

EVOLUTION OF HUMAN RESOURCES IN SCIENCE AND TECHNOLOGY IN THE OECD COUNTRIES

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ABSTRACT

Human Resources in Science and Technology (HRST) represent the main element of science-based economies.

In the OECD countries, over 50% of intellectual and technical professions are practiced by women.

Although it is true that international mobility seems pretty balanced between the OECD countries, however, it is unpleasant that several developing countries are faced with constant waves of native-born highly skilled workforce in ST immigrating to the OECD countries ("brain drain").

The European Union is attracting more and more experts in ST from third world countries.

KEYWORDS: *human resources (HR); science and technology (ST); waves of immigrants; international mobility; flows of knowledge; highly skilled; scientific researchers; innovation efforts.*

The European Research Area (ERA) is becoming more attractive, although the intensity of Research-Development (R&D) activities stagnates in the European Union.

The *Science, Technology and Competitiveness key figures report 2008* (published in Brussels on January 22, 2009) provides an overview on the progresses made by EU-27 (European Union member states) between 2000 and 2006. The report presents the key figures regarding R&D investments in EU-27 and also ways of promoting the potential of the ERA. The report indicates that the number of researchers in Europe is on the rise and that the European Union is mainly attracting foreign researchers and private R&D investments from the U.S.A.

The stagnation of EU-27 R&D intensity (R&D expenditure as share of GDP) at 1.84% is worrying in the context of the European Union's intention to become the most competitive knowledge-based society in the world.

Although many European Union member states have increased investments in scientific research and mainly research fields that are more efficient, the European Union is still far from fulfilling the main objective under the Lisbon Strategy, to boost spending on R&D to 3% of GDP.

R&D investments by industrial enterprises remain dim, especially because the high-tech sector in the EU's industrial structure is smaller than that in the U.S.A., which hinders performance at EU level.

The European Innovation Scoreboard (EIS) 2008, also published in January 2009, provides an in-depth assessment of the innovation performance of EU member states.

The two above-mentioned reports call on EU member states to change their industrial structure and base their industry on innovation much more than they have done so far, for the purpose of profit-oriented R&D.

The main conclusions of the *Science, Technology and Competitiveness key figures report 2008* indicate that:

- 1) Research is an essential factor for competitiveness on a globalized market.
- 2) R&D intensity (R&D expenditure as share of GDP) EU stagnates, but this conceals gaps at national level.
- 3) Investment intensity in the private sector remains dim.
- 4) Research Excellence: increasing number of researchers, but the knowledge exploitation capacity remains inferior to that of competitors.
- 5) A more attractive sector for investments and foreign professionals in science and technology (ST).

According to the *Canberra Manual* (OECD and Eurostat, 1995), Human Resources in Science and Technology (HRST) are defined as people with university degree or professions in the field of ST, which normally entails high qualifications and is based on a high innovation potential.

- **Intellectual and scientific professions**, namely, specialists in Physics, Mathematics and Technics (physicists, chemists, mathematicians, statisticians, specialists in informatics, architects, engineers), specialists life science and healthcare (biologists, botanists, doctors, veterinarians, pharmacists etc.), specialists in education and other specialists in intellectual and scientific professions (specialists holding management and commercial positions within companies, specialists in research, social science, clergy members and specialists in public service administration).

- **Intermediary professions**, namely, intermediary professions of physical and technical sciences, intermediary professions of life science and healthcare, professions intermediary to education, other intermediary professions (finance, sales, economic operators, commodity brokers, management, public administration, judicial police inspectors, social work, entertainment and sports, assistants within religious cults).

- **Managers and management staff**, namely, managers, management staff, production and operations and managers of small-scale businesses.

- People who do not hold management positions are not mentioned for reasons targeting quality data and comparability problems at international level.

- HRST represent the main element of science-based economies.

In 2005, employees with intellectual and technical professions (according to definitions mentioned above) accounted for more than 30% of total workforce in the U.S.A. and EU-25, respectively (which, in absolute values, translates into nearly 57 million employees in the U.S.A. and 59 million employees in EU-25, respectively).

In 2004, employees with intellectual and technical professions totaled 10 million in Japan, with one in six employees working in ST.

- In Europe, the first four largest economies reported nearly two thirds of HRST (22% in Germany, 12% in France and the United Kingdom and 11% in Italy).

The Czech Republic, Hungary, Poland and the Slovak Republic all together registered more than 11% of the employees in ST.

Nordic countries were among the first ten countries with a high employment share in ST, namely, more than 35% of total workforce.

HRST in Spain, Greece, Ireland and Portugal accounted for nearly 20% of total workforce.

- Latest available data indicate that more than 50% of intellectual and technical professions are practiced by women in most OECD (Organization for Economic Cooperation and Development) countries.

The highest employment share of women in ST is registered in Poland (60.7%) and Hungary (60.3%), respectively.

The lowest employment share of women in ST is registered in Japan (34.0%) and Korea (40.1%), respectively.

- In 2006, the distribution of employees for intellectual and technical professions was well-balanced.

Nevertheless, Norway, the Czech Republic, Italy and Austria reported a slightly higher number of technicians, as compared to people with intellectual professions.

- Throughout the past decades, employment in ST has grown at a faster rate than total workforce, at the level of the OECD countries.

The rate reached an annual average of 2.7% in the U.S.A., of 3.3% in EU-15, of 4.1% in Korea and of 4.5% in Australia. Several countries, such as Spain, Hungary, Ireland and Greece, in which the share of intellectual and technical professions was relatively low, are catching up.

Australia and Luxembourg, in which intellectual and technical professions already held a high share, continued the strong development of employment in ST.

- With few exceptions (for instance, Hungary, Poland, the Slovak Republic and the Czech Republic), the speedy development of employment in ST is mainly based on the increase of women in the workforce.

An in-depth analysis on HRST (International mobility of highly skilled employees, R&D Staff, Evolution of Scientific Researchers in the OECD countries), leads to the following conclusions:

- ◆ ERA has become more attractive over the past years, although not all EU member states have managed to fulfill the main objective under the Lisbon Strategy.

- ◆ The *Science, Technology and Competitiveness key figures report 2008* (Brussels on January 22, 2009) and *The European Innovation Scoreboard (EIS) 2008* (January 2009) call on EU member states to change their industrial structure and develop their industry on innovation, in order to become competitive at global level.

- ◆ The European Union has attracted R&D investments in recent years mainly from the U.S.A. and foreign professionals even from third world countries.

- ◆ In 2005, employees with intellectual and technical professions accounted for more than 30% of total workforce in the U.S.A. and EU-25, respectively.

- ◆ In most OECD countries, over 50% of intellectual and technical professions are practiced by women.

- ◆ The highest employment share of women in ST is registered in Poland (60.7%) and Hungary (60.3%), respectively.

- ◆ The lowest employment share of women in ST is registered in Japan (34.0%) and Korea (40.1%), respectively, of total highly skilled workforce.

- ◆ In most OECD countries, the speedy development of employment in ST is mainly based on the increase of women in the workforce.

- ◆ Highly skilled specialists and technicians and their mobility represent key human resources for the field of science and technology.

- ◆ U.S.A. receive the most highly skilled specialists and technicians immigrating from both the OECD area and non- OECD countries.

- ◆ U.S.A. are closely followed by France, Germany, the United Kingdom and Canada which attract highly educated workforce.
- ◆ These countries, just like Portugal and Spain, are the beneficiaries of a significant colonial legacy and linguistic advantages.
- ◆ A high percentage of specialists and technicians immigrating in the OECD area originate from Asia and mainly India and China.
- ◆ Highly skilled workforce in ST is beneficiary of significant flows of knowledge.
- ◆ U.S.A. and France register a high percentage of highly skilled immigrants and a low percentage of native-born highly skilled population immigrating to other OECD countries.
- ◆ Share of women in total highly skilled workforce immigrating in the OECD area is below 45%.
- ◆ In the OECD countries, although the number of auxiliary staff supporting a researcher has seen a relative decrease, due to the uptake of new technologies, however, several laboratories are faced with a shortage of technicians and auxiliary staff.
- ◆ Employment share of women in the R&D sector of industrial enterprises is lower.
- ◆ U.S.A. are disadvantaged by misvaluing the exact number of researchers, on account of excluding the highly skilled military staff in the U.S. public sector.
- ◆ The number of researchers in ST, in the area of the OECD countries, saw an increase between 1995 and 2005, due to the Research-Development-Innovation policies promoted by these countries.
- ◆ The distribution of researchers on sectors of the Research-Development-Innovation system, as well as the increase in the number of highly skilled researchers, depends on the national features of each country.
- ◆ China saw a significant increase in the number of researchers within industrial enterprises, between 2000 and 2005, which offered the country a competitive potential at global level.

References

1. European Commission (2009), European innovation scoreboard 2008, Comparative analysis of innovation performance Pro Inno Europe Inno Metrics, Belgium, January 2009;
2. OCDE (2002), Manuel de Frascati: méthode type proposée pour les enquêtes sur la recherche et le développement, OCDE, Paris;
3. OCDE (2007), Principaux indicateurs de la science et de la technologie, Volume 1/2007, OCDE, Paris;
4. OCDE (2007), Principaux indicateurs de la science et de la technologie, Volume 2/2007, OCDE, Paris;
5. OCDE (2007), Science, technologie et industrie: Tableau de bord de l'OCDE 2007, Innovation et performance dans l'économie globale, OCDE, Paris.