

## Can Science Save New Zealand; Or, Can New Zealand Save Our Science?

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(This article is a précis of longer, detailed discussion of the issues raised here. It is titled *Can Science Save New Zealand; Or, Can New Zealand Save Our Science?* It is available free of charge as a downloadable pdf file on <http://robert.gauldie.com>)

### 1. Why does New Zealand need saving? From what? And what has science got to do with it?

New Zealand finds itself in the same position as many other small countries at the dawn of the 21st century that are all struggling to go forwards in an increasingly technology-dominated world economy. Except that we are going backwards. Our once admired capacity for technological innovation has slipped away. We have been left in the third stream of low-tech “technology adopters” in the new trickle-down economics of wealth originating in the most scientifically advanced, technology innovating, nations. Science and technology are not just politically puffed-up words that politicians use to inflate their chances of election. The economy of New Zealand, like all other nations in the modern world, is driven by science and technology. But the science and technology that drives the New Zealand economy is mostly someone else’s science and technology. We buy and use imported expensive high-end technology tools and pay for them with cheap low-tech commodity products. While China is up-scaling and up-skilling its industries to provide us (and the rest of the world) with high quality engineering products, we are cheering and clapping because we can sell China more milk powder!

Let us have a close look at our economy and quantify our decline, and what it means in practical terms. It will quickly become evident that we do, indeed, need saving; saving from being the top dog of the second-world countries. It will also be evident that we will need science to save us. Then we can look at how to change direction and get back on top where we once were.

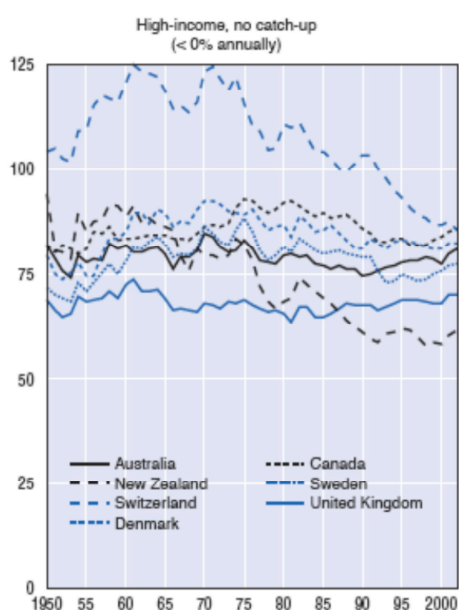


Figure 1. Income levels in the target OECD countries from 1950 to 2002 based on the US standard as 100 units

### 1. Productivity comparisons with other countries: working hard for little value

Productivity is the universal measure of economic status. Basically, productivity measures how much of our GDP do we earn for each hour that we work. Productivity measures our relative prosperity with other countries. The information we need is in the Organization for Economic Co-operation and Development (OECD) Science, Technology and Industry Scoreboard (STIS). The latest version of the OECD STIS available is for 2006.

The graph in Figure 1: *Income levels in the target OECD Countries* are from the OECD STIS 2003 is a good place to start on the issue of comparing productivity with target nations. It is evident from the graph *High-Income, No Catch-up*, that New Zealanders lost ground in relative income from 1974 to 2002. The other graphs make interesting reading in terms of which countries have prospered over the same period.

### 3. Low productivity is a consequence of low-tech exports and low-tech manpower

The diagram *Share of Technology Industries in Manufacturing Exports, 2003* in Figure 2 locates New Zealand with the highest proportion of low technology components in our exports in the entire OECD. This means that we are not competing with exporters from the OECD nations to sell the bulk of our goods. We are competing with the second world and third world nations who are the suppliers of bulk commodity, low technology exports. We are back to where we were in the post-Muldoon economic crisis, trying to sustain a growing demand from New Zealanders for twenty first century consumer goods on the earnings of what amounts to a nineteenth century agricultural economy. This means that we sell cheap butter, cheese, milk powder, trees, wool, meat and tourism and buy expensive computers, IT tools (like cell phones) and toys (like I-Pods), cars, trucks and heavy plant, tools, steel and other metal products, shoes and clothes; all the things that enable us to strive to live the same lifestyle as the high productivity Americans.

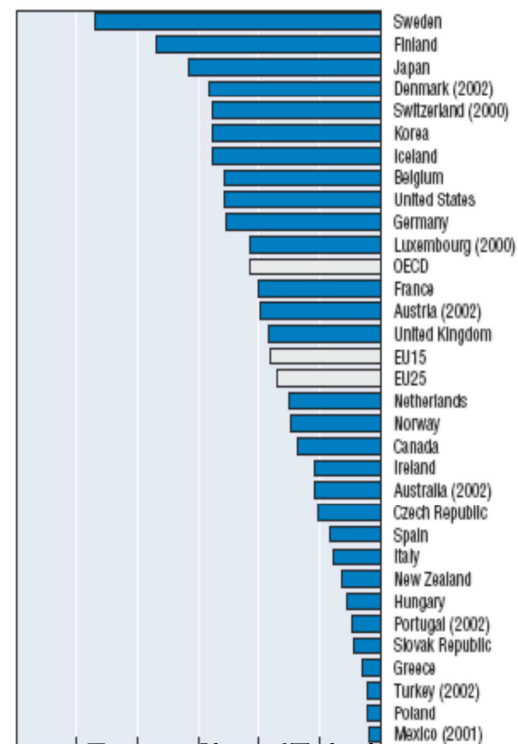


Figure 2. *Share of Technology Industries in Manufacturing Exports, 2003*

Here is what the OECD STIS 2005 has to say about migration of skilled people Para 1, page 56 OECD STIS 2005:

*“Modern economies rely on human expertise and compete in attracting the best competencies. Migration of the highly skilled remains limited, however, as most international migrants are medium and low-skilled persons; in 2001, out of the 67 million foreign-born residing in an OECD country, only 16.8 million were educated at the tertiary level.”*

Figure 3: *International Mobility of the Highly Skilled* shows the interesting graph that accompanied the OECD statement on skilled migrants. Either way, residence or birth, New Zealand exports a much higher proportion of its skilled workers to other countries than any

**Highly skilled migrants to the OECD countries, by country of birth, 2001<sup>1</sup>**  
As a percentage of highly skilled natives in the country of birth

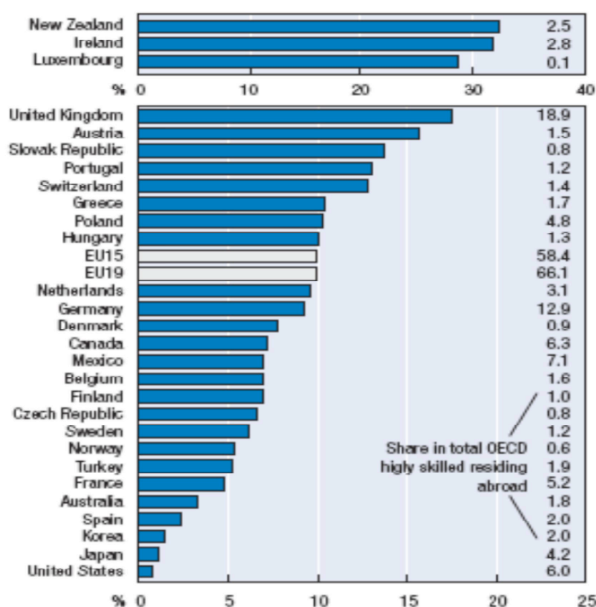


Figure 3: *International Mobility of the Highly Skilled*

other country in the OECD. Is New Zealand so uninteresting and so unproductive that 20% of our skilled workers would rather be somewhere else? It certainly seems so. We can add another dimension to our low-tech export status. We also export the well-educated skilled workers whose abilities help maintain the high tech and medium tech experts to New Zealand from other countries. While their absence from New Zealand helps to explain the chronic shortage of skilled workers we need to raise us out of the low-tech commodity export trap that prevents us from making economic progress.

### **3. What have we got on our hands in terms of science that can actually help our economy?**

Firstly, we are clearly under-performing in terms of developing marketable high technology, high profit margin products. In part, the economic reforms of the last ten years have seen ownership of our largest companies go offshore so that the kind of re-investment of profit into R&D that other countries can expect from their largest companies has not been possible. This may explain why New Zealand companies offer so little support to science of any kind. Let us hope that they have not started to see the money needed for science as a kind of greenmail that they pay in order to keep doing business.

Secondly, the process of evaluating where our taxpayer dollars should go in science is an awful mess. It is hag-ridden with self-interested committees, hindered by secret agreements between government departments and their favored CRIs or other research institutions, and biased by the government's science policy writers with social engineering agendas to implement.

Thirdly, the past and present New Zealand governments have long had a cavalier attitude to museums, libraries and the process of publication itself that has signaled to scientists that they were not of any value to New Zealand. Sadly, the current government's junior partners foster an anti-science demonology that makes government science policy in New Zealand look yet even less attractive in comparison to most other developed countries. The fact that New Zealand scientists can get higher salaries offshore is not a big part of the reason to leave. Scientists need to be a part of the international science debate in the literature otherwise they are simply not scientists. Can you imagine trying to make the All Blacks perform better by discouraging them from playing any test matches? Astonishingly, to me at least, FRST is on record for reprimanding one CRI for allowing its scientists to publish too much science!

As a nation, we cannot afford to spend more than \$3 billion on science over the next ten years without some clear understanding of how the science budget is to be divided into non-innovative, measurement-research, government mandated science aimed at safeguarding the health and wealth of our nation, and the innovative research to produce new knowledge that will raise the competitive edge of our economy. What we quickly discover is that an evaluation of the possibility of a productive role for science in saving New Zealand's butter-and-cheese-republic economy is also an evaluation of the underlying criteria of New Zealand science funding policy. This, in turn, boils down to identifying the following specific issues:

1. What are the criteria that determine what kinds of industries or institutions are to be funded?
2. What are the criteria that determine what kinds of programs are to be funded?
3. What are the criteria that determine what kinds of ideas are to be funded?

These criteria determine the success or failure of science funding to produce innovative technologies that can be turned into profitable goods manufactured in New Zealand for New Zealand's economic benefit. The track record of science funding to date in New

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Zealand is so poor in even producing published measurement-research science, let alone new technologies, that we cannot continue to make decisions based on secret criteria set by self-interested anonymous committees who never have to justify their views. We need to have a public debate on the criteria in use; and a sufficient agreement on the use of such criteria to allow the courts to enforce those criteria when the funding committees of government departments act to their own advantage.

#### **4. How are the criteria for successful funding of new science to be developed?**

Investment in science is no different than in other kinds of investment in that it must be clear what the investment is to achieve. Political policies about what is important to the nation are ineffective as a guide to investment in particular science projects. What is so often called science strategy is too vague to be of any practical use except to a politician. Imagine if a person asked you for the rules of good living needed to go to heaven and you showed them a painting of the Pearly Gates; that is how science policy documents in New Zealand read to a scientist. Science proceeds step-by-step, program-by-program. Advance in science occurs when we throw out the large numbers of failed programs as much as when we keep the few successes. This is what is meant by conjecture and refutation. Vague global policies all too often allow institutions with lousy science track records to continue to justify their existence by claiming to be aimed at the right targets. In the New Zealand science funding system we have seen large, politically correct, and politically well-placed, science institutions with indifferent science records grow and prosper because they have been able to have their performance judged in terms of police policies deemed by government to be in the national interest, rather than whether certain science projects could, and did, produce meaningful results. Global warming is a good example. If government wanted a proper science evaluation of global warming, or any aspect of climate, then their policy would be to fund both sides of the debate to ensure the conjecture and refutation that assures good science. On the other hand if the government wanted only such measurement science data that supported their current policy stand on global warming then they would only fund one side of the debate; which is, of course, what they do.

#### **5. The land of milk and money. Yeh, right.**

This snappy title comes from an article in Forbes.com

([http://www.forbes.com/2007/07/11/new-zealand-kivi-pf-ii\\_in\\_wb\\_0711soapbox\\_inl\\_print.html](http://www.forbes.com/2007/07/11/new-zealand-kivi-pf-ii_in_wb_0711soapbox_inl_print.html)).

It is certainly worth reading, even if you do not believe it. But the article does, by virtue of its comparison of New Zealand with Dubai, and milk with oil, raise a question that we have all asked ourselves at one stage or another. Why have the Arab nations, awash with oil money, spent so much on arms and war among themselves and so little on building industries to run their economies when the oil runs out? In New Zealand, we seem to have the idea that the milk will never run out; that somehow China, or some other wealthy polluter, will always want to buy our pure milk at a premium. Almost every nation in the world produces milk. Worldwide milk production is rapidly increasing. Fonterra, in fact, markets a great deal of it. But what happens when we are just another, higher-cost, milk producer? Fonterra will be fine. Like Glaxo, once another milk powder company, they will simply move further offshore than they are now. What happens then? Well, it is obvious, isn't it? All the science and technology that we have created by wise investment of our milk money will simply take over.

The answer is, of course, no. It is far more likely that we will be obliged to have another Lange-type government that will be forced to sell off what is left of our national assets, devalue our dollar and try to survive as either the one and only green and clean third-world exporter, or as East Tasmania. Yes, unfortunately, it is as crude as that. If science funding is re-organized around quality science and not around government policy, then

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New Zealand will have saved our science; and in doing so given our science a fighting chance to save the New Zealand economy when the milk-run comes to an end.