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Research institutes in Europe

Major growth among research institutes in Europe has been the result of a conscious political effort. Levels of public grant funding have risen in many countries, and Norwegian financing initiatives in the sector can no longer be described as particularly significant. This article presents a review of the technical-industrial component of the institute sector in some European countries.

Introduction

The Norwegian institute sector was given a clean bill of health in the Government's Research White Paper of 2005. The clean bill of health asserted that the research institutes played a key role within the innovation system, and that dramatic organisational changes would result in major negative consequences in the short term.

The White Paper reflected positively on the institute sector, but the myth that the Norwegian sector is disproportionately large compared with other countries lives on.

Both the 2005 and 2009 Research White Papers promised increased levels of investment in terms of public grant funding, in particular in the technical-industrial institutes, and to those centres focused on the environment. Five years later, the situation is such that "comparable" countries have taken the contents of the Norwegian Research White Paper seriously, and have directed focus on their own respective institute sectors. They have directed their focus towards that part of the institute sector that has the greatest relevance for innovation. Growth in several countries has been goal-oriented, and that which once could be defined as a difference is no longer so easy to identify.

From an external perspective, it appears that many EU countries are adopting an active institute policy, and that the relative dominance

of the institute sector within EU research activities has caused a shift in focus towards the sector in certain countries. The research institutes enjoy a higher priority than they did ten years ago.

In Norway, the authorities' policy towards the institute sector continues to be relatively passive. The institutes constitute the backbone of Norwegian participation in the context of European research collaboration, but insufficient effort is being made to prepare the ground for further advances.

Using examples taken from a number of European countries, this article will show that EU countries are establishing an innovation policy built around the consolidation of their respective research institutes, and in particular the technical-industrial project-based centres.

The article goes on to provide a general review of how different parts of the institute sector have developed in some European countries. It focuses on the commercial- and basic research-oriented technical institutes. In the case of the social science and administrative-oriented institutes, many countries have opted to incorporate this expertise either within public sector institutions or by means of linkage to the universities. For this reason it is much more difficult to present a corresponding review of this aspect of research activities.

Historical development

The first European research institutes were established in the early part of the 20th century with the aim of contributing towards industrial development. After the Second World War the newly established Norwegian Council for Scientific and Industrial Research (NTNF) published a report prior to the establishment of the Central Institute for Industrial research (SI) and SINTEF. Emphasis was placed on the fact that the "establishment of dedicated research institutes" contributed towards Germany outpacing England in terms of industrial capacity, and eventually assuming a leading position in world research. The recognition of this fact, combined with the USA's massive investment in research during the Second World War, demonstrated that industrial growth would proceed much more rapidly when backed-up by research institutes focused on industrial development. The majority of countries not already in possession of this type of research institute established such centres in order to assist in meeting the post-war "Grand Challenges", and "elevate the country" in the wake of a period of destructive conflict. This was probably a factor that contributed towards the fact that countries in most need of reconstruction, such as Germany, the Netherlands and Finland, built for themselves a more robust technical-industrial institute sector more quickly than countries that emerged less damaged from the war.

In some countries during the 1980s, policies changed by means of the comprehensive privatisation of state-owned research institutes. This was especially the case in the UK. The UK is an example of a country in which former research institutes were transformed into today's listed companies. Other countries have adopted the opposite approach and have focused on research institutes designed to make a contribution towards the development of a given region or the country as a whole.

At the onset of the new millennium, the participation of the research institutes in the European Research Area (ERA) has had much greater relevance for the individual host countries in question than might be justified by the status of the institutes themselves. Insti-

tute sector policies in several countries appear to reflect this, and this article will outline some of the development trends observed in the countries in question that support this assertion. The figure below shows what proportion the institute sector (research centres) in the countries selected received of the country in question's grant funding from the EU's 6th Framework Programme for Research and Technological Development (6FP). The German and French institute sectors are large, and together received one eighth of the total EU funding linked to the 6FP. The institutes described either individually or as groups in the following text received well over 10% of the contribution allocated through the 6FP.

Research institutes in selected countries

Austria

During the last decades, a number of organisational changes have taken place within the Austrian technical-industrial institutes. Public authorities have established new research institutes, or have become stakeholders in existing institutions. Salzburg Research was founded ten years ago under the ownership of the Salzburg state administration and has between 50 and 60 employees. Joanneum Research, which has its origins in the 1950's, underwent major restructuring between 2002 and 2003, and is co-owned by the Styria state administration (90%) and the TNO (10%).

In an Austrian context, Joanneum is a relatively large organisation, with 430 employees. Austrian Cooperative Research (ACR) represents an amalgamation of 15 smaller institutes employing a total of 640 people. The largest institute in the country is the Austrian Institute of Technology (AIT) which employs 900 people and has a turnover of €120 million. The state owns just over 50%, while the remainder is held by industry stakeholders. AIT has its origins in the 1950's, but changes in ownership structure and organisation were implemented in 2009. About 40% of its turnover is in the form of basic funding.

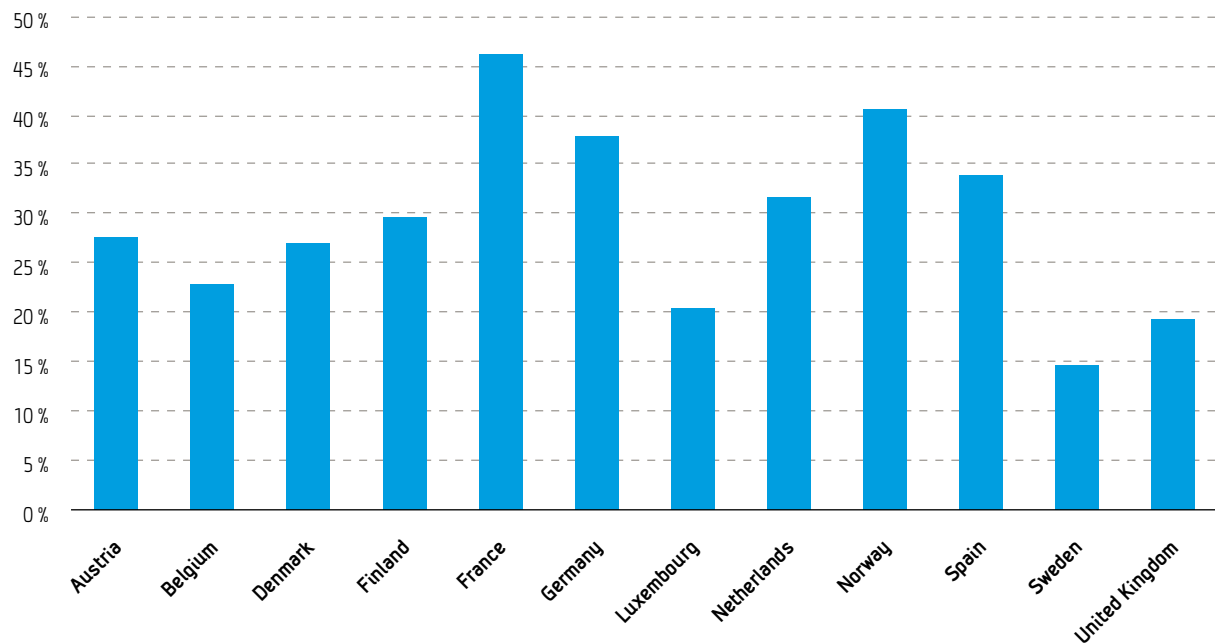


Figure illustrating the RTD sector's (research centres') proportion of the individual countries' contribution from EU in the 6th Framework Programme.

Belgium

In the past, Belgium possessed a small research institute sector, and commercial companies obtained research assistance from the universities. However, since the middle of the 1980s, the research institutes IMEC and VITO were established and both have enjoyed massive growth based on regional investment in the Flanders region.

IMEC was established in 1984 and has become Europe's leading research institute in the field of advanced micro- and nanoelectronics. IMEC has expanded into the Netherlands and employs more than 1,000 research scientists and a total of 1,783 employees, including researchers on secondment from industrial concerns. IMEC receives € 52.7 million in the form of grant funding. These grants, amounting to 20% of turnover, are derived from the Flemish regional administration (€ 44.7 million) and the Dutch national authorities (€ 8 million).

VITO was established in 1991 by the Flemish regional administration, and has a multidisciplinary technical profile somewhat similar to that of TNO, VTT and SINTEF. At the beginning of 2010, VITO had 631 employees and received grant funding amounting to 49% of turnover (€ 40 million) from the Flemish regional administration.

Denmark

A large part of the Danish research institutes were incorporated into the universities in 2007. For the most part, this process involved research institutes with governmental duties and high levels of state funding. Much media attention was devoted to this process, and the high levels of publicity gave the impression that all research institutes were merged into the universities.

Considerably less attention was paid to the fact that the applied research institutes were gathered under the umbrella institute grouping GTS (Approved Technology Service Institutes), made up of nine institutes employing a total of 3,500 people. In 2009, GTS had a turnover of DKK 3,225 billion. Basic funding amounts to 10% of the turnover, and income from foreign sources accounts for approximately 40%. During the recent decade, the proportion of turnover derived from overseas has increased by almost five-fold.

The Danish Technological Institute (DTI) is the largest single research institute with a turnover of DKK 842 million in 2009, well over 900 employees, and a basic funding source (contract-based research) amounting to 12% of turnover.

Finland

The state-owned research institute VTT dominates the research institute sector in Finland. VTT has undergone a major restructuring in recent years, but has succeeded in maintaining a total workforce of approximately 2,700. In 2009 the institute had a turnover of € 269 million, of which 14% was derived from overseas and 31% (€ 85 million) were basic funding. The basic funding awarded to VTT amount to approximately the same order of magnitude as those distributed by the Research Council of Norway to the entire Norwegian institute sector.

France

In France there are a number of smaller research institutes, and the majority of these are oriented to dedicated sector in the industry. Moreover, France is the country that hosts the most members of EARTO (European Association of Research and Technology Organisations).

CEA is the French research organisation with responsibility for en-

ergy research and in particular nuclear research and the operation of nuclear reactors. CEA has a total of 15,500 employees distributed among ten research centres and a turnover of € 3.9 billion. CEA has both a civil and a military division. The civil division receives basic funding amounting to 45% of turnover. Two of CEA's centres are also members of the Carnot Institute Network.

The Carnot Institute Network is an umbrella organisation established a few years ago in order to create an institution similar to the German Fraunhofer-Gesellschaft, with the aim of meeting the needs of the commercial sector. In 2009 the network comprised 33 research institutes with centres located all over France. A total of € 60 million has been made available in the form of grants from the French state authorities in order to develop the Carnot system. The Carnot system has a workforce totalling 13,000 permanent staff, making up 12% of all the public sector research employees in France. 7,000 Ph.D. students are linked to the Carnot institutes.

In addition to the Carnot network, the CNRS (the French National Centre for Scientific Research) employs approximately 25,000 employees across the whole of France. As a legal entity, this organisation should be regarded as a governmental research facility dedicated to basic research. The CNRS is the largest organisation within the EU's Framework Programme.

Germany

Germany has a well-functioning technical-industrial institute sector enjoying excellent collaboration with the universities. It is dominated by four major institutes; Max Planck-Gesellschaft, Leibniz-Gemeinschaft, Helmholtz-Gemeinschaft og Fraunhofer-Gesellschaft. All have enjoyed unhindered growth since the fall of the Wall in 1989, and are currently among the largest organisations within the EU's Framework Programme. There are also some smaller independent institutes in Germany but, in comparison with the four majors, these constitute only a minor component in terms of turnover and manpower.

Max Planck-Gesellschaft (MPG) was founded in 1948 and has grown to embrace a total of 80 research organisations currently employing a total of 14,300 people, of which 5,510 are research scientists and 7,000 Ph.D. students. The most expansive growth has occurred following German reunification. MPG is closely linked to the universities and has a funding of 50% federal and 50% from the states.

Leibniz-Gemeinschaft is an umbrella organisation for academic institutions which also receives 50% of its funding from federal sources and 50% from the state administration. Leibniz-Gemeinschaft has doubled in size since German reunification, and currently employs 16,000 people, of which over 7,000 are research scientists. It is currently linked to 86 institutes, with an aggregated turnover amounting to € 1.6 billion.

Helmholtz-Gemeinschaft is an umbrella organisation comprising 16 German research institutes employing 30,000 people. They are subdivided into a variety of legal entities, but receive joint public sector grant funding of which 90% is obtained from federal sources and 10% from the state administration. The precursor of today's organisation was founded in 1958. Gradually, more organisations were brought into the fold, and the institute has enjoyed extensive growth most notably in the wake of German reunification. The institutes are assigned clearly-defined projects, many of which are almost administrative in nature. They carry out relatively little project-based research funded by the private sector. The institute has an annual turnover of € 3 billion.

Fraunhofer-Gesellschaft was founded in 1949. On its 60th anniversary last year it had expanded to embrace 59 institutes employing 17,000 people, inclusive of its part-time employees, and had a turnover of € 1.6 billion. As is the case for the other organisations, German reunification triggered expansive growth. In the case of the Fraunhofer, this growth has continued at a steady rate. Fraunhofer is a project-oriented organisation defined as a single legal entity, and is the institution with which SINTEF has most collaboration in the EU-framework programme. In 2009, Fraunhofer received basic funding amounted to 38% of its total turnover with a 9 to 1 ratio in terms of federal and state funding respectively.

Luxembourg

During the period 1987-1989, three public research institutes (CRPs) were established in Luxembourg. They are primarily publicly funded and a large part of the activity is basic research. The majority of project-based research is carried out by the CRP Henri Tudor, which is also the largest research institute, with a workforce in excess of 400 employees. CRP Henri Tudor is 20 years old, and has expanded by 150% during the last nine years. The three research institutes together employ a total of approx. 850 people. In relation to the population it is more staff than in the Norwegian institute sector.

The Netherlands

The Dutch research institutes have a considerable role within the innovation system. The technical-industrial institutes are made up of nine smaller research institutes, 4 larger and the Netherlands Organisation for Applied Scientific Research (TNO). In 2009, TNO had about 4,350 employees, a turnover of € 576 million, and received basic funding amounting to € 203 million (35% of turnover). TNO was hit hard by the financial crisis in 2009 and incurred a loss of € 14 million. Together with the Belgian IMEC institute, TNO has established a co-operative research constellation (the Holst Institute) in the field of micro- and nanoelectronics. This is located in Eindhoven close to Philips. Restructuring within the industry has resulted in a movement of expertise in electronics and telecommunications from the company to the research institutes.

ECN (energy research), together with its subsidiary NRG (nuclear research), represents the second largest institute, employing about 1,000 people, with a turnover of € 141 million and grant funding amounting to EUR 45 million in 2009.

In total, the TNO and ECN employed 5,350 employees and received about € 250 million in basic funding during 2009. In comparison, the entire Norwegian technical-industrial institute sector combined to deliver 3,500 man-years during 2009, with total funding amounting to NOK 0.96 billion (€ 120 million) from the Research Council of Norway for both basic and project-based research.

Norway

In Norway, SINTEF is the largest research organisation with 2,100 employees, a turnover of NOK 2.75 billion and basic funding amounting to 7% of its turnover during 2009. The Norwegian technical-industrial institutes had a turnover of NOK 4.9 billion in 2009 and their basic funding was NOK 413 million (appr. € 50 million).

About 45% of the contribution from the EU-funded research programmes FP7 finds its way to the research institutes. The research institutes carried out about 22% of the R&D in Norway. Basic funding to the Norwegian research institutes through the Research Council of Norway constitutes 11% of the institutes turnover.

Spain

The research institutes in Spain have enjoyed a massive expansion since the country became a member of the EU. Great emphasis has been placed on the development of technology centres, and in 2008 74 such centres were organised together in the member association FEDIT. The centres are distributed throughout Spain, with many concentrated in the Basque region and in the area around Valencia.

In total, these centres employed 7,400 people and had a turnover of € 481 million. 35% of the centres employed more than 100 people. Project-based revenues from private sector companies constituted 48% of turnover, while basic funding from the EU and national and regional sources made up 39%. They also succeeded in procuring revenues from the EU's Framework Programme, comprising as much as 9.6% of turnover. In comparison, approximately 5% of SINTEF's revenues are linked to EU-related research.

In the Basque region, ten of the centres are assembled together as part of Tecnalia which has enjoyed a 10% increase in turnover in the period 2008-2009. Tecnalia currently employs 1,650 people, and in 2009 had a turnover of € 141.5 million, of which 22% was made up of grant funding.

Sweden

The Swedish research institute sector has been small and fragmented, but with a significant state ownership. A study carried out a few years ago concluded that a restructuring ought to be implemented, and that a large research organisation should be established. Sweden has made great advances in this regard. The state-owned holding company RISE (Research Institutes of Sweden) was established at the end of 2008 as an umbrella federation bringing together all the technical-industrial research institutes.

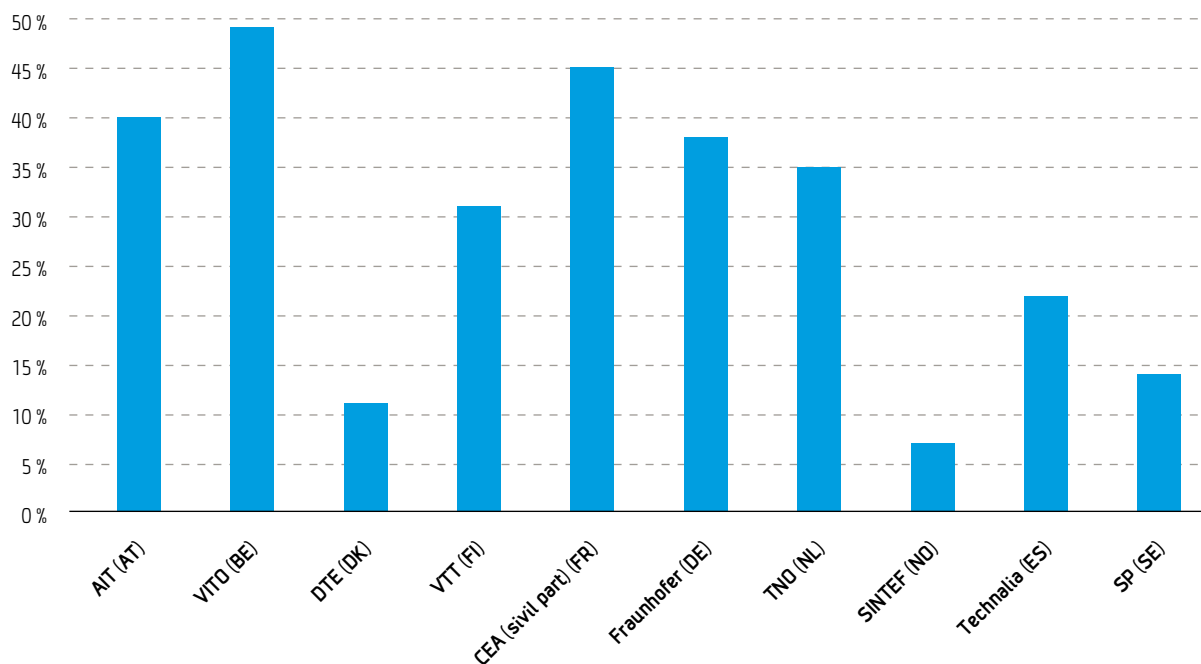
RISE is subdivided into four groupings/organisations, of which the largest is the technical research organisation SP with a turnover of SEK 947 million. RISE's total turnover amounts to SEK 2,215 million, and the organisation has well over 2,000 employees. RISE is responsible for allocating state-sourced expertise funding (basic funding) to the technical-industrial institutes. In 2009, this funding amounted to SEK 310 million, and on average constituted 14% of turnover. This followed a massive increase of 25% recorded in 2008.

The Swedish Defence Research Agency (FOI) was formerly the largest research institute in Sweden, but downsizing of Swedish defence capabilities during the last five years has resulted in a reduction of 33% in total man-years, although the institute continues to employ over 900 people.

The United Kingdom

The research institutes in the UK was in a large extent privatized in the 1980s and 1990s. Basic financing fell almost completely away, and the research institutes were more oriented towards consultant work. The privatization of defense research has led to what was once the Dera is now the listed company QinetiQ. QinetiQ sells expertise to the UK defence establishment on the basis of large long-term contracts that incorporate a research component.

This development, or rather lack of intended development, has resulted in the "Hauser-report", which was published in March 2010 by Department for Business Innovation and Skills. The report recommends the establishment of a series of "Technology and Innovation Centres" (Maxwell Centres) in selected locations across the UK, and refers to policies practised in countries such as Germany, Finland and the Netherlands. The description of the intended operation of



The figure shows basic funding as a percentage of turnover for some of the technical-industrial institutes.

these centres is almost identical to that currently practised by the technical-industrial research institutes in the rest of Europe.

Pan-European institutes

As well as the national institutes described in the foregoing, there exist several major pan-European institutes which emerged in the wake of an early recognition of the fact that some challenges are best tackled with a collaborative approach. They have arisen either by means of direct EU membership, via the EU system, or as a result of some other form of organisation.

The Joint Research Centre (JRC) is the EU's own research centre and is funded as part of the research framework programmes. The JRC has its headquarters in Brussels and comprises seven institutes located in five different countries. Its activities consist of essential goal-oriented basic research projects directly applied to EU policy development. Almost all its funding is direct from EU. In order to preserve its independence, major constraints are imposed on the JRC in terms of the kind of project-based research it can carry out outside the terms of reference of competition within the framework programmes. Norway is currently paying its share towards funding of the JRC via its EU subscription, although there are considerably fewer Norwegians employed at the institute than the size of the payment would suggest. JRC employs 2,750 people, and has a turnover of € 300 million.

There are also several pan-European research institutes operating in the fields of basic and/or applied research which are not focused on the contract market. Norway makes an active contribution to the funding of these institutes, but does not always reap the full potential benefit of its investments. Three of the largest of these institutes are CERN, ESTEC and ESRF.

The largest is CERN (the European Organisation for Nuclear Research), located on the border between Switzerland and France. CERN was founded in 1954, and now employs about 2,500 people. At any given time it also plays host to a considerable number of guest researchers from its member countries.

ESTEC (the European Space Research and Technology Centre), is the ESA's research centre. It is located in the Netherlands and employs 2,000 specialists dedicated to space-related projects.

The ESRF cyclotron is located in Grenoble and focuses on basic research in physics. It employs a staff of 600 people, and in 2009 had a turnover of € 94 million.

None of these institutes carry out research projects under contract in competition with the project-related institutes described in the foregoing. For the most part, they act either as clients or contract partners.

Conclusions and development trends

For the majority of countries where a conspicuous institute sector exists, the sector's participation in EU-related research is proportionately greater than for other sectors. There is a growing awareness of this trend in many countries.

In recognition of the fact that competition for European research funding is not getting any easier, there is a considerable focus on exploiting this advantage.

Basic funding is for the most part higher in most other countries than in Norway. The institutes that enjoy a particularly high level of basic funding have somewhat more obligations in terms of the direction of their research and laboratory activity than is the case in Norway.

Basic funding provides guaranteed running costs and increases the opportunities for success in terms of participation in EU-related research activities. We see the clearest signs of this trend in Belgium, Luxembourg and Spain. Countries with a traditionally weaker institute sector, such as Denmark, Sweden, and perhaps in time also the UK, are now taking initiatives to strengthen the sector. The most conspicuous efforts are those directed towards that part of the institute sector that represents an asset within the innovation system.

A trend is also emerging by which the larger institutes are more successful within the EU system. They are also increasingly working more closely together.

In highly simplified terms, development trends appear to indicate that the big are getting bigger, the specialised institutes are consolidating, and the smaller institutes are finding it difficult to compete for funding that is allocated on the basis of technical and academic criteria.

Our recommendation

Our recommendation to the Norwegian authorities is simple enough: Adhere to your own recommendations as set out in the last two research White Papers and increase basic funding to the institute sector.

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