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SCIENCE AND THE KNOWLEDGE ECONOMY

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SCIENCE AND THE KNOWLEDGE ECONOMY

Much has been made lately of the 'knowledge economy' and its importance to our future. Concern has been expressed about the allegedly low number of science and technology graduates emerging from tertiary education and about New Zealand's low level of investment in research and development (R & D) relative to other advanced countries. Both major political parties have developed elaborate plans to invest in our future by fostering research, technology and innovation in New Zealand, in partnership with the private sector.

Today the government is announcing its 'Five Steps Ahead' programme, which has been heralded as including elements such as:

- better focusing the direction of the government's effort in research and development;
- developing closer linkages between enterprise, research and tertiary education;
- improving access to risk and investment capital; and
- ensuring regulations and laws support, rather than frustrate, innovation.

Some of this programme, as foreshadowed, makes good sense. Entrepreneurship and innovation are vital to growth. In general the programme does not look like a lurch towards active government direction of industry. The practical effect of much government intervention is to stifle, not encourage, entrepreneurship. Max Bradford has said that "the government does not believe politicians or bureaucrats are the right people to judge what is, or isn't, a good idea." Instead he has told business that the focus is on:

... getting government out of your way ... as little regulation as possible, a simple tax regime, flexible laws such as employment and accident legislation

As a statement of intent, this is hard to fault. The trouble is that it is also hard to square with what the government has actually been doing in recent years. There has been an avalanche of new laws and regulations – some 5,200 at last count – over

the past decade, which have added enormously to the costs of doing business in this country. What's more, the flow hasn't stopped – the government has been busy this year promoting things like price controls for electricity, new restrictions under the Commerce Act, additional disclosure obligations in telecommunications and environmental regulations in areas ranging from energy efficiency to biodiversity. At the same time it has been making the tax system more complex rather than simpler, and has it failed to deal with obstacles to employment such as the Employment Court and the Holidays Act.

All of these things suppress entrepreneurship and help explain why the business sector and the economy are struggling. If the government is serious about promoting economic growth, today's package should be grappling with the basic problems of high tax and regulatory burdens that are holding business back. It does not look as though it is addressing the most fundamental issues.

We should also be wary of some of the hype associated with discussions about technology and the knowledge economy. You may remember British prime minister Harold Wilson's talk about "the white heat of the technological revolution" at a time when growing state interventions were strangling the British economy to the point that it ended up in the hands of the International Monetary Fund in the 1970s. Many myths and misdiagnoses of problems arise in discussing science and technology and need to be unravelled.

Take, for instance, the proposition that New Zealand is producing too many lawyers and not enough scientists. In a recent paper Warwick Bishop of the Institution of Professional Engineers New Zealand looked at the figures and found that the overall number of science graduates produced each year by New Zealand universities compares well with our OECD partners. Moreover, although many science graduates go overseas after leaving university, the pattern has been for a high proportion of them to return. Warwick Bishop's conclusion was that what we were lacking was not scientists but wealth creators.

If anyone thinks we have too many lawyers in this country, the obvious question to ask is whether we have too much law and too many bad policies. Businesses have

to hire lawyers or legal advisers to deal with the mass of law that politicians and courts have been generating. Dismissals now raise the possibility of grievance cases almost as a matter of course. The grey areas in competition law and the government's endless proposals to regulate network industries must be generating an enormous amount of work for lawyers. The Resource Management Act has created a legal industry of its own. Then there is legal aid – now a \$100 million annual subsidy – and the totally open-ended and taxpayer-supported litigation over Maori claims.

We should not operate on the assumption that businesses, tertiary institutions and students are irrational. Businesses will hire people whose skills are most essential to their operations – if lawyers are more important than scientists to their survival, they will hire lawyers. For their part, students will go to where the rewards – financial and otherwise – are greatest. And tertiary institutions will heed student and employer demand. If we don't like the outcomes of these rational decisions we should be asking questions about the government's influence on the environment in which they are made.

We should also be looking at our performance in maths and science at the school level. International surveys have been pointing to low levels of achievement in this area. We appear to have significant shortages of good maths and science teachers, and this will remain the case so long as a rigid national award system does not allow for proper pay differentials. The new maths and science curricula have been criticised as lacking solid content by international experts, and the proposed new schools qualifications look like a weak, politically driven compromise between examinations and unit standards. The virtual state monopoly of education suppresses innovation in the sector. Despite all the talk about a knowledge economy, it is knowledge and innovation that have been the persistent casualties in the education system.

There has also been a lot of loose talk about the reliance of the country on primary industries and the need to move into 'added value' and 'high technology' industries. Several points need to be made here.

First, it is nonsense to confuse price with income. The price of a silicon chip has collapsed compared with the price of a rack of lamb or a tray of kiwifruit. So has the price of Microsoft's software, adjusted for quality. Yet the founders of Intel and Microsoft have earned fabulous incomes. Ray Kroc made great wealth producing a basic commodity – the Big Mac. Starbuck has prospered on a basic commodity – coffee.

Secondly, a fall in prices associated with increasing output points to superior productivity. New Zealand farmers keep producing more output with fewer labour and capital inputs, despite being handicapped by inefficient producer boards. The key to success in any business is continuing productivity improvements.

Thirdly, income depends on performance, not technology. Michael Jordan and Jonah Lomu do not get their income from high-tech activities. High-tech films can flop.

Most importantly, however, we should look at what drives the structure of production in our economy. We have what we have because of the constraints our businesses and entrepreneurs face. If primary production is dominated by outdated producer board structures, why would we expect innovation in sophisticated and branded consumer products to flourish? If businesses are constrained by the outputs of a mediocre government-dominated education system, a history-driven pattern of scientific research and a tax system that pushes companies and entrepreneurs offshore, how much entrepreneurship can we expect?

The bottom line here is that New Zealand businesses can be relied on to work out for themselves how to do best in the environment that confronts them, and the economy is wide open to entry by any business from overseas that thinks it can do better. Any politician who thinks businesses are getting it wrong should put their own money on the line if they are so sure that opportunities are going begging.

We are also told that New Zealand invests too little in research and development compared with other countries. But this argument also suffers from problems. R & D is an investment like any other, and what matters is the rate of return on any

investment. More is not better if the returns do not justify the costs. Countries will have a comparative advantage in particular lines of R & D. New Zealand businesses can conduct R & D in New Zealand where it is profitable to do so or buy it from overseas in a myriad of ways. We benefit from Microsoft's R & D regardless of where Bill Gates sites his business or develops his software. It has become fashionable to point to Ireland as a success story in some high-tech industries. However, relative to gross domestic product (GDP), Ireland spent relatively little more on R & D than New Zealand in the first half of this decade – some 0.98 percent of GDP on average in the first half of this decade compared with our 0.88 percent.

Moreover, such comparative statistics are often misleading as they are distorted by factors such as defence expenditures and government incentives provided to R & D. I have no doubt that if we started subsidising private sector R & D activities, a great many more would suddenly materialise, just like the miraculous increase in the number of sheep when Supplementary Minimum Payments were introduced. There is a large arbitrary element in deciding whether or not some business expenses should be classified as R & D. Important product and process innovations may occur as part of the normal operations of an innovative firm – as a result of management decisions to try something different – rather than as a result of work undertaken in a laboratory. There is no particular reason why R & D undertaken by people wearing white coats should necessarily yield a higher return to the nation than, for example, the analysis of sales figures for a firm's markets to get a better understanding of consumer demand. From a public policy perspective, the important issue is whether or not the regulatory environment in New Zealand impedes the search for better processes and better ways to meet consumer requirements. The extent to which that search should be undertaken through activities that may be classified formally as R & D is a matter that individual firms are much better placed to decide than governments.

Some argue that the government can help businesses by selective grants and tax breaks. But what this argument overlooks is that a subsidy to one industry is inevitably a tax on some other industries. For every winner a government picks, it creates a loser somewhere also. Firms that only become more profitable because of the government grant expand while others that could otherwise stand on their own

feet are forced to contract because of the tax. In the process resources are misallocated into less socially productive activities and overall tax rates are pushed up to pay for the subsidies. Such industry policies also breed a culture of rent-seeking and cronyism which was all too familiar in New Zealand in the Muldoon era and in some Asian countries in more recent times.

Research and development is often presented as a field that needs special support from government. Some of the arguments for a government role in this area are weak. For example, it is sometimes suggested that the government has some unique strategic advantages and needs to act as a national champion in the face of global competition. Professor Howard Frederick of the New Zealand Internet Society, in a study funded by the Ministry of Research, Science and Technology (MoRST), warns that unless a champion is found, New Zealand will be left behind in electronic commerce. Yet, according to Ernst & Young's study of e-commerce, New Zealand is perhaps the most networked country in the world. We have exceptionally high growth rates in business-to-business e-commerce. For Professor Frederick this is all at risk without a national champion and other government interventions to deal with what he calls the "bewildering" number of choices. This view may be contrasted with that of Paul Rudolph, president of EDS, who recently, stated that:

New Zealand is an incredible country for e-commerce establishment. It is ready. It has the infrastructure. It has a population of a demographic characteristic that embraces technology. It has a strong business culture. It's a free market society. It's perfect – this could be a model.

One might add: a model only for as long as the government can restrain itself from intervening, appointing national champions and the like.

A stronger argument for government involvement in R & D is that, especially with basic research, the returns are too diffuse for private companies to undertake such investment. This 'market failure' argument is the basis for public funding of so-called public good research. However, this is a difficult area for government intervention and the case for it should not be overstated. Large US companies engage extensively in basic research and some of the highest performers are the

highest investors. Much new technology derives from existing technology, and indeed applied technology often precedes any deep understanding of the underlying theory. Nor does state investment in R & D necessarily translate into an increase in overall R & D spending – studies suggest that governments which provide major funding displace private sector activity. The ratio of government spending on R & D in New Zealand to GDP is the sixth highest in the OECD. Moreover, the deadweight costs of the higher taxes needed to finance public science must be balanced against the value of whatever knowledge is gained.

Also, before we accept the 'market failure' rationale for taxpayer-funded R & D, we should review the risks of government failure. Political or bureaucratic influence, not some 'objective' evaluation of national benefit, can too easily determine who and what will be funded. Public good science funding can ossify into support for the status quo in research allocations or mutate into a variant form of pork-barrel spending based on the latest fad.

There may well be a risk of such politicised developments with the MoRST Foresight project. The Foresight papers contain much material about vision, and something called a "strategic, far-sighted and pro-active strategy". We are told that a "vibrant and thriving knowledge-based society" will be "underpinned" by activities fostered through Foresight. MoRST's document *Blueprint for Change* talks about Foresight "constructing a vision of a desirable future, and then identifying strategies to take you there". The very title *Blueprint for Change* implies that somebody has the knowledge and capability to plan a path for change, in this case national economic change. Professor Leon Phillips of the University of Canterbury has likened the approach to Soviet-style central planning of science.

The document is full of pretentious language. Four "science envelope goals" are set out:

- an innovation envelope goal (which links back to the national innovation system);
- an economic envelope goal (which is where enterprise and competitiveness get a mention);
- an environmental envelope goal; and

- a social envelope goal.

From these "envelope goals" 14 target outcomes are developed, including "future focused global intelligence", "strong families and communities", "Maori development", "vibrant culture and identity", "resilient ecosystems", "the global biophysical environment" and so on. Such outcomes may well be desirable but the extent to which the government's research activity can reasonably be expected to contribute to them is very doubtful. The Alliance Party's election manifesto will probably be less ambitious.

Presumably, any particular research proposal will not have to hit all 14 target outcomes. However, an astute applicant may well slip a few remarks about resilient ecosystems, vibrant culture and Maori development into even the most mundane or abstract research proposal. Indeed, purchase agents – referred to as "stewards" by MoRST – are told they must meet wide-ranging expectations including:

- "using strategic analysis as the basis for Government's investment";
- "responsiveness to Maori"; and
- "optimising global connectedness".

This is heavy freight for research proposals – whether commercial or academic – to carry. Much of it is entirely irrelevant to most research programmes. Critically, there can be no effective accountability for the wise use of taxpayers' money under this framework. Any allocation decision is as good as any other when objectives conflict and there are no objective criteria for resolving conflicts. This is a sure recipe for capture by interest groups and providers. In consequence, Foresight is likely to give birth to a whole industry of flimflam and rent-seeking, in good part at taxpayers' expense.

MoRST's proposals would no doubt increase its own status but it is not necessarily serving New Zealand science well to bring our researchers into a politically correct twenty-first century. In talking of the "strategic, far-sighted and pro-active strategy for focusing on the achievement of outcomes", MoRST states: "This ethos will also need to be imbued in all of the scientists and technologists that are funded by the Government." So much for science as a discipline devoted to building objective

knowledge, knowing not where it will lead. Foresight is a good illustration of how ill-equipped, indeed dangerous, bureaucrats can become when they try to steer research, science and technology. Will good serious scientists be lost to New Zealand because of such claptrap?

The focus of government involvement in R & D should be on public good research. Investments should be tested on three criteria, non-appropriability, national benefit and likelihood of success. This focus was clearly established in the science policy reforms of the 1980s but appears to be in danger of being diluted. We risk a renewal of rent-seeking by private sector interests looking to access funding for projects that do not meet strict public good criteria.

If the government is really serious about creating a better climate for entrepreneurship and innovation in this country it must focus its efforts on reducing the barriers that entrepreneurs face. The priority task should be to stick to Max Bradford's stated but unfulfilled aim of "getting government out of your way". The government's direct role in undertaking public good science is a more modest one, but there is certainly work to be done to reduce the extent of state ownership and control of our universities and Crown Research Institutes and to improve their linkages with the private sector.

Our flagging reform process is deterring mobile capital and labour and dragging down the rate of economic growth. The prime minister's wish to "foster a passion for enterprise, hard work, skill and creativity" is to be applauded. But if we are to promote these attributes in the private sector, the government must move to curb the restrictions it imposes on the business sector and significantly reduce the massive 41.5 percent of GDP that is absorbed by central and local governments. Such action would do far more than the Foresight saga to provide the platform for science and technology to flourish.