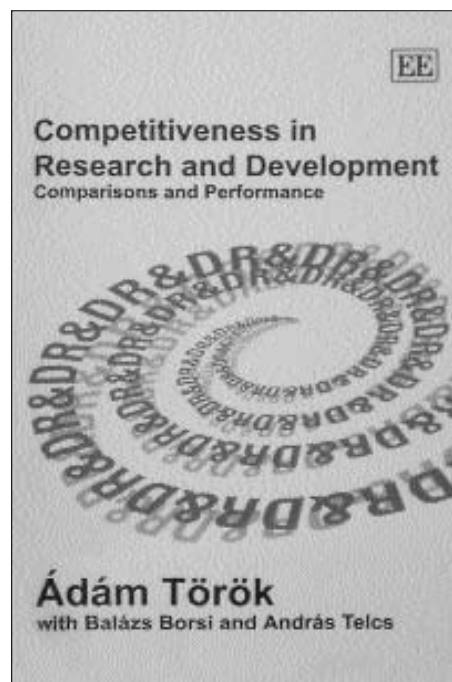


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Competitiveness in Research and Development

Comparisons and Performance
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The idea of the book comes from a practical experience. Professor *Ádám Török*, being the author of four chapters out of five, was been the president of the National Office for Technology some years ago. He perceived some essential financial and operational problems of the Hungarian R&D sector, and then he met the polite opinion of the European Commission (Agenda 2000), saying, Hungary's S&T output places the country among the first twenty in the world, and the accession brings mutual benefits for the EU and Hungary in this field. This contradiction gave him an impetus for research, and he experienced that there are very few published results on the competitiveness based R&D benchmarks.

During the research work, the mixing of two phenomena: R&D and innovation caused a continuous methodological problem for the authors. Based on the Hungarian experience, we cannot be surprised, since *innovative* companies enjoy R&D tax benefits, and the due

innovation contribution may be lowered by the proven R&D expenditures of the company.

■ The *first chapter* clarifies the theoretical and methodological questions of the issue, with special attention to the applicability of the competitiveness phenomena on R&D. The authors analyse the models for imperfect competition, the role of entry barriers, and the application potential of the Porter diamond for the analysis of competitiveness. The role of competitiveness at the supply and the demand sides and the role of R&D and innovation are analysed. National innovation policies are scrutinised in the frames of the modern National Innovation System model.

■ *Chapter two* focuses on the measurement of competitiveness. It gives an overview on the methods and data to be found in the literature. Starting with the productivity of labour, and analysing the indicators of international trade, the authors conclude with the analysis of high-tech sectors. It is stated that high-tech trade, accord-

ing to all perceptions and qualitative experiences, is related to R&D, but the exact deduction of this relation is not easy.

Hungary has a remarkable international position in the ratio of high-tech exports, mainly due to the activity of foreign direct investments. The technology balance of payments (TBP) shows a strong deficit, but, as the authors argue, it is not necessarily a problem. A deficit of the TBP can be closely related with the rapid technology inflow, and with the improving IPR awareness of the companies. There is an interesting calculation based on the ratio of TBP deficit to the gross domestic expenditure on R&D. This indicator shows that Hungary is the closest to the Irish model.

The authors analyse the literature sources on the R&D expenditures, especially the ones concerning the corporate R&D expenditures. The roles of the different indicators are also compared. There is a very interesting analysis on the not recommended indicators. The authors point out: all analyses based on any individual indicator can be misleading. It is also not clear whether absolute or relative indicators are more characteristic of the R&D performance of a country better. Based on the R&D expenditures, the authors create four categories for the countries: 'Leaders', 'Followers', 'Midfielders' and 'Marginals'. Hungary belongs to the 'Midfielders' group, based on both the total and the corporate R&D expenditures.

If there are several indicators under scrutiny in parallel, there is always a methodological question: how to compact them into one indicator? The European Commission has had a successful attempt with the Summary Innovation Index (SII) within the European Innovation Scoreboard. The United Nations also use a successful composite indicator, ranking Hungary as #34 in the world in 1999.

The authors state that the global R&D position of a country can be well described by two input and two output indicators: the number of researchers and the gross expenditure on R&D (GERD) on the one hand, and the number of

scientific publications and patents on the other hand.

■ *Chapter three*, focusing on the quantitative analysis of R&D competitiveness, is a real delicacy for professionals dealing with science and innovation policy. The authors create different international rankings: first more simple and intuitive ones, then more refined and complex ones, relying on advanced mathematical tools. Statistical data are not always fresh (the latest ones are related to year 2000), but from a methodological point of view, the reader gets an excellent and innovative analysis.

The comparative analysis of absolute and relative indicators is of great value. It demonstrates that the different economic and historical conditions created surprisingly high differences in these indicators, and sometimes in reverse directions. It is especially interesting that the comparison covers many more countries than usual. The authors compare the European countries to some Asian and South American countries, and these results are novel and often astonishing.

In my opinion, the main strength of this chapter is the *application of the Data Envelopment Analysis (DEA)*. This method makes extensive use of the fact that variables are grouped as input indicators (number of researchers, GERD) and output indicators (publications and patents). The DEA method is used to analyse how efficient a country is compared with another? This is a very plastic way for the understanding of complex phenomena described by several parameters. The rankings after the graphs are also worthwhile, showing the actual values and the trends simultaneously.

“The range around the optimum is always flat”. Therefore, it is a pleasant surprise that the rankings created by different methods and very different efforts are similar, and show a considerable overlap. Of course, the most complex information can be obtained from the different rankings together, taking also their assumptions and methodologies in account. I think these rankings and conclusions will give ideas and motivation for many people for further analyses and research.

The authors state that European countries and especially the new member states will lose even their present position in the global knowledge competition if they do not change their attitude radically. The challenge is not only Northern America and Japan any more, but more and more Eastern Asia as a whole. It is not widely known that the Central and Eastern European countries are already outpaced by some newly industrialized countries, being typically neglected as competitors in R&D up to now: China, Korea, India, Brazil, Republic of South Africa, Argentina or Mexico. Other promising countries such as Turkey, Singapore, Indonesia and Portugal are also on a good track. The relatively high number of Hungarian-born Nobel Laureates educated in Hungary may hide the threat for the decision makers, that stagnation in an accelerating international environment leads to a guaranteed loss of position.

■ The next two chapters analyse the policy consequences of the above analyses. *Chapter four* focuses on country groups where losing position in the international R&D rankings needs a policy answer. The related countries are especially some Central and Eastern European countries being already members of OECD and EU, but their national innovation system still shows some (common) features that are missing in the most successful countries. Newly industrialised countries also obtain special attention. Some of them have already achieved remarkable results in R&D. These countries are not simple receivers of technology (for this phenomenon, there is a good example in the book: a nuclear power plant in an underdeveloped area). By now, however, the earlier gap that existed for centuries in R&D between advanced and lagging countries tends to disappear. This catching-up is probably related to the cultural impact of globalisation: if a country has motivation and resources for R&D in some priority areas, it is possible to employ excellent research teams. If the country does not have a well trained researcher society by its own, but

has an engagement and financial sources, it is possible to recruit even the best experts from abroad with attractive financial and R&D infrastructural conditions.

■ *Chapter five* summarises the conclusions, with special respect to the global issues of R&D competitiveness, to the “big picture”. The policy ideas are mainly focused on the developing countries, in accordance with the EU Lisbon strategy. The authors point out that less than a hundred countries play any role in R&D and less than fifty among them can be considered as serious players. On the top of the list there are the G-7 countries and South Korea, producing 80–90% of the global R&D results. These countries represent the centre of the map shown in the book. A further considerable group of countries is still shown on the “main board”, partly by virtue of their absolute, partly their relative indicators. Based on its good relative indicators, Hungary belongs to this group. Some newly industrialised countries also deserved this position, for example Malaysia, Kuwait, Venezuela). Of course, all “small” and successful countries (e.g. Switzerland, Denmark, Finland, and Sweden) belong here, and by their size and their absolute indicators, the “big” countries: China, India. The authors state: the new EU member countries may contribute to the fulfilment of the joint Lisbon targets, but their actual national innovation system does not provide good background to that. The authors think the solution of this problem needs structural and political means.

The book provides interesting, well formulated information and many new thoughts. It can convince the reader that there are still plenty of unexploited research areas at the borderline of R&D, innovation and economic competitiveness. The research in these fields can contribute to the development of the science and innovation policies. It would be useful if the knowledge included in this book could be utilised by the policy opinion-shapers and by the university tutors and instructors as well.

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