

Technology and computing

Research and development: Does NZ really

THE argument that "we don't really need much research in New Zealand, we can buy what we want from overseas", is a good colonial attitude that we are just a poor, inferior, offshoot of great overseas powers.

Surely we cannot do it here as well as they can do it overseas.

A more rational reply to the question consists of several parts:

- We can usually do research for a lower cost than overseas;
- We have the ability to do first-rate research;
- R & D for overseas interests is a good source of employment;
- The research we want may not be for sale;
- Overseas research may not take into account important local factors;
- We need expertise even to know what to be asking of others;
- There are co-operative programmes where we can supply missing data;
- Frequently research shows

up unexpected opportunities;

- We cannot have a high standard of living without more research;
- We need research even to maintain our competitive position.

First, it should be made quite clear that nobody is advocating self-sufficiency in R&D. No country can attempt this, not even the superpowers. Rather the argument is that in the modern world it is essential for countries like ourselves to be active in research if we are to maintain, let alone improve, our standard of living.

Labour costs are usually the largest single cost in research. If we need research on a continuing basis then it will be cheaper in New Zealand, particularly since last year's devaluation. New Zealanders, given the opportunity, have shown that they can do the work as well as anyone. It does

Last week David Penny reported that New Zealand was 17th out of 20 OECD countries in the percentage of GDP spent on research and development. We spent about 0.88% of our GDP compared with the average of 2.01%. In this second of four articles, independent and university researcher Penny examines the consequences of reduced R&D in New Zealand.

not make economic sense to commission ongoing research overseas when we would pay United States and European labour costs.

The evidence does support the high standard that can be reached here in that scientific results, published either in New Zealand or overseas, have become core references in their fields. We all know success stories in both applied and basic areas of research.

The danger was that we generalised from these cases to assume that everything was all right. The problem has been that our total commitment to R&D has been low, rather than

lacking good research.

An interesting consequence of the previous two arguments is that we should be seeking to do research within New Zealand for overseas interests. Already there are some small projects examining native plants and seaweeds for chemicals that may have medicinal value.

The largest project may be in computing with the "Link" system. Perhaps the major limitation for this strategy is the poor graduate education in the universities but the necessary reforms could be carried out quickly and for only a small cost.

Much research can be done at a lower cost in New Zealand for overseas clients. What we need is leadership to organise it and any action in this area will depend on people going out and selling the idea.

Usually a company wants to exploit their own discoveries while they are still new. This applies for example with pharmaceuticals and manufacturing.

In many cases we may only get the chance to use the research results when the main benefits have been realised and competition is reducing the rewards. At this later stage cheap labour is an advantage and this seems to be the strategy we are adopting. Figure 1 shows how the United States relies on skill as an economic strategy, exporting high value goods and importing low value goods for which cheap labour can be used.

More research expenditure is the "high value added" approach to an economic strategy; devaluing until our labour is cheap by world standards is the third world approach.

In addition, it is essential to have competent and reliable New Zealanders who have the technical knowledge of current work in a field to help evaluate plans. Scientists are born optimists and I pity the director or government official who has to evaluate the technical merits of a very interesting but new scheme.

It is difficult for most non-active researchers to evaluate what is currently realistic in a technical field. Many people think that New Zealand wasted millions of dollars over the first major computer for the Health Department; we had to rely on enthusiastic overseas consultants.

A major disadvantage of research completed overseas is its lack of local information. Obvious cases are work on New Zealand geology and on the native animals and plants. However, the requirement is much larger than this. Varieties of plants must be bred for our climate, whether in agriculture, horticulture or forestry. Much progress has been made in understanding nutrient deficiencies in our soils.

There are also other areas like developing our own resources such as timber for construction, and designing buildings to withstand earthquakes. Developing geothermal

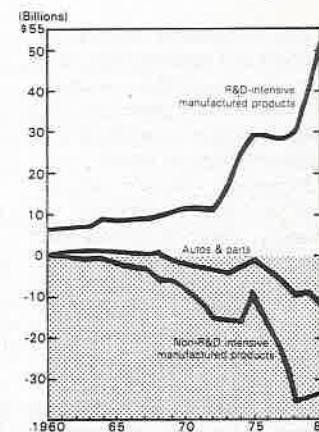


Figure 1. United States trade balance in R&D intensive and non-R&D intensive manufactured product groups. Cars and car parts are taken separately because (according to the United States) they "only became R&D intensive in 1980" — pity nobody told the Japanese! One economic strategy is to sustain high labour costs and a high standard of living by a policy of high R&D.

power is another important example. Thus in many cases we are forced to carry out the work here.

A related observation is that sometimes we need to supply local figures to help obtain a world pattern. One obvious example is weather and climatic research. We expect a marked improvement in the world models and prediction in this area of research (even if it will not improve the weather itself!).

This is only one of the fields where, in return for data from New Zealand, we get access to far larger amounts of both data and results.

Unexpected benefits can arise from research programmes. Recent discussion of research policy in western nations has emphasised the necessity of a strong basic research programme. This is certainly more so than 10 years ago when there were still those who honestly doubted the usefulness of basic research.

Over the last decade several important areas of basic research have had, or are about to have, major impacts. These include much of computing, plant and animal tissue culture, genetic engineering, and NMR imaging systems in medicine.

Nearly all countries (except Britain and apparently New Zealand) are stressing the importance of basic research as part of a total research and development package. Problems can arise in either area and in practice ideas then flow between basic and applied areas (this will be discussed again in next week's article).

For most countries, their cur-

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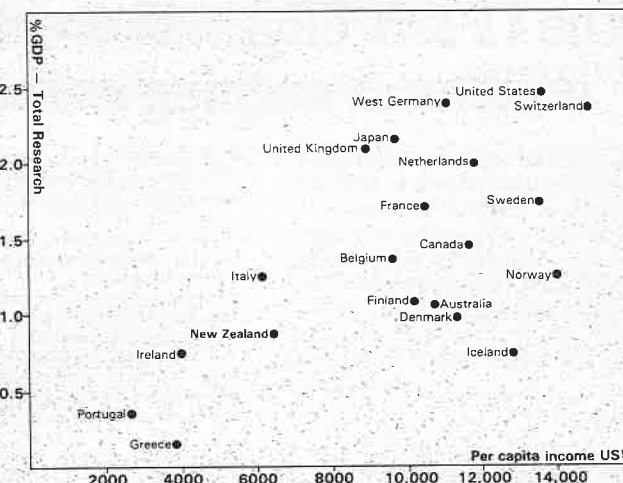


Figure 2. The relationship in OECD countries between private sector research and personal income. There is a strong positive correlation according to these figures from the Science and Technology Indicator Unit of the OECD.

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need it?

rent standard of living is strongly influenced by their research effort. This is shown in Figure 2 which gives the relationship between total research and personal income for some OECD countries.

The figure shows an extremely important relationship: there is a positive correlation between total research and personal income. Private sector research also shows a high correlation with per capita income but some smaller countries such as Australia, Canada, Denmark, Iceland and Norway show relatively lower private sector research. But with the Government sector research there is no such relationship. The figures (shown last week) vary from New Zealand with the highest Government research (and virtually the lowest per capita income) to Switzerland with the second lowest Government research and the highest per capita income.

We could not expect an exact fit, but it is interesting to look at two major deviations, the United Kingdom and Iceland.

The United Kingdom appears to spend a lot on research but has a poor economic performance. There has been considerable discussion on research policy over the past two years in Britain. One major factor in the United Kingdom is that 0.6% of GDP is spent in the private sector on military research. There is virtually no economic benefit from this (some sales of weapons?) but it does divert people and money from research in the productive areas of the economy.

When expenditure on military research is removed, Britain fits much more closely to other nations. This is perhaps unfair as most other countries also spend money on military research though not to the same extent as Britain. Japan is one example of a country which spends very little on military research.

In addition, the United Kingdom spends a relatively low percentage of GDP on basic research and on research in universities. A recent study (that analysed publications by numbers and effectiveness in 100 different subject areas) shows that England is weakest in basic research areas that are expected to contribute strongly to productivity in the future.

Their elitist attitude leads to a relatively small number of extremely good research centres, particularly at Oxford and Cambridge, but they fail to establish the broad base of very good secondary centres that is characteristic of North America. To make matters worse, the present Government is cutting basic research still further while increasing military research. It is difficult to expect anything but the continued decline of England as an economic power.

Iceland is another interesting exception. It has a high income but spends little on R&D. This may be a genuine case of being able to buy much of the research it needs. Iceland is helped by exclusive access to fishing grounds (the "cod war") combined with access to a large market and it also has cheap geothermal power. Oil-rich countries would be expected to fit into this same category of resource-rich countries that do little research. Iceland does need more detailed study.

Our experience over the last 40 years shows that New Zealand certainly does not fit

into this category. We spend little on research and our living standards are still falling relative to other OECD countries. For 40 years we have lived in the smug belief that things would get better.

Finally, we need research even to maintain our current position. Research is not just about new things in the future, much of it is about maintaining our existing position. What would happen if we stopped research? New varieties of plant and animal diseases would arise and reduce production. New products, techniques and materials would be produced by others and our existing products would be less competitive. At this level research is not a luxury, it is a vital necessity. Figure 3 illustrates this from a well-known story.

New Zealand has tried the option of low research effort



Figure 3. "Now, here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that." (The Red Queen, in *Through the Looking Glass*, by Lewis Carroll.)

and hoping things will be all right. That policy has failed. But it is going to be extremely difficult to get effective action. Business leaders know little science, universities are impoverished, and Government scientists lack incentives. Where do we turn for effective leadership?

Imported PC package claims doubled storage

by Stephen Ward

DIMENSION Advertising managing director Roger Bilson says he has found a source of personal computer hardware that offers high storage capacity at a third to half the price of anything comparable being sold in New Zealand.

Through Dimension Sales he is marketing an Australian-assembled Macpro computer which incorporates a 1.3 megabyte Mitsubishi floppy disc drive.

The rest of the computer componentry is Taiwanese and Bilson says he can import the package and sell it for around \$6500. He suggests it has double the storage capacity at half

the price of one major company's product.

Auckland-based Dimension had discovered this package when it was doing a project for a client requiring lots of relatively cheap storage space.

Bilson told *NBR* that the design of most systems in New Zealand with adequate capacity incorporated expensive, solid state operational memory as well.

Lower-priced PC's could not have coped with his client's requirements and higher-powered PC's or minis with enough storage would cost between \$15,000 and \$30,000.

So with no import restrictions or duty on computer com-

ponentry Bilson decided marketing of the equipment here was a viable proposition.

The equipment found, says Bilson, has the capacity for client listing of 1500 customers. It can also provide stock inventory and a direct mail facility.

For another \$2000 to \$2500, he adds, a second drive could be incorporated and take the customer listing base up to 3500. The gear has a 64k operational memory.

The computers have a standard 90-day guarantee, he says, which could be extended for a "small premium".

At present, any faulty equipment would have to be serviced or replaced through Australia. However, Bilson told *NBR* he had looked at the possibility of providing a "Tisco"-style service back-up network for the computerware in New Zealand.

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