B-HERT Position Paper No. 3

The Case for Additional Investment in Basic Research in Australia

A Policy Statement

April 1999

"We must recognise the knowledge based nature of the economy."
"Technology contributes to economic performance by helping to create more good jobs."
Employment and Growth in the Knowledge-based Economy, OECD, 1996.

In the decades to come knowledge will increasingly be the driving force of our economy and our way of life. A prerequisite to the development of knowledge is research in all its aspects.

The Business/Higher Education Round Table (B-HERT) sees investment in research as an investment in Australia's future.

In this context –

B-HERT welcomes The Australian National University Paper 610/1999, The Case for Additional Investment in Basic Research in Australia, as a constructive contribution to the development of policy on research funding in Australia. B-HERT endorses the proposition put in the paper that the opportunities for Australia to participate in and profit from the current revolutions in information technology and biotechnology are at a maximum over the next few years. B-HERT also endorses the case put in the paper that Australia will only be able to do so if the levels of public funding for research in Australia are increased to keep pace with the substantial increases taking place in many leading OECD and Asian countries.

B-HERT emphasises that increased public funding for university research must be new Budget funding and not a re-allocation within existing funding in the higher education sector.

B-HERT notes that pure basic research, strategic research, applied research and experimental development are interacting activities within the spectrum of research undertaken by universities. Additional support for university research should be seen as contributing to the government's broader strategy for supporting the full spectrum of research and innovation in all performing sectors. No part of this spectrum can be neglected if the full economic benefit of the research and innovation activities of our universities is to be realised.

B-HERT recommends The Australian National University paper to government as a basis for its policy of harnessing knowledge for Australia's future economic development.

THE CASE FOR ADDITIONAL INVESTMENT IN BASIC RESEARCH IN AUSTRALIA

International Developments

In the latter half of this decade many OECD governments, including the US, Japan, Germany, UK and Canada, have recognised public investment in basic research as essential for economic development. Emerging Asian economies, despite the setbacks of the recent financial crisis, are maintaining growth in public investment in R&D including basic research. All these countries have provided additional funding for basic research despite competing budget priorities.

Much of the economic growth in this decade is attributable to the growth of knowledge based industries particularly those associated with information technology and biotechnology. The ascendancy of the US in the 1990s relative to Japan and Europe has been attributed to its unwavering commitment to supporting basic research through the earlier decades. Although Japan's strategy of exploitation of imported knowledge seemed a winning one at the time, it has ultimately failed, a fact now widely recognised in Japan.

Returns on investment in R&D

Returns on investment in basic research over the next decade are expected to be even greater than in the 1990s. Completion of the sequencing of the human genome scheduled for 2003, for example, will provide unprecedented opportunities for growth in biotechnology industries for countries able and willing to position themselves. Australia is one of only eight to ten countries that have this capability. Continuing rapid advances in information and communications technologies provide immense opportunities for nations prepared to exploit them.

The benefits of basic research are difficult for private investors to retain for themselves but are spread throughout the community. Estimates of the private rate of return on private R&D investments are in the range 7% to 43%, and of the social rate of return are in the range 123% to 270% per annum. In September 1998, a US House of Representatives Committee on Science acknowledged evidence that 49% of economic growth can be attributed to technological progress.

It has been estimated that the optimum level of R&D investment in the US economy is four times greater than the current level of private investment. Public investment complements and stimulates private investment. Additional funding for research announced by the German Government in the 1999 Budget is intended in part to stimulate private investment.

Australian situation

Basic research as a proportion of all research has been in decline in Australian universities since 1992. 60% of all basic research in Australia is conducted within universities, a much higher proportion than in most other OECD countries. The value of block grants currently available to universities is effectively 15% less than their 1996 value due to funding cuts and unsupplemented wage and salary increases. This has impacted negatively on the resources available for research and research training.

Research equipment costs have been rising rapidly. UK funding increases for basic research recognise this trend. There is evidence that these cost increases in a situation of flat or decreasing funding is driving Australian researchers out of areas where they were previously internationally competitive. The impact of Australian research, as measured by how often the resulting publications are quoted by researchers internationally, has been declining since the mid-1980s.

Despite these difficulties the quality of Australian basic research and research training is still internationally competitive in some research fields, such as geosciences, computer science, agricultural science, biological science and medical sciences. Many of these in turn draw on strength in basic chemistry and physics. Australia's competitiveness will decline rapidly unless measures are taken to relieve the current pressures resulting from the widening gap between available funding and required resources.

The windows of opportunity to benefit from the current revolutions in information technology and biotechnology are at a maximum over the next few years. Entering the field at a later time will take greater investment and the available benefits will be diminished.

What Australia needs to do

To take advantage of these opportunities, the Australian government could provide substantial additional funding comparable to the increases recently provided in competitor countries. For example, an attempt to achieve the same increase as in the UK on a percentage of GDP basis, could see an additional $350 million per annum for basic research facilities and projects in Australia, predominantly in the universities. These funds could be applied to the following:

- ♦ Consistent with national research strategies, the development and continued support of major research facilities in Australia, the collaborative development of facilities in Australia and elsewhere, and gaining access to overseas facilities
- ♦ Improvement within the universities of the quality of the infrastructure for basic research
- ♦ Attraction by universities of the best researchers to Australia and retention of the best researchers in Australia through the establishment of research positions and teaching & research positions that are internationally competitive
- ♦ Strengthened career opportunities in Australia for outstanding young researchers through increased numbers of postdoctoral and other categories of fellowships; and
- ♦ Relief of the funding pressure on competitive granting programs to ensure that grant numbers and sizes are internationally comparable.

Providing this funding support will ensure that Australia does not miss these windows of opportunity and will deliver the following benefits:

- ♦ Improved employment opportunities through growing small and medium businesses that exploit the knowledge generated through basic research.
- ♦ Attraction of more multi-national corporations to locate regional headquarters and high technology manufacturing operations within Australia, bringing enhanced employment opportunities in those sectors.
- ♦ Improved capacity to access knowledge and technologies generated in other advanced countries.

- ♦ Enhanced reputation for producing world class research and research graduates, increasing their global employment options.

As in the case of UK, where substantial funding increases for research were provided within the context of a Competitiveness White Paper, Australia needs to ensure that additional funding is provided within a broader policy framework. Such a framework should ensure maximum returns from this investment through diffusion of knowledge to industry and community, improving the skills level of the workforce, encouraging organisational culture change and collaboration, and promoting competition.

The above is an Overview of the complete paper (16pp) and attachments (12pp) which can be obtained from Professor Deane Terrell, Vice-Chancellor, The Australian National University, on 02 6249 2510.

WHAT THE REST OF THE WORLD IS DOING

The following case studies demonstrate that there is a paradigm shift taking place in many OECD and leading Asian countries at the highest levels of government. It is the realisation that knowledge and its applications is now the major driving force of economic performance and that there is an important facilitation role for government consistent with the diverse and dispersed benefits of public investment in the generation and diffusion of knowledge.

The case studies have been extracted from a briefing paper prepared by Professor Deane Terrell, Vice-Chancellor, Australian National University, and submitted to the Prime Minister and related Federal Ministers in early March, 1999.

Japan: a long-term commitment since 1996 to increased public investment in basic research

Japan provides the most striking example of recognition that importing knowledge and building high technology industry through applied R&D is not a sustainable strategy for economic growth and prosperity. Despite Japan's enormous success in the 1970s and 1980s based on the earlier strategy, it is now widely recognised in Japan that current US ascendancy in technology based economic performance is due to its long-term

United States: continuing the tradition of commitment to basic research

Since WWII the US has maintained world leadership in basic research.

Support for non-defense R&D has fallen from 1% of GDP in the 1960s to 0.4% in the 1990s. Federal Budget share of non-defense R&D has fallen from 5.7% in 1965 to 1.9% in 1997.

It is notable that in this environment the basic research share of Federal R&D support has increased from 18% in 1992 to 21% in 1997. The NSF budget, representing a significant share of basic research support, increased in 1999 by 7.1% and the 2000 Budget request is for a 6.9% increase. The National Institute of Health budget increased 15% in 1999 and the budget request for 2000 is for a 2.1% increase. This is largely explained by the fact that the US administration and legislature continue to express strong support for the public funding of basic research as a key to the nation's future prosperity.

United Kingdom: major funding boost for S&T, measures to strengthen innovation

In 1998, the UK Government announced £1,107 million additional funding from Government and £400 million from the Wellcome Trust for research infrastructure and research grants in priority areas over the three years 1999-2001. The British Prime Minister has noted that his government has found new money for science and the universities because the UK's future success depends on knowledge and innovation.

The 1998 Competitiveness White Paper, *Building the Knowledge Driven Economy,* states the policy framework and announces the funding required, including the above funding, for strengthening capabilities, encouraging collaboration and promoting competition.

Canada: a transition from commodity exports to high-technology industry

Science is playing a key role in Canada's transition from an economy dependent on commodities and exports to one based on knowledge and technology. During this momentous change, the industry is experiencing shortages – sometimes acute – of scientists in fields ranging from computing professions to information technology and health and biotechnology.

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The Japanese government has responded to this new understanding of the crucial role of basic research by enshrining the Science and Technology Basic Law. The S&T Plan of 1996 based on this Law has committed Japan to doubling its investment in basic research between 1996 and 2000. Total R&D spending by the Japanese government in this period is a projected ¥17 trillion or US$155 billion. The Japanese government's budget decisions for 1999 confirm that the planned increased investment is on track despite the considerable difficulties experienced in recent years by the Japanese economy.

Singapore: leading the world in competitiveness ranking by integrating knowledge, technology, infrastructure and business

The World Economic Forum and the World Competitiveness Scoreboard of the Institute for Management Developments consistently rank Singapore first or second in the world in competitiveness measured on the basis of a range of factors including science and technology and infrastructure. Singapore now boasts over 60 research scientists and engineers for every 10,000 persons in the workforce, ahead of most OECD countries. Underpinning these achievements is a long-term commitment to public investment in science and technology.

In the year 2000, Singapore will conclude its second 5-year S$4 billion National Science and Technology Plan. Singapore has also announced plans to build a S$5 billion Science Hub. The decision to build the 176 ha facility, in addition to the two science parks in existence was announced last year. When completed it will be the home for over 200 high technology companies and will include the presence of world class institutions such as INSEAD and Johns Hopkins University. Singapore also continues to make strategic investment in research infrastructure. It has announced plans for a second major national high performance computing and communications facility and a new synchrotron light source to be used by both academic and industry researchers.

South Korea: commitment to S&T in the face of financial adversity

Despite the severe impact on South Korea's economy of the recent Asian financial crisis, its government has approved a five-year Science and Technology Innovation Plan designed to increase government-funded research and development to boost economic growth. The South Korean government will increase R&D expenditure from 3.9% to 5% of total government expenditure by the year 2002. This is an increase of at least 28% in a four-year period.

Canada: transition from commodity export to high-technology industry

Science is playing a key role in Canada's transition from an economy dependent on commodity exports to one based on knowledge and technology. During this moment of structural change, the Country is experiencing shortages – of scientists in fields ranging from computing and professions to information technology, health and biotechnology.

It is widely expected that the Federal Government of Canada will allocate some of its substantial budget surpluses, an estimated Canadian $70 billion, as investment in science and technology. Canada has a major concern in relation to losing its highly skilled workforce to more attractive employment opportunities south of the border in the United States. The increased investment in science and technology is in part being directed to create incentives to retain the highly trained younger Canadians in employment within Canadian research institutions, government and business.

Finland: a knowledge-based society

The Government of Finland considers that knowledge and know-how are central to economic growth, employment and social welfare. They create a basis for better incomes and intellectual growth. Consistent with this approach, Finland has consistently increased its total R&D expenditure from both public and private sectors since before 1985. As a proportion of GDP, expenditure on R&D in Finland has risen from about 1.5% in 1985, to 2.35% in 1995 and 2.7% in 1997. The Government's goal is to increase R&D expenditure to 2.9% of GDP by 1999.

Government support for R&D through Tekes, the Technology Development Centre of Finland, substantially increased in 1997 over the previous year. In information

France: major investment in science and education for the third millennium

The French Government in 1998 announced plans for a higher education and research development project to be called the University of the Third Millennium (U3M). U3M will be organised along the same lines as the earlier program University 2000 (U2000) with a funding level of FF42 billion (US$7.4 billion). U2000 resulted in the construction between 1988 and 1992 of about 1.3 million square metres of university space. The new U3M program will be funded to at least the same level as the U2000 program and will focus on research infrastructure including high-speed computer networks and new biotechnology centres.

Germany: promotion and funding of research a top priority of the new government

In January 1999, the German Cabinet has provided an additional DM904 million in the Budget of the Federal Ministry of Education and Research, a 6.4% increase on the previous year, declaring the promotion and funding of research to be one of its top priorities. The government has appropriated DM3 billion to supplement current S&T projects and to establish new strategic research projects in the areas of health, employment, work and technology design, biotechnology, information technology, environment, and transport.

Germany industry reduced investment in R&D during the first half of this decade and reversed this trend increasing investment between 1995 and 1997 by 10%. The government believes that a better performance on investment in R&D is required for Germany to make a successful transition to becoming a knowledge-based society. The additional public investment is in part intended to stimulate further investments from German industry.

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Government support for R&D through Tekes, Technology Development Centre of Finland, substantially increased in 1997 over the previous year. In information technology, 1997 funding is FIN611 million, a 37% increase on the previous year, and in biotechnology, chemistry and environment, funding is FIN535 million, a 74% increase on the previous year.

MEMBERS OF THE BOARD

MISSION STATEMENT

The purpose of the Business/Higher Education Round Table (B-HERT) is to pursue jointly initiatives that will advance the goals and improve the performance of both business and higher education for the benefit of Australian society.

It is a forum where leaders of Australia's business, research and academic communities can jointly examine important issues of mutual interest, to improve the interaction between Australian business and higher education institutions, and to guide the future directions of higher education.

In pursuing this mission B-HERT aims to influence public opinion and both government and non-government policy on selected issues of importance.

B-HERT believes that a prerequisite for a more prosperous and equitable society in Australia is a more highly-educated community. In material terms it fosters economic growth and improved living standards - through improved productivity and competitiveness with other countries. In terms of equity, individual Australians should have the opportunity to realise their full social, cultural, political and economic potential.

The membership of B-HERT comprises, by invitation, the chief executives of major Australian corporations and research organisations, and the vice-chancellors of Australian universities.

B-HERT pursues a number of activities through its Working Groups, State Chapters and active alliances with relevant organisations both domestically and internationally. It publishes a regular newsletter (B-HERT NEWS), reporting on its activities and current issues of concern relevant to its Mission.

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