The Challenge of the Knowledge Economy for Slovakia: Preliminary Assessment

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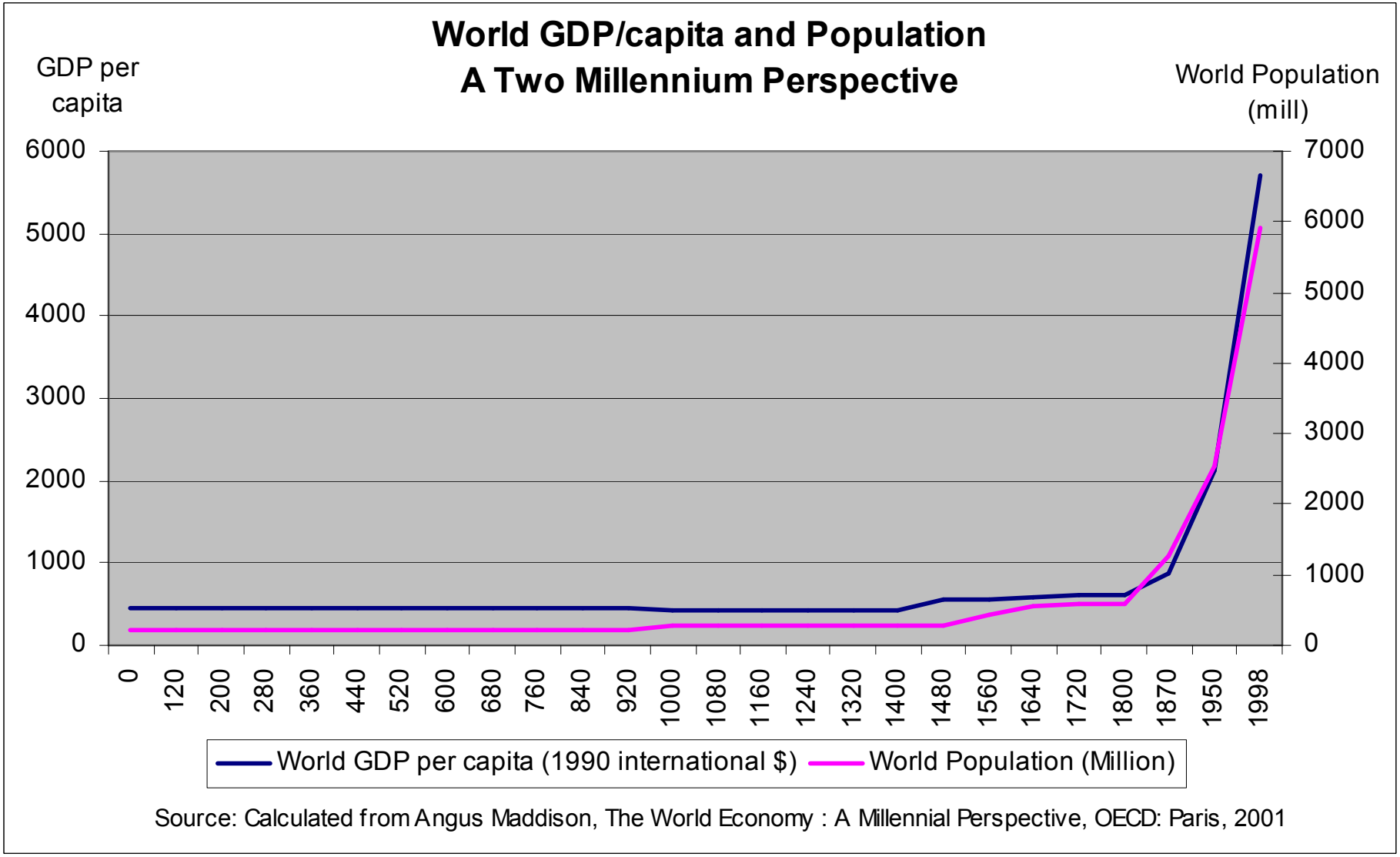
Structure of Presentation

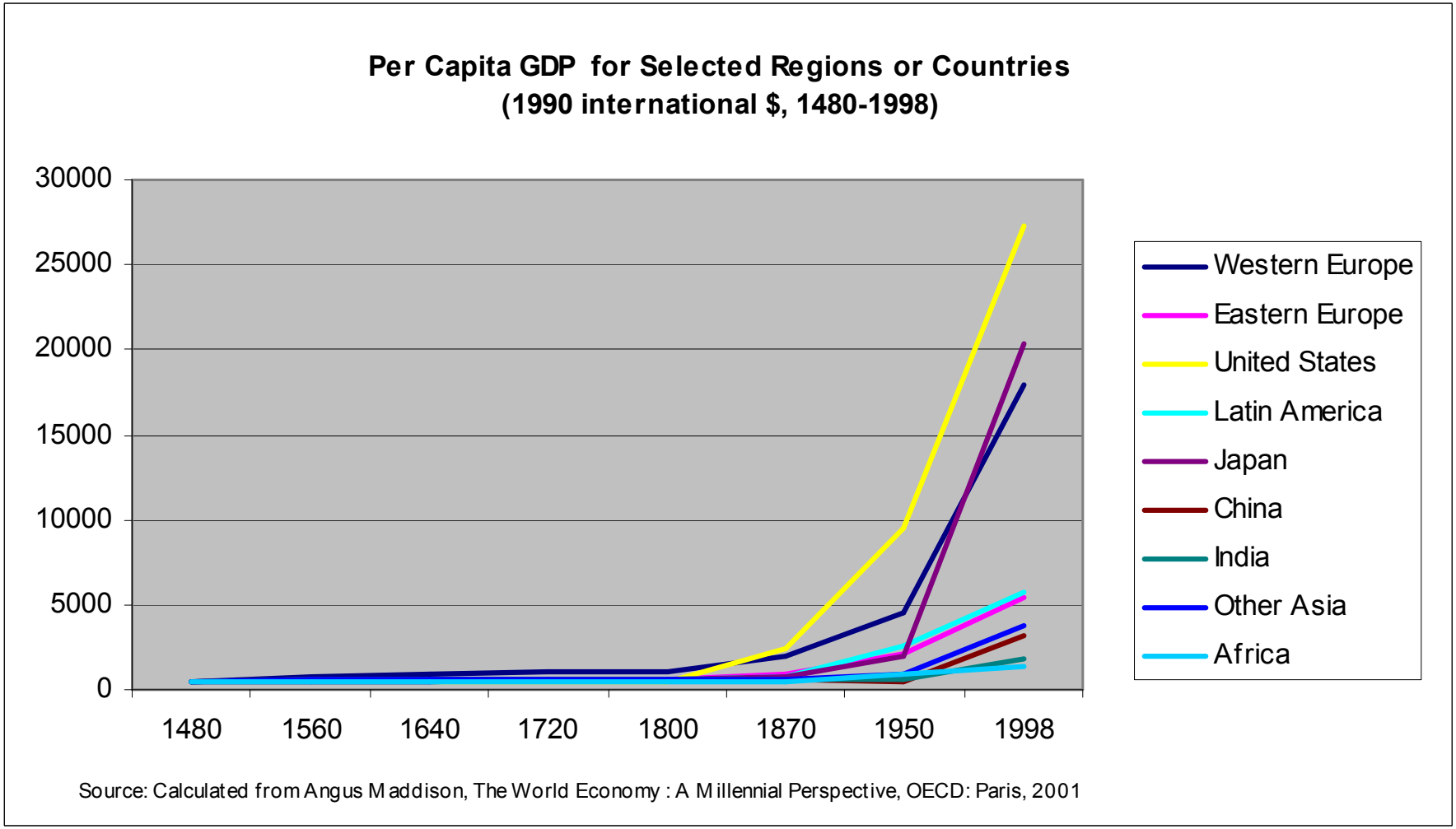
- Knowledge and Growth
- The Knowledge Revolution
- Implications for Slovakia
- Framework for Country Knowledge Assessments
- Preliminary Benchmarking for Slovakia
- Moving Forward in Slovakia

World GDP/Capita and Population

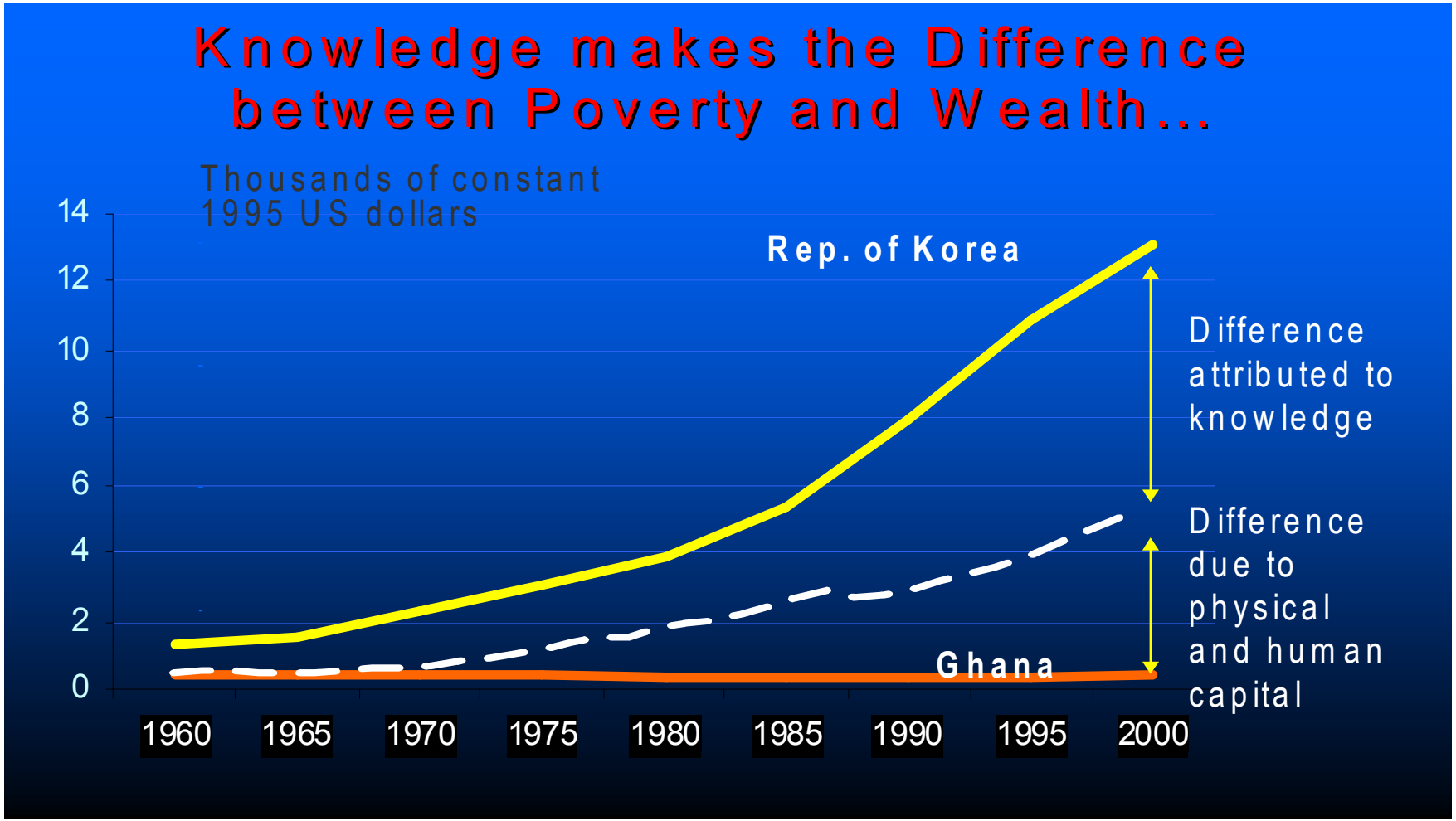


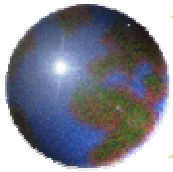
Source: Calculated from Angus Maddison, The World Economy : A Millennial Perspective, OECD: Paris, 2001

Growing Differences in GDP/Capita



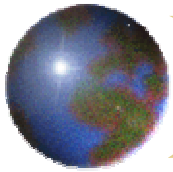
GDP/Capita Growth: Korea vs Ghana





The Knowledge Revolution

- Ability to create, access and use knowledge is becoming fundamental determinant of global competitiveness
- Seven key elements of "Knowledge Revolution"
  - Increased codification of knowledge and development of new technologies
  - Closer links with science base/increased rate of innovation/shorter product life cycles
  - Increased importance of education & up-skilling of labor force, and life-long learning
  - Investment in Intangibles (R&D,education, software) greater than Investments in Fixed Capital in OECD

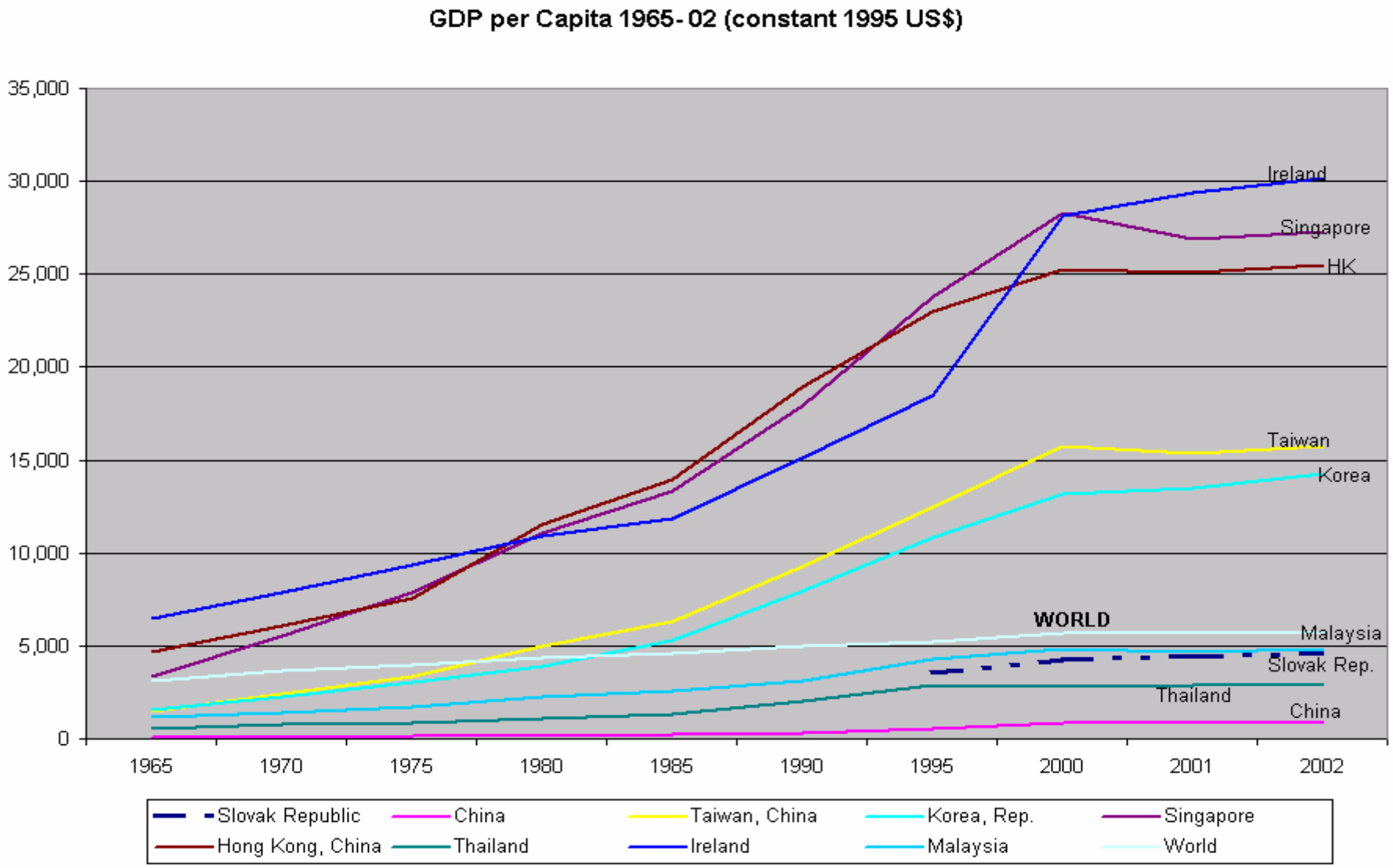


The Knowledge Revolution -2

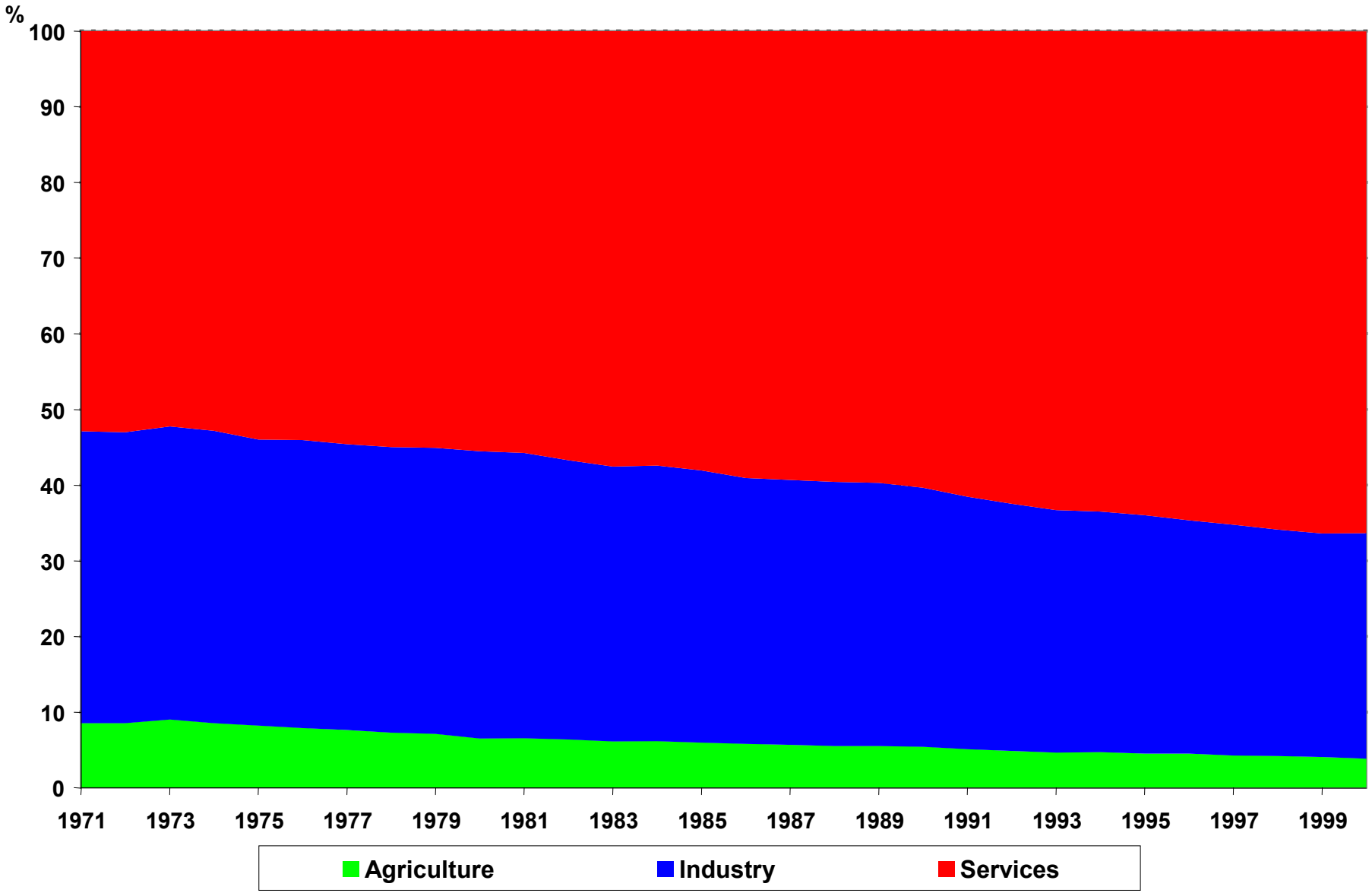
- Greater value added now comes from investment in intangibles such as branding, marketing, distribution, information management
- Innovation and productivity increase more important in competitiveness & GDP growth
- Increased Globalization and Competition
  - Trade/GDP from 38% in 1990 to 57% in 2001
  - Value added by TNCs 27% of global GDP

- Bottom Line: Constant Change and Competition Implies Need for Constant Restructuring and Upgrading

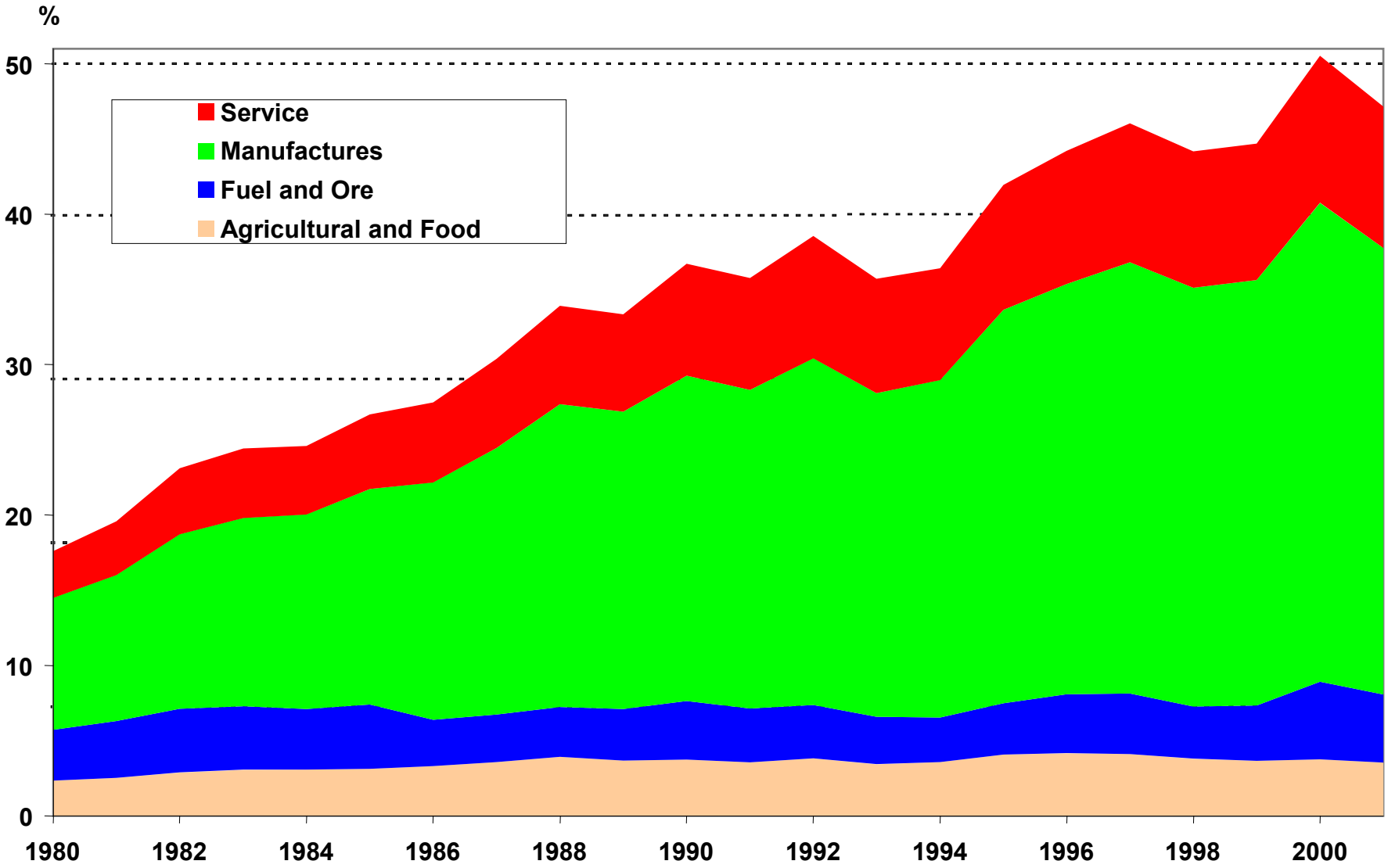
Eight Economies with Fastest GDP/Capita Growth 1965-2002 vs World and Slovakia



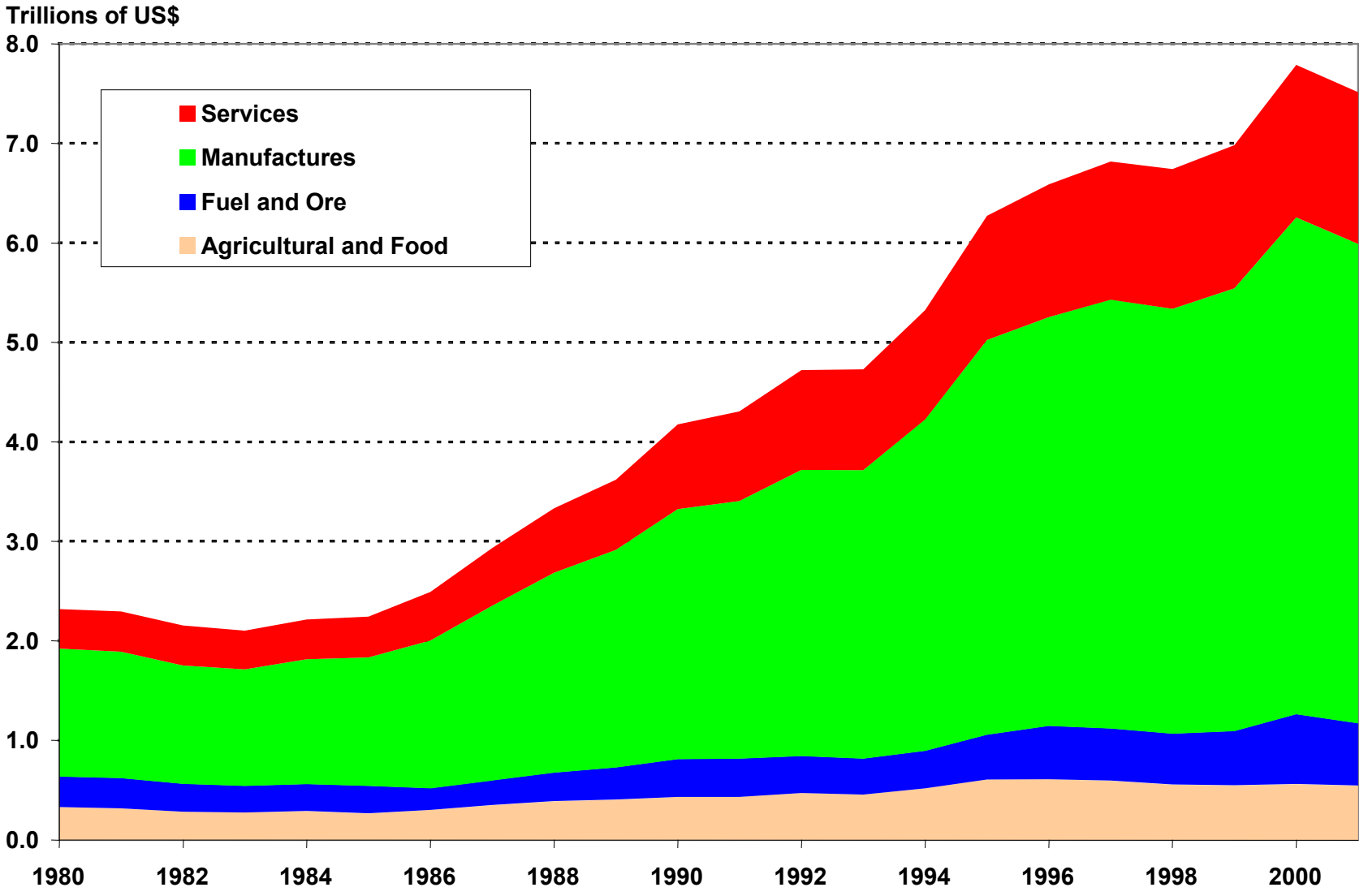
World Value Added to GDP Ratio (1971-2000)

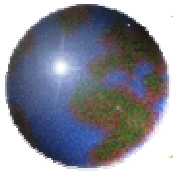


World Merchandise & Services Trade as Share of GDP (1998 –2001)



World Merchandise & Services Exports (1998 –2001)





Implications for Slovakia

- As Slovakia joins the EU it will be under increased pressure to improve its economic incentive and institutional regime, to improve its investment climate and the ability of its economy to re-deploy resources to the most efficient uses.
- It risks falling behind because it also has to strengthen basic infrastructures in education, information and communications and innovation
- It needs to develop strategies to use existing and new knowledge to
  - Improve performance in traditional sectors
  - Exploit opportunities for leapfrogging
  - Develop competitive new sectors

Global Competitiveness Indicators

Countries	GCI 2002	GCI 2001	MICI 2002	MICI 2001	MICI 2000	MICI 1999	MICI 1998	GDP/capita (2001 PPP-adjusted)
Slovakia	**47**	**40**	**41**	**39**	**36**	**48**	**36**	**11,739**
Czech Republic	39	37	33	35	34	41	30	14,885
Hungary	29	28	28	26	32	33	31	12,941
Poland	49	41	45	41	41	37	41	9,327
Slovenia	28	31	27	32	-	-	-	18,233
Estonia	26	29	30	27	-	-	-	10,380
Lithuania	35	43	39	49	-	-	-	7,764
Latvia	42	47	44	42	-	-	-	7,750
Finland	2	1	2	1	1	2	2	25,611
Ireland	24	11	20	22	22	17	13	32,133
Germany	14	17	4	4	3	6	4	25,715

Sources: The Global Competitiveness Report (WEF) 2001-2 and 2002-3

Strategies of Using Knowledge for Development

- Have to be tailored to specific realities of each country
- Involve different trade-offs
- Are not just about ICT or high technology,but about broader economic strategies
- Require coordination across functional areas and among government, business and civil society

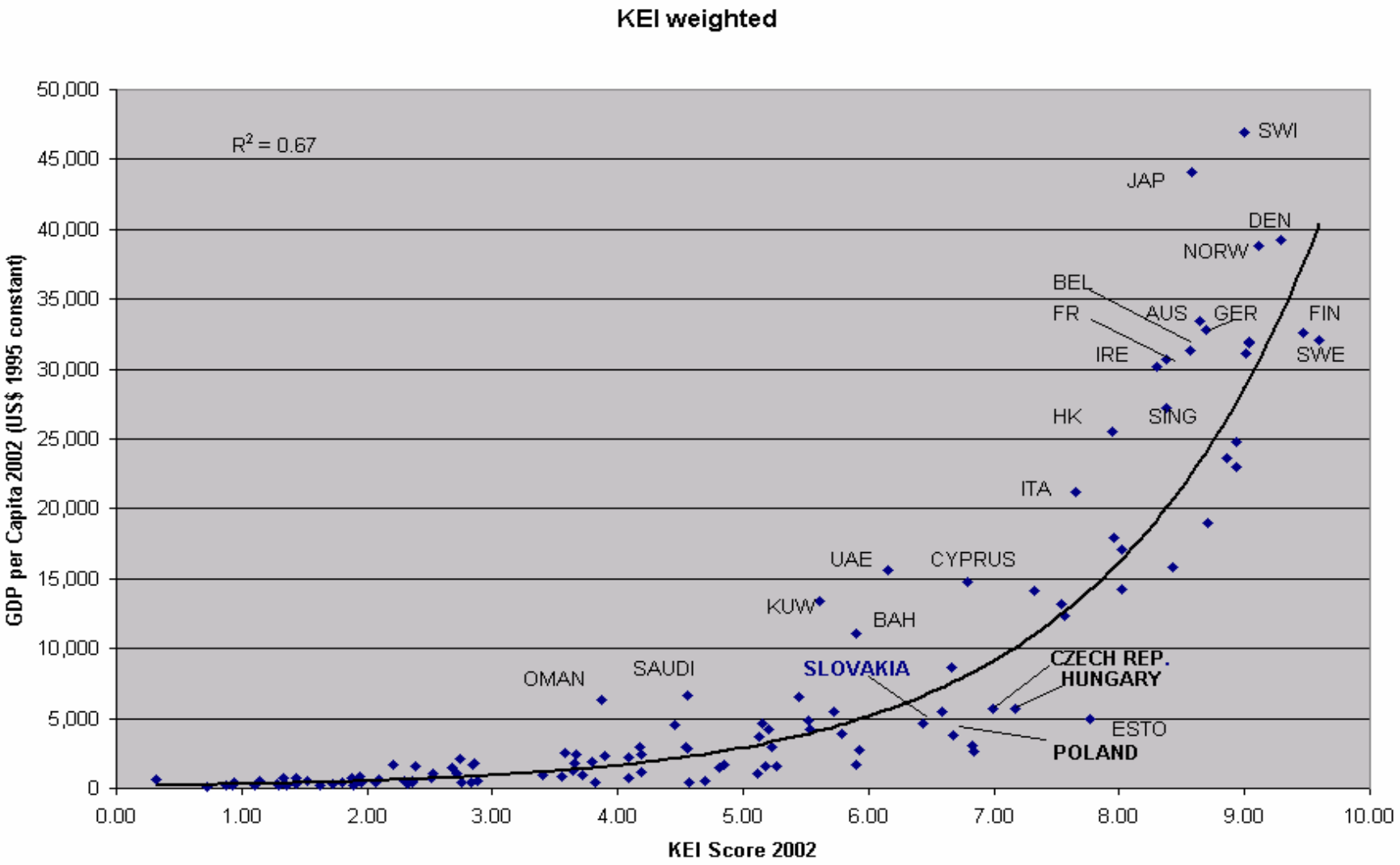
Framework for Using K4D: Four Key Functional Areas

- Economic incentive and institutional regime that provides incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship
- Educated, creative and skilled people
- Dynamic information infrastructure
- Effective national innovation system

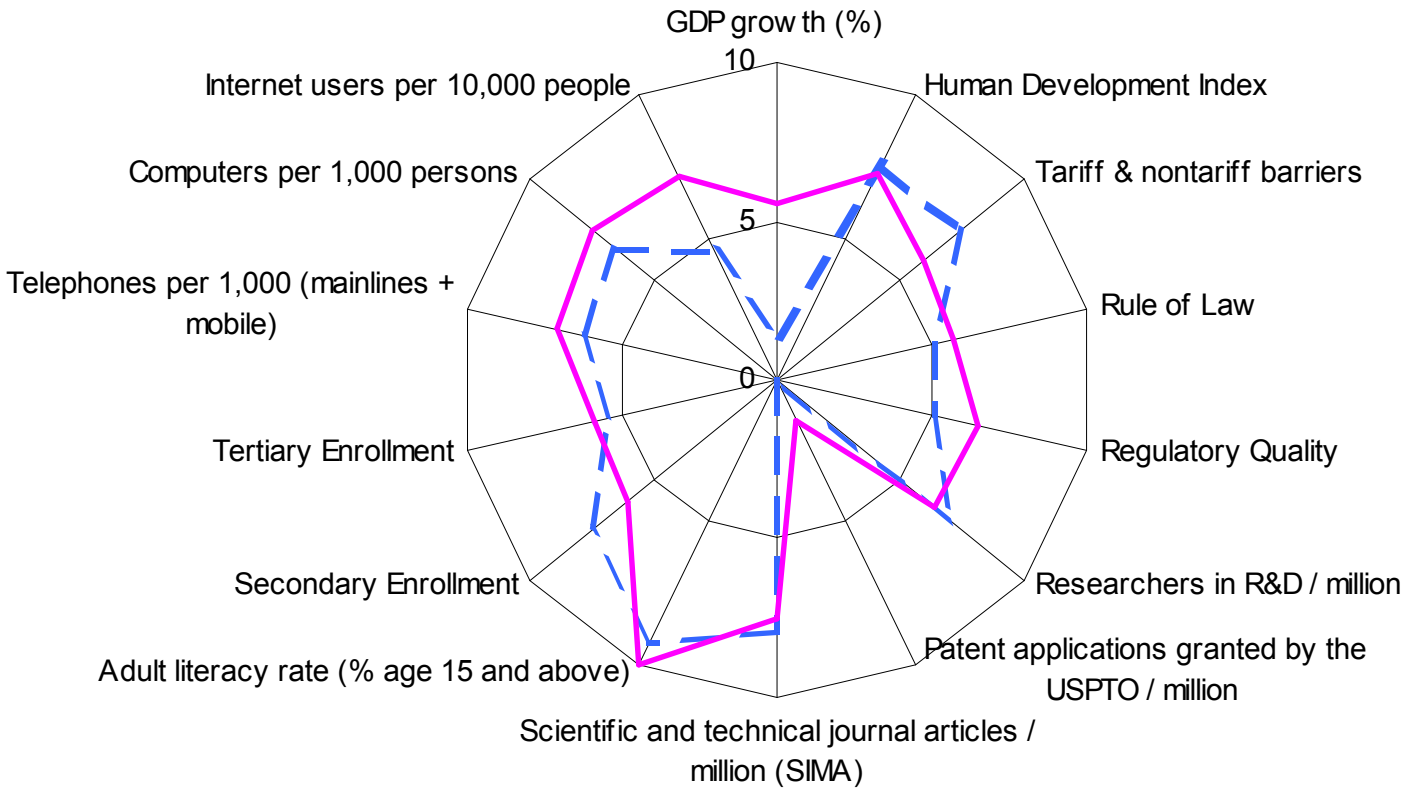
KAM Methodology

- KAM: 76 structural/qualitative variables to benchmark performance on 4 pillars
- Variables normalized from 0 (worst) to 10 (best) for 121 countries
- **www1.worldbank.org/gdln/kam.htm**
- Basic scorecard for 14 variables at two points in time, 1995 and 2002
- Aggregate knowledge economy index (KEI)

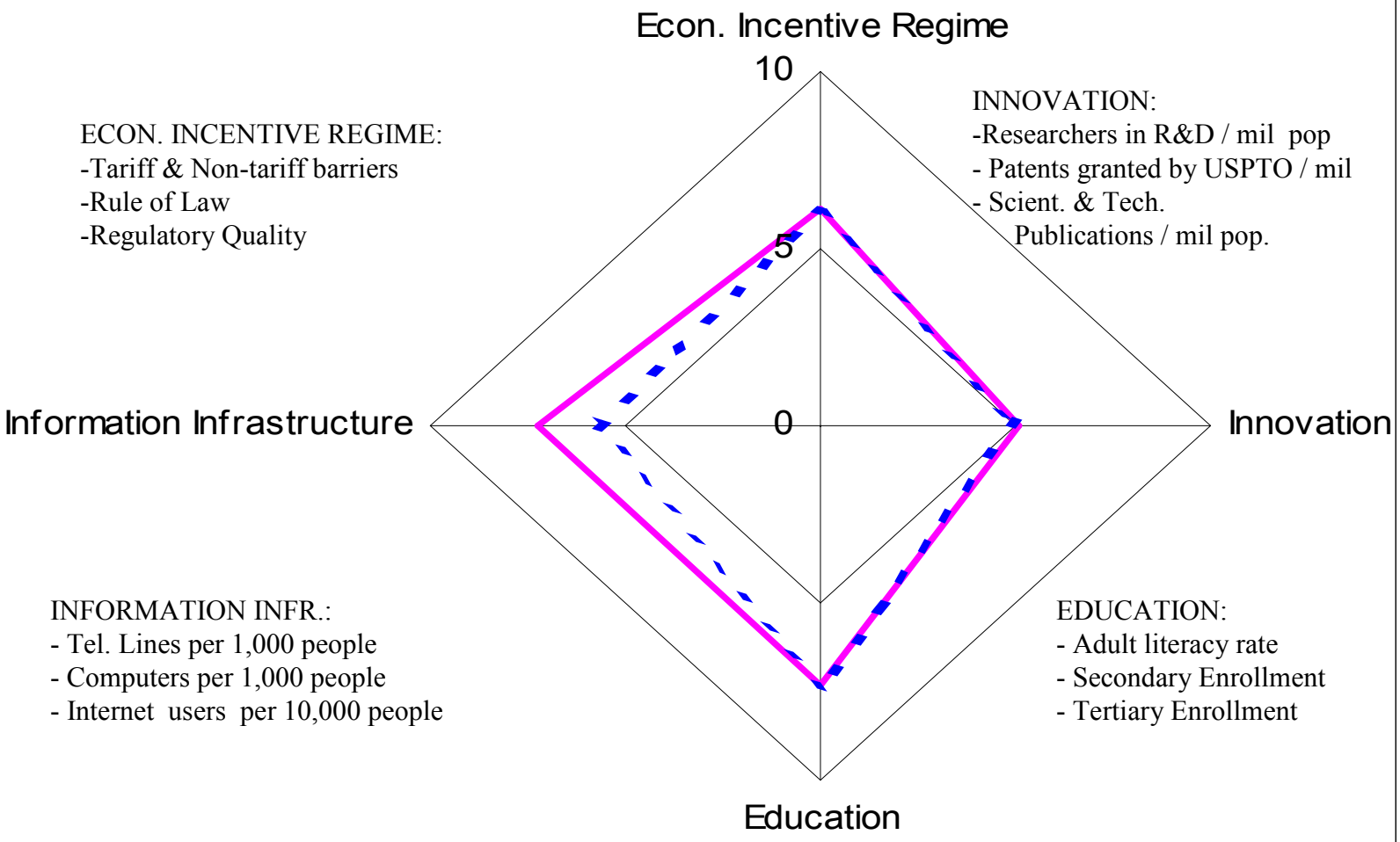
Strong Correlation between GDP/Capita & KEI



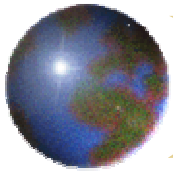
Slovakia - Basic Scorecard



Aggregate Changes Basic Scorecards



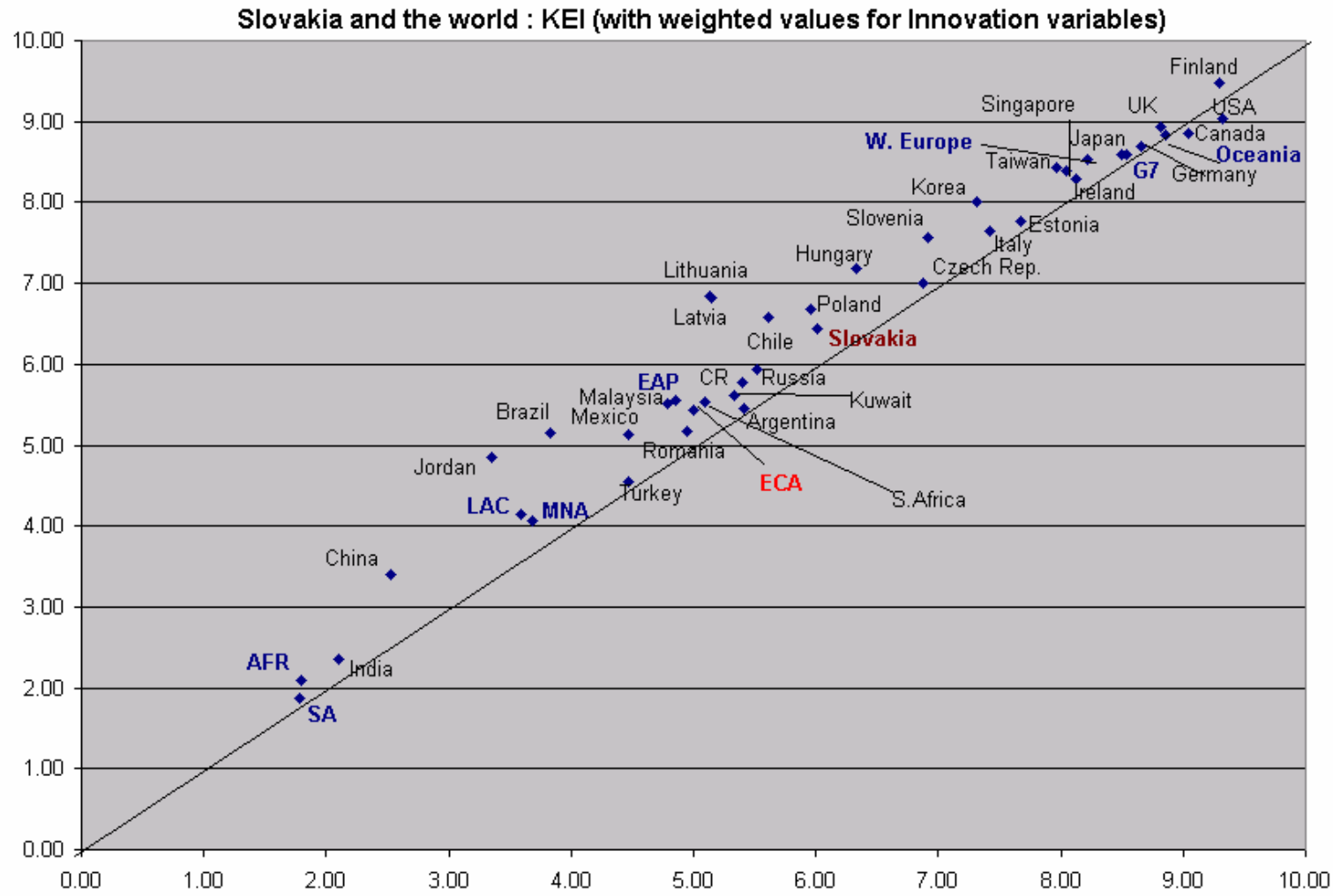
Slovakia (weighted)



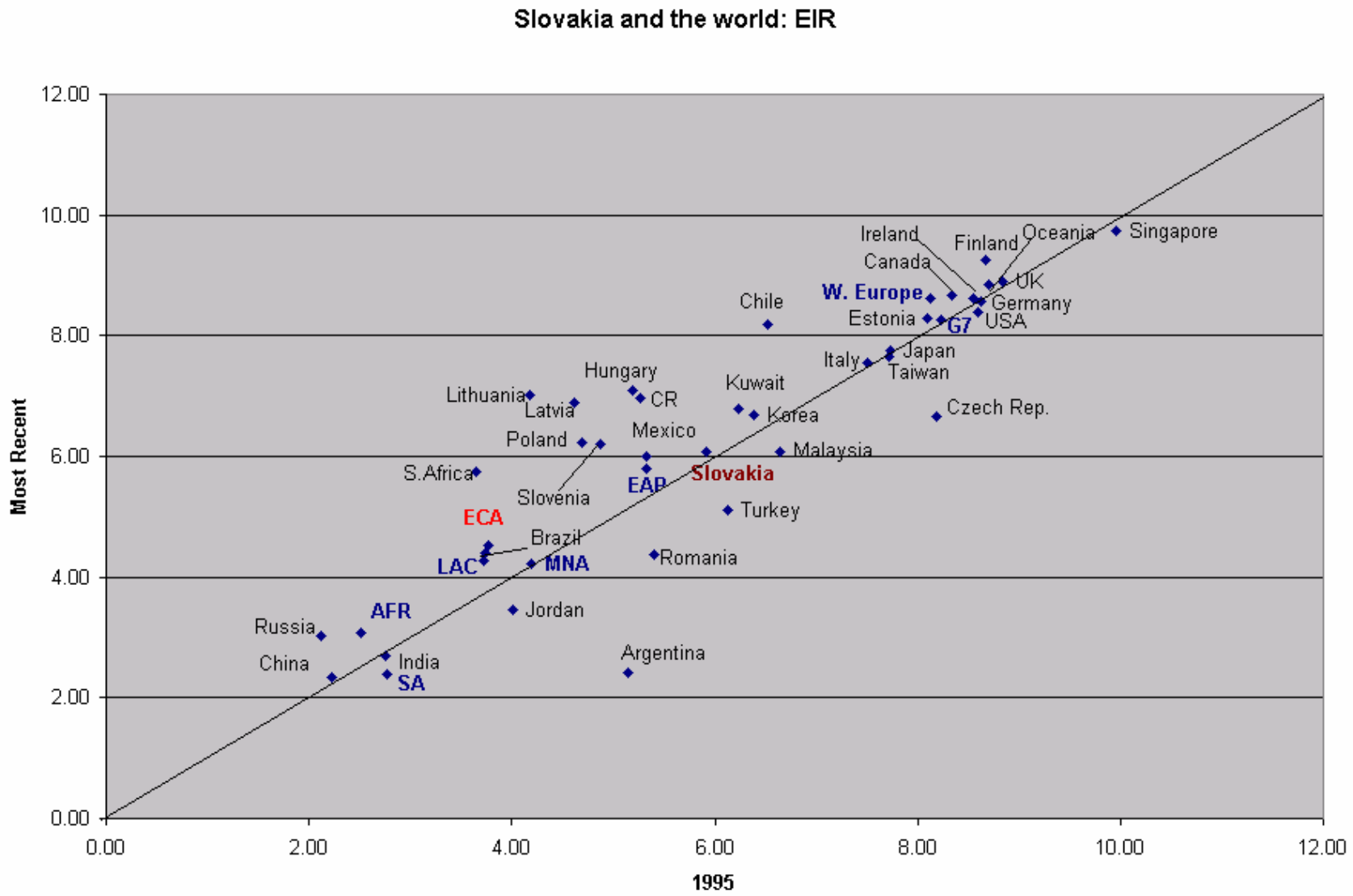
Slovakia in the International Context

- Slovakia is roughly in middle ranking globally on the KE Index,behind other neighbors
- But only made small improvement since 1995, whereas many other countries in Region have made significant improvement
- Will look in more detail at four pillars:
  - In EIR, not much net change: advanced on regulation and rule of law, but regressed on tariff and non-tariff barriers
  - On ICT, made significant progress
  - On Education, although relatively strong, actually regressed
  - On Innovation, its weakest pillar, rather stagnated

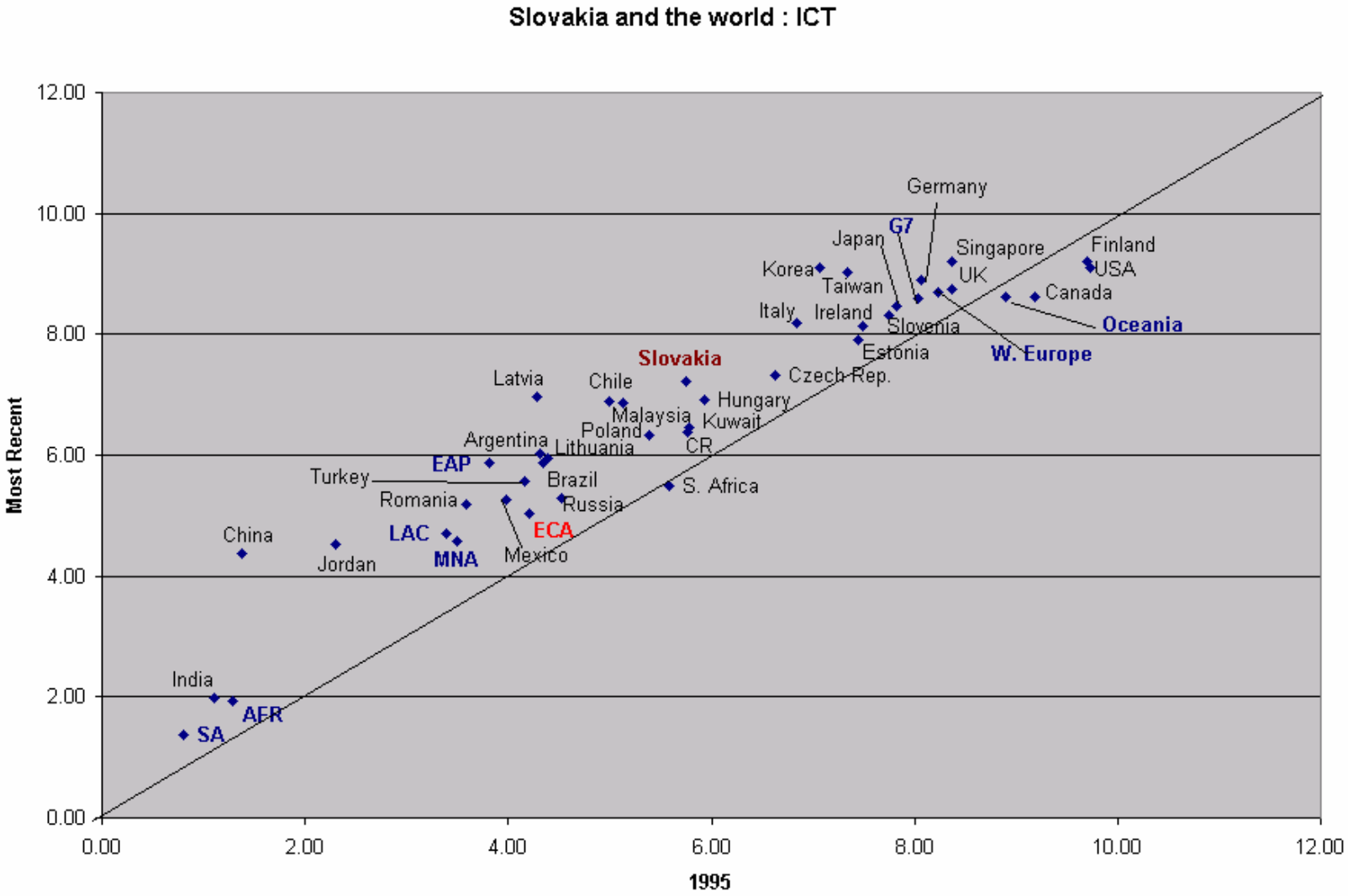
Slovakia and the World: KEI



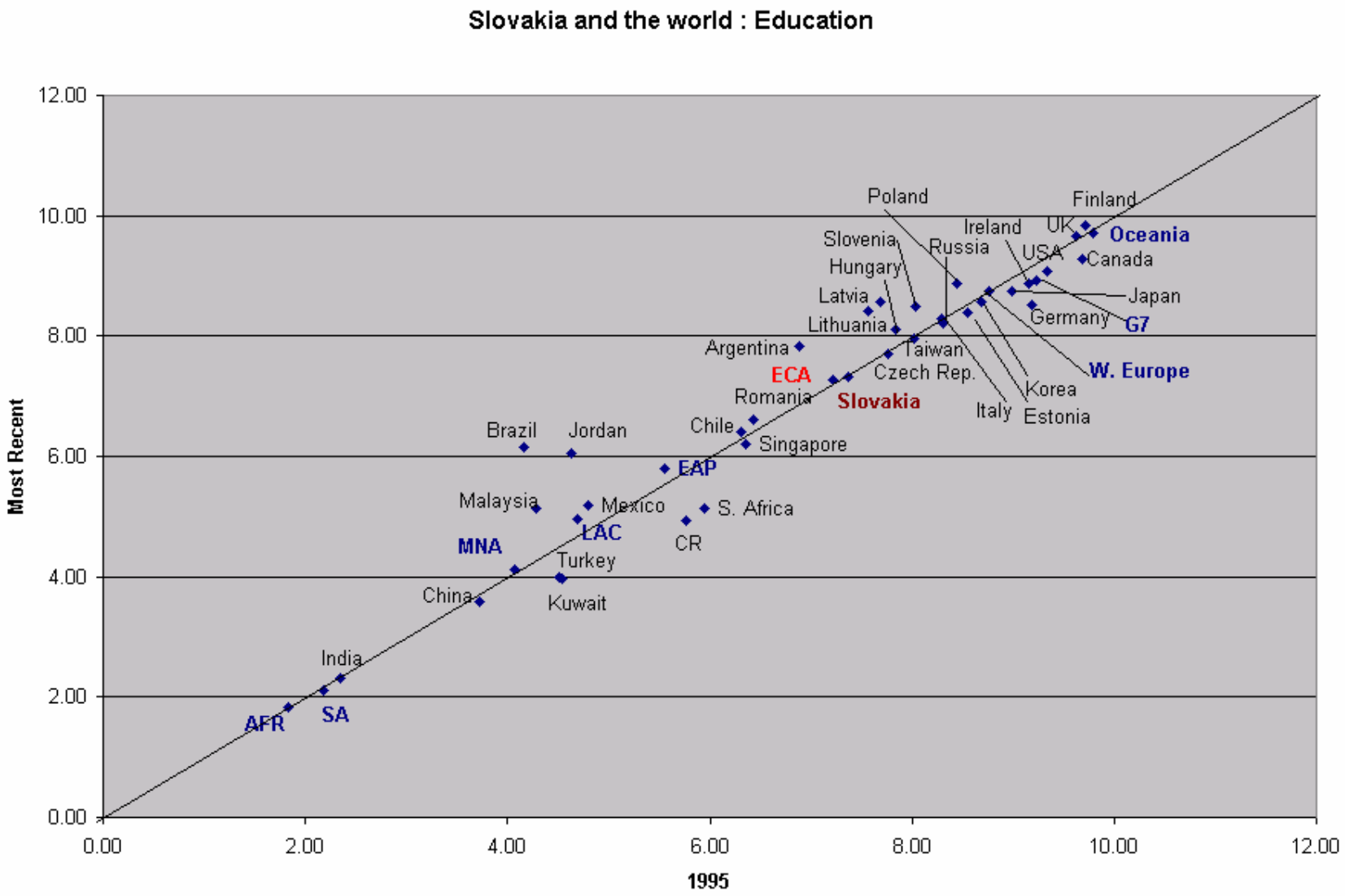
Slovakia and the World: EIR



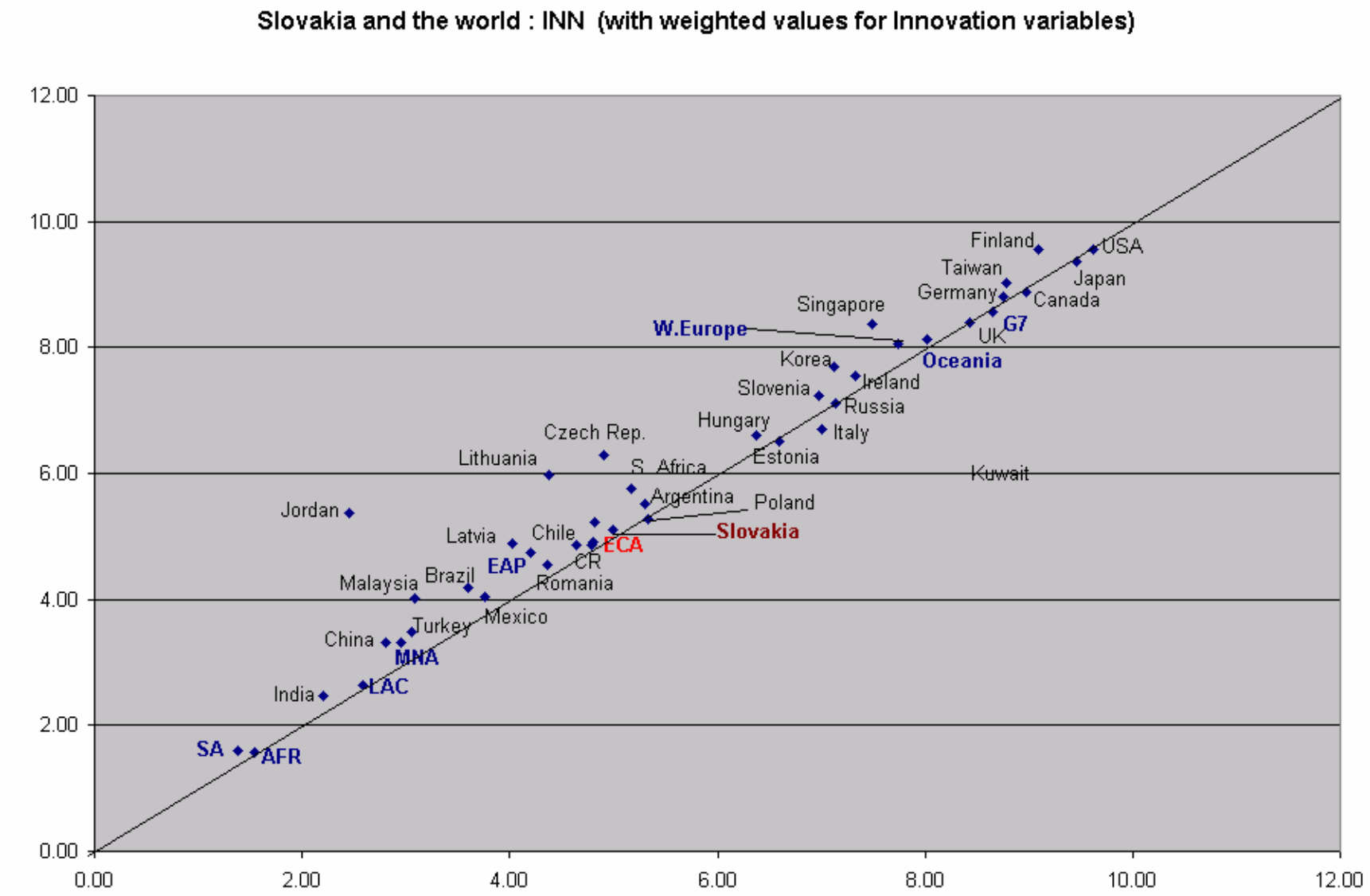
Slovakia and the World: ICT



Slovakia and the World: Education



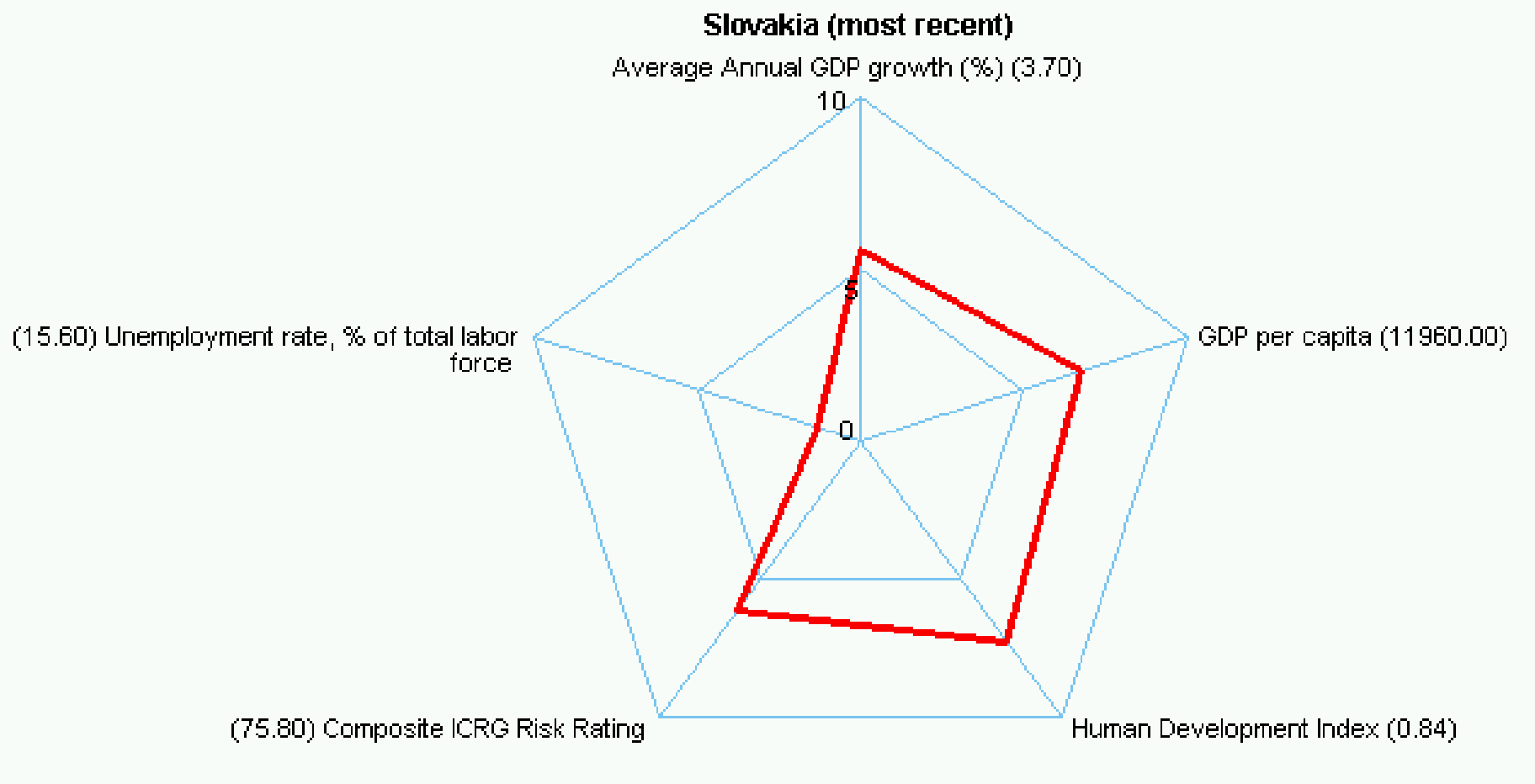
Slovakia and the World: INN



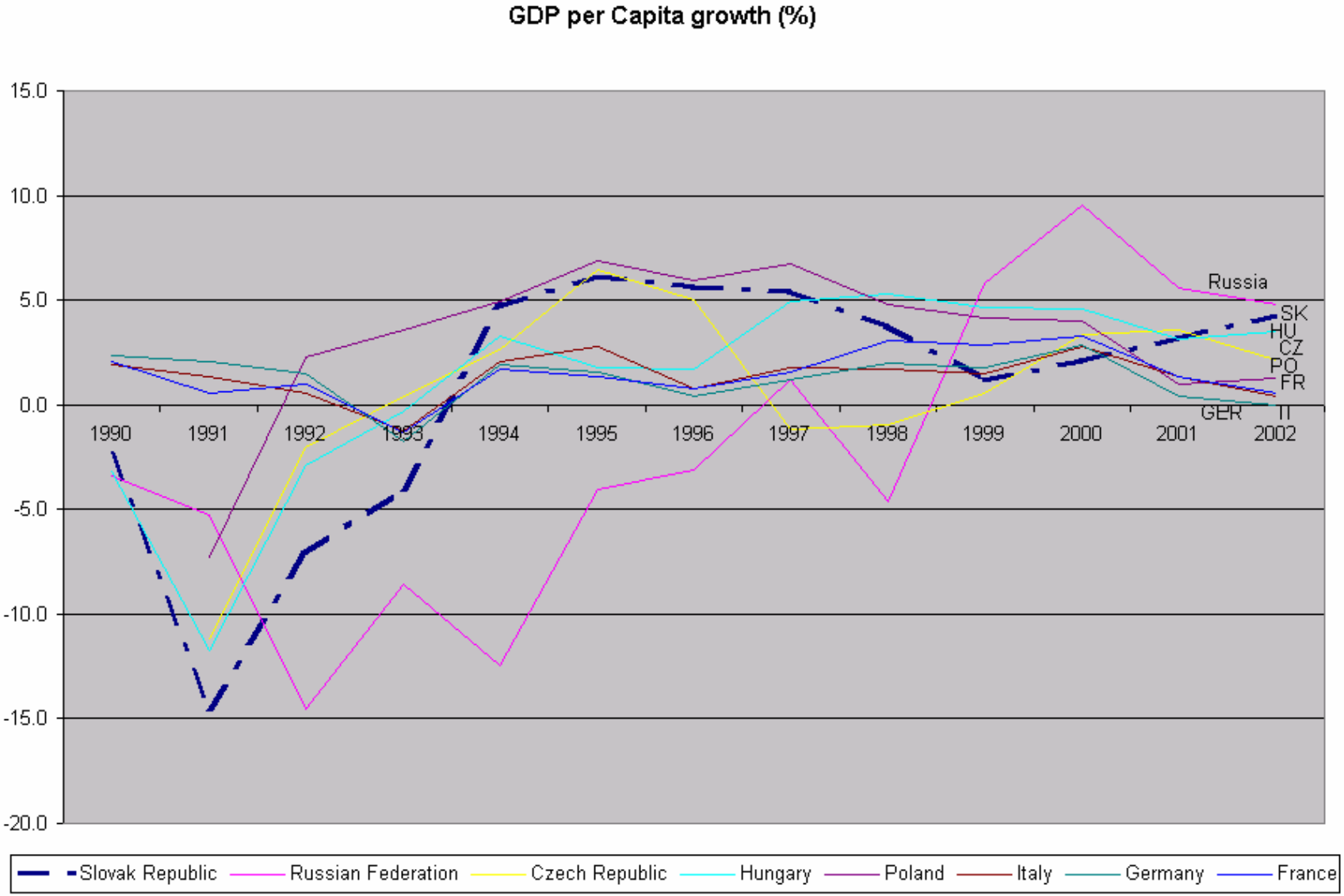
Overall Economic Performance

- Slovakia had a good growth spurt of 5-6% GDP 1994-1997 but growth fell to 1% in 1999 and recovered only to 4% by 2002
- It is behind some of its neighbors not just in growth but in terms of per-capita income
- Has one of highest unemployment rates among OECD economies

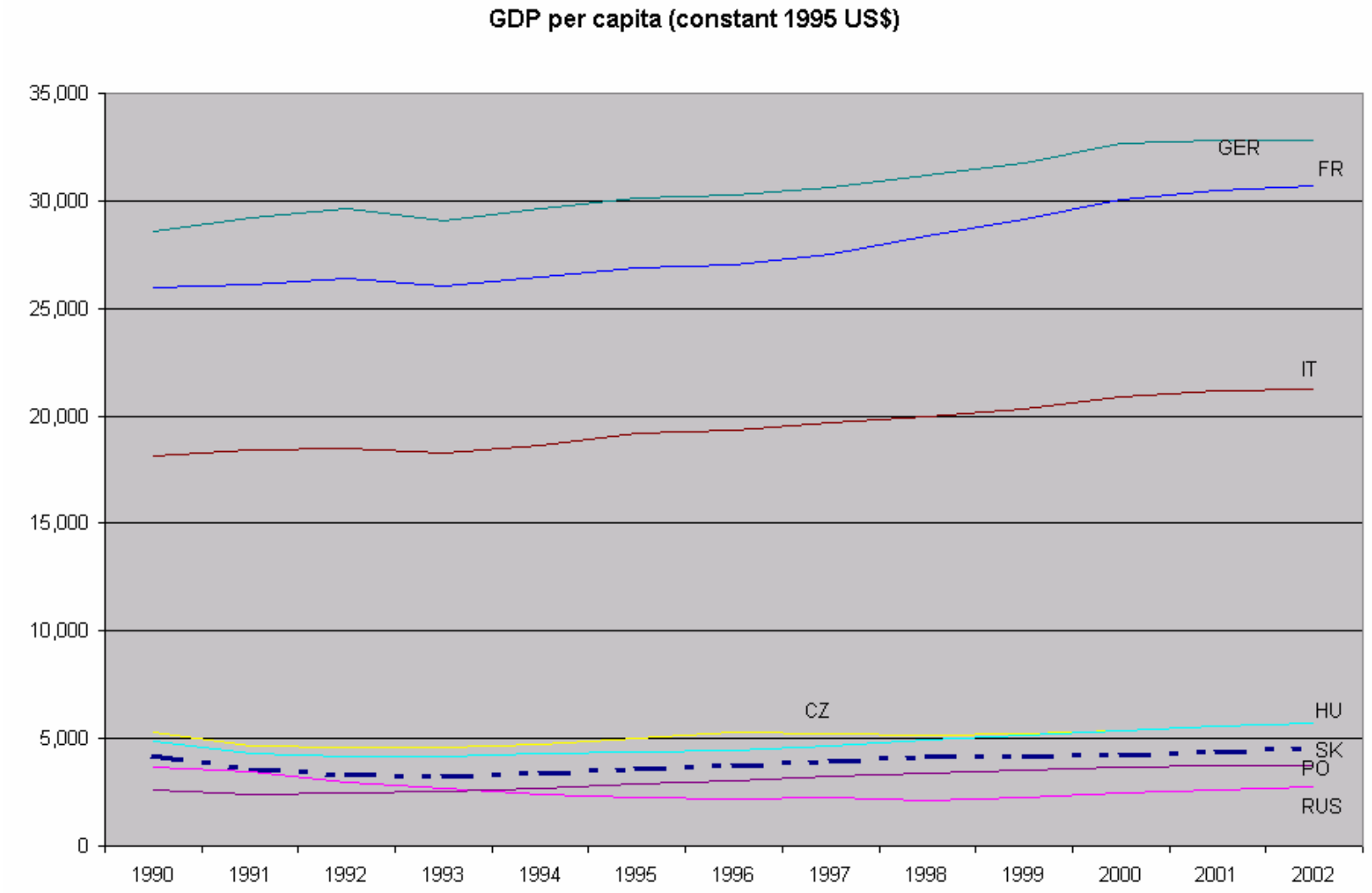
Slovakia: Performance Variables



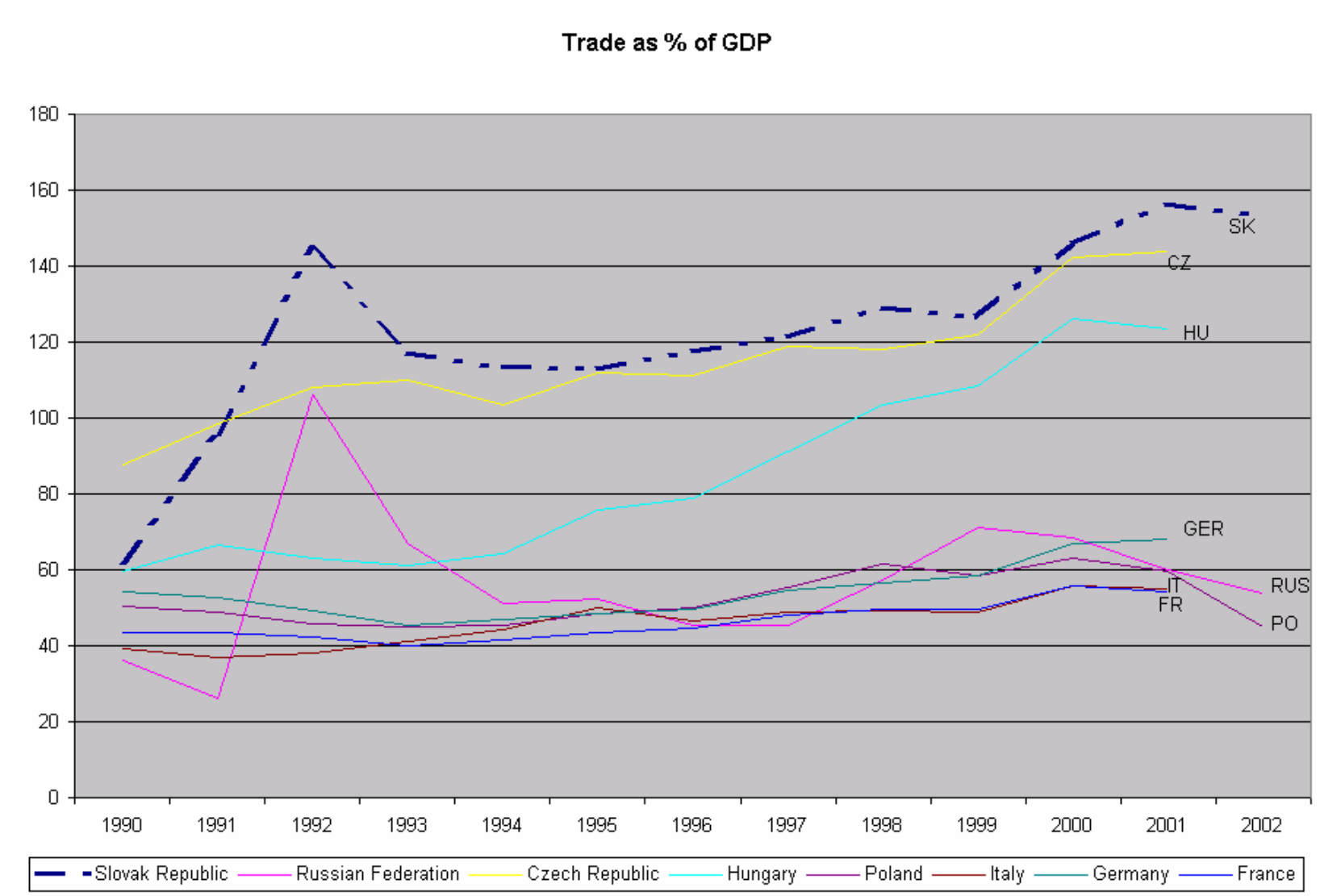
GDP per Capita Growth (%)



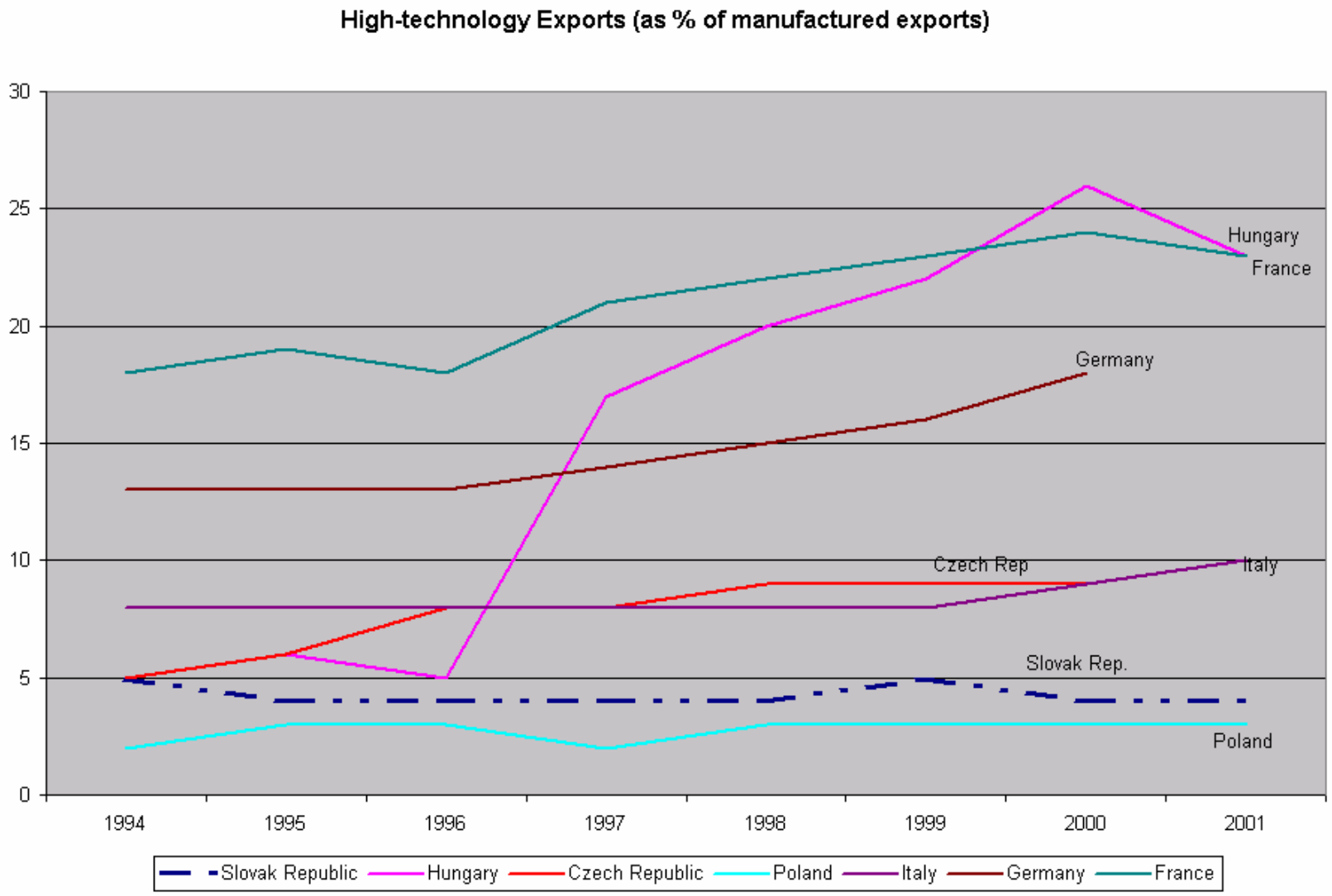
GDP per capita (constant 1995 US$)



Trade as % of GDP



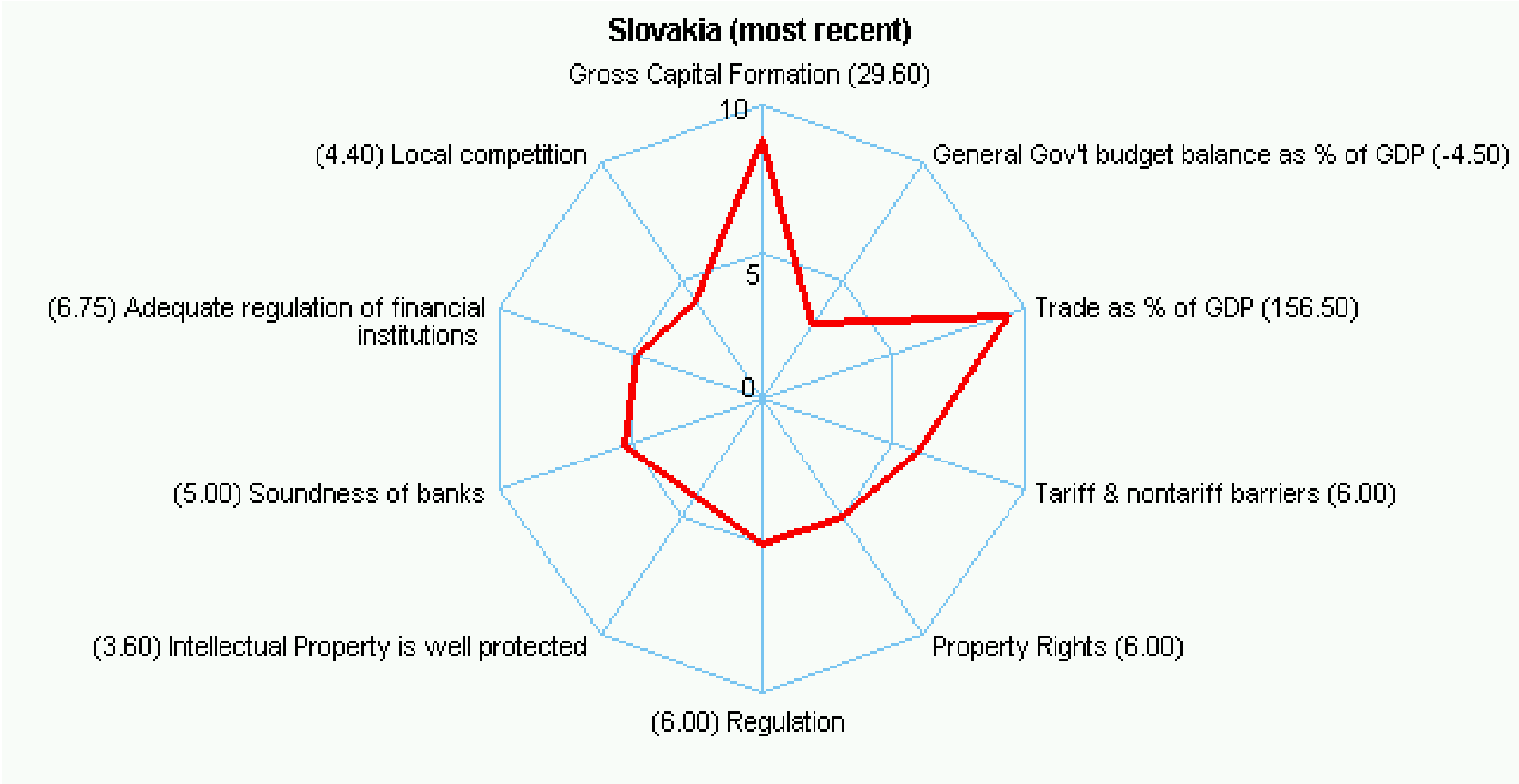
High-technology Exports



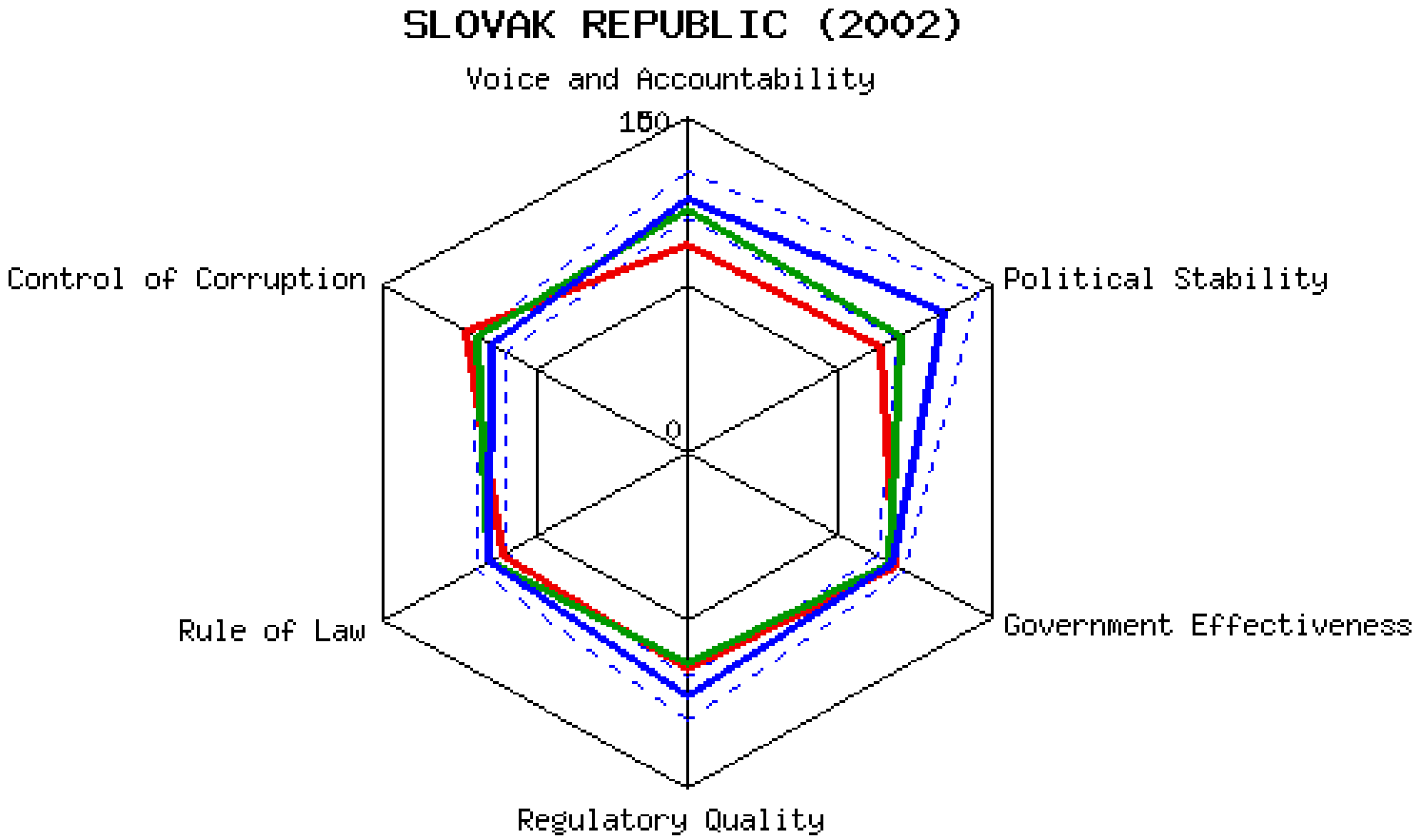
Key Elements of Economic Incentive & Institutional Regime

- Competitive environment as stimulus for improved performance
- Financial system that mobilizes and allocates capital to its most productive uses
- Flexible labor markets including support for up-skilling
- Appropriate legal and regulatory system and strong rule of law that support entrepreneurship
- Effective safety nets to facilitate adjustment to constant restructuring
- Effective, transparent and accountable government

Slovakia: Economic Regime



Slovakia: Governance Variables



Comparison between 2002 (blue), 2000 (green), 1996 (red)
Country's Percentile Rank (0-100)

Source: D. Kaufmann, A. Kraay and M. Mastruzzi, 2003: Governance Matters III: Governance Indicators for 1996-2002 (http://www.worldbank.org/wbi/governance/pubs/govmatters3.html)

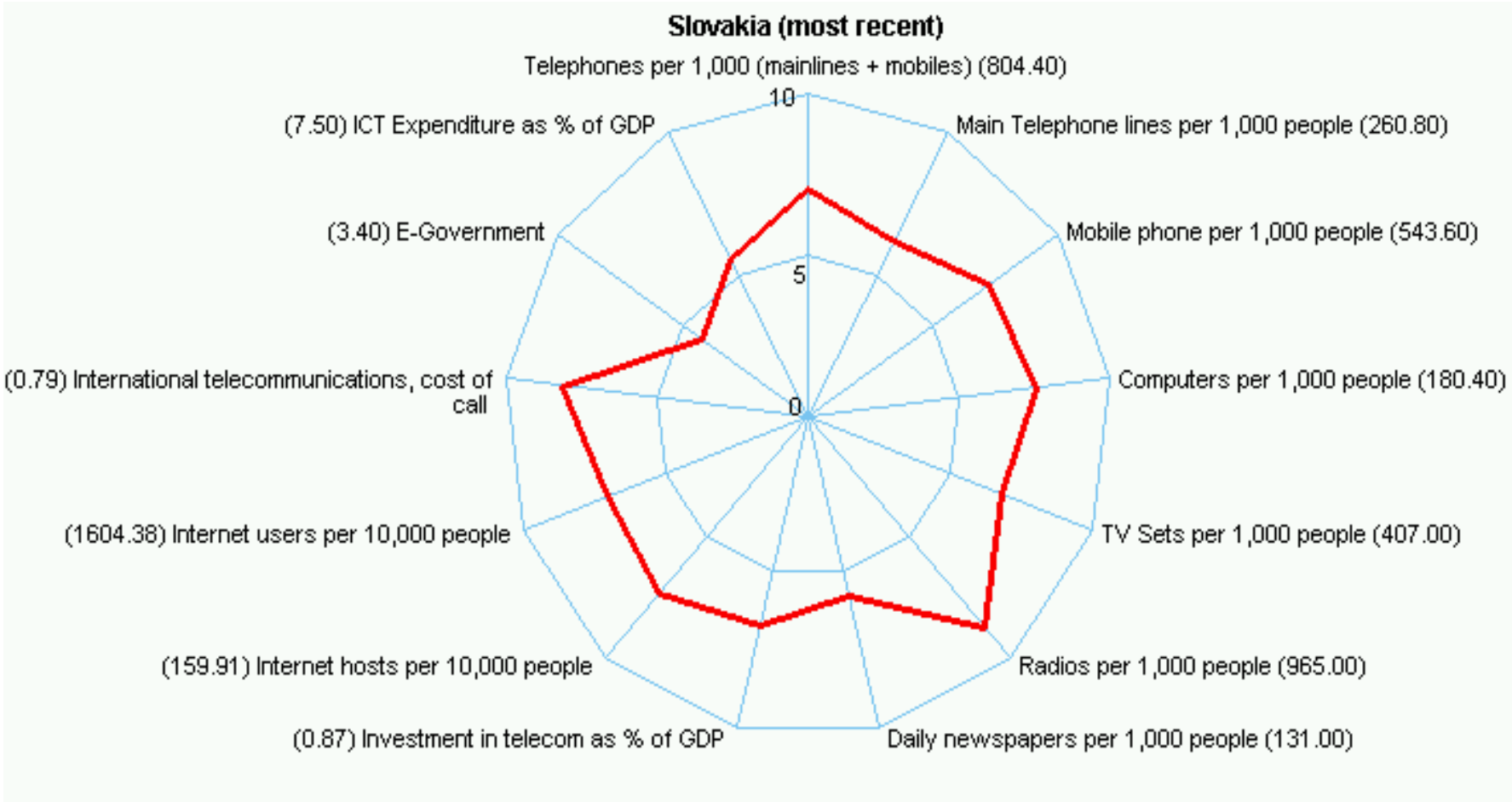
Key Issues in the EIR for Slovakia

- Unemployment at 19% (2002) among highest in OECD, combined also with one of lowest employment to population ratios in OECD.
- High and generous social security expenditures, combined with highest payroll taxes burden in OECD, and rigidities in labor market discourage job creation
- Perceived increases in corruption
- Large current account and fiscal deficit issues of significant concern

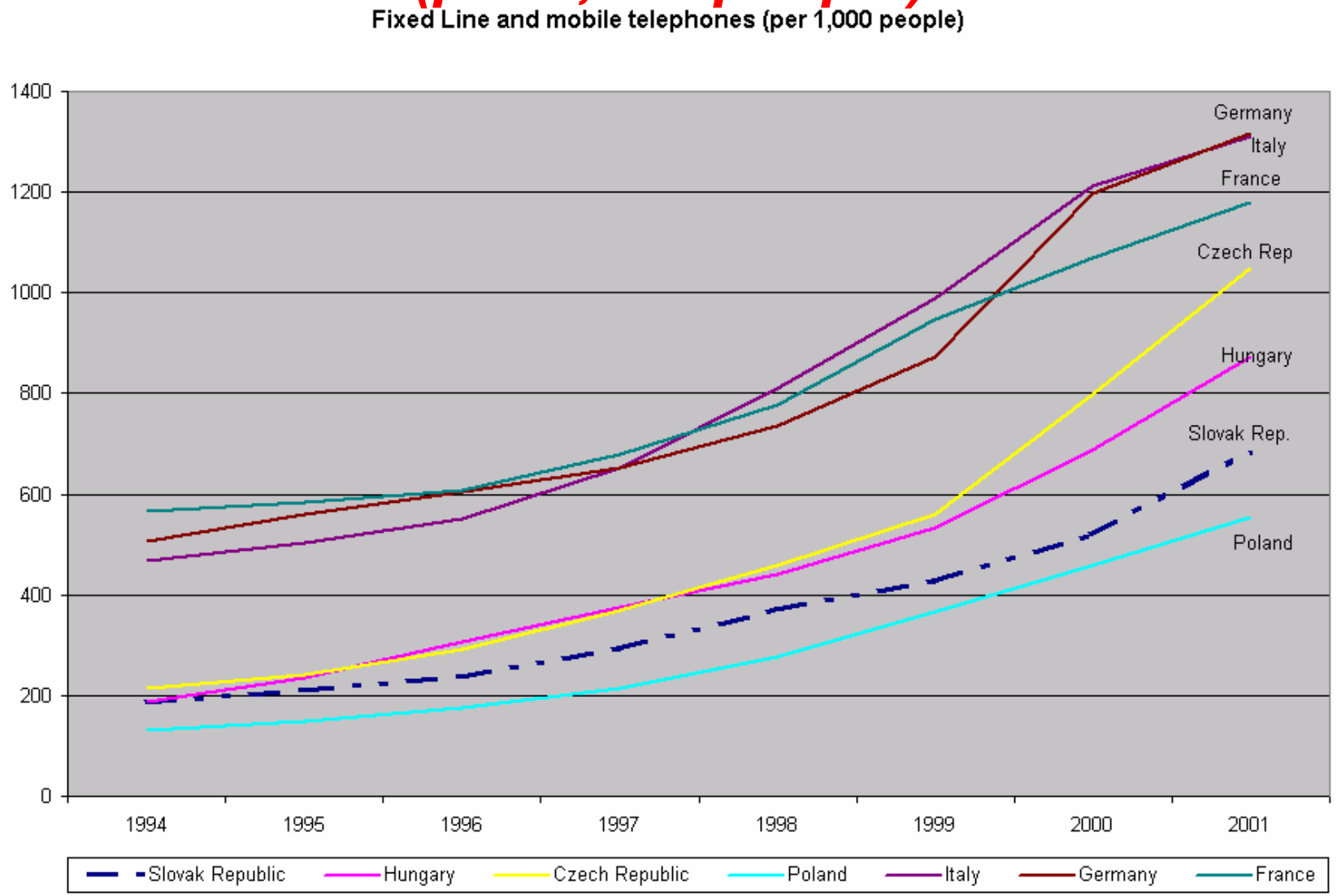
Key Elements in the Information Infrastructure

- Communications infrastructure (from radio to internet)
- Telecom issues (competition, pricing, regulation)
- Digital Divide (access, content, language)
- Use
  - E-govt, E-business, E-education, E-health
  - Legal and regulatory regime for E-economy
  - Software
  - Skills to use

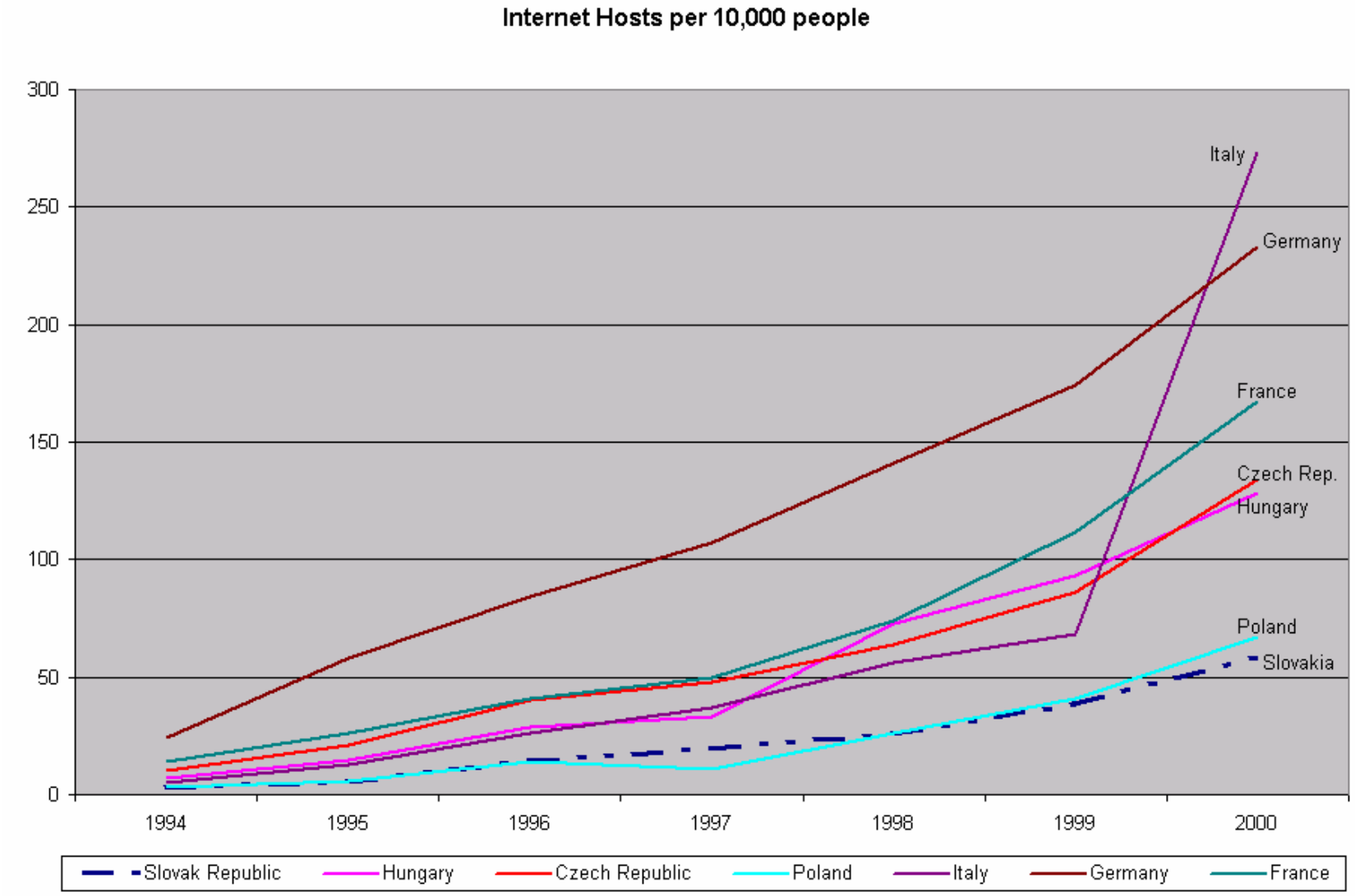
Slovakia: ICT Variables



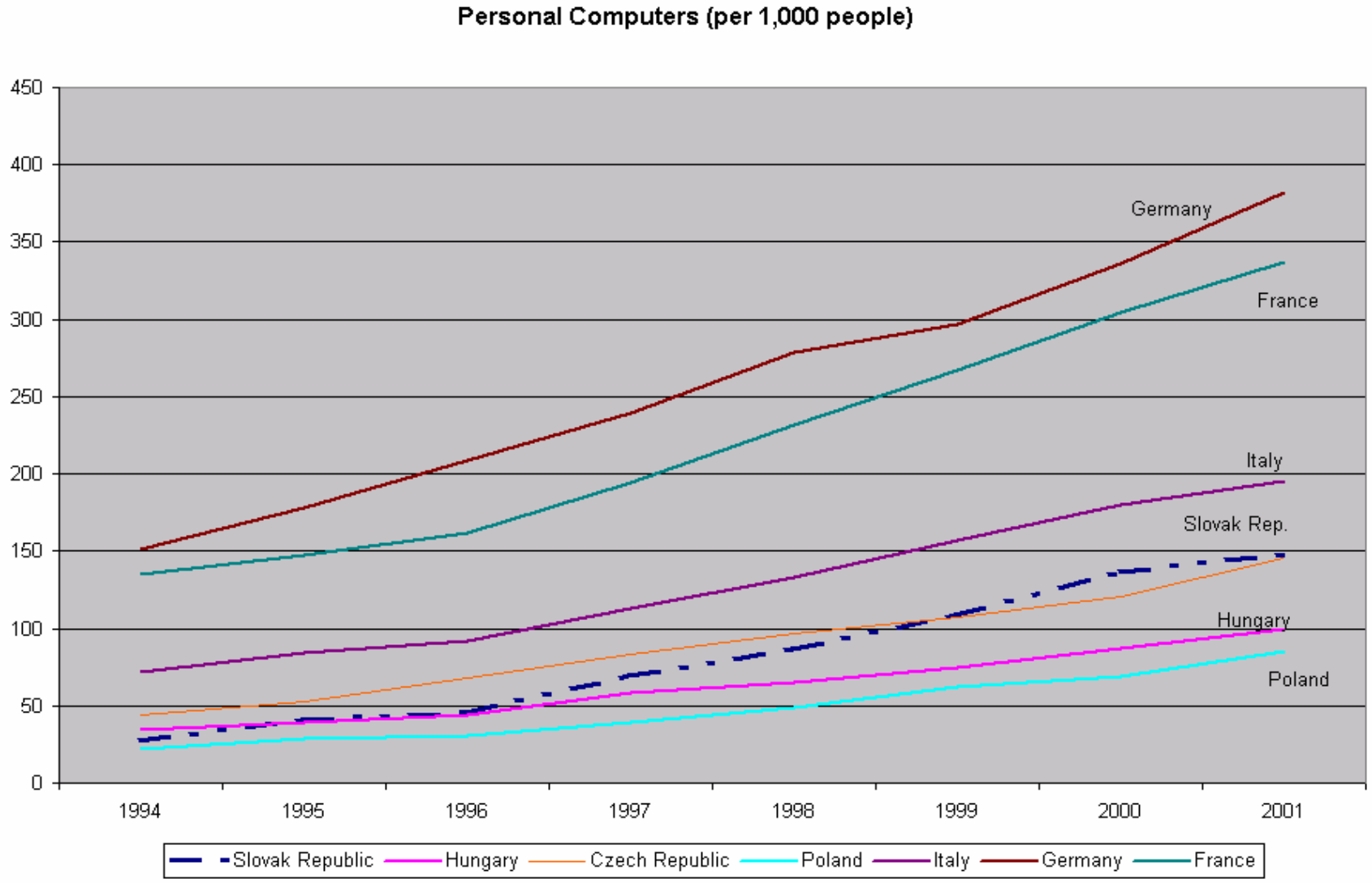
Fixed Line and Mobile Telephones (per 1,000 people)



Internet Hosts (per 10,000 people)



Personal Computers (per 1,000 people)



Key Issues in Information Infrastructure

- Improvements have been made in the ICT infrastructure, but the penetration ratios are still low by OECD standards
- Regulation and competition environment are improving and should improve infrastructure in near future
- However greatest weakness is application of ICT to the whole economy
  - Greatest weakness here is not so much adoption by individuals, but,
  - Lower adoption by business, and especially
  - Low adoption by government

Overall Networked Readiness Index Rank

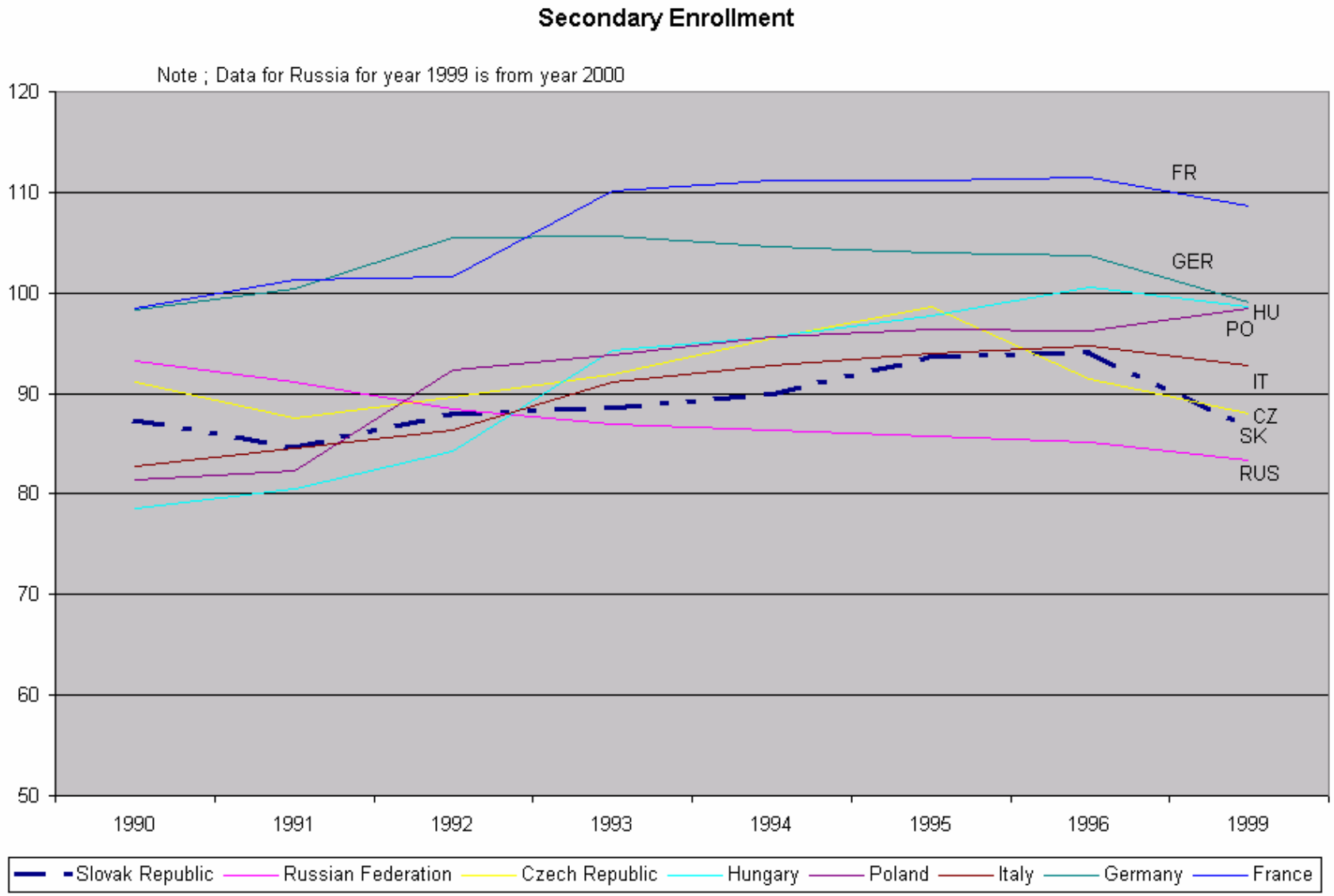
SLOVAKIA: OVERALL INDEX RANK	
2002-2003	**40**
2001-2002	**33**
Environment Component Index	**37**
Market Environment	37
Political and Regulatory Environment	41
Infrastructure Environment	36
Readiness Component Index	**39**
Individual Readiness	30
Business Readiness	39
Government Readiness	51
Usage Component Index	**45**
Individual Usage	35
Business Usage	44
Government Usage	55

Source: The Global Information Technology Report (WEF) 2002-2003

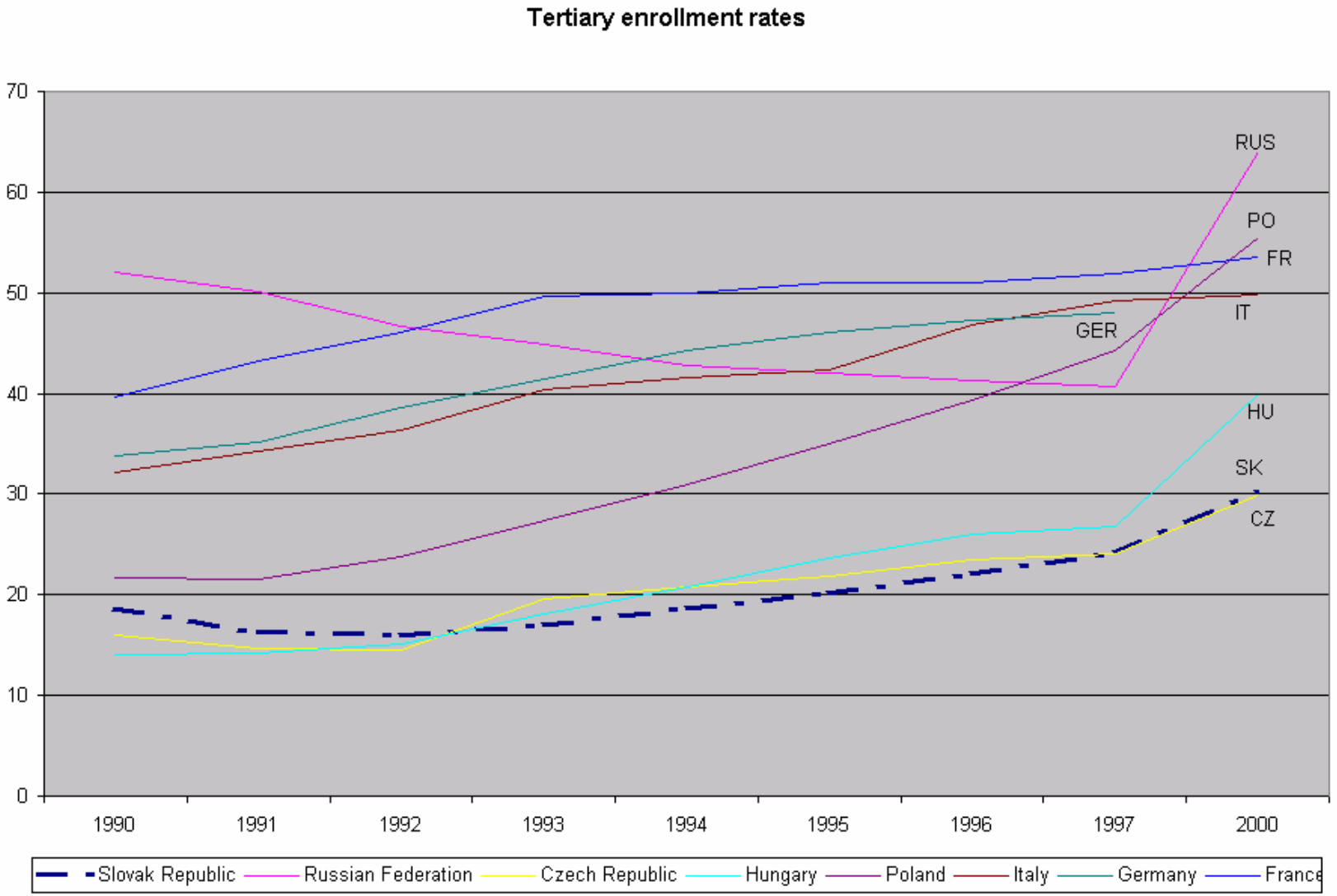
Key Elements in Human Resources

- Access to different levels of education
- Gender balance
- Quality of educational content (core technical & social skills, relevance, creativity)
- Balance among different levels of education
- Financing & public and private roles
- Life-long learning opportunities
- Role of the ministry of education and its relations with labor, market, and economy

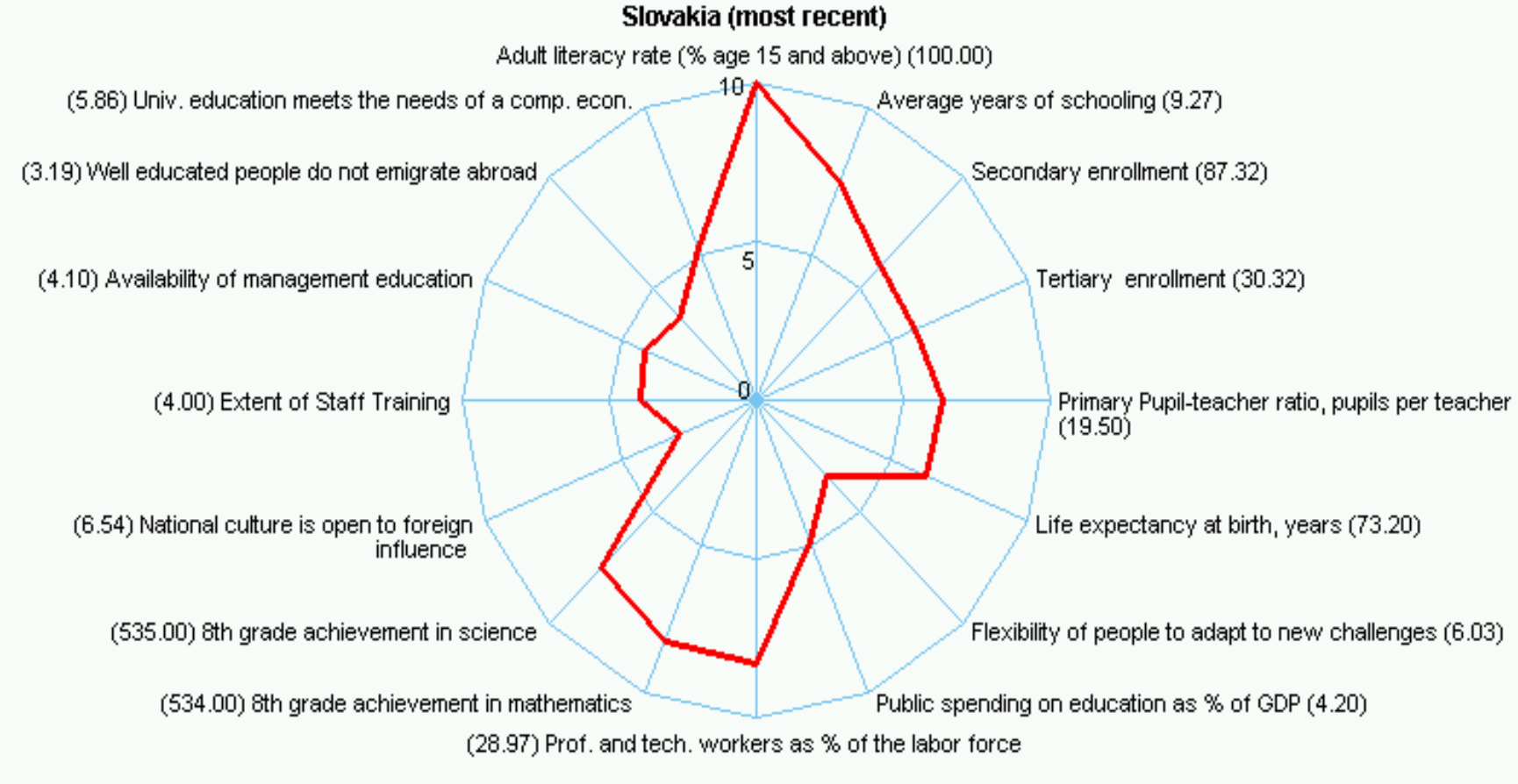
Secondary Enrollment



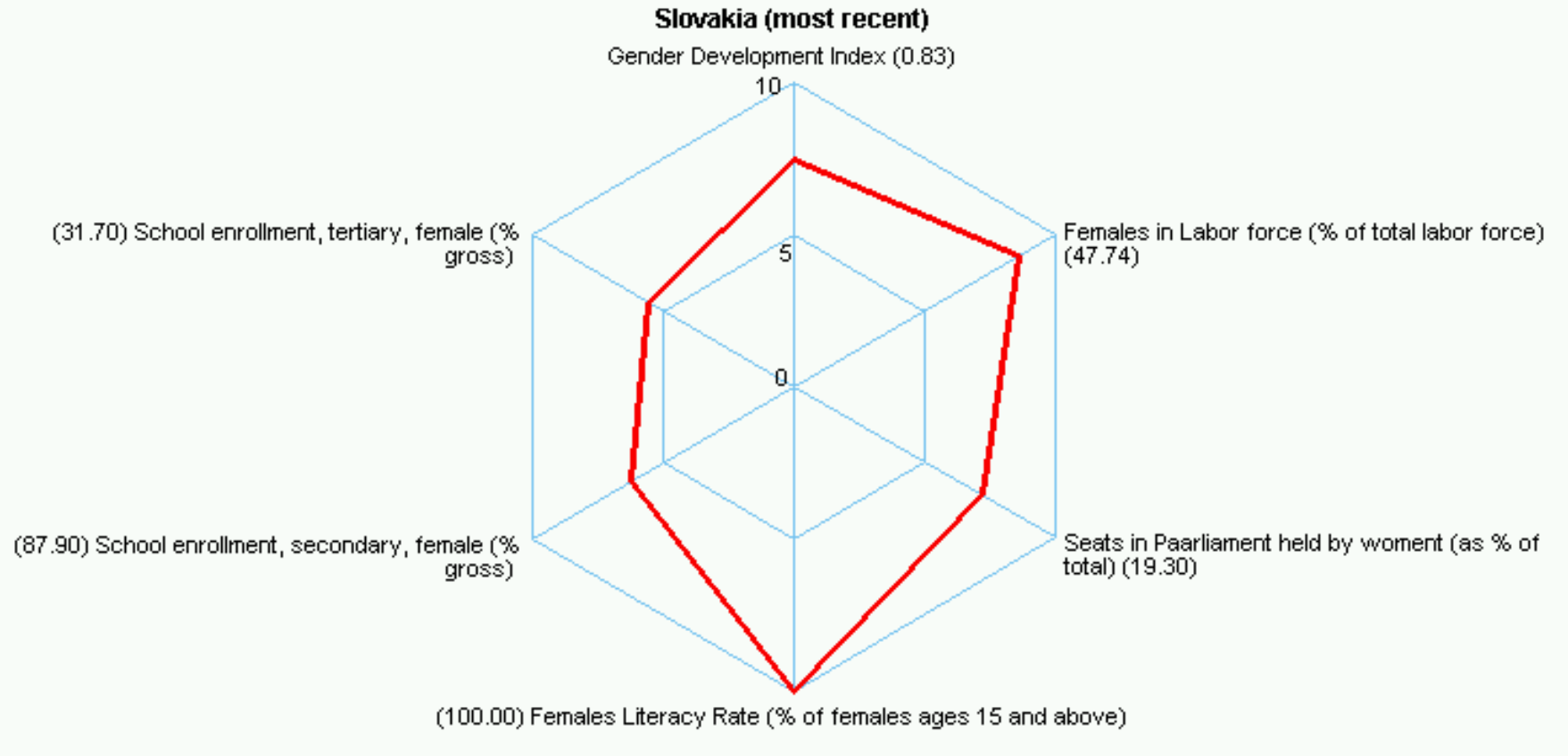
Tertiary Enrollment Rates



Slovakia: Education Variables



Slovakia: Gender Variables



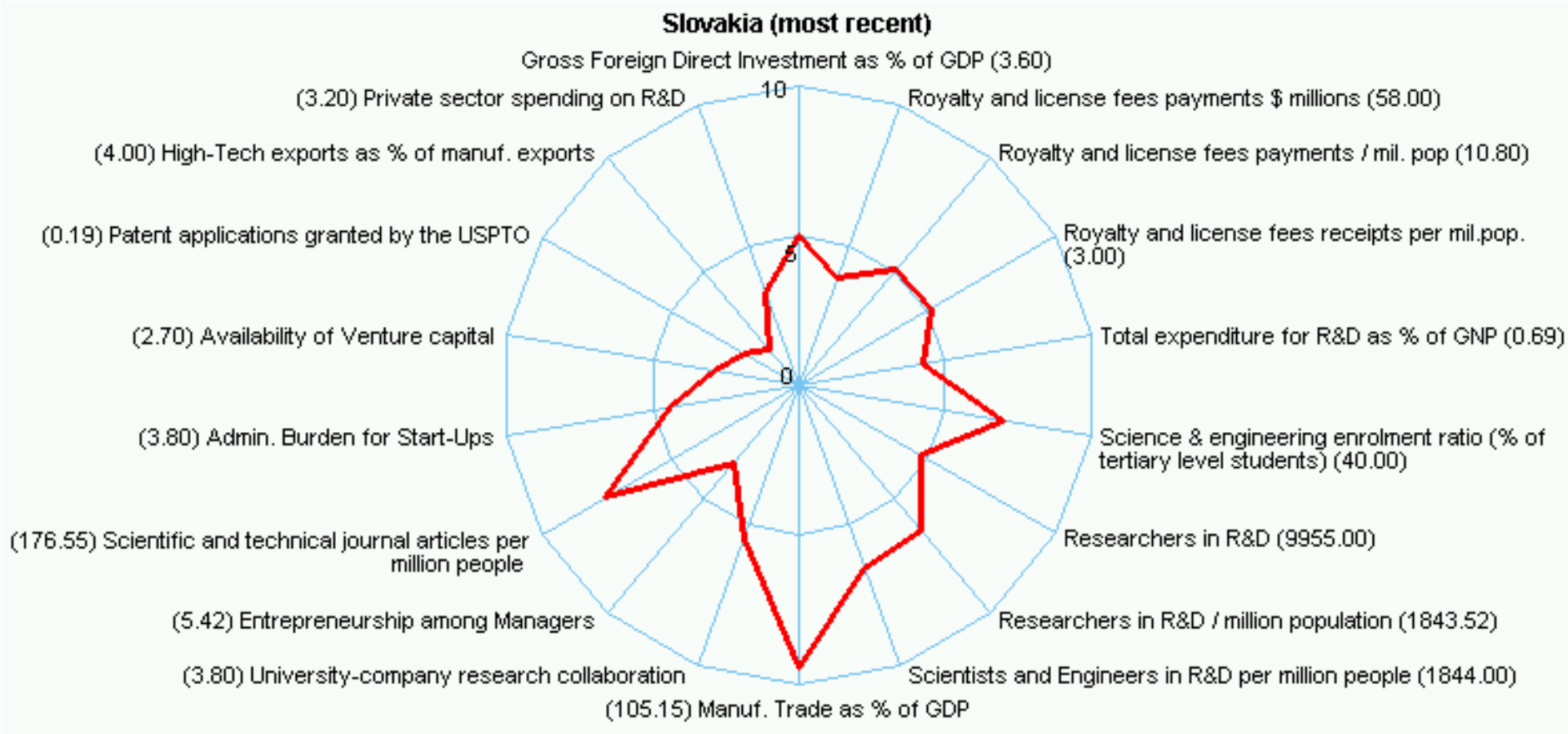
Key Issues in Education

- High levels of education are one of Slovakia's greatest assets, but tertiary enrollment rates are still low by regional and EU standards
- Moreover, education is narrow specialized, creating mobility and flexibility problems in labor market
- Gender imbalance in secondary education is even greater for higher education
- Participation in life long learning is very low compared to EU and among lowest in accession countries
- Will need to restructure the education system, particularly higher education

Key Elements in National Innovation System

- **Tapping into Global Knowledge**
  - Trade, foreign investment, tech transfer,
  - Technical journals, travel, internet, conferences
- **Creating and adapting knowledge**
  - Pubic vs private R&D; Basic vs applied R&D
  - From specialized research institutions to production
- **Disseminating Knowledge**
  - Growth of more efficient enterprises
  - Suppliers of equipment, technical services and info
  - Extension services: agricultural
- **Using knowledge**
  - Depends on cost and benefits
  - Depends on education, skills, complementary inputs
  - Depends on economic and institutional regime

Slovakia: Innovation Variables

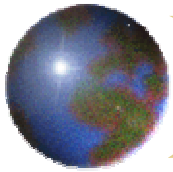


Key Issues in Innovation System

- Innovation pillar is the weakest pillar in Slovakia
- Slovakia has been falling further behind
  - Falling share of R&D/GDP ratio
  - Falling number of scientists and enginers
  - Falling number of scientific and technical publications
  - Very little patenting
- To some extent Slovakia is compensating weakness in domestic innovation system by obtaining knowledge and technology through manufactured imports and through inward foreign direct investment, but later is low by regional standards
- Slovakia will have to strengthen its innovation capability and innovation skills to improve it competitiveness

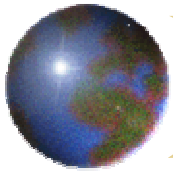
European Innovation Scoreboard 2002- Candidate Countries

European Innovation Scoreboard 2002 - Candidate Countries			
	EU Mean	CC Mean	Slovakia
S&E Graduates/20-29 years	10.26	6.60	
Population with Tertiary Education	21.22	17.50	10.66
Participation in Life-long Learning	8.50	5.40	
Employment in med/hi-tech manuf.	7.57	5.40	6.75
Employment in hi-tech services	3.61	2.60	3.03
Public R&D/GDP	0.67	0.41	0.24
Business R&D/GDP	1.28	0.32	0.45
EPO Patents/Population	152.70	7.10	5.90
USPTO hi-tech Patents/Population	12.40	0.50	0.19
Home Internet Access/Population	31.40	14.80	16.70
ICT expenditures/GDP	8.00	6.00	7.50
Inward FDI/GDP	30.30	31.30	24.20
Source: European Innovation Scoreboard 2002			



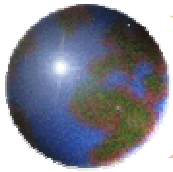
Challenges Ahead

- Very dynamic situation with moving goalposts & risk of increasing knowledge divide between advanced and developing countries and with-in countries
- Need to raise awareness among policy makers, private sector and civil society in developing countries
- Need to develop coherent strategies to take advantage of opportunities and reduce adverse impact

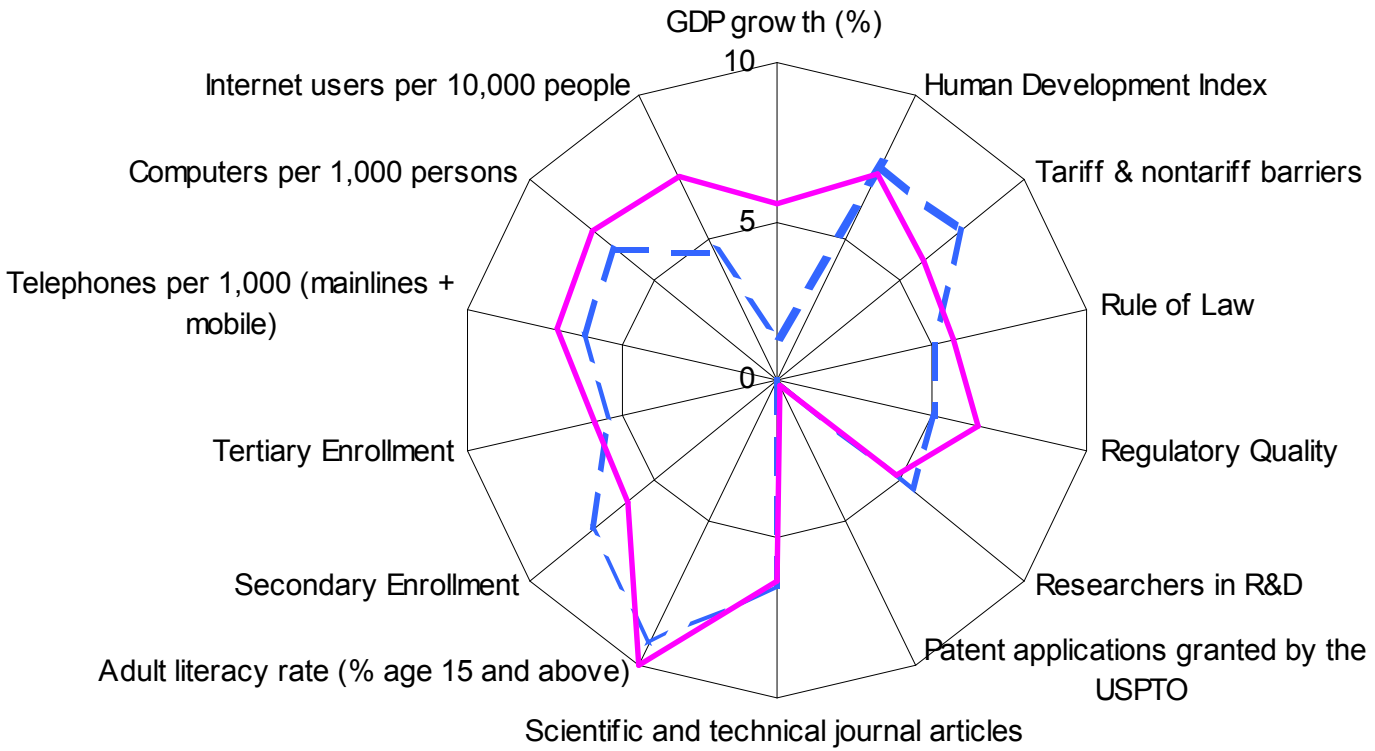


The Way Forward

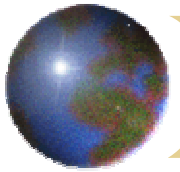
- Critical to go from analysis of problems to concrete initiatives to improve KE performance
- Successful further reform requires creating stakeholder awareness
- Consultation and discussion necessary to create stakeholder ownership
- Monitorable goals and constant evaluation key to improving performance
- Rapid adjustment needed in light of experience and changing circumstances



Annex

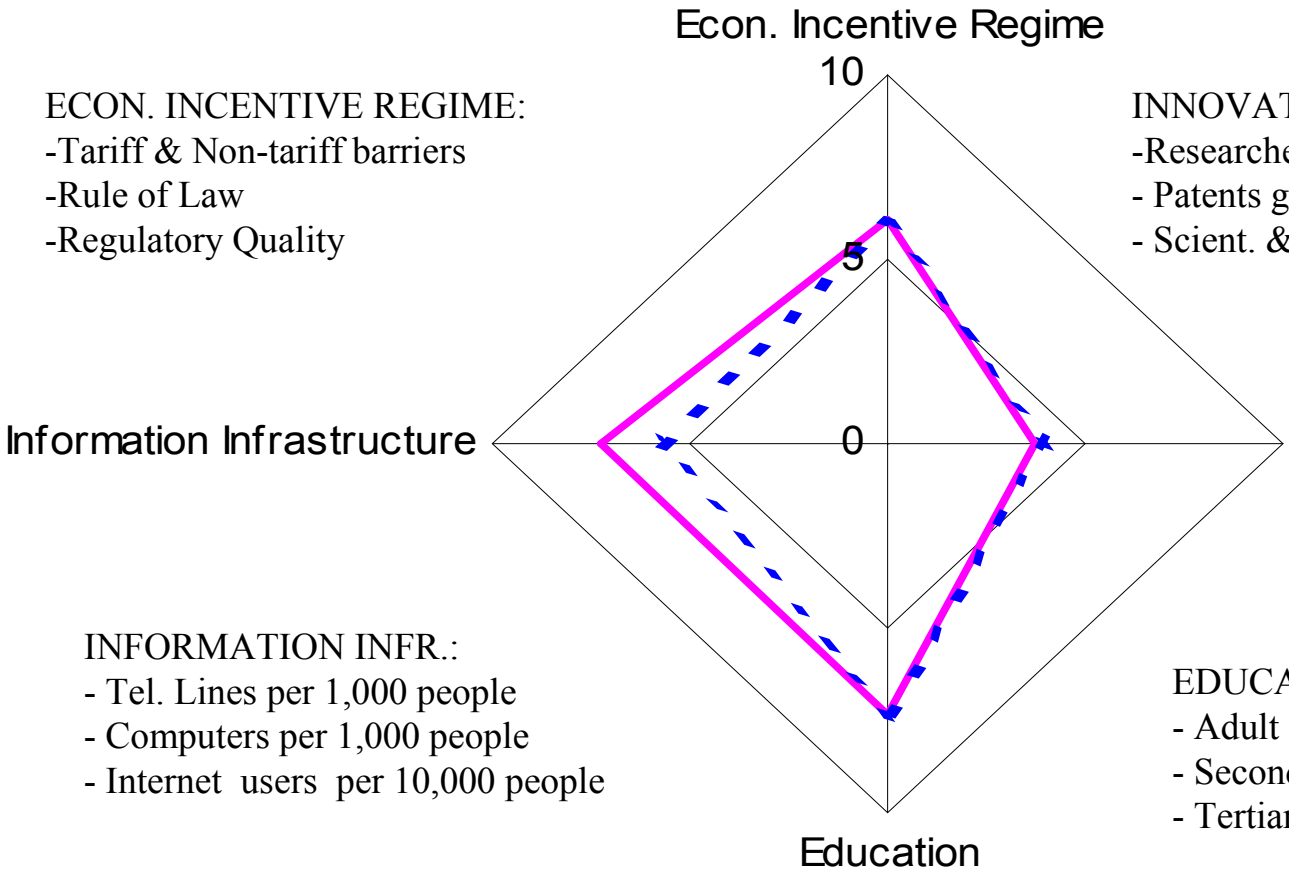


Slovakia (absolute)



ECON. INCENTIVE REGIME:
-Tariff & Non-tariff barriers
-Rule of Law
-Regulatory Quality

INNOVATION:
-Researchers in R&D
- Patents granted by USPTO
- Scient. & Tech. Publications



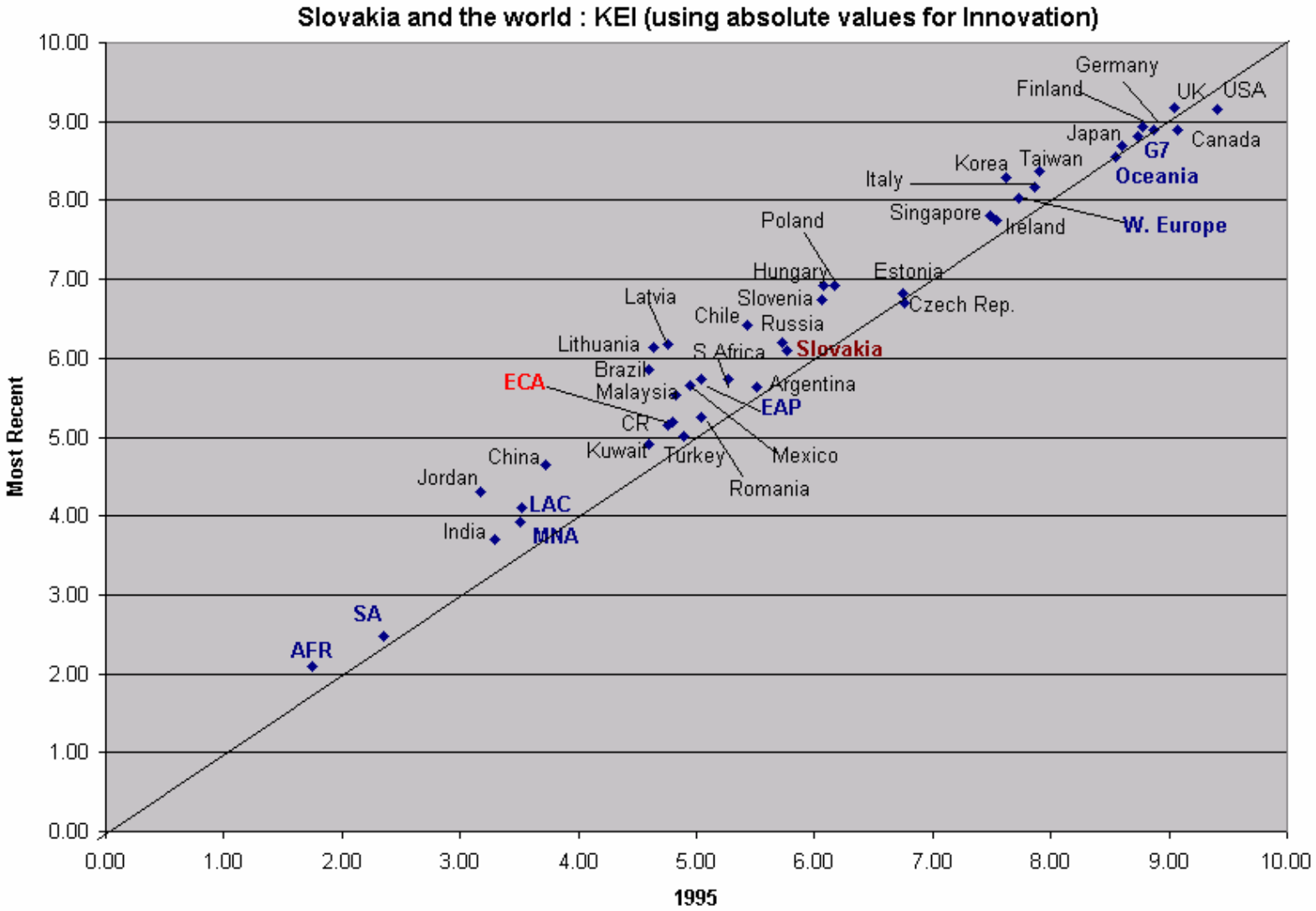
INFORMATION INFR.:
- Tel. Lines per 1,000 people
- Computers per 1,000 people
- Internet users per 10,000 people

EDUCATION:
- Adult literacy rate
- Secondary Enrollment
- Tertiary Enrollment

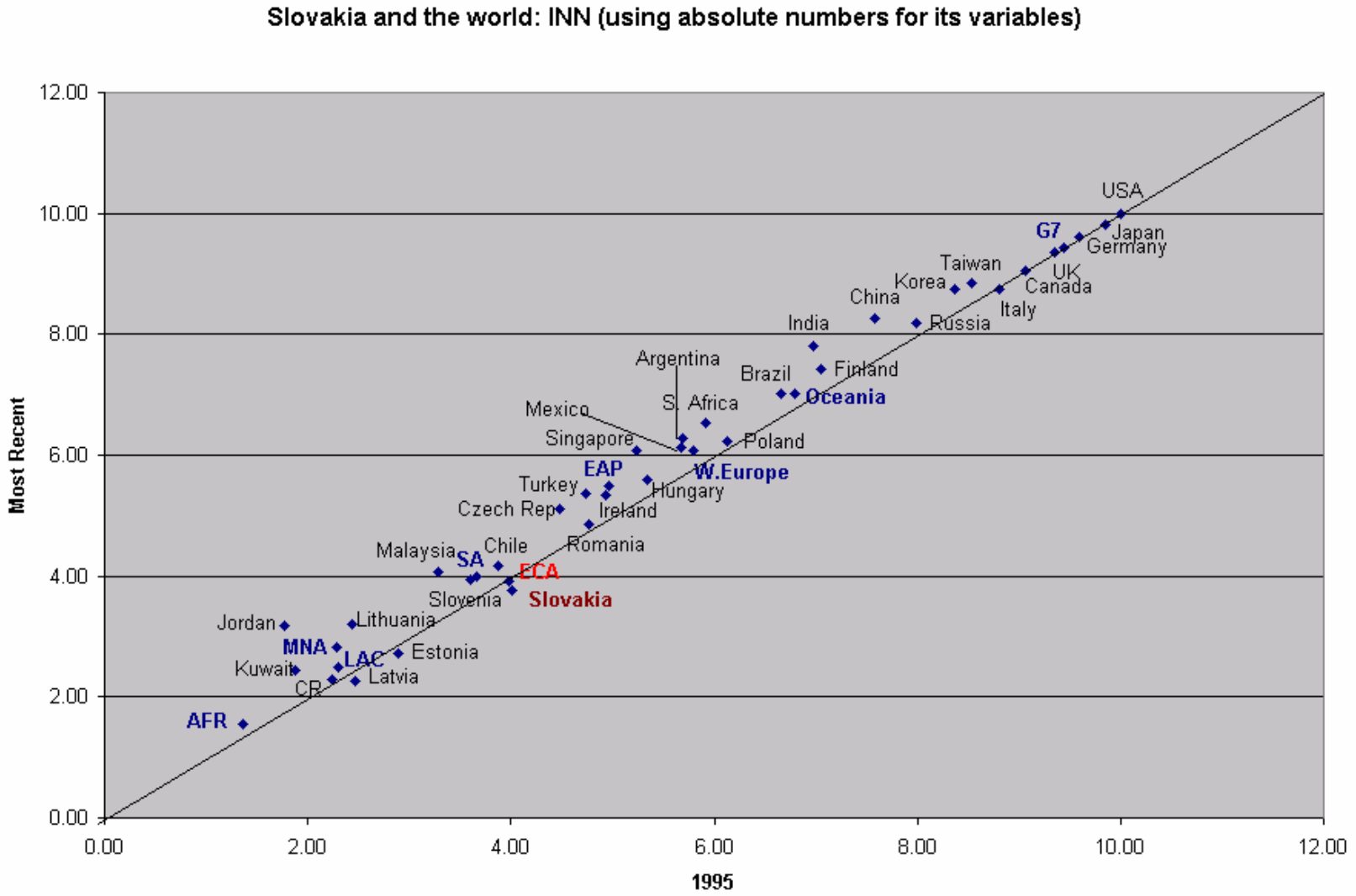
Slovakia (absolute)

most recent 1995

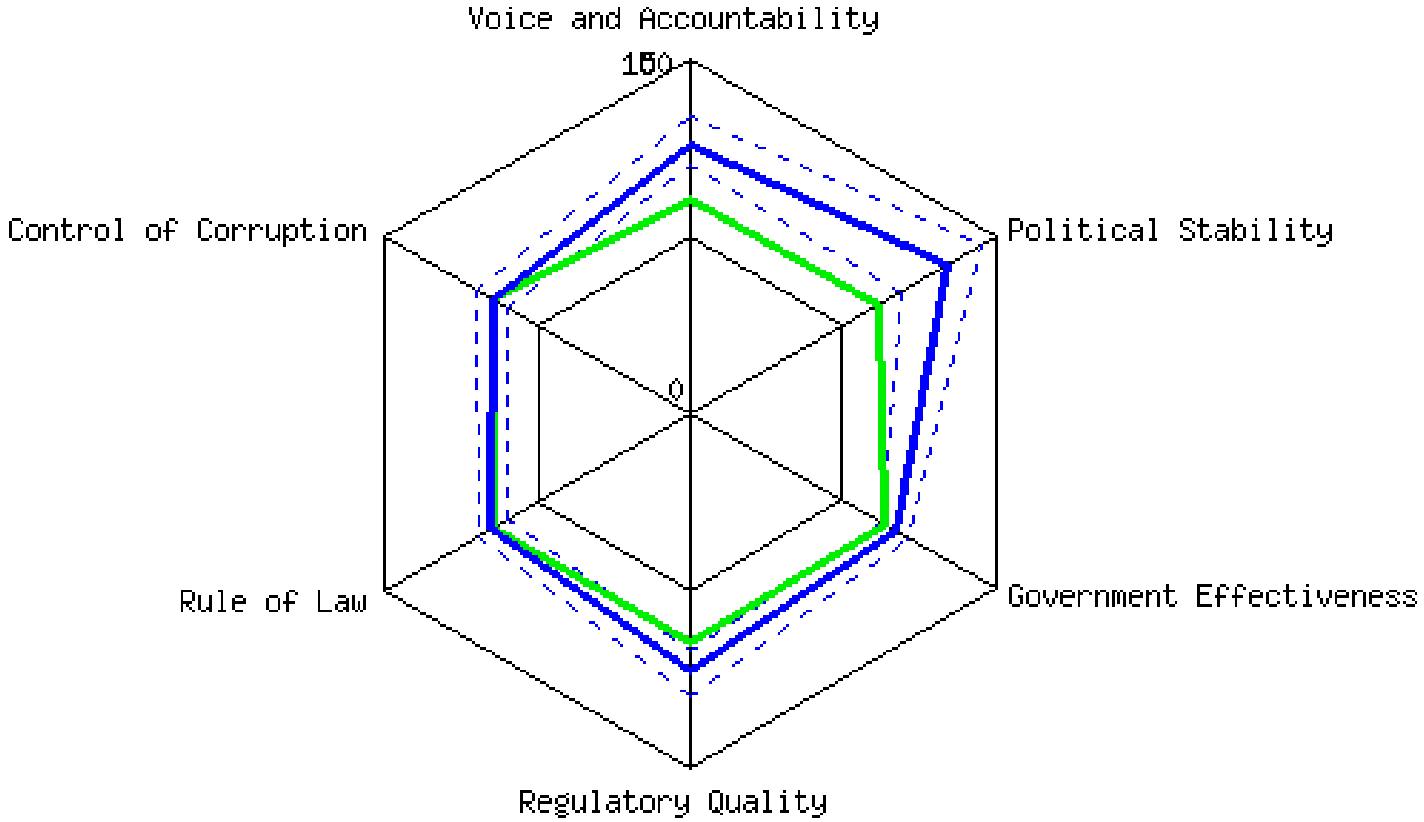
Slovakia and the World: KEI



Slovakia and the World: INN



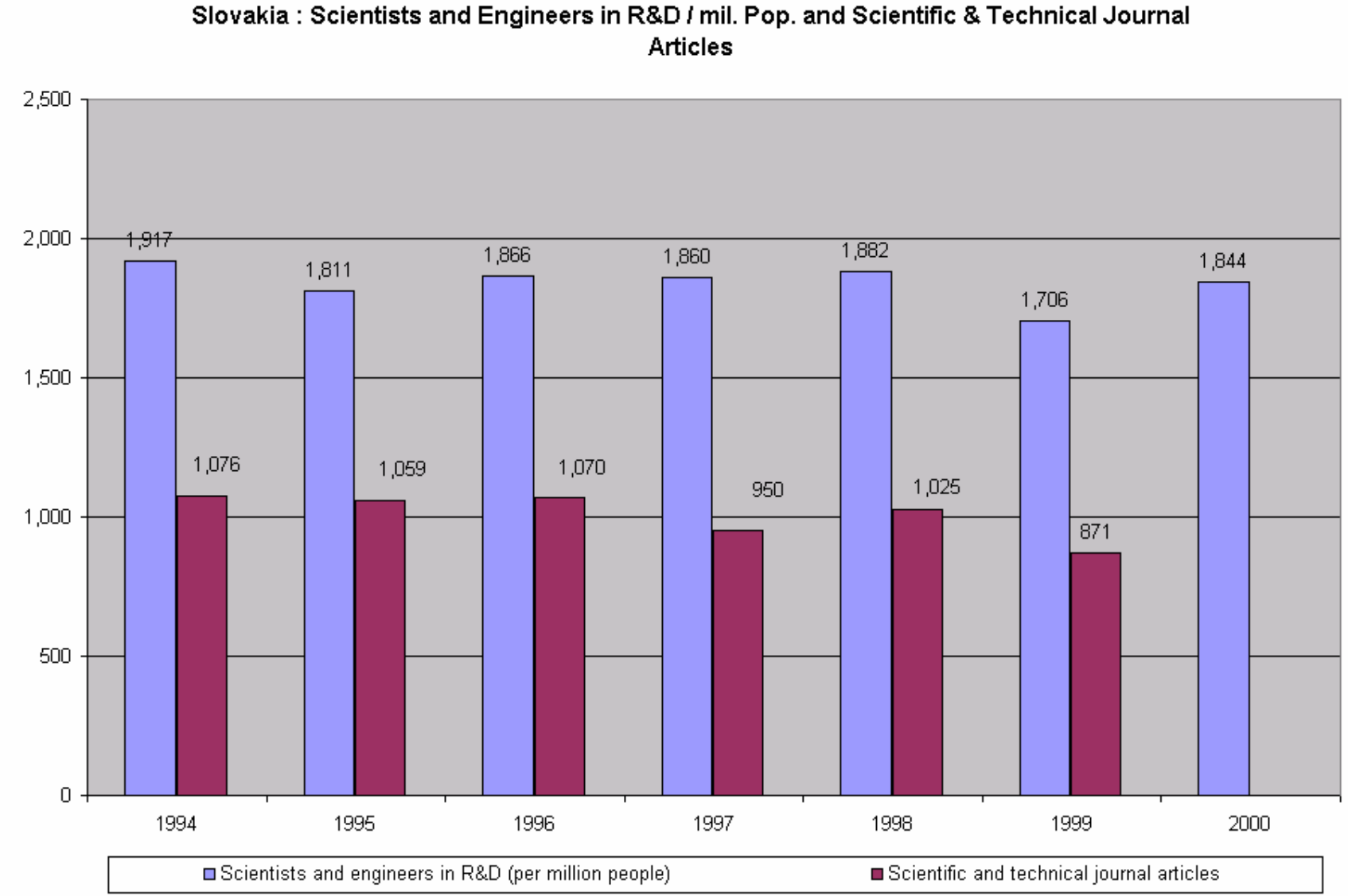
SLOVAK REPUBLIC (2002)



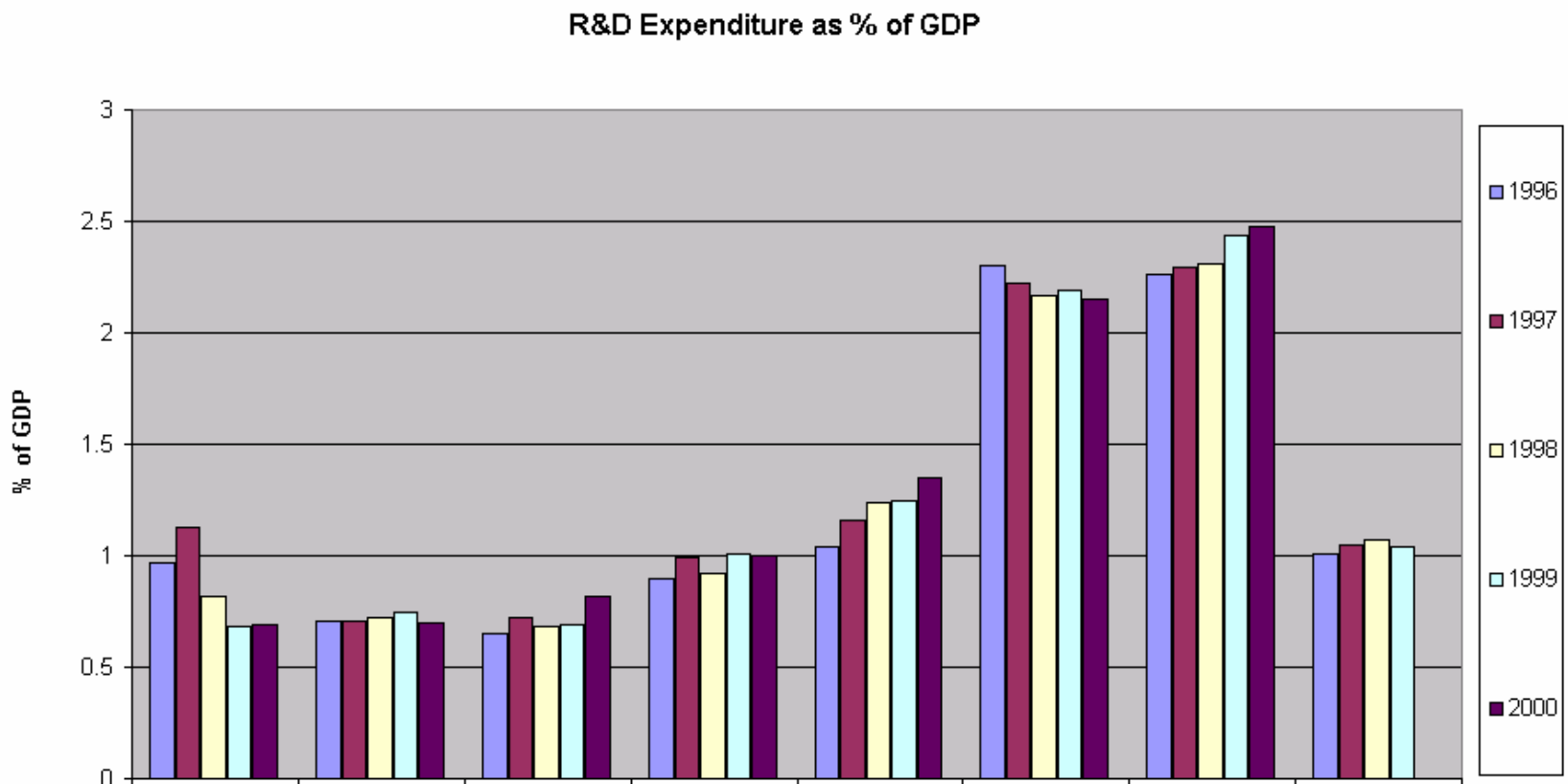
Comparison with income category average (Upper Middle Income) (green line)
Country's Percentile Rank (0-100)

Source: D. Kaufmann, A. Kraay and M. Mastruzzi, 2003: Governance Matters III: Governance Indicators for 1996-2002 (http://www.worldbank.org/wbi/governance/pubs/govmatters3.html)

Slovakia: Scientists and Engineers in R&D

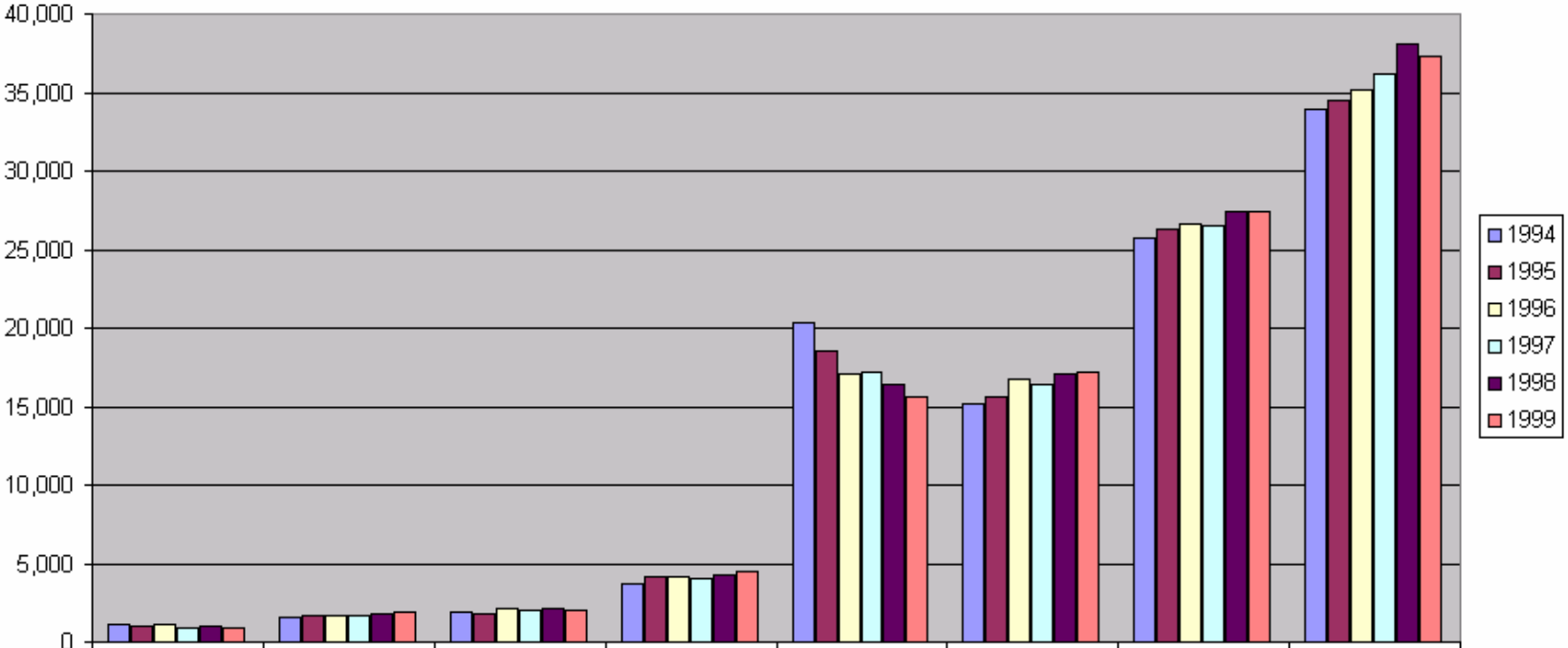


R&D Expenditures as % of GDP



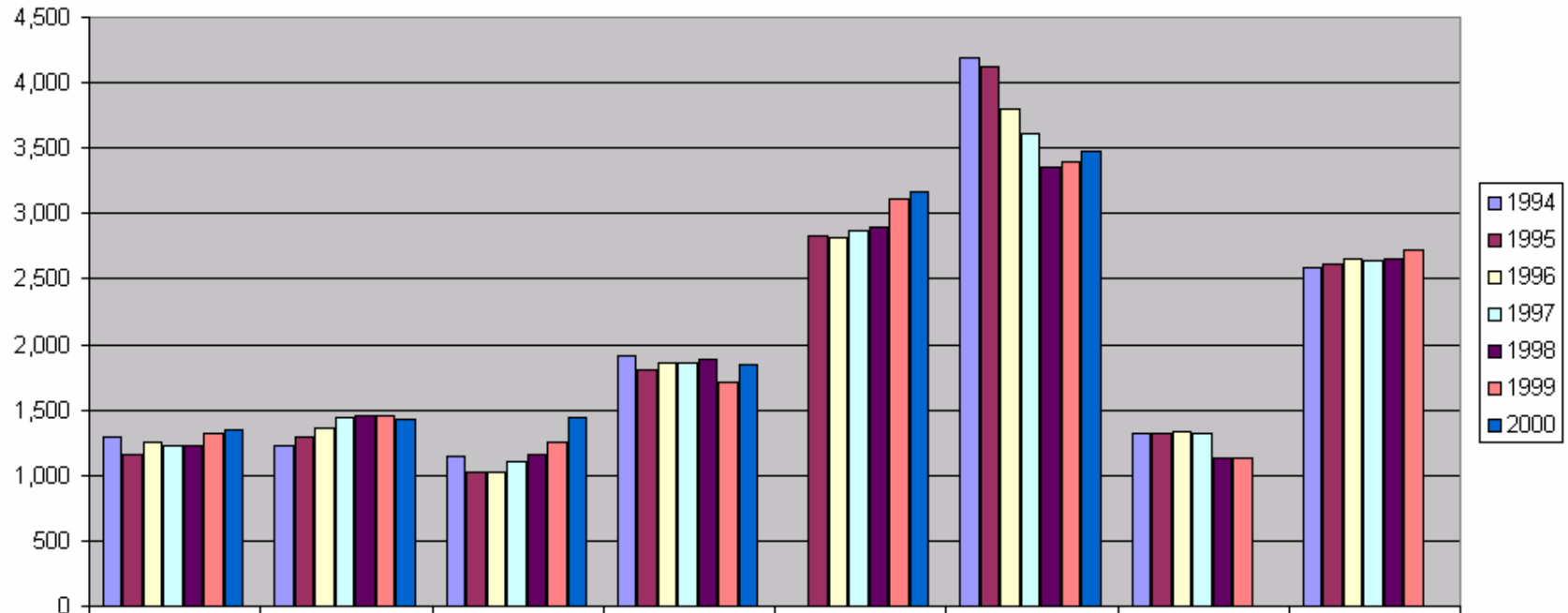
	Slovak Republic	Poland	Hungary	Russian Federation	Czech Republic	France	Germany	Italy
1996	0.97	0.71	0.65	0.9	1.04	2.3	2.26	1.01
1997	1.13	0.71	0.72	0.99	1.16	2.22	2.29	1.05
1998	0.82	0.72	0.68	0.92	1.24	2.17	2.31	1.07
1999	0.68	0.75	0.69	1.01	1.25	2.19	2.44	1.04
2000	0.69	0.7	0.82	1	1.35	2.15	2.48	

Scientific and Technical Journals



	Slovak Republic	Hungary	Czech Republic	Poland	Russian Federation	Italy	France	Germany
1994	1,076	1,607	1,963	3,735	20,337	15,193	25,704	33,987
1995	1,059	1,657	1,825	4,186	18,512	15,660	26,265	34,442
1996	1,070	1,630	2,079	4,174	17,108	16,703	26,590	35,206
1997	950	1,717	2,024	4,019	17,147	16,405	26,509	36,233
1998	1,025	1,850	2,094	4,318	16,352	17,081	27,421	38,044
1999	871	1,958	2,005	4,523	15,654	17,149	27,374	37,308

Scientists & Engineers in R&D



	Czech Republic	Poland	Hungary	Slovak Republic	Germany	Russian Federation	Italy	France
1994	1,289	1,231	1,145	1,917		4,192	1,326	2,587
1995	1,155	1,290	1,026	1,811	2,831	4,120	1,320	2,615
1996	1,257	1,357	1,021	1,866	2,810	3,801	1,333	2,658
1997	1,221	1,437	1,098	1,860	2,874	3,606	1,326	2,646
1998	1,220	1,454	1,165	1,882	2,898	3,354	1,136	2,648
1999	1,316	1,461	1,255	1,706	3,112	3,399	1,128	2,718
2000	1,349	1,429	1,445	1,844	3,161	3,481		