

INDI NEWS

Newsletter on Science & Technology & Innovation Indicators

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Préface

Cette nouvelle lettre d'information «IndiNews», publiée par l'unité K-2 de ma Direction «Prospective technologique et actions de recherche socio-économique» a pour objet de favoriser la circulation d'informations les plus récentes possibles sur les résultats de nos travaux, mais aussi sur des études, des analyses ou des indicateurs en provenance d'autres services ou de l'extérieur. Nous n'avons retenu que ce qui entre dans nos domaines de compétence et que nous avons jugé susceptible d'intéresser de nombreux services de la DG Recherche – et même d'autres directions générales. Avec votre aide, nous sommes sûrs que l'utilité de cette lettre sera reconnue.

Jean-François Marchipont
Directeur RTD-K

Contents

- Introduction.....p. 1
- Is US-American scientific leadership on the decline?.....p. 1
- What about patents?
The situation in Europe, the US, and Japanp.3
- News.....p.4

**This newsletter is prepared by
DG RTD/K-2-Competitiveness,
Economic Analysis and Indicators**

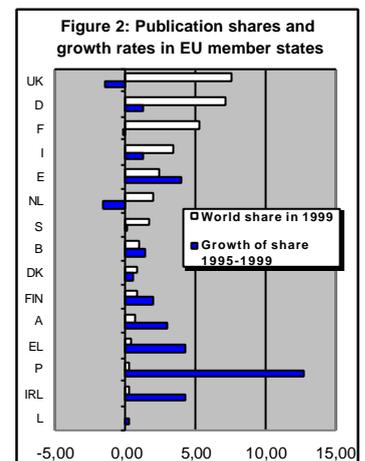
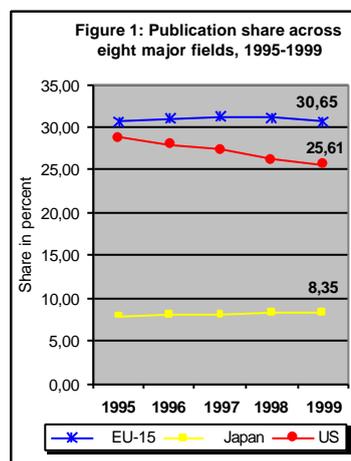
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Is US-American scientific leadership on the decline ?

Indicators on scientific publications – a measure of production of new knowledge, are becoming more and more important for measuring the performance of a country as well as at the institutional level. The quantity ("number of publications") and the importance ("number of citations") of this scientific output has been regularly examined in the European Report on S&T Indicators. Preliminary information including 1999 data have been analysed prior to the publication of the next edition of the report.

The world scientific output increased between 1995 and 1999 by 2.9 %. In 1999 more than 754,000 scientific publications were added to the scientific stock of knowledge. For many years now the US has been the major producer of scientific output. However, despite the fact of its economic growth during the 1990s, its world share of the scientific output has decreased each year since 1995. From 1995 to 1999 a decrease of -2.91 % is contrasted by a growth of 1.3 % for Japan and a constant share for the EU-15 (see figure 1).



DATA: CWTS/ISI

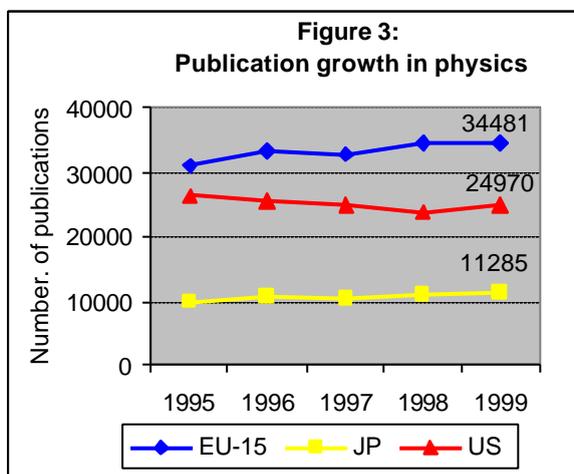
The US negative growth reflects not only a decreasing share – which could also be due to increases for other countries -, but the absolute number of publications per year decreased by 0.08 %, while in Japan it grew by 4.3 % and for the EU-15 by 2.9 %. The US shows significant losses in fields such as physics (- 1.31 %), chemistry (- 0.8 %), but also in biomedical research (- 0.5 %), a field where the US used to display great strength.

One can observe an increasing number of publications in each of all EU-Member States (= total number of publications).

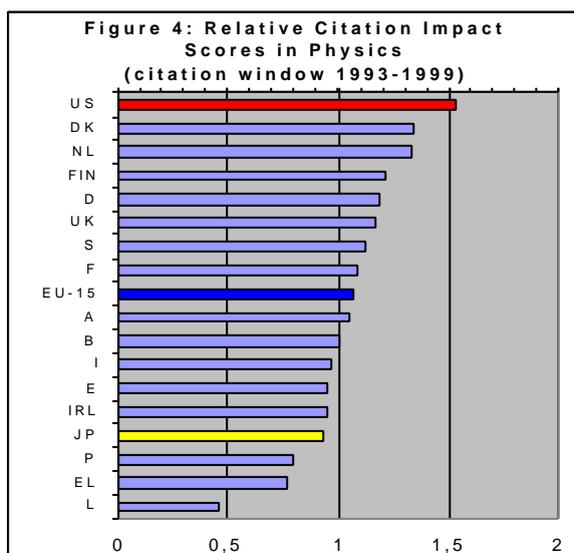
The increase ranges from 2.7 % for France to 15.9 % for Portugal; France producing around 40,000 scientific publications in 1999 and Portugal about 2,500. These differences are only partially matched by changes in the world shares: France's share fell from -0.17 % to 5.24 % in 1999 whereas Portugal's increased from 12.64 % to 0.33 % (see figure 2).

Differences per field

The picture becomes even more diverse if one focuses on specific fields, e.g., physics, and if one adds citations as an indicator. In physics, Japan increased its publication output by 3.2 %, the EU-15 by 2.65 %, whereas the US decreased by -1.31 % between 1995-1999 (see figure 3).



DATA: CWTS/ISI



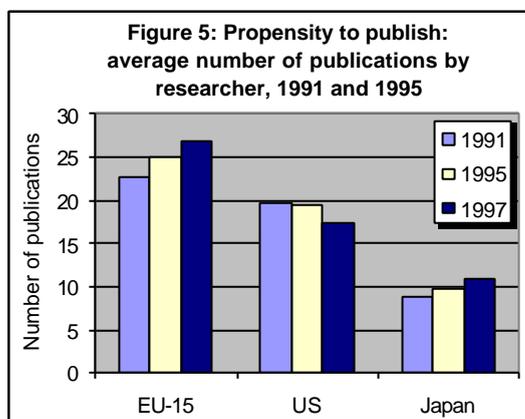
DATA: CWTS/ISI

Citation-wise, the picture is rather different: The US publications in physics receive the highest citation rate of 1.53, the EU-15 scores second with 1.07 and the Japanese achieve citation rates

of 0.93.¹ Within the Member States, the citation rates in physics vary between 0.46 for Luxembourg and 1.34 for Denmark (see figure 4).

Decreases of scientific in the US

One of the most startling facts is the diverging trends of growing numbers of researchers and those of publication output. Between 1995 and 1997, the EU-15, Japan and the US all had positive growth rates in terms of number of researchers: EU-15: 2.37 %, Japan: 2.32 %, US: 6.21 %. In terms of output, the figures are most stunning for Japan: within the same period 1995-1997, it increased its output by 1.19 % and between 1997-1999 it increased even more by 1.42 %. This increase can be expected taking into account publishing lags of new researchers. For Europe the growth rates are positive in the first and negative in the second period with 0.86 % and -0.86 % respectively. For the US they are -2.57 % and -3.3 % for the two periods showing an on-going negative trend. Looking at the propensity to publish, European researchers do not only publish more on average, but they increase the number of publication per researcher during the 1990s as well (see figure 5).



DATA: CWTS/ISI, Eurostat, OECD

Europe on the rise

Despite the fact of decreasing numbers of scientific publications, the scientific influence of the US is still apparent in all fields with significantly higher citation counts. The discrepancy between the quantity of publications and the more qualitative side of citation impact is apparent and can be explained by several factors. The key one may be that in science reputations have long-term effects; it takes a long time to build up a

¹ Citation window 1993-1999, excluding self-citations; scores above 1 are higher than the world average.

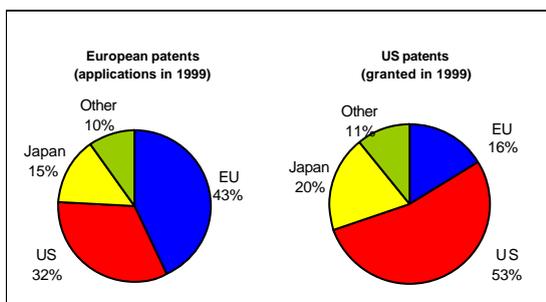
reputation and it takes in general an equally long time to lose one – whether good or bad. Another important factor is the continual change induced by inserting new journals into the SCI database. Important journals from various countries other than the US are introduced by this process and thus, reduce the relative number of publications of US-authors. This said, one can assume that a decline of the impact of US-research will only occur in the very long run and not necessarily in all fields. Therefore, it is too early to assume that the US is on the decline but one can certainly conclude that Europe is on the rise. *V.P.*

What about patents? - The situation in Europe, US and Japan

EU share of US patents lower than the US share of European patents

Latest data on patenting trends show a much stronger presence of US inventors seeking patent protection in Europe than of Europeans seeking patent protection in the USA: 33 % of patents at the European Patent Office (EPO) are from US inventors, while only 17% of patents at the US Patent and Trademark Office (USPTO) belong to European inventors. Of course, the European Union has the major share of European patents (43 %), owing to a “home advantage” effect, i.e. EU countries have a much higher propensity to patent at the European Patent Office than non-EU countries because it provides protection in their home market. Similarly, the USA has the dominant share of US patents (53 %). Japan has a slightly higher presence in the US patent system than in Europe (see figure 1).

Figure 1: European and US patenting (1999)

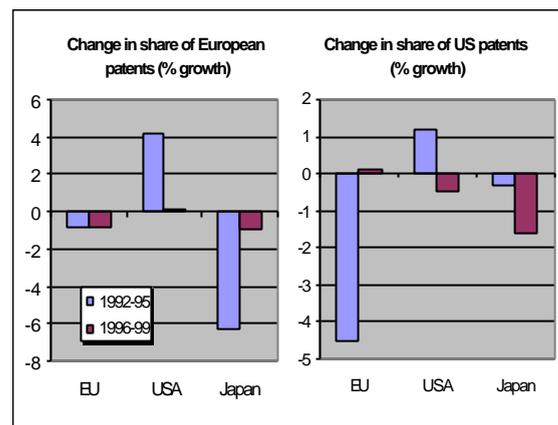


... but the decline in the EU's patent shares appears to have stabilised ...

Much of the decline in the EU share in the US patent system, and the corresponding growth of

the US share, occurred in the first half of the 1990s. Since then, there has been greater stability of patent shares (although Japan registered a slight decline during 1996-99). As for European patents, the EU's share declined marginally during the 1990s, but the US share rose significantly during 1992-95, while Japan's share declined sharply during the same period (see figure 2).

Figure 2: Growth rates of patenting

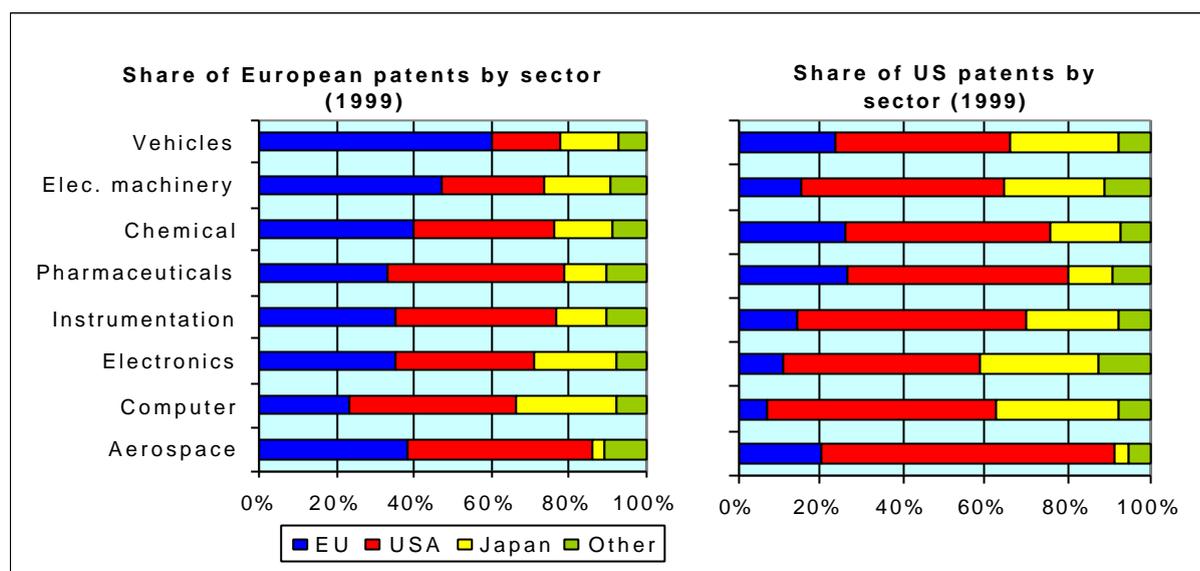


The EU patents more in traditional sectors than its main partners ...

If one breaks these shares down according to the industrial sector of the inventors, one can observe that, in terms of European patents, the EU's strengths lie in motor vehicles (for which sector it is responsible for 60 % of European patents), and electrical machinery (47 % of European patents), closely followed by chemicals and aerospace. The US is most dominant in aerospace, pharmaceuticals and instruments, and has higher shares of European patents than the EU in these sectors. Japan's highest shares are in computers and electronics.

Turning to US patents, one sees that the US has the largest share of patents in all of these sectors, with the highest being in aerospace (71 %) and the other sectors situated between 42 % (vehicles) and 56 % (instruments). Europe's largest shares are in pharmaceuticals and chemicals (both 26 %), followed by vehicles and aerospace. Japan's strengths in the US patent system are in the computer and electronics sectors (see figure 4 on page 3). *B.S.*

Figure 3: EPO and USPO patents by sectors (1999)



Internal News

• **Brain drain**

Dans le cadre de notre projet 'braindrain' en cours, une enquête a été lancée par MERIT sur l'Internet dont nous attendons impatiemment les résultats.

<http://meritbrn.unimaas.nl/Mobility>

• **OECD/NESTI**

Le 14 et 15 mai 2001, une réunion de NESTI (National Experts in Science and Technology Indicators) a eu lieu à Rome, au sujet des indicateurs S&T; parmi les plus importants points de l'ordre du jour figuraient :

- la 5ème révision du manuel Frascati, (cette nouvelle version sera publiée en 2002;
- la nouvelle base des données sur les sources et les méthodes en R&D;
- le rapport sur la croissance;
- les familles de brevets;
- les développements en statistiques biotechnologiques.

Cette réunion était précédée par trois jours de discussion intensives sur la révision du manuel de Frascati.

External News

• **The RAND report**

"New Foundations for Growth: The U.S. Innovation System Today and Tomorrow"
Published by the Science and Technology

Policy Institute (USA) in order to support the national innovation system.

An executive summary of this report is available @

<http://www.rand.org/centers/stpi>

Workshops / Conferences

- 26/27-06-2001, à Paris, sur "Les trajectoires américaine et européenne réévaluées. Institutions, innovations et performances", par le CEPN, Univ. Paris XIII.
- 13/14-09-2001, à Luxembourg, sur le "benchmarking" en recherche, par Eurostat (groupe de travail des experts nationaux en indicateurs S&T).
- 5th International Conference on Technology, Policy and Innovation, Delft, the Netherlands, 26-29.6.2001. Its main focus is on critical infrastructures. For more info see: <http://www.delft2001.tudelft.nl>
- 8th International Conference on Scientometrics and Informetrics, Sydney, 16-20.7.2001. This bi-annual event covers all aspects of quantitative science indicators. See program and accepted papers: <http://sistm.web.unsw.edu.au/conference/issi2001/>
- Oct./Nov. 2001, Oslo, planned OECD-NESTI workshop on "Policy Relevance and Measurement of Basic Research"