



OFFICE OF THE PRIME MINISTER'S SCIENCE ADVISORY COMMITTEE

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Clearly there is a more intense focus on the role of science in New Zealand's development than there has been for two decades. There is a shift in thinking and in particular a growing realisation in Government that science expenditure must be seen as an investment in our country's future rather than viewed as a cost. I discussed many of these issues in a recent article in *Boardroom* magazine.

Studies by the OECD show a remarkable relationship between a nation's investment in RS&T and productivity: nations that invest more in RS&T are the most productive. While in the past it has been argued that this relationship reflects the fact that more productive countries can afford to undertake more RS&T, the international and very strong consensus is that there is a causal relationship in the other direction, namely that investment in RS&T drives innovation and productivity.

That is why despite tough economic times many nations including the UK, USA, Denmark, France, Germany, Australia, Japan, Korea, Singapore and China have in the last 12 months announced marked increases in their public investment in research, science and technology and in the tertiary education sector in which so much public research is undertaken.

As a whole, we spend only 1.2% of GDP on research, about half of that from the public sector, and half of that from the private sector whereas comparator nations spend somewhere between 2 and 3 times that amount. Of particular concern is our low expenditure from the private sector although there is evidence that investment in the public sector leads the way.

If we just compare ourselves to Denmark, a nation of similar size and with a strong agricultural sector. In 1980 we and the Danes invested very similar amounts in research, science and technology. At that time we also had a similar GDP, slightly above OECD average and similar levels of productivity. The same was true of Australia. But between 1980 and 2010, if we were to have spent at the same rate as the Danes, we would have invested an additional NZ\$35 billion in science than we have and at least 50% of that would have come from the private sector. In terms of an Australian comparison we would have spend an additional NZ\$25 billion.

And what has happened? In part, I would argue, because of that investment gap, Denmark's labour productivity more than doubled while ours has risen by much less, Denmark's GDP remained well above the OECD average while ours fell from 120% of average to only 75% of average.

We need to consider why we have such a low investment both from the public and private sectors. We need a frank and urgent national discussion on addressing this problem. At the heart of it I think we have a very deep cultural issue. Have we have been seduced by our national mythology – myths like the number 8 fencing wire, punching above our weight? We celebrate innovation yet the recent reports of the OECD and the New Zealand Institute show that we are not particularly innovative. Has our strong egalitarianism led us as a country to deprecate that intellectual activity which has been projected as elitist? Is it that over time we have built up a pattern of spending which means that shifting expenditure towards a productive area when there are long delays before return such as R&D becomes difficult, against the frame of short electoral cycles?

We also need to ask why is it that our private sector spend on RS&T is so low? Could it stem from the chronically low public sector investment dis-incentivising the private sector from seeing RS&T as exploitable because there has just been insufficient ideas flow? It is also argued, I think cogently, that the private sector will not invest until they see a sustained public commitment towards infrastructure and training and culture change. Has it been that the incentives in the public research sector drove it to an inappropriate degree of focus on late stage application rather than knowledge generation and knowledge transfer and this either displaced private sector investment or competed directly with the private sector? There is evidence that has been the case. Could it be that the New Zealand private sector is too focused on short term returns through commodity cycles and property rather than long-term growth? There are exceptions – look at Weta Digital and Fisher & Paykel Healthcare.

Given the quality of science and engineering education in New Zealand, we clearly have a large unexploited potential for knowledge based industry growth but clearly there is an issue of the availability of investment capital and the commitment of the New Zealand shareholder to more speculative investments or those with a longer term return. Perhaps some of the heralded changes in the tax system might assist a necessary shift in mindset.

There are many more issues – one of particular importance to this audience is that of the interaction between the public and private sectors. Universities and CRIs have been so competitive and been so driven by their own bottom line considerations that they have confused their core role of being ideas generators with that of being their own ideas exploiters. Excessive competition has hurt rather than helped. We have very few people skilled in knowledge transfer, we tend to work as lots of small individual operations rather than going to scale by combining expertise. Our skill base in managing and developing the knowledge based sector and in learning how to take it to scale internationally needs enhancement. This issue is occupying much of my time.

A complex area of policy formation is the issue of the role of the State in promoting private sector R&D directly. The issues go beyond affordability and include issues of principle – for example should it be a broad entitlement through tools such as tax breaks – or is a more expansive discretionary grant-based approach needed?

Incentives operating in our public research providers lead them to focus on institutional health rather than seeking synergies through inter-institutional activity. That is why the Government has embarked on a program of change starting with the CRIs. There is a need to develop a more “New Zealand Inc” approach and give priority to exploiting the latent synergies that exist across institutions. This is a fundamental shift in thinking beyond pure competitive models that have driven our research system for the past 20 years. It is not generally appreciated that our system is much more competitive and less strategic than that of other countries and that a highly competitive but poorly funded system of research is likely to be highly conservative.

Cutting edge research is based on two core capabilities; infrastructural and human. Sadly too many of our best scientists and technologists have judged the climate for research and innovation based careers in New Zealand as non-competitive and we have much work to do to reverse this trend. There is much to do here as the global competition for scientific talent continues to get more aggressive. There are areas where major research infrastructures are needed. We do not have a clear approach to publically funded infrastructure and what principles it should operate under. How should it link to the private sector? Can we achieve better national - and in some cases international - coordination? Work is underway to address these questions.

Seeing where that productivity growth will be is complex, for we face the peculiar challenges of distance, size, and lack of internal markets. We have to become clever about using our resources – our well educated people, our ability to grow grass and ruminants, our clean water, our minerals, our closeness to Australia, our strengthening umbilical cord to Asia. We have to work out where will our capacity to export will really grow – will the food industry in 20 years be focused more on food for health, what can we do with our mineral resources, how should we respond to global warming, how can we export services better, what will be the role of advanced ICT? We need to become clearer about that science we can do well on our own and that where taking it to scale will require partnerships from an early stage. Will we do better trying to grow a hi-tech industry on our own or, in an age of parallel discovery, will we do better by partnering from the discovery stage?

But let me now turn to a direct focus on the Institute of Directors. The mix of skills at the board table is a concern: few scientists, academics or technologists are appointed to Boards, be it of public or private companies. The type of analytical and lateral thinking that they bring can be of immense value and their appreciation of the innovation process can be of great value. The few scientists and academics on Boards in New Zealand tend to be found only in companies directly related to their technical expertise whereas in many other economies such individuals make important contributions well outside their narrow disciplinary expertise. The inherent scepticism of scientists and their capacity to ask fundamental questions gives them a value distinct from that of other disciplines, including engineers.

But two matters you need to consider are firstly the problem of founder-scientist capture in start-up companies. This requires that the other Board members must have the skills to assess science and its development plans. Too many of our start-up companies have had too narrow a skill base.

Secondly there are different types of personality in science and not all, no matter how good they are as scientists, make for good Board members. The strategies for the business of science are different to being an expert in a narrow area. You need the lateral thinking intellectually entrepreneurial and strategic individuals on your Boards and such people would contribute well on any company Board. Skill diversification would be of great value. Their international perspective adds another dimension. We need to work together to find such individuals and up-skill them to meets the needs of the private sector, and we need to work with you so you can see the value such individuals would bring.

Such Board members can also play a major role in bridging the cultural divide. University and CRI researchers live to different rules and incentives to those in the private sector. Time horizons are different, the linearity of objectives is much less for the academic. Relative to other countries we have little churn between the public and private sector and we need to find ways to enhance that churn. As a result, companies tend to come to researchers late to solve a particular problem rather than an early dialogue about where science is going and how it might transform their firm.

There is currently much reflection on how to advance New Zealand both economically and in the broader social domain. Already the Government has identified science as an important element in our next phase of development. Indeed science will be key to transformation of our economic base while protecting our primary sectors. A number of initiatives are underway. Support of initiatives such as the global research alliance on greenhouse gases in agriculture and the Square Kilometre Array (SKA) proposal in partnership with Australia indicate the potential that New Zealand science has to play in protecting and developing New Zealand's position in the world.

Government is stepping up to the plate – it is important that the private sector recognises the essential role that knowledge formation will play in its own development – it too must invest.

Thank you.