

***Benchmarking the Competitiveness Strategies of Six Small
European Countries: A Small Country Perspective***

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1. Introduction

The competitiveness of a country depends upon many factors. It is important to increase the understanding of what makes a country perform well and what strategies countries should choose in order to maintain competitive. A country does not usually choose a certain strategic system in order to maintain competitive, but rather ends up with one due to historical background, geographic location, size of the country and political and economic circumstances. It can be argued that small countries need to adopt other strategies and policies in order to be able to compete with large countries. One of the major issues in European policy making of the current decade is to develop the knowledge base and the competitiveness of the whole EU. There is reason to believe that this task needs to be elaborated in order to increase the understanding of what strategies each country should choose, in other words what policies and institutions are crucial for the countries to become competitive and to increase their knowledge base.

In this benchmarking exercise the small country aspect of competitiveness strategy is elaborated. Here it is looked more closely at policies and institutions of six small European countries that belong to the KNOGG project¹.

¹ KNOGG is a two-year EU financed research project, organised as a thematic network. It brings together researchers from 6 small European countries (Finland, the Netherlands, Ireland, Greece, Hungary and Slovenia) to review science and technology policies in their respective countries, and to develop general guidelines at the EU level for improving knowledge-based growth and competitiveness in small European countries.

2. Benchmarking the national policies

The Lisbon Council 2000 set the goal to make Europe the most competitive and dynamic knowledge-based economy in the world by 2010. This goal included plans of increasing the capability of sustainable economic growth, creating 20 million additional jobs and thus increasing the employment rate to 70 % (an increase of almost 10 % from the European level in 2000) and increasing the social cohesion. To achieve these far reaching objectives, the European Union member countries adopted a *Lisbon Strategy*, combining short-term political initiatives and medium- and long-term economic reforms. It is evident that measures to achieve the goal are now implemented. In terms of research and development, an important issue has been how to develop a unified research area of Europe. A major step in this direction is the European Research Area program (ERA) which has provided a framework for research policy in Europe since 2000. Strengthening the interaction between researchers in the member countries will help to improve the overall efficiency of European research efforts.

It is essential in implementing such a large-scale strategy as the Lisbon Strategy, in an area with economic, political as well as cultural diversity, to understand the national policies and the country specific impediments for growth. The *Open Method of Co-ordination* is chosen as a method to implement the strategy. It includes benchmarking based on quantitative and qualitative indicators, the setting of specific timetables and the translation of European guidelines into national and regional policies. In the open method practice, benchmarking is an important means of evaluating the performance of national policies, especially science, technology and innovation policies. It increases the transparency of national practises and allows for comparing the success of national policies.

2.1 Benchmarking the STI policies

A country's competitiveness depends largely on the technological level in the country. It is thus rather a rule than an exception that the countries with the highest R&D expenditures are the most competitive ones. Innovations play a key role in the technological progress that is essential for a country to maintain its competitiveness, since they directly affect the firms long-term capacity to stay in the market. Ultimately this leads to the reasoning that innovations create the conditions for sustainable employment.

When benchmarking the impact of science, technology and innovation policy on competitiveness and economic growth it is important to take into consideration a wide range of factors and processes that affect the structure and performance of the economy. In other words many different factors explain Europe's economic performance. Still STI policies are generally recognised as important policy instruments for improving the competitiveness of the country and thus of the country's economic well being. Benchmarks of the performance of these STI policies, which have an eventual impact on competitiveness and employment, are thus highly desirable as inputs to improved policy making. Benchmarks help to develop standards against which performance can be assessed. In STI policy making benchmarking is an important way of assessing the national R&D policies and performance, in order to

improve policy making. The benchmarking exercises provide information in the form of indicators that capture the changing relationship between science, innovation and the economy. They are thus crucial so that policy makers may evaluate how their performance compared to that of other countries, make informed decisions and set priorities as to where greater efforts may be needed, and identify the challenges posed by the knowledge-based economy.

3. Data and methods

Since 2000 an array of benchmarking methodologies have been developed to serve as instruments for the annual follow-up of the Lisbon Strategy. Several sets of indicators are used for benchmarking research policies. One is the European Innovation Scoreboard (EIS). It contains 17 quantitative indicators that focus on high-tech innovation and provides information for tracking the EU's progress towards the Lisbon goal. The indicators are grouped around four areas: Human resources, Creation of new knowledge, The transmission and application of knowledge and The innovation finance, output and markets. OECD (Science, Technology and Industry Scoreboard) provides a similar scoreboard. The OECD STI-Scoreboard compiles over 160 indicators. The scoreboard contains, like the EIS, indicators in four interconnected areas: Creation and diffusion of knowledge, Information economy, Global integration of economic activities and Economic structure and productivity.

The World Bank Institute's (WBI) program "Knowledge for Development" uses a benchmarking tool called knowledge assessment methodology (KAM) which consists of a set of 69 structural and qualitative variables that benchmark the economy in respect to its competitors or the countries it wishes to emulate. It helps to identify the problems and opportunities that a country faces and where it may need to focus policy attention or future investment. The comparison is undertaken for a group of 100 countries, which includes most of the developed OECD economies and about 60 developing economies.

Knowledge Assessment Methodology is a benchmarking tool developed by the WBI to serve as a quick graphical way to compare countries' policies and institutions. It uses as a framework the four main pillars of a knowledge-based economy that were summarised at a recent knowledge economy forum organised by the World Bank in co-operation with the European Commission, OECD, EBRD and EIB. The KAM data consists of 69 structural and qualitative variables that benchmark how an economy compares with its competitors or countries it wishes to emulate.

This benchmarking report will be largely based on the KAM indicators, while also relying on data from the European Innovation Scoreboard and the OECD STI-Scoreboard². A selected group of indicators from the KAM are used to illustrate the country performance with scorecards. For convenience reasons not all the indicators discussed in the report are included in the scorecards, since there is a trade off between having more informative scorecards with more indicators and the interpretability of the scorecards.

² Greece is not included in the set of countries selected for KAM. Numbers for Greece will be reported for all other indicators used in the report except for the indicators derived using the KAM.

4. The interactive internet-based KAM and the scorecards

The internet-based KAM exercise (<http://www1.worldbank.org/gdln/kam.htm>) developed by WBI's program on Knowledge for Development facilitates quick graphical comparisons of policies and institutions and thus serves as a tool for benchmarking the STI-policies in the KNOGG countries. From the 69-variable data set one can create knowledge assessment scorecards with a limited number of variables. The standard scorecard provided by the Knowledge for Development group consists of 14 variables that represents all the four pillars of the knowledge-based economy (economic incentive and institutional regime, education, innovation system and information structure). An alternative scorecard that is attempted to capture the main elements of the policies and institutions of importance for the STI-policy of small economies is presented below.

Each of the variables used in the scorecards is normalised on a scale of 0 to 10, where the lowest value is rated 0 and the highest value is rated 10. The normalised variables are included in star diagrams to graphically illustrate and facilitate comparisons among countries. As a reference group for the scorecard of a particular country can be used either (a) all countries in the sample (b) all countries within a particular range of human development (c) a group of countries within a region³.

4.1 An overview of the KNOGG countries' overall performance

Indicators, that describe the overall performance of the country quite well, are the average annual GDP growth rate, unemployment rate and productivity growth. Using the KAM gives poor results for the KNOGG countries. When WESTERN EUROPE is taken as reference group, the scores are mediocre and not even in comparison to all countries in the KAM data, can the KNOGG countries performance on the above mentioned indicators be held as good. Despite high rankings in several recent competitiveness reports, Finland scores poorly on the above mentioned indicators. All KNOGG countries present low scores for productivity. There is still reason to believe that the KAM results for this indicator are misleading. According to other scoreboards, Finland and Hungary show a positive trend in labour productivity growth during the second half of the 1990s and rank several ranks above e.g. USA and Japan.

Using all the countries the KAM as a reference group, the Netherlands get almost top scores on the unemployment indicator (8.73), which implies that the country has a low unemployment rate. Hungary, Ireland and Slovenia have a relatively low unemployment (6.67, 6.67 and 6.73 respectively) while the Western European average is (6.70). Finland has a much higher unemployment with scores far below the Western European average (4.55). The average annual GDP growth is around the Western European average level

³ The KNOGG countries (Finland, Ireland, the Netherlands, Greece, Hungary and Slovenia) are not grouped into the same regional group. Finland, Ireland and Netherlands has WESTERN EUROPE (except for the European G7 countries) as the regional reference group while Hungary and Slovenia are benchmarked in comparison to EASTERN EUROPE AND CENTRAL ASIA. Thus the most reliable results are derived using ALL COUNTRIES as the reference group.

(6.17) in the KNOGG countries except for Ireland, which present better performance scores with (8.22) on the average GDP growth indicator.

4.2 Institutional regime

When benchmarking the STI policies of countries, it is important to have a thorough understanding of the institutional characteristics of the country and how the interplay between policies works. Useful indicators that highlight the institutional regime are trade, intellectual property rights and the regulation of financial institutions.

Using WESTERN EUROPE as the reference group, the KNOGG countries show widely different scores on the economic regime indicators. Finland seem to have a very restrictive trade policy while Ireland is number one in Europe regarding openness of trade with full score 10. Using all the countries as the reference group, Finland (9.61) and the Netherlands (9.80) have high scores on the IPR indicator, that measures how well intellectual property rights are protected, while the intellectual property is poorly protected in Hungary (5.49) and Slovenia (5.29). Finland is number one in regulation of financial institutions (10) while Ireland get low scores on this indicator when WESTERN EUROPE is used as reference group. Using all the KAM countries as reference group, it is seen that Slovenia has a weak regulation of financial institutions (1.71).

4.3 Innovation system

The performance of the innovation system can be evaluated using indicators such as Technology Assessment Index, number of patent applications granted, the private sector spending on R&D, the total expenditure on R&D, foreign direct investments, research collaboration between companies and universities and availability of venture capital. Another useful indicator is the percentage of manufacturing SMEs with in-house R&D activity.

When WESTERN EUROPE is used as reference group the KNOGG countries do well in comparison to the rest of Europe showing number one scores on all the indicators. The Finnish innovation system is ranked number one (10) on the technology assessment index and on the indicator that measures the degree of collaboration between companies and universities (10). Finland also has the highest private sector spending on R&D (9.21) while Hungary (4.74) and Slovenia (4.74) are far below the Western European average on this indicator. Ireland is behind the Western European average on private expenditure on R&D (6.58 compared to 7.63) and total expenditure on R&D (4.25 compared to 5.72). The foreign direct investments are large in Ireland (5.7) compared to Finland (2.14) and the Western European average (3.17). The availability of venture capital is good in Finland and the Netherlands (9.33 for both) while this financial instrument still seeks its forms in Hungary (5.11) and Slovenia (3.56).

One indicator that is commonly used to evaluate how well functioning the country's research system is, is the number of scientific publications produced per million of the

population. On this indicator Finland (1320) and the Netherlands (1120) are clearly above the EU average (818) while Greece (501) and Ireland (600) are clearly below the average.

The SMEs conducting in-house R&D is an indicator that measures how broad the skill base is in the manufacturing sector. Ireland has the largest percentage (62.2) of SMEs conducting research in the EU. The Netherlands has also a relatively broad skill base in the manufacturing sector with 51 % of the SMEs conducting R&D, while Finland and Greece has a less developed SME structure according to this indicator with only (EU average 44 %) 27.4 % and 20.1 % respectively of the SMEs conducting R&D.

4.4 Social and human capital

The performance of the innovation system depends on the general educational standards within the system. A well-educated population has a higher capability of taking advantage of technological advances than a poorly skilled population. Broad indicators of social and human capital are: percentage of GDP spent on education, percentage of working population with tertiary education and the degree of participation in life-long learning. A more specific but nevertheless important indicator is the number of new science and engineering graduates (S&E graduates) within the age class between 20–29 years. Here science refers to natural sciences and life sciences. The new S&E-graduates is a good indicator reflecting the country's potential of creating a larger skill base.

Finland is the country with the highest percentage (32.4) of the population with tertiary education. The EU average is 21.2 % and Greece lags considerably much behind with only 16.9 % of the population having a third-level degree. Among the KNOGG countries Finland has the largest public spending on education while Ireland has relatively low values on this indicator. The participation in life-long learning is an important indicator of human resources. The European Council defines life-long learning as: *“all purposeful learning activity, whether formal or informal, undertaken on an ongoing basis with the aim of improving knowledge, skills and competence”*. The current interest and support for life long learning is based on the belief that continuous learning is required to address several economic, technological and demographic changes in modern economies. On this indicator Finland and the Netherlands find themselves remarkably high above the EU average while Ireland is below the EU average and Greece is the EU country with the lowest part of population participating in life-long learning.

Ireland is the EU country with the largest number of S&E-graduates (23.2 S&E-graduates per thousand of the population in the age class 20–29). Finland is also doing well on this indicator with 17.6 S&E-graduates per thousand of the population in the age class 20–29. Slovenia is clearly above the EU average (10.3/1000) with 13.1 graduates per thousand of the population in the age class 20–29. Greece, Hungary and the Netherlands have a lower rate of S&E graduates than the EU average with (3.6), (4.5) and (5.8) per thousand of the population in the age class 20–29 respectively.

4.5 Information infrastructure

Internet use by the domestic population is a measure of the ability to access an enormous wealth of data on-line, including business-to-consumer, e-commerce and government-to-citizen online services. Of the KNOGG countries, The Netherlands had the highest domestic access to Internet while Finland and Ireland are above the EU average. Greece is clearly below the EU average with only 12 % of the population possessing home access to Internet.

5. Small countries vs. large countries

When comparing the performance of the KNOGG countries with the large countries in Europe (France, Germany and UK), it can be seen that the overall performance of the KNOGG countries is good. When the average of all the indicators used in this exercise is calculated using the normalised values with respect to all countries, it reveals that Finland and the Netherlands (7.91 and 7.42 respectively) get substantially larger average scores than the Western European average (6.89). Ireland (6.76), Hungary (4.97) and Slovenia (4.48) are below the Western European average. France, Germany and United Kingdom are all below the Western European average with (6.21), (6.64) and (6.42) respectively. The large European countries do not seem to have any particular relative advantage compared to the KNOGG countries. The KNOGG countries seem to attract more foreign direct investments (FDI) compared to the large European countries. The KNOGG average on the FDI indicator is (3.59) while the large country average is (1.72).

An interesting issue is to compare the performance KNOGG countries on the selected indicators with the performance of USA. The average of USA (7.68) is above all the average of all the KNOGG countries except for Finland (7.91). USA has the best functioning venture capital market (10) and has a higher private sector spending on R&D (9.74) than any KNOGG country. When Western Europe is compared to USA, it can be seen that the average score of the selected indicators is lower for Western Europe (6.89) than for USA (7.68).

6. Conclusions

The main findings of the KAM study for the KNOGG countries are the following:

1. The accession countries (Hungary and Slovenia) have not yet converged with the current EU members of the KNOGG project included in the KAM (Finland, The Netherlands and Ireland). Both Hungary and Slovenia nevertheless represent the most competitive accession countries with a promising capacity to catch up with the EU-average level. Of the EU members Finland is the most competitive while Ireland still has to catch up with the EU average in what concerns the innovation system.
2. In comparison to the large European countries, the KNOGG countries do well. The KNOGG countries are even more competitive than the large European countries if only the EU members are taken into consideration. The KNOGG countries have proportionally more trade than the large European countries. This observation is quite feasible; taking into consideration that small countries may be more specialised in certain industries while having to rely on imports in order to cover the shortcomings of other fields. The small countries also attract more foreign direct investments than the large European countries.
3. The KNOGG countries are clearly less competitive than USA. Finland is the only KNOGG country that gets higher average scores than USA.
4. Finland has a restrictive trade policy and attracts less foreign direct investments than the other KNOGG countries. The innovation system is the most competitive in Finland. The intellectual property rights are well protected, one can however ask, whether that's good or bad. Finland is investing more in education of highly skilled labour than the other KNOGG countries.
5. The Netherlands has a less competitive innovation system than Finland but has a more open trade policy and attracts more foreign direct investments.
6. The innovation system of Ireland is not as competitive as that of Finland and that of the Netherlands, even though Ireland has a large potential with the highest number of S&E-graduates in the EU and a large skill base in the manufacturing sector. Ireland has managed to attract more foreign direct investments and has a less restrictive trade policy than both the aforementioned countries.
7. Hungary has still to catch up with the small EU member countries on many areas. The foreign direct investments are on a satisfying level. This can partly be explained by the fact that the regulatory framework and the regulation of the financial institutions are well developed in Hungary.
8. Slovenia has still to catch up on many areas. One of the weaknesses seems to be too loose a regulation of the financial institutions. This can partly explain the problems of attracting foreign direct investments into the country. The high level of young S&E-

graduates contributes to the knowledge base of the workforce and improves the potential of technological convergence with the EU average.

9. Greece, which is not included in the KAM, but for which other benchmarking statistics is available, is clearly behind the EU average on the human capital indicators and innovation indicators. Compared to the Hungary and Slovenia, the accession countries included in this report, Greece seem to have a somewhat less developed innovation system than Hungary.

Strategies

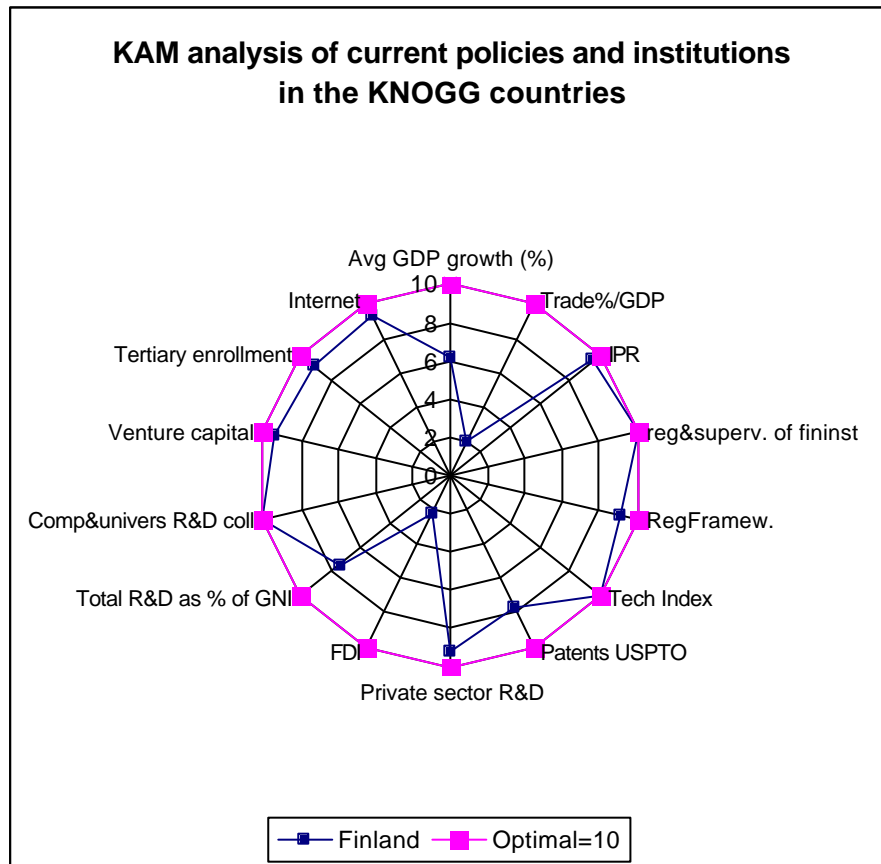
The benchmarking exercise is a very rough evaluation of a country's performance as a whole and it has been argued that one cannot build a synthesis of the country's performance on the grounds of performance on individual indicators. It is still evident that the performance on indicators, such as the ones used in this benchmarking exercise, reflect the different strategies of STI-policies of the KNOGG countries. One strategy seems to be to an open policy that attracts multinational companies. In this strategy emphasis is not so much laid on the creation of an innovation system as it is on the attraction of foreign direct investments. Ireland is the KNOGG country that has relied most strongly on this strategy. It can be seen from the results that some other KNOGG countries have been more towards the creation of an efficient national innovation system as a strategy of being competitive. Finland represents a good example of a country with relative few multinational companies and mediocre scores on openness indicators but very good scores on indicators benchmarking the national innovation system.

This benchmarking exercise reveals the importance of taking into consideration all the areas that the benchmarking tools or scoreboards cover. By doing so, one can increase the understanding of different policy mixes and STI strategies.

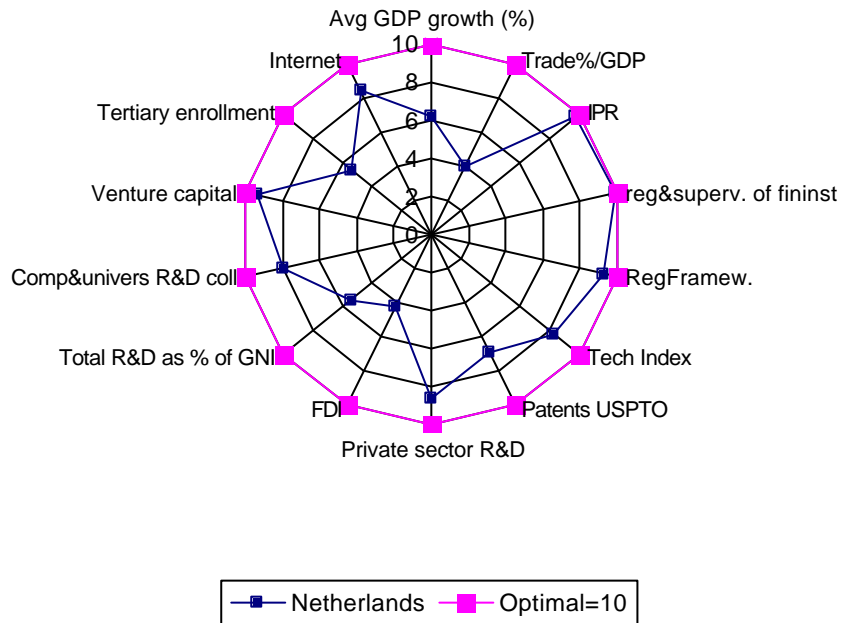
Annex 1. The normalised values of the selected KAM indicators (using ALL COUNTRIES as reference group)

Area	Variable	Finland	Netherlands	Ireland	Hungary	Slovenia	USA	W-EUR	France	Germany	UK	Optimal=10
Performance	Average annual GDP growth (%)	6.12	6.26	8.22	5.47	6.12	6.54	6.24	5.7	5.61	6.17	10
Economic regime	Trade as % of GDP	1.98	4.01	5.87	3.68	3.72	0.21	2.84	1.28	1.57	1.4	10
Economic regime	Intellectual Property is well protected	9.61	9.8	7.25	5.49	5.29	9.8	8.65	10	9.41	9.02	10
Economic regime	Adequate regulations & supervision of financial institutions	10	9.85	7.91	5.44	1.71	8.45	8.7	6.15	9.01	6.48	10
Governance	Regulatory framework	9.02	9.22	8.8	7.71	6.83	8.46	8.44	7	8.2	8.78	10
Innov. system	Technology Assessment Index	10	8.32	7.37	5.87	5.78	9.84	8.13	6.92	7.63	7.96	10
Innov. system	Patent applications granted by the USPTO	7.57	6.98	5.57	2.44	3.58	9.11	6.58	6.64	7.6	6.59	10
Innov. system	Private sector spending on R&D	9.21	8.68	6.58	4.74	4.74	9.74	7.63	8.42	9.47	7.37	10
Innov. system	FDI as % of GDP 1990-1999	2.14	4.25	5.7	4.89	0.99	1.25	3.17	1.76	0.6	2.82	10
Innov. system	Total expenditure for R&D as % of GNI	7.38	5.51	4.25	1.76	3.85	6.98	5.72	5.96	6.39	5.16	10
Innov. system	Research collaboration between companies and universities	10	8	7.78	7.11	4.89	8.22	7.89	7.78	7.78	7.33	10
Innov. system	Availability of Venture capital	9.33	9.33	7.11	5.11	3.56	10	8.19	7.56	8	8	10
Education and Human Resources	Tertiary enrolment	9.21	5.39	5.28	3.71	5.84	8.99	6.26	5.62	5.06	6.4	10
Information Infrastructure	Internet hosts per 10,000 people	9.27	8.37	6.97	6.25	5.92	10	8.12				10
	Average	7.917	7.426	6.761	4.976	4.487	7.685	6.897	6.214	6.640	6.421	10

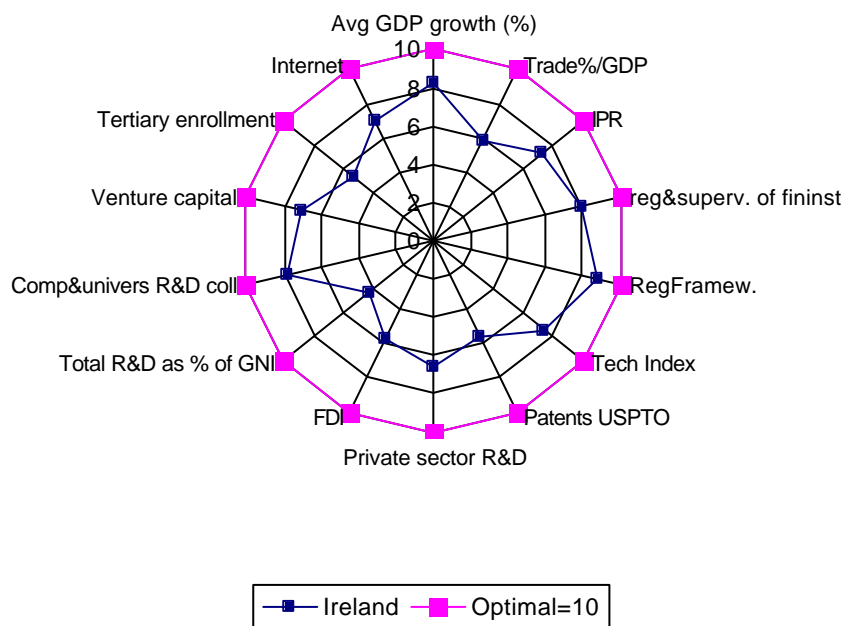
Annex 2. The KAM Scorecards (normalised values with respect to ALL COUNTRIES)



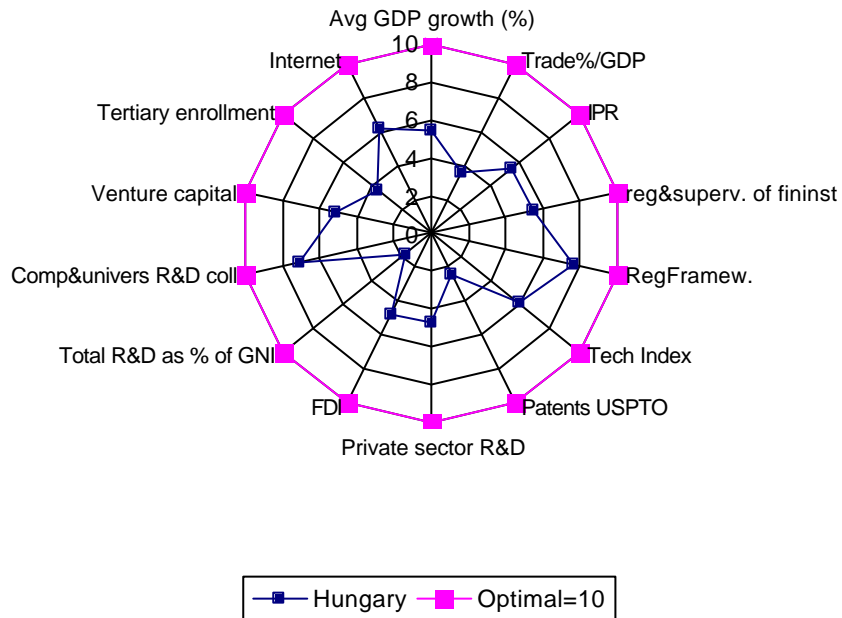
**KAM analysis of current policies and institutions
in the KNOGG countries**



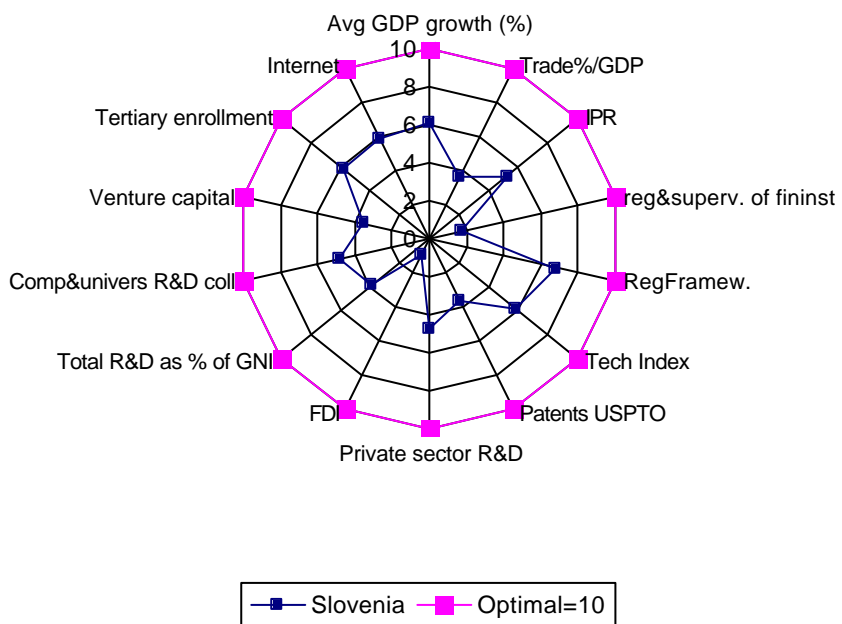
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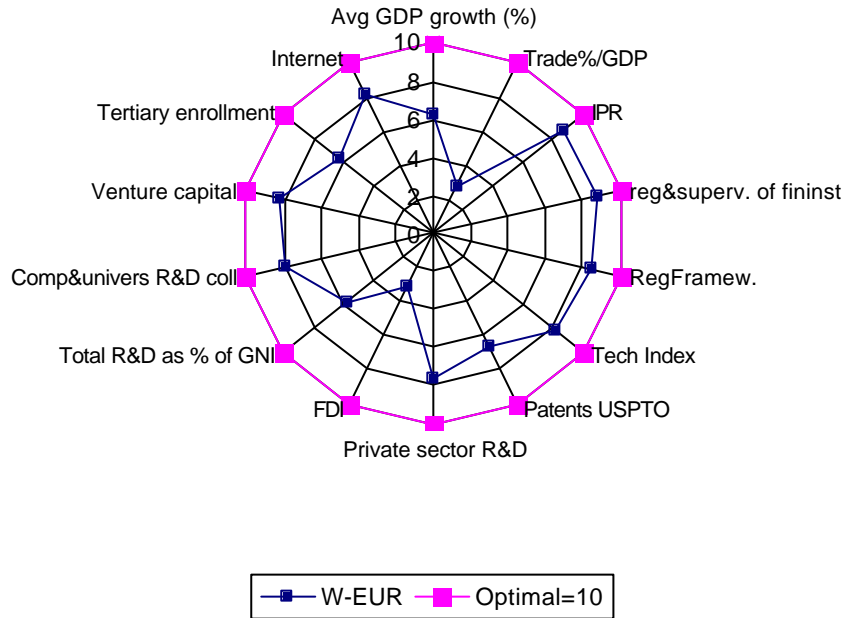
**KAM analysis of current policies and institutions
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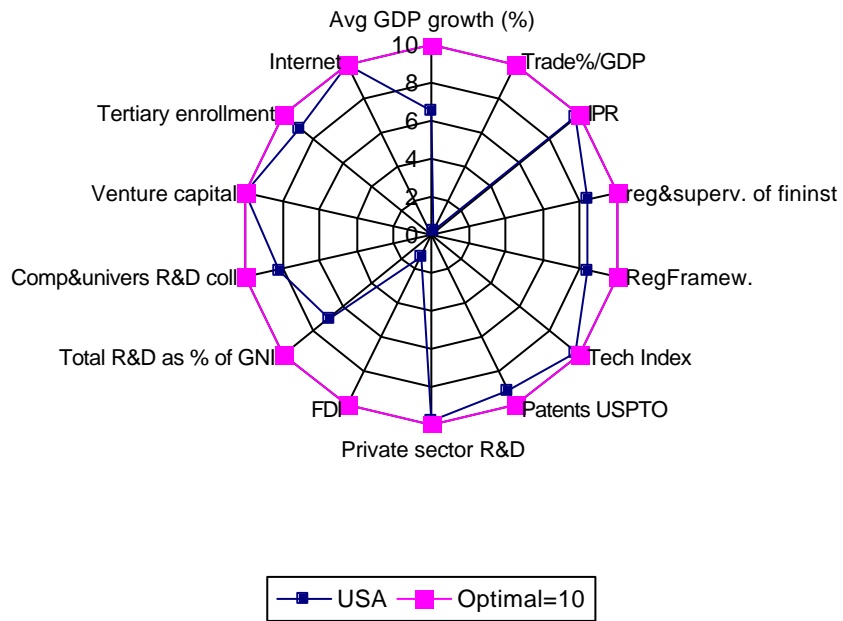
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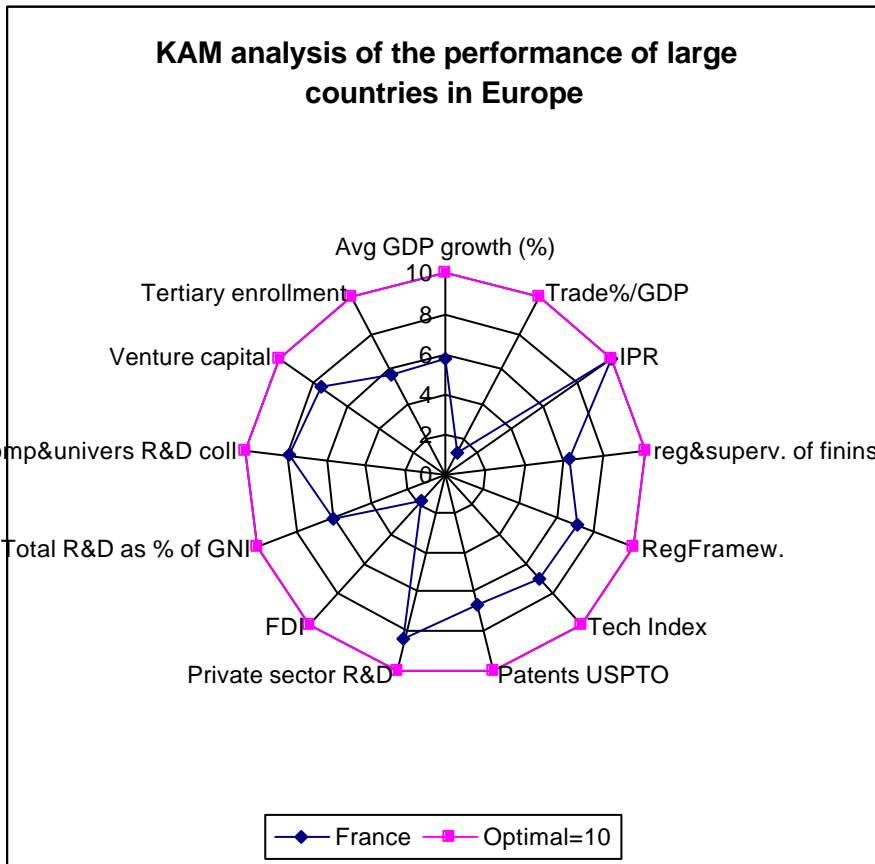
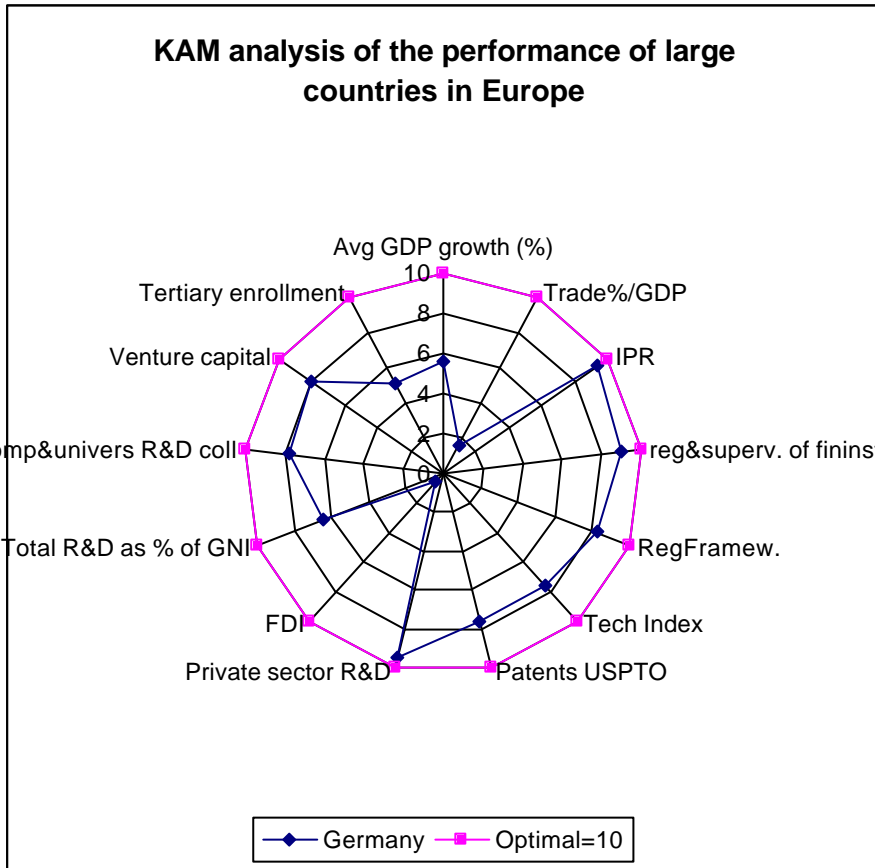


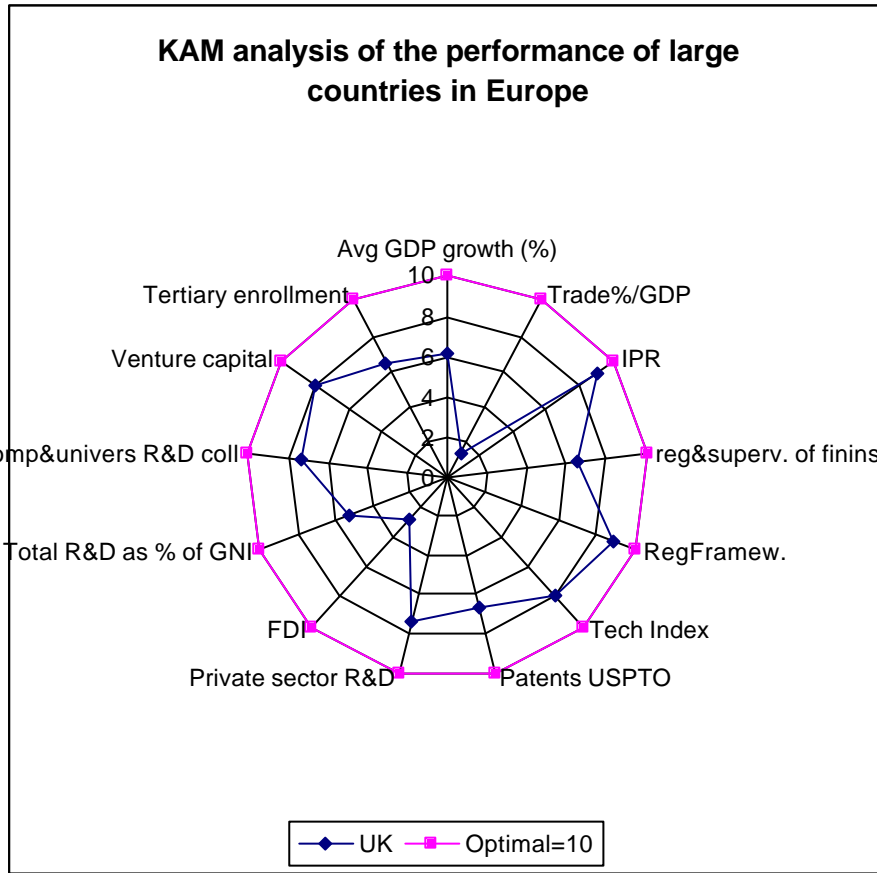
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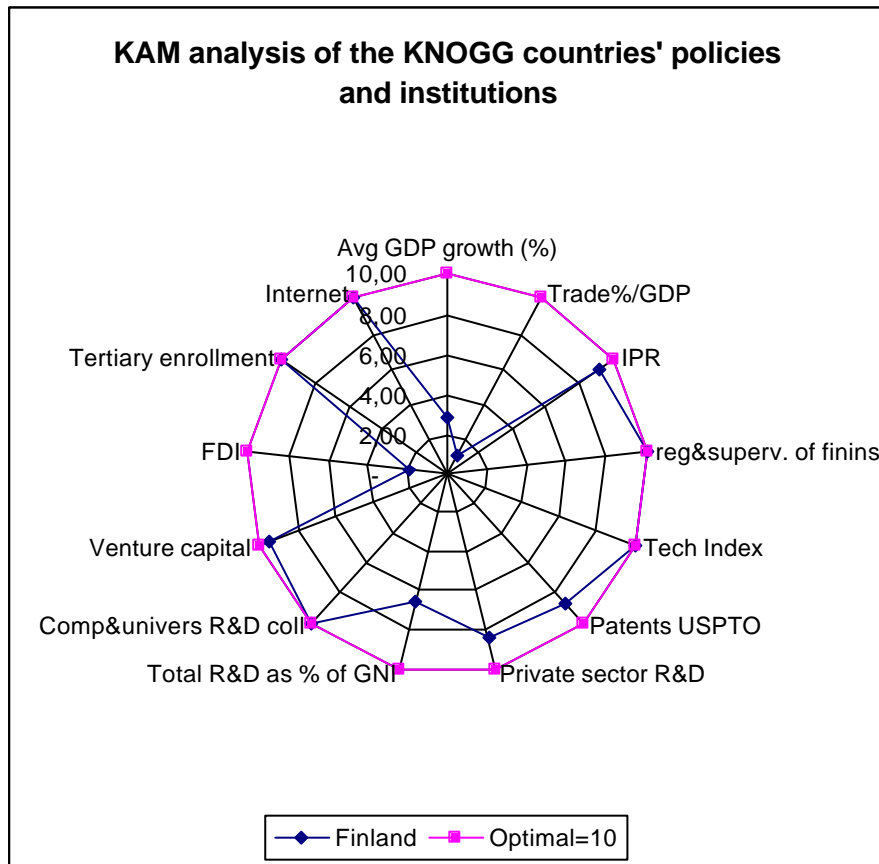




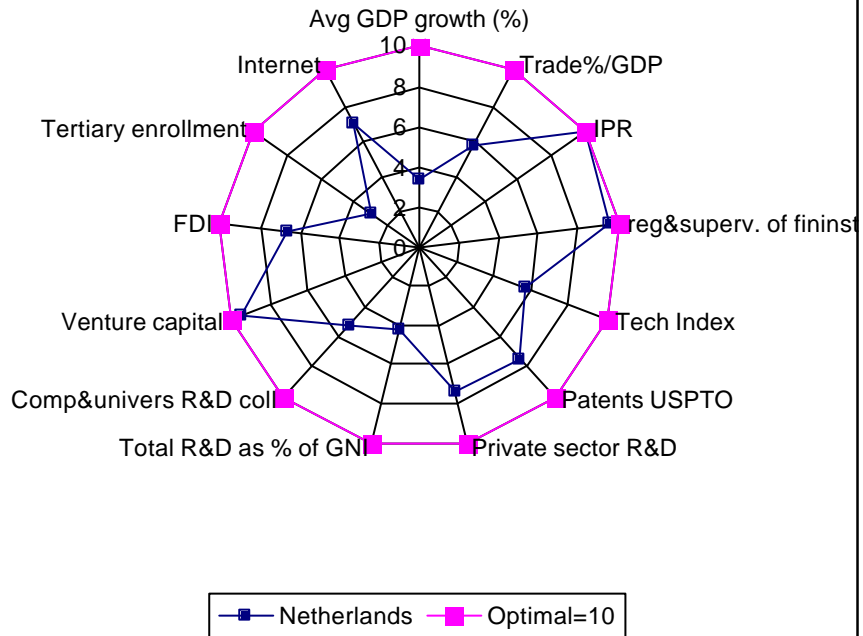
Annex 3. The normalised values of the selected indicators for Finland, Ireland and the Netherlands (using WESTERN EUROPE as a reference group)

Variable	Finland	Netherlands	Ireland	Optimal=10
Average annual GDP growth (%)	2.86	3.33	10	10
Trade as % of GDP	1.05	5.71	10	10
Intellectual Property is well protected	9.23	10	0	10
Adequate regulations & supervision of financial institutions	10	9.55	3.85	10
Technology Assessment Index	10	5.67	3.23	10
Patent applications granted by the USPTO	8.69	7.45	4.48	10
Private sector spending on R&D	8.42	7.37	3.16	10
Total expenditure for R&D as % of GNI	6.57	4.13	2.48	10
Research collaboration between companies and universities	10	5.26	4.74	10
Availability of Venture capital	9.41	9.41	3.53	10
FDI as % of GDP	1.92	6.58	9.77	10
Tertiary enrolment	10	2.92	2.71	10
Internet hosts per 10,000 people	10	6.96	2.22	10
Average	7.55	6.49	4.63	10.00

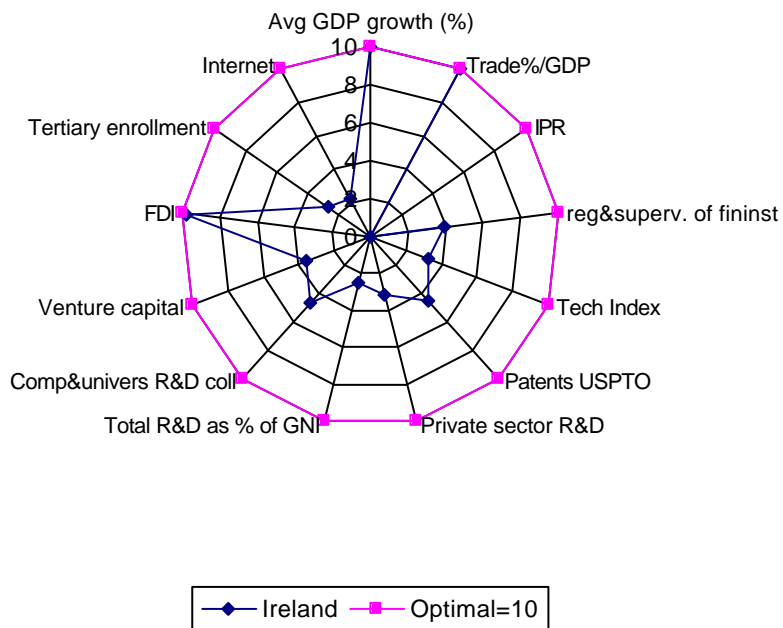
Annex 4. The KAM Scorecards: Finland, The Netherlands and Ireland (normalised values with respect to Western Europe)



KAM analysis of the KNOGG countries' policies and institutions



KAM analysis of the KNOGG countries' policies and institutions



Annex 5. Description of the KAM indicators used in the benchmarking exercise

Description of indicators

In order to capture the important issues of the four pillars suggested as a framework for the national strategies in building up a knowledge base one must use indicators that represent all the four areas. For small knowledge based economies like the KNOGG countries the following indicators are suggested. Not all of the indicators mentioned in the report are included in the scorecards for convenience reasons; the scorecards are not interpretable if too many indicators are included:

Overall Performance Indicators

The Average Annual GDP Growth 1990–1999 (%) (2001 WDI)

Productivity Growth is a good complementary indicator to GDP growth, but it is not included in the scorecards. The productivity numbers of the countries were somewhat misleading showing low values for the KNOGG countries on this variable. The productivity growth indicator is measured by the percentage change of GDP in the country per person employed. The data is gathered for year 2000 (2001 IMD). One weakness is that the data is only for one year. Another weakness of the indicator is that the labour productivity is already high in the KNOGG countries compared to the country that got the highest rates on that variable, that is Russia, where the productivity is recovering from having been practically non existent for a long period.

Unemployment rate, % of total labour force 1996–98 (2001 WDI)

Economic Incentive and Institutional Regime

Trade as % of GDP, 1999 (2001 WDI)

Trade is the sum of exports and imports of goods and services

The protection of Intellectual Property (2001 WEF)

A large sample group were questioned whether “intellectual property is well protected” in the country. (1 = weak, 7 = equal to the world’s most stringent).

Adequate Regulation and Supervision of Financial Institutions (2001 IMD)

A statistical score on a 1–10 scale resulting from a country based survey on legal regulations of financial institutions and financial stability.

Regulatory framework (Kaufman, Kraay, Zoido-Lobaton, World Bank, 2001)

The indicator measures the incidence of market-unfriendly policies.

The Innovation System

Technology Assessment Index (2001 UNDP)

The Technology Assessment Index (TAI) from UNDP aims to capture the country's ability to create and diffuse new technology and build a human skill base.

Patent Applications granted by the USPTO year 2000 (per million pop.) (2000 USPTO)

Number of patent applications granted by the USPTO to a country in the year 2000 divided by the population of that country in the same year.

Private Sector Spending on R&D (2001 WEF)

Based on a statistical score of a large sample group in a particular country responding the question of whether “companies invest heavily in research” in their country. (1 = non existent, 7 = heavy relative to international peers).

FDI as % of GDP 1990–1999 (SIMA)

The value is an average of the FDI as % of GDP during the period 1990–1999. It was calculated from data available on the SIMA database, World Bank, Washington D.C.

Total expenditure for R&D as % of GDI, 1987–1997 (2001 WDI)

Expenditures on R&D are current and capital expenditures on creative, systematic activity that increases the stock of knowledge.

Research collaboration between Companies and Universities (2001 WEF)

Based on a statistical score of a large sample group in a particular country responding to the question of whether “companies collaborate closely with local universities in research and development activities”. (1 = non existent, 7 = intensive)

Availability of Venture capital (2001 WEF)

Based on a statistical score of a large sample group in a particular country responding to the question of whether “entrepreneurs with innovative but risky projects can generally find venture capital” in their country. (1 = not true, 7 = true).

SMEs innovating in-house (% of manufacturing SMEs) (1996 EUROSTAT)

Innovative manufacturing firms are defined as those who introduced new products or processes either:

1. In-house or
2. In combination with other firms

Human Capital

Tertiary enrolment 1997 (SIMA)

Tertiary education normally requires, as a minimum condition of admission, the successful completion of education at the secondary level.

New S&E-graduates (/1000 of the age class 20-29)

The indicator is a measure of the supply of new graduates with training in Science & Engineering (S&E). The reference population is all age classes between 20 and 29 years inclusive. Tertiary graduates in Science & Engineering (S&E) are defined as all post-secondary education graduates (ISCED classes 5a and above) in life sciences (ISC42), physical sciences (ISC44), mathematics and statistics (ISC46), computing (ISC48), engineering and engineering trades (ISC52), manufacturing and processing (ISC54) and architecture and building (ISC58).

Information Infrastructure

Internet hosts per 10,000 people, 1999 (2000 ITU)

Internet hosts are computers with active Internet Protocol (IP) addresses connected to the Internet.

This group of indicators covers quite substantially all the four areas suggested to be included in a successful benchmarking of the policies and institutions required developing a knowledge-based economy. Remarks and comments on the choice of indicator are welcome.

Annex 6. Table including variables from all the four categories of The European Innovation Scoreboard

	TrendChart2002	Country					
Category	Variable	Finland	Netherlands	Ireland	Greece	Hungary	Slovenia
Human resources	1.2 Population with a tertiary education (% of 25-64 years age classes)	32.4	25	22.2	16.9	14	14.1
Human resources	1.3 Participation in life-long learning (% of 25-64 years olds)	19.6	15.6	5.2	1.1	3	3.7
Creation of new knowledge	2.1 Public R&D expenditures (GOVERD and HERD)(% GDP)	0.95	0.87	0.35	0.38	0.45	0.68
Creation of new knowledge	2.2 Business expenditure on R&D (BERD)(% GDP)	2.14	1.05	1.03	0.13	0.36	0.83
Creation of new knowledge	2.3.2 USPTO high-tech patent applications per million population	35.09	19.6	3.8	0.5	0.3	0.5
Transmission & application of knowledge	3.1 SMEs innovating in-house (% of manufacturing SMEs)	27.4	51	62.2	20.1	–	16.9
Innovation finance, output & markets	4.1 High-tech venture capital investment (% GDP)	0.138	0.162	0.065	0.004	0.035	0.15
Innovation finance, output & markets	4.4 Home internet access (% of all households)	44	55	36	12	2.6	24
	Average	20.21	21.03	16.35	6.38	2.96	7.6

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