Chapter 10

The European Research Area and EU Enlargement

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The economic and technological gap between the EU and the United States continues to grow despite the commitment made by the European Council in Lisbon in 2000 to create the world's most competitive knowledge-based economy. EU member states face a more demanding task than they realized in implementing their "Lisbon Strategy." More innovation, research and technology is the key to a dynamic and creative, knowledge-based society. The future of the European economic and social model hangs in the balance. Many reforms will have to be undertaken to establish the conditions needed for the European Research Area (ERA), which is an important instrument to achieve the ambitious goals of the Lisbon Strategy. Recent EU enlargement adds to the EU's research and technological development capacity and will contribute to the successful development of the ERA.

The Growing Gap between the EU, U.S. and Japan

During the last two decades the difference in GDP per capita between the EU and the U.S. increased dramatically. The 20% gap in favor of the U.S. in the early 1980s widened to 40% by 2002. The recent growth of euro-dollar exchange rate disparities in favor of the euro has reduced this gap in monetary terms, but in purchasing-power-parity (PPP) terms the gap remains painfully wide. The disparity in growth rates during the period 1997-2002, when the U.S. grew 3% annually and the EU only 2.4%, aggravated the problem even further.

Productivity in the U.S. during the period 1997-2002—measured in value of hour worked—was 13% higher than in the EU, and Americans officially work 15% longer than Europeans.

Most industrial knowledge creation and absorption still takes place in the manufacturing sector. In the EU the manufacturing sector's

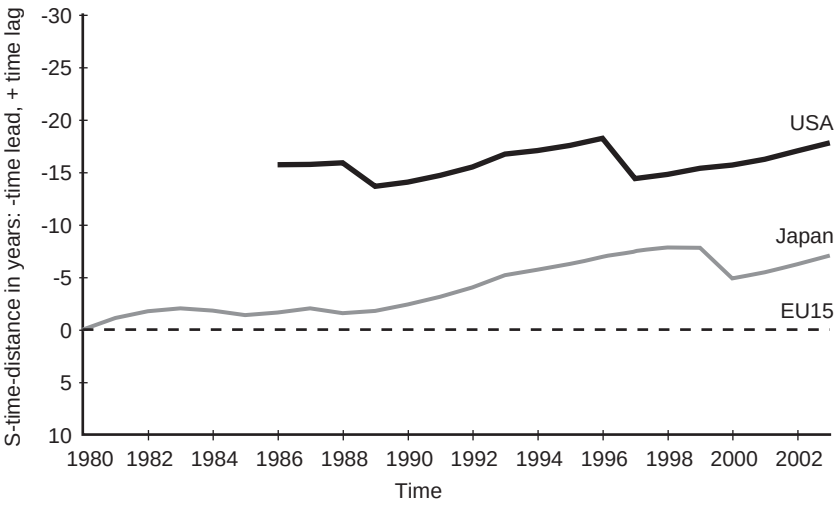
share is 84% and that of services only 13%, while in the U.S. the share of the manufacturing sector is 64%, and services 35% (almost 3 times higher than in the EU). These figures underscore a striking fact: in terms of innovation only the United States is really a post-industrial society.

It is worth mentioning, however, that the contribution of high- and medium-high technology industries to the total gross value added in the U.S. (7.9%) is slightly lower than in the EU (8.3%). The share of workers in these industries in total employment is 5.3% in the U.S. and 7.6% in the EU.

At the same time, high-tech products represent 29% of total U.S. exports and only 20% of total EU exports. The shares of world exports in these products are 24% for the U.S. and 20% for the EU.

The implications become even clearer when charted with the time distance method, as shown in the graph below. Time distance measure is a novel way of describing the magnitude of gap(s) between coun-

Graph 1. Time distances: how many years earlier was the respective GDP per capita level for EU15 attained by the USA and Japan



Source: Pavle Sicherl, research paper commissioned by Eurochambres, Brussels, 2004.

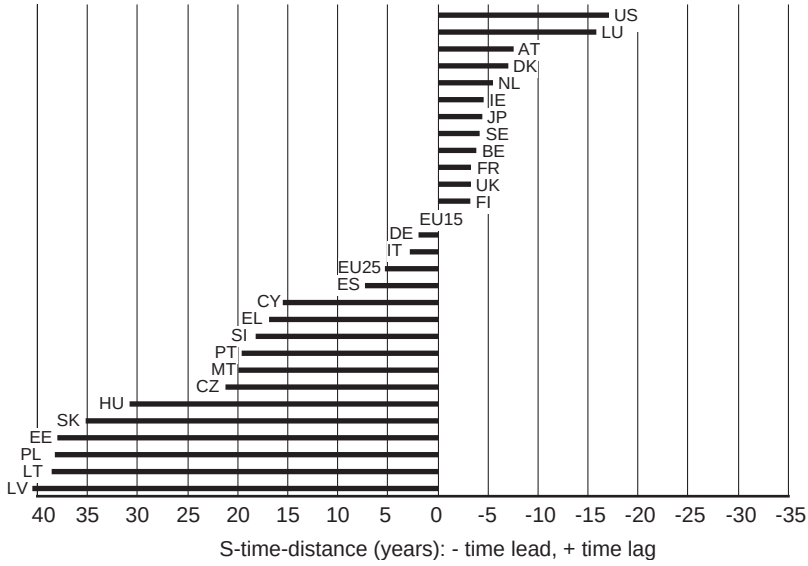
tries, regions, socio-economic groups, etc. It measures the difference in time when compared units attain a given level of the indicator.[1]

Perhaps the European economic and social model needs to be redefined in the context of the Lisbon Agenda. Of course, Europeans don't have to copy everything American, but if they fail to become more competitive in the global economic environment, can they sustain their way of living and working habits, as well as the level of social security, income redistribution and solidarity? Probably not.

The Gap between the EU-15 and the EU-10

The 10 new EU member states face an even more demanding challenge: they have also accepted the Lisbon Strategy, but still have a lot of catching-up to do with the EU-15.

Graph 2. GDP per capita (ppp): time distance for selected countries from EU-15 average for 2003



Source: Pavle Sicherl, Time distances between countries in the enlarged European Union (graphs for the EU25 member countries), Sicenter, Ljubljana, October 2004.

[1] A new dimension is added while no earlier results are lost or replaced. Expressed in time units S-time-distance is an excellent presentation tool easily understood by policy makers, managers, media and general public and can support decision-making and influence public opinion. For further details see www.sicenter.si.

The calculation shows that in terms of GDP the gap of EU-10 vis-a-vis EU-15 represents 15-35 years. In other words the average GDP per capita of the EU-10 was reached by the average EU-15 between 15 and 35 years ago.

These are of course calculations on the basis of averages. But if we take the two extremes—Luxembourg on the one hand and Latvia on the other—the real time distance widens to 56 years.

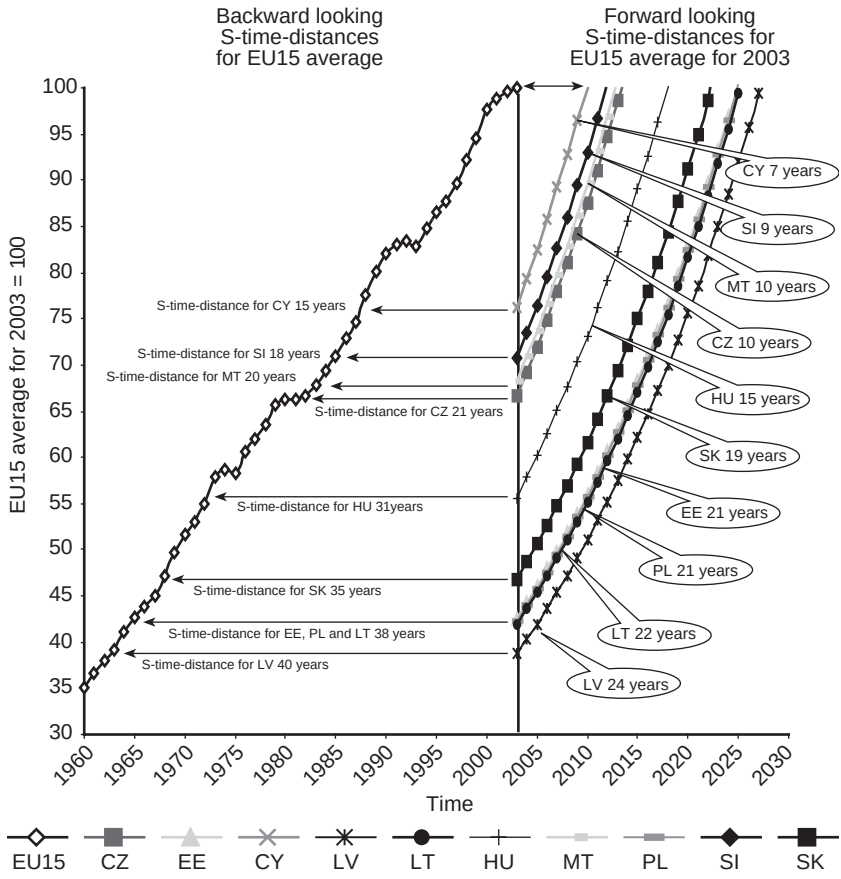
Even under a rather optimistic scenario—EU-10 countries growing on average 4% annually—it would still take them 5-20 years to reach the EU-15 average level of 2003. However, the latter countries will continue growing, and thus it will be very difficult to close the gap between the two groups of countries, unless the the EU-10 register at least 3% higher annual growth rates than the EU-15—an extremely demanding, if not impossible challenge over such a sustained period of time.

No doubt one purpose of the European Union is to reduce differences between member states, which would require extraordinary efforts by the new member states. But the new members are also entitled to expect appropriate support and assistance from the more advanced and richer member states. This has always been accepted in the Union, and EU cohesion policy has been very successful in the cases of Spain, Portugal, Greece and Ireland. In the short run, cohesion policy funding seems to be a sacrifice on the part of the richer member states, but in the longer run it is a smart investment in the purchasing power of the less developed economies.

In discussions of the new EU "Financial Perspective" between the European Commission and member states for the period 2007-2013, the net contributors to the EU budget (Germany, France, Sweden, Austria, the Netherlands) and ironically the UK (which insists on keeping its famous "rebate"—making its payment position always neutral) resisted any budget proposal that went beyond 1% of the combined GDP of member states. This is below the limit of 1.27% set years ago, and illustrates the weak political will on the part of too many European national politicians to provide more resources at EU level for common programs and initiatives. Yet without additional resources it is difficult to imagine either the future cohesion policy

or the successful implementation of the Lisbon Strategy. The Barroso Commission is fighting energetically to win support for its 1.14% proposal, which is crucial to advance the Lisbon targets. Acceptance of higher budget resources will be a test of European strategic wisdom.

Graph 3. Estimates of time distances for the past and time distances (projected) at the level of EU15 average GDP per capita for 2003 (Scenario: growth rate in selected countries is 4%)

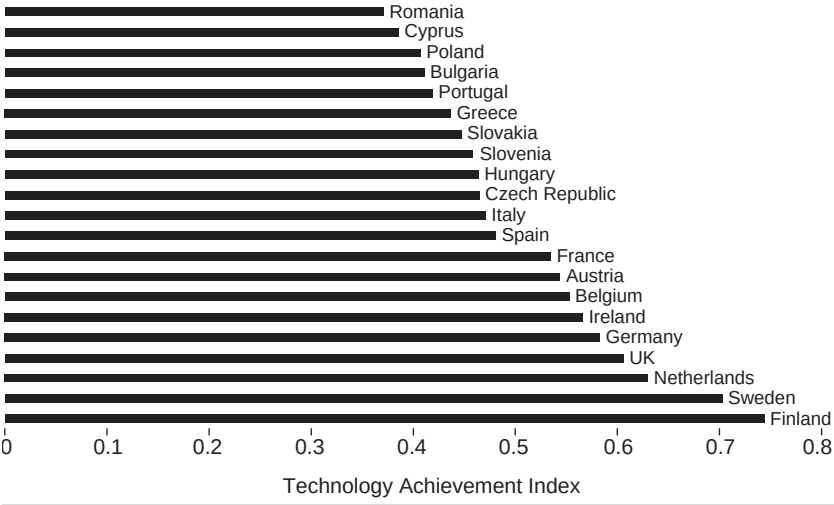


Source: Pavle Sicherl, Time distances between countries in the enlarged European Union (graphs for the EU25 member countries), Sicenter, Ljubljana, October 2004.

The central challenge for the enlarged EU is to help upgrade productivity levels in the new member states. The lag for EU-10 countries (measured in GDP per person employed) in time distance ranges from 17 to 38 years vis-a-vis the EU-15 average. The situation regarding intellectual property is also rather dramatic. The EU-10 share of patents registered with the European Patent Office in the year 2000 was only 0.27% (exactly 100 times less than the share of the U.S., which was 27.5%). This is a major challenge for the new EU members as they strive to become equal members of the big European family.

Another indication of the EU-10 countries' weakness is the Technology Achievement Index, shown at the graph below:

EU-25 Countries Technology Achievement Index



Source: Lucija ?ok, Slovenian Minister for Education, Science and Sport, Presentation at Launch of FP6, organized by the European Commission, 2002.

This can be explained in part by the fact that in EU-10 countries only 1/3 of the total number of researchers (172,000) are employed in the corporate sector, while in the EU-15 countries—with over 1.7 million researchers—this proportion is 50%. At the same time the gross annual expenditure per researcher in EU-10 countries is on average less than 20% of the expenditure in EU-15 countries. Therefore it is not surprising that patent applications per million of population are at the moment still 20 times lower for EU-10 than for

the EU-15 countries. All the patent applications from the EU-10 countries in 2001 were less than from Belgium alone, and represented just 1% of the total number of applications from the EU-15 countries.

The main instrument for EU-10 countries to reduce their disadvantage vis-a-vis EU-15 is basically the same as for the EU as a whole, i.e. to make research, innovation, and technology the prime focus of their development efforts.

There is real human potential for success: in EU-10 countries 81% of the population has at least a secondary education, while in the EU-15 this percentage is only 64%. In 2001 22% of all university graduates in the EU-25 came from EU-10 countries, a share more than 4 times higher than the EU-10's share of the EU-25's combined GDP.

It is also worth mentioning that the EU-10 accounts for over 10% of the EU-25's total researchers, double the EU-10's share of the EU-25's combined GDP.

Measured in scientific publications the output of EU-10 countries is quite comparable with EU-15, as shown in the table below:

Number of scientific publications per million of population, 2002

Country	No. pub.	Country	No. pub.
Sweden	1,598	Spain	567
Denmark	1,332	Italy	545
Finland	1,309	Czech Rep.	415
Netherlands	1,093	Estonia	379
UK	1,029	Hungary	374
Belgium	929	Portugal	339
Germany	731	Slovakia	291
Slovenia	726	Poland	266
France	712	Luxembourg	196
EU-15	673	Bulgaria	182
US	**774**	**Japan**	**550**

Source: Towards a European Research Area—Science, Technology and Innovation: Key Figures 2003-2004, European Commission, 2004, Table I-1a, p.23.

As with many other indicators the 3 EU Scandinavian countries—Sweden, Finland, and Denmark—are almost a separate category within the EU-15, with performance almost double that of Germany or France.

The Lisbon Strategy and the Creation of the European Research Area

It is difficult to magine Europe becoming a knowledge-based society without better functional integration of its knowledge-production sector. That is why the initiative to create the European Research Area (ERA) is as logical as the Single Market or the Common Agricultural Policy. Several conditions must be met, however, if ERA is to become a functioning reality and therefore an engine of higher European competitiveness.

At the moment, the vast majority of publicly funded research in EU member states is not open to European competition, and the recommendation of the European Commission that national research programs gradually become open to researchers from other member states is not regarded as a priority. Therefore even the insufficient resources invested in Europe are not engaged optimally, there is too much fragmentation and duplication of research, and the involvement of private sector end-users of innovation is much lower in European processes of selection and prioritizing of research topics than in the U.S. Particularly in the smaller EU countries evaluation of publicly funded research results is not sufficiently transparent, rigorous or competitive. It often suffers from lack of objective peer review. [2]

Also in Europe, and particularly in EU-10 countries, there is very limited circulation of high caliber experts between the corporate and research domains. Finally, patenting procedures are too cumbersome and expensive, and the whole social environment does not encourage researchers to develop their innovative achievements into the business domain, while the careers of researchers are generally not socially recognized as favorably as in the U.S.

In 2002 the Barcelona European Council recommended that member states devote about 3% of their GDP to R&D by 2010. There has been little progress toward this goal over the past few years, except in countries such as Sweden and Finland, which had already exceeded the goal, or Denmark and the Netherlands, which were making very systematic steps towards the goal. Countries making positive progress

[2] According to Vito Turk, this problem could be resolved by scientific evaluation at international level. See *EMBO Reports*, Vol.5, October 2004, p.938.

toward the Barcelona targets also include Belgium, UK, Austria, Slovenia and the Czech Republic. Unfortunately, one-third of EU-15 countries are below 1.5% with no sign of improvement in the short run. Therefore, the EU-15 average is still below 2.0%.

EU member state commitments to R&D expenditures are illustrated in the table below:

EU-27 Gross R&D Expenditure as GDP Percentage (GERD), 2001 (except Malta)

Country	GERD	Country	GERD
Sweden	4.27	Italy	1.07
Finland	3.49	Spain	0.96
Germany	2.50	Hungary	0.95
Denmark	2.40	Estonia	0.79
France	2.20	Portugal	0.77
Belgium	2.17	Lithuania	0.69
Austria	1.94	Greece	0.67
Netherlands	1.94	Slovakia	0.65
UK	1.83	Poland	0.65
Luxembourg	1.71	Bulgaria	0.47
Slovenia	1.57	Latvia	0.44
Czech Rep.	1.30	Romania	0.39
Ireland	1.17	Cyprus	0.27
EU-15	**1.98**	**U.S.**	**2.80**
EU-27	**1.93**	**Japan**	**3.06**

Source: Towards a European Research Area—Science, Technology and Innovation: Key Figures 2003-2004, European Commission, 2004, Table I-1a, p.23.

Unfortunately for Europe, resources invested in R&D within the U.S.-EU-Japan Triad vary not only in volume, but also in growth. During the period 1995-2001 the total amonts of GERD for EU countries grew from 124 to 175 billion euro, for Japan from 109 to 143 billion euro, and for the U.S. from 141 to 315 billion euro. Calculated per researcher the resources spent in Japan were 20% higher, and in the US 30% higher, than in the EU-15.

This gap has very serious cumulative effects: comparing the GERD for the EU and the U.S. for the whole period of 1992-2001, the difference in favor of the U.S. amounts to an enormous figure of 629 bil-

lion euro.[3] If only a part of this difference was spent for the acquisition of the most advanced instruments and research equipment for laboratories, research institutes and universities, one can understand why many top European researchers decide to move to the U.S. As has often been emphasized, salary differences are not the only, and often not even the most important reason for the brain drain Europe continues to experience.

Taking into account the high growth of R&D stock in the U.S. (estimated by Griffith, Harrison and Van Reenen at 33% during the technology boom in the 1990s), quick transformation of innovation into marketable products, and indeed the whole environment creating higher knowledge spillover levels in the U.S than in Europe, Rachel Griffith claims that European companies can expect great benefits from R&D investments in the U.S.[4] This claim is substantiated by a recent study showing that UK companies following such advice gained 5% in productivity. But Griffith at the same time proposes that companies should also have an active repatriation strategy for their R&D personnel.

Besides pooling financial resources to be invested in R&D, the argument for Europe to intensify the process of creating the ERA is also to better utilize its human capital by avoiding unnecessary duplication of research and by focusing on priority areas selected with stronger participation of the corporate sector. This is important since the share of private R&D funding in the EU (56%) is lower than in the U.S. (66%). How can this be achieved? The private sector either spends on its own in-house R&D efforts, or commissions research to universities and research institutes. Much depends on the regulatory framework and tax regime granted by governments to encourage companies to spend their resources for basic and applied research at the national and international level.

It is interesting to note that some countries whose spending on research trails the EU-25 average in terms of GERD actually spend a higher share of their GERD on basic research than countries such as

[3] In PPS, 1995 prices.

[4] Rachel Griffith, "Why Europe should consider sending its R&D labs to America," *Research Europe*, No. 179, p. 7.

the U.S. In 2001 the Czech Republic, Poland, and Hungary each invested between 30 and 40% of their GERD in basic research, compared to 20% in the U.S., 24% in France, and only 12% in Japan. This contradiction could be interpreted in view of the modest tradition of industry-led research in the first category of countries, the very limited financial resources available for research, and a concerted effort by the respective governments to prevent brain drain. Many of the EU-10 countries have experienced serious losses from their research communities during the period of economic transition.

On the other hand, because in EU-10 countries there are very limited private funding facilities for research apart from the corporate sector, the responsibility of governments is even greater—not only to secure funding from the budget, but also to encourage such private sector investment through tax concessions, which is far less developed than in EU-15 countries.

EU Enlargement and the Prospects for ERA

What are the most likely effects of EU enlargement on the prospects for the successful development of the ERA? One could anticipate the following:

(A) Stronger emphasis on RTD policies and greater support for EU funded research;

(B) More involvement and higher competition among European researchers in EU RTD programs;

(C) Higher level of participation of researchers from EU-10 countries in European Centers and Networks of Excellence, European Technology Platforms;

(D) Greater participation of the corporate sector in EU RTD programs.

Because governments of EU-10 countries are less inhibited in their RTD policies, they are likely to lend greater prominence to RTD policies in the overall EU Agenda. Facing severe budgetary limitations at the national level, EU-10 countries will tend to support greater RTD budgets at the Union level. This has been the impression so far in view of the preliminary discussions on the 7th RTD Framework

Program—which is to rise above 35 billion euro, almost double the 6th Framework Program.

Judging from the FP5 and FP6 experience the research communities from EU-10 countries will further increase their participation in EU funded research. This is actively supported by the European Commission, and will be possible as the researchers have learned how to prepare EU submissions in the last few years. As shown in the table below researchers from EU-10 countries have participated within FP5 in 2,267 EU funded projects, for which their countries contributed in reduced fees 315.8 million euros, and the funding received reached 230.8 million euros. The negative difference of 85 million euros should be accepted as "learning fees" and should be treated as an investment in skills needed to be successful in future calls for proposals.

Net Payment Position of EU-10 Countries in Framework Program 5 (1998-2002)

Country	No. of projects financed	Est. funding obtained projects (M€)	Full FP5 membership fee (M€)	Reduced fee (M€)
BG	141	8	13.5	9.0
CY	87	10	10.4	10.4
CZ	405	40	68.3	68.3
EE	100	8	5.7	3.8
HU	380	35	58.9	39.3
LV	74	7	7.3	49
LT	68	7	11.6	7.7
MT	16	2	n.a.	n.a.
PL	493	55	161.7	108.5
RO	160	12	45.6	30.4
SK	134	10	25.6	17.1
SI	209	36.8	24.4	16.4
Total	2,267	230.8	433.0	315.8

Source: Ales Gnamus, "Slovenia's International Cooperation in R&D, 1992-2002" in R&D Activities in Slovenia in the 1990s, Slovenian Academy of Science and Arts, Ljubljana, 2002, Table 10, p.37.

Due to limited national funding the research communities from the EU-10 countries will be strongly motivated to participate in EU RTD programs. This will increase the already strong competition, and consequently encourage higher quality of research to be supported from EU resources.

Under these conditions, the quality of consortia will tend to increase, and this will also lead to superior networks of excellence at the European level. The more the EU RTD programs will attract ambitious European companies to participate in these efforts, the more direct the impact will be achieved upon European competitiveness. In this context the recently introduced new RTD instrument, the European Technology Platforms, offer an important potential for ensuring that "winning technologies" in Europe (such as the Airbus) become successful also at the global market level.

If other elements of the Lisbon Agenda and ERA are created, the entire innovation sphere will be strongly enhanced, with appropriate researcher mobility, SME support, venture capital, and IPR protection better secured at the European level. Enlargement should thus contribute to stronger European economic competitiveness.

As the Marimon Report clearly indicated, however, the European Commission should make its RTD instruments more accessible for smaller research establishments, and small and medium companies. The request for double evaluation procedure is justified and will save a lot of time for European researchers, specially if administrative procedures are somewhat simplified. Criteria for the assessment of proposed consortia, particularly in terms of their optimal size, should also be made more realistic.

Finally, the critical level for the success of EU RTD policies, including the creation of ERA, remains the national level, where the majority of resources are invested in research. Governments will need to devise better policies to encourage the research and business communities to make joint efforts in improving Europen innovation and productivity, and consequently upgrade Europe's competitive position in the global market.