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**HOUSE OF
REPRESENTATIVES**

STANDING COMMITTEE ON SCIENCE AND INNOVATION

Reference: Business commitment to research and development in Australia

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HOUSE OF REPRESENTATIVES
STANDING COMMITTEE ON SCIENCE AND INNOVATION
Monday, 23 September 2002

Members: Mr Nairn (*Chair*), Ms Corcoran, Mr Evans, Mr Forrest, Ms Grierson, Mr Hatton, Mr Lindsay, Mr Tony Smith, Mr Ticehurst and Dr Washer

Members in attendance: Ms Corcoran, Mr Evans, Mr Forrest, Mr Hatton, Mr Lindsay, Mr Nairn, Mr Ticehurst and Dr Washer

Terms of reference for the inquiry:

To inquire into and report on:

The international comparisons indicate that while the public sector in Australia supports R&D at an impressive level, business investment is less impressive.

With particular consideration of:

the R&D drivers in small and medium sized business;

the needs of fast-growing companies; and

the considerations by which major international corporations site R&D investment,

the committee seeks to address three questions.

What would be the economic benefit for Australia from a greater private sector investment in R&D?;

What are the impediments to business investment in R&D?; and

What steps need to be taken to better demonstrate to business the benefits of higher private sector investment in R & D?

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Committee met at 4.45 p.m.

BALDWIN, Dr Ken, Chair, Policy Committee and Member, Executive, Federation of Australian Scientific and Technological Societies

FELL, Professor Chris, President, Federation of Australian Scientific and Technological Societies

GASCOIGNE, Mr Toss, Executive Director, Federation of Australian Scientific and Technological Societies

CHAIR—I declare open this public hearing of the House of Representatives Standing Committee on Science and Innovation inquiry into the commitment by business to research and development spending in Australia. I welcome the representatives from the Federation of Australian Scientific and Technological Societies. I remind you that the proceedings here today are legal proceedings of the parliament and warrant the same respect as proceedings in the House. The deliberate misleading of the committee may be regarded as a contempt of the parliament. The committee prefers that all evidence be given in public, but should you at any stage wish to give evidence in private you may ask to do so and the committee will give consideration to your request. I invite you to make a brief opening statement before we proceed to questions.

Prof. Fell—With your permission, Chair, we will each speak extremely briefly. Firstly, let me say that we feel that business investment in R&D in Australia is too low by international standards. That is probably not news. We believe that it would be extremely useful if Australian business adopted a quadruple bottom line. You have all heard of the triple bottom line: financial return, community impact and environmental impact. We believe that the innovative impact should also be looked at and reported on. I will simply offer the comment that I was at a meeting fairly recently where we were talking about innovation, and I questioned the research director of one of Australia's largest companies and said, 'As a shareholder, I'm not really told much about the research you are doing. Don't you think that would be very advisable?' The person's response was, 'Of course that's secret; we won't tell you.' It happened that the chief scientist comes from another organisation, and I said, 'Do you tell your shareholders what you're doing for the future benefit that will come?' He said, 'Yes, we do.' I went home and thought quite seriously about where I should invest my superannuation funds. The concept of a quadruple bottom line looking at innovative capacity is something we need to pay attention to. We need to look at ways that government can change policy to help make investment more common—and I include in that superannuation fund investment.

Dr Baldwin—Chris has mentioned the need for a quadruple bottom line, and I think what this underlies—in Australia at least—is the need to have a change in the culture in which we regard innovation and investment in science and technology. One of the key aspects of our submission is that this cultural change needs to be brought about by indicative incentives. I think it is true to say that amongst the academic and research community these days, compared to 20 years ago, there is a much higher awareness of the need to generate innovative products and to generally keep an eye out for opportunities for the research that we are undertaking. I am speaking here as an academic who has contacts in all areas of academia, operating from fundamental research to the commercial application of this research.

However, we believe that there still needs to be progress in this area, and we have ideas on that front. We also believe that there needs to be much more progress on indicative incentives for industry. One way of bridging this gap, we are suggesting, is the introduction of 100 postdoctoral positions into industry, jointly funded by the government and by industry itself as a way of bringing about this culture change and injecting a high level of expertise into corporations so that industry can set up its own R&D laboratories and programs. This is one of the key things we would like to focus on in the submission that we are making today.

Mr Gascoigne—The point I wanted to make was to refer to an article in the *Australian* on 14 June on either page 25 or 26, depending on which edition you got. It reported a speech that Hugh Morgan made when he retired. I will quote from the first sentence of the article:

Mining magnate Hugh Morgan paints a gloomy picture of his industry saying, ‘Short-lived chief executives and a focus on shareholder value are undermining its future.

He went on to talk about the fact that the average life of a CEO in industry these days, from members of the Business Council of Australia, is about 4.2 years and that they tend to be rewarded with options as much as by salary. So there seems to be every incentive for them to drive up shareholder value. Quite often this is done by cutting out the research and development capacity of a firm, where long-term value lies. I think this issue is compounded by a matter which I suggest is largely outside your control—that you have a three-year federal parliamentary term, rather than a four-year term as they do in the States or a five-year term as in Great Britain. It means that no sooner are you through one election than you are back out on the old campaign trail again and looking for another term in office. Perhaps this is not the best way to set the long-term future and long-term goals, and to have the patience to let them mature and allow things to happen. It probably militates against good national policy setting.

Prof. Fell—May I offer one last comment? R&D is not just gee-whiz new pharmaceuticals that fix cancer or some other complaint. It could be something as simple as making sure cornflakes do not get soggy when you pour the milk on them, and that piece of research is worth many billions of dollars.

CHAIR—How many members of the committee prefer their cornflakes crisp or soggy after the milk goes on?

Prof. Fell—You could buy Special K because Special K is an excellent example of a low-saturation protein coating.

CHAIR—Your comments about terms of parliament are interesting, Mr Gascoigne. As chair of another committee of this parliament, I have recommended four-year terms on two occasions. It has not happened as yet. Dr Baldwin, you mentioned industry being able to establish its own research labs and incentives to do that. Do you think that is always the way to go? We have quite substantial laboratories and other things within academia and other research facilities. Surely, given the size of Australia, industry working more closely with those research centres is potentially a better solution than them establishing their own?

Dr Baldwin—Yes, and I agree that there are already schemes in place that address that particular aspect. There are things like the R&D Start program, which had linkages with

universities and with industry that try to create this linkage. The CRC program is another example. I think what we are talking about here is a way not only of establishing new R&D activity in companies that maybe have no R&D activity at all, but also of placing people with scientific and technical expertise into the management structure of those companies. They can then make the appropriate technical decisions on the uptake of new equipment, on the development of R&D facilities and on the leveraging of Australian R&D in other institutions because they would know where to look for that sort of partnership that you are talking about. It is not just their ability to join a company and, with their research and project management experience, to immediately start to set up R&D activity; it is also their ability to enter the management stream and to then make these crucial decisions which will then leverage the rest of the research system in the country.

CHAIR—What about many of those international companies that are doing more research than others? In your submission you talk about the branch office sort of mentality and keeping the research back closer to head office. Has FASTS had a look at some examples of where that is blatantly occurring with respect to companies that are in Australia? It always helps to hear a few good practical examples of these sorts of things.

Prof. Fell—The gold extraction industry would be one clear example. There has effectively been a substantial movement of gold assets offshore. Certainly the South African gold companies have bought extensively into Australian gold companies and most of the work has closed down in Australia. One I know personally, Acacia Resources, is quite a good operating company, a very efficient one. I think it spent some millions of dollars in supporting R&D in Australia. That is now gone completely.

CHAIR—I am personally aware of that one.

Prof. Fell—I suspect the Placer group purchase of AurionGold, if it happens, will have much the same effect.

Ms CORCORAN—On what grounds was the decision made to close that company down and take it somewhere else?

Prof. Fell—We are not closing the company down—

Ms CORCORAN—Sorry—the R&D part of it.

Prof. Fell—but it is taking it to a larger organisation. They simply have one research laboratory and it happens to be near head office.

Ms CORCORAN—So it ‘happens to be’ or—

Prof. Fell—It is already established and they argue efficiencies of scale, but often it is repatriation of benefits as well.

Mr LINDSAY—Dr Baldwin, I heard your evidence suggesting 100 new postdocs. Let me put this to you: is it time to reconsider what the role of a postdoc is? By that I mean that you get young people who come through the system, they have had years and years of study and a lot of

them would express the view to us that they want to go out and contribute, be in the real world, and that they have had enough of study, research and whatever. But you and I know that these people can be very valuable in doing some research. Is there a possibility of developing a new model of what a postdoc means that satisfies a person's wish to get out there and do real things and be in the business world but still be doing science or research? Do you have any advice on that?

Dr Baldwin—I think there is. What we are proposing is not an exclusively business orientated program. We anticipate that these people will retain the links with their primary research institution—their university or CSIRO or wherever they have come from—so we are not excluding that linkage being maintained. What we are saying is that under the existing schemes you have to have that linkage. So if you wanted to join a company which wanted to raise its level of R&D intensity and it wanted to have somebody with the appropriate expertise but it could not find a partner in the university system—with CSIRO or somewhere else—that would join them under the normal schemes that are in operation at present, then you would not be eligible. This is available to act as a more or less stand-alone scheme whereby we can inject people into companies directly in a way that does not require them to be linked with the university system. I agree, though, that we need to have a way of allowing those linkages to develop and to be retained but, at the same time, we do not want to cut out other possibilities as well.

Mr LINDSAY—So you are arguing as well that this is part of your point about breaking down cultural barriers between industry and academia, effectively. Are you all academics?

Mr Gascoigne—No, I am afraid I am a complete failure as a scientist. I am an arts graduate so I can speak with a different voice. I would just like to add to Ken's answer on that. We tried out this idea of the postdoc scheme on people in industry to see what they thought of it. We wanted to find out their views before we put it up to the minister. There are a number of interesting factors about it.

The first one is that we try to make it as red-tape free as we possibly could, which I think everyone would applaud. The second factor is that the scientist being recruited would not necessarily have to go into a research position. They might go into a position in sales, marketing, administration, or a combination of that with research. But the whole idea is that you have now got a highly trained scientist working within industry, and that would be for an initial two-year period.

Over that period their salary and on-costs would be met half by government and half by industry. At the end of the two-year period the company would have a decision to make and so would the individual scientist. The company could either offer them a position under the normal terms and conditions or they could go their own way. If they offer them a position the benefits are obvious. If they go their own way, I think you would then have a fairly valuable commodity in the Australian market. You would have a scientist trained to PhD level with a couple of years of industry experience in various capacities, who would have something of the best of both worlds.

Mr LINDSAY—Would you still call that position a postdoc?

Prof. Fell—It is simply a small ‘p’ postdoctoral degree.

Mr Gascoigne—Basically it would be for a graduate, a person who has graduated with a doctoral qualification. Our notion is that it would be suitable for any person within three years of them graduating. So it would probably be a younger person, around the age of 30.

Mr LINDSAY—Why does the government have to contribute any dollars?

Mr Gascoigne—The government contributes to schemes like the Start scheme.

Mr LINDSAY—That is not a reason to contribute.

Mr Gascoigne—No, it is not. But there was an interesting example, when—

Prof. Fell—Can I personalise it for a moment?

Mr LINDSAY—Of course.

Prof. Fell—I did a PhD. I then went into industry. I worked in development and in production. I had difficulty getting a job in industry because the industry people felt I was too academic. In the event, I did get back into academe where I was able to be an effective teacher because I had actually been in the industrial world—more importantly, in Australia. I was able to be an innovator and carried a piece of science through to a major commercial development.

I am not saying that for personal aggrandisement; I am simply saying, ‘Here’s an opportunity.’ There is a great reluctance in the industrial community to hire people who have done PhDs because they are considered to be ‘pointy-headed’. People who have done PhDs do have the ability to focus on the cutting edge of new science. You need some people in industry who can do that, because that is the way the world is leading us.

Mr LINDSAY—Your evidence is you will only get them in there if there is a government subsidy. Is that what you are saying?

Prof. Fell—I believe it is strong factor, particularly with smaller companies.

Mr LINDSAY—I have one more question. Professor Fell, you mentioned superannuation funds. What would you propose the government should consider in how it might modify superannuation fund rules to get investment into the funds?

Prof. Fell—One of the reasons I suggested the quadruple bottom line is to highlight for fund managers the futuristic view of respective companies, which may encourage them to invest in the companies that are going to take on R&D activity.

Ms CORCORAN—I am interested in the short-term problems that you raised. I know from first-hand experience the pressure to operate on a short-term basis. I have never been able to find an answer to the question of what you can do to encourage a company to think beyond the short term. Have you got any ideas or suggestions?

Mr Gascoigne—There have been some interesting discussions recently about rewarding CEOs with share options. If you give them share options of one cent each it gives them every incentive to drive the price up in the short term, cash in their options and get out of the companies. There are a number of examples of that. So I think there has been a reassessment of that lately. There has been some talk in the financial press about it.

That is one way. I guess there is a suspicion on our side of the fence that possibly the greater settings within Australia do not encourage that patient long-term capital in areas which are going to generate jobs and new industries. In fact, we tend to be rather too obsessed with real estate. That is treading in some interesting water there but there are a whole raft of general government settings that could take place to make it more attractive to people—

Ms CORCORAN—That is really where I want to go. Do you have an example of what could be changed to encourage that long-term thinking?

Mr Gascoigne—There was a nice cartoon in Saturday's *Weekend Australian* about the man who dared to suggest capital gains tax on, I think, individual home ownership, and I refer you to that. The second panel of the cartoon had his head being blown off by a howitzer being carried by the Prime Minister.

Dr Baldwin—We do actually have a suggestion on that in terms of the venture capital. We suggest that there be a tapered scheme, which means that if you invest for purposes of R&D over a long period, the capital gains on the investment could be reduced in a tapered fashion over a number of years. That creates a long-term approach to thinking about these types of investments.

Prof. Fell—The difficulty is convincing people. R&D yields have shown a rate of return of about 30 per cent which is very high. It needs a little pump priming from government to get that message out. The message needs to be of the sort that Dr Baldwin has talked about—maybe an alteration to capital gains regimes et cetera.

CHAIR—Where does that 30 per cent figure come from?

Dr Baldwin—I can actually give you a copy of the FASTS policy document that we launched this morning in which we reference these types of studies in some detail. There have been a number of studies over the last six to 10 years which, in a number of major OECD countries, have shown that the return on investment in R&D is of the level of 25 to 30 per cent direct return. Then there is an additional rate of return, which is another 25 per cent on top of that, to raise it to the order of 50 or 60 per cent return. That is known as a 'social rate of return' whereby the indirect benefits of that research, which perhaps were not even envisaged by the original researcher, are captured by other people and turned into new products and new technologies. These studies have now been done several times by independent people and they all come up with more or less the same figures—and I can give you copies of this document.

Ms CORCORAN—Over what sort of time period does it take to get to that sort of 30 per cent or 50 per cent?

Dr Baldwin—It is a long time because many of these things take a long time to be realised.

Prof. Fell—This is the annual rate of return. It is 25 per cent annually and it probably takes five years to realise.

Ms CORCORAN—Yes.

Prof. Fell—Twenty-five per cent is high—but it is better than Credit Suisse at the moment.

Dr WASHER—For the panel, I am glad to hear that they have mentioned you as that sideline, flow-on employment factor, which, I guess, is what Ken was talking about there. It is good to see. You mentioned superannuation. On your figures, the US is about fourth in the scale of R&D business investment. How is it different? How do they get the superannuation money out of the super funds in America to invest so heavily, which apparently happens, as compared with us? What are they doing differently from us?

Prof. Fell—I cannot be entirely specific because it is not in my knowledge area. But I believe that their capital gains tax systems are different from ours—they are more attractive. So when people exit from new ventures they do better and the rate of return is high. It is a case of balancing risk versus return, and I think the risk return factors are better in the US.

Dr WASHER—Professor Fell, to continue that: we literally have had no dollars in superannuation money from the US in spite of tax changes in this country to attract them. As far as I know, literally nothing has flowed. Have you got an explanation for that, or have we not done enough?

Prof. Fell—I believe my American venture capital friends would tell me the opportunities are so good in the US they are not looking offshore. They are certainly looking offshore to buy licences and, if you are trying to pick up new technology, that is the cheapest entry. But they do not particularly wish to start new companies in Australia.

Dr WASHER—Fair enough. My other question was about the behaviour of CEOs in Australia as compared with America where, again, we are about fourth last. I would have thought their behaviour was probably less ethical than some of ours. If ethics and not the rewards of CEOs are going to be used to monitor success, that is an odd sort of equation we have in our graph.

Mr Gascoigne—I am sorry, I am not sure I understood that question.

Dr WASHER—There are a rewards for nominal benefits of share flow-ons to the CEOs in the US if they are successful. There seems to be a greater manifestation of that in the US than in Australia, but their R&D business investments do not seem to be affected by that. They are fourth on the list of the most successful R&D investors. The proposition was put forward that if we could possibly change the mentality of CEOs or reward them in a different way in companies, in a long-term view rather than a short-term share jump, that would make a difference. That has not exactly happened in America, as far as I am aware, but they certainly have good investment.

Prof. Fell—It is an interesting proposition you put. I think it has to do with the fact that in Australia the short-term gain can be made by downsizing work forces, and there are ample

examples of this around the country. I believe that, in the American psyche, the market takes a fairly negative view of that and it looks for new business as the prime indication of a CEO's effectiveness. I think in lots of venture capital work people are equally ethical in both countries. Obviously there are blatant examples of bad practice but, looking at the development of new industries, the US is quite effective in making that happen.

Dr WASHER—I think it is a great idea having postdocs going into industry and our putting some money into that. We certainly need to pump prime in some way, I would have thought. That is a terrific idea. I say that because, to reinforce what you said, 30,000 people a year leave Australia—we always hear about the immigration; we do not hear about the emigration, and a lot of our emigrants are our better educated young people, particularly scientists. Sadly, a lot do not return, or they have not in the short term. So to attract them back home we need to do something a little better. As a last question: why is mining R&D so successful in this country? We have done very well in mining R&D, I would have thought.

Mr Gascoigne—It has changed fairly significantly. When I looked at the most recent BERD figures it looked as though mining R&D had slumped really significantly over about the previous five years, and yet it jumped back up. It seems to me to be related to metal prices, I would have thought, as much as anything. But I always remember running across one of the senior journalists in Australia who said that the R&D that the mining companies had done and the results in terms of not only clever ways of extracting minerals but also in cleaning up the mess afterwards, meant that the software and the approach were going to be worth more than the actual materials that were invested.

Dr WASHER—We are still the world's leaders, I think.

Mr Gascoigne—I think it is also the case that we are major league players in that particular area and we have just got very good at it. The risk is that in certain areas of mining, as we discussed earlier, we could de-skill, and that is a problem.

Dr Baldwin—I think the challenge is to replicate that performance in other industries, whereas at the moment we do not have that track record. We do not have the ability to value add to the same degree that the mining industry has done. Indeed, it is not just value adding, but exporting the expertise involved in that process, which is what we are talking about—the software and all the rest of it—and making that a major export earner in its own right. We need to replicate that in manufacturing and in other industries as well.

CHAIR—My view is that the mining example is one of the examples where innovation and R&D have become a grey area, because some of the great areas in mining are really what you would put in the innovation category if you could do that in a separate way to research and development. The best mining software being used anywhere around the world came out of Australia. I suppose it is R&D, but it is more an innovative aspect of how software has been used.

Mr MARTYN EVANS—If you look at the schedule on page 23 which covers the business impediments to R&D, you have the chart of business R&D intensity. If we go to the top of the declining list we see Sweden, Finland, Japan and the United States and Australia is sadly very low on that list. You look at Sweden, at the top, which is very dramatic, and you think 'mobile

phones'. There are clearly a number of other industries as well. You can see clear innovative outcomes which have led to important new major industries here. You can see the same thing in countries like Japan, the United States and Switzerland with pharmaceuticals. You can see investment in R&D which has led to major productive industries and major innovative outcomes for industrial and commercial outputs for the country.

But then you look at Australia and you think to yourself, 'Our R&D tends to be very conscious of the government subsidy.' The present government changed the R&D tax regime some years ago and, in effect, we conducted a bit of a scientific and economic experiment. We varied the rate and—lo and behold!—what happened? The industry almost matched it. A few months later, we saw a matching change to the R&D investment rate. It has almost tracked the income tax change. When you look at the kind of outputs we have had from this investment of very substantial money and you compare it with the people at the top of this very effective graph of yours, it almost says to me that people are investing in R&D here and in many cases—there are obvious exceptions, I grant that—it looks like they are tracking this not on the basis of the innovative output, the new mobile phone industry or whatever, but on the basis of a tax investment. They track it according to the tax rate, and it follows that; it does not follow innovation. It does not say, 'Gee, guys, we've got this whole new mobile phone industry that we're going to make billions of dollars from.' If the government makes some modest change to the tax rate, that would not have a big impact on Ericsson in Sweden or something. They would still keep investing because the carrot there is the global mobile phone investment. You would not be bothered by some modest change in the government's tax rate, because you have this huge carrot at the end of it. But, if your investments are basically focused on the tax system and your R&D is almost driven by the need to make the tax claim because your accountant is saying, 'Well, you've got this option for the tax claim, guys, so you've got to drum up some R&D,' that is quite different. Is that really what is happening here in many cases? Are we seeing companies investing for the tax claim?

Dr Baldwin—That is a very good question. That is, I think, part of the motivation for us saying that what we really ought to focus on are indicative incentives for people to increase their R&D for other reasons. That is the reason for the hundred postdocs in industry suggestion, but it is also the reasoning behind our suggestion to change the rate of R&D tax deductibility in a way that rewards those companies which have a higher R&D intensity to try and match the parts at the top of the graph in countries like Sweden. What we are proposing here is not, as you are indicating, to get companies to follow the tax return; we are trying to approach a threshold whereby a specific level of R&D intensity generates so much benefit to the company that they realise they have to do that for their own future. The current and past tax systems have not done that. It has been a flat rate right across the board, so you ramp your R&D up and you ramp it down with the tax rate.

We are suggesting here that the R&D tax deductibilities start at a level which gives you some very small return for a low level of intensity in the company—say, less than one per cent of total turnover. It is maybe down below the 120 per cent level, but then it ramps up to an internationally competitive level of somewhere around the 175 per cent for companies that perhaps have 10 per cent of their R&D investment as a percentage of turnover. Once the companies realise that they have to cross this threshold in order to reach the big tax returns, that is the threshold that we want them to reach in order to be able to realise—for all the other reasons that we know—that they should maintain that investment anyway.

Mr MARTYN EVANS—So we have to be very careful to target our incentives to ensure that we really get at the people who are doing bona fide R&D, to result in innovation that will drive new outcomes here, not the tax driven R&D which a lot of this may have been in the past.

Dr Baldwin—Exactly. But to do that, you have to cross the threshold whereby they realise that the benefit is there for them in the future. Indeed, part of the reason we are suggesting this sliding scale is to try to keep the tax burden on the taxpayer the same. I think this can be done because, if you look at the lower level of R&D intensity, it corresponds to the majority of companies that are actually receiving the benefit. By ramping down the value that they get, you have a lot more money that is tax neutral to play with and to put at the top end of things.

Mr MARTYN EVANS—Is there any reason those companies, whose R&D concentration is minimal, should not in fact simply receive a regular deduction? Are they doing anything more than what would simply necessitate it being a deductible expense like all other business expenses?

Dr Baldwin—There are arguments that say that is true. On the other hand, if you are starting up a company, or at least trying to get companies that have had no previous R&D activity whatsoever interested in these sorts of things, they are not going to want go straight into the five per cent, as a percentage of turnover, level of intensity. They are going to want to ramp up their activity to start with as well. I do not think you can make a sudden threshold jump from zero to some large number for that reason.

Mr MARTYN EVANS—Although, if one contracted out R&D, would that be the answer? If you contracted it out to an R&D organisation—a university, the CSIRO or whatever—then you would be contracting it out to an organisation that is 100 per cent R&D intense.

Dr Baldwin—That is true, but it depends on the sort of work you are asking them to do. Indeed, if all you are asking them to do is, in a sense, to innovate rather than do R&D, it is not the best use of the universities', CSIRO's or anybody else's resources to do that for them. They have to actually be doing something that contains new scientific and technical groundbreaking work. For that reason, you will find that companies that are looking to outsource their activities will often only be doing it because they are not prepared to set up a large lab themselves to do that sort of work. They should not be tempted to do the innovative part outside; that should all be done within the company.

Prof. Fell—One of the observations I want to make is that a number of the countries in this particular table have targeted, very specifically, areas of expertise. Korea, Iceland and Finland each have a national policy that says, 'We want to be good in such and such.' At the government level, they have provided incentives, as you rightly say. An idea has just crossed my mind. We are engaged in the activity of ranking national research priorities. If we were to extend Dr Baldwin's thinking a little, as well as rewarding companies that spend a high proportion of their turnover on R&D, what about rewarding companies that worked in areas that were known national research priorities? It is an interesting view of the world and something that probably needs a little reflection. We have not thought that one through, but it would certainly emulate some of the activity that I believe has occurred here. For instance, France has said that it wishes to be the best in the world in water treatment, and has nearly achieved that.

Mr MARTYN EVANS—Yes.

CHAIR—On the point that we were just discussing, what about the case of much smaller firms? Take the example of the agricultural sector where there are many hundreds of tiny companies and individuals: a little apple grower at Araluen, for instance, is contributing to substantial research and development through a levy that they all pay. Individually, none of them will ever do any research and development, but quite substantial and quite groundbreaking research and development could be done on their behalf. That aspect, I think, would have to be considered in the scenario that you are putting.

Dr Baldwin—That is right. We are very supportive of that type of model and, indeed, we suggest it could be extended to other industry groupings where there is a common interest. It is not often that you will find that in manufacturing, for example, but in large scale agricultural type production it is much more applicable because everyone is making the same product.

Mr TICEHURST—I have a couple of questions about your fifty-fifty doctorate. Larger companies could probably afford to employ a researcher on the basis that half the funding is picked up by government but, when you come down to the smaller companies, you run into a situation where they probably would not be able to afford that because maybe the project is not going to last a year or two—it might be a small one. How would you propose being able to handle that situation, where that expertise could certainly be used in a small business or even a microbusiness? A lot of R&D starts with one or two people with an idea and is built on from there. How would you see your scheme working in that scenario?

Dr Baldwin—What is required here is that the company takes a much longer term view of the person that they are employing—albeit for 50 per cent of the two- or three-year period we are talking about—and that they are making an investment in the future of the company in terms of the management or the level of expertise that they are bringing on board to the company. So while the project itself may be funded for only two years or three years jointly with government, the person that they are employing should be looked upon as somebody who they could groom for future management roles, who has the expertise and who has the ability to tap into all these linkages that they have formed during their postgraduate education. I guess that is really where the benefit will come. If those people then form the technical and scientific expertise in the management structure of these small companies, they will have an enormous resource that will then enable them to leverage all the other areas that I mentioned, in terms of the other institutional research and development activities.

Mr TICEHURST—The other question relates to where the R&D figures are drawn from. How do you actually get hold of the R&D figures, say, from small firms? Do we not isolate them out? With a larger firm, you can pick the figures out from the annual reports, but you cannot do that if companies are not putting out those reports. Are you taking into account the R&D in smaller firms? I have another question relating to the fall-off in R&D. If you look at the cost of manufacturing in Australia, for some industries it is prohibitive to manufacture here. If we look at what happened years ago, we used to manufacture TVs and radios here, which were highly labour intensive in those days. That does not happen here now because we will never get the volume and we will never have the demand to warrant manufacturing that sort of stuff here. Have you looked at the R&D, say, in service type situations, where we are probably not competing on an unequal field as we are in manufacturing areas?

Dr Baldwin—I think the key issue here—and this is one issue that the other countries higher up on this table have addressed right from the word go—is that our markets are not purely Australian markets driven by Australian demand; they are global markets driven by global demand for these products. In terms of the small companies, they need to have the confidence and also the expertise available to go international and look at the marketing of their products to find out where the demand is for their products. There are examples that we can give you of Australian companies that are very small that from day one have gone into the global marketplace and have not even bothered with the Australian market. It is this sort of confidence building process that needs to be engendered by incentive measures and by the injection of expertise in the ways that we describe.

Mr Gascoigne—I would like to add to Ken's earlier answer. One of the things about the position that we suggest—100 postdocs—is that people would not necessarily be employed in R&D, or not all their job would necessarily be in R&D. The idea is that they would be something of a conduit for current scientific thinking, from the scientific community into the new company. They would bring all sorts of expertise and connectability. The company might have a related problem which is outside a particular person's area of expertise, but at least that person being connected to the science community could suggest areas where they could find the answers.

When we tried this proposal out on industry, we talked to a number of key organisations and individuals within industry to find out what they thought of it. In fact, a couple of them addressed your problem. One response said:

I can think of one small company in my organisation that is struggling to grow. It could start a person immediately.

That was one response. Another, from a different person, was:

Another thought is to quarantine some of the positions for SMEs—and perhaps make the bar lower for them eg pay 70% of costs—

rather than 50 per cent. So there are ways in which it could be tinkered with to make it fit. But there was in fact very strong support for it in broad terms.

Dr WASHER—What I like about that idea is that it goes both ways: it also exposes the scientists to business administrative skills. The big problem is that our scientists do lack a lot of those skills and that is a disability, so they become the victims of companies and they are put away in their boxes. But I think, if we are going to get this culture, we need our scientists to be trained how to operate and be effective and noticed, and to become more dominant in our businesses. We would be giving them an added skill by doing that.

Mr Gascoigne—I could not agree more. We did a bit of a study—and I have left you copies of this paper too—where we talked to around 130 scientists and basically asked them: 'Why aren't you guys commercialising your research?' One of the things that came back very clearly from the scientists was that they wanted to, but they had difficulty interacting with industry and they did not understand the ways of industry. So I think the point you make is exactly one of the things that is driving the notion.

Prof. Fell—It is interesting that, in the higher education review reference group, David Murray, the CEO of the Commonwealth Bank, said that he was not all that interested in hiring commerce graduates or MBAs; he was very interested in hiring people who understood some science. If you pressed him, I am sure he would say, ‘And a few postdocs, who have a deeper knowledge of science,’ because these are the people who, when you move into an international forum, can interact at the elevated levels that you have to. Plus, they will have the other benefits that you talk of, such as mixing in the industry.

CHAIR—Have you put some numbers on it? From the quick calculation I did, it is about \$5 million to government. Does that sound right?

Mr Gascoigne—Can I offer you this letter? We put the proposal to Minister Macfarlane in a letter dated 24 June. He has responded to us and is in fact seeking time for a meeting. I will give you the letter, Mr Nairn.

CHAIR—I was not far off: \$4½ million in the first year.

Prof. Fell—It is \$4½ million moving to \$9 million in steady state.

Mr Gascoigne—We estimated that the cost of employing a postdoc in salary terms would be about \$60,000 a year. By the time you added on superannuation, training and a few on-costs, it would be about \$90,000 a year. The Commonwealth component would be half of that: \$45,000 a year. Australia produces about 1,000 science graduates every year. Let us say 100 of these come under the scheme. That would be \$4.5 million in the first year, with the first 100 going through a two-year tranche. In the second year, when you put another 100 on top of that it would go to \$9 million for the second and each subsequent year.

Mr HATTON—First of all, going back to the business R&D intensity table, I think we are in a bit of trouble when the Icelanders are more than two to one—or pretty close to that—more heavily committed than we are. They were innovative in the past with their SAGAs. What is the Icelandic SAGA today that sees them in that position and us where we are, relatively?

Prof. Fell—The clear decision by the Icelandic government was that they wanted to have an innovative R&D-driven community, much like Ireland. There are a number of countries that have taken some fairly clear decisions in this direction.

Mr HATTON—What are they specialising in?

Prof. Fell—Iceland? You’ve got me! But I do know that they are looking at a range of high-tech stuff. I do not have an honest answer. We can certainly find that for you.

Mr HATTON—But they have chosen, as some of the others have, to pick winners there. They are not winners from current companies or current company activity, but they have marked out an area and said, ‘We want to concentrate on this; we want to put our resources into it. We think we can actually make it.’ Part of our problem in Australia is that we are risk averse and averse to doing anything like that. That is one of the difficulties that we have. But, if you look at the rest of the list, Sweden, Finland and the others have not been afraid to adopt that

approach. I do not know where Singapore is standing on that, but Singapore has done that recently with ePharma.

Mr Gascoigne—In fact the 100-postdocs proposal came from the Singaporean government. We had one of our meetings addressed by the head of SmithKline Beecham, and they were looking at where they would locate their research headquarters for Asia—Beijing, Hong Kong, Singapore or Australia. They chose Singapore. One of the reasons was that the Singapore government said, ‘We’ll pay all the expenses of every postdoc you put on for the first two years.’ That seems to be a conscious government decision to support them. So SmithKline Beecham said, ‘Thanks, we’ll put our \$90 million R&D headquarters in Singapore.’

Dr WASHER—Sorry to interrupt. I have read about that. After those two years, that postdoc had to move from that company, though, as part of those conditions.

Mr Gascoigne—No, the condition was that SmithKline Beecham had to make sure that the person came back to Singapore. If SmithKline Beecham did not want to take advantage of them and offer them a permanent job then the Singapore government would find them a job. They were regarded as too valuable to be allowed to escape the country.

Dr Baldwin—One of the other aspects of this league table is, if you look at the countries that are up there, one of the key indicators is that they are willing to make investments in people, and the postdoc scheme is just one of those examples. When Ireland went about revolutionising its economy, one of the things it did was try and get people back from overseas who had this sort of expertise and this high level of training. They did so very successfully. Look at countries like Sweden, which invest an enormous amount in the education of their population. It is the investment in the knowledge base and in the skills of the people in these countries that really sets the groundwork for these things, as much as it is to concentrate on particular industry sectors and ‘pick winners’. I think you have to look at it in that context as well. It is not simply a matter of saying, ‘Australia should go out and choose that industry and then go for that hell for leather.’ There are many other foundation areas that these countries have invested in that actually underpin these decisions to go for particular areas of expertise.

Mr HATTON—But if you look at the Japanese experience over a long period, they have developed their manufacturing in particular areas to the absolute extent they can. But then they are always looking at when they will close down that area of activity and what they then need to go into on a 20-year to 30-year basis. There is willingness to redirect activity within the economy to that end. I do not think we have that.

Mr Gascoigne—There is an interesting related issue to the one you are raising about being very selective about which areas you are going to support. I was fascinated by an American medical person—I cannot remember his name now—who gave an address at the National Press Club earlier this year. He said that when America made a decision to double the amount of money they put into medical R&D—and I think that decision was made about four years ago—he was astounded to find that the government funding doubled but dropped as a proportion of total funding. In other words, the government funding doubled but the private funding more than doubled. Simply by adding greater government impetus to an area, they stimulated a greater private industry response. I wonder if that is, in some ways, a roundabout way of answering your question.

Mr HATTON—It would be interesting to compare the figures here to what Dr Wooldridge did a couple of years ago, by focusing on medical R&D over and above anything else, and trying to kick that along. If I can go more broadly into the industry culture problem or a general cultural problem that typifies us as being prisoners of the English and the English disdain of trade and commerce and so on. The Germans did not have that problem, and I think the Americans have escaped that as well. How much do you think we are still bound in this industry-science divide? How much of that is still crippling where we could go in R&D?

Prof. Fell—I guess the answer to that is the question: which job would you rather your children take up, merchant banking or science? But let me say—because I saw some figures the other day—that things have changed in England. The numbers of their spin-off companies from university research, on a population adjusted basis, are much higher than the US. I found that fascinating. I think they have managed a major cultural change in the UK and there is a good chance that that will flow through to here. If I were a young person starting out, the way I could become seriously wealthy in tomorrow's world is probably by being an inventor rather than a property developer or a banker. I could be wrong but if we could make that happen we would have a very successful country.

Mr HATTON—Isn't one of the problems we have historically had that Australians have been fixated on invention rather than R&D, innovation or commercialisation—in the popular culture?

Prof. Fell—I would argue that there is very little difference between invention, innovation and R&D. It is a continuum in that good R&D can be gee-whiz very bright new things—the laser printer or something—or it can simply be a better way of doing things that pays off for you. I think a good economy is one where everybody is aware of doing things better.

Mr Gascoigne—There is a good definition of R&D in John Stocker's report on the CRCs. In answer to your question about the divide, we are concerned about that and we feel that industry is here, parliament is there and science is over there. Unlike in the States where they seem to be clustered closely together and there seems to be a very easy interaction between those three sections, we do not feel that is the same here. Because of that, one of the things we have bolted on to our Science Meets Parliament Day event—and your electorate offices would have had a letter about that in the last couple of days—is a new event which invites 50 members of parliament, 50 scientists and 50 people from industry to a dinner on the Wednesday night. Basically, you have all been invited to indicate an interest in attending that dinner. The whole notion is to try and get that cultural thing going where you have carefully structured tables with two parliamentarians, two scientists and two people from industry, sitting together and talking to each other and discovering how they can be useful and interesting to each other. I think there is every possibility but there is a cultural gap to bridge.

Mr HATTON—Because we lack that ready flow from one area to another and the pollination effect from that?

Prof. Fell—Yes.

Mr HATTON—I know we have done a great deal with CRCs but do we need to do more with technology parks such as the one in Redfern to bring the different elements together in a more productive way?

Prof. Fell—Yes, I think we do. We have really just touched the sides with a lot of the technology park development, agreeable though it is. I can speak particularly of the ATP in Sydney. That is coming along. It is certainly doing some good work but it is not yet at the highly advanced stage that you would find, say, in Taiwan or Japan. There is a real opportunity there to do a lot more.

Dr Baldwin—Indeed, in the commercial arms of the universities around the country I think there is a need to try and aggregate the expertise and knowledge of people involved in the commercialisation process to make it available to all R&D institutions—in the tertiary sector or wherever—because at the moment it seems to be a much more fragmented process that spreads that expertise too thinly.

Mr Gascoigne—Our suggestion in this paper, after talking to scientists across Australia and from every institution, was that instead of having 38 universities and 38 commercialisation arms we should have about five commercialisation arms and that any scientist should be able to go to any one that they liked. You would have a slapping together of that expertise and you would really try to get somewhere then. The impression certainly that we got from writing that paper was that Australian science at that stage—about three years or so ago—was at a stage of maturity. It has moved on since then but it is still at a relatively immature stage.

CHAIR—Thank you very much for your submission and your evidence today. I compliment FASTS on their Science Meets Parliament Day initiative which you put in place a couple of years ago. I think it is excellent and it seems to be improving each year. It kept Professor Cullen away from press releases that offended scientists within the parliament in the first year. That is always a good step. So thank you very much for that. It has been a very valuable contribution to this inquiry.

Mr Gascoigne—We wish you well in your deliberations.

CHAIR—Thank you.

Resolved (on motion by **Dr Washer**):

That FASTS occasional paper series No. 2 April 1999 *Scientists commercialising their research and Australian science: investing in the future* be received as exhibits.

CHAIR—Is it the wish of the committee that the letter from Professor Fell of FASTS to Ian Macfarlane, the Minister for Industry, Tourism and Resources, dated 24 June 2002 be incorporated into the transcript of evidence? There being no objection, it is so ordered.

The letter read as follows—

[5.48 p.m.]

ARTHUR, Dr Evan, Branch Manager, Innovation Branch, Higher Education Group, Department of Education, Science and Training

BOTT, Dr Cliff, Director, Science and Innovation Analysis Section, Economic Analysis and Evaluation Branch, Research Analysis and Evaluation Group, Department of Education, Science and Training

BRIDGE, Mr Richard, Branch Manager, Economic Analysis and Evaluation Branch, Research Analysis and Evaluation Group, Department of Education, Science and Training

COOK, Mr Grahame, Group Manager, Science Group, Department of Education, Science and Training

WALSHAW, Mr Timothy, Assistant Director, Science and Innovation Analysis Section, Economic Analysis and Evaluation Branch, Research Analysis and Evaluation Group, Department of Education, Science and Training

CHAIR—Welcome. I remind you that the proceedings here today are legal proceedings of the parliament and warrant the same respect as proceedings in the House of Representatives. The deliberate misleading of the committee may be regarded as contempt of the parliament. The committee prefers that all evidence be given in public, but should you at any stage wish to give evidence in private you may ask to do so and the committee will give consideration to your request. I invite you to make a brief opening statement before we proceed to questions.

Mr Cook—Thank you. The focus of our portfolio is primary responsibility for funding and policymaking in the higher education sector and for public sector research. We have a particular interest in skills and linkage issues that may be of interest to your committee. The portfolio manages a number of specific science programs and it also includes the three research agencies, one of which I am aware has made a separate submission to your committee. We also have a whole of government role in respect of overseeing Australia's science, engineering and technology base and its relationship with the innovation system, and the department supports the ministerial committee overseeing the implementation of Backing Australia's Ability.

We have responded very briefly to each of the three terms of reference of the committee and I might just quickly highlight a few of the key comments that we have made. First of all, I should acknowledge that responsibility for policy and programs supporting private sector investment in R&D are primarily with our colleague department the Department of Industry, Tourism and Resources, so our submission is structured while recognising that. Going back to basics, there are two types of economic benefits arising from private sector research and development: there are those private benefits which are captured by the firm itself and there are those benefits which we call spillover benefits which are about those things which result from research and development which actually cannot be appropriated by the firm. It is the existence of those spillover benefits which really provide the primary justification for government intervention in, and support for, business research and development. Our submission refers to a number of studies which show that the social returns to R&D in Australia and other countries are quite

high. We know that private sector returns to R&D in the US are high, but unfortunately we do not have the same type of information for private returns to R&D in Australia.

That takes me to the second term of reference about impediments. While we have provided some commentary on general issues, as I have mentioned earlier, our primary focus is on linkages and on skill bases. Clearly, the most direct determinant of business investment in R&D is the private return that the business itself can expect to achieve from its investment. In our submission we postulate that perhaps a relatively low BERD to GDP ratio could be a consequence of a lower rate of return here relative to other major OECD countries. But this hypothesis remains untested and we think that perhaps some further work needs to be done in that area to give us a better analytical base for policy development. But if private sector returns were in fact lower than elsewhere, a number of reasons have been postulated by others about this which go to the structure of our economy and the structure of our industry, such as the relatively large service sector and small manufacturing sector here in Australia, the relatively large level of foreign ownership in R&D intensive industries and the need for R&D intensive industries to be located close to large markets, which we generally do not have. But we are not aware of any published work which convincingly proves or disproves any of these things, so it seems to us to be an area requiring some further analysis.

Turning to the things of direct interest to us, which are the linkages between public sector research and the private sector, we note that our universities and our public sector research agencies have improved their linkages in that area over the years. That is obviously becoming increasingly important. There are also a number of government programs which are directed to that end. In particular I mention the CRC program and the ARC linkage program. So, given those things, it is not clear to us that the lack of linkages per se is a significant impediment to greater industry investment in R&D, but I hasten to say in that regard that it is also clear that there is obviously scope for further improvement. In respect of the skills base, the gross figures indicate that there is a significant flow of skilled people both into and out of this country, and the government has also, through Backing Australia's Ability, put increasing funding into generating increased numbers of graduates in core science subjects here in Australia. So it is not apparent on the face of it that the skills base per se is also a major impediment to increased industry effort in this country.

Finally, in respect of the third term of reference which talks about what further needs to be done, our key points here are that, firstly, the reasons for Australia's relatively low level of BERD are not as well understood as they might be. It may be for a number of reasons including the return on private sector investment in R&D. It could be that businesses are not aware as much as they might be of the high returns that can be achieved from that type of investment. It may be their managerial capability is not extracting the full value for those things or it could be relating to the structural nature of our economy and industry. However, through Backing Australia's Ability and other government programs supporting science and innovation, the government has in place a range of measures to address possible impediments of this type and also assist in greater promotion of success stories which might also assist other businesses get further involved in R&D.

In the light of the recent pick-up in BERD in the most recent ABS statistics and the fact that the Backing Australia's Ability suite of programs and issues is still only about 18 months old, given our lack of knowledge at this stage about some of the underlying factors, we suggest in

our submission that perhaps we need to wait a little longer before we do anything much more about BERD to just see how successful the BAA suite of programs is going to be in increasing our BERD performance.

CHAIR—Thank you. The Australian Research Council in their evidence and submission identified what they saw as still a gap in looking at the linkages program. They best described it that in many cases there just still is a gap there for the production of a prototype or something like that. Research gets to a particular point but then, to be able to jump into the commercialisation part of it or attract attention for investing in that commercialisation part, basically you need some sort of prototype which is not there from the other programs. Have you got any comment to make on that? At this stage would you agree with that? Is there anything in the Backing Australia's Ability that you think might ultimately fill that gap?

Mr Cook—I might lead off and my colleagues may have supplementary comments. I think it is true to say that that is an identified gap in our capital market. Under Backing Australia's Ability the pre-seed funds for universities and public sector research agencies are designed to enhance the capital market in that very early stage investment. The pre-seed funds are still getting established so it is still too early to say whether or not that initiative will have a huge impact. Given the interest in the funds, the fact that each of the funds was able to attract a fairly significant consortia of partners and raise some non-government money to leverage the government contribution, it seems to me that there certainly is quite a deal of interest in that area. That augurs well for the future. In comparison to a number of other economies it is true to say that Australia's capital market at that high-risk, very early stage is not as deep or comprehensive as it might be. The ABS statistics are showing that our market is deepening and broadening and people are moving further down into that area. I should say that they were prior to the tech bust and that of course has tended to slow things down.

CHAIR—Does anybody else want to comment on that?

Mr Bridge—No.

CHAIR—I heard earlier today in evidence from FASTS of their recommendation of 100 postdocs. Do you have a view on that?

Mr Cook—It is true that Australian industry could certainly be encouraged to employ more highly qualified people in the postdoc area. We are having a look at the FASTS proposal with interest to see whether or not that is a possible solution or part of a solution to that problem. Already, under Backing Australia's Ability, the number of postdoc places has been increased. I am aware that CSIRO has recently entered into an arrangement with the ARC to enhance the postdocs situation with a clear industry linkage. Things are happening. We just have to take a closer look at it in the context of everything else which is happening at the moment. It is certainly an interesting idea.

Ms CORCORAN—In your submission you talk about successful R&D coming from a very small percentage of R&D—something like 80 per cent to 10 per cent or something like that. You are making the point about risk being an off-putting factor. I have two questions. Is successful R&D coming from a particular area? Is one area being more successful than another

area? The question that we all ask is how you overcome the risk. Who wants to have a go at that one?

Mr Cook—I will ask Mr Bridge to comment on that.

Mr Bridge—On the risk idea, the issue is that in any sort of R&D activity it is very speculative, and it is very hard to know where it will necessarily finish or end up. In any 100 projects you will get 80 duds which meet a dead end, or not necessarily reach an amazing outcome. You will get a smaller number that hit pay dirt and that really pay off and make a huge amount of money. That is probably the R&D story in a nutshell, where you have this diverse range and quite a skewed range of outcomes. When you talk about a particular rate of return, that very much is an average and reflects none, zero, a big loss or a small loss for a particular R&D activity in terms of return versus some that are really paying off amazingly with particular discoveries and innovations being made.

In terms of the public sector R&D, there are a number of programs that do recognise and try to respond to that environment where there is a range of activities. Among those are the R&D tax concessions and the tax arrangements there where, effectively, the taxpayer is a shared owner. It is taking some of the risk in itself because it is rewarding that activity and, in return, that is supported. The system is recognising that it is a balance of risks, and there are going to be some that really work well and a lot that may not work well.

Dr Arthur—In terms of the question as to whether there are particular areas in which it is more likely that things are going to succeed and there is less risk, I do not know that there is any analysis out there. Certainly in the venture capital industry there are a lot of very clever people trying to understand that particular problem. The statistics that we have at the moment, in terms of the success and failure, are the product of those people's efforts to identify the most likely ones to succeed. The evidence is reasonably clear that, as Richard has said, the story of R&D, investment in R&D and capitalisation of R&D is that it is a high return in a very high risk environment.

Mr Cook—It also does depend on what you are talking about with R&D. The closer you are to the development end, and that is the more focused you are on tactical research then, clearly, the greater your chances are of a significant pay-off, and that type of research tends to be quite successful. The further you are down towards the more blue sky end of things then, of course, the higher the risk but also the higher the return. It is an interesting observation that if you look at companies like ResMed, Cochlear and so forth, one of their characteristics is that the invention that has led to the success of those companies was all based around blue sky research. The potential benefits from blue sky research are very high and, of course, the potential risks are also very high. It is a standard risk-reward ratio.

Mr TICEHURST—With the emphasis on larger firms, which seems to be the area where R&D funding can be looked at and can be evaluated, I noticed that you said you had some problem getting information from small firms. From the small firm's point of view, they can only carry out R&D, as well as employing people, out of profit. If they are not making a profit, they have no money to do anything. It certainly would have helped them now with the company tax rates being down to 30 per cent. That is probably more of an incentive than any 125 per cent or 150 per cent R&D tax incentive figure.

There is a proliferation of programs out there. A lot of these smaller firms would not have access in order to know what these programs are all about, let alone fill out the paperwork—if they do know—needed to apply. Have you looked at the impact on these smaller firms of the difficulty in applying for these programs? Have you been able to try and simplify the forms so that it does not take a specialist to make the application?

CHAIR—That is what their federal member is for, among other things, isn't it?

Mr Cook—You are now talking about an area that is the responsibility of the Department of Industry, Tourism and Resources. But having come from that department I can make the comment that significant effort has been put into that, including broadening the regional network of AusIndustry which is the delivery agency in this area, to try and make it more accessible and simpler for firms. It is the case that, as you say, with some of the programs, particularly the R&D tax concession, a whole consultancy industry has grown up around doing those applications so it is a problem for the smaller firms. I am sure my AusIndustry colleagues would say that they have put a very substantial effort into that area over the last 12 months or so to try and reduce the transaction costs for small firms to access the programs. Again, you would need to address that question to DITR.

Mr TICEHURST—What about the promotion of these programs so that firms know about their existence?

Mr Cook—Similarly, AusIndustry do quite a lot of promotion of the programs. They also do a lot of promotion of their success stories. They have award nights for people who have been successful applicants of programs and so forth. But my knowledge of exactly what they are doing at this stage is out-of-date, unfortunately. An interesting thing you will find at almost every industry R&D forum is that quite a number of the firms will—without any prompting from government officials—talk about these programs to their colleagues, because the sort of assistance that they received, whether it has been through COMET or by way of a tax concession or whatever, has often come at quite a crucial period in the firm's life in the development of their particular invention. So you get quite a lot of networking occurring. Indeed, I think that one of the most valuable things at these business-to-business gatherings and the R&D forums is that that knowledge is spread very quickly. My perception is that that networking is far more successful than people like me getting up and talking from a lectern to businesspeople because you are just another grey bureaucrat. But if it is one of their colleagues getting up and talking from a lectern about this, it really does hit home. But, again, DITR could give you far more information about that.

Mr HATTON—Last week in previous evidence, a cultural point was brought up again, comparing us with other countries. A key point was that we had a fear of failure in this area, so there was a strong tendency for us either not to get involved in particular areas or that we had an expectation that things had to succeed. What has happened in the last couple of years, probably with the move from more of a research base to expecting people to get practical outcomes, is that an inappropriate set of expectations has been placed on people in this area. We can compare it, in particular, with the United States where they are used to 80 per cent of things failing and where people who are putting their dough up know that is going to happen and know that they are only going to strike paydirt in a very small number of cases. How significant a problem is it in relation to this area? Do you think it is real for Australia?

Mr Cook—I am not sure that we have any qualitative data on that cultural issue. Certainly something that the venture capitalists—our businesspeople from the US et cetera—constantly comment on is that, in the US, if you go bankrupt several times it is regarded as a badge of honour and that you are really trying hard; whereas here, you would be pilloried in the popular press. So it is an issue for us. I am not quite sure why we have got to that situation. Through things like the Innovation Awareness Program, the government is trying to do something about that by promoting the value of innovation—and I am talking about my colleague department DITR's efforts here—through Innovation Week, which was held for the first time this year and will be held again next year. Also, there are things like promoting young entrepreneurs and entrepreneurship as a valuable and worthwhile career aspiration for people while they are still at school by running business plan competitions at university to try and get people to think about starting and growing their own business as a career aspiration as opposed to being an employee for somebody else. That gap does seem to be there. To get a handle on just how important it is, I cannot offer you any concrete evidence on that point, unless my colleagues have seen research.

Mr Walshaw—I have a small observation. To the extent that the culture stems from previous days of trade protection, that would now not be rational behaviour. If an entrepreneur acts in that way nowadays, they would lose money. I think that form of cultural behaviour will quickly disappear.

Mr HATTON—Probably associated with that, if we think about the experience Australia had with the Sarich orbital engine and the saga over that—I can remember 500 million bucks at a time being put up by the government for that venture—there was not much forthcoming from Australian industry. Australian industry was as directly concerned as it could have been, but there was not the willingness to invest. They eventually had to go to the States to do anything and there was an argument that, if the overseas company did not take it up, they were not going to do anything. Is it an ongoing problem that our primary industries are not willing to grab things at the side, invest in associated entities or in people who have these ideas and try to bring them on?

Mr Cook—The venture capital statistics indicate that more and more funding is becoming available for those higher risk type investments. Superannuation funds are now prepared to have at least part of their money placed into the quite high risk end of the marketplace. That certainly has improved dramatically over the past 10 years. For some markets and some products, I think we should not get too hung up about the fact that the thing might go overseas. For example, if you have developed a new pharmaceutical in Australia, the size of our market is not sufficient to run a world-class pharmaceutical company manufacturing operation, other than in specific areas. There are people like CSL but not huge numbers of them. Going to the US—

Mr HATTON—But we have excellent examples of taking a product from nothing to \$400 million in export dollars, but no other regional part of a worldwide company has been doing that. They cannot start from a base company and expect to grow as big as the big farmers. I think part of our reality is that we are, (1), stuck in that niche area and, (2), we are a part of the regionalisation play. We may actually have to do more with overseas companies that are based here to try to push them forward.

Mr Cook—I agree with that. I was just trying to make a very simple point that one would hope we would do far more of that in the future. I think the signs are that we are doing more

there. It is not necessarily a bad thing for our people to be going overseas and marketing their products to the international markets and establishing a beachhead in huge markets like the US, providing they do that cleverly and we make sure the appropriate returns come back to Australia. For some products, I think that will probably be the way we will get into those international markets. If we can keep doing that, if we could only establish a few global brand names like the equivalent of Nokia, for example, it would make a huge difference. Part of the challenge for Australia is that some specialists, like Cochlear and ResMed, have an international reputation, but they are for quite specialist markets. In other areas like our resources sector, everybody knows we are the world leader, but that does not have the same resonance in the population at large as Nokia does. Not everybody knows about that, but the minerals industry people do. That is part of the story. I think we just have to keep working at it.

Mr HATTON—We have been making advances in some areas. Is there another area where we have been going backwards recently with the contracting out that has taken place from one end of the country to the other, from councils through to state and federal governments? There are things like Telstra and their research labs that have been cut back; CSIRO has been cut back. This even goes down to the council engineer level where a lot of the expertise, just in local council business, has been taken out. Do you think that we have a significant problem in terms of corporate memory with the fact that a lot of the skills base that existed in our companies or institutions has been dredged out of them and is no longer part of the practical business of confronting and dealing with problems?

Mr Bridge—You are talking about the skills base. It is not necessarily the case that those people are lost forever or have left the system forever. In a lot of cases the company is outsourced and a lot of the skills go with that outsourced provider who will be providing the skills. It may no longer be provided internally by the council, as in the possible example that you mentioned, but rather in a service company that works towards providing services. It applies also to some of your previous comments that a lot of these decisions are the product of rational decisions by business people who are hopefully in the best position to be able—

Mr HATTON—Following the current fashion.

Mr Bridge—There are cultural aspects and there are other factors intruding, of course. In terms of decisions as to outsourcing and the time to undertake R&D, they are hopefully and usually the product of rational business decisions about the best thing to do for the company and the best thing to put our money in to get a return or to operate most effectively. That is a partial answer.

Mr HATTON—My rough point is that most innovation and development come from being involved in doing things and trying to solve practical problems, whether it is in companies, industries, government or whatever. If you extract the people from the practice, you start to have problems and there is less output because people are not thinking about those problems on an ongoing basis in as close a relationship as there might be.

Mr Cook—Certain people have made that point to me before. It is hard to get a handle on exactly how big an issue that is.

Dr WASHER—You should come to WA, Michael; we have plenty of cowboys over there. In fact, Sarich made over \$100 million out of the rotary engine when he retired. I want to come back to the education side of things. One of the problems concerns encouraging people to get into the right educational product. One of the motivations has been, of course, job opportunities at the end. Science offers poor job opportunities compared to medicine, where you are almost guaranteed to be employed, and law et cetera. Law is particularly flexible; you can do multiple things. You might not become a lawyer but you are going to be employed somewhere. Should we skew our HECS repayments to motivate people to take a higher risk degree like science where job opportunities are not guaranteed? In other words, we charge them less HECS than for studying medicine. I am a doctor, so I can pick on medicine instead of law—which I would rather pick on, given an opportunity! That is the question. Following that, what appeals to me about the proposition of employing 100 postdocs is that we give an increased job opportunity guarantee. That is the best idea I have heard for a long time. I am really thrilled with that.

Dr Arthur—The impact of HECS on student choices in general is being addressed in terms of the higher education review. I do not know what the outcome of that might be. I am personally not an expert in the analysis that has been done over time of the impact of differential HECS on student choices. The little I do know of it is that there does not appear to have been a pattern of effect in the price of courses on students' choices. Courses that have had differential HECS have not, to my memory—I am not an expert on this—had an effect on enrolments. I am not really sure whether or not the HECS price signals are going to be effective in directing students through.

Your previous comments on people's perceptions of the long-term economic consequences of that—and, indeed, of the social image—tend to have been far more powerful in terms of student choices. The factors impacting on a student's mind, or that of a student's family, when they make those crucial choices are a very complex area that we do not understand particularly well. We do not understand a lot of things about human motivation. It is certainly an issue which can be considered. The higher education review is considering all issues associated with higher education, including HECS. That is all I can really comment on about that.

Dr WASHER—Dr Arthur, it is a fascinating subject, and Mr Cook mentioned it: how do we teach innovation? I see you are the Innovation Branch man, but what do you do to teach innovation?

Dr Arthur—If I had an answer to that, I think I would go out and start running a consultancy somewhere. It is not easy. A number of things need to be addressed throughout the educational experience. It is clearly not the case that you can simply come in at the end of a process, run 'Innovation 101' as a particular tertiary course and have an effect. It is certainly an issue which has been receiving a lot of attention in this department—and indeed in state and territory education departments at the school level—over some considerable period of time.

For some time now, we have been pursuing at the school level enterprise education and a number of activities attempting to deal with that cliched view of the Australian mindset: that it is risk averse, and that enterprise and entrepreneurship are not as valued as in other cultures such as the US. Those things need to be addressed. I can only say that a number of initiatives have been tried but there is no simple answer.

Mr FORREST—It seems to me that sometimes we might overlook the obvious in terms of what good models already exist. I am very strong in agriculture and horticulture, and I think the Grains Research and Development Corporation model is a good one. I hope you will agree with me on that. There have been some very clever outcomes in terms of agriculture. We have drought-resistant wheat, a whole range of new varieties and entomological challenges—that is, insects—and so forth. But there is a suggestion in your submission that, because we are trying to entice industry involvement, that reduces the effectiveness of CRCs. Real effectiveness comes when the players are contributing their research levies. That brings in the government, which commits to match them, and you have all of the players involved.

The FASTS submission suggests something like that. I know the big challenge is trying to entice R&D in a whole new area of sexy new products and so forth. But the boring ones work very well and produce immensely successful outcomes, so let us not overlook that model. In reply to the chairman's question, you did say that you are looking at the FASTS proposal. Would you be in a position to report back to this committee before we write our report?

Mr Cook—I am not sure about that. Certainly we can give it some more thought and give you a supplementary bit of paper on that if you wish. You are reporting about the end of the year; is that correct?

CHAIR—No, it will be later than that. It seems that it will not be possible to get through the public hearings before the end of the year. All of my colleagues are very busy people, so it will be into the new year.

Mr FORREST—One of their suggestions is that the players should get together and volunteer a levy in the same way the GRDC works. Wheat growers contribute a levy.

CHAIR—It is not only the GRDC; a number of them work in a similar way.

Mr FORREST—There is a range of them right across horticulture as well, with tremendously successful outcomes in trying to grow the perfect orange or whatever it is.

Mr Cook—We will take that on board and see what we can do by way of giving you some further analysis of the FASTS' idea. With respect to your basic point about 'don't forget the things we are really good at,' I could not agree more: I think Australia has very strong skills in our natural resources area. We, I understand, are possibly the leading provider of mineral industry software in the world, for example. There is no doubt that our rural R&D corporations have been fantastically successful—and they are successful because they have been oriented towards the industry's needs. The CRC program is another program which is designed to try to ensure that more of our research is based on industry pull as opposed to researcher push. It has achieved some good results.

In a number of areas, the biotech area generally and medical research as well, Australia has world leading capabilities. If only we could broaden that base into new areas that we are trying to develop, that would be great. Australia has a great track record in invention and innovation. Currently we also have a fantastic advantage in our cost structure, which sees, for example, firms like Ericsson in the ICT area even today maintaining a significant part of their total global R&D effort here in Australia. That is a huge endorsement of Australia's innate capabilities and

our cost competitiveness. I do not think people should get too gloomy about all this. I think we have tremendous strengths and skills and an enormous base on which to build. It is about doing things better than we are at the moment.

Mr FORREST—My point is that in the submissions I am reading none of the suggestions are new; they operate in other commodity sectors. Participation in postgraduate studies out at research bases occurs now. Even in my own constituency you meet a lot of young people out there trying to make a future. There is nothing all that new in what I am reading. Why could we not develop models like those for these new emerging areas of science research?

Dr Bott—I think the difference with agriculture is that there is virtually no private sector R&D in agriculture so the RDCs serve to work out what their research needs are and purchase that from public sector organisations like universities and CSIRO. With other industry sectors the firms do their own research. There is a question of whether you apply the RDC model in the other industry sectors or whether you encourage the firms to do more of their own research.

Mr FORREST—There is private sector investment—it is coming from 30,000 grain growers. Right? That is the benefit—participate en masse.

Dr Bott—The funds come from there but the research is performed mainly in the public sector and CSIRO. The research is purchased on behalf of the grain growers and so on by the RDCs.

Mr FORREST—I am just suggesting what a good model it is.

Dr Bott—Yes. It has a long economic pedigree. There is a very prominent economist in the area, Paul Romer, who suggested it some time ago. It was considered by the Industry Commission review in the mid-1990s. I think there were some industry associations in other fields in the mid-1990s too.

CHAIR—I think the point FASTS made earlier with respect to that is that the difficulty in some industries is finding enough smaller companies that are all in the same product area. In the agricultural industry they are all apples, sort of thing.

Dr Bott—And you then need to get them to agree to a levy.

CHAIR—Certainly I think there is scope for pursuing that, from what has been said.

Dr Arthur—The reason for my second comment was that you also need to have a situation where everyone agrees that a certain amount of research needs to be done and all share in the result, which is what you are talking about in the agricultural area. They all have a common interest, the research is done and it is then made available essentially to all the players. We are working in a sector where you have a large number of SMEs who may actually see the research as part of their competitive advantage vis-à-vis other SMEs. It is not necessarily easy to produce the same kind of pooling arrangement. It is not impossible, but it has an extra difficulty.

Mr Cook—Yes, that is right. I think it is much harder when you move beyond the industries which are characterised by large numbers of small players to more specialised areas. In the rural

area, the wine industry is an industry where there are big players who still, to this day, centralise their basic R&D through the Australian Wine Research Institute. So it does happen in one or two cases.

CHAIR—You mentioned that Ericsson are placing a significant part of their research and development in Australia and the fact that, particularly at the moment, there are substantial advantages in Australia—the exchange rate et cetera. Why do you think there are not more of those large international companies doing similar sorts of things?

Mr Cook—It is a bit difficult to say so I could only make a very general observation. I think that for many of the US based companies their first instinct when things get a bit tough is to withdraw back to home base whereas the Europeans seem to take a slighter longer view about some of these things, so maybe there are some cultural differences at play. And perhaps we are just not promoting ourselves well enough. Under Invest Australia's new charter, we are trying to do things better than we did in the past and R&D attraction will be one of its strategies. I think in part it is about the fact that we possibly have not marketed ourselves, our skills and our cost competitiveness as well as we might have done into a few of those key companies. But we are starting to rack up some pretty impressive track records in a number of areas.

CHAIR—That is a good point and I am pleased that you have made it. We had evidence from the Australian Academy of Science that indicated, for instance, that the decision by Glaxo to locate in Singapore, while there were some specific advantages in Singapore, was primarily made upon certain other perceptions about Australia generally rather than upon reality. I thought at the time, 'Why was that decision made? Why do they have those perceptions?' Often, like anything that is marketed, it is because not enough information is provided or it is not provided in the best way. So I am pleased to hear that that has been recognised and has been pursued in different sorts of ways.

Mr Cook—I think there would be nothing like getting the Ericssons of the world on a plane and taking them around the world to tell their stories. That would be far more powerful than government trying to do it by itself.

Mr Bridge—I will just add there that currently Australia is very cost competitive but that this level has not always been the case. Decisions about location are made over a prolonged period. They are not decisions you would take lightly or quickly so decisions on placing a particular R&D effort in a country may well include lag times. That is my main point: there are going to be lags in those decisions. Australia's cost competitiveness, if it is sustained, is likely to continue to attract businesses here, particularly if there is some more extensive and focused effort to provide information about the competitiveness of R&D in Australia. Some very salient facts there are that it is not just about cost, of course. It is also about the availability of a skilled work force, the livability of Australian cities and political and financial stability, and security issues are very important as well. It is not just about cost so I think Australia will be increasingly very well placed into the future with regard to those decisions.

Mr FORREST—You mentioned in your comments the inability at the moment to make any assessment of the impacts of the BAA program. How long would it be before you might be able to provide advice as to whether that has had a positive impact on the issue? That would be useful feedback for us.

Mr Cook—I will ask Richard to comment more fulsomely, but we can already get some partial indicators of the BAA program's success in terms of indicators which relate to the usage of the programs per se. The challenge then is to assess the package more broadly and to also look at our innovation performance more broadly.

Mr Bridge—Backing Australia's Ability is a whole suite of programs. Some of them already exist, a lot of them are new and some are ramping up, as is normal. Evaluation and review of government programs take place on quite a cyclical and systemic type basis. Some of the Backing Australia's Ability programs are 12 or 18 months old, and you usually need to ensure that programs are in place for a reasonable period of time before you necessarily have the information available or are in a good situation to review whether a particular program is being effective. We have quite a deal of evaluation and review activity planned over the next year or two in the Backing Australia's Ability program. For example, the CRC program is one that we are going to be looking very closely at over the next 12 months to evaluate how effective it is.

Mr Cook—I should also mention in that context that the government is planning to release its next annual innovation report before the end of this year. That will be the first time that we have gathered in a lot of the program type information, so that will start to tell the story. As we go on each year that information base will become richer and we will be able to say more and more about exactly what is being achieved. In the next couple of months that report should emerge and will give you an update on how things are going. It will be well before the committee reports. That will be a useful input. We will make sure that the committee gets copies of that report.

Mr Bridge—On that point, some of the concentration of the inquiry has been on this expenditure of business R&D. That is an input measure, obviously. You are seeing what business is putting in and spending on research and development. Of course, better measures overall would be the outcomes. The evaluation activity is probably trying to look more at the effectiveness of the program in terms of getting value from it overall rather than simply how much you are putting in, which may or may not impact on economic and social outcomes overall.

Mr FORREST—Sometimes it can be years down the track.

Mr Cook—That is true.

Mr HATTON—Finally, I have an observation to underline the importance of the question that you asked. If you are right in your submission that there is not much hope in terms of a better BERD in the future for Australia because we have a large services sector and a small manufacturing sector, then it may be critical to actually look at this area of how we can offer ourselves to the world as an R&D centre of excellence and not only do R&D for ourselves but, if our base is strong enough, to say that we are almost guns for hire in this area, rather than, as we have been doing, perennially asking ourselves why we are not doing better in this. Maybe it is because the questions we have been asking have not been heading in the right direction.

Mr Cook—I hope we did not leave you with the impression that we did not think that there was any chance of increasing our BERD. I certainly think that there is a chance, but the figures show that we have a long way to go and we need to look at different ways that we can get there.

Mr HATTON—But that structural impediment argument may be extremely well founded. That may be a fundamental reason why we are being stopped from doing better than we thought we were.

Mr Cook—Yes.

CHAIR—Thank you very much for your evidence and submission today. We have spoken about a couple of possible follow-ups between now and the committee reporting.

Resolved (on motion by **Ms Corcoran**):

That this committee authorises publication, including publication on the parliamentary database of the proof transcript of the evidence given before it at public hearing this day.

Committee adjourned at 6.40 p.m.