

# SUMMARY

## Background

The 'Value of Research' Committee was set up by the Royal Netherlands Academy of Arts and Sciences to explore the economic value of research. Its ultimate aim was to investigate whether instruments can be developed to measure the return on investment (ROI) of research. The underlying idea was that a model capable of measuring the influence of research policy on the economy can also show whether such investment is in fact valuable.

Although the Netherlands has a long tradition of macro-economic modelling and advice, existing models that estimate the effects of election programmes often have a limited scope and capacity for measuring the effects of research. For example, the Netherlands Bureau for Economic Policy Analysis (CPB) includes expenditure on research in its forecasting estimates of election programmes, but it does not quantify the economic benefits of this investment in research.

## General findings

In order to clarify the sort of instruments needed to calculate the ROI of research, it is important to have a clear idea of the 'value of research'. In the Committee's view, that value goes far beyond the purely economic value represented by research's measurable contribution to gross domestic product (GDP). After all, research traditionally involves the search for better, more comprehensive explanations, often driven by curiosity and the need to understand unexplained phenomena. Research often acts as a guidepost in that regard, and helps solve the problems of society. Its roles in this context are difficult, if not impossible to quantify, particularly in the short term.

Much of the wider value of research cannot be quantified according to current econometric principles. Other methods will need to be found, some of which will be more qualitative in nature. The Committee believes, on the one hand, that there is almost irrefutable evidence of that wider value – in the most extreme case, can we imagine the state of the world and the economy *without* research? – and, on the other, that there are already basic methods for identifying that value more precisely. For example, we can assess the ‘market value’ of research by linking macro-economic public and private expenditure on R&D to GDP. Although this method does not analyse the short-term effects of specific research policy measures directly, it can help clarify the long-term importance of knowledge for the Dutch economy. That importance is most clear in the Netherlands’ ability to absorb knowledge generated either within its own borders or elsewhere in the world, and to apply that knowledge in new ways.

## Structure of the report

This survey report consists of four chapters. Chapter 1 explains the Committee’s choices in its analysis of the value of research. Because the Committee focused specifically on the effects of research as expressed in the Netherlands’ GDP, that analysis does not cover the additional contributions that research makes to prosperity above and beyond GDP. That is why Chapter 2 begins with a broader survey of the value of research. It identifies four functions of research, which elucidate the enormous value of research and the great benefits of public investment in knowledge related to such common goods as renewable energy, sustainable public transport, clean water, food and health. Such benefits do not always express themselves in productivity gains, but rather in much broader returns on investment, for example improvements in the quality of life. When viewed from this vantage point, research is a broad, diverse phenomenon that is difficult to confine to specific categories. Research results depend on many different factors, making them difficult to predict.

After this broad exploration of research in Chapter 2, Chapter 3 surveys the empirical economic literature. This overview reveals that there are in fact scientifically sound methods for understanding the value of research in terms of its effect on GDP. The Committee observes that there have been very few micro-econometric studies measuring the impact on economic growth of public investment in research. In its view, however, the very absence of such studies makes clear that the customary micro-econometric methods cannot be used to demonstrate the macro-economic effect of research investments that produce positive externalities, but no financial gain. The Committee therefore recommends starting with a macro-economic approach that can analyse the effect of research on GDP. This is largely consistent with the methods used by CPB when calculating the impact of investment on education. A macro-economic approach also has its limitations, of course, but in the Committee’s view, it may be vital to clarifying the importance of knowledge for the Dutch economy. That importance is clearest in the Netherlands’ ability to utilise and absorb knowledge generated within its own borders or elsewhere in the world.

Although the Committee's findings in this survey report are mainly reflective in nature, they can nevertheless lead to a number of general conclusions of practical use for government and research organisations. Chapter 4 looks more closely at those conclusions.

## Conclusions

Based on its survey study, which focuses on the economic and financial value of research, the Committee has reached the following general conclusions:

1. Research has irrefutable value, which can be measured directly in its contribution to GDP (and GDP growth) and in the broader economic and social arena. Thanks to research, people today live longer, are more prosperous than ever before in history, and have more opportunities in life than previous generations. Science and technology have become an intrinsic part of our daily lives and are crucially important to our material and immaterial prosperity.
2. CPB's macro-economic estimates are highly valued; they play an important role in the national debate on policy. Given the importance of that role, CPB and policymakers have an obligation to identify the limitations of such estimates. CPB's macro-economic models do not offer an all-encompassing view of the economy, especially in so far as they focus on short-term policy analyses. In some cases, an all-round view is still scientifically impossible. In other cases – and in the Committee's view, such cases include research policy – relevant literature and data are available to begin an in-depth econometric study on the value of research.
3. The Committee believes that interpretations of short-term models should make more allowance for analyses measuring the effect of public investment in research. CPB could state the limitations that it has encountered more explicitly, and indicate the potential effects on GDP of past investment in research, so that policymakers are aware of the consequences of short-term decisions. It is essential to understand that the effect of research policy can only be usefully evaluated in the long term; that is where the effect is felt. If research policy is analysed only by looking at its short-term budgetary effects, the political discussion becomes too one-sided. The aim should be to explore the extent to which the positive long-term effects of research and public R&D can be integrated into policy analysis and political discussion.
4. There are plenty of empirical studies available that link public and private expenditure on R&D to GDP growth at the macro-economic level. These provide sufficient evidence that the economic value of research can be measured and analysed. It is understandable that the elasticities found in these studies vary; this is, to some extent, the result of spill-overs, serendipity, and variations in policy and in the broader innovation system. The first, vital step towards developing a set of instruments to quantify the influence of public investment in research is to carry out an econometric study focusing on the Dutch context and systematically comparing different model specifications over a longer period of time.

5. Quantitative studies exploring the value of research do not make allowance for much of the broader economic and social value of research because that value is difficult to quantify, especially in the short term. The value of research is not limited to its present or future contribution to GDP, and only part of that value lies in its productivity effects. It is much more difficult to measure the overall economic and social value of research. One important task for the Academy and other organisations is to explore what is meant by research (and the value of research); they can do this by bringing together researchers from different disciplines to discover methods that can help us understand the broader value of research.
6. Research is valuable worldwide, and scientific knowledge that is relevant for the Netherlands is not generated in the Netherlands alone. However, if we are to make use of scientific knowledge generated abroad, we need absorptive capacity. It is precisely because the Netherlands is a small country that it must continue investing in research, both to generate and maintain new knowledge itself and to remain capable of absorbing knowledge generated in other countries. That is why the role of absorptive capacity must be taken into account in the quantitative analysis of research policy. For a better understanding of the value of research, we need more insight into the precise *modus operandi* of knowledge-sharing and the necessary absorptive capacity.