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Treasury Guest Lecture Series (Auckland): Kevin Fox

11:05 am	Introductory remarks (following the welcome remarks by Gail Pacheco)	Dominick Stephens
11:15 am	Presentation	Prof. Kevin Fox
11:45 am	Questions & Answers session	Prof. Kevin Fox Moderated by Dominick
12:25 pm	Closing remarks	Dominick

Opening

Dominick

11:05 – 11:15 am

- E ngā iwi, e ngā mana, e ngā hoa mahi. Tēnā koutou katoa.
- E mihi ana ki a koutou, kua tae mai ki te tautoko tēnei kaupapa.
- Ngā mihi nui ki a Professor Kevin Fox, te kaikōrero o te rā. Tēnā koe.
- Kō Dominick Stephens tōku ingoa. Tēnā koutou, tēnā koutou, tēnā koutou katoa.

Good morning, everyone! It's fantastic to see you all today here at the Auckland University of Technology, where the Treasury is privileged to host our Treasury Guest Lecture Series seminar.

I'd like to thank Professor Gail Pacheco and her team from the NZ Work Research Institute at AUT for all their support, generosity and co-operation in bringing today's event to fruition.

The purpose of the Treasury Guest Lecture Series is to bring the latest research and cutting-edge thinking into the Treasury, as well as to foster public engagement and debate on contemporary issues facing New Zealand.

In recent years we have chosen a theme to frame the Guest Lecture Series. The Series supported our work in the run-up to the publication of the Treasury's wellbeing report, Te Tai Waiora. We hosted a range of domestic and international speakers to

bring different perspectives and insights on wellbeing, including Nobel prize winner Professor Joseph Stiglitz. Under our current theme 'Productivity in a Changing World' we have had a range of impressive productivity experts, such as Professor Chad Syverson from the University of Chicago, Professor Jonatan Pinkse from Manchester University and Professor David Teece from the University of California.

Even though the seminar series has been going strong for over two decades, it is the first time we are holding it outside of Wellington. We aim to hold a guest lecture once a year in Auckland from now on. But these seminars are held online or in a hybrid format – so even when they are in Wellington, you can tune in to enjoy and learn.

Today we have another productivity guru with us. I would like to extend a very warm welcome to our speaker today, Professor Kevin Fox from the University of New South Wales Business School.

Before I formally introduce Kevin, I would like to take a few minutes to introduce the current theme of our series, and briefly summarise the New Zealand context to set the scene for the discussion today.

1. Importance of productivity for living standards

We chose the current theme of *Productivity in a Changing World* as a focus for this year's seminar series to reflect that productivity is a key long-run driver of economic performance, wages, and wellbeing.

New Zealand's productivity performance matters for our living standards. Higher productivity means higher incomes, as well as cheaper and better-quality goods and services. Real wages tend to grow more rapidly when labour productivity growth is strong and are more likely to increase in high-productivity growth industries.
Higher incomes increase the opportunities for public and private spending to support social and environmental goals, such as schools, hospitals, and infrastructure.

Higher productivity can also protect future wellbeing by providing more income to invest in our national wealth and by enabling us to use existing wealth less intensively.

In short, higher productivity lifts New Zealanders wellbeing.

2. *The world is changing*

However, we face the challenge of lifting the contribution of productivity to wellbeing in the context of a changing world.

And that brings me to the second part of our series theme, *Productivity in a changing world.*

Climate change means that New Zealand's economy will need to operate in a warmer, wetter world at the same time as emitting less carbon.

Global and New Zealand population ageing will change how we do things.

Technology is changing all the time, with massive implications for how we work. The rise of Artificial intelligence could have significant implications for productivity growth and will also require changes to how we educate our children and train our workforce.

The global geopolitical landscape is changing. With hindsight we now see that we have lived through 30 years of a relatively peaceful global environment. Supply chains lengthened, new workers entered the global workforce and the development of global values chains drove prosperity around the world. This helped keep inflation and interest rates down, creating positive conditions for investment.

We now find ourselves in a world that looks more like an era of de-globalisation, or at least slow-balisation. Countries appear to be turning inward and the global order is becoming more fractured.

Global supply chains and financial flow have been disrupted, firms and countries are more concerned with bolstering security as much as ensuring efficiency. Changes in market access and competition will require New Zealand to navigate new alliances, new trade agreements and geopolitical risks.

This shifting global context suggests significant changes in our economy if we are to sustain and improve our economic performance and productivity. It explains the current focus of our Treasury Guest Lecture Series on the implications of these trends for the sustainability and resilience of New Zealand's economic performance.

3. New Zealand's productivity performance and challenges

Before handing over to Kevin for his perspective on the productivity slowdown across industrial economics, I want to provide some context around New Zealand's economic and productivity performance.

The dominant economic narrative has been that New Zealand has a history of relatively poor productivity performance.

New Zealand experienced a comparative decline in GDP per capita in the post-war years, with real GDP per capita growing at a slower rate than in other high-income OECD countries.

The relative decline in GDP per hour worked halted in the early 1990s but we have not succeeded in closing the gap with other high-income countries.

This appears to be a bit of a paradox given our stable macro-economy and flexible micro-economy.

Explanations for our productivity performance vary and are contested, including macroeconomic imbalances, capital shallowness, New Zealand's small market size and distance from other markets, low business R&D, and slow diffusion of productivity-enhancing changes. Also relevant is the performance of the non-market sector, the role of our cities and the effectiveness of reforms to reduce barriers to productivity.

4. Changing economic performance narrative

But more recently an alternative narrative has been emerging that suggests New Zealand's economic performance may not have been as bad as we thought.

In particular, New Zealand's real per capita income has grown faster than our labour productivity - and since the 1990's has increased faster than in other advanced economies.

A key driver has been New Zealand's rising terms of trade over the last 20-30 years, which is not captured in real GDP or productivity measures. New Zealand has been fortunate to enjoy rising food prices. But part of the improved terms of trade seems to be a result of the New Zealand economy adapting to import more lower-priced products, like manufactures, and export more higher-priced commodities and services.

The other key driver of higher incomes, relative to productivity, has been strong employment growth. Our labour market appears to have been relatively effective at creating full-time jobs at a range of skill levels for a wide range of people.

Our terms of trade and employment growth means we have enjoyed higher incomes than suggested by looking at our productivity growth alone. This might help explain why we seem to do better on measures of wellbeing, such as the OECD's Better Life Index and the UNDP's Human Development Index, than our productivity performance would suggest.

5. Understanding the productivity growth slowdown

Whether or not you accept this rosier view of New Zealand's economic performance, we cannot rely on the terms of trade, or even continued employment growth, as a source of income growth forever. The only sustainable way for our economy to grow over time, particularly given climate and other environmental challenges, is to boost New Zealand's productivity.

That is why I am so excited to have Professor Kevin Fox here with us today. Kevin will be sharing his insights on the slowing productivity growth in industrial countries over the last two decades, which can help us understand both the drivers of New Zealand's productivity growth and how we think about measurement of productivity.

While the challenges and policy responses are likely to vary across countries and industries, there is much for us to learn from Kevin's work about the implications for New Zealand.

About the speaker

- Let me now introduce our speaker, who we are absolutely delighted to have with us today.

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- **Kevin Fox** is a Professor of Economics and Director of Centre for Applied Economic Research at the Sydney's University of New South Wales Business School.
- He works primarily in the field of economic measurement, with a focus on productivity and prices.
- Kevin's research on the use of scanner data in price indices has changed inflation measurement in multiple countries, including here in New Zealand.
- He has worked extensively with firm-level data and his current research interests include the valuation of free digital goods and the effectiveness of public R&D funding.
- Kevin is a Fellow of the Academy of Social Sciences in Australia and advises multiple agencies, including the Australian Bureau of Statistics, Productivity Commission, and the United Nations.

Logistics

- I will now invite Kevin to present his talk. Following that, we will have time for questions from the audience and discussion.

Questions	**Dominick / Kevin** *app.11.45 am – 12.25 pm*

- Thank you, Kevin, for your interesting presentation.

  Perhaps make an observation of something that you were struck by.
- We now have time for questions and discussion. I'd like to ask that if you have a question for Kevin, please put your hand up. I ask if you can please stand up and introduce yourself before asking the question.

Questions till around 12.25 pm.

Closing	**Dominick** *approx. 12.25 pm*

- *Unfortunately, we have run out of time – and we need to bring today's event to a close.*
- Thank you very much, Kevin, for taking the time to share your thoughts and latest work with us today.
- And thanks to everyone here in the room for joining us for today's talk.

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- Kevin will present another seminar on Wednesday this week. This talk will focus on the effectiveness of alternative uses of public funds in supporting Research and Development (R&D). I encourage you to join either in person or online.
- Please keep in mind that Treasury Guest Lectures are open to everyone. A lot of them are held online, so you can join them from anywhere. You can subscribe to our mailing list from the Treasury's website if you would like to be notified about each upcoming lecture. We have an impressive line-up of speakers scheduled for the next few months.
- Let me now close our seminar today and farewell you all with a whakataukī – a proverb. This whakataukī says that discussion, learning, understanding and knowledge underpin the wellbeing of all people.

  Mā te kōrero, ka mōhio

  Mā te mōhio, ka mārama

  Mā te mārama, ka mātau

  Mā te mātau, ka ora te iwi.

  Haumi e, hui e, tāiki e!

- Thank you once again to Kevin, and to everyone for participating today!

TE TAI ŌHANGA
THE TREASURY

CBAx Community of Practice #9

Improving CBA Practice

with Kirsten Jensen (Amie White is away)
Guests:
Marc de Boer (MSD), Rebecca Hollingsworth (SWA), Philip Stevens (Prod Com) and Tim Denne (MfE)

27 NOVEMBER 2023 | IN CONFIDENCE

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Whāinga e te rōpū / group objectives

- **Empower** you to feel confident in providing well-considered, evidence-based advice
- Provide **support** to do a CBA using CBAx
- Create a space for **kōrero** on using the tool
- **Share insights** and answer questions

Ongoing Decision-Making Principles

15. The Coalition Government will make decisions that are:

A. Principled – making decisions based on sound public policy principles, including problem definition, rigorous cost benefit analysis and economic efficiency.

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Rōpū rārangi take / group agenda

Lifting CBA practice 2023 series

Slides / recordings available online for Session #1 to #8 (note session #1 is slides only)

#1 Learn and develop: CBAx update for Budget 2024, Budget 2023 CBAs experiences and intervention logic and a CBA (and other methods)

#2 Evaluation: CBA: What is CBA, when to do it and why, evaluating CBAx summary outputs, how other methods complement a CBA

#3 Value for Money in Budget 2024: Applying a value for money lens, Panel – insights into how Treasury looks at CBA submissions

#4 Different aspects and approaches to CBA: Guest panel on Living Standards Framework, He Ara Waiora, Social Investment and Outcomes / Performance Reporting.

#5 Worked example of CBA: Guest panel Transport intervention;

#6 Cost pressures, sensitivity analysis and reverse analysis: When do we do it, why do we do it, how to we do it?

#7 Impacts Database – how to use impacts, how to include non-monetised impacts,and how to add new impacts.

#8 Environment and Climate Change Guest panel on CBA and other tools for environmental issues.

Today (Mon 27 November)
This is the last session for 2023 series!

Ex-post analysis

Look out for:

- **Release of the updated CBAx in December**
- **The series with a monthly hui in 2024!**

Email cbax@treasury.govt.nz with session topic suggestions.

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Ex-post evaluation and CBA

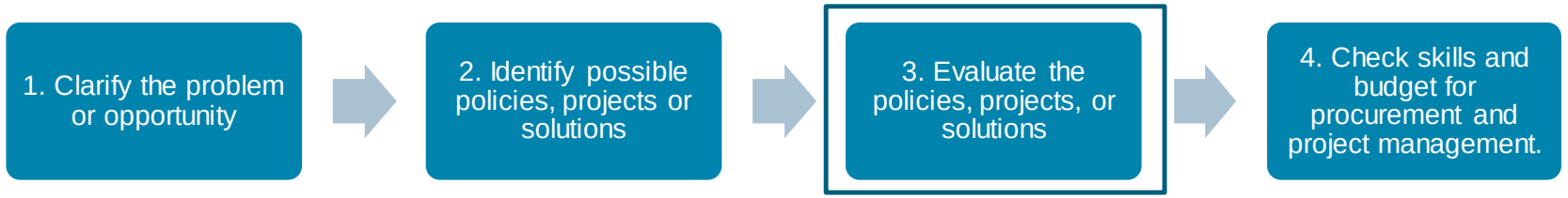
Topics	Presenters	
Ex-post CBA	Kirsten Jensen	CBA/CBAx lead, Treasury
Impact monitoring and evidence	Marc de Boer	Principal Analyst, Insights MSD, Strategy and Insights, Ministery of Social Development (MSD)
Evidence for evaluation	Rebecca Hollingsworth	Manager Policy and Insights, Social Wellbeing Agency (SWA)
Evidence and policy – Is it possible?	Philip Stevens	Director, Economics and Research Productivity Commission (Prod Com)
Lessons from international experiences	Tim Denne	Principal Economist, Climate Change, Ministry for the Environment (MfE)
Ex-post evaluation panel	Presenters	

Please raise questions and comments in the chat.
We will cover your questions with the panel at the end.

IN-CONFIDENCE

The 7 steps of a CBA and inputs to CBAx

CBA is part of the **evaluation stage** of the policy development process. It is a method for assessing proposed options that have been developed to respond to a policy problem



Using CBAx is a 7-step evaluative process as follows:

Policy evaluation *using CBA on each feasible option*	
Inputs to CBAx	**Step 1:** Define policy and counterfactual **Step 2:** Identify those who gain and those who lose **Step 3:** Identify the benefits and costs; allocate to time periods
Analysis in CBAx	**Step 4:** Quantify the benefits and costs within ranges **Step 5:** Discount to a common period, compare benefits and costs
Outputs from CBAx	**Step 6:** Is the result clear enough? If not, consider whether it is worth investing in more research, repeat previous steps **Step 7:** Write report

CBA using CBAx: the IQM approach

- **Identify wide –** identify impacts broadly (using wellbeing frameworks like the LSF)
- **Quantify where possible –** quantify impacts (the initial CBA steps and CBAx input assumptions).
- **Monetise selective** – monetise impacts where possible (using CBAx), focus on key impacts with good evidence.

Only monetise a subset of impacts

SECTION ONE

Kirsten Jensen

CBA/CBAx lead (Treasury)

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Ex-post CBA

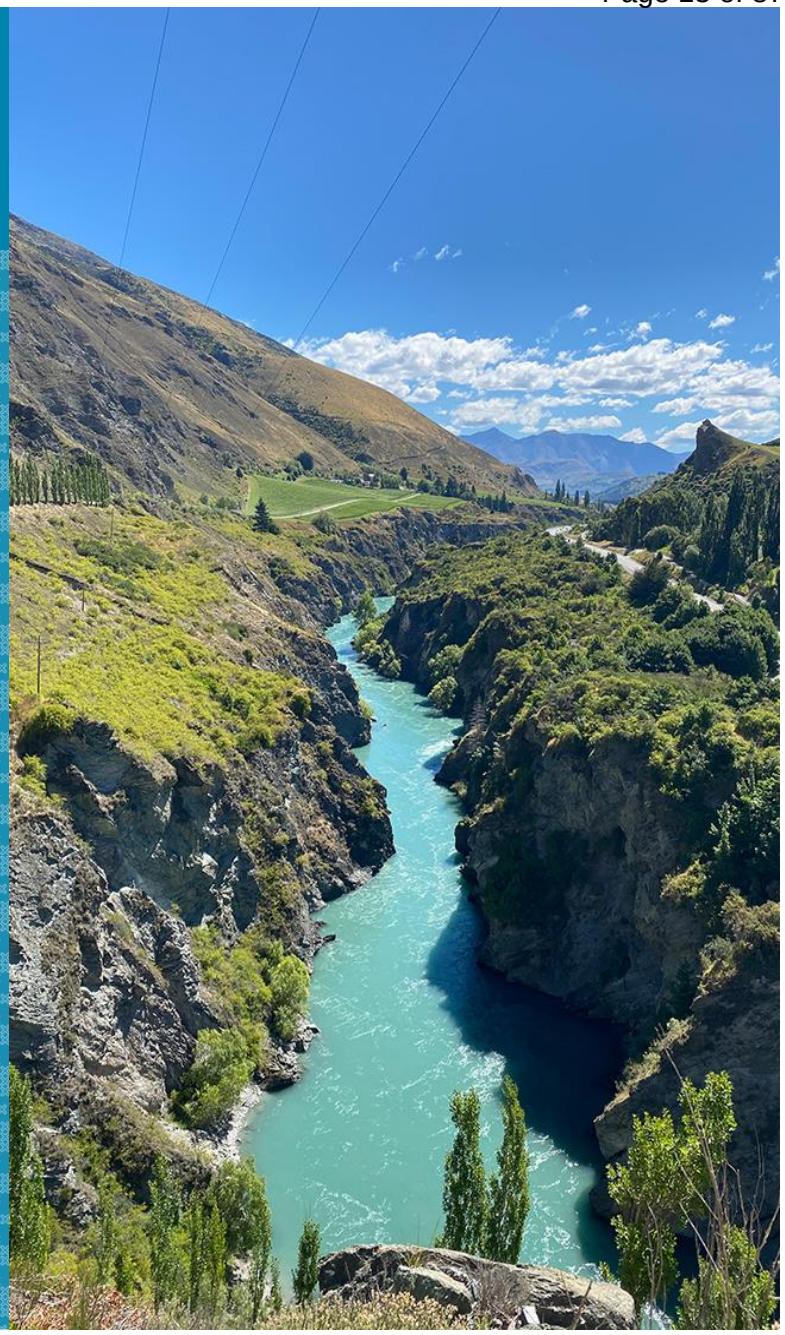
Impact monitoring and evidence

Evidence for evaluation

Evidence and policy – Is it possible?

Lessons from international experiences

Panel discussion



IN-CONFIDENCE

What is ex-post analysis or evaluation

Ex-post evaluation: a new appraisal in a moment subsequent to the starting of the operational phase of a project. **Improve the evidence base.**

Think about ex-post early, ex-ante. Ex-post CBA is useful for understanding and improving the evidence for the ex-ante assumptions that supported the decision.

The scope is more than discovering deviations from ex-ante forecasts. It seeks evidence and understanding of the causes. How and why are the impacts different from what we expected?

It helps making better estimates in the future. Ex-post CBA can improve implementation. It can build confidence, e.g., by conditional funding on achivement of targets.

IN-CONFIDENCE

You use the same 7 steps of a CBA for ex-post

Using CBAx is a 7-step evaluative process as follows:

Policy evaluation *using CBA on each feasible option*		*Ex-post CBAx considerations*
Inputs to CBAx	**Step 1:** Define policy and counterfactual	• Define the evaluation purpose and scope to determine the appropriate analysis period and the base year for analysis • Restate the initiatives objectives and outcomes from the initial proposal. • Consider other feasible options and assess whether better options might now be available.
	Step 2: Identify those who gain and those who lose	• Analyse whether the targeted cohort received or led to the expected outcomes. • Assess the actual distributional of gains and losses. • Assess equity impacts by reporting any specific groups that have disproportionally or unexpectedly been affected or benefited.
	Step 3: Identify the benefits and costs; allocate to time periods	• Use evidence to identify realised outcomes and the costs and benefits attributable to the initiative. Identify any impacts not anticipated in the ex-ante stage. • Use an outcome evaluation or performance monitoring to measure outcomes achieved. • Use historical evidence to update any forecasts of the volume of outcomes and their underlying assumptions.

IN-CONFIDENCE

You use the same 7 steps of a CBA for ex-post

Using CBAx is a 7-step evaluative process as follows:

Policy evaluation *using CBA on each feasible option*		*Ex-post CBAx considerations*
Analysis in CBAx	**Step 4:** Quantify the benefits and costs within ranges	• Quantify / value costs and benefits using market prices or robust non-market valuation techniques. • Include information on unmonetised impacts where it is not practical to quantify.
	Step 5: Discount to a common period, compare benefits and costs	• Assess net benefit with sensitivity analysis • Work out present values by converting nominal values into real ones and discount to the base year of the ex-post analysis (using the standard discount rate) • Estimate using the most robust evidence considering the distribution of possible outcomes and the impact of uncertainty. Generally use the average values of costs and benefits. • Account for risk and uncertainty by testing the sensitivity of results.
Outputs from CBAx	**Step 6:** Is the result clear enough? If not, consider whether it is worth investing in more research, repeat previous steps	
	Step 7: Write report	• Report results and key findings in executive summary format. • Where relevant, compare ex-ante and ex-post CBA results, and explain any observed divergence. • Explore factors that may have impacted the results and provide insight into the relative effectiveness of alternative options to inform future decisions. • Include lessons learnt to formulate actionable recommendations.

SECTION TWO

Marc de Boer

Principal Analyst, Insights MSD, Strategy and Insights, Ministery of Social Development

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Ex-post CBA

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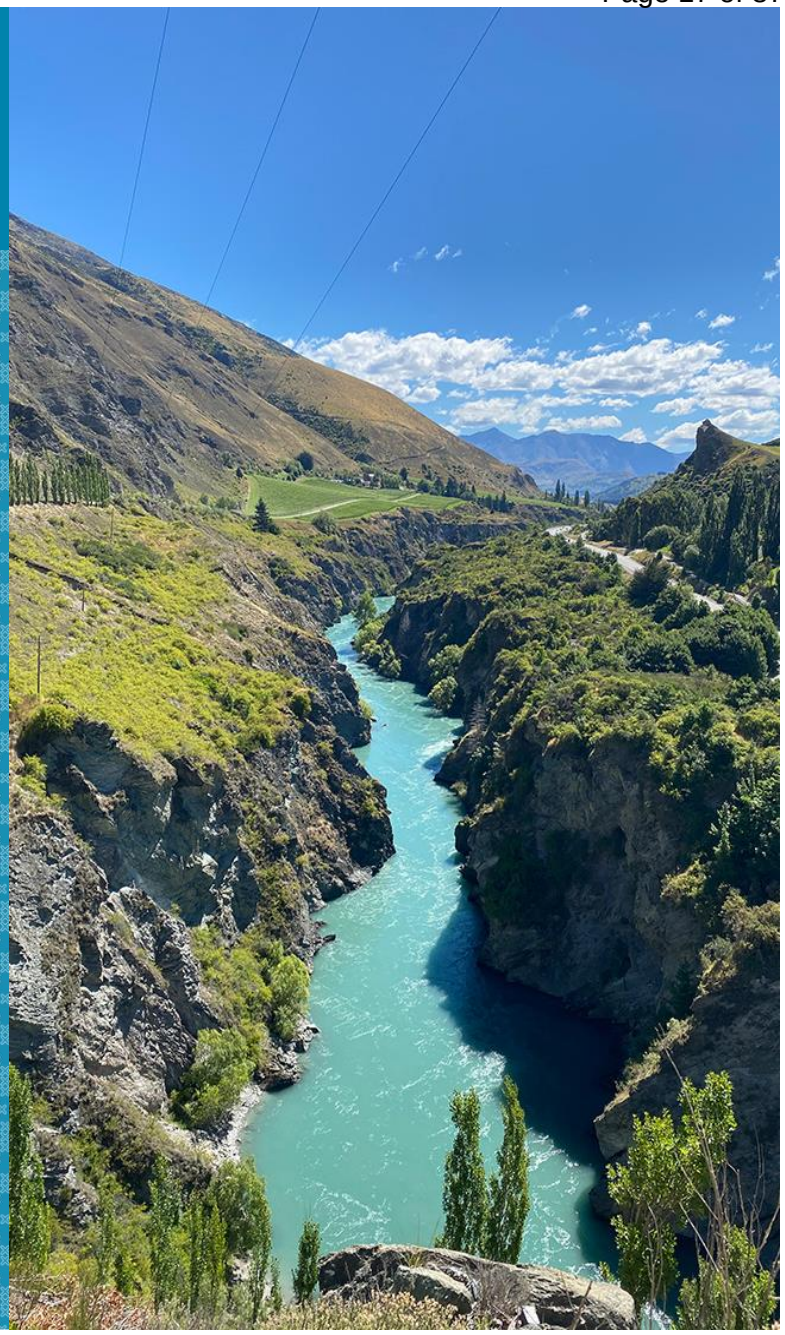
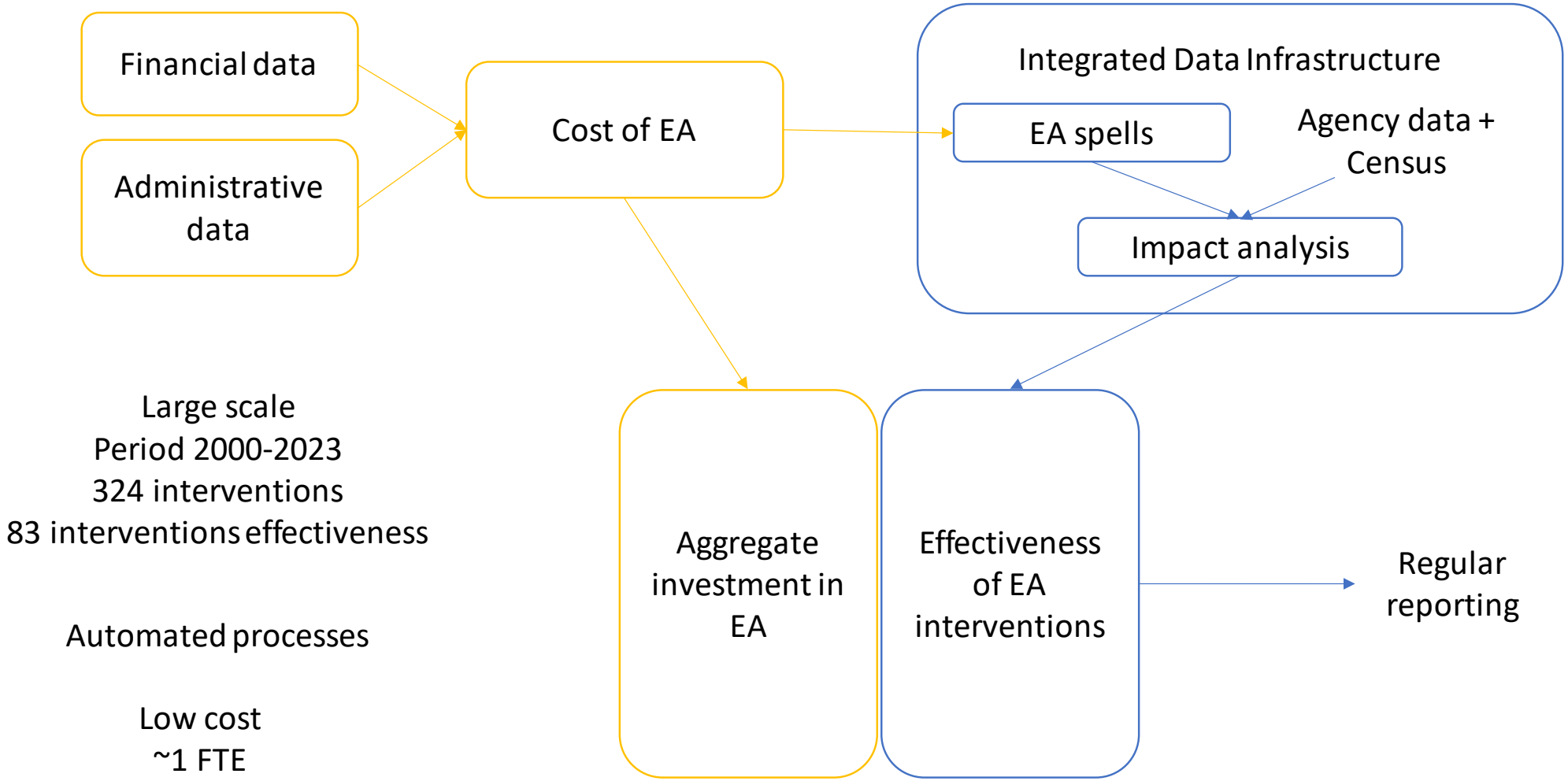
Panel discussion



Impact monitoring of MSD Employment Assistance (EA)



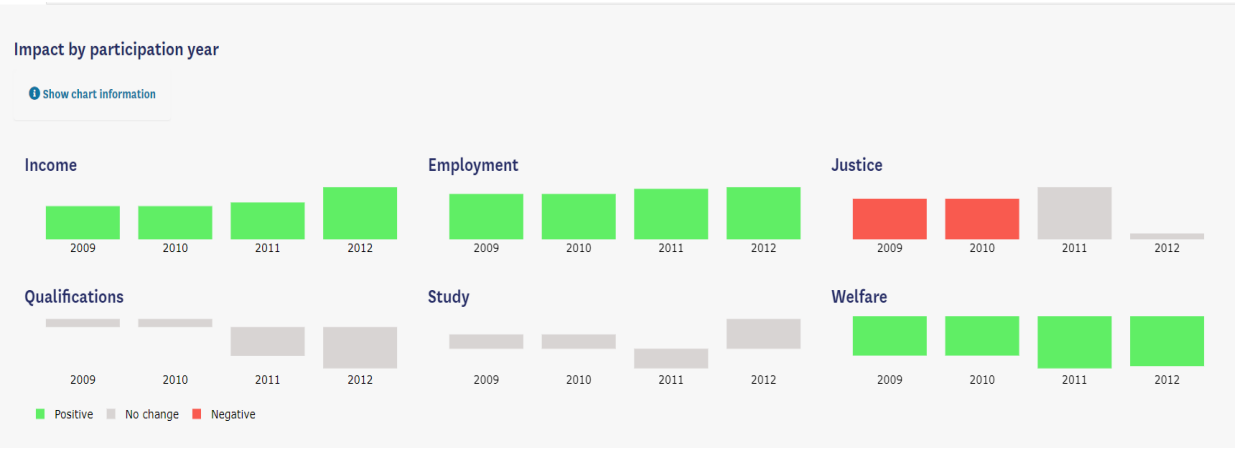
EA evidence catalogue

- Intervention description and history
- Profile of programme participants
- Expenditure
- Effectiveness
- Literature

Current and historical programmes
Methods and results updated regularly for all interventions

Reduces discovery time for policy and delivery staff

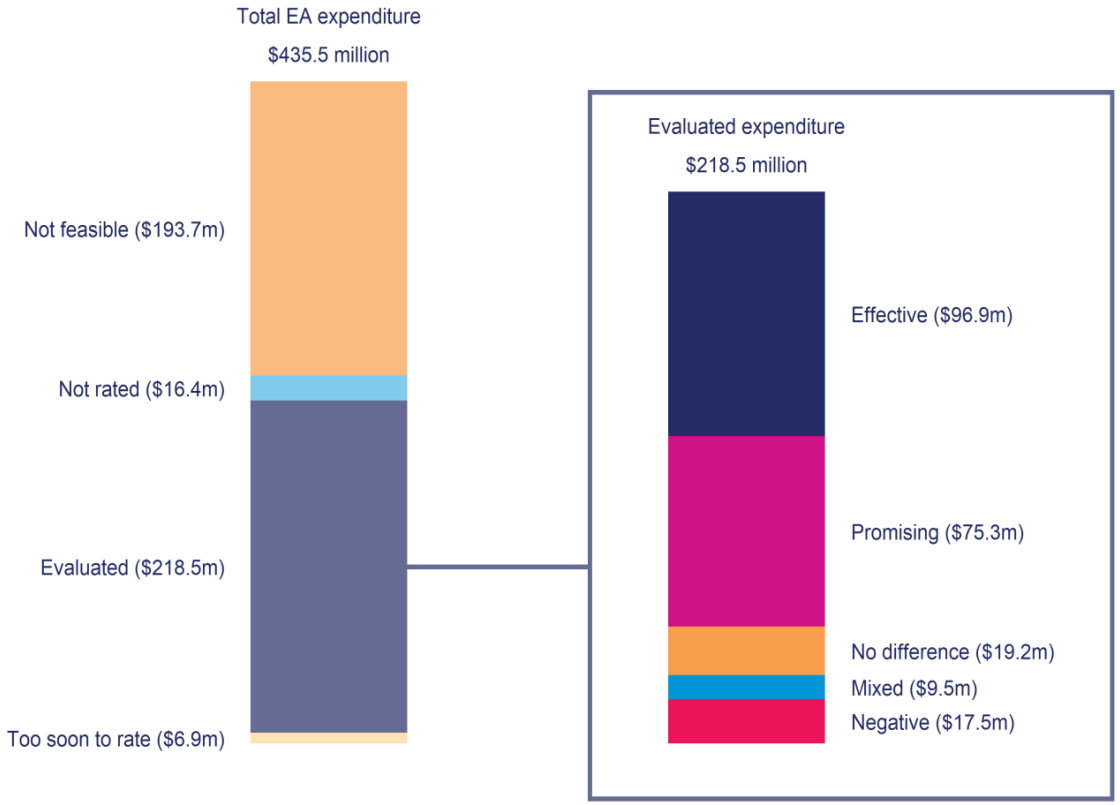
Enables higher quality analysis and advice



[Employment Assistance Evidence Catalogue (msd.govt.nz)]

Improving accountability

Follow the money: linking evidence to expenditure



Improve sustainable employment outcomes	**Client outcome:** Sustainable exits (Notes 4, 12 and 13)	No less than 55%	All clients: 63.1%	All clients: 62.7%	✓
			Māori: 56.5%	Māori: 53.9%	✗
			Pacific: 63.4%	Pacific: 62.1%	✓
	Future reliance: Average future years on a main benefit (Note 4)	Decrease	All clients: 12.8	All clients: 13.6	✗
			Māori: 15.1	Māori: 16.2	✗
			Pacific: 13.8	Pacific: 14.8	✗
	Future reliance measures the average number of future years each working age main benefit client will be supported by main benefit, until age 65. This KPI did not meet the direction because of less favourable economic forecasts (including higher unemployment rates), lower exit rates and changes in our client mix from those requiring support during the COVID-19 pandemic.				
	Programme effectiveness: Effective employment programmes (Notes 4 and 14)	No less than 90%	Programmes: 86.7%	Programmes: 94.5%	✓

Effectiveness of MSD employment assistance 2019/2020 - Ministry of Social Development

msd-annual-report-2023.pdf (page 77)

SECTION THREE

Rebecca Hollingsworth

Manager, Policy and Insights, Social Wellbeing Agency

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Ex-post CBA

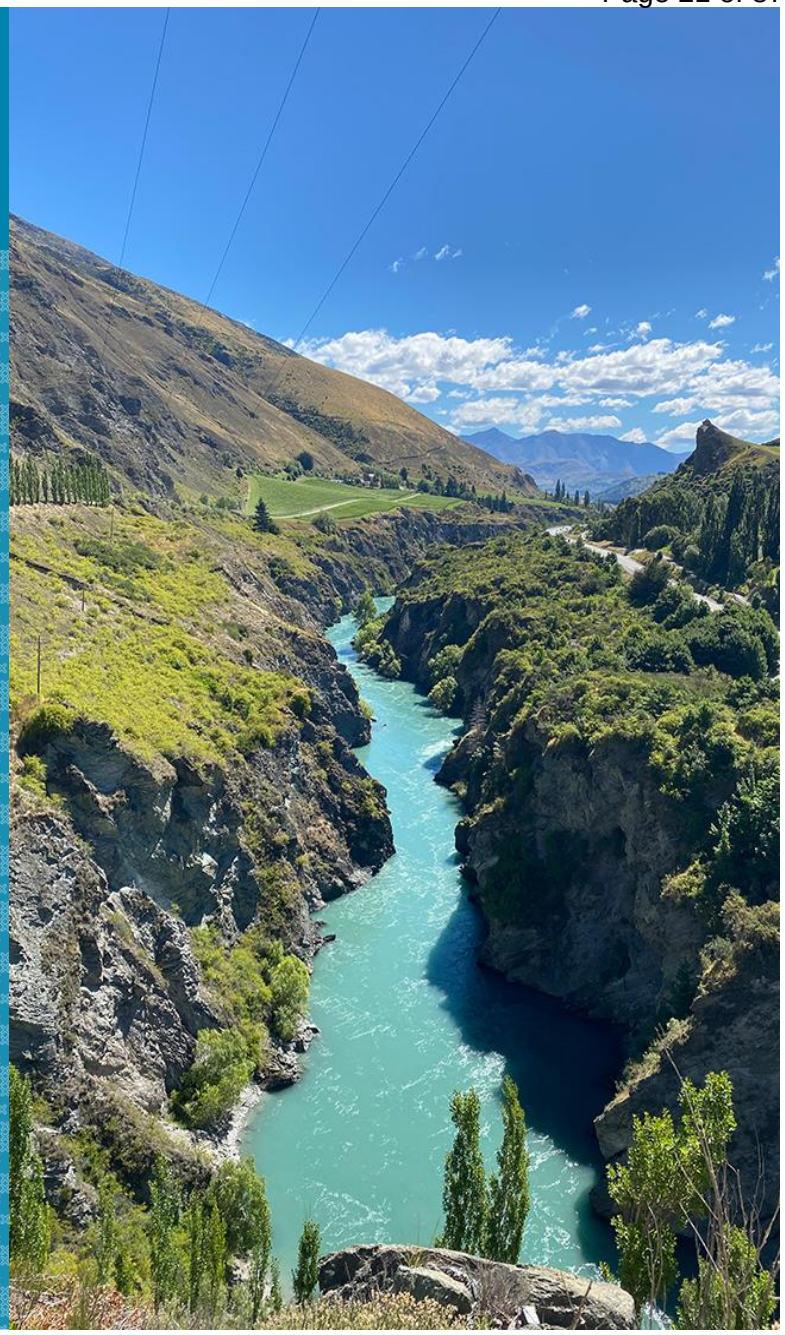
Impact monitoring and evidence

Evidence for evaluation

Evidence and policy – Is it possible?

Lessons from international experiences

Panel discussion

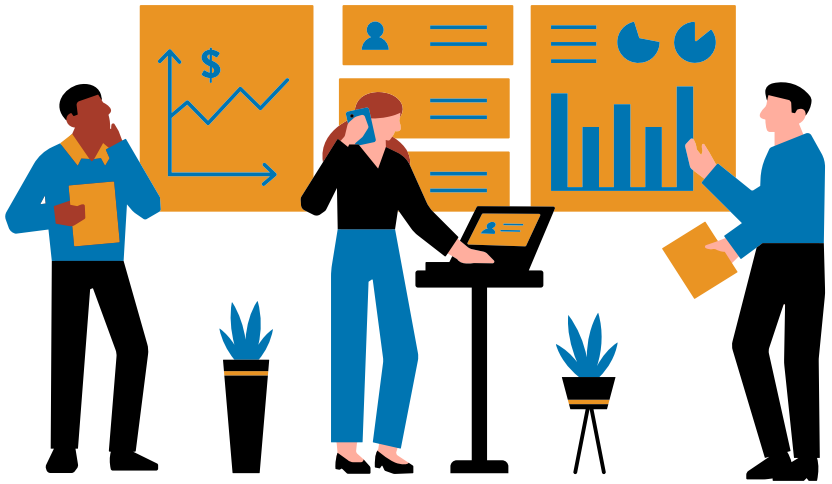


Evidence for evaluation

Evidence generation, collation, collaboration

CBAx Community of Practice

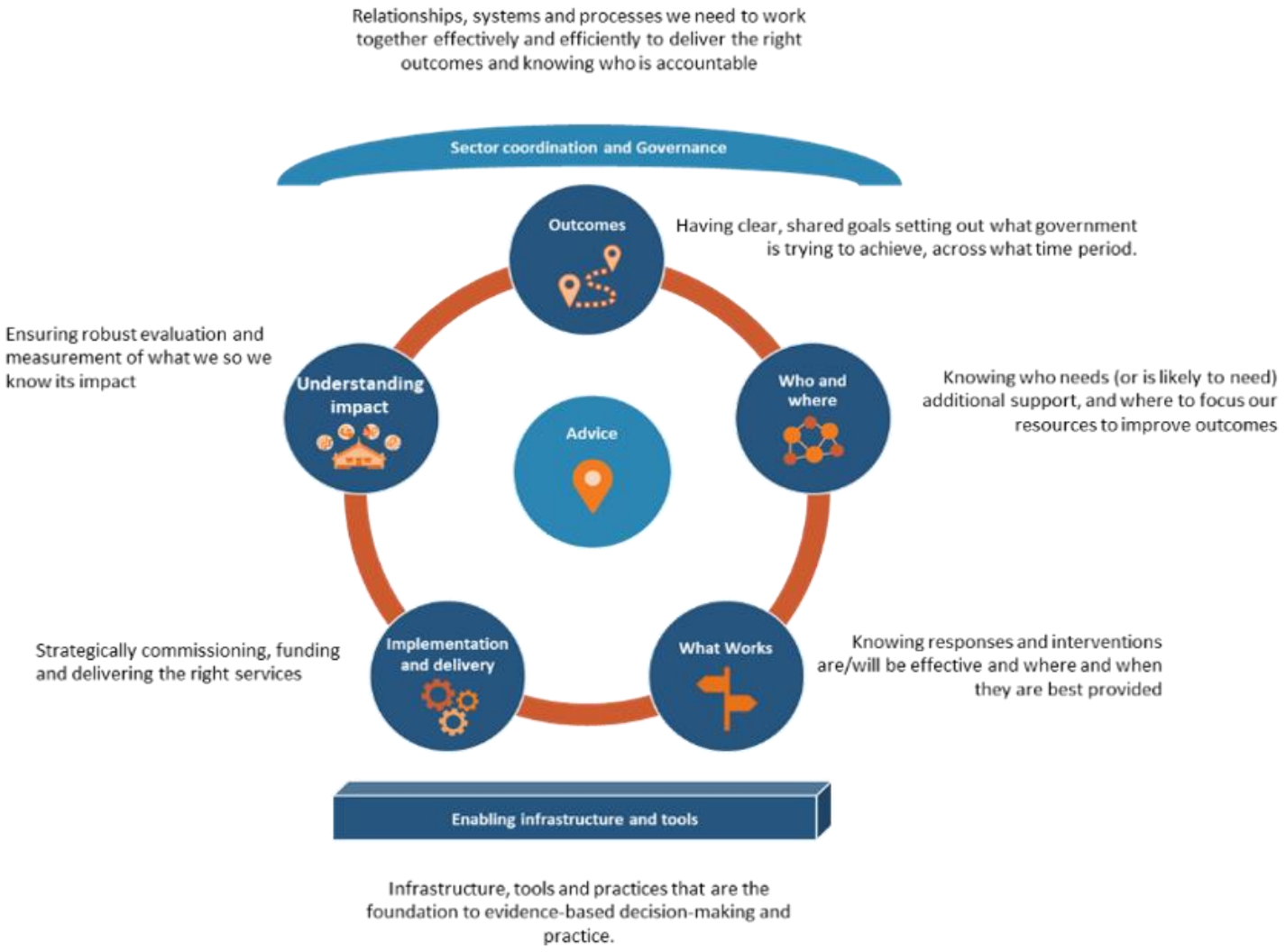
27 November 2023



SOCIAL WELLBEING AGENCY | TOI HAU TĀNGATA

SOCIAL WELLBEING AGENCY | TOI HAU TĀNGATA

Evaluation is best enabled by a strong and consistent approach to good data and evidence



SOCIAL WELLBEING AGENCY | TOI HAU TĀNGATA

CBAx as a tool to engage with the data and identify outcomes that should be measured

- Helps you to be purposeful about the impacts that you're going to measure
- Pushes you to be quite disciplined throughout the process to collect data/record findings which enables evaluation
- A tool for documenting changes (don't set and forget) and having this inform evaluation
- It's not all about CBAx – other analytical tools used with CBAx can help provide rich input on potential impacts.

SOCIAL WELLBEING AGENCY | TOI HAU TĀNGATA

The IDI can help us learn more about the impact of an intervention

We worked with ERO to evaluate Alternative Education Services (AE). Our results indicate that the service is a missed opportunity to better support the lives of young people.

Through this work we were able to:

- describe the characteristics, past experiences and whānau and community context of AE participants
- create **a matched comparison group** of learners with similar past experiences and contexts, but who never enrolled in AE.
- Track AE participants over time to age 30, looking at outcomes relating to education, income and employment, crime, and health and compared the outcomes of the two groups, as well as the total population.

About 1600 learners first enrol in Alternative Education each year.

Our results imply more effective support for these learners could lead to…

Increased desired outcomes

- **545 more learners** attaining a qualification at school
- **454 more learners** attaining at least NCEA Level 2
- **81 more learners** in tertiary education at age 19
- **157 more people** employed at age 22
- **$6,450 (about 40%)** increase in total wage income at age 30

Decreased undesired outcomes

- **237 fewer people** on benefit at age 30
- **86 fewer people** serving custodial sentences at age 26
- **154 fewer people** serving community sentences at age 26
- **384 fewer victims** of crime over age 20-30
- **1,539 fewer admissions** to hospital emergency departments over age 20-30

* Based on outcomes of the matched comparison group.

Microsimulation models can be a useful tool for *ex-post* evaluation

A number of agencies have microsimulation models providing a quantitative method for estimating the expected impact of an intervention

They are particularly useful when we're assessing policy proposals – helping us quantify impacts, and for evaluation.

SWA is currently taking stock of the models available across government for forecasting and scenarios testing with a focus on microsimulation models their current state and future potential. We focussed on some of the following microsimulation models:

- The Treasury – Tax and Welfare Analysis (TAWA)
- Ministry of Education – Student Loan Valuation model
- Ministry of Justice – Justice Microsim
- Ministry for Children – Child Wellbeing Model
- Ministry of Social Development – MSIM (costing and forecasting) and the Social Outcomes Microsim

SOCIAL WELLBEING AGENCY | TOI HAU TĀNGATA

Stay in touch with us...

SECTION FOUR

Philip Stevens

Director Economics and Research

Productivity Commission

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Ex-post CBA

Impact monitoring and evidence

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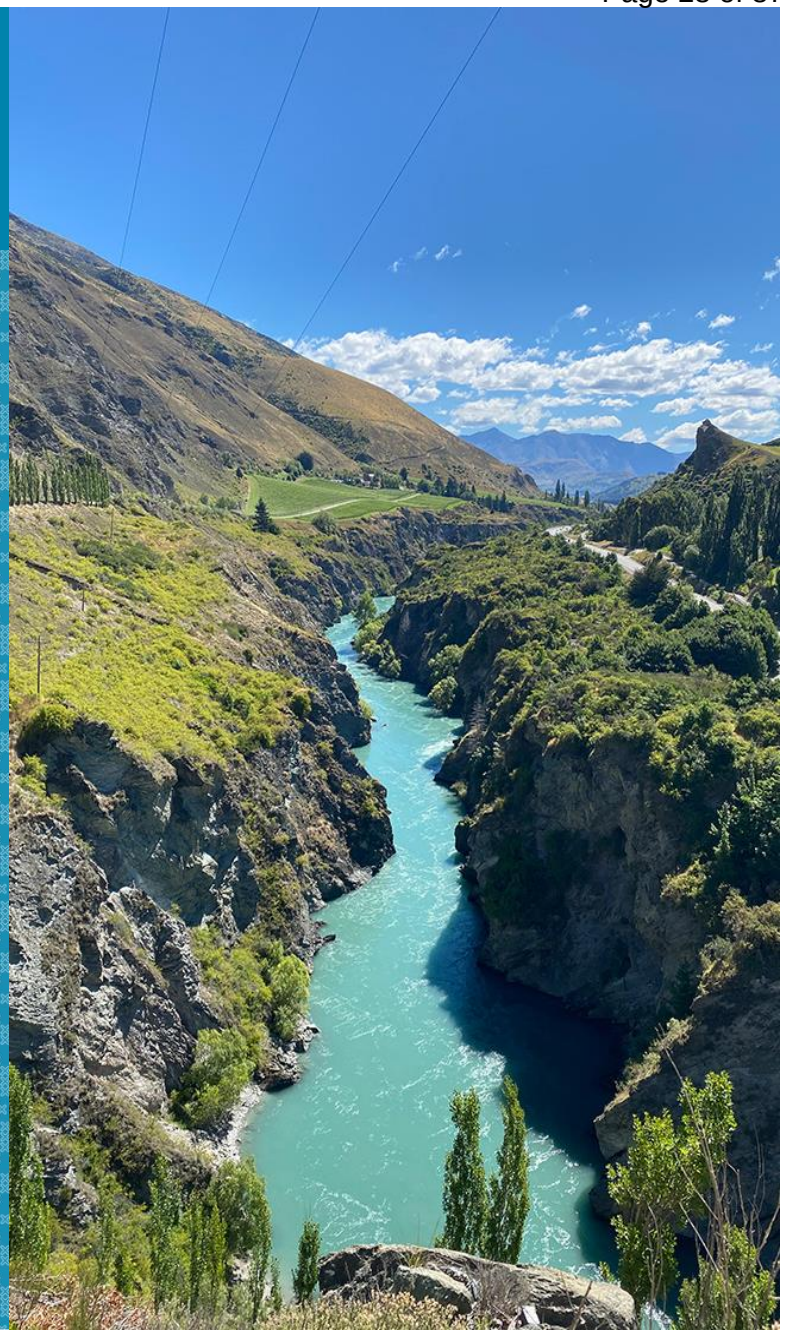
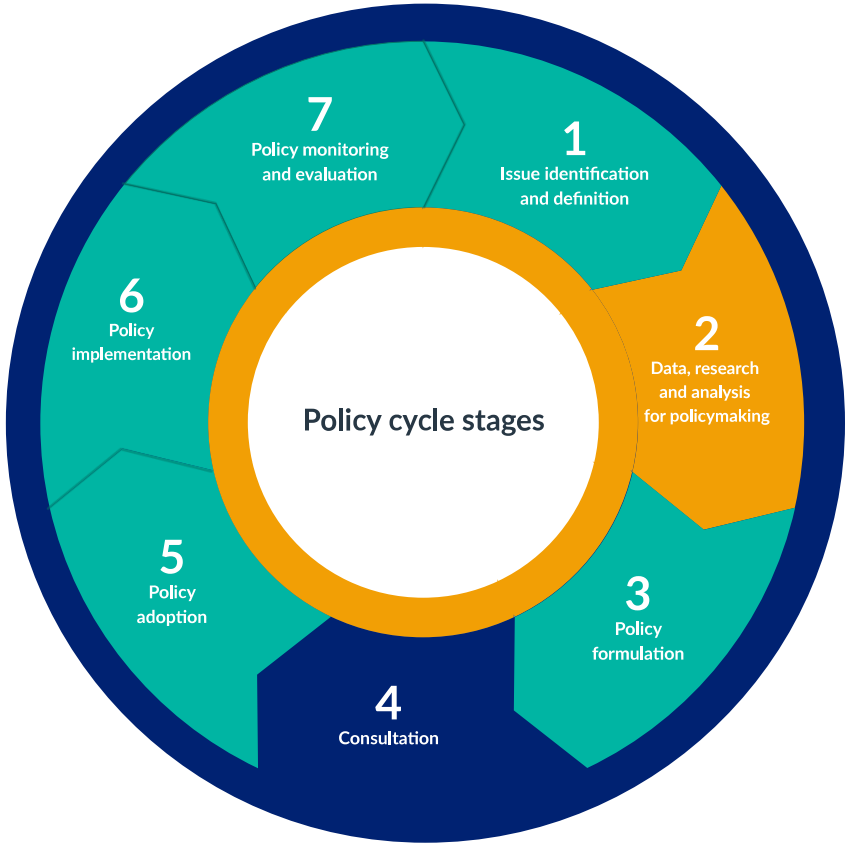
Panel discussion



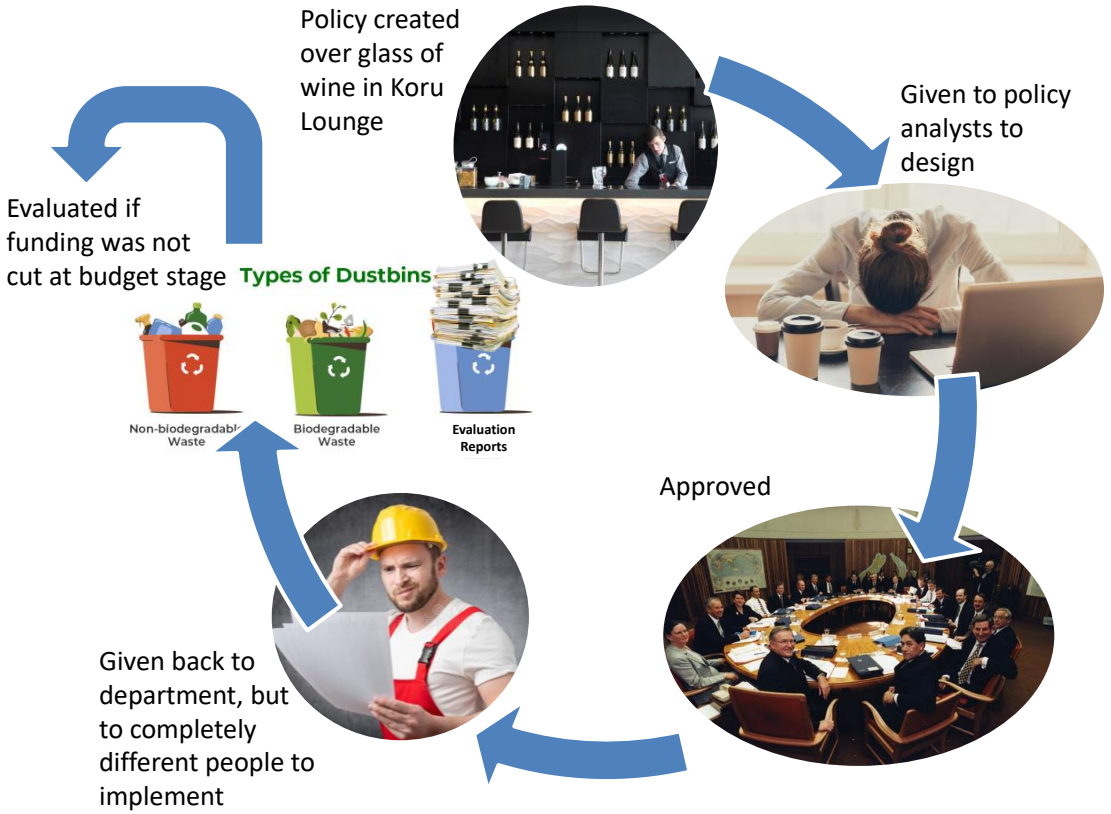
NEW ZEALAND PRODUCTIVITY COMMISSION
Te Kōmihana Whai Hua o Aotearoa

The Policy Cycle

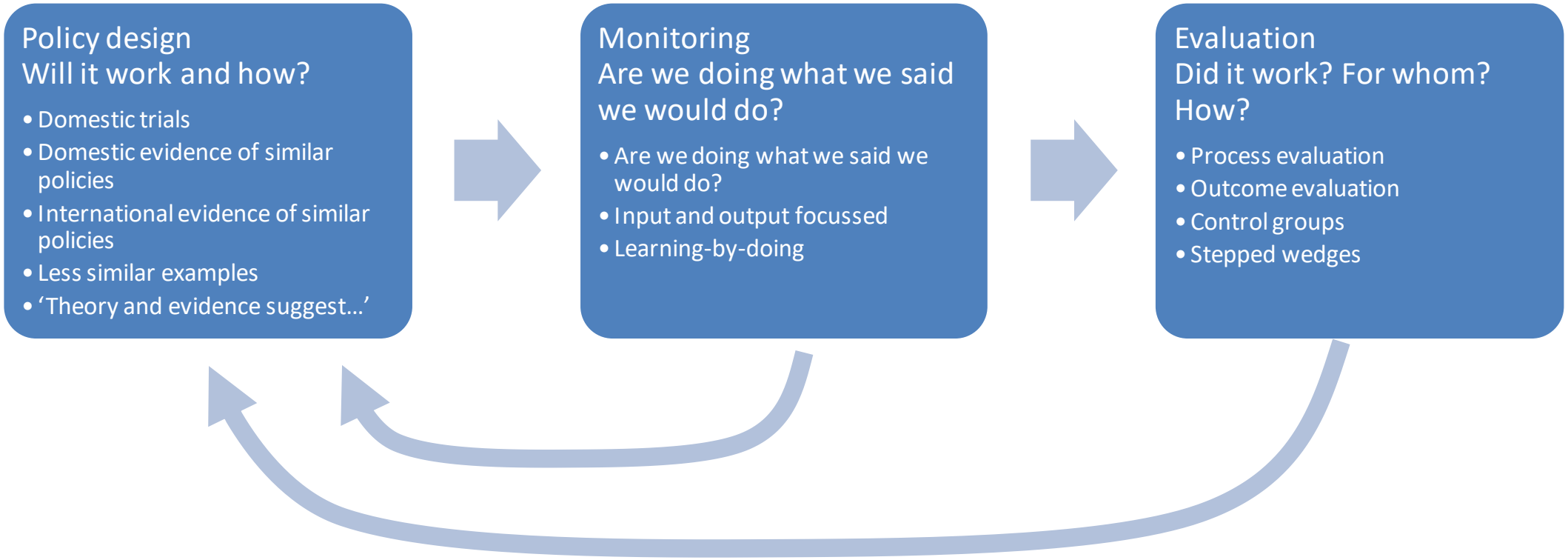
Theory



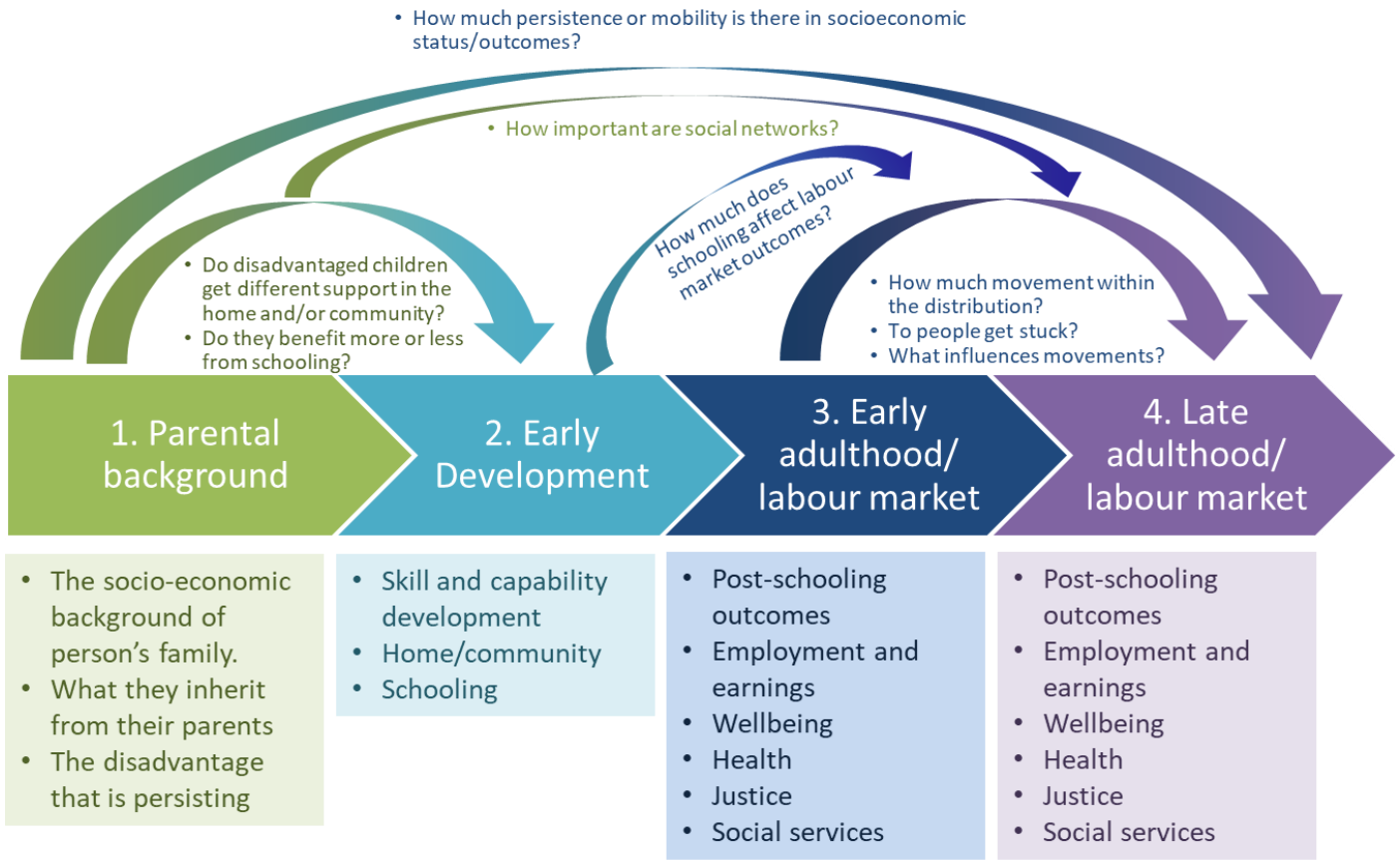
Reality



Information in the life cycle of policy



Disadvantage



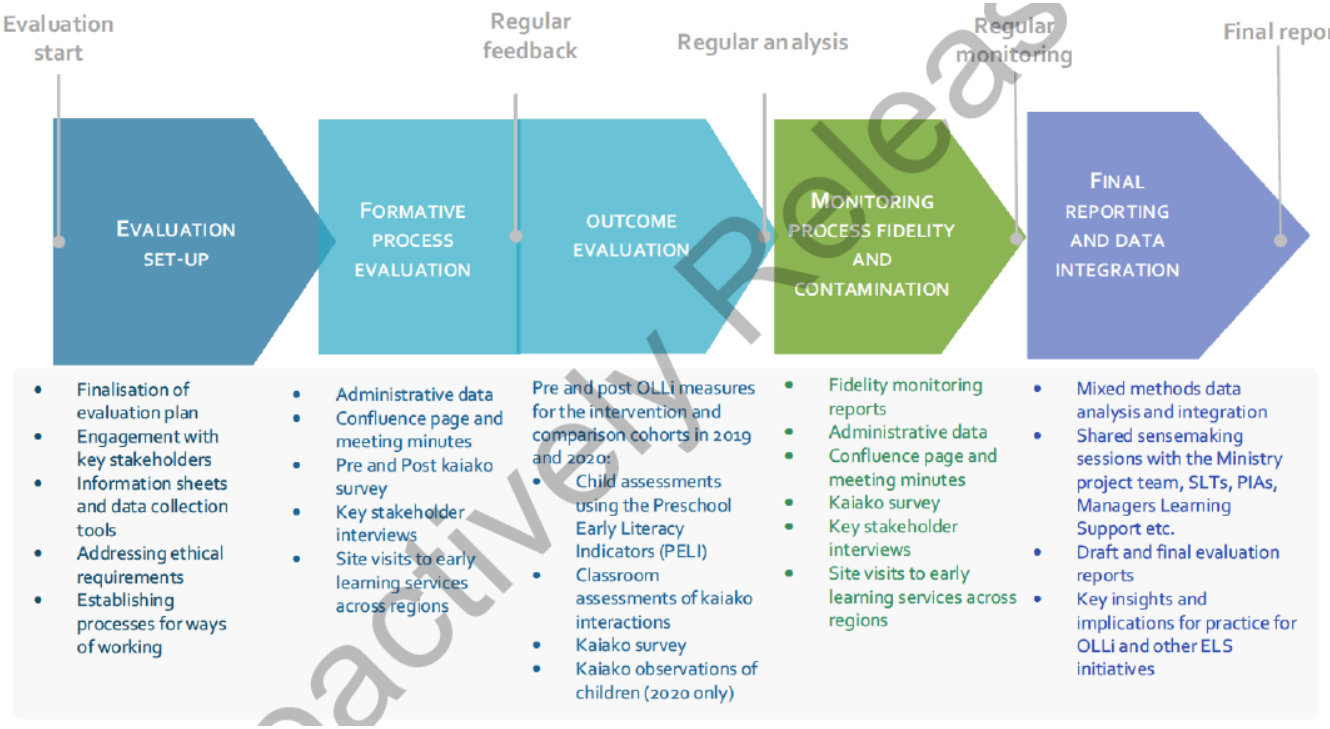
NEW ZEALAND PRODUCTIVITY COMMISSION
Te Kōmihana Whai Hua o Aotearoa

It is possible | example of SIA

Outcome: Children and young people are learning and developing

Indicator	Measure
Participation in early learning	Percentage of children attending early childhood education for 10 or more hours a week on average at age 3 and at age 4 – see page 17 of this report
Regular school attendance	Percentage of children and young people who are regularly attending school – see page 18 of this report
Literacy, numeracy, and science skills	Percentage of 15 year-olds meeting the Level 2 benchmark for reading, maths and science – see page 49 of this report (indicator number 7)

	Service	Purpose	Coverage and results
New services	Incredible Years Autism (IYA)	Part of a series of programmes for parents of children aged 2 to 5 on the autism spectrum that aims to promote children's emotional regulation, positive social interactions and language development.	• In 2018, we began offering two IYA programmes specifically designed for teachers and caregivers, parents, and whānau of children on the autism spectrum aged 2 to 5 years. • All providers are now using the IYA web app, with an exceptionally high consent rate (87% of enrolled participants), and online assessment enabling efficient collation of quality data for the impact evaluation. • Early evidence, gathered through an online data management system, shows a significant increase in parental wellbeing, and largely positive shifts in teacher confidence and reported practices.
New services (cont)	Oral Language and Literacy Initiative (OLLI)	Enhances teacher knowledge, practices and confidence to successfully support the oral language and early literacy development of children in selected early learning services.	• Delivered to 102 early learning services in eight regions from February to June 2019 (118 early learning services in the control group are involved from July to November 2019). • Results of the monitoring and evaluation will be used to enhance OLLI support, practice and delivery, and ensure the quality and integrity of the evaluation. • A significant change in reported teacher practice and confidence due to OLLI was found. Moreover, positive effects of OLLI are experienced in early learning services, with results shared in two *Educational Gazette* articles.



Oral Language and Literacy Initiative (OLLi) Impact Evaluation: Key Insights

MINISTRY OF EDUCATION TE TĀHUHU O TE MĀTAURANGA

SYNERGIA

NEW ZEALAND PRODUCTIVITY COMMISSION Te Kōmihana Whai Hua o Aotearoa

OLLi

- OLLi supports the capability of early learning services (ELS) and kaiako to develop children's oral language and literacy skills through a tiered Response to Intervention (RTI) approach, which is aligned with the Learning Support Delivery Model (LSDM).
- OLLi targets three and four year olds attending ELS in low socioeconomic communities to mitigate disadvantage and improve future educational outcomes.
- OLLi was supported by an evaluation; the first of its type for this tiered approach.

OLLi delivery

- Delivery was led by speech-language therapists (SLTs) in eight regions. OLLi was delivered to six cohorts of ELS involving:

8	636	1283
Regions	ELS	Kaiako

- **SLTs focussed their work on tiers 1 and 2.** Across the five evaluation cohorts, there were:

1,575	1,083	1,894	679
hours spent in tier 1	hours of ABC and Beyond workshops in tier 2	video coaching sessions in tier 2	hours spent in tier 3

Evaluating the impact of OLLi

OLLi was evaluated from 2018 for three years. Five of the six cohorts were evaluated (three intervention and two control). The evaluation used a pre-post intervention randomised control trial design involving:

1390 kaiako surveys
804 pre-OLLi surveys and 586 post-OLLi surveys

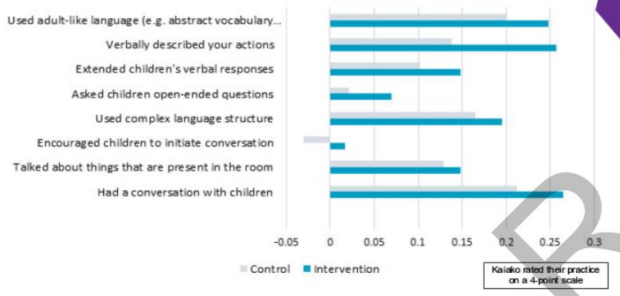
151 interviews
26 ELS Managers, 63 kaiako, 62 Ministry staff

Other data sources:

- Classroom environment assessments
- Observations of kaiako
- Kaiako observations of children
- Preschool Early Literacy Indicators (PELI) assessments of children's oral language and literacy
- Fidelity monitoring reports.

OLLi improved kaiako confidence and practice

Kaiako change in practice – Average increases across control and OLLi intervention groups, over six months



16% Increase in kaiako confidence because of OLLi

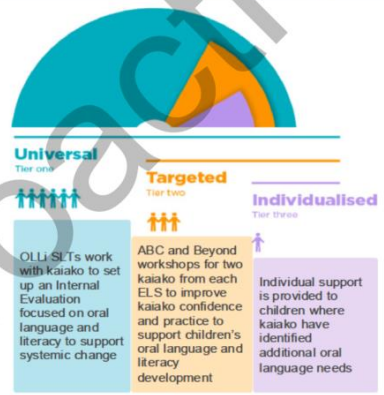
15% Increase in kaiako practice because of OLLi

Kaiako identified the impact of OLLi on children's readiness for school

- Kaiako observed increases in children's use of oral language, interest in reading and pro-social behaviour.
- At six months, an assessment of children's early literacy indicators (PELI) did not identify the impact of OLLi.

> *More language is being used. Children are more confident to express ideas. Those who used to be quite shy are talking a lot now. Children are able to build more relationships and have more friends. - Kaiako comment*

OLLi's tiered RTI approach and alignment with the LSDM was highly valued



- Working across the tiers is new for ELS and SLTs. Initially, it required extra time to learn and shift to this new approach.
- The shift to working with the whole ELS rather than an individual child caseload was highly valued.
- The tiered approach was effective for ELS, and gave the SLTs flexibility to work at the right pace for each ELS.

> *Our SLT was very involved and felt part of our team. She would attend our strategic meetings and come when we needed support. She would attend parent whānau evenings and help us share OLLi strategies… If you look at what made OLLi a success, I would definitely say the SLT was one of the big ones. - Kaiako comment*

Sustaining OLLi and the changes in SLT practice

Sharing OLLi strategies and skills across ELS networks (e.g. kāhui ako and associations) helped kaiako continue to embed OLLi at the ELS.

Changes to the ELS environment (such as increased use of print in posters and dedicated small reading spaces) supported kaiako and the ELS to prioritise oral language and literacy development.

ELS with an emphasis on literacy supported the sharing and sustainability of OLLi strategies and changes to the ELS.

Through OLLi, SLTs have gained deeper skills and knowledge that align with the LSDM. SLTs are now confident working with the whole ELS and are continuing to adopt a community approach to learning support.

> *You can see the difference from when they started and where they are now… If I look at my other SLTs, [the SLT involved in OLLi] has a lot more skills and I feel that returning to their previous SLT role would be boring for [them], but also a waste of [their] skills especially in tier 1. - Service Manager comment*

Planning for the future of OLLi

- Minimise financial barriers for ELS, for example, support teacher release with funding.
- Provide training for SLTs and other Learning Support colleagues to work across tiers effectively.
- Sustain the leadership support from the Ministry, such as SLT mentoring.
- Evaluate over a longer timeframe with a specific cohort to further assess the impacts of OLLi on children's oral language and literacy development.
- 9(2)(f)(iv)

The Oral Language and Literacy initiative (OLLi): Process evaluation summary for cohort 2

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The rationale for OLLi

- Research demonstrates that oral language and literacy skills have an impact on a child's future educational outcomes, and life trajectories.
- The Education Review Office found only 19% of early learning services were well focused on supporting oral language development.
- OLLi was funded as a Track 1 bid through the Treasury's Social Investment Fund.

What is OLLi?

- Eleven Speech language therapists working from eight regional offices provide an intervention to two cohorts of 12 early learning services each year.
- OLLi is designed to improve capability of early learning services and Kaiako through the Response to Intervention (RTI) model.

The RTI model

Tier 1 (universal) Supporting systemic culture change for the entire early learning service that to create an environment that benefits all children.

Tier 2 (targeted) ABC & Beyond training to 2 Kaiako to develop skills to develop language and literacy skills in children who may need more support.

Tier 3 (specialist) SLTs work with Kaiako to provide tailored support to children with more specific needs.

The process evaluation

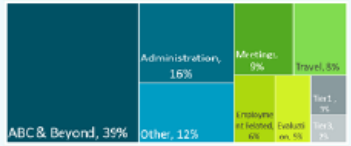
Evaluation aim: To conduct a formative process evaluation of OLLi alongside testing the tools and methods of the outcome evaluation. This phase focuses on cohort 2 alongside some insights from cohort 1.

Mixed methods data integration of: OLLi administrative data, an online kaiako survey, key stakeholder interviews with SLTs, regional and national office staff, and staff from the early learning services (ELSs), including kaiako and managers.

A summary of findings relating to the core components of OLLi and its evaluation

Inputs

Based on cohort 2 delivery, SLT capacity is stretched across recruitment, three tiers of delivery, evaluation and administration support. This means that SLTs did not always have capacity to give enough time to all tiers.



The ABC & Beyond programme is very highly regarded. Early learning services consider it to be relevant across a range of contexts and teaching philosophies. Further work is needed to understand its relevance to non-English speaking contexts.

The SLTs were passionate about the focus on systemic change through tier 1; more training would develop their skills and confidence with this aspect of the model.

Reach and access

Quantitative data was only available for cohort 1. This data demonstrated good reach to the intended cohort.

Barriers to access: releasing staff, staff turnover, time to share learning and large amount of content.
Enablers to access: Relevant topic, kaiako motivation, no direct costs, ongoing engagement to apply skills and SLT characteristics.

Tier 3
Identifying children for tier 3 could be improved. There is confusion over tier 3 children with tier 2 evaluation children and referrals for existing SLT services. Identification is also challenging within the 6 month timeframe.

Design and implementation

Early learning services are happy with the communication and engagement from SLTs. Opportunities for improvements include clarity on the outcome evaluation process for the ELSs and enhancing two-way communication from the national office.

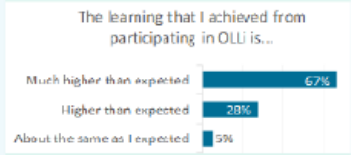
✓✓ **Tier 1** is still developing. Services value the general support and advice provided by SLTs. However, there is still variation in delivery of activities across SLTs.

✓✓✓ **ABC & Beyond** has been implemented with fidelity and kaiako speak highly of this tier.

✓ **Tier 3** is still developing. At the time of evaluation site visits many services were not yet at this stage, although some reported difficulties in identifying children for this tier.

Capability and development

Developing a systemic change in culture is a long-term task but services are starting this process. SLTs are sharing templates and resources, facilitating meetings, and guiding kaiako to support this.



Consistent feedback from all kaiako speaks highly of the knowledge and skills they have gained from ABC & Beyond and particularly the opportunity to practice their skills with SLT support.

"We've practiced and learnt different strategies with the OLLi PD that by this time, we're confident with them. We've practiced them enough times to feel that it's not foreign." - Kaiako

Outcome evaluation

Nearly all kaiako preferred the MacArthur Bates measure, although there was variation in its use across parents and teachers.

"The MacArthur Bates, I think it could be a good tool. The issue I have is... every one of my teachers filled it out different." - SLT

The Strengths and Difficulties questionnaire was not valued by many kaiako, leading some not to use it.

All kaiako indicate that they are seeing changes in children's interest in reading and use of language already. They perceive that behavioural changes will take more than six months.

The MacArthur Bates indicated an improvement in literacy within the 6 months, although the sample size was small. Consistency of use and the completion of post-assessments will be crucial for the success of the outcome evaluation.

Summary across all components of OLLi

- OLLi is highly accepted and valued by ELSs and SLTs, particularly the focus on a holistic approach to support capability development and systemic culture change.
- Benefits have been reported in terms of early learning service culture, kaiako capability, and early benefits in oral language and literacy skills of children.
- The delivery of OLLi is in its early stages of implementation. There are some variations in the implementation of OLLi activities for pragmatic reasons, although components are being implemented with good fidelity. The main challenge to fidelity is the capacity for the SLTs to support all three tiers, the outcome evaluation and the administration of the initiative.

Key considerations

- Support SLT capacity with other resources enabling them to focus on delivery and fidelity.
- Ensure consistent support and supervision across the regions, supported by national level opportunities to build SLT capability for tier 1 and to share learning.
- Enhance two-way communication between the national and regional staff and SLTs.
- Consider engaging with previous cohorts to assess the sustainability of ELS level changes.
- Ensure a consistent and systematic approach to pre and post outcome data collection. This is currently the greatest risk to the outcome evaluation.

SECTION FIVE

Tim Denne

Principal Economist, Climate Change, Ministry for the Environment

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Ex-post CBA

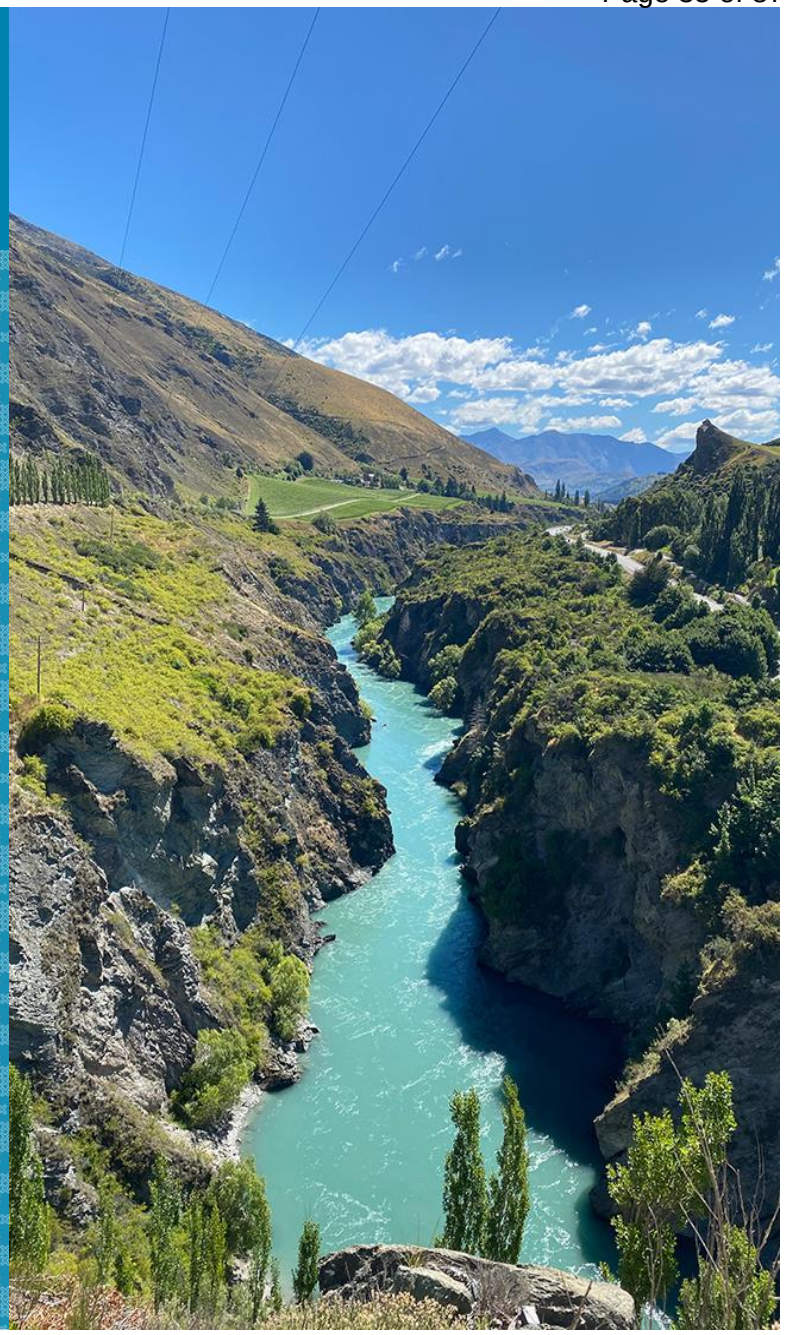
Impact monitoring and evidence

Evidence for evaluation

Evidence and policy – Is it possible?

Lessons from international experiences

Panel discussion



The problem(s)

- NZ Productivity Commission (2014): there is -
  - “a bias in favour of more regulation.”
  - no “strong processes for reviewing regulatory regimes, leading frequently to a ‘set and forget’ mindset

- International approaches
  - **Sunsetting** requires a regulation to be re-made after a certain period (typically 5 to 10 years) or it will lapse
  - **Embedded statutory reviews** - legislation includes a requirement for a review after specified time and might include scope etc
  - **Post implementation reviews** (PIRs) within 1-2 years of introduction
  - **Ad-hoc reviews** responding to complaints, benchmarking, studies etc
  - **One-in, one-out** (OIOO) regulation – UK, EU

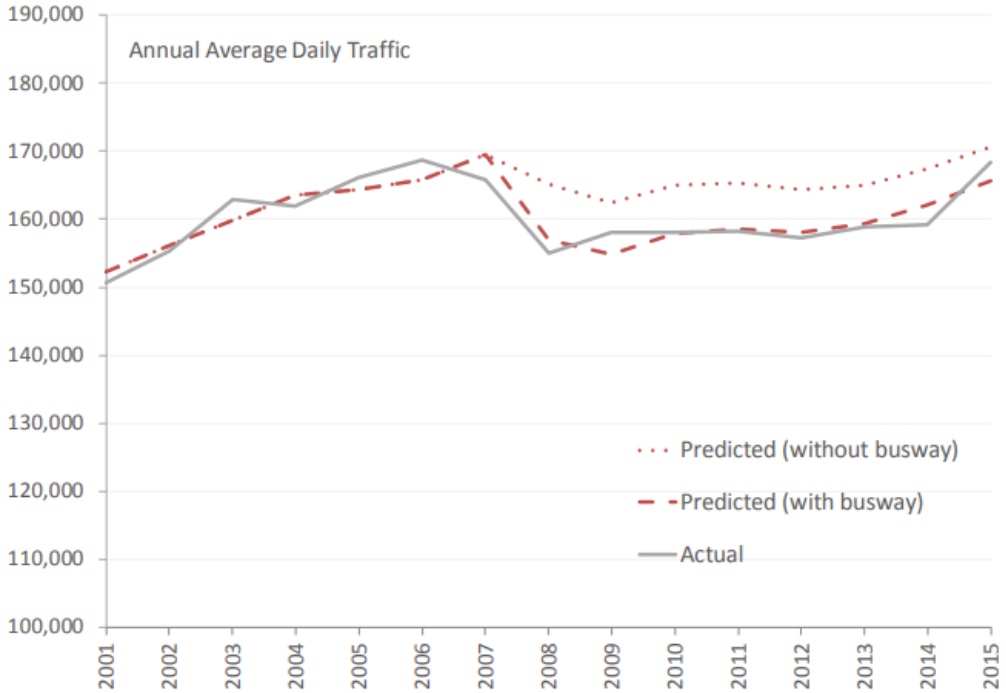
Analytical components

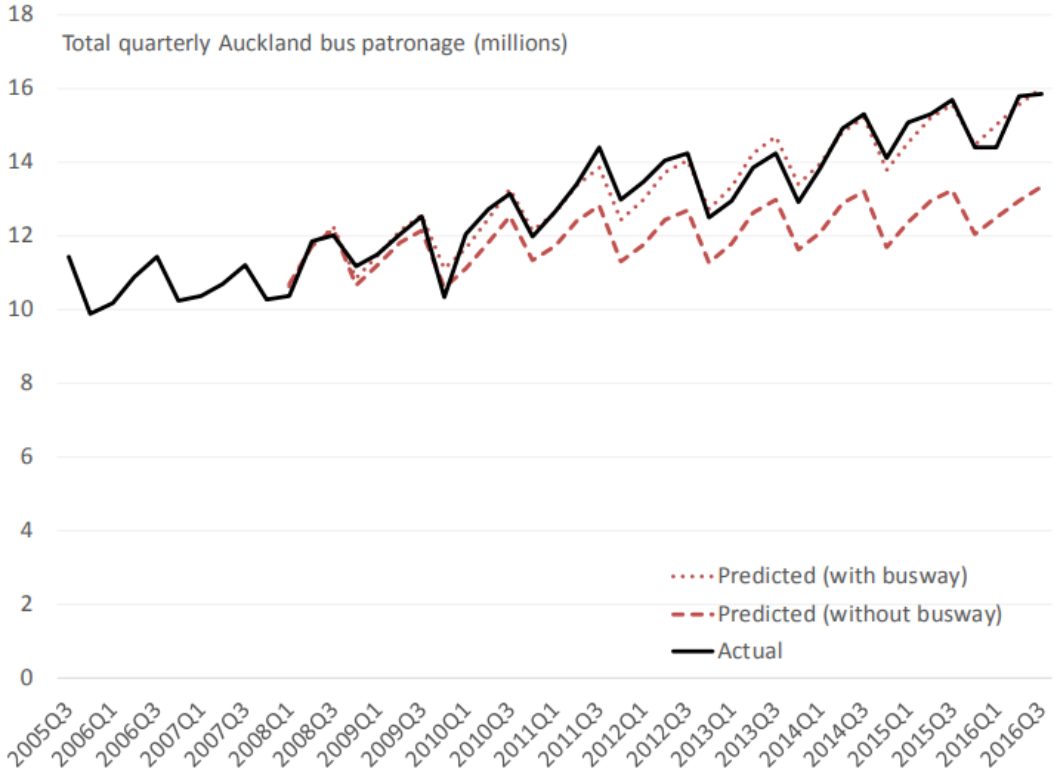
Component	Questions	Analytical tasks
1. Problem definition	(a) what is the problem – underlying justification of the regulation? (b) has it changed? Trends, technologies etc	(a) Market failure analysis – is there still justification? (b) Market and physical trend analysis
2. Effectiveness of current regulation	(a) How effective at addressing the problem? (b) Were expected benefits achieved? (c) Any unintended consequences	Outcomes compared with: (a) no regulation counterfactual (b) expected outcomes
3. Regulatory options	(a) Is regulation still optimal approach? (b) Are there options?	(a) What does market failure analysis suggest? (b) Review of practice
4. Regulatory analysis	(a) Do benefits still exceed costs (if they ever did) (b) Do alternatives have greater net benefits	CBA of current regulation and options
5. Regulatory improvement	(a) Can regulation be integrated with other regs? (b) Can admin burden be reduced? (c) Could it be more flexible?	Transaction cost analysis

Ref: www.nzta.govt.nz/resources/research/reports/604/

Causal inference analysis

Auckland Northern Busway analysis





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SECTION SIX

Panel – Ex-post Evaluation

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Ex-post CBA

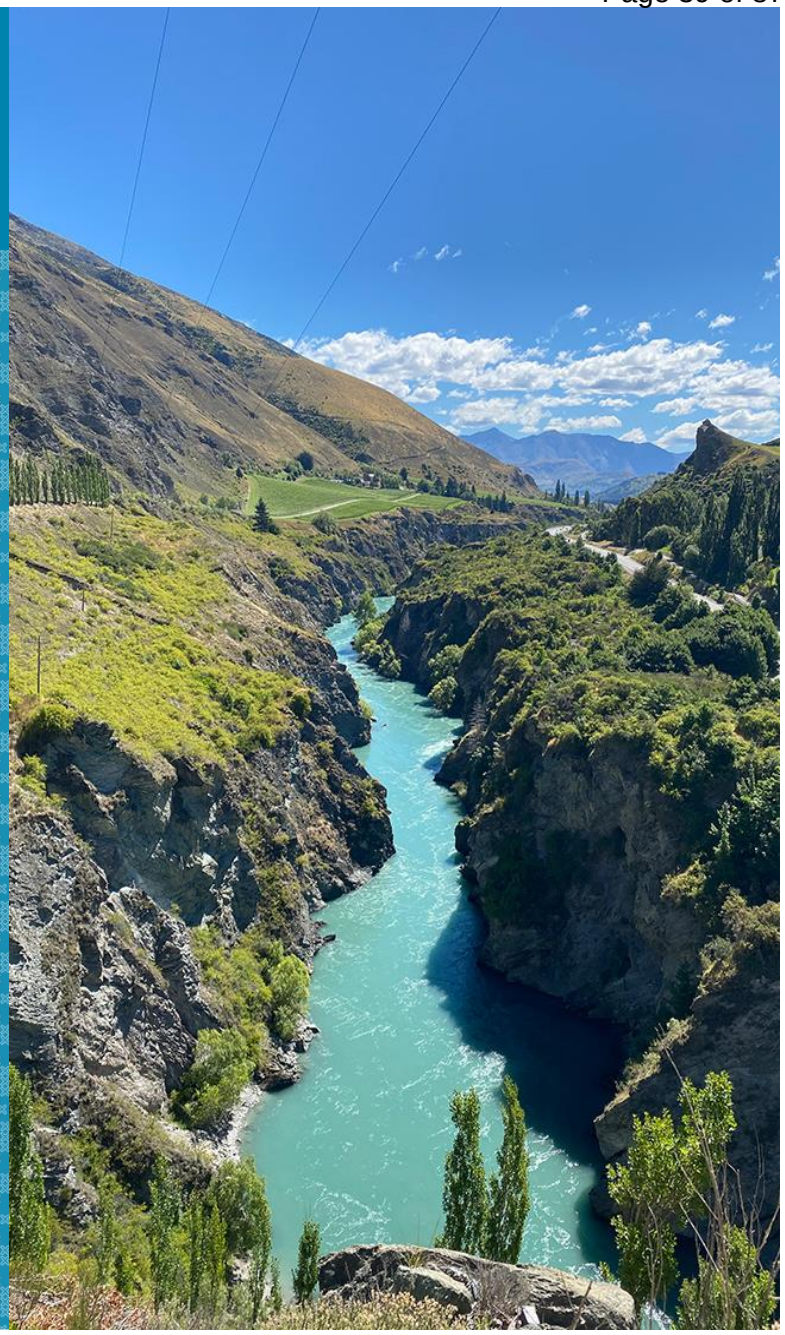
Impact monitoring and evidence

Evidence for evaluation

Evidence and policy – Is it possible?

Lessons from international experiences

Panel discussion



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Panel members – Ex-post evaluation and CBA

Marc de Boer

MSD

Rebecca Hollingsworth

SWA

Philip Stevens

Prod Com

Tim Denne

MfE

Kirsten Jensen

Treasury

Please raise your questions and comments in the chat

IN-CONFIDENCE

Pātai / Questions?

Photo credit: Chris Chapman
Description: Fox Glacier Valley

Heoi anō tāku mō nāianei, ngā mihi.
That's all for now, thank you.

Get in touch: cbax@treasury.govt.nz

TE TAI ŌHANGA
THE TREASURY

Healthcare structural reform and the performance of public hospitals: The case of Queensland, Australia

Bao Hoang Nguyen
Shawna Grosskopf,
Jongsay Yong,
Valentin Zelenyuk

8 February 2024

Importance of Health

- **"The health of the people is really the foundation upon which all their happiness and all their powers as a state depend."**
  – attributed to Benjamin Disraeli

Importance of Productivity

- **"Productivity isn't everything, but in the long run, it's almost everything..."**
  – Paul Krugman (1997)

Outline

Research Question and Motivation

Research Question

- Our research question in a nutshell:
  Does the Activity Based Funding reform help to improve the technical efficiency of hospitals?

Motivation

- **Activity Based Funding** (ABF) is a funding system that *aims at promoting effectiveness and efficiency* in utilisation of healthcare resources
  - to address **rapidly rising cost** in the healthcare sector,
  - to provide **timely service** for people in need.

  Basically, under the ABF, hospitals:
- are **reimbursed** based on the **number** and the **complexity** of patient care episodes they provide.
- and receive a **fixed rate for each episode**,
- the value of the fixed rate is pre-determined (by health authorities) **based on the DRG** to which the episode belongs.

In theory, ABF **provides financial incentives** for hospitals to decrease unit costs and simultaneously increase the number of episodes treated, resulting in efficiency improvement (Böcking et al. 2005).

Motivation

- Most studies look at the impact of ABF on some **single** outcomes of hospital performance, e.g.:
  - Quantity of services delivered
  - Average length of stay
- So far, the empirical evidence about the impact of ABF on an economic measure of hospital efficiency is **limited** and **mixed**, e.g.:
  - *Positive association* was found for **Norway** (Biørn et al. 2003, Biørn et al. 2010), **Sweden** (Gerdtham, Löthgren, Tambour & Rehnberg 1999, Gerdtham, Rehnberg & Tambour 1999), and **Italy** (Cavalieri et al. 2018)
  - *No significant association* for the **USA** (Borden 1988, Chern & Wan 2000) and Germany (Herwartz & Strumann 2014)
  - No evidence so far found for **Australia** (to the best of our knowledge).
- Previous studies focus on **Association rather than causation**.

Overview

Overview

- **Empirical novelty 1:**
  We provide an **empirical evidence** about the impact of *ABF on hospital efficiency in Australia*.
- **Empirical novelty 2:**
  Try to identify the **causal effect** by exploiting what can be thought of as a natural **quasi-experiment** in Queensland, Australia.
- **Methodological novelty**:
  We adapt the **double bootstrap truncated regression framework** of Simar & Wilson (2007)[1] to the **panel data context**
  with the **difference-in-differences** analysis
  - with staggered treatment adoption.

[1] Truncated regression framework of Simar & Wilson (2007) has been the state of the art in the analysis of determinants of efficiency (See a discussion about the application of this framework in hospital efficiency analysis in the systematic review of Kohl et al. 2019).

Measure of Hospital Efficiency

Efficiency Measure

- The **Farrell-type technical (in)efficiency** measure
  - The most widely-used measures of efficiency in the literature.
  - It is a key component of Farrell profit efficiency (Färe et al. 2019).
- **Output orientation**
  - The level of inputs used in public hospitals is usually fixed in a short-run.
  - Consistent with the aim of QLD Health to maximize healthcare services to local community from given resources (see Queensland Health 2016)
- **Mathematically**, this measure of (in)efficiency is defined as

$$\theta(x, y) = \sup_{\theta} \{\theta > 0 : (x, \theta y) \in \Psi\}, \tag{1}$$

where Ψ is a technology set characterizing the technology defined as

$$\Psi \equiv \left\{(x, y) \in \Re_+^p \times \Re_+^q : x \text{ can produce } y\right\}. \tag{2}$$

- **NB:** $\theta(x, y) \geq 1$ for $(x, y) \in \Psi$, and the higher value of this measure, the less efficient a hospital is (taking reciprocal converts it into (0,1] scale).

DEA Estimator of Technical Efficiency

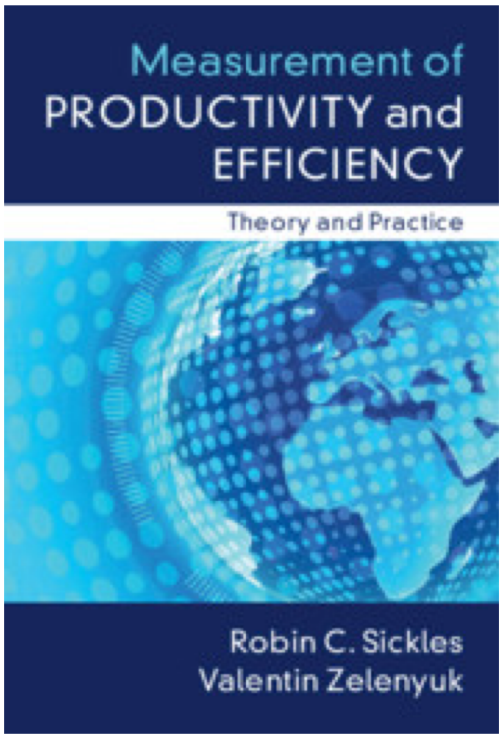
- Ψ is **not observable** in practice, and thus the efficiency measure is not observable either – **need to estimate** them.
- **Data Envelopment Analysis** (DEA) is among the most popular methods to estimate the technology set and efficiency, especially for hospitals.[2]
- For a longitudinal sample, $\mathcal{S}_N = \{(x_{it}, y_{it}) : i = 1, \ldots, n,\ t = 1, \ldots, T_i\}$, $N = \sum_{i=1}^{n} T_i$, and $T_i \leq T$, CRS-DEA estimator is then defined as

$$\widehat{\theta}_{kt} \equiv \widehat{\theta}\left(x_{kt}, y_{kt} \mid \mathcal{S}_N\right) \equiv \sup_{\theta} \left\{ \theta > 0 : \theta y_{kt} \leq \sum_{i=1}^{n} \sum_{t=1}^{T_i} \xi_{it} y_{it}, x_{kt} \geq \sum_{i=1}^{n} \sum_{t=1}^{T_i} \xi_{it} x_{it}, \right.$$
$$\left. \xi_{it} \geq 0, i = 1, \ldots, n, t = 1, \ldots, T_i \right\}. \tag{3}$$

- That's a preliminary or the **first stage**.

[2] See reviews in Hollingsworth (2003, 2008), O'Neill et al. (2008), Kohl et al. (2019)

More Details on DEA and SFA



"Robin Sickles and Valentin Zelenyuk have written an outstanding book on a very important topic – the measurement of productivity and efficiency.

The book provides a complete and thorough introduction to the economic theory of production and its many applications to national accounting and econometric modeling.

An especially valuable feature of the book is the detailed treatment of productivity and growth in the world economy."

-- **Dale Jorgenson**, Harvard University

Figure 1: Further readings

Causal Inference for Analysing DEA-estimated Efficiency (The Second Stage)

Causal Regression: The Model

- Difference-in-differences (DiD) Regression model

$$\ln \theta_{it} = \delta abf_{it} + \sum_{t=2}^{T} \alpha_t Year_t + W_i' \lambda + Z_{it}' \beta + c_i + \varepsilon_{it}, \tag{4}$$

- $\ln \theta_{it}$ is the logarithm of efficiency score of hospital i at time t,
- abf_{it} is the policy variable representing funding status of hospital i at time t, taking value 1 if hospital i is ABF funded at time t and 0 otherwise,
- W_i and Z_{it} are vectors of control variables (time-invariant & time-varying).
- $Year_t$ is a period specific dummy capturing the aggregate effect that may influence the efficiency measures of all hospitals at period t,
- c_i is a hospital specific effect capturing time-invariant unobserved individual heterogeneity, which may correlate with the policy variable.
- ε_{it} is the idiosyncratic error.
- The setup here is in principle the **two-way fixed effects** (TWFE) model.

Causal Regression: A Key Assumption

- The treatment coefficient in TWFE setup is an unbiased estimator for the average treatment effect if
  (i) the parallel trends assumption holds and
  (ii) the treatment effect does not vary over time and across cohorts
  (Goodman-Bacon 2021, de Chaisemartin & D'Haultfoeuille 2022).[3]
- δ is then the **parameter of average treatment effect on treated** (assuming treatment effect is constant across groups and overtime).

[3] Other alternatives we plan to try are heterogeneity-robust DiD estimators: de Chaisemartin & d'Haultfoeuille (2020), Callaway & Sant'Anna (2021), Sun & Abraham (2021)

Estimation strategy

Correlated Random Effect

- $\theta_{it} \geq 1$ by construction, so
  - equation (4) is a non-linear model (with limited dependent variable).
  - It is panel data truncated regression model with individual heterogeneity.
- **How to estimate** Eq. equation (4)**?**
  - **Fixed Effects approach?**: incidental parameter problem, the effect of time-invariant covariates is not identified.
  - **Random Effects approach?**: The assumption that c_i and other covariates are uncorrelated seems to be too strict.
  - We utilize the **Correlated Random Effects** (CRE) approach.[4]
- Specifically, following Mundlak (1978), we model the time-invariant individual heterogeneity as

$$\begin{aligned} c_i &= c_0 + \overline{Z_i}.'\tau + a_i, \\ a_i &\overset{\text{iid}}{\sim} \mathbb{N}(0, \sigma_a^2), \end{aligned} \tag{5}$$

where $\overline{Z_i}.$ is the time average of Z_{it} , i.e., $\overline{Z_i}. = \frac{1}{T_i}\sum_{t=1}^{T_i} Z_{it}$.

[4]Note that all these approaches require the assumption of **strict exogeneity** conditional on individual heterogeneity.

Estimation strategy

Correlated Random Effect

- Substituting (5) to (4) (with $\ln \theta_{it}$ as the dependent variable), we have

$$\begin{aligned} \ln \theta_{it} &= c_0 + \delta abf_{it} + \sum_{t=2}^{T} \alpha_t d_t + W_i' \lambda + Z_{it}' \beta + \overline{Z_i}.' \tau + a_i + \varepsilon_{it} \\ &= V_{it}' \Gamma + a_i + \varepsilon_{it}, \end{aligned} \tag{6}$$

- ε_{it} is assumed to be independent (Conditional on a_i and V_{it}) and follow $\mathbb{N}(0, \sigma_\varepsilon^2)$ left truncated at $-V_{it}' \Gamma - a_i$.
- Model (6) can be then estimated using the method of maximum likelihood (MLE).

Estimation strategy

Likelihood Function

- The conditional likelihood of individual hospital i at t[5]

$$L_{it}(\varepsilon_{it} \mid a_i) = \frac{\frac{1}{\sigma_\varepsilon}\phi\left(\frac{\ln\theta_{it} - V_{it}'\Gamma - a_i}{\sigma_\varepsilon}\right)}{1 - \Phi\left(\frac{-V_{it}'\Gamma - a_i}{\sigma_\varepsilon}\right)}. \tag{7}$$

- The conditional likelihood of individual hospital i

$$L_i(\varepsilon_{i1}, .., \varepsilon_{iT_i} \mid a_i) = \prod_{t=1}^{T_i} \frac{\frac{1}{\sigma_\varepsilon}\phi\left(\frac{\ln\theta_{it} - V_{it}'\Gamma - a_i}{\sigma_\varepsilon}\right)}{1 - \Phi\left(\frac{-V_{it}'\Gamma - a_i}{\sigma_\varepsilon}\right)}. \tag{8}$$

- The marginal likelihood for each individual hospital i

$$L_i(\varepsilon_{i1}, .., \varepsilon_{iT_i}) = \int_{-\infty}^{+\infty} \frac{1}{\sqrt{2\pi}\sigma_a} \exp\left(\frac{-a_i^2}{2\sigma_a}\right) \prod_{t=1}^{T_i} \frac{\frac{1}{\sigma_\varepsilon}\phi\left(\frac{\ln\theta_{it} - V_{it}'\Gamma - a_i}{\sigma_\varepsilon}\right)}{1 - \Phi\left(\frac{-V_{it}'\Gamma - a_i}{\sigma_\varepsilon}\right)} da_i. \tag{9}$$

[5] Conditioning on data and parameters is omitted to ease notation

Estimation strategy

Likelihood Function

- The integrand in (9) does not have a closed-form solution, but we can approximate it numerically using Gauss-Hermite quadrature.
- By changing variable $\upsilon = \frac{a_i}{\sqrt{2}\sigma_a}$, (9) can be rewritten as

$$L_i(\varepsilon_1, .., \varepsilon_{T_i}) = \frac{1}{\sqrt{\pi}\sigma_\varepsilon^{T_i}} \int_{-\infty}^{+\infty} \exp\left(-\upsilon^2\right) \prod_{t=1}^{T_i} \frac{\phi\left(\frac{\ln\theta_{it} - V_{it}'\Gamma - \sqrt{2}\sigma_a\upsilon}{\sigma_\varepsilon}\right)}{1 - \Phi\left(\frac{-V_{it}'\Gamma - \sqrt{2}\sigma_a\upsilon}{\sigma_\varepsilon}\right)} d\upsilon. \quad (10)$$

- Use Gauss-Hermite quadrature, we have

$$L_i \approx \frac{1}{\sqrt{\pi}\sigma_\varepsilon^{T_i}} \sum_{r=1}^{R} \omega_r \prod_{t=1}^{T_i} \frac{\phi\left(\frac{\ln\theta_{it} - V_{it}'\Gamma - \sqrt{2}\sigma_a\upsilon_r}{\sigma_\varepsilon}\right)}{1 - \Phi\left(\frac{-V_{it}'\Gamma - \sqrt{2}\sigma_a\upsilon_r}{\sigma_\varepsilon}\right)}, \quad (11)$$

where υ_r and ω_r denote quadrature abscissas and weight, respectively, for $r = 1, \ldots, R$.

Estimation strategy

Likelihood Function

- The likelihood of model (6) is obtained by multiplying the individual likelihood in (11) across all individuals

$$L \approx \frac{1}{(\sqrt{\pi})^n \sigma_\varepsilon^N} \prod_{i=1}^{n} \sum_{r=1}^{R} \omega_r \prod_{t=1}^{T_i} \frac{\phi\left(\frac{\ln \theta_{it} - V_{it}'\Gamma - \sqrt{2}\sigma_a \upsilon_r}{\sigma_\varepsilon}\right)}{1 - \Phi\left(\frac{-V_{it}'\Gamma - \sqrt{2}\sigma_a \upsilon_r}{\sigma_\varepsilon}\right)}. \tag{12}$$

- The log-likelihood is then obtained by taking logarithm of (12)

$$\mathcal{L} \approx -\frac{n}{2}\ln(\pi) - N\ln(\sigma_\varepsilon) + \sum_{i=1}^{n} \ln\left(\sum_{r=1}^{R} \omega_r \prod_{t=1}^{T_i} \frac{\phi\left(\frac{\ln \theta_{it} - V_{it}'\Gamma - \sqrt{2}\sigma_a \upsilon_r}{\sigma_\varepsilon}\right)}{1 - \Phi\left(\frac{-V_{it}'\Gamma - \sqrt{2}\sigma_a \upsilon_r}{\sigma_\varepsilon}\right)}\right). \tag{13}$$

Estimation Strategy

Double bootstrap procedure

- θ_{it}, **is not observable in practice**, to estimate the model specified in (6),
- we **replace** θ_{it} **by its DEA estimate**, $\widehat{\theta}_{it}$.
- As discussed in Simar & Wilson (2007), $\widehat{\theta}_{it}$ is however **biased and serially correlated** in a complicated way, and thus the conventional statistical inferences are theoretically invalid.
- To correct the bias and make valid statistical inferences, **we adapt the double bootstrap procedure** of Simar & Wilson (2007) into the context of panel data truncated regression.

Estimation Strategy

Double bootstrap procedure

1. From the original sample $\mathcal{S}_N = \{(x_{it}, y_{it}) : i = 1, \ldots, n, \ t = 1, \ldots, T_i\}$, use the DEA estimator to estimate $\widehat{\theta}_{it}$.
2. Apply MLE to estimate model (6) (with $\ln \widehat{\theta}_{it}$ as the dependent variable) to obtain the estimates $\widehat{\Gamma}$, $\widehat{\sigma}_\varepsilon$, and $\widehat{\sigma}_a$ of Γ, σ_ε, and σ_a, respectively, using the observations where $\widehat{\theta}_{it} > 1$.
3. Loop over next four sub-steps, $b = 1, \ldots, B_1$ times.
   - 3.1 For each $i = 1, \ldots, n$, draw $\widehat{a}_{i,b}$ from $\mathbb{N}(0, \widehat{\sigma}_a^2)$. Then, for a given i, for each $t = 1, \ldots, T_i$, draw $\widehat{\varepsilon}_{it,b}$ from $\mathbb{N}(0, \widehat{\sigma}_\varepsilon^2)$ with left truncation at $-V_{it}'\widehat{\Gamma} - \widehat{a}_{i,b}$.
   - 3.2 For each $i = 1, \ldots, n$ and $t = 1, \ldots, T_i$, compute the bootstrapped analogues of efficiency scores: $\theta_{it}^{b*} = \exp(V_{it}'\widehat{\Gamma} + \widehat{a}_{i,b} + \widehat{\varepsilon}_{it,b})$.
   - 3.3 Define $x_{it}^{b*} = x_{it}$, $y_{it}^{b*} = \dfrac{\widehat{\theta}_{it}}{\theta_{it}^{b*}} \times y_{it}$ for each $i = 1, \ldots, n$ and $t = 1, \ldots, T_i$.
   - 3.4 For each $i = 1, \ldots, n$ and $t = 1, \ldots, T_i$, estimate $\widehat{\theta}_{it}^{b*}$ using the DEA estimator with the reference technology estimated using the bootstrapped data, $S_N^b := \left\{\left(x_{it}^{b*}, y_{it}^{b*}\right) : i = 1, \ldots, n, t = 1, \ldots, T_i\right\}$, i.e., $\widehat{\theta}_{it}^{b*} = \widehat{\theta}\left(x_{it}, y_{it} \mid S_N^b\right)$.

Estimation Strategy

Double bootstrap procedure

4. For each $i = 1, \ldots, n$ and $t = 1, \ldots, T_i$, compute the bias-corrected estimate $\widehat{\theta}_{it}^{bc}$, given by $\widehat{\theta}_{it}^{bc} = \widehat{\theta}_{it} - \widehat{Bias}\left(\widehat{\theta}_{it}\right)$, where $\widehat{Bias}\left(\widehat{\theta}_{it}\right)$ is the bootstrap-based estimate of the bias of $\widehat{\theta}_{it}$, given by $\widehat{Bias}\left(\widehat{\theta}_{it}\right) = \frac{1}{B_1}\sum_{b=1}^{B_1}\widehat{\theta}_{it}^{b*} - \widehat{\theta}_{it}$.
5. Apply MLE to estimate model (6) (now with $\ln \widehat{\theta}_{it}^{bc}$ as the dependent variable) to obtain the refined estimates of Γ, σ_ε, and σ_a, denoted as $\widehat{\widehat{\Gamma}}$, $\widehat{\widehat{\sigma}}_\varepsilon$, and $\widehat{\widehat{\sigma}}_a$, respectively.

Estimation Strategy

Double bootstrap procedure

6. Loop over next three sub-steps, $b = 1, \ldots, B_2$ times, to obtain the a set of bootstrapped estimates of parameters of the regression.
   - 6.1 For each $i = 1, \ldots, n$, draw $\widehat{\widehat{a}}_{i,b}$ from $\mathbb{N}(0, \widehat{\widehat{\sigma}}_a^2)$. Then, for a given i, for each $t = 1, \ldots, T_i$, draw $\widehat{\widehat{\varepsilon}}_{it,b}$ from $\mathbb{N}(0, \widehat{\widehat{\sigma}}_\varepsilon^2)$ with left truncation at $-V_{it}'\widehat{\widehat{\Gamma}} - \widehat{\widehat{a}}_{i,b}$.
   - 6.2 For each $i = 1, \ldots, n$ and $t = 1, \ldots, T_i$, compute the bootstrapped analogues of efficiency scores: $\theta_{it}^{b**} = \exp(V_{it}'\widehat{\widehat{\Gamma}} + \widehat{\widehat{a}}_{i,b} + \widehat{\widehat{\varepsilon}}_{it,b})$
   - 6.3 Apply MLE to estimate model (6) (now with $\ln \theta_{it}^{b**}$ as the dependent variable) to obtain the bootstrapped estimates Γ_b^{**}, $\sigma_{\varepsilon,b}^{**}$, and $\sigma_{a,b}^{**}$.
7. Use $\widehat{\widehat{\Gamma}}$, $\widehat{\widehat{\sigma}}_\varepsilon$, and $\widehat{\widehat{\sigma}}_a$ and their double-bootstrapped analogues from Step 6, i.e., $\left\{\Gamma_b^{**}, \sigma_{\varepsilon,b}^{**}, \sigma_{a,b}^{**}\right\}_{b=1}^{B_2}$, to construct the bootstrap-based confidence intervals for each elements of Γ, σ_ε, and σ_a.

Data and Variables

Data and Variables

Sample

- Hospital type: to ensure homogeneity.
  - Data was obtained from Queensland Department of Health.
  - Only **Queensland public acute hospitals** are included[6]
- Time period: 2005/2006 - 2016/2017
- Final sample consists of 684 observations (57 hospitals in 12 years)

[6] For health facilities in rural and remote areas, due to the variation in their characteristics and service mix, only district and rural hospitals, which serve populations of more than 2000 people with a comprehensive mix of acute health services including medical, surgical, emergency and maternity, are included

Data and Variables

Table 1: Summary statistics

	All sample	Hospital cohorts based on the timing of ABF adoption			
		FY 2011/12	FY 2013/14	FY 2014/15	Never adopt
Labour factor	378.72	756.77	68.61	57.08	34.73
	(657.97)	(801.66)	(22.02)	(9.29)	(16.13)
Total beds	160.85	308.25	37.58	37.96	26.71
	(244.03)	(290.46)	(8.25)	(5.03)	(11.51)
Drug and medical supply expenditure	18.49	38.08	1.91	1.64	0.72
($1,000,000s in 2012/13 constant price)	(37.18)	(46.80)	(0.80)	(0.68)	(0.67)
Non-admitted occasions of service (1,000s)	165.88	321.26	42.56	45.96	23.23
	(235.51)	(266.63)	(8.58)	(6.47)	(10.72)
Casemix weighted inpatient episodes	17.63	35.62	3.36	2.48	1.21
(1,000s)	(29.91)	(35.70)	(0.63)	(0.32)	(0.55)
Large hospitals	0.40	0.85	0.00	0.00	0.00
	(0.49)	(0.36)	(0.00)	(0.00)	(0.00)
Major city hospitals	0.19	0.41	0.00	0.00	0.00
	(0.39)	(0.49)	(0.00)	(0.00)	(0.00)
Teaching hospitals	0.32	0.63	0.04	0.00	0.05
	(0.47)	(0.48)	(0.20)	(0.00)	(0.22)
Occupancy rate	0.67	0.85	0.68	0.51	0.50
	(0.26)	(0.21)	(0.12)	(0.06)	(0.20)
Casemix index	0.92	1.02	0.79	0.80	0.83
	(0.22)	(0.25)	(0.11)	(0.05)	(0.11)
The ratio of outpatient to inpatient	13.97	11.05	10.14	15.12	17.20
	(6.60)	(3.15)	(2.62)	(3.39)	(7.95)
The proportion of unit producing personnel	0.66	0.70	0.70	0.64	0.62
	(0.07)	(0.05)	(0.04)	(0.05)	(0.07)
Number of observations	684	324	24	24	312

Notes: Means for the variables are reported with their standard deviations in parentheses.

Results and Discussions

Results and discussions

Exploratory Analysis

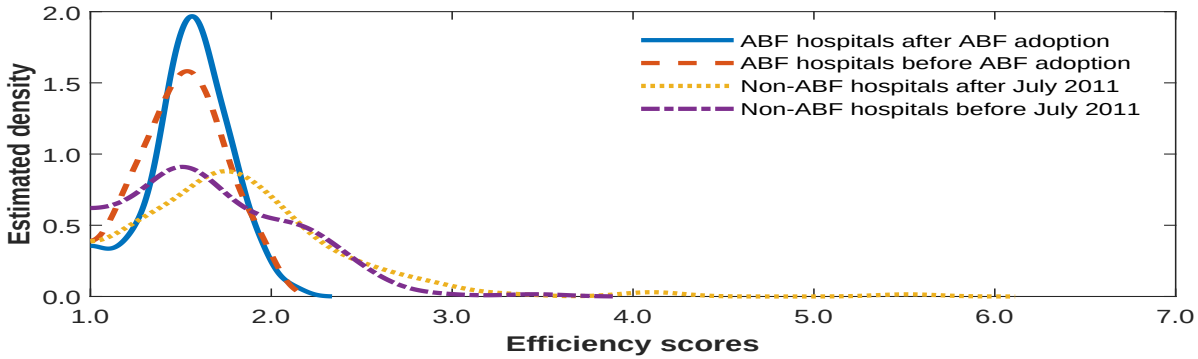


Figure 2: Estimated density of (in)efficiency scores estimated from CRS-DEA model for ABF and non-ABF hospitals

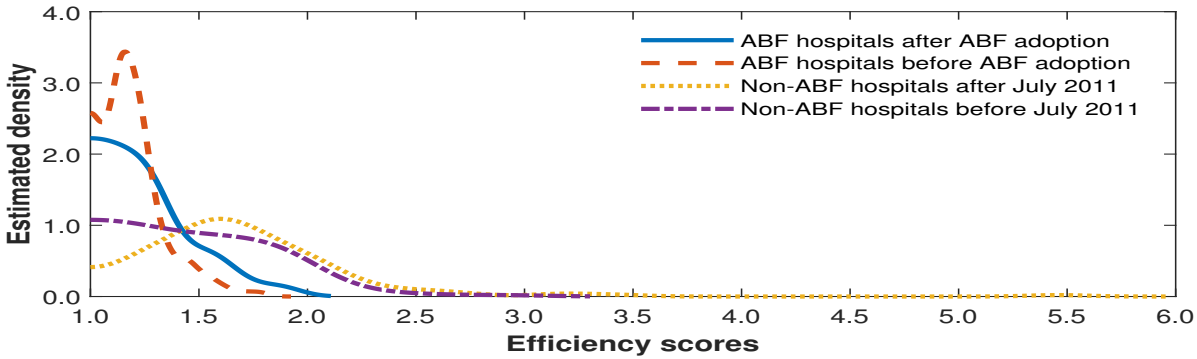


Figure 3: Estimated density of (in)efficiency scores estimated from VRS-DEA model for ABF and non-ABF hospitals

Results and discussions

Regression Analysis - Panel Data Truncated Regression

Table 2: Regression results

	Technical efficiency (CRS-DEA, log)		Technical efficiency (VRS-DEA, log)	
	Coeff.	APE	Coeff.	APE
Acitivity-based funding	−0.056***	−0.054***	−0.064***	−0.048**
	(0.013)	(0.013)	(0.022)	(0.017)
Major city hospitals	−0.131***	−0.125***	−0.117**	−0.091**
	(0.039)	(0.036)	(0.051)	(0.038)
Large hospitals	−0.018	−0.018	−0.130**	−0.106**
	(0.030)	(0.029)	(0.056)	(0.046)
Teaching hospitals	0.005	0.005	−0.046	−0.037
	(0.010)	(0.010)	(0.030)	(0.024)
The ratio of outpatient to inpatient (log)	−0.467***	−0.450***	−0.279***	−0.223***
	(0.066)	(0.063)	(0.102)	(0.082)
The proportion of unit producing personnel (log)	−0.019	−0.018	−0.199***	−0.159***
	(0.017)	(0.016)	(0.029)	(0.023)
Casemix index (log)	0.150**	0.144**	0.130	0.104
	(0.051)	(0.049)	(0.085)	(0.068)
Occupancy rate (log)	−0.163***	−0.157***	−0.086**	−0.069**
	(0.023)	(0.022)	(0.033)	(0.026)
Constant	0.331**	n.a	0.498***	n.a
	(0.107)	n.a	(0.124)	n.a
$\hat{\sigma}_a$	0.138***	n.a	0.096***	n.a
	(0.013)	n.a	(0.013)	n.a
$\hat{\sigma}_\varepsilon$	0.124***	n.a	0.130***	n.a
	(0.003)	n.a	(0.005)	n.a
Number of observations		684		684
LogLikelihood		394.177		513.912
AIC		−734.353		−973.824
BIC		−612.098		−851.569

Results and discussions

Event-study setup and parallel trends test

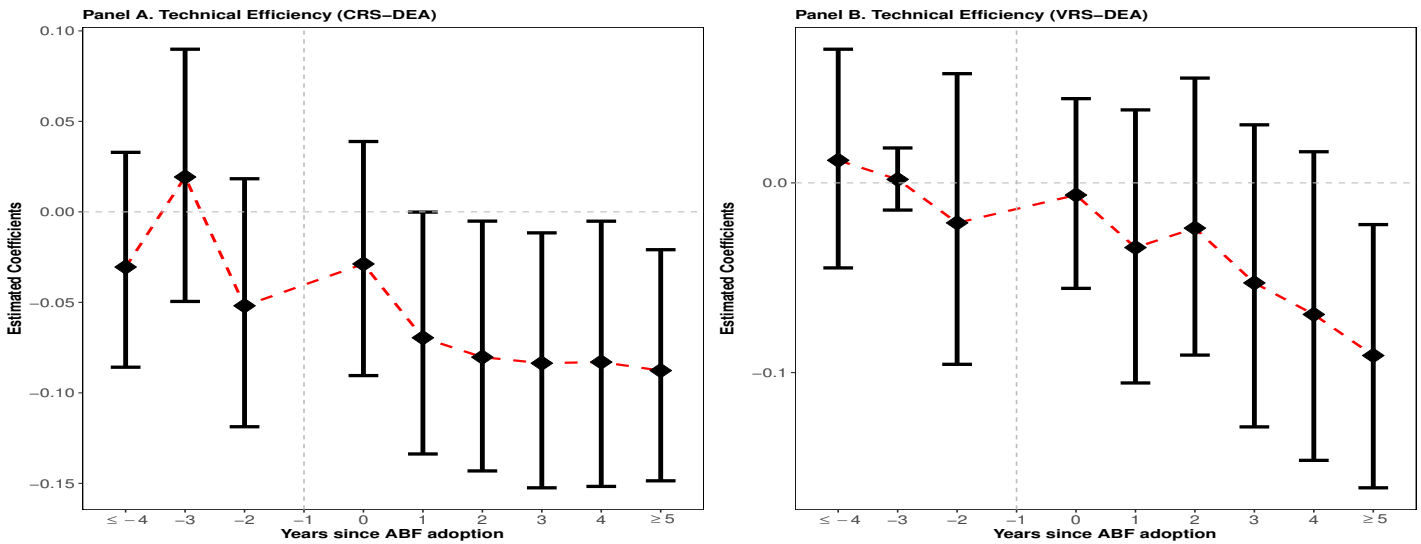


Figure 4: Event-study plots for est. technical (in)efficiency vs. ABF adoption

Results and discussions

Summary

- Our main hypothesis is confirmed, namely:
  We find some statistically significant and causal evidence that the **ABF had a positive impact on technical efficiency** (or negative impact on technical inefficiency) of public acute hospitals in Queensland.
- **Remote hospitals** are also found to **have lower technical efficiency** than hospitals located in cities (on average and ceteris paribus).
- Other organizational characteristics are also found to be significantly associated with hospital efficiency.
  - occupancy rate, the ratio of outpatient volumes to inpatient volumes, and the proportion of producing personnel to total staff: positive association
  - For hospital size and case-mix index: depend on the assumption about the returns to scale of the reference technology.

THANK YOU!!!

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IN-CONFIDENCE

Treasury Guest Lecture Series: Prof. Valentin Zelenyuk

3:00 pm	Welcome remarks Introduce topic and speaker	Patrick Nolan
3:05 pm	Presentation	Prof. Valentin Zelenyuk
3:50 pm	Questions & Answers	Session chair: Patrick Questions from the room & posted online using Q&A function on Teams
4:25 pm	Close	Patrick to close

Opening

Patrick

3:00 – 3:05 pm

- E ngā iwi, e ngā mana, e ngā hoa mahi. Tēnā koutou katoa.
- E mihi ana ki a koutou, kua tae mai ki te tautoko tēnei kaupapa.
- Ngā mihi nui ki a Professor Valentin Zelenyuk, te kaikōrero o te rā. Tēnā koe.
- Kō Patrick Nolan tōku ingoa. Nau mai, haere mai ki Te Tai Ōhanga.

Your own mihi or personal introduction.

- **Welcome everyone.** It's wonderful to see you join us here at Treasury and online to hear from today's speaker in the Treasury Guest Lecture Series. And a very warm welcome to our presenter, Professor Valentin Zelenyuk.

Hygiene

- Before I introduce our speaker in more detail, let me run through a quick health & safety briefing for those of us who are in the room.
- In the event of a fire alarm, please follow Treasury staff to the nearest exit and progress down the stairwell to evacuate the building; do not use the lifts.

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- In the event of an earthquake, please drop, cover and hold; stay in the building until instructed by a Warden.
- Bathrooms can be found to the left-hand side of the kitchenette; walk straight ahead after exiting the rooms.

Context of this seminar series

- This seminar is under the theme: *Productivity in a Changing World.*
- Our theme emphasises that productivity is a crucial long-run driver of economic performance, higher wages, and overall wellbeing. However, the world around us is evolving rapidly, presenting us with the challenge of lifting productivity amidst significant economic, social, and environmental shifts. Just like many other countries, New Zealand is navigating these changes in a dynamic global context.
- We are hosting a range of speakers to explore the implications of these challenges for New Zealand's economic and productivity performance and the sustainability and resilience of our economy. Our overarching aim for the series remains the same - that the new ideas and research of experts is critical for stimulating and provoking our thinking here at the Treasury and across the public sector.

About the speaker

- Let me now introduce our speaker, who we are excited to have with us today.
- **Valentin Zelenyuk is** a Professor at the School of Economics, University of Queensland.
- He is an elected member of the Conference on Research in Income and Wealth group of the National Bureau of Economic Research.
- Prof. Zelenyuk's research focuses on the economic theory of production, productivity and efficiency and related aggregation issues; econometric\ and applications mainly in healthcare, banking and cross-countries economic growth analysis.
- Valentin has co-authored over 70 international peer-reviewed publications. He also co-authored the 2019 book, "Measurement of productivity and efficiency: theory and practice", published by Cambridge University Press, which was highly endorsed by top experts in the field.

Topic of the presentation

- **Today Valentin will share** his preliminary empirical evidence showing that activity based funding improves the technical efficiency of hospitals. This work has been presented in a recent working paper he has co-authored on improving performance within the Australian public hospitals in Queensland.
- This is very relevant to all of us in Aotearoa, as we, similarly to the majority of health care systems worldwide, face challenges imposed by constrained public budgets, an aging population, and more chronic diseases. This is the first seminar in our productivity series that has focused on public sector productivity

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and is an important reminder that continued improvements in value for money are critical to the sustainability of public services.

Logistics and hand-over to the speakers

- I will soon invite Valentin to deliver his presentation. He will present for around 40 minutes and then we will have the remainder of the time for questions. We will allow questions from the room and our online audience.
- We will use the Q&A function in Teams, so please post your questions there. If you have any technical query, please use the standard chat function.
- Over to you, Valentin, welcome again.

Questions — Patrick / Valentin

app.3.50 – 4.25 pm

- Thank you, Valentin, for your interesting presentations.

  Perhaps make an observation of something that you were struck by.
- We now have around 30 or so minutes for questions.
- We already have some questions online and please keep them coming in. We will try and cover as many as we can. To all those in the room, I invite you to raise your hand, so we can provide you with a microphone, if needed. Please introduce yourself briefly before asking your question.

If there are lots of questions, we could suggest alternating them – one Q from the room, one Q from online etc.

A few back-pocket questions in case there are not many to start off:

1. *In terms of introducing activity-based costing (ABC), is it feasible to start before the data is in really good shape, and wait for it to improve in quality once it is in use? Or do you need to wait until you've got really tidy, reliable data before shifting to ABC?*

2. *In doing this research, did you have any priors or identify any common beliefs or expectations ex ante that just turned out to be wrong, to many people's surprise?*

3. *In Queensland, has shining a light on the average cost of treatment for particular conditions in different population segments made it easier or harder to argue for investment in preventative initiatives targeted to those population segments?*

Questions till around 4.25 pm.

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Closing	**Patrick** *approx. 4.25 pm*

- *Unfortunately, we have run out of time – and we need to bring today's event to a close.*
- Thank you very much, Valentin, for joining us here in Wellington and taking the time to share your interesting findings with us.
- And thanks to all of you – here and online - for joining us.
- We will have many more interesting speakers in this series this year, so please keep your eye out for updates on the Treasury website.
- I would like to finish with a karakia.

  Piki te kaha

  Piki te Ora

  Piki te Wairua

  Hui e, tāiki e!
- Thank you everyone for attending.
- Mā te wā.

EARLY IN FINANCE CAREER FORUM SPEAKING BRIEF

Thank you so much for agreeing to present in the next planned Early in Finance Career Forum.

BACKGROUND

The Early in Finance Career forum caters to professionals in the early stages of accounting/finance careers, including those without formal accounting qualifications. Attendees, spanning recent graduates to qualified individuals, aim to build a professional network, undergo development, and gain insights into the finance function and long-term career prospects in the public sector.

Led by Trish McAuliffe, CFO at Stats, the forums complement the Finance Development Programme and align with PSC's early career initiatives, focusing on supporting finance professionals.

Emphasizing the broad relevance of EIFC topics for professionals at all levels, the advertising approach underscores that these impactful strategies in public sector finance are beneficial to everyone, regardless of career stage.

This forums topic will be **Making an Impact: Embracing Opportunities in the Hard Stuff**

SESSION OUTCOME

Event Description: This is the first session of the "Time to Shine Series," where we explore effective strategies in public sector finance.
The theme of the first session is **"Making an Impact: Embracing Opportunities in the Hard Stuff."**

This event, presented by the **Early in Finance Career Cohort** and, is for all professionals keen on navigating challenges in public sector finance.

Learning Objectives:

1. **Adaptability:** Learn to handle change in the public sector, fostering resilience and proactiveness.
2. **Stakeholder Engagement:** Develop techniques for building strong relationships and positively influencing decision-making.
3. **Innovative Problem Solving:** Explore creative approaches to problem-solving tailored to the public sector.
4. **Effective Communication:** Hone communication skills to convey complex financial information clearly.
5. **Wellbeing Management:** Learn practical strategies for maintaining mental and physical health during stressful periods.
6. **Building a Support Network:** Discover the value of networking within the public sector and beyond.

Time to Shine Series Theme: The "Time to Shine Series" focuses on empowering finance professionals to embrace opportunities within challenges. The first session dives into the spirit of making a positive impact in the public sector, even when faced with difficult tasks. As a proud public servant, adapting to changing demands reflects the evolving needs of the people of New Zealand.

AGENDA

Timing	Topic
12.00noon (5 mins)	Introduction and context setting/ H&S Fergus Welsh
12.05pm (54 mins)	Making an Impact: Embracing Opportunities in the Hard Stuff
12.59pm (1 min)	Closing the forum
1.00pm	Close session

FORUM LOGISTICS

This forum will be mc'ed by Fergus Welsh

We will be hosting this hybrid forum at the **Treasury**, Level 3, 1 The Terrace. Aaron Thompson will be attending in person to support.
Project Lead Trish McAuliffe, Chief Financial Officer at **Stats New Zealand.**

Please be aware that we will record this session so please let me know if you would **not** like that to occur. We do a post event survey and if you would like these results shared, please let me know.

I am happy to meet beforehand, or email if you would like more information. Just let me know how I can help further.

Thank you.

Michelle Cornish, Finance Development Programme Lead