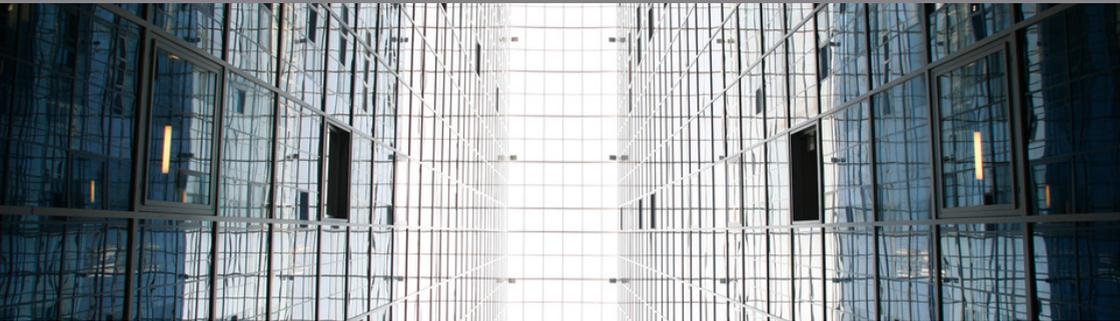




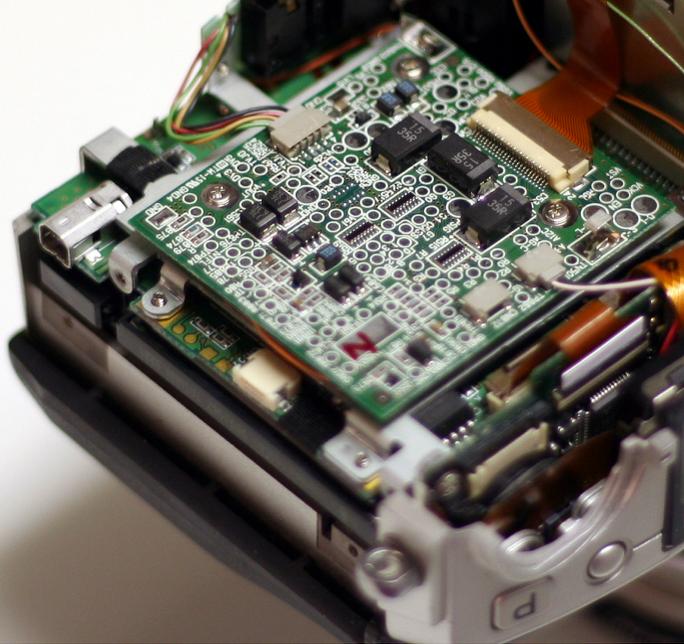
# Analysis of the evolution of the costs of research - trends, drivers and impacts

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## **The following ETEPS member organisations make up the study team:**

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CERIS - Institute for Economic Research on Firm and Growth – National Research Council of Italy (IT)  
CM International (France & UK)  
GOPA-Cartermill (BE)  
Georgia Tech Technology Policy and Assessment Centre (US)  
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## Why the cost of research is important

Over the last two decades research costs have been increasing. Little is known in detail about the underlying drivers of these costs or the trends across different regions, industries, and research fields. Has Europe perhaps become too expensive? Are we losing R&D activities to low cost countries?

For the first time, this study examines the drivers, development trends and consequences of increasing research costs in Europe through original data collection, including comprehensive field research, indepth qualitative

case studies, and scenario development. This study addresses the contention that rising research costs are threatening the competitive position of the European economy; the extent to which increases in research costs stem from an expansion of the volume in R&D activity or rising unit prices; and the responses of companies and Public Research Organisations in Europe to growing research costs.

This empirical information about the development of the costs of research which has been gathered and analysed aims to enhance understanding of the strategies chosen by public and private R&D performers and the effect of policy actions such as the creation of the European Research Area.

## Defining the cost of research

In view of the fact that it is not simple or accurate just to use „R&D expenditure“ trends as an indicator of cost trends, in this study the „costs of research“ have been defined as „price per unit research times volume“. The novelty of this approach compared to the well-known Frascati definition of R&D business expenditures is that it allows us to distinguish between price and volume changes. Furthermore, a breakdown of cost components of research such as labour, capital, management, financing, etc. allows to compare trends over time and across sectors.

### Research Methods

The study with a volume of € 639,300 combines several methods, specifically:

- a literature review synthesizing findings from three distinct strands of academic literature, namely accounting, economics and management
- an analysis of official statistical data about R&D expenditures covering the last 15 years
- a survey of 103 firms from the top 2,000 on the European Industrial R&D Scoreboard
- a survey of 64 public research organisations among the top 500 European Public Research Organisations (PROs)
- 16 case studies of large R&D-intensive companies in Europe (e.g. Philips, BBC, Rhodia, Eni, Rolls-Royce) and 5 case studies of US and Chinese R&D-intensive companies (e.g. Texas Instrument, Ruijie Networks)
- 16 case studies of small and large European Public Research Organisations (e.g. DLR, ELLETRA, INRA, SINTEF)
- a scenario analysis contributed to by experts from private and public research performers

## Main Findings

Total research costs, across all industries, have grown by 47% over the last 5 years. Crucially, the evidence reveals this growth to have mainly been due to the volume of research being conducted (e.g. an increase in the number of researchers) rather than price increases (e.g. increases in the wages paid to each researcher).

This growth will slow down in the next 5 years, although research costs are still expected to grow by 30%

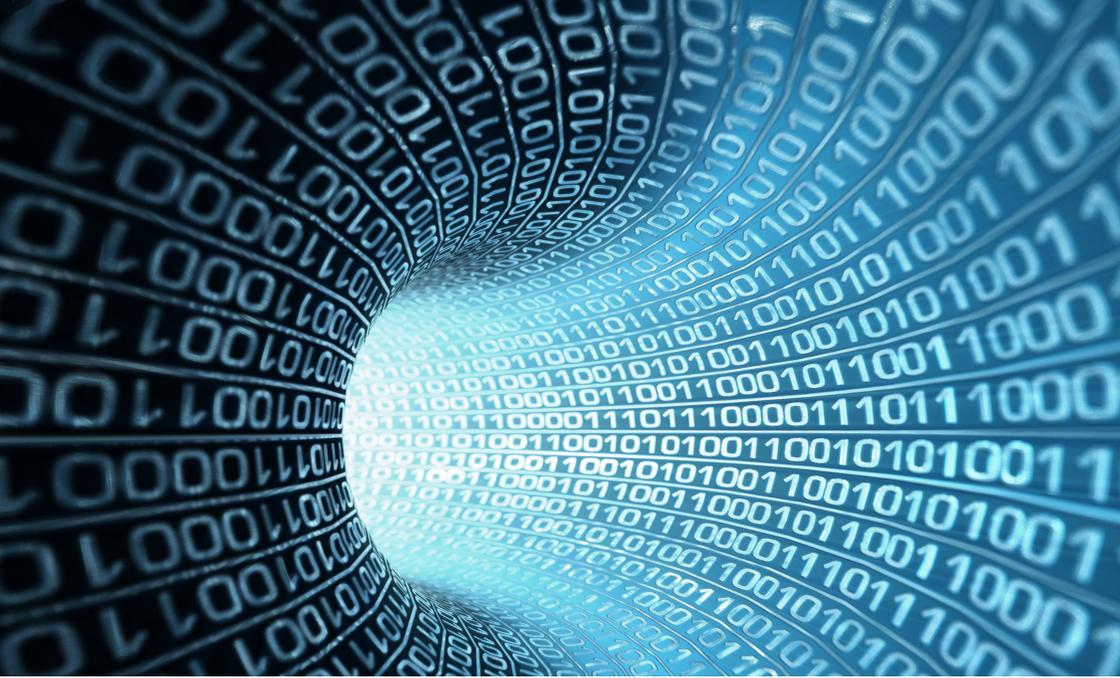
Wage costs are still the most important element of research costs, accounting for 50% of all research costs in companies and 62% of research costs in PROs, but wage costs are not regarded as the most significant contributor to increases in research costs. The evidence also shows that while human resource policies are not explicitly designed to contain research costs, increasing worker productivity is considered as one of the most important strategies to cope with rising research costs.

Offshoring of R&D, contrary to common assumption, is not driven by the opportunity to reduce wage costs in research. Across the globe, the market for highly qualified researchers

has become a global market and the variations between salaries are relatively small as a result.

Capital costs (e.g. equipment, infrastructure) represent the most common element contributing to increases in research costs. Capital cost increases associated with research represented a total percentage increase of about 60%. Clearly, research equipment is becoming more sophisticated and powerful, helping to improve productivity and changing the nature of research. Advanced equipment makes possible research at the leading edge, while simultaneously shaping new methods of research, and the study found this particularly relevant for sectors such as the pharmaceutical industry.

Public Research Organisations (PROs) spend less on capital costs and purchasing research services compared to firms. However, PROs expressed concern about their ability to finance research infrastructure and equipment and to attract qualified researchers. As reported by PROs these factors are compounded because of several important cost-increasing factors relating to a reliance on public funding including costs associated with the applications for research grants, co-ordination costs in EU funded projects and the reporting of research results.



Companies and PROs reported that the increasing complexity of the R&D process is a primary driver of the growth of research costs. Research complexity arises from factors such as the need for multidisciplinary projects, the fusion of technologies and research strategies, the development of platform technologies, and a more sophisticated and comprehensive capability to address technological and socio-economic and environmental issues.

Environmental regulation and product market regulation are significant drivers for increasing research costs. This reflects the demands of society, employees, and customers for safer and more environmentally friendly

products and healthy working conditions and can be further seen in relation to the EU Grand Challenges. However, while legislation in these areas can be interpreted as a cost driver, it may also offer new business and R&D opportunities for firms.

The study results indicate that spending on research was not considered as a cost per se but rather as an investment. Companies may therefore choose very different strategies to cope with rising research costs depending on their view of research as an investment.

The trend towards the internationalisation of research will continue and companies will expand their research

activities in Non-EU-15 countries, US, China, India and other countries.

However, the study clearly shows that research costs play a minor role in corporate decisions about the location of R&D. Instead, market and demand-driven strategies dominate the internationalisation of research suggesting that complementing and augmenting knowledge from research conducted 'at home' may be an important strategy.

Companies are increasingly collaborating with other companies, universities, and research organisations sharing costs thereby reducing the cost of research to individual companies and PROs. These trends imply a further increase in the use of open innovation strategies and new approaches to financing research activities, although companies expect that the costs associated with purchasing research services and financing research will grow.

Research services and financing research will grow. The study provides strong evidence for a changing paradigm of research characterised by multiple and diverse collaborative arrangements, the growth of research services, new funding models, and the evolution and integration of efficient knowledge eco-systems within new business models.

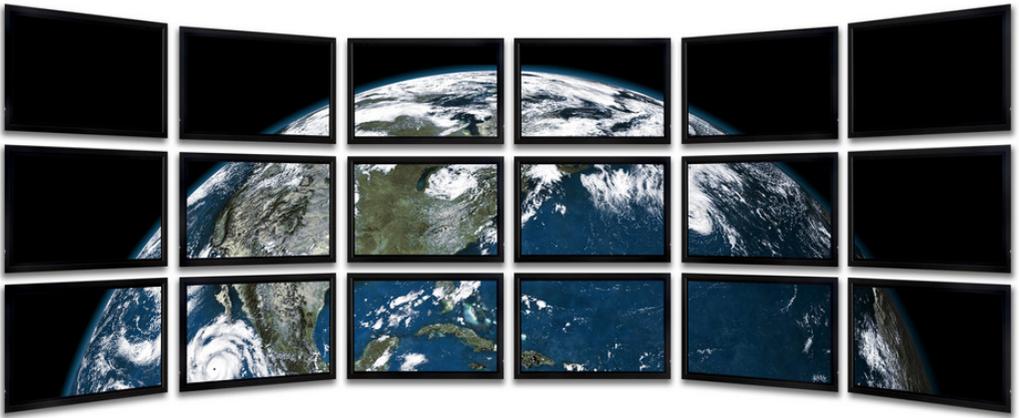
## Policy Conclusions

Designing policies that can effectively manage the cost of research is vital to drive Europe's industries forward.

To remain competitive in a globalised economy, Europe's industries must invest efficiently in facilities, equipment and high calibre staff to perform research at the frontiers of science and technology.

Support for collaborative research while mitigating the costs of collaboration should be a policy aim by developing new structures and tools for collaborative research. While collaboration can significantly reduce the cost of research by reducing risk, sharing costs and allowing expertise and capability to be distributed in a network, they can bring new costs into focus that policy should continually seek to identify and mitigate.

Research policy should continue to focus on improving the quality and excellence of research. Research choices are driven by return on investment rather than by the direct cost of research. The focus in Europe of improving the quality of research conducted and the outputs, rather than focusing on the cost of research inputs, remains appropriate.



Policy should strengthen the ways in which the returns from research spending abroad can be appropriated in Europe. Global firms are able to exploit positive spillover effects from research done outside the EU providing the opportunity for 'reverse technology transfer' to emerge as a positive feature of geographically dispersed R&D.

Specific programmes are needed to cover the different demands and types of infrastructure in PROs. Despite initiatives, at the European level, to fund research infrastructure for PROs the challenges faced by publically funded research performers can be exacerbated by the almost constant need to collaborate, attract the best researcher and to invest in leading edge equipment.

The benefits from regulation can stimulate research directed towards societal challenges. While legislation in environmental areas can be interpreted as cost drivers, such legislation also offers new business and R&D opportunities for firms but this will only be achieved if there is a harmonising of regulation across Europe.

The development of a European Research Area which promotes competition on research excellence, is important to address the fragmentation of research and create truly European centres of excellence, in order to attract more R&D activities from Non-EU companies.

For more information visit: [www.etsps.net](http://www.etsps.net)

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