

# Session 3

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**Patrick Nolan:** Well, welcome back from what was a relatively short lunch break. There's a lot of energy in the room, so let's keep that going. We are now into an afternoon session, which I'm very much looking forward to.

We've got Professor Beth Webster and Professor Adam Jaffe who will be talking about particularly the evaluation of some of the government assistance. This should be particularly topical, and it follows on very nicely from the discussion that we just had from the Treasuries.

Professor Beth Webster is the Director of the Centre for Transformative Innovation, Swinburne University of Technology. She's also an Honorary Professorial Fellow of the Melbourne Institute of Applied Economic and Social Research at the University of Melbourne and has authored over 100 articles on the economics of innovation and firm performance – and I should note that the Centre is also one of the sponsors of today. So thank you Beth for helping us with today.

And then we've got Professor Adam Jaffe, who's the Director of Motu Economic and Public Policy Research. He's been in that role since May 2013 where he came from Brandeis University in the US where he was a Professor in Economics and Chair of Economics and Dean of the Faculty of Arts and Sciences. Also, he and his colleagues at Motu have been doing a fantastic job in working with Hub agencies on making more use of the LBD. So thank you Adam, and thank you to your colleagues from Motu for that.

I think that's enough from me. We all know how things are going to work by now, so I'll pass over to Beth. So Beth, thank you.

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**Keynote address:**

## Professor Beth Webster, Swinburne University of Technology

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**Beth Webster:** Thank you very much to Paul Conway for inviting me; Patrick Nolan for doing a lot of the organising to get me over here.

What I want to do today is talk about when governments should give support for business R&D, what drives a firm to make a decision to invest in R&D, and that's with a view to then talking about what sort of support mechanisms governments can offer to encourage firms to do more R&D.

...why should public monies be spent on business R&D? ... the additional R&D that's stimulated by the government programme has got to deliver benefits to third parties...

So just starting off, why should public monies be spent on business R&D? Probably the easiest way to think about it is to assume if all of the

benefits from doing R&D or knowledge creation or innovation return to the firm, should public monies be spent supporting that R&D activity? And if you put it in those stark terms it's very easy to see that no, effectively there needs to be benefits to third parties for any case to be made for supporting R&D in business. And it's not just benefits to third parties. There have got to be what we call infra-marginal benefits. They've got to be benefits at the margin. So the additional R&D that's stimulated by the government programme has got to deliver benefits to third parties – not the whole R&D itself. That's essentially the case.


 **Donal Curtin** @donal\_curtin:  
Beth Webster at #innovatenz back to 1st principles, why you would want to support/subsidise R&D

...is it possible for a firm really to capture all the benefits from creating knowledge or doing R&D, and I would suggest no.

The question then naturally follows – is it possible for a firm really to capture all the benefits from creating knowledge or doing R&D, and I would suggest no. And the reason for that is that benefits from knowledge creation are perpetual. They go on forever and they're non-rivalrous. A very easy example of an idea with perpetual benefits is the wheel. It was a great idea, occurred maybe 10,000 years ago, but it's still delivering benefits to us today and it's non-rivalrous. You can use the wheel, I can use the wheel, it doesn't detract from anyone else's ability to use the wheel.

...why then should a government support R&D spending?

So in the long run probably the business captures none of the benefits from the R&D. The consumer captures it all. So why then should a government support R&D spending? If the New Zealand Government supports R&D, it creates knowledge, it creates a great idea – it might be bungee jumping, it might be The Lord of the Rings, and the benefits flow ultimately to the seven billion people of the world. So what's in it for New Zealand? Well, you have to make an additional case that in the short run, neighbouring firms – they're the third parties – neighbouring firms benefit from the R&D that one business undertakes. So there's some short run capture either by local firms or by local consumers. The short run can be very long, it can be decades, but in the short run they get extra profits or extra benefits.

 **Donal Curtin** @donal\_curtin:  
Webster's conclusion – yes, the social return to R&D tends to be > than the social discount rate so subsidies etc worthwhile #InnovateNZ

So that's essentially the case you have to think through when you say, we want to put public monies into R&D. In the long run, this whole process is just competition. In the long run, competition drives profits down to normal; and the firm gets no extra return on their investment. They've got to get it all in the short run. And if your country is accruing these short run benefits, which could be very short or they could be, as I said, decades, if you're continually getting these short run above normal profits, then you're getting permanently higher incomes. And that's where countries want to be and that's where I'd argue some of those countries in that Northern

European belt, in the US and Japan, this is why their incomes are so high there – higher than other countries.

 **Shaun Hendy** @hendysh:  
Prof Beth Webster from @Swinburne says the world still underinvests in R&D; still a strong case for government support

...what part of the R&D involvement do we want to subsidise?

So the next question you have to confront is, well, what part of the R&D involvement do we want to subsidise? And when most people think about subsidising R&D they think of the boffin in the laboratory with the test tubes doing the experiments – we think of this as the unit that actually undertakes the R&D activity. And in fact I think most public sector programmes that I've seen typically tend to subsidise or support the unit that is actually doing the R&D activity and the externality or the spill-over benefit from that activity occurs when the technical people, the scientists or the R&D workers, talk to each other, or there's a bit of labour mobility between sectors and that's the way the knowledge flows – that's how the knowledge gets to the third parties.

Should we also subsidise or support firms that finance R&D activity?

However, there's another alternative. Should we also subsidise or support firms that finance R&D activity? They might not undertake it themselves but they might finance it. And that's a little bit of a harder one to understand, but there is emerging evidence,

good statistical evidence, that businesses that outsource R&D but still own the output – they probably control the patent – create spillover benefits for other businesses in the same home industry. So we might want to think about that and there are some schemes in the world that do allow support for businesses who outsource their R&D to another country, for example.

...should we support businesses that use the R&D?

And the third one is, should we support businesses that use the R&D? They don't do the R&D, they don't finance it, but they actually consume the products of the R&D. So say I'm in a business and I bring in a really sophisticated IT system, I link my accounts up with my customers and my suppliers for example, and I go and I tell Jim down the road or Adam down the road what I've done. And I say, this is great, you've got to go and talk to this guy, these are the problems and these are the benefits, and Adam says, great idea, I'll do it too. So that's the externality, that demonstration effect is the externality. So should we support that? So these are the issues you've got to think through for a good R&D support scheme.

Knowledge diffusion's really important, so why don't we support knowledge diffusion instead?

The obvious question then is – I've slipped between knowledge creation and R&D and innovation deliberately – but a lot of government programmes are really focused on the R&D and I mean accounting R&D, that hard definition. But we know that that's not the source of productivity increase. It's biased towards certain firms, certainly biased towards industries, manufacturing, mining, telcos are the obvious ones that

I know of. They might be slightly different in New Zealand. It's not the source of productivity increase. Knowledge diffusion's really important, so why don't we support knowledge diffusion instead?

You've got to think through those issues and decide where you get the best bang for your buck. I can't give you answers here and I actually don't know many studies that will pin it down, but Bronwyn's talking after me and she might know more about it than me.

So, essentially, what we've talked about is, is the case for supporting R&D or innovation or knowledge diffusion if you want to make it broader, is the externality or the spill-over problem? The usual line people come out with when there is an externality is "oh okay, just internalise it". And in this specific instance it means introducing intellectual property like patents, trademarks, plant variety rights, etc. That doesn't work in many cases when the externality, the knowledge that's just flowing out, is unobservable or very hard to trace.

A really great example here is the research behind sudden infant death syndrome. This is where new-born babies suddenly died in their cots – cot death. People did a lot of research and they found that to stop that was just the way you put the baby in the cot and that's actually cut the deaths down considerably. It is not possible to observe people using that piece of knowledge. All seven billion people in the world can use it and you certainly can't apply IP to it. So there are certain types of knowledge. IP's just not suitable at all, not practical and you wouldn't want to in any case. You wouldn't want to really go round looking in people's bedrooms and charging them a royalty for using the knowledge.

And then there's the other one, which I am sure most of you are familiar with, which is that where you have a non-rivalrous score, the marginal costs of using it is zero and if you internalise it through intellectual property, you're charging a price above the marginal cost of using it. We all know that's dead weight loss and inefficient. So then public support becomes an alternative policy for these sorts of cases.

One thing I didn't mention is at the very first slide but I included that qualification "national" R&D policies. Many governments around the world do support R&D for the general good of the seven billion people. Think of the green revolution; think of medical research for things like Ebola, SARS, Malaria, and what have you. They're up there in the cot death space. But my talk today is about national policies. Policies to build up the capability and the standard of living of one particular country.

There's an additional reason why markets might fail and therefore governments want to step in to this R&D support space.

There's an additional reason why markets might fail and therefore governments want to step in to this R&D support space. I don't know whether you really want to call it an externality or not, but this is when you've got a mismatch between the person who has the great idea and the person who's got the cash. So the great idea needs cash to be developed, commercialised and then marketed. An age-old problem, that has been recognised since the Late Middle Ages when they brought in marine insurance. Over the last few hundred years, we've got this fairly complicated, or sophisticated financial set of institutions to match the person with the great idea with the person who's got the cash.

...one of the things with intangibles is their value depends pretty critically on who is using it.



However, when you're talking about something intangible like R&D, innovation, knowledge or what have you, you've got an additional problem that you don't have when you're just borrowing to buy, build a building and store plant equipment; you're trading in intangibles. And one of the things with intangibles is their value depends pretty critically on who is using it. It depends on the person it's embodied in. So when I invest in an intangible, it's very hard to mortgage. There's a small market here for mortgaging patents and trademarks, but in general their value is uncertain, it's bound up with how that person behaves; I don't know you, I might not trust you or I might. But the problem is it produces really high rates of discount on how I'm going to evaluate the probability of me getting back my money if I lend you money. And what this means is that you've got the great idea, it's going to save the world, it's going to save the New Zealand economy. You go to the bank, they apply this high rate of discount to you and you don't get the money because they figure it doesn't stack up. And so the demand supply curves for loans don't intersect and you might call that a source of market failure.

Related to this is the uncertainty problem. That's a picture of CERN there, that's my version of penicillin. When you're dealing with an idea that is very, very profound but very, very risky but you really think it's certainly worthwhile – it might be laying optical fibre cables all around a country; it's certainly worth the while to roll them out, but there's huge risks. So a huge amount of uncertainty associated with it. So much so that there are so many unknown and unknowable factors about the costs and the potential benefits that you're not going to get a bank to lend. You're certainly not going to get a financial institution to lend, and the only possible way you're going to get to do it, is to actually spread the risk of the whole project across the entire population, which basically means the taxpayer picks up the tab.

When you've got a situation where you've got fundamental uncertainty, you can't pull risk and get rid of it. You can only spread it across the population.

And one of the reasons this is a particular problem is you're dealing with uncertainty, not risk. So you're not dealing with actuarial risk where you have a probability density function, you can work out expected value, you can apply portfolio reasoning to the problem, as you can with an equity trust or a property trust, and you can say to the person investing that the returns are pretty certain. When you're got a situation where you've got fundamental uncertainty, you can't pool risk and get rid of it. You can only spread it across the population. So this would be another instance where governments step in. An example might be the Manhattan Project. Whatever you think about the morality of the Manhattan Project, they said it is highly uncertain. We'll discover



something that Einstein had dreamed up in bed, we'll make it operational, but we're not going to put money into it, the Government has to do it. And they actually cracked it within a few years. Not the same for fusion energy. They've been working on it for decades and it hasn't worked. But these are examples where there is a rationale for government support.

The evidence is even with the amount of support most developed countries give to R&D, there's still a prima facie case that we are under-investing in R&D.

So that's the set of arguments that I'll bring to bear if I said well is there a case for R&D support? We already do a lot. We've heard from Callaghan Innovation. They already do a lot of R&D support, and similarly for most developed economies, they already do a lot to support innovation through tax concessions or direct procurement or grants. So do we still have an externality problem? Is there still an argument for doing more? And I'll just say briefly the evidence is probably yes, but again I think Bronwyn and perhaps Eric will talk you more through this. The evidence is even with the amount of support most developed countries give to R&D, there's still a prima facie case that we are under-investing in R&D. So I'll leave that one there.

...what drives firms to invest in R&D?

The second thing I want to just talk about very briefly because the evidence is really, really weak, is what drives firms to invest in R&D? Lots of studies try to explain R&D or try to explain innovation, and a lot of them find firm-specific factors dominate and it's a little bit of a black box. We don't know what it is.

One systematic factor, and this is coming from many, many studies across countries, is that size is important. Sometimes I find large firms, sometimes it's medium-sized firms that have the most intensive or dense rate of R&D relative to sales. Exports status and foreign ownership consistently come up as being associated with firms that do more R&D or more innovation.

...the evidence is that being innovative makes you an exporter, not the other way around...

Unfortunately there's a couple of studies I've looked at on the direction of causality with exports and I'd say on balance the evidence is that being innovative makes you an exporter, not the other way around, so that's not a factor we can talk about. Industry comes up as well. But what I've said there is they're relatively empty of content both from an understanding perspective and certainly a policy perspective. You can't make a firm change industry or be bigger than it already is. It's already trying to grow as fast as it can. You probably can't change its ownership either. So it's possible these systematic forces are really proxying for other things that we think are important, but the evidence there is quite weak and I'll just leave it there.

Did you move to a cluster because you're innovative or did the cluster make you innovative?  
We just don't know...

We also know that there are other things that are complementary to R&D and innovation – the direction of causation again is unclear. Things like ICT, other forms of innovation, being in a cluster. Did you move to a cluster because you're innovative or did the cluster

make you innovative? We just don't know, unfortunately and a de-risk to the environment's another one.

## ...how can we influence the decision to innovate?

So the economic research in this area's not flash, but there's no point waiting until we've had the answer – we have to act today. So the question is, how can we influence the decision to innovate? And there is three broad ways.

We can change the cost benefit ratio using money, grants, loans, subsidies of some sort, to make the present value of an investment more attractive.

We can de-risk the environment, and a lot of people here have talked about those sorts of things. Investments are all about confidence and if you don't have much information about where the technology's going, where the market's going, who your competitors are, what the Government's going to do, you are not going to have confidence and you won't invest. But if you are embedded in that environment where you're hearing gossip and know-how, you've got a lot of people around you who are giving you information – and the best information's not from the internet, it's obviously going to be informal know-how, it gives you greater confidence to act, because you have a feel for where all the other people are.

And the third basic type of R&D support are schemes that bring relevant parties together. Governments do this in all sorts of different ways. A famous way was done by the US the Defence Department DARPA programme. As well as doing a number of other things, they brought firms together and told them to share information. They brought firms together with academics and told them to share information.

So there are your three basic ways, but what I want to do is talk about something a little bit more prosaic and more grounded and less abstract. I will talk about the sort of R&D schemes that actually exist today and just make

a few comments on them. Back in Australia I've done a bit of surveying of companies to find out what they understand about these schemes and how they operate, and that's going to be the basis of the remaining part of my talk.

Networking's very important and there's a real huge area of growth in research among sociologists, political scientists to look at what networks work best.

There's three essential types of schemes. There's competitive schemes, entitlement schemes and R&D boards. In terms of what they hand out, the largess, grants is the most common and loans is less common. But they're both financial things and basically they're trying to make the market work better, improve the present value of an investment in some sort of innovative R&D type project. The last four: networking, worker exchange, advice mentoring, blue sky procurement, they're more saying, oh forget the market, we'll just go for something else. I think Sarah from Callaghan Innovation mentioned worker exchanges and student exchanges. Knowledge travels via people, so they're obviously very important. Networking is very important and there's a real huge area of growth in research among sociologists, political scientists to look at what networks work best. Advice mentoring is pretty straightforward.

There's no evidence that we saw in our grant programme in Australia that those additional requirements actually work.



So competitive grants, and I think your R&D scheme here falls into this group. Firms compete for a finite pool of money; there's standard requirements. There's a peak body that usually ranks them, but they also tend to be over-engineered and it's very hard to design them to create additionality. We want to make you do something additional and sometimes they become so over-engineered with rules and qualifiers and things that they don't achieve it. There's no evidence that we saw in our grant programme in Australia that those additionality requirements actually work.

Entitlement schemes are basically saying, okay, here are the rules, everyone who passes the bar gets the money. So typically R&D tax concessions or tax credits are entitlement schemes. Once the rules are set, it then falls back to the accountants or the tax office to actually administer in a more nuanced way. I'll comment a bit more on some of the pros and cons of this scheme in a minute, but one of the problems here is that the research just flows to the company that values their research most – themselves, because they're prepared to put their money in. It's like a matched grant scheme.

And finally, industry boards. These are really interesting beasts, so I'll talk a little bit more about them. The other two are pretty straightforward. I think you have R&D boards in your agricultural area, the R&D councils. We have a lot of R&D boards in our agricultural area and in some of the manufacturing areas like dairy manufacturing, etc. They can be instigated by government. Sometimes they're set up under an Act of Parliament. They're usually funded partly by industry, partly by government. They are owned and controlled by industry, so industry has to engage and the buy-in is great. And what they do is they say okay, here's the problem we've got, it has to be general to all the firms in the industry. We're going to contract someone to do the research for that problem. We're then going to bring it in and then we're going to translate it back out to all our members. These boards often have a lot of extension officers. In the case of primary industry, the extension officers actually do go out and knock on the farm gate. So these industry boards, they take very much a problem-solving approach.

They're the three main generic types of R&D support you can give, but they all have costs and benefits, depending on the size of your budget and what you want to achieve. I'll just highlight some of the most notable ones.

Competitive schemes are usually very costly to deliver. This is when you say here's a grant, apply for it and here are the rules. We surveyed about 150 companies in Australia. We found out that they were spending two to three weeks just writing the proposal. Moreover, we found that the knowledge of the schemes across industry was very poor. Even large companies hadn't heard of the schemes, let alone SMEs, and in addition – and this might be a problem with our Government and not yours – we found that the governments continually change the schemes, rename them, change them. Even when firms had worked out or heard of it from Fred and Jim down at the pub about the scheme, it had gone, it had changed, the rules had changed. So I don't know why governments still do them, but they do. Maybe it's cutting the ribbon, kissing the baby, I don't know.

R&D boards, on the other hand, are not sustainable without solid engagement by most of the industry.

There's no industry engagement with these grants. The company that gets the grants is very engaged and they're very happy, but the rest of the industry generally aren't. R&D boards, on the other hand, are not sustainable without solid engagement by most of the industry. They have a lot to offer and the administrators in the R&D boards, it's their job to make sure they're known and they're engaging with industry, otherwise industry will not pay the levy and their job will disappear. Our R&D boards are set up under an Act of Parliament, which means a new minister or a new government really can't change them very quickly, and there's a lot to be said for that. A lot of them have been going since World War II.

One other thing is most of them really can't handle the additionality problem quite well. So the additionality issue is, if I give you support for your R&D, will you just cut back on what you put in yourself and the amount you do will just be the same anyway – it's just that I'm paying, as a government, paying for part of it. So all the schemes try and minimise that deadweight loss and try and maximise additionality. It's very, very hard to do. Even in a lot of labour market programmes, you've just got to wear it; you're just going to have deadweight loss.

...in Australia... for every dollar the Government gives a firm through the tax concession, the firm increases their R&D by 40 cents, so in fact they keep the extra 60 cents to themselves.

The evidence on entitlement schemes that we've got in Australia is that for every dollar the Government gives a firm through the tax concession, the firm increases their R&D by 40 cents, so in fact they keep the extra 60 cents to themselves. So there is some additionality, it's not huge and it's certainly a lot lower than what they're finding in Europe on that score, and we don't know why, but we suspect that our R&D environment's not very good which is why it doesn't have the same effect. So in theory the R&D boards shouldn't come up against the additionality problem, because they're targeting problems that are general to the whole industry. It might be locusts or it might be a technology that has gone wrong and they're fixing up, that affects all the firms equally. It might be something to do with the export market that will affect all of the firms equally, so they won't be targeting something that the firm would want to do themselves.

I think maybe, just one thing about the grant scheme that might be very relevant to

New Zealand – it's certainly relevant to Australia – is that when you've got a competitive grant you really need a selection committee that knows their stuff. They know the technology, they know who else is doing it elsewhere in the world. They know if this is a goer, or this is just a second rate imitation of what someone else is doing in the world. Now in America and in Europe you probably have the depth of specialised skills to get a board to evaluate every programme that comes across your desk. In Australia and in New Zealand you just don't have that. So that is a really big drawback of having an expert committee rank applications.

Just finally, the last slide. The generic problems with a lot of the R&D support schemes that I've seen here and elsewhere is a) the changes to the programmes, b) the over-engineering. Sometimes the criteria for getting a grant or even getting a competitive entitlement ties the firms up in knots, so on the one hand they've got to say no-one will lend to us – on the other hand they'll say it's a great idea, those sorts of problems. I think they're well-known. There is, across the board, an absence of really good evaluations on whether they work or not, but Adam might have more to say about that. And a lot of these programmes are isolated and fragmented and I would have thought to get a lot of bang for your buck in terms of their programmes, you need to embed it in a bigger programme of bringing up capabilities in a particular industry.

So thank you very much. [Applause]

 **Donal Curtin** @donal\_curtin:  
V good typology of R&D support schemes and pros/cons from Webster #InnovateNZ

**Patrick Nolan:** Thank you Beth and sticking perfectly to time as well. I'll invite Adam to the stage and I'll just change the slides.



**Discussant:**

## Professor Adam Jaffe, Motu Economic and Public Policy Research

**Adam Jaffe:** Thank you Patrick and thank you to the Hub for inviting me here, and thanks Beth for your comments. What I'm going to try to do is connect some of Beth's comments specifically to the New Zealand context and in doing that I'll pick up on some of the things Sarah said this morning and comment on those.

Both Patrick and Beth have suggested that I was going to talk about evaluation of R&D programmes. I actually wasn't going to do that, because I thought I was supposed to be commenting on Beth, but I will tell you I do have a paper with Trinh Le here which looks at the R&D subsidy programme in New Zealand in an evaluation mode and you can get that paper on the Motu website.

Beth has talked to us in general terms about why we would want firms to do more R&D and Sarah also used this term BERD which is the OECD term. I think it is Business Enterprise Research & Development, but we all just talk about BERD. She talked about some of the mechanisms that you could use if you wanted to increase BERD, and I'm going to just try to comment a little bit more on the specific issues that are raised in a New Zealand context.

...we want to increase the wellbeing of Kiwis in the long run... so what can we do that will make Kiwis better off in 2030?

So, before I do that, I want to take a step back. Beth kind of did this, but I think it's really important, and remind us why we think about this. So my assumption and Girol [Karacaoglu] will, I think, agree with me, is that what we're trying to think about as a country and as a government is to make Kiwis better off. Very broadly defined, we want to increase the wellbeing of Kiwis in the long run, off in the future at some point. So what can we do that will make Kiwis better off in 2030?

We could just invest in capital of various kinds. We could build more roads, we could make the environment cleaner, natural capital, we could strengthen our society in various ways. There's lots of things we could do. All of those things cost money and they're subject to diminishing returns. The more you spend, you tend to get less return for the marginal dollar, if you build too many roads, for example.

...if we have new ways of doing things, in the future people will be better off.

So an alternative to do is to try to find new ways of doing things that will actually make it less costly in terms of resources in the future to accomplish the things we want to accomplish, whether those things are mitigating our greenhouse gas emissions or increasing our consumption of sausages. Either way, if we have new ways of doing things, in the future people will be better off.

...historically and globally the effort of private firms to come up with new ways of doing things has been the most successful mechanism for this phenomenon of innovation...

And historically and globally the effort of private firms to come up with new ways of doing things has been the most successful mechanism for this phenomenon of innovation, I didn't use that word in this bullet, but that's what that bullet basically is. So that's why we're doing this. We're doing this because we want to increase our opportunities in the future and we think that firms doing cool, new things is going to be an important source of that. I'm going to come back to that in a second.

BERD is low in New Zealand. Many of you know this, relative to GDP, relative to population, depending on exactly how you counted. We're somewhere like 25 or 30th in the OECD. A partial explanation for our low BERD, there's two important – I don't want to say the reasons – but they're things to understand about why our BERD is low.

Our GDP has a very big share of industries which everywhere in the world spend relatively little on BERD, so in some sense it's not surprising if your GDP is half things that people don't normally do research in – the ratio of your research to GDP is going to tend to be low.

Secondly, in all countries R&D is less prevalent in small firms and as we've already seen today, Sarah had some numbers about this. We have a lot of small firms. What I want to do – we know those things – I want to ask what are the implications of that if we then want to think about increasing BERD?

...why do some industries not invest much in R&D?



So, first of all, why do some industries not invest much in R&D? There are a number of things that might be going on. In the jargon of the field we might say the technological opportunity is low. What we mean by that is that science just isn't giving us many things to do in this sector compared to other sectors. That could be one reason. It could be that there are lots of things we can do to innovate, to make ourselves more productive, but they don't involve research. It's other kinds of things that are the highest payoff in terms of getting better ways of doing things. It could be that we're doing things in these industries that really are research but we just don't tend to count it as such. We only count research when there's a research department or a man or a woman whose title is scientist. But people can be doing research without that being true and in that case we're not going to count it.

## Why might small firms not invest in R&D?

And then finally it may be that in some of these industries the fragmented industry structure makes the spill-over problem that Beth emphasised, even bigger than in other industries and that's why firms aren't investing. Why might small firms not invest in R&D? Typically R&D itself is subject to economies of scale. It's more effective if you can do it at a higher scale. A small firm isn't going to be able to do it at big scale. Getting the benefits may require capabilities that small firms don't have, so it may be that they could do research but even if it were successful they wouldn't really be able to exploit it because of other gaps they have. They may not be able to get money – Beth talked about this. Again, they may be doing things like research. If you've only got five employees, it's pretty unlikely you're going to designate one of them as head of research, but any of your five employees may, in fact, be spending part of their time on research and it's just not getting counted. And then finally, their small sales base again may make the spill-over problem more acute.

### Motu Research

@moturesearch: Why is Business R&D challenging in NZ? Ag, forestry, tourism low everywhere + NZ firms mostly small #InnovateNZ

...the extent to which BERD is low, because there are things getting in the way, as opposed to it's low just because actually there's not much return there, is crucial to deciding what we want to do as a country.

...we only want them to do a billion dollars more R&D if it's actually going to be useful.

Now why have I gone through this? The reason I've gone through this, I would argue, is we need to understand these things because the extent to which BERD is low, because there are things getting in the way, as opposed to it's low just because actually there's not much return there, is crucial to deciding what we want to do as a country. And if you think back on the two lists I had, they were mixtures of both explanations. Sarah referred to the billion dollar problem that we want to get New Zealand firms to do a billion dollars more R&D. Well, I would argue we only want them to do a billion dollars more R&D if it's actually going to be useful. We don't want them to do a billion dollars more R&D just so we can tell the OECD we moved up from number 26 to number 21 in their list. That doesn't actually make Kiwis in the year 2030 better off if the research itself hasn't been productive.



 **Motu Research**

@moturesearch: Adam Jaffe:  
goal is NOT moving NZ up in the  
OECD BERD report tables, but  
rather increasing innovation and  
productivity #InnovateNZ

...I'm sceptical that we  
could get a lot of spill-over  
benefits without generating  
any primary benefits to the  
firms involved.

There is an issue: you might argue, well, maybe the problem is it's not going to be valuable to them but there are going to be huge spill-overs. So we want them to do it even if it's not productive from their perspective. And that could be true, but in general I'm sceptical of arguments where you tell me the first order effect of what I'm going to do is zero and the second order effect is really big. There are some cases. The sudden infant death syndrome may be one case of that, but as a general proposition I'm sceptical that we could get a lot of spill-over benefits without generating any primary benefits to the firms involved.

...we can work on  
coordinating better  
between firms and  
between non-profit  
research organisations  
and firms. We can try to  
improve the technological  
opportunity by funding  
basic science...

This is just saying it again. Depending on which of these reasons are the reason why firms are not doing R&D, you get a different story as to what would actually happen if we succeeded in solving the billion dollar problem and getting more BERD. We can reduce the funding barriers to some extent, depending on how we do the financing. If we create new partnerships, for example, we may be simultaneously giving them money and helping solve a coordination problem which is actually a barrier to R&D. So there are things that we can do. Oh, and then there's also things we could do separate from financing which would try to directly attack the barriers, as we see them. So if there are barriers out there, we can work on coordinating better between firms and between non-profit research organisations and firms. We can try to improve the technological opportunity by funding basic science that's going to generate new science, new ideas, new research tools that then the firms could use and possibly, importantly in New Zealand, we could work directly on trying to build management capability, with the notion that if they had that then they would see the benefit of doing research and they would do more R&D.

...we don't want to think  
of BERD as an end in itself.

But the danger is we don't want to think of BERD as an end in itself. It is not an end in itself. It's a means to an end. So as we think about increasing it, I worry that when we say things, with all due respect, when we say things like we need a billion dollars more of BERD, there's a danger that we're going to forget why we wanted more BERD and the million dollars more BERD could become the goal and I think that's potentially counterproductive.

Okay, thank you. [Applause]



## Discussion



**Patrick Nolan:** Well, thank you Adam and Beth – both very punctual speakers, so you have made my job very easy, thanks.

Beth went back to first principles and talked about some of the economic arguments for supporting business R&D, things like the externality problem, mismatch between ideas and money, also the uncertainty problem. She then talked about how can we influence the decision to innovate and the different types of schemes and some of the problems with these schemes. Some of these included, of course, the fact that politicians will be politicians, so the uncertainty of policy settings. The additionality problem; you mentioned the Australian evidence of a dollar in assistance – only 40 cents is additional, so I thought that was very interesting. And some of the challenges around over-engineering and isolated, fragmented programmes and I think for a lot of the New Zealand policy makers some of these concerns will sound relatively familiar, so I guess in a way that's reassuring to know that we are all making the same mistakes.

Is the issue that research in New Zealand is of a relatively low value because the domestic market is relatively small, so why would you do it? Or are there particular social, economic, institutional factors that we should be looking to address?

And then Adam also took a step back and argued why we would want to increase BERD, in particular the importance of lifting productivity as a way of increasing incomes and wellbeing into the future. He highlighted the importance of actually understanding what the real problem is. Is the issue that research in New Zealand is of a relatively low value because the domestic market is relatively small, so why would you do it? Or are there particular social, economic, institutional factors that we should be looking to address? And on that he talked about ideas like financing to reduce the financial barriers or maybe even directly attacking the barriers themselves. One of the issues is a particular bugbear of a lot of people here – around management capability.

So fascinating presentations. You will know the process now, so any questions? We've already got a suite, so I'll start with Eric Bartelsman and Bronwyn and then Andrew. The microphone's at Andrew, so away you go Andrew.



**Andrew Sweet:** Adam, while I'm worried about your worry, it's hard to argue with your point that BERD is not an end in itself, but I wonder whether your worry is a real practical worry or if it's more of a theoretical worry because when firms, be it tax credits or grants, governments only ever subsidise BERD. They never fully pay for it. So firms are always carrying some of the cost and I'm just not aware of any country in the OECD that has high levels of BERD and low levels of innovation or productivity. In other words, I can't think of any country that's fallen into your trap.



...it's not an accident that we start with low levels of BERD.

**Adam Jaffe:** But I think the point is it's not an accident that we start with low levels of BERD. That's the point. There are reasons why BERD is low here. It's not just that we haven't had the policies that other countries have had. There are real reasons why it's low. And don't get me wrong, I'm not suggesting we should stop trying to raise business investment in research. I think we should be trying to do it, but I think we should do it in a thoughtful way and be sensitive to the possibility that, as Beth said, if you're only getting 40 cents on a dollar of additional research for any dollar you spend, that's something to be thinking about as, as you're doing it. And I do worry that when, particularly when we set an explicit numerical goal for how much we want to increase BERD, the temptation is going to be very large to engage in activities that will raise the reported numbers without much attention to whether they're really dealing with the real market failures.



**Beth Webster:** Can I just add, following on from what Adam said, there's probably a reason, and Australia's got the same problem of low R&D to GDP ratio. It looked much lower than the OECD. There's probably a reason for that, and I suspect it's because our environment, in many industries, is just too risky. We have a lot of R&D in the mining industry because we have developed a whole culture, institutions, educational institutions, stock market analysts, who support and de-risk that environment and they know it and when the new IPO comes out in the mining area, they can evaluate it and they can work out whether they should invest in it or not. Outside mining we're hopeless, and it's that environment that is probably driving the low R&D in certain sectors and that we need to de-risk it in some way by no doubt engaging with other countries in a more new, instant and face-to-face way, as people have said this morning.



**Adam Jaffe:** And just to broaden that slightly, particularly when you're trying to bring about a significant increase, to think about policies that are complementary to the funding policies that try to address the barriers more directly, otherwise you're just pushing on the string of trying to get money into the system and it's probably not going to be as productive.



**Andrew Sweet:** So I wouldn't disagree with any of that. I would simply point out that other countries have managed to push their BERD intensity up.



**Beth Webster:** Yeah.



**Andrew Sweet:** ... through sustained careful effort and they've got dividends. So, I'm not saying it's easy...



**Adam Jaffe:** Mm.



**Andrew Sweet:** ... but I'm equally saying it's not impossible.



**Adam Jaffe:** I'll bet they didn't try to do it in three years.



**Patrick Nolan:** Right, thank you. So Eric Bartelsman and then Bronwyn and then we've got Wendy, so we're getting a stockpile of questions. Put your hand up quickly if you want them.



**Eric Bartelsman:** I have a question related to the country's size and related to the fact that we all think that spill-overs are a big reason for doing R&D and so if there are a lot of spill-overs we think the benefits of doing the subsidies publically are large. On the other hand, being a small open economy, you can have a "beggar-thy-neighbour" policy – namely, take the spill-overs from other people's BERD. Try to get those technologies. They will improve the lives of Kiwis and you won't have to pay for it. The neighbours might not like it. They might call you names [laughter], but it's much cheaper if you don't worry about that.



**Patrick Nolan:** Beth, do you want to... and then Adam.



**Beth Webster:** Well, that gets back to the point that there is a view that you've got locational stickiness in that knowledge. Eventually it does get to all corners of the globe, but you might get a lead time of decades in terms of developing an expertise in certain areas. And I'm sure New Zealand has got it in your lamb industries. In the beef industry there are certain obvious areas. You look at your export industries and it's a prima facie case for you being very efficient at it and you've probably got it in a lot of industries without realising it and they're sticky and probably the other countries in the world that produce similar products aren't as advanced or at the frontier as much as they are here. So that's why you do it. There is that knowledge travels a bit slowly.



**Patrick Nolan:** Adam.



**Adam Jaffe:** I could, but let's take some more questions.



**Patrick Nolan:** Okay, Bronwyn.



...people from New Zealand and Australia and Canada complain about low R&D and introduce very big tax credits, etc. I don't think it's an accident that they all do less R&D than you'd expect... free riding is a really good activity for them because they speak a language in which all the world R&D is done.

**Bronwyn Hall:** Just on that, on that point I've listened to people from New Zealand and Australia and Canada complain about low R&D and introduce very big tax credits, etc. I don't think it's an accident that they all do less R&D than you'd expect and the reason of course is precisely that free riding is a really good activity for them because they speak a language in which all the world R&D is done. And they're relatively small, and I think it's not an accident that they see themselves as having a problem. That's one of the reasons.

I really liked the presentations, and thank you both. I found them really good. I had a question and a comment for Beth. One question was, at the very beginning you mentioned some research that showed productivity benefits from the outsourcing of R&D and I wondered if that was coming from the pharmaceutical biotech nexus or if that's a general phenomenon? To me it suggested pharmaceutical biotech. The biotechs are doing the R&D; the pharmaceuticals are showing the productivity from that, because they're buying the output of that R&D.

...the Australia experience is very interesting, but I wouldn't generalise from it except for the fact that New Zealand is somewhat similar to Australia.

The comment I had was to go back to this tax credit thing. The Australian experience is really an outlier. The bulk of the evidence says dollar for dollar. In fact, my evidence says even more, but that's an extreme, but around the world pretty much you get what you pay for. The elasticity is one, and the tax price elasticity. And so the Australia experience is very interesting, but I wouldn't generalise from it except for the fact that New Zealand is somewhat similar to Australia.

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**Beth Webster:** Yeah, so this is a study that's an industry by country times series study. What happens to the home industry when a company outsources R&D to another country? Say you've got Fonterra: what happens when Fonterra outsources its R&D to say, the UK, for example. This is a bad example because they're virtually a monopoly, but let's say there was another milk manufacturing firm in that industry. Do the other firms in that industry also benefit? So what's happening is Fonterra are going, say, to the UK, because there is the fantastic special person in the UK who's top of the field in powdered milk, for example. They do the research, they bring it back into New Zealand but the other firms in that industry also benefit. So that's what the studies are showing. I didn't do the study, but I don't know if it's pharmaceutical, but it's a good idea. I'll chase it up.

Your other question about why is the elasticity so low in Australia? It was a short run elasticity and I think in Europe the median short run elasticity is 60 cents, so it's not hugely lower. But we thought – and this is combined with evidence that our R&D spill-overs are lower than overseas as well – we thought there's probably something that doesn't have the depth in Australia to take advantage of synergies and connections and what have you.



**Patrick Nolan:** Thank you. Wendy.



...there is an incentive in other countries to collect R&D and put it in the accounting reports, but there is not that incentive in New Zealand.

**Wendy McGuinness:** Hi. For those of you that weren't here yesterday, we talked a lot about crocodiles and alligators so it's an interesting word now in BERD. And the reason that I raise it like that is I suspect that BERD is not actually a good indicator. So when I went back and actually had a look at the OECD reporting processes, there is a behaviour that there is an incentive in other countries to collect R&D and put it in the accounting reports, but there is not that incentive in New Zealand. And I'm not an expert in this area, but I went back because I was trying to use it. So I tried to understand it, and I actually thought that you couldn't. These are not comparable systems, because there is an incentive in these other countries to collect this data and there is not an incentive in New Zealand.



**Patrick Nolan:** Do you want to pick up that and Adam as well, just general, some of the challenges and data in this area.





**Adam Jaffe:** No, I don't know specifically about the incentives, the relative incentives. I think it relates to the point that I made, that a lot of people do stuff that is effectively research. It doesn't get counted.

...we still think that the social return to research is higher than the private return.

The question is so what's the implication of that? Beth is making an argument which, in general, I think is right, that we still think that the social return to research is higher than the private return. So whether we are truly no. 28 in the OECD or no. 12 in the OECD, it may still be the case, and it would still be the case, that if we could increase the real expenditure in productive R&D in New Zealand firms, that would be a good thing for the Kiwi of 2030. So don't interpret me to be arguing with that. I'm just saying the question then is we want to make sure we do it in a way that it is that real increase rather than moving things, or mostly that real increase. I think Beth is right: there's always going to be some slippage.



**Beth Webster:** Just on the measurement issue, if you've got an R&D tax credit, tax concession there's a real incentive to report it. So it's probably better measured. You don't have it here, so there is probably not the incentive other countries have to report it accurately. I think you're right.



**Patrick Nolan:** We've got a question there and then Arthur Grimes and Paul Conway and then Carlos. So we'll go to this fellow here.



...we have a massive problem with reporting business R&D expenditure in New Zealand for a variety of reasons and I think... it might be worth doing some research on it.

**Male Participant:** I just want to go back to the point about the reporting. I don't have the numbers either, but I can assure you that we have a massive problem with reporting business R&D expenditure in New Zealand for a variety of reasons and I think it might be useful, given that it's quite often a big political point in the debate, it might be worth doing some research on it. I spend a lot of my time talking to manufacturers and most of them systematically don't report because there's a disincentive to do so.

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**Beth Webster:** And you might get to your \$1 billion very quickly if they report it, yeah.  
[Laughter]

• • •

**Patrick Nolan:** Yeah. Arthur, have you got the microphone.

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**Arthur Grimes:** Thanks. Beth, you talked about three types of R&D policies, competitive, entitlement and industry board, and one that seems to be increasing internationally, but only in specific places, is prizes. One can think about if we had Shaun's baby of a possum-free New Zealand or something like that, rather than funding people to do research, just put a \$200 million prize out there or something for the person who comes up with something that's going to be effective. Have you thought much about that solution?

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**Beth Webster:** Yeah, the prizes – you still need the expert committee to award the prizes.

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**Arthur Grimes:** Only after the fact, not before the fact.

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**Beth Webster:** True, after the fact.

• • •

**Arthur Grimes:** It's a lot easier after the fact.  
You can tell if somebody's gone to the moon or not.

• • •

**Beth Webster:** People only get the money after the fact too, so it doesn't cover that up-front financing problem. I assume you'd be talking about prizes where they buy up the IP or it's then freely available to all. But no, I have seen prizes, not prizes but competitions work in the research space really well where everyone jumps in and tries to solve a problem. But they usually have up-front funds.



**Adam Jaffe:** I think it only applies where there is a very clear socially desirable goal. For a lot of what we're talking about, we don't know what it is we were trying to generate. We just are trying to generate innovation. I think for things like malaria vaccine or something like that where there is a very clear... we could all agree that would have a huge social value. I think prizes might well be of...



**Bronwyn Hall:** Off terrain robots [indistinct]. They've got prizes for that right now in the [indistinct].



**Adam Jaffe:** I see. Actually we should advertise that in New Zealand. I think Kiwis would probably be good at coming up with that.



**Beth Webster:** The fastest Indian.



**Adam Jaffe:** Yeah.



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**Tane Dunne** @TaneDunne: Interesting point around using prizes to incentivise innovation. XPrize, Netflix algorithms, NZ fastest growing sheep...? #innovatenz

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**Patrick Nolan:** Paul Conway.



We've got lots of small firms and Sarah tells us that they don't really engage with the grants process. Does that push us towards more of an R&D board type of set up?

**Paul Conway:** Thanks – both were really interesting presentations. My question is whether or not the characteristics of the New Zealand economy, whether we can use that as input into designing the optimal Government support programme for R&D. We've got lots of small firms and Sarah tells us that they don't really engage with the grants process. Does that push us towards more of an R&D board type of set up? And also the point that Eric mentioned that as an economy we tend to be in diffusion mode or catch-up mode. So is that the fact that we're not pushing out the global technological frontier, we're more interested in catching up to it, does that have implications for the optimal way in which Government can support innovation?

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 **d harg** @dharg2: #innovatenz Paul Conway wonders if govt innovation support should focus more on spreading overseas ideas to NZ.

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**Adam Jaffe:** Just two quick things. I think it's been mentioned several times here, the issue of trying to work on capabilities more generally for New Zealand firms which would have benefits of a variety of kinds, and the other is this issue of just trying to improve coordination and communication. It relates to Shaun's work as well. If we can increase the extent to which firms and non-firm research entities in New Zealand are working together and talking to each other, that both improves the strength of the network within New Zealand, and as Sarah mentioned, can also be related to strengthening the overseas connections.



**Beth Webster:** I think those are very good points. The R&D boards have two great advantages. One is it's owned by industry. Industry feel in control. They determine the agenda and that gets great engagement, or else they fall apart. The second one is they often have in-built extensional translation services which means it's an easy way to introduce or diffuse the technology wherever it comes from. And some of the boards I know of, like one of our wine boards, just goes over to Sicily and gets new grape varieties. I don't think they do any R&D themselves.



**Adam Jaffe:** But that's fine. That's still a public good.



**Beth Webster:** Exactly, exactly, yeah, exactly. So climate change? Mm, just go to Sicily and get grapes that grow in rocks. And that's a very attractive part.



**Patrick Nolan:** Great. Carlos, there was a question over there, and then Gary.



**Carlos Abeledo:** Part of my question was answered now, but since we have time, if you could expand the options for the complementary policies. Much of the earlier questions were more focused on the financing and entitlements and so on.



**Adam Jaffe:** I've given my ideas. I don't know what more...



Is management more important than introducing the latest whizz-bang ICT system into your company? We don't know...

**Beth Webster:** Yeah, all of the above are probably complementary. The problem is if you want to really get down to being rigorous about it, we really don't know which ones are more important. Is management more important than introducing the latest whizz-bang ICT system into your company? We don't know, so it is an area where we're great at the theory but in practicality I don't think we can offer that much.



**Patrick Nolan:** Okay, Gary.



...we do measure R&D... BERD increased by \$53 million since 2012 to \$1.2 billion.

**Gary Dunnet:** Hi. I think we need to recognise that we do measure R&D, and the latest figures and the first headline indicates that "Business Expenditure on R&D – BERD – increased by \$53 million since 2012 to \$1.2 billion."

There's quite a lot of research that's gone on around the R&D innovation at a firm level and how that's being exploited.

Also just recently, as we've moved to our new measure of GDP under the System of National Accounts 2008, one of the new aspects to the SNA08 was the capitalisation of R&D and we have been looking at our R&D survey and aligning that with what's going through into the GDP measures. Finally, we do have a lot of this inside the Integrated Data Infrastructure [IDI] environment, and there's quite a lot of IDI research that's gone on around R&D innovation at a firm level and how that's being exploited. So if there is more information / data that can be added to the debate I'd be keen to know, but there is a lot in place now. As these statistics follow an internationally approved standard, I think the challenge is to move the discussion to increasing R&D rather than debating the numbers. Thanks.



**Patrick Nolan:** Okay, thanks. Geoff?



**Geoff Lewis:** Geoff, Productivity Commission. A question about additionality that Beth mentioned. It seems to me that we worry a lot about additionality, in terms of R&D grants. First of all there's the question of language and it's mentioned as a deadweight loss, but in a technical, economic sense it's simply a transfer. So we're talking about giving a grant to a firm that would have done the R&D anyway and what we want to get is additional R&D. But that's simply a transfer and we don't worry about that, for example, with other policies like tax cuts. So you think of a cut in the corporate tax rate – that's going to induce some extra investment at the margin, but it's also giving away revenue for the intramarginal investment that's already occurred. So, you did say we have to accept some deadweight loss. Well first of all, I wouldn't call it deadweight loss except some giving away of money, but I don't think it's any more serious than the revenue that's given away without a corresponding efficiency gain in many tax cuts, for example.





**Beth Webster:** No, I think you're absolutely correct. Most of the reason why I talked about additionality is it's an obsession usually with people designing the schemes and I think it does lead to the over-engineering that I spoke about, and it does annoy firms, because they've got to make up this fictional story about how no-one would lend to them. It's a great idea, it's certain to succeed but no-one would lend to them. So if you just give me the money, it'll be additional.



Usually the Government is not using taxpayer dollars to pay for an activity [...] that firms routinely pay for themselves.

**Adam Jaffe:** Not to disagree fundamentally but to quibble slightly, the deadweight loss is associated with the fact that what you're doing is you're taking revenue that was raised by taxes – so presumably that generated a deadweight loss – and you're substituting it directly for private expenditure. And it's true there are other cases where we do that, but not very many. Usually the Government is not using taxpayer dollars to pay for an activity which is itself an activity that firms routinely pay for themselves. There are other examples – I'm not saying there are no other examples. But that's, I think, the reason why the additionality becomes a concern, is that you're taking money that was raised with taxes, which therefore does generate a deadweight loss, and you're substituting it for money that otherwise is routinely spent by firms out of their own money. So 20% of it might be a deadweight loss – not all of it.



**Patrick Nolan:** We've got Norman and then Simon.



...it seems there's a massive number of possible places we can invest a taxpayer dollar and we think we're going to get big returns.

**Norman Gemmell:** I'd just like to almost reiterate Adam's reply there which was the point I would have made if he hadn't made it. And in particular, whatever estimate we have of the deadweight cost of taxation, whether we call it 20 cents in the dollar or whatever, that's quite a substantial cost that has to be recouped from the social gains from any investment. The other point I'd make is that, routinely, government departments tell us that when they look at benefit-cost ratios for all the projects that are being proposed or policy changes that are being proposed, that they're cutting off allegedly a benefit-cost ratio of two or sometimes more. So out there it seems there's a massive number of possible places we can invest a taxpayer dollar and we think we're going to get big returns. I never see this kind of investment in innovative R&D and so on being weighed up against that. It may be that the benefit-cost ratio for that is actually lower than some of the other things that we put our tax dollars into.



**Patrick Nolan:** Okay. And Simon.



**Simon Wakeman:** Thank you. Simon Wakeman from the Productivity Commission. So I'm going to take us a little bit wider. This may not be what you were prepared to talk about but hopefully you'll still have an answer.

We've talked a lot about encouraging business R&D, but we know that R&D is only one of the inputs into innovation and there are a lot of other things that can benefit, types of innovation that can benefit the economy, including organisational innovation, management capability. Do you have ideas of what government policy can do to stimulate these types of innovation?



We've talked a lot about encouraging business R&D, but we know that R&D is only one of the inputs into innovation and there are a lot of other things that can benefit, types of innovation that can benefit the economy, including organisational innovation, management capability. Do you have ideas of what government policy can do to stimulate these types of innovation?



**Beth Webster:** I think you would work through some of the other types of programmes, which I listed but didn't really discuss, whereby you're talking about worker secondments, blue sky procurement, networking things. They tend to come with a lot of those sorts of services attached, looking not just at the R&D but at other broad things. I know we do have programmes to improve the management capability of firms in Australia. I don't know if it's been successful, but they give you a certain number of hours free and then you have to pay if you want to go on and do more extensive work. So you could have programmes like that.

I think the reason, and I'm guessing, I'm not a government person, but the reason they attach the subsidy or maybe the grant or the loan or tax concession to R&D, is it's been externally verified by an accountant, by another party. You're not just asking the firm to report something that hasn't gone through the accounting system and all their rules and regulations, their standards. So there is a bit of probity around it when you give out money – that's my guess. But you're right, you're absolutely right. These other things are probably more important or as important.



...I think there's reasons why we think that innovation that's based on new knowledge generates spill-overs.

**Adam Jaffe:** Though we should remember, again, the reason we're subsidising the activity is because of the spill-overs and some of these other forms of innovation, like organisational innovation and so forth, may not really generate spill-overs. They may be new ways of doing things that are good for the firm – in some cases they may be, but I think there's reasons why we think that innovation that's based on new knowledge generates spill-overs. Other kinds of innovation may as well, but might not.



Is the problem here that research is of low value in New Zealand or are there particular barriers?

**Patrick Nolan:** Okay, great. Thank you. Well we're almost at time. I'll just take us back to the question that Adam asked. I'm not sure if we've quite answered it. Is the problem here that research is of low value in New Zealand or are there particular barriers?



...it's worth trying to find opportunities to increase research where it is valuable. It's also worthwhile to try, if we can, to work directly on the barriers...

**Adam Jaffe:** Well I think it's both. It goes to the very first question. I think it's both and therefore it's worth trying to find opportunities to increase research where it is valuable. It's also worthwhile to try, if we can, to work directly on the barriers, but I just wanted to do so with this caution that if you give no thought to it there is some danger you're going to end up spending money that gets counted as your goal but actually isn't productive.



**Patrick Nolan:** Yeah. Beth.



...other indices you can look at is how extensively do foreign multinationals outsource their R&D to New Zealand?

**Beth Webster:** I wouldn't be able to say. I don't know enough about the data, but one way you could test that would be to – and I know the rankings of New Zealand's scientific higher education research sector, they come up quite highly, so that doesn't seem to be an issue. But other indices you can look at is how extensively do foreign multinationals outsource their R&D to New Zealand? So that would be a test for the quality of the research being undertaken here. I don't know what the answer is. And there's various data sources you can use to look at it. But there are talent spotters in New Zealand whose job is to pick out the person who's on the frontier of their particular area and hire them back for some multinational overseas, because they're the best in their field. So barriers, I wouldn't be able to comment on.



**Patrick Nolan:** Okay, great. Thank you for all of your questions and thank you to Adam and Beth for what was a fascinating session and for your presentations. So if you could join me in thanking Adam and Beth. [Applause]. And so we'll see you back here in 30 minutes, where we've got, first of all, Bronwyn Hall and then Simon Wakeman.

Someone called D Harg tweeted Paul Conway's question about government and wonders, "if government innovation and support should focus more on spreading overseas ideas to New Zealand"

In case you're interested in the activities of Twitter, people are still tweeting so I appreciate that. Someone called D Harg tweeted Paul Conway's question about government and wonders, "if government innovation and support should focus more on spreading overseas ideas to New Zealand", so highlighting the importance of diffusion, which came up in some of the earlier sessions. Also quite a lot of tweets about some of the measurement issues. So there we go, Gary – I'm pleased that you got to put the case for Statistics New Zealand. So thank you and I'll see you again in half an hour.