% of data from 2011, 35% from 2010, 21% from 2009, 9% 2008 or earlier
 - 11 series eliminated in 2012, 16 added, 2 composed

Annex 2: Year-on-year comparability

Belarus, not included in GII 2011, is not concerned

Relative performance

- The change in the ranking had the 2011 framework/countries been identical in 2012
- Measured by plugging the 2012 data into the 2011 framework for 125 economies
- The word **relative** is crucial; as changes in rankings can be due to improved/worsening **absolute** performance (school life expectancy from 12 to 13 years) or to other factors (better data coverage, different computation of data, etc.)

Adjustments to the GII conceptual framework

- Difference between the above and the 2012 ranking in the sample of 125 economies
- Viet Nam would have kept its 2011 ranking among the 125 economies included in GII 2011 had we maintained the GII 2011 framework unchanged

Addition of 16 countries

- This affects countries at the bottom of the ranking disproportionately
- Malaysia, Yemen would have kept their 2011 rankings had we not expanded the country coverage (same relative performance, not affected by adjustments to the framework)

Annex 3: Independent statistical audit

- Audit performed by the Joint Research Centre of the European Commission
- The published rankings are based on fixed weights (0.2 for input pillars, 0.5 for output pillars, input and output averaged for GII) no imputation of missing data and arithmetic averages
- Three adjustments, at the basis of 90% confidence intervals:
 - Imputation of missing data by expectation-maximization algorithm
 - Geometrical averages (instead of arithmetic averages, less compensatory)
 - Random weights: input pillars [0.1, 0.3] instead of 0.2; output pillars [0.4, 0.6] instead of 0.5
 - 4 times 1,000 Monte Carlo simulations:
 - Random weights / no imputation / arithmetic average
 - Random weights / imputation / arithmetic average
 - Random weights / no imputation / geometric average
 - Random weights / imputation / geometric average
- Missing data are very problematic, particularly for the output sub-index
- Belarus 90% confidence: GII 78 [60, 81]; Inputs 80 [69, 85]; Outputs 75 [57, 79]
- In contrast, Switzerland (1st) and Sweden (2nd) have 90% confidence intervals of [1, 1] and [2, 2] respectively; their rankings are therefore extremely robust.

10 analytical chapters

Focus on the systemic dimension of innovation and on the importance of building strong **linkages** across the **innovation ecosystem**.

Chapters on innovation linkages

- The Role of Public-Private Partnerships in Driving Innovation, **Alcatel-Lucent**
- Accounting for Science-Industry Collaboration in Innovation, **WIPO**
- An Integrated Policy Approach in Science, Technology, and Innovation for Sustainable Development, **UNESCO**

The Internet as a platform for innovation

- Broadband, Inevitable Innovation, and Development, **ITU & INSEAD eLab**
- The Internet: An Unprecedented and Unparalleled Platform for Innovation, **Internet Society**
- We Are All Content Creators Now: Measuring Creativity and Innovation in the Digital Economy, **Google**

Four case studies

- The Role of Coherent Linkages in **Gulf Cooperation Council** Countries, **Booz & Company**
- Academia-Industry Innovation Linkages in the Case of **Saudi Arabia**, **King Fahad University for Petroleum & Minerals**
- **The Russian Federation**: A New Innovation Policy, **Higher School of Economics**
- Shaping the National Innovation System: **The Indian Perspective**, **Indian Space Research Organization**

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