MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
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Estimating Labour Market Activity post COVID-19

Analytical Report

April 2021

New Zealand Government

Table of Contents

Revision History

Version	***Date***	***Notes***
Version 1.0	December 2020	Original version following peer review, for internal MBIE signoff.
Version 2.0	January 2021	Incorporates new forecasting data and assumptions from Treasury December 2020 Half-Yearly Economic and Fiscal Update.
Version 3.0	February 2021	Revised following Stats NZ release of Labour market statistics for December 2020 quarter on 3 February 2021.
Version 3.1	April 2021	General update and final review.

Executive Summary

The *Estimating Labour Market Activity post COVID-19* (ELMA) project was instigated by MBIE in July 2020 to develop a model that would assist decision-makers and planners to consider how changes in economic activity occurring as a result of COVID-19 would impact on labour supply and demand at regional and sectoral level. In particular, we wanted the model to be able to be used as a tool by MBIE, its stakeholders and other government agencies, to provide a common framework for planning and decision-making. The model is described in this report, with the tool accessible through accompanying data files and a User Guide.

The model was developed in collaboration with Treasury, the Reserve Bank of NZ, MSD and Stats NZ. It incorporates the assumptions and economic and fiscal data developed by Treasury in it official forecasts, most recently for the Half Yearly Economic and Fiscal Update (HYFEFU) of December 2020. These assumptions include the lasting economic impacts of COVID-19; a slower than previously experienced rate of GDP growth, large near-term deficits and rising debt levels. Nevertheless it is clear that New Zealand has experienced better economic outcomes than many other countries, in large part because of the success of its public health response to the virus. As a result, the labour market impact has been considerably better than was initially anticipated early in 2020, with a lower forecast peak in unemployment and a faster recovery in labour market participation.

Uncertainty, however, remains, particularly with the emergence of new variants of the virus and resurgence in some countries. To capture the potential for continuing unpredictability, the ELMA model adopts a scenario based approach, based on three plausible possibilities for how COVID-19 will impact on economic activity in 2021. A main scenario is based on the current state of play, with two variations - one based on continuing recovery and the second based on the possibility of localised outbreaks with community transmission. These different scenarios are built into the model, based on Treasury assumptions about the effects on economic and labour market activity of operating at different Alert Levels.

Regional and industry input data has been derived using a combination of long-term averages, and application of multipliers. These assess the impact of COVID-19 on demand for goods and services and output, including those related to changes in Alert Levels.

Outputs from the model are high-level scenario-based estimates for employment, unemployment and labour market participation for all 16 Regional Council areas and 17 selected industries. The estimates identify the impact of COVID-19 in comparison to what would have happened had COVID-19 not occurred (based on 2019 economic forecasts). The model has been tested against new data as it becomes available – results show that while the scenario-based estimates are limited in their predictive accuracy, the direction of changes is largely what is expected, particularly for larger regions and industries. In particular, results from the model are heavily dependent on assumptions contained in the underlying forecasts. In addition, estimates at a regional or industry level may mask variations at sub-region or sub-industry level.

Overall, outputs from the model suggest that the impact of COVID-19 will continue to vary by industry and region; and identifies those industries and regions where change is likely to continue over the course of 2021. It is anticipated that employment in many areas will hold up in response to domestic demand, with employment gains coming mainly from business and

public services, construction, and health services. These gains are expected to offset employment losses in COVID-19 hit industries. Similarly, the biggest negative impacts of COVID will continue to be experienced in Otago/Southland and Auckland; while Gisborne, Hawkes Bay and Nelson are all estimated to experience faster employment growth than the national average.

Part One: Estimating Labour Market Activity post COVID-19

Part One of this report provides general background to the Estimating Labour Market Activity post COVID-19 project (ELMA), including summarising its intended purposes and audiences.

Background and context

Prior to COVID-19, the NZ labour market was in generally good health, with low levels of unemployment and high rates of labour market participation, driven by generally strong overall economic performance. COVID-19 has resulted in an economic shock to the New Zealand and global economies of a type that has not been experienced in many decades. From the earliest stage, with emerging realisation that the pandemic was taking hold, apprehension was expressed about the potential for a deep global recession, the pace and trajectory of economic recovery, and the short and long term impacts that this would have on labour markets. Specific concerns expressed included high levels of unemployment (particularly amongst groups already disadvantaged in the labour market), wholesale displacement of workers from industries that had been particularly affected by border closures and supply chain disruptions, shortages of labour in industries traditionally reliant on workers with temporary work visas, and fears that opportunities for growth in some industries might be constrained through lack or reduced access to needed skills. Alongside these, concern was expressed about the potential for significant regional disparities to become entrenched, with labour markets in some centres experiencing significant decline and others remaining relatively buoyant.

While the economy and the labour market continue to operate under a high level of uncertainty, there is considerable interest across government and industry stakeholders in attempting to quantify how the labour market might fare in the face of the recession brought about by the pandemic and as the economy moves into recovery. Immediate policy interventions to support businesses and maintain employment appear to have been relatively successful in the short term, but there is less certainty as to what will happen now that these supports are being withdrawn. This is compounded by the emergence of new variants of the virus, deterioration of the global economic outlook; disruptions to supply chains, and extended border closures. Commercial and banking sector forecasts continue to suggest a further increase in unemployment, but these forecasts have been volatile and subject to frequent revisions. Treasury's Pre-election Economic and Fiscal Update (PREFU) in October 2020 forecast an increase in unemployment (to a peak of 7.8% in the March 2022 quarter) and, more significantly, in the underutilisation rate. More recently, the Half Year Economic and Fiscal Update issued on 16 December 2020 revised these estimates downwards as shown in the following Table:

Table 1: Treasury forecasts of unemployment 2021-2025

June Years	*2020 Actual*	*2021 Forecast*	*2022 Forecast*	*2023 Forecast*	*2024 Forecast*	*2025 Forecast*
Unemployment rate (June quarter)	4.0	6.6	6.8	5.7	4.7	4.0

Source: The Treasury, December 2020

No economic shock is the same and predicting the future is highly uncertain. However, estimating the impact of COVID-19 on the economy has been more uncertain than usual, as the current pandemic shock is composed of at least three inter-related facets, namely, supply-chain disruptions, demand shocks and the implications of economic policy responses to COVID-19. This report aims to manage some of that uncertainty by estimating the range of labour market outcomes that we might see over the next 12 months at regional and industry level; given more recent economic data, patterns of responses in labour markets around the globe, and how the New Zealand labour market has responded to COVID-19 to date.

Purpose of this report

While MBIE regularly produces Medium to Long Term Employment forecasts, the current level of uncertainty surrounding factors that influence short-term labour market performance mean that traditional forecasting methods are inappropriate. In response to requests for an analysis of how the labour market might respond to current economic uncertainty, the *Estimating Labour Market Activity post COVID-19 project (ELMA)* began in mid July 2020. This report is the first report from ELMA and considers the range of labour market futures that NZ might face due to COVID-19; and how these different scenarios might influence labour market supply and demand over the short term (to December 2021). In particular, the report aims to help address the information gap at regional and sectoral levels.

This report outlines the methodology used to model the range of labour market futures and the scenario-based estimates available as outputs. The primary intended users of the model are MBIE and other government agencies and Ministers; with secondary users being industry stakeholders. It is designed to provide a data-based framework for considering factors influencing labour supply and demand based on currently available information, all the while recognising that these might be heavily influenced by future events and circumstances.

We wanted the model to be able to be used as a tool by MBIE, its stakeholders and other government agencies, to provide a common framework for planning and decision-making. To this extent, the model and this report have been explicit about the data that has been used, the assumptions that have been made and calculations that have been applied. As more up-to-date and detailed regional and industry data becomes available, we intend that the model will be updated and used as a tool to inform on-going bottom-up analyses.

Purpose of the *Estimating Labour Market Activity post COVID-19* project (ELMA)

The *Estimating Labour Market Activity post COVID-19* project (ELMA) was scoped by MBIE in July 2020. Its purpose was to build a model that would allow scenario-based estimates of labour supply and demand to be made for regions as well as nationally, and for selected economic sectors. The model adjusts for differing COVID-19 related scenarios – for example, changes in Alert Levels and differing periods of time being spent in those levels.

Having common estimates of labour market activity is useful for providing consistency in COVID-19 recovery work programmes across MBIE and the wider-Government sector. Calculations related to labour demand have been constructed using latest available Treasury data, including forecasts of GDP growth, domestic and international trade, and household and Government consumption. We disaggregated national-level forecasts and looked into regional and industry-level data to estimate future levels of employment and unemployment for 16 Regional Councils and 17 Industry Groups[1] based on those sectors identified as a priority in MBIE's economic recovery and development framework.

We worked closely with Treasury, the Reserve Bank of NZ, Stats NZ and MSD; all who have provided comments and suggestions throughout the process. Several workshops were held during the development process, involving both MBIE staff and those from other government agencies[2]. Several iterations of the model were subject to review, prior to this version[3]. We have aimed to keep the model as simple as possible, given our desire for it to be able to be used by industry, regional and other stakeholder groups. This means that we have put some potential refinements to one side for now; and welcome approaches from stakeholders who wish to make improvements to the model over time.

The analysis undertaken and the estimates made reflect the pre-COVID-19 baseline structure of the economy, and the short-term nature of the estimates that are being made (to the end of 2021). As the economy adjusts, and as more data becomes available, more traditional methods for forecasting labour market demand over the longer term can again be adopted. We would also note that the usefulness of the model depends on the extent to which it is sensitive to changes in assumptions that impact on the demand for and supply of labour by region, for example, responses by employers to the demand for seasonal labour. Over time, we expect to develop a more detailed understanding of these changes, and how we can develop alternative

[1] The industry groupings were made consistent with the grouping used in MBIE's Modelled Territorial Authority Gross Domestic Product, which provides estimates of GDP for territorial authorities and regional councils to better understand local and regional economies.

[2] In August 2020, a workshop to discuss methodology and potential data sources was attended by 43 people from MBIE and other Agencies. On 14 October a second workshop was attended by 14 participants from across MBIE (LSE, PDU, SPP and CGI) to discuss the first draft of the model, including methodology, assumptions, scenarios and preliminary results.

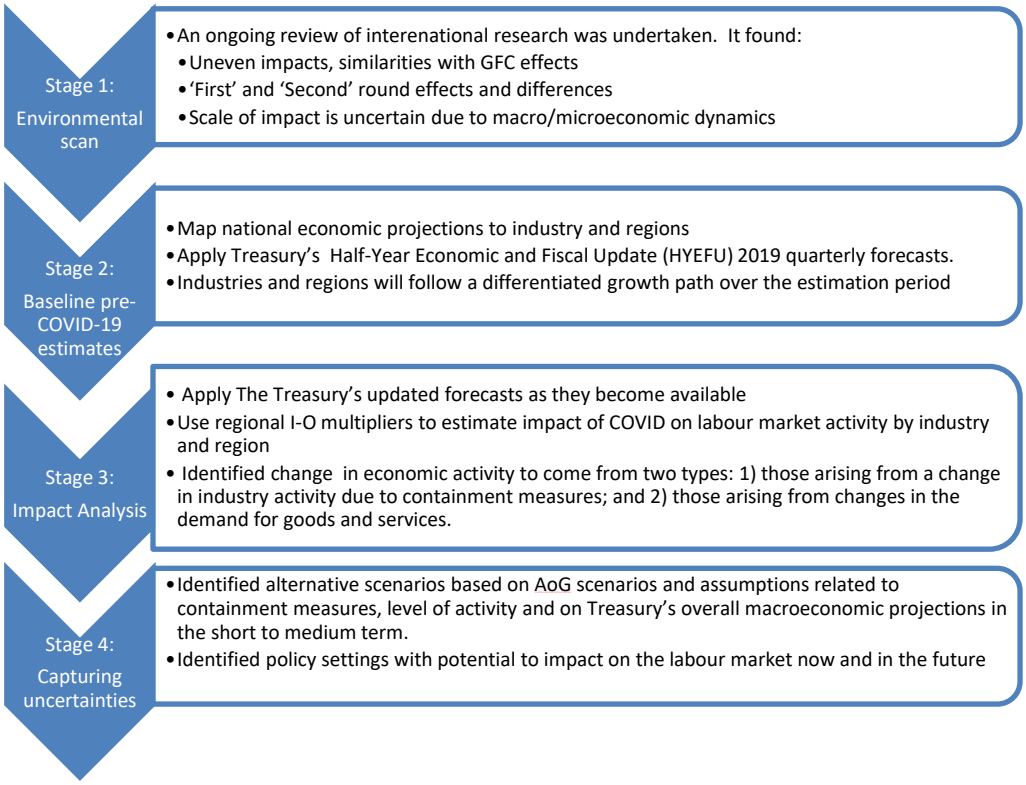
[3] A first prototype model was reviewed by the Chief Economist's Unit and revisions were made. The model was also peer reviewed by Treasury, the Reserve Bank of NZ and MSD.

scenarios to assess whether domestic or international changes are the most important on sectoral and regional labour markets.

Overview of Process

The development of the model took place in a series of steps and is summarised as follows:

Figure 1: Stages used to create the model



This report provides:

- greater detail about the thinking that went into each stage of the process, including details of inputs and outputs, and data sources;
- information on assumptions made, and
- alternative scenarios and guidance for how the model might be used by stakeholders.

The model has been developed into an accompanying tool for use by Government Agencies and stakeholders undertaking their own planning processes. This includes worksheets with details about the macro economic data included in the model, and our assessments of industry level output demands for regions and industries. A User Guide is available that provides greater detail about the fixed assumptions that have been included in the model, and which of those assumptions are able to be changed. As time goes on, and as the COVID-19 environment changes, it is likely that those making use of the model may wish to change these assumptions;

and potentially substitute their own data to make the model more useful for their own planning and decision-making processes.

Caveats and limitations

The task of economic forecasting is difficult and complex at the best of times and the international literature suggests that this is even more so in the current pandemic. Several conditions have contributed to this – forecasting is dependent on the reliability of economic data; but there is a lag in the availability of much of the data on which our forecasts depend; and some questions about how some of this data should be interpreted[4]. Secondly, in this particular recession, economists are having to delve into understanding epidemiology, while at the same time public health experts are challenged by ever-changing knowledge about the scope and effectiveness of different public health interventions to manage the virus. The emergence of new variants of the virus in second and third waves of the virus is contributing to this ongoing uncertainty. Lastly, a large number of policy changes are being put in place quickly and simultaneously, and their impact on economic and labour market behaviour is unpredictable. All of this has contributed to volatility in economic and labour market forecasts.

In the face of this volatility, understanding the assumptions underlying forecasts is necessary. Over time, however, the trend in forecasts for unemployment in NZ have been revised downwards from early projections, with recovery expected to take place over a period of several years. For example, between the September Pre-Election Economic and Fiscal Update and the December Half-Yearly Economic and Fiscal Update, new data showed that there had been an unanticipated rebound in economic activity in the September quarter that resulted in forecasts being revised. The ELMA model relies heavily on Treasury forecasts and this means that assumptions made as part of those forecasts have been incorporated into this model. Some of these assumptions include:

- The impact of COVID-19 Alert Level restrictions on economic activity (ranging from 25% - 30% decrease at Level 4 to 3-5% decrease at Level 1)
- A fall in net migration to 5,000 by June 2021; with a gradual increase to 43,000 in June 2022 as international travel restrictions rise
- Contracting economic activity in our top 16 trading partners by 2.8% with a re-bound of 5.3% in 2021

Given the prevailing uncertainty, the ELMA project was deliberately kept as simple as possible. In particular, the time horizons for the project extend only to the end of 2021. Beyond this, a wide range of factors (including domestic policy settings, the availability and efficacy of a vaccine, and the trajectory of international economic recovery) contribute to ongoing uncertainty. These are all factors which will be monitored over time. As new information

[4] For example, many commentators were surprised at the drop in the unemployment rate in the June quarter HLFS. This was due to the fact that over the course of lockdown, respondents were unable to meet the requirement of "actively seeking work" Disaggregation of the quarterly results by week, however, demonstrated the rise in unemployment that had taken place over the period.

becomes available, and as MBIE's forecasting capability is enhanced over time, they can be introduced to update the model and produce newer estimates.

Updating the model

New economic and labour market data becomes available all the time, and demonstrates changing levels of activity. At the same time, in order for the scenario planning tool to be useful to stakeholders some level of consistency is needed over time. MBIE plans to ensure that the ELMA model is updated at regular intervals to incorporate robust and reliable data that evidences significant changes in economic and labour market activity. This includes, for example, regular labour market statistical releases from Stats NZ and official changes in Treasury forecasts. The Revision History set out at the beginning of this document and the User Guide indicates the version of the model that is most up-to-date.

Part Two: Process - Stages of model development

Part Two of this report outlines the process that was used to develop the model and produce the scenario-based estimates that are set out in Part Three. It first summarises some of the research that we considered, both from NZ and international research; before going on to describe how we established a baseline against which to assess the impact of COVID-19; and how we accounted for regional and sectoral differences.

Research on the impact of COVID-19

Forecasting is based on judgements about the extent to which past patterns can be relied upon to make projections about the future. The disruptions that have resulted from COVID-19 have made it difficult to predict whether changes that we have seen in the economy and in the labour market are likely to be one-off responses to shocks, or "turning points" that represent the start of a longer term trend. In order to be able to make some informed judgements in these areas, we have been careful to consider New Zealand and international research that would help us to answer four inter-related questions:

- How has the New Zealand labour market performed in the face of the disruption generated by COVID-19 so far?
- How has the New Zealand labour market responded to economic shocks in the recent past? (particularly the GFC and the SARS epidemic)
- What has been the experience of other economies in relation to COVID-19? What impacts have they seen in their labour markets?
- What methodologies are proving most useful in helping to understand the future trajectory of labour markets?

Our high-level conclusions in these areas are summarised below.

The New Zealand labour market has proved to be more resilient than expected in the face of COVID-19

The long term performance of New Zealand's labour market has been mixed: strong in generating jobs and skilled workers (on average), but weak or variable in other areas that matter for economic and social wellbeing. These areas include low real wage growth, variable job quality and safety, ineffective matching of skills and labour supply to shifts in demand (both at the aggregate and firm level), inequitable outcomes for some population groups, and uneven sharing of costs, risks and rewards between workers and firms.

So far the impact of COVID-19 on the labour market has been better than initially expected, given the magnitude of the initial contraction in GDP (12.2% in the June 2020 quarter). Some policy responses to COVID-19 have cushioned the impact of the shock on workers and firms (especially the wage subsidies, fiscal and monetary stimulus, and business support). The timing also helped - with COVID-19 hitting after the peak tourism season, and reducing the common outflows of people normally experienced in the winter. The sudden reduction of incoming

overseas tourists simultaneously reduced labour demand and supply particularly in the tourism sector. But it appears evident that different sectors, regions and particular population groups are experiencing different impacts and rates of recovery.

The sudden contraction in consumer demand and business activity across large sectors of the economy during Alert Level 4 reduced labour demand temporarily for some firms, more permanently for others, particularly those in tourism-related sectors. Many firms responded to this by cutting hours of work, wages, hiring and jobs in response to sudden drops in their revenue. Wage subsidies achieved their policy goal of keeping the workforce attached to their employers, with around 1.6 million people supported in employment at the peak uptake of this mechanism in June 2020.[5]

While business and income support interventions undoubtedly played a part in cushioning the economy despite significant restrictions on economic activity, key indicators of labour market demand worsened over the June and September 2020 quarters. The official unemployment rate rose to 5.3%, the biggest quarterly rise on record, with 151,000 workers unemployed, 37,000 more than in the June quarter.[6] The under-utilisation rate (which combines unemployment, under-employment and potential employment) rose to 13.2%. This figure is below its 15.6% post-GFC peak, but is an important indicator of falling demand. The participation rate fell by 0.6 percentage points to 70.1%. The employment rate fell to 66.4%, but remained high compared to the post GFC period. The number of paid hours dropped by 3.4% over the June quarter, reducing incomes for many households, but this drop substantially recovered during the September quarter.[7]

As a result, the total number of people receiving main benefits increased by over 70,000 in the period following March 2020, with rapid increases occurring at a point when Alert Levels increased (both nationally and in Auckland in August 2020) and when wage subsidies ceased for many workers (June/July 2020). While the total number of people on benefits now seems to be reducing, there is remaining concern about more workers will be displaced from their jobs or else finding it hard to enter the labour market.

Border restrictions are also likely to continue to disrupt the labour market, despite the beginning of a Trans-Tasman "travel bubble" from April 2021. The flow of offshore visitors and international students has heavily restricted the customer base for the tourism sector (now mostly reliant on domestic travellers) and the international education industry, as well as impacting the conference and major events industries. Border closures have also constrained

[5] A total of 1.8 million workers were supported by wage subsidies over 2020.

[6] The official unemployment rate fell to an average of 4% over the June quarter. This figure masks the rise that occurred during the quarter: from around 2% (during lockdown) to 5-6% at the end of the quarter. After lockdown ended (13 May) more jobless workers were deemed to be actively seeking and available for work (the formal definition of unemployment).

[7] Hours of work reduced by 10% during the June quarter, the biggest quarterly decline since records began. This reduction was heavily concentrated in the tourism sector where hours of work fell by around 30%, reflecting the impact of lockdowns and border restrictions (which continue to halt foreign tourist flows) on the tourism sector.

the inward flow of migrant labour, affecting industries such as horticulture, viticulture and dairy farming. There are however, still approximately 290,000 temporary migrants in New Zealand with work rights (including students); and changes to immigration settings around visa conditions may have ameliorated the impact of reduced migrant inflow.

COVID-19 has been a different type of economic shock than those that have been experienced in the past

The sharp economic shock delivered by COVID-19 has caused many to draw parallels to the Global Financial Crisis (GFC). Some of the initial forecasts of the impact of COVID-19 suggested that the impacts would be even worse than those experienced at the height of the GFC, where unemployment peaked at 6.7% and GDP fell by 2.3%.

What has become evident in research over the course of the pandemic is that the impact of COVID-19 has been different. In that case, the causes of recession were as a result of fundamental flaws in the financial system; and on-going problematic decision-making on the part of economic actors. Consequently, the ongoing effects of the GFC took a long time to be ameliorated – for example, the lowest recorded growth in GDP as a result of the GFC took place in 2011, some two years after the initial crisis.

The recession due to COVID-19, on the other hand, has been the result of a public health crisis, unrelated to economic fundamentals. In addition, in NZ as in many other parts of the world, unprecedented action has been taken by the government and central banks to cushion workers and businesses from negative economic impacts resulting from restrictions on economic activity necessitated by the stringent public health measures put in place to manage the pandemic. Across the world, the OECD is now anticipating that the global economy will gain momentum, with global GDP at pre-pandemic levels by the end of 2021 (OECD, 2020). NZ is in a good position to participate in this global upswing, with public health measures having proved to be relatively successful in global terms, and our economy having proved to be more resilient than expected.

There are some similar patterns in the impact of COVID-19 on labour markets internationally, and we can learn from these

Throughout the course of the project, we continued to scan international research on the impact of COVID-19 on labour markets. These lessons were used to inform the judgements that we needed to make in building the model by region and industry; and also to make assessments about whether the resulting outputs (the scenario-based estimates) made sense. There is now a considerable body of research on the economic and labour market impacts of COVID-19, and some of the key findings that have contributed to our thinking are summarised below. In summary, international research suggests that the impact of COVID-19 on the labour market differs by industry, occupation and spatial location. These impacts hinge on a number of factors, ranging from economic and fiscal responses to behavioural changes. Given the uncertainties surrounding the pandemic, and how people and firms respond, studies that estimate and anticipate the impact of COVID-19 on the labour market have had to make

assumptions. This does, however, contribute to an ongoing need to approach estimated impacts on employment, participation and unemployment with a high degree of critical reflection and an understanding of the assumptions on which they are based.

Impacts on businesses and labour demand

A key aspect of public health measures designed to manage the COVID-19 pandemic have been restrictions on economic activity. Among some the key findings that we have noted from international studies are:

The speed, magnitude and concentration of impact on employment varies by industry and region

A number of studies on the impact on COVID-19 on employment suggest that there is a degree of variability between industries— and that positive and negative impacts on employment can occur simultaneously. This international pattern has been replicated in New Zealand. For example, for a subset of industries such as retail, and cafes and restaurants (where use and consumption of goods and services was prohibited or limited due to COVID-19 mitigation measures), the impact on labour demand has been significant. At the same time, the demand for workers in the health care and health services, retail grocery and other logistic services increased.

This impact also often has regional dimensions. For example, the lack of sectoral diversity and concentration of employment in service-based industries makes some local areas more vulnerable to COVID-19 containment measures and travel restrictions (Grodach C. and Martin, D., 2020).

There appear to be "wave" effects

An emerging theme from international research is the "wave" effects that appear to be experienced; attributable both to the impact of disruptions to supply chains, and also the effect of localised COVID-19 outbreaks and resurgence.

As international trade has spread over recent decades, so has the potential for economic shocks in one part of the world to impact on others. For example, in New Zealand, the impacts of COVID-19 were felt earliest in those parts of the economy trading with China, particularly food exporting businesses and international tourism. The first wave effects were more prevalent in regions that had high reliance on tourism (both in terms of activity and employment) – Tasman, Otago, Hawke's Bay, Marlborough and Nelson (Martin Jenkins, 2020; Olsen, Whiteford and Beattie, 2020), and the number of people requiring JobSeeker Support increased in these regions more than any others. First wave effects are the result of these impacts being spread through related industries, particularly consumer service industries (accommodation, food services and retail), which are concentrated in major cities and urban areas (Joyce & Xu, 2020).

Second wave effects are more likely to be experienced as a result of in-country localised outbreaks. They are more likely to occur in a wider range of industries, including those with greater concentrations of workers and more intensive face-to-face contact.

Impacts on workers and labour supply

To some extent, the impact of COVID-19 on labour supply is a result of changes in demand – for example, those population sub-groups that have been most affected by COVID-19 have been those working in the industries where changes in employment have been most significant. At the same time, international research suggests that COVID-19 has had an effect on people's decisions to participate in the labour market. Summaries of both these influences on labour supply are set out below.

Employment impacts have been most significant in industries directly affected by restrictions imposed as a result of public health measures.

In general, international research suggests that the impacts of COVID-19 on labour demand were a direct result of restrictions on economic activity and other containment measures, and varied by industry and labour market areas. This has regional impacts dependent on the concentration of employment in service-based industries, exposure to tradeable sectors and vulnerability to supply chain disruptions

This effect also does not equally affect all occupations. Those in many professional services have been able to work from home and continue their work without any disruptions. Others, who work in occupations that require direct physical contact with customers or clients, have had their jobs affected by physical distancing (Leibovici & Santacreu, 2020).

As a result, the international evidence also suggests that the impacts on workers have been uneven. Job losses and reduced hours have been more concentrated on young workers and low-wage earners; and those working in customer-service occupations and tourism-related industries (ILO, 2020).

The impact on labour supply is mostly on labour market participation, which is driven by behaviour

Existing evidence on the economic impact of influenza-like pandemics suggests that most labour supply effects occur through choices about participation in the labour market. This occurs because workers choose to withdraw from the labour force to avoid COVID-19, because of childcare or elder care responsibilities, or to care for ill family members.

Labour supply effects have been examined through studies examining a wide range of variables including health insurance, school closures, and the fraction of staff able to perform their work remotely. Very few conclusions are able to be drawn, given the wide range of (often local) interventions that have been put in place; and the difficulty of assessing the extent to which labour market choices are affected by personal and family/community choices as much as they are amenable to influence by policy interventions.

Scenario planning methodologies are proving more useful in the face of uncertainty than traditional forecasting methods

COVID-19 has also seen the adoption of new approaches and methods to forecasting economic and labour market activity. Traditionally future projections of economic and labour market activity have used a number of input-output, computational general equilibrium (CGE) and econometric modelling approaches. However, emerging evidence suggests that in the face of uncertainties about the further evolution of the virus and of the pandemic, scenario planning is more likely to produce plausible estimates of the impact on the labour market.

These techniques differ with respect to assumptions, methods, policy settings and data that underpin the scenarios modelled. However, they are better able to account for the range of possibilities that might plausibly occur over time. In respect of COVID-19, considerations such as length of time that a country (or regions within it) is operating under different COVID-19 Alert Levels; length of border controls; annual average real GDP growth; and value of fiscal response, underpin the scenarios used to analyse the impact of COVID on the national and regional economy.

There is considerable uncertainty in estimating future unemployment, particularly given the uncertainty surrounding the pandemic. Estimates vary with assumptions related to the size and duration of the shock to economic activity (or GDP), the rate at which job creation and job destruction return to pre-COVID levels, and how quickly workers can relocate from shrinking to expanding industries. In the medium term, the impact on regions will depend on exposure to tradeable sector, global value chains and type of specialisation (Martin Jenkins, 2020; Olsen, Whiteford and Beattie, 2020). A number of studies (ANZ Research, 2020; ILO, 2020) also assume that the global economic disruptions will be long lasting, although more recent international reports are suggesting that the world economy may recover faster than originally expected.

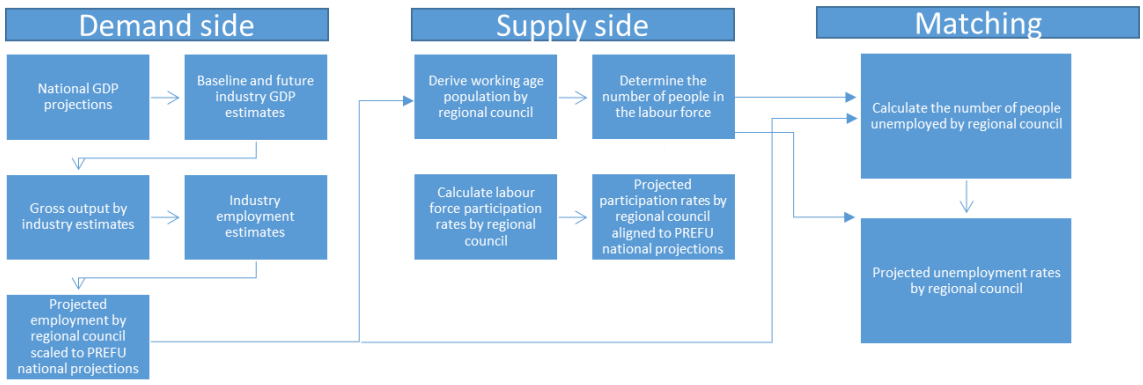
Establishing a baseline level of Labour Market Activity

We needed a starting point to assess the impact of COVID-19 on the labour market

In order to assess the impact of COVID-19 on labour market activity, particularly for regions and sectors, the ELMA project used a baseline level of labour market supply and demand. To create the baseline, figures were used from the Government's 2019 Half-Yearly Economic and Fiscal Update (HYEFU).

Pre-COVID-19 baseline levels of employment for 17 industries and 16 Regional Councils were constructed using Treasury economic and fiscal updates and other official statistics. To determine the effect of COVID-19, we constructed a series of assumptions about labour demand based on an input-output framework that takes account of inter-industry linkages measuring how changes in economic activity in a particular industry translate into employment changes throughout the wider economy. We also built in changes in activity levels permitted or prohibited at each Alert Level for each industry. A flow chart that illustrates the calculations involved is set out below.

Figure 2: Calculations used to create the model



We constructed a pre-COVID-19 baseline for employment, unemployment and labour force participation over the September 2020 to December 2021 quarters. The baseline estimate was used to evaluate alternative possibilities and their consequences on the labour market. Our baseline captures what sectoral and regional labour markets might look like if domestic and global economic conditions continued as 'business-as-usual' – that is if the COVID-19 pandemic did not happen. This baseline helps us contextualise the immediate and ongoing impact of COVID-19 management strategies at sectoral and regional levels on demand for and supply of labour from the December 2020 to December 2021 quarters.

We then compared the baseline estimates with those derived under certain COVID-19 related economic and health assumptions. This comparison gives indications of the possible magnitude and directions of change in the labour market demand and supply under alternative futures.

Prior to COVID-19, the NZ labour market was slowing down a bit

Before COVID-19 spread across the world, and the first COVID-19 case was reported, the New Zealand labour market was expected to show modest, yet stable, employment growth, in line with the national economy's anticipated growth trajectory. Unemployment levels were expected to be stable, and regional economies were expected to continue to be supported by the global economy for export goods and international tourism. Net migration was also expected to remain elevated.

Table 2 summarises economic and labour market projections that were anticipated in December 2019. It includes forecasts for key macroeconomic and labour market indicators up to December 2021 quarter, given pre-COVID-19 conditions and policy settings. At that time New Zealand was expected to experience slow but solid economic growth, driven by weak growth in household consumption and business spending and lower export services. Slower population growth was also expected to contribute to slower growth over the short to medium-term. The Treasury forecasted the national economy to pick-up in 2020/21 year, supported by expansionary fiscal and monetary policy (e.g. additional government capital investment and reductions in the official cash rate).

Against a modest yet stable economic backdrop, the labour market was forecast to be tight; with slower demand growth matched by declines in labour supply. In particular:

- Employment growth was expected to remain weak, in the range of 1.4 per cent to 2.1 per cent during 2020/21.
- The national unemployment rate was forecast to remain steady at around 4.2 per cent. Labour productivity was forecast to be lower over the following 2 to 3 years.
- Labour force participation rates were expected to increase in line with the trending upwards participation of women and older age-groups. Net migration was also expected to continue to add to labour supply, albeit at a slower pace compared to the previous three years.

In the near term, wage and cost pressures were anticipated to increase as a result of a tight labour market, increases in the minimum wage, and wage settlements in public sector collective (and pay equity) agreements.

Table 2. Baseline (pre-COVID) macroeconomic and labour market projections

	Sep 2020	Dec 2020	Mar 2021	Jun 2021	Sep 2021	Dec 2021
Real GDP (SA expenditure) (quarter-on-quarter % change)	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
Employment ('000) (SA)	2693	2707	2721	2735	2748	2761
Unemployment ('000) (SA)	118	119	119	119	119	120
Working-age population ('000) (SA)	3,979	3,994	4,010	4,026	4,041	4,057
Employment rate (SA) (Calculated)	67.7%	67.8%	67.9%	67.9%	68.0%	68.1%
Unemployment rate (SA)	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%
Labour force participation rate (SA)	70.7%	70.7%	70.8%	70.9%	71.0%	71.0%

Source: The Treasury, Half-Year Economic and Fiscal Update 2019.

On the global front, there were signs of increasing trade protectionism despite an overall continuing high level of world trade. However, New Zealand exports, both goods and services, were projected to remain stable. New Zealand's main trading partners' growth was projected to be slow, with terms of trade to remain at their current level in 2021. The outlook for the global economy, was at that time, contingent on investment decisions, the emerging US-China trade dispute and uncertainties brought about by Brexit.

Identifying regional and sectoral variations

Regions and industries were not all performing at the same rate

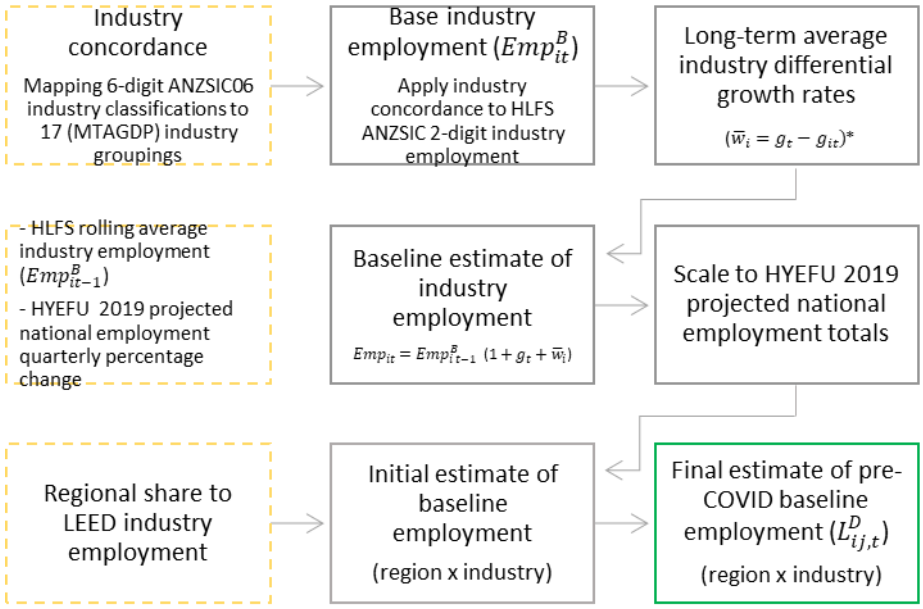
As noted earlier, one of the gaps in official economic forecasts is the extent to which national level projections are expected to play out at a regional and sectoral level. Developing a model that would attempt to provide some high level information that would at least partially fill this gap was a key goal for MBIE, because of our roles in policy related to regional and industry development.

In developing baseline estimates for industries and regions, we assumed that regions (industries) do not necessarily grow (or decline) at the same rate as the projected national rates due to circumstances which provide regional (industry) comparative advantage (or disadvantage). We did, however, assume that regions (industries) would retain their long-term share of average annual average gross domestic product (GDP) and employment growth rates. We also assumed a fixed relationship between employment and value-added over the estimation period.

The national projections for gross domestic product, employment and working-age population included in Table 2 were used as the basis for deriving labour demand and supply at the industry and regional council levels using shares and rates of change from employment data from Statistics New Zealand's Household Labour Force Survey (HLFS) and Linked Employer-Employee Data (LEED). We also used industry specific forecasts for 2021, where available (e.g. National Construction Pipeline 2019 report) to describe expectations of the business-as-usual trajectory pre-COVID-19.

Below is an illustration of the generic calculation used to construct baseline employment levels for industries and regions. This baseline employment was then used to derive labour force participation and unemployment levels as described in the modelling framework.

Figure 3: Flowchart for estimating pre-COVID baseline employment



*where $\bar{w}_i$ differentiated growth rate for industry *i* between Jun 17 quarter to Dec 19 quarter , g_t = national growth rate at quarter t; g_{it} = industry growth rate

Legend: Data Input: Process: Output:

The first step in deriving baseline employment was to disaggregate national gross domestic product (GDP) into industry and regional estimates of GDP. This process required concordance of industry classification across datasets (Linked Employer and Employee Data (LEED) and HLFS), and calculation of long-term average differential growth rates by industry. We applied these rates to average employment levels by industry to derive anticipated employment levels scaled to the projected national employment total over the estimation period.

The above process produced pre-COVID regional employment estimates for the September 2020 quarter to the December 2021 quarter, broken down by 17 industry groupings. These estimates provide an indication of how the regional labour market might be if the New Zealand economy continued business-as-usual, and if COVID-19 had not resulted in a global health crisis.

Changes in one region or industry can also have an impact on others

There are significant differences in economic structure across New Zealand's regions. In particular, past economic performance varies significantly from region to region over business cycles. For example, resource-driven regional economies that rely on agriculture and mining are more vulnerable to commodity price cycles.

In developing our regional and sectoral estimates, it was important to account for how dynamic linkages influence the performance of the economy as a whole. For example, raw goods may be produced in one region, transported to another, and then processed as inputs in several different value-added activities. Modelling this involved the use of input-output tables (IOT) to provide granularity of how the pandemic affects the economy. This approach also allows us to summarise the complexity of supply-side and demand-side impacts of COVID-19 on the economy.

In order to extend the analysis at the regional level, an inter-regional IOT (IRIOT) captured regional differences in terms of size, mix and structure of industries for each region. In New Zealand, no official regional input-output tables are compiled. Since 2015, the Ministry of Business, Innovation and Employment (MBIE) has published experimental estimates of Modelled Territorial Authority Gross Domestic Product (MTAGDP) and Statistics New Zealand (SNZ) also provides Regional GDP statistics for 15 Regional Council areas. As part of developing tools to understand our regional economic activities, we leverage our work of estimating MTAGDP to develop an inter-regional input-output table. The methodology for developing experimental inter-regional input-output tables can be found in Annexe One.

Capturing Uncertainties

Given the uncertain environment, we developed the following three scenarios related to the extent and speed of COVID-19 spread within the community to consider how these might affect different levels of labour market activity. In addition to the main scenario, two alternatives were developed based on the possibilities of:

- Faster economic recovery
- Localised outbreaks in 2021

As noted earlier, the use of scenarios to help people understand the range of ways in which the future might play out has become more common as a way of helping us prepare for a variety of plausible outcomes, including the effectiveness of alternate policy responses.

Labour market outcomes will be influenced by how we manage the COVID-19 pandemic

The use of future scenarios help us prepare for a variety of possible outcomes. As part of the ELMA project, we reviewed a number of scenarios that have been developed in response to COVID-19, including those that were progressed as part of the Government's management of the pandemic; and others that have informed the development of MBIE's strategic direction (Te Ara Tauwhiro /Te Ara Amiorangi). The scenarios were also based on:

- HYEFU 2020 economic scenarios
- NZ COVID-19 Vaccine Strategy[8]
- NZ COVID-19 Alert System.

By outlining alternative scenarios regarding labour market development at industry and regional levels, we are supporting decisions related to labour market and immigration policy. We note that the stylised conditions for each scenario is a matter of judgement based on assumptions which may change over time.

Scenario 1 is a **faster economic recovery scenario**. It assumes that NZ's current effort to "eliminate" COVID-19 cases is largely successful. Greater Auckland successfully transitioned to Level 1 after an initial return to Level 3 during August 2020, and since during early 2021. Since then community spread has been insignificant and new cases are predominantly due to overseas travel or contact with a known case. Scenario 1 assumes that the rest of the country remains at Level 1 until an effective vaccine is available and rolled-out in the middle of 2021. The scenario assumes a two-way travel bubble between New Zealand and Australia is formed after the first quarter of 2021, opening travel between the two countries without the need for quarantine on arrival. Strong domestic demand and earlier easing of border restrictions support a faster economic recovery in 2021. Businesses are able to better cope with remote

[8] The Government has signed four agreements for the supply of COVID-19 vaccines: Pfizer and BioNtech, Janssen Pharmaceutica, University of Oxford and AstraZeneca and Novovax. Nearly 15 million doses for New Zealand and Pacific neighbours are covered by the agreements. Vaccination would be voluntary. See https://www.health.govt.nz for more about the Vaccine Strategy.

work and travel restrictions than they were in 2020. Under this scenario of low or zero community transmission, health and border workers and their household contacts would receive the vaccine first. Uptake of vaccine in the remainder of the population is strong, which means that a significant number of people are immune to infection. New Zealand's main trading partners are also assumed to have a more positive economic and health outlook, supporting stronger growth of our main export services in 2021.

Scenario 2 is **localised outbreaks and a weaker global economy**. It assumes that small clusters emerge but are effectively managed and contained once identified. Level 3 measures are imposed in those locations for two weeks followed by three weeks at Level 2 to manage the spread of the virus. After this period, the affected locations are able move into Level 1, joining the rest of the country, until an effective vaccine is rolled out in the middle of 2021. The localised outbreaks are assumed to happen in the first three quarters of 2021 following easing of New Zealand borders to Pacific island countries and Australia. Based on the Government's vaccination strategy, people in areas affected by an outbreak would be among the first to receive the vaccine. We assume that the uptake of the vaccine is weak, leaving a large proportion of those groups susceptible to infection. The distribution of vaccine at a scale is also assumed to be slower. The localised outbreaks have resulted in weaker consumer and business confidence. Under this scenario, a slower recovery in export services is a drag on economic activity in 2021. Uncertainties related to COVID-19 across the globe has led to weaker export prices and demand for our main exports. The timing of easing of border restrictions is similar with the previous scenario and the main estimate.

More detail is provided in Table 3. It is noted that since the development of these assumptions at the beginning of 2021, some have been overtaken by events.

Table 3: NZ labour market scenarios 2020-2021

Scenario	Main Estimate – current state of play	Scenario 1: Optimistic – faster economic recovery	Scenario 2: Pessimistic – localised outbreaks and weaker global economy in 2021
COVID-19 Alert Levels	• Effort to "eliminate" COVID-19 cases is largely successful, with New Zealand remaining under Alert Level 1 in 2021 • Rollout of vaccine, first to priority groups of people in the second quarter of 2021. The Government has set a sequenced rollout plan. • Alert Level 1 restrictions remain in place until the end of 2021	• Elimination strategy is largely successful, with new cases only detected from new arrivals at the border. • Outbreaks are identified and contained with minimal activity restrictions necessary • Safe and effective COVID-19 vaccine is rolled-out to a first group of people in the second quarter of 2021. Uptake of vaccine among priority groups is strong.	• Elimination strategy is not sustained, and small clusters emerge but are effectively managed and contained • Small outbreaks require regional response (e.g. Alert Level 3 for 2-3 weeks, followed by Alert Level 2 for 3-4 weeks) • Uptake of vaccine, following rollout is weak.
Global and Domestic settings	• Average quarterly percentage growth in real GDP in 2021: 0.5 per cent (or average annual growth of 4.5 per cent) • Reduction in economic activity at Alert Level 1: 3% to 5% • Unemployment rises to 6.9% in 2021 • Lower productivity growth due to constraints and costs associated with containing the spread of COVID-19. • Global economic conditions remain weaker compared to the previous year but stable • Pandemic overseas improves, and impact of COVID-19 are less negative than expected	• Average quarterly percentage growth in real GDP in 2021: 0.7 per cent (or annual average growth of 5.2 per cent) • Reduction in economic activity at Alert Level 1: 3% to 5% • Unemployment rises to 6.2% in 2021 from 4.0% in Sep Qtr 2020 • Strong global condition, supporting early recovery of export services. Recovery in export services is anticipated after March 2021 quarter. • Pandemic overseas improves, and roll-out of vaccines begins in NZ's key trading partners in the second quarter of 2021.	• Average quarterly percentage growth in real GDP in 2021: 0.2 per cent (or 2.4 per cent annual average growth) • Reduction in economic activity at Alert Level 1: 3% to 5% • Fall in domestic demand due to falls in private consumption and business and residential investment • Unemployment rate peaks at 8.5 per cent in 2021 • Weak global growth, with delayed recovery of export services • Epidemiological recovery stalls, with health crisis worsens in other countries

Policy setting	• COVID-19 related fiscal support: $18.1 billion, of which $2 billion is unallocated. Fiscal support is assumed to have peaked in 2020. • Monetary policy support throughout 2021, including Fund for Lending Programme, and Large Scale Asset Purchases.	• COVID-19 related fiscal support: $18.1 billion, of which $2 billion is unallocated • Monetary policy supporting business profitability is still place throughout 2021	• COVID-19 related fiscal support is higher (~$4.4 billion) than our main estimate • Monetary support is also put in place to support weaker domestic demand and main inflation within target
Border management	• Pacific two-way travel bubble in February 2021. Two-way bubble with Australia is introduced in mid-2021 • International students are welcomed back in Jul 2021 • NZ opens its borders in Jan 2022	• Two-way Trans-Tasman bubble is implemented in Jul 2021 • NZ begins to open its borders to international students in Jul 2021 • International travel remains constrained by MIQ facilities. • Border restrictions are lifted in Jan 2022.	• Two-way travel bubble with Pacific countries and Australia is implemented from the second quarter of 2021 • NZ extends its border closure until there is certainty in implementing a population-based immunisation program.

Policy settings also make a difference

One of the key lessons to be learned from the experience of different countries in managing COVID-19 is that policy settings make a difference. However, the scale of the impact of individual policies and the timing of changes is not always knowable in advance. The same is true of knock-on effects – changes in one policy area can impact on policy in another; and policy changes in one country can also have far-reaching impact around the world.

In addition, changes in the labour market are influenced by factors other than the direct impact of COVID-19. Factors independent of COVID-19, including the impact of new technologies, demographic change and climate change, all have their own disruptive effect. Over time, they are leading us in the direction of a more highly skilled labour force; and employment growth is expected to be higher in some industries (such as construction and business services) than others.

Policy settings may also impact on labour supply and demand in ways that are not always foreseeable. These include the policy settings that have been put in place to mitigate the immediate impacts of COVID-19 on the labour market, together with others designed to facilitate labour market adjustment to short-to-medium economic change. The ways in which employers and workers respond to these interventions has an effect on the level of confidence they have in the economy and influences their effectiveness over time. This in turn can influence job growth and people's labour market participation.

One of the features of the response to the COVID-19 pandemic has been the extent to which governments world-wide have been prepared to make use of public policy interventions in both the public health arena (to manage the health threat from the pandemic) and the economy (to support economic and social integration). Within New Zealand, a comprehensive package of initiatives was put in place that provided a short-term "cushion" to both businesses and workers, while normal economic activity was severely restricted in order to manage the immediate public health threat.

The range of those interventions included the Wage Subsidy Scheme, the COVID-related Income Relief Package, and a variety of business supports and border closures. While a long term assessment of the effectiveness of those interventions has yet to be undertaken, in the short term it appears that they were successful in protecting businesses, households and individuals from the negative effects of restrictions on economic activity that might otherwise have led to permanent business closures and job losses.

In addition to the range of policy interventions that have been deployed to date, a wide range of policy interventions are likely to have an effect on the labour market over the next 12 months. These include:

- Continuing short- term initiatives to support businesses and workers negatively affected by COVID-19 (for example, by loss of job or income, or temporarily having to suspend business or not attend work)
- Border settings, particularly in relation to the arrival of people from countries with high rates of transmission
- The effectiveness of new vaccines and their take-up within the population
- General labour market measures including the minimum wage, improving the availability of and access to Vocational Education and Training, improved support for jobless workers, targeted job creation and active labour market policies
- Measures directed towards providing direct support for industry, such as Industry Transformation Plans and the Construction Accord
- Measures designed to transform the economy, including measures promoting energy efficiency and renewable energy.

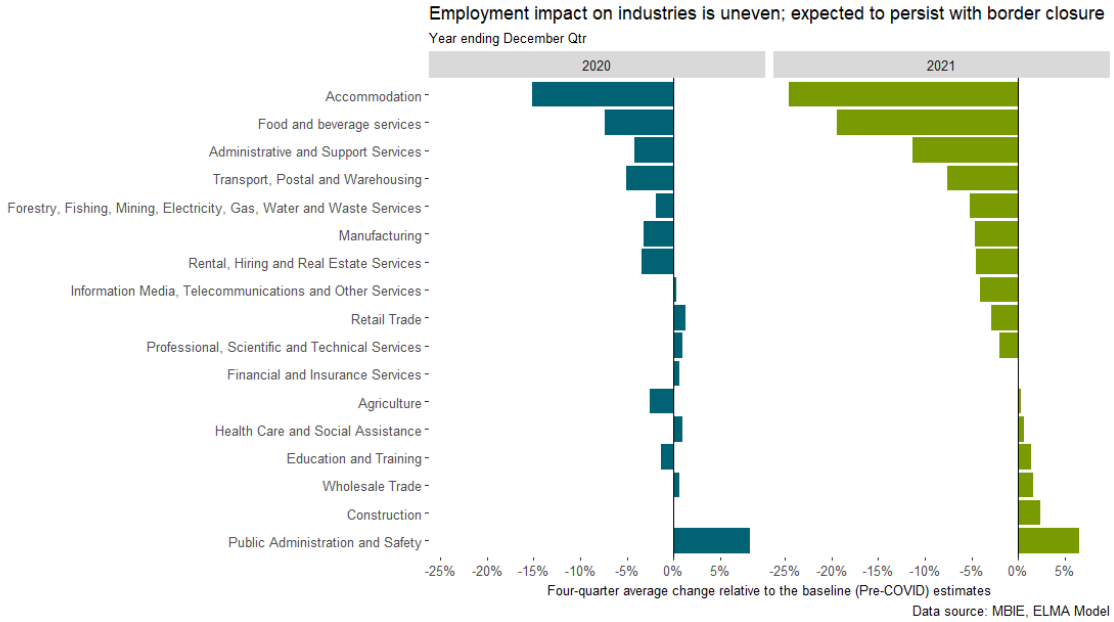
Part Three: Labour market estimates for 2021

Part Three of this report summarises high level scenario-based estimates that have been produced by the model. It begins by outlining high level estimates of impact when compared to those that were produced by our pre-COVID baseline. It goes on to look at how labour demand might vary for our selected industries, depending on how different COVID-related scenarios play out. Finally we look at how labour market activity is likely to vary across regions in New Zealand.

The impact of COVID-19 on labour market activity is expected to vary by industry

Figure 4 below shows our estimated Post-COVID-19 employment impacts relative to Treasury's pre-COVID projections. Some of the insights that can be taken from this overall picture are then summarised.

Figure 4: Estimated impact of COVID-19 on industry employment December 2020 and December 2021 – relative change from baseline projections



Labour demand is likely to change during 2021, and there are some areas where there are likely to be employment opportunities

In 2021, New Zealand is likely to see employment in many areas remain stable in order to meet domestic demand, with employment gains mainly coming from business and public services, and construction. Retail spending and domestic tourism are also expected to support employment in the short-term, albeit with weaker gains compared to those seen a year ago.

In particular, business and public services are estimated to offset employment losses in COVID-19 hit industries

A rebound of economic activities to pre-COVID-19 levels and more buoyant household spending will drive labour demand in 2021. Recovery in the labour market will be broad-based, with some industries showing greater resilience and bouncing back faster than others.

In 2021, Professional, technical and scientific services are expected to make the largest contribution to overall employment growth, followed by Health and social assistance and construction (refer to Figure 5). The growth in these industries will offset employment losses in COVID-19 hit industries (see Figure 7).

The business services[9] sector is likely to outpace overall employment growth rate in the short-term. This sector will drive demand for highly skilled workers particularly in urban regions like Auckland and Wellington. Professional, technical and scientific services showed resilience in 2020, as most occupations within the industry can be performed remotely. In contrast, lower-skilled occupations in the Administrative and support services[10] are less able to be performed offsite.

The public services sector (including Public administration and safety, Health care and social assistance and Education and training) will also be a key area of employment opportunity in 2021. Rising demand for general health care and care for our ageing population will support growth in this industry— particularly in urban regions, including (in particular) in the Waikato and Bay of Plenty regions.

The Construction sector remains one of the biggest employers in 2021, supporting demand for more professionals, technicians and trade workers, and labourers across the country. By the December 2021 quarter, the industry is expected to employ 252,000 workers, boosting employment in the regions such as Auckland, Waikato and Wellington that are experiencing growth in residential investment. The impact of COVID within the sector is wide-ranging, from the impact of social distancing at work sites to supply chain disruptions. The latter's impact on the sector meant delays in shipping materials to New Zealand leading to slower building activity and lower value of work put in place in the near–term.

Employment levels in the retail trade and hospitality industries for most of 2020 were supported by the Government's fiscal support and sustained consumer spending. These industries showed resilience last year, but their recovery may be derailed by supply chain difficulties and risks of another outbreak in the near-term. In 2021, demand for labour in more consumer facing industries like hospitality remains vulnerable to risks of going into higher Alert Levels due to resurgence of outbreaks. Any resurgence of outbreaks is anticipated to slow recovery of these industries, particularly for regions in the South Island

[9] Business services includes the following industries: Professional, scientific and technical services; Administrative and support services; and Financial and insurance services.

[10] This industry supports day-to-day operations of businesses and organisation including office administration, travel and tour arrangements, and other administrative support services; building and other cleaning services; pest control; packing and other support services.

These estimates reflect an ongoing employment shift towards demand for consumer goods, housing and public services resulting from stronger consumer confidence and government spending intended to support economic recovery over the next four quarters.

Figure 5: Estimates of year-on-year employment change, 2020-2021

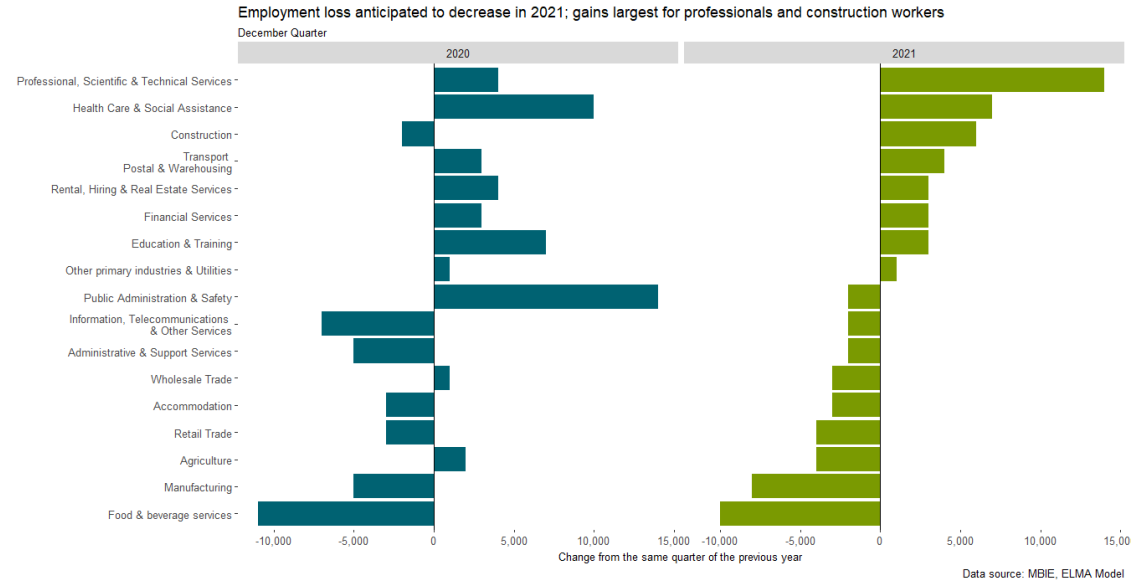
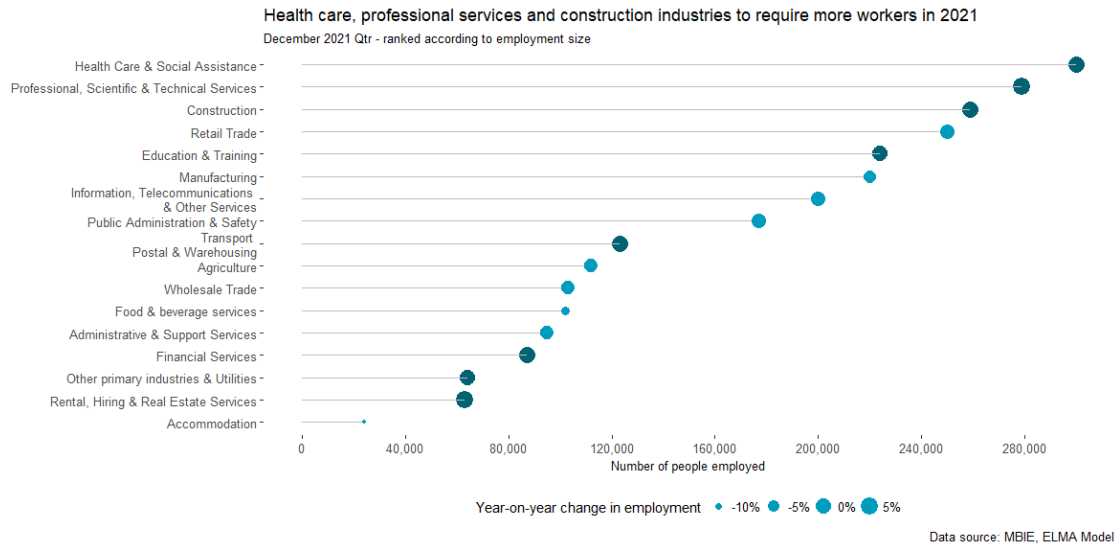


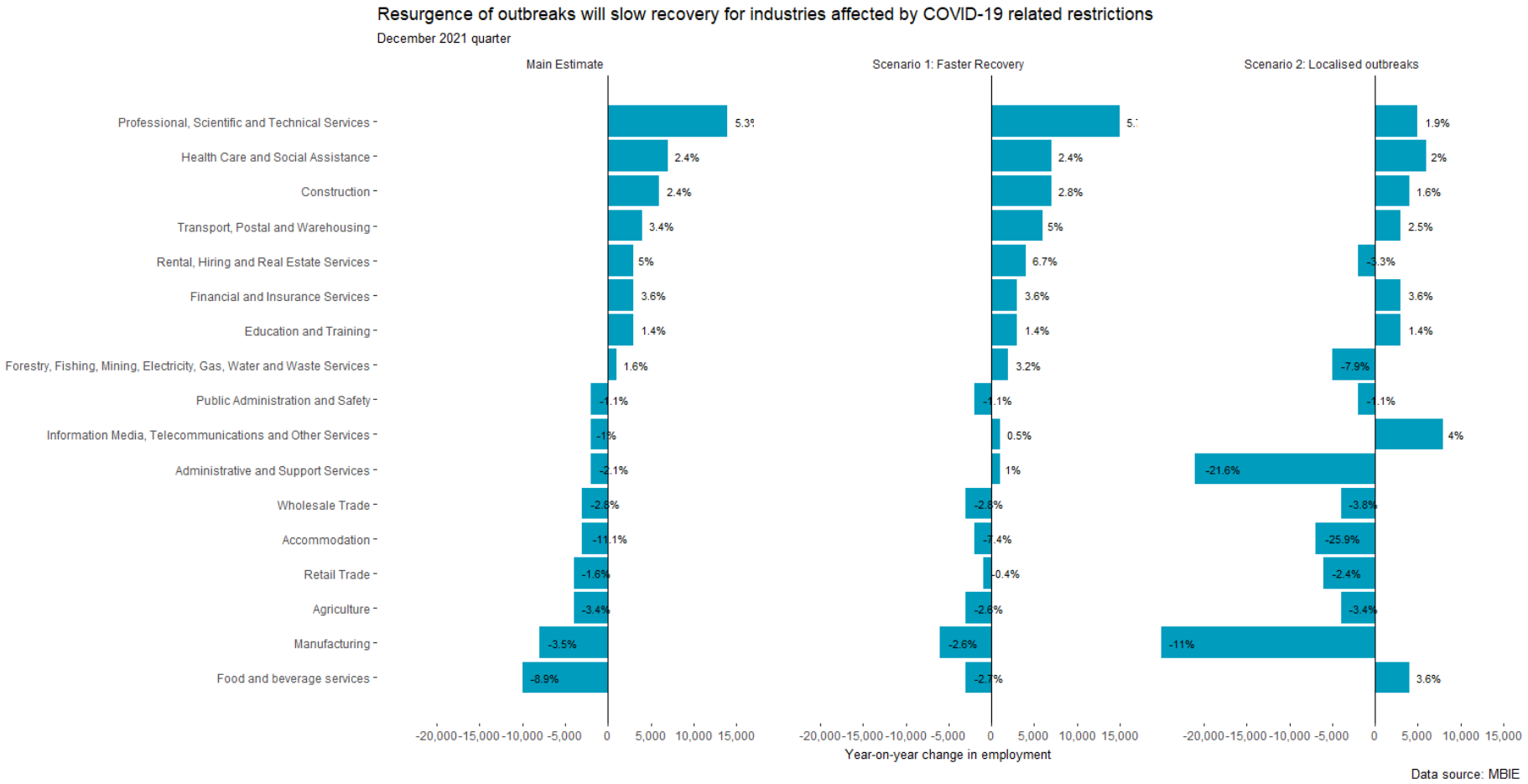
Figure 6: Estimates of year-on-year changes in employment, 2020-2021



Note: Colours indicate the direction of change: "Green" - negative and "Teal" – positive.

Figure 7 shows the employment outlook in the short-term. Tourism-related industries such as Accommodation and Food and beverage services may continue to experience lower than pre-COVID employment levels. These industries are at high risk of further employment losses with resurgence of outbreaks and shift to higher Alert Levels. However, travel bubbles with Australia and other countries that have effectively managed COVID-19 (for example, Taiwan and Singapore) are likely to support the recovery of those industries. Travel and border restrictions will also continue to impact on activity and employment in the Transport, postal and warehousing industry. Global supply chain bottlenecks and weaker global economic outlook pose further challenges for manufacturing and construction industries. On the other hand, Construction, Health care and Public adminstration and safety might continue with their expected employment trajectory in 2021, having showed resilience in 2020.

Figure 7: Estimate of annual change in labour demand by Industry



Labour Market Activity will also vary by region

In addition to industry variations, labour market activity is also likely to vary by region, based on different concentrations of industries within regions. A summary of the main findings produced by the model are set out below; and estimates of employment, unemployment and labour market participation are included in Annexe Two.

Labour market performance will vary significantly across regions – some rural regions grow at a faster than the national growth rate

In the same way that employment growth is estimated to grow faster in some regions than others, growth rates are likely to vary across the regions. Overall, six out of the 16 regions (4 in the North Island and two in the South island) are anticipated to grow faster than the national average annual growth in 2021.

The highest annual average percentage employment growth is likely to be in the Bay of Plenty and Auckland regions in the North Island, and Canterbury and Marlborough regions in the South Island in the year ending December 2021 (see Figure 8). Expectations of higher than average labour demand in these regions will be driven by a number of industries including health care and social assistance, agriculture and business services. The employment outlook is relatively more positive for regions engaged in forestry, horticulture, and meat and dairy farming. Demand for these regions are anticipated to remain strong in 2021 as the world and domestic economy recovers. Regions that have high reliance on international tourism and other export services, are poised to benefit from proposed travel bubbles and easing of border restrictions when they occur.

Employment in the Auckland region is anticipated to be weak, but on par with the national growth rate in 2021. Employment growth in the region will be broad-based and supported by strong household spending and sustained residential building activity. Business services and rental and real estate services are expected to drive employment in the region over the next four quarters; while employment in retail trade and manufacturing industries will continue to show decline in the short-term. Economic activity in those industries is likely to continue to experience challenges where there is a resurgence of community transmission, and global supply chain difficulties. Employment in tourism dependent regions in the South Island, like Otago and Southland is still likely to remain weaker than other regions. On the other hand, more resilient meat and dairy farming in South Island regions is anticipated to continue to offset activity and employment loss from the lack of international tourism in 2021.

Weaker economic growth in 2021 will see unemployment increase in most regions

Despite the drop in the national unemployment rate in the December 2020 quarter, the number of people who are unemployed is still 25,000 higher than it was a year previous. Unemployment is expected to increase in a number of regions in 2021. The sharpest increases are likely to be in the regions, with economic activities concentrated in domestic and international tourism. Sporadic outbreaks and international border restrictions increases the risk of employment loss for those regions, particularly in the South Island. By the December 2021 quarter, unemployment levels in small regions is likely to stabilise relative to main urban centres. Once economic activities normalise further and border restrictions are gradually lifted, faster declines in unemployment in most regions are anticipated in the quarters leading to 2022.

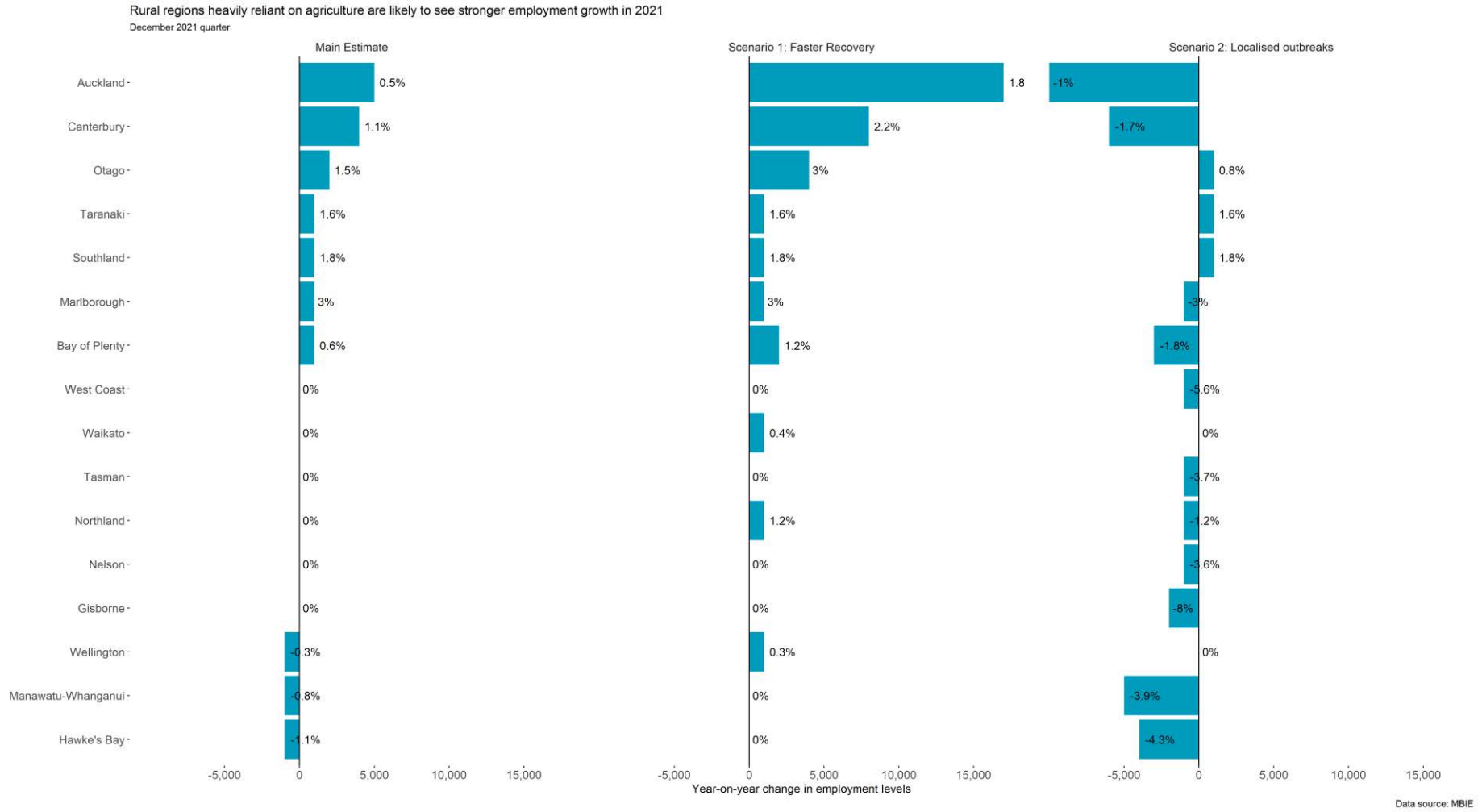
Regional variations may differ under different COVID-related scenarios

We also note that these estimates may vary under different scenarios. These variations occur as a result of different industry mixes in different regions, and in particular the concentration of more vulnerable sectors in different regions. The effects of different scenarios can be seen in Table 4 and Figure 8.

Table 4. Projection for Auckland region – December 2021 quarter

Output	Pre-COVID-19	Post-COVID-19		
	Baseline	Main Estimate	Scenario 1 Faster economic recovery	Scenario 2 Localised outbreak and weaker global economy
Number of people employed	1,004,000	965,000	977,000	950,000
Number of people unemployed	43,000	59,000	51,000	71,000
Working-age population	1,464,000	1,449,000	1,448,000	1,448,000
Employment rate	68.6%	66.6%	67.5%	65.6%
Unemployment rate	4.1%	5.8%	5.0%	7.0%
Labour force participation rate	71.5%	70.7%	71.0%	70.5%

Figure 8. Estimates of labour demand by regional council



Next Steps

As noted earlier, this report is the first output of the ELMA project. There are a number of steps that will be taken in 2021 to advance the initial thinking that has gone on.

Validating the model

Since the initial model was developed, we have put in place a number of steps to test the model in terms of its predictive accuracy. This has consisted of comparing our forward estimates for employment, unemployment and labour market participation with actual numbers for employment and unemployment released quarterly by Stats NZ. It also includes testing our estimates with other indicators such as filled jobs and number of people in all main benefits.

To date, our model shows a reasonable degree of robustness; with limitations largely arising from the underlying assumptions on which the model is based. The greatest degree of accuracy is seen in its estimates of the direction of change; and for larger regions and industries. Checking processes will continue to be undertaken throughout 2021.

Disseminating the model

A key step in early 2021 will be to disseminate the thinking lying behind the model across Government Agencies. The model has been operationalised as a tool that is able to be used as a common framework for planning by Government Agencies, in respect of policy development and service delivery. In addition to its dissemination within Government, MBIE is keen to ensure wider distribution to regional and industry stakeholders, as a tool that they are able to use to provide inputs to their own planning processes. This will take place from April 2021, when this Report, data files and a User Guide for the Tool will be pro-actively disseminated across relevant Government Agencies; particularly those with an interest in the labour market and/or planning and forecasting. Particular targets for dissemination include

- Government Agencies involved in regional planning and purchasing decisions, particularly those in MSD and MBIE involved in the planning and purchasing of employment and training initiatives and industry engagement
- Members of the Cross-Government Forecasting Group
- Regional Council and industry groups who have asked to be kept informed.

We will keep updating the model through 2021

The most recent update to the model occurred following the release of the December 2020 ¼ labour market statistics by Stats NZ in February 2021. The next opportunity to do this will be in June 2021 with the release of new economic and labour market statistics for the March 2021 quarter.

There may also be opportunities to extend to model to provide it with additional capabilities, including sensitivity analysis and different cuts of the data.

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Annexe One: Investigating the impact of COVID-19 using input-output multipliers

Input-Output Framework

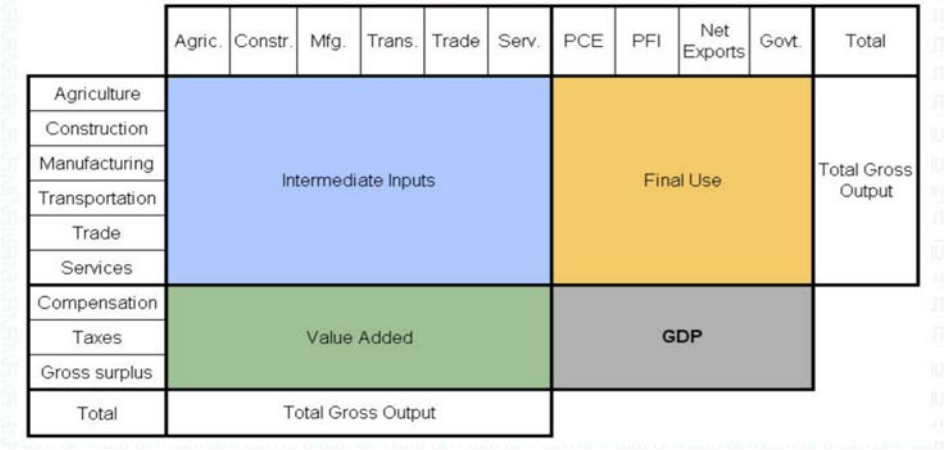
The Input-Output (I-O) framework provides a link based on historical data between inputs and outputs for various sectors in the economy, including a link between output and employment. It reflects the relationship between the level of output and the required inputs, and the balancing of supply and demand goods and services (see Figure 9). For a given change in the level of output, we can calculate the level of associated employment change from this link using *multipliers*.

Multipliers are derived from I-O tables. They are summary measures used to estimate the total impact that be expected from a change in a given economic activity (or a shock to the status quo). For this work, we used multipliers for:

- **Output** – estimates the change in gross output resulting from a change in the demand for goods and services. It also describes the interdependence of industries in the regional economy.
- **Value-added** – provides an estimate of additional value-added to the sector resulting from a change final output. Value-added refers to the value of the final demand for output or the value of primary inputs to that production.
- **Employment** – measures the employment required to generate the change in output of an industry. An increase in value-added for an industry multiplied by this multiplier provides an estimate of employment created in the region.

The advantage of this method is ease of application of the I-O table, and its ability to provide estimates not only of direct effects, but also of indirect and induced employment. One disadvantage of this approach is that the I-O table may not provide the level of industry breakdown needed.

Figure 9. An input-output transactions table schematic



Estimating impact of COVID-19 on future demand for and supply of labour

We estimated the direct impact on employment of changes in the final demand for goods and services. These direct impacts are the additional employment created or destroyed in a given industry as it responds to changes in demand for goods and services due to containment measures, level of economic activity and overall macroeconomic and policy settings.

For a given change in the level of output, we calculated the level of associated employment change using regional multipliers. We derived the multipliers from an experimental 2018 inter-regional input-output table. This table was developed in-house and re-scaled from Statistics New Zealand's 2013 national I-O table.

We used multipliers for value-added and employment. These multipliers helped us assess the distributional effects of changes in economic activity resulting from COVID-19 across industries and regions. The impacts were then compared to a pre-COVID baseline estimates of labour market activity. Further details on our approach in estimating direct employment impact from COVID, and post-COVID-19 labour supply impacts are available on request.

Shocks to the status quo – Output and demand effects of COVID-19

The effects of COVID-19 on the labour market combine both output and demand-side aspects. An output effect is related to the economy's ability to produce goods and provide services. Changes in activity levels resulting from restrictions related to a higher COVID-19 Alert Level is an example of a supply-side effect. A demand-side effect, on the other hand, is associated with changes in spending done by households, firms, government and the rest of the world. For example, firms could reduce or delay their investment expenditure because of the gloomy economic outlook.

To estimate sub-national employment levels, we categorised impacts into the above effects: 1) those arising from changes in the demand for goods and services; and 2) those arising from a change in industry activity level due to containment measures. For each type of impact, changes in gross domestic product provide the basis for a change in industry output and a requisite increase in labour (input) demand. We assumed that demand-side effect is greater than supply-side effect on activity levels when New Zealand entered Alert Level 1.

Output effects due to changes in Alert Levels

We calibrated changes to activity levels that were related to permitted or prohibited activity at each Alert level for each industry using a number of data sources, including Treasury and Reserve Bank of New Zealand (RBNZ)'s estimated reduction in GDP while containment measures are in place. We based the reduction in activity levels for each industry on the size and the characteristics of the workforce, and judgements about capacity of firms to operate and proportion of workers who are able to work remotely.

Demand-side impact due to changes in demand for goods and services

To include demand impact, we used various methods to assess the impact of COVID-19 on different sectors. For example, we used Paymark data to inform our judgement on how

consumer spending has changed post-COVID-19 lockdown. Consumers restraining their spending for fear of catching the virus or losing their jobs, can be thought of as a demand effect related to COVID-19.

Assumptions and key limitations

We recognise some limitations in the use of multipliers as a tool for assessing the impacts of economic change. This framework assumes:

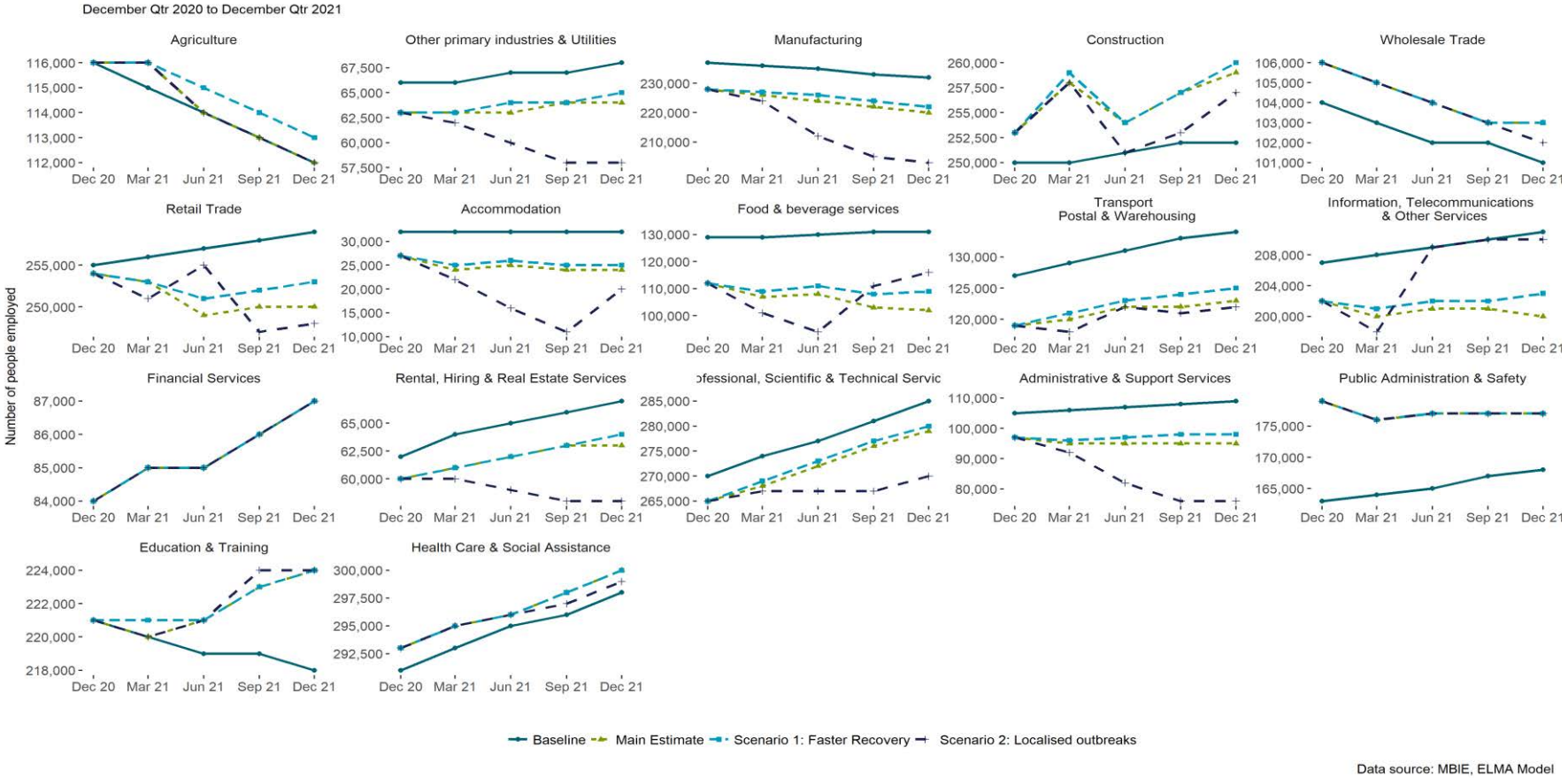
- Average relationship between inputs and outputs apply to marginal change;
- Fixed input structure in an industry;
- Constant returns to scale in production;
- Fixed input prices, with changes in input mix not resulting in changes in their costs; and
- No resource constraints.

The above assumptions makes the I-O framework static, and presents a snapshot in time of an industry or a regional economy. By design, it does not account for price changes, and for general equilibrium effects such as offsetting gains or losses in other sectors or regions. Prices of commodities and inputs change with changes in allocation of resources from one industry to another, and with technology used in the production. Several factors also affect the average relationship between input and output in the economy, including resource constraints at the household and government sectors.

The regional multipliers used to generate estimates of employment levels required by a future level of economic activity also have shortcomings. Because of the simplifying assumptions, the multipliers are unable to consider supply-side constraints, possibility of change in the input-output relationships, and effects policy variables have on behaviours of people and businesses. This meant that their applications might be limited to investigating relatively minor shocks to the economy. Despite these limitations, the multipliers remain as useful tools for summarising and quantifying interdependencies of industries and assessing distributional effects of economic change across industries and regions included in the I-O table.

Annexe Two: Estimates of labour market activity by Industry and Regional Council

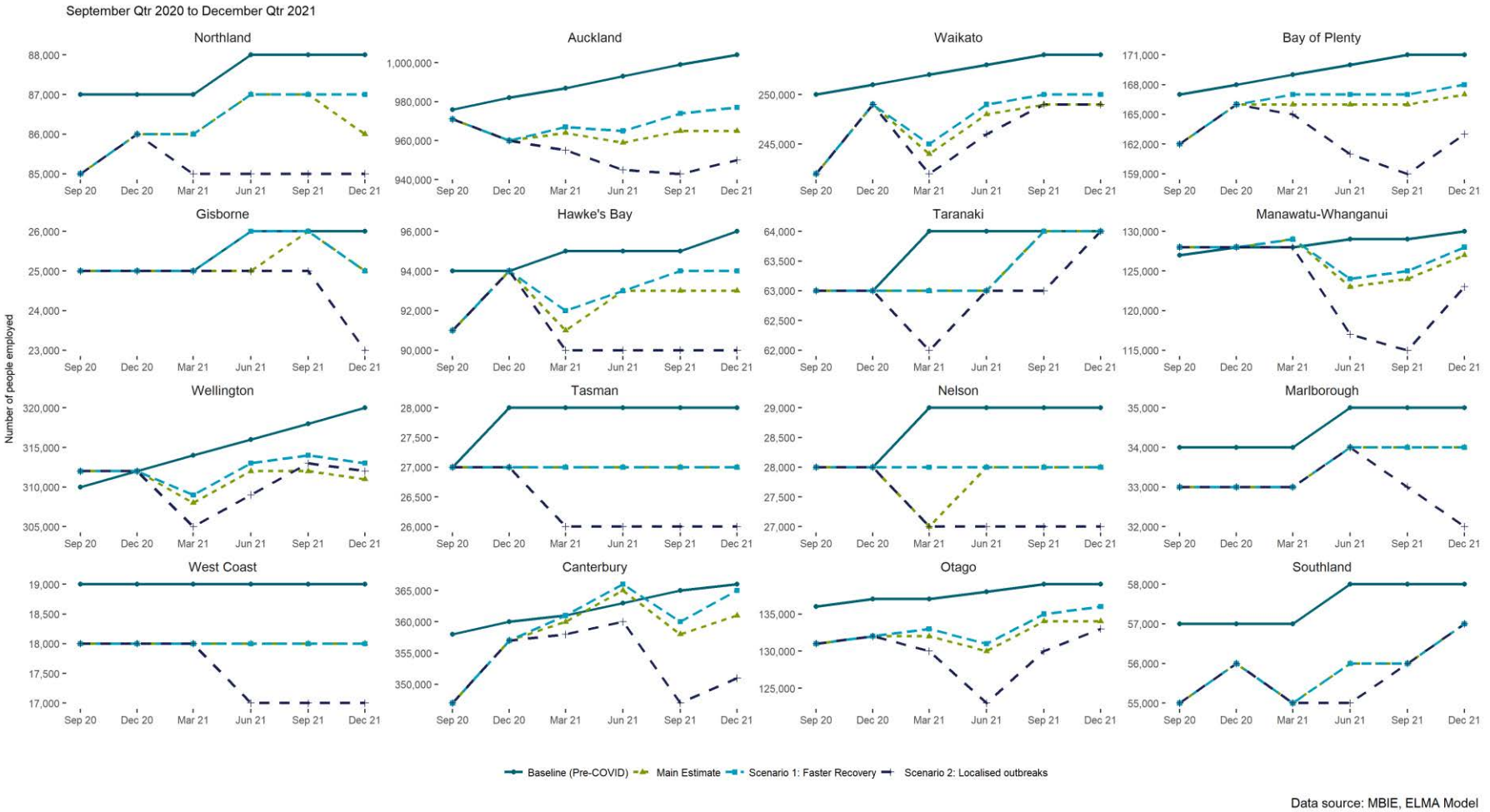
Figure 9 Estimates of employment by industry



Data source: MBIE, ELMA Model

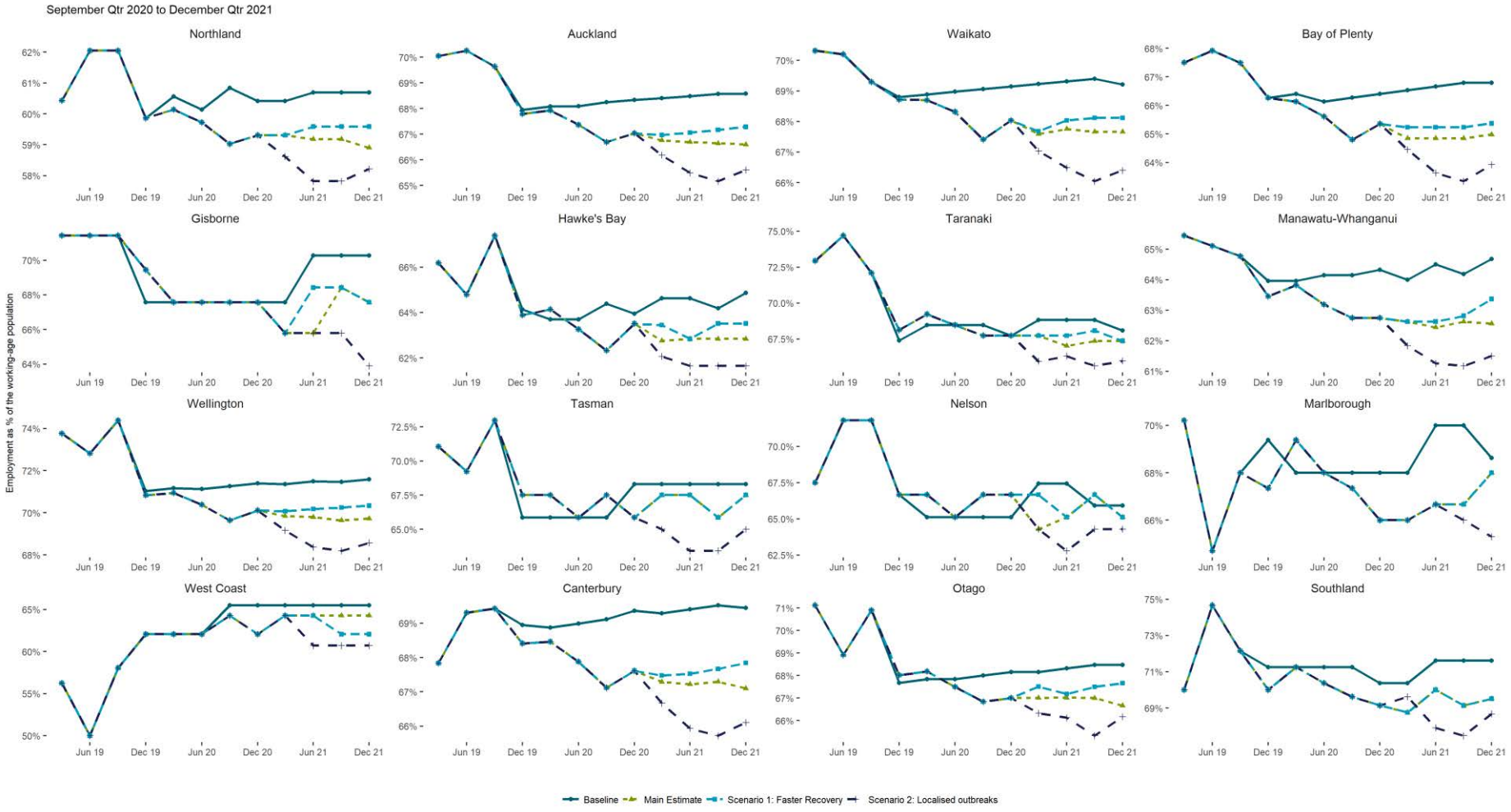
Note: Information, Telecommunications and Other Services include Arts, Sports and Recreation Services; Baseline estimates were based on The Treasury's Half-Year Economic and Fiscal Update (HYEFU) 2019; Main and Scenario estimates used labour market and economic projections in the HYEFU 2020.

Figure 10. Estimates of employment by regional council



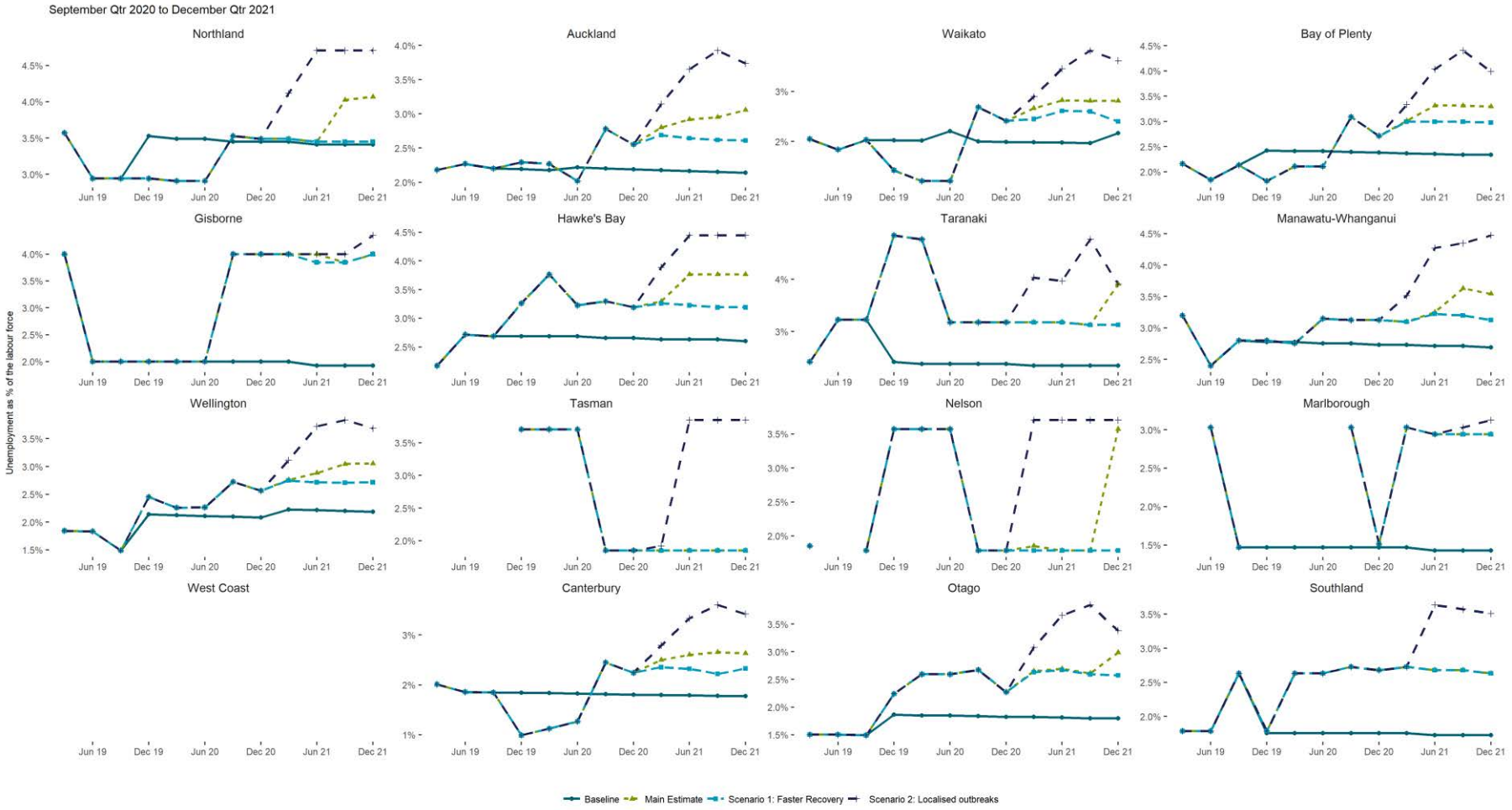
Note: Baseline estimates were based on The Treasury's Half-Year Economic and Fiscal Update (HYEFU) 2019; Main and Scenario estimates used labour market and economic projections in the HYEFU 2020.

Figure 11. Estimates of employment rates by regional council



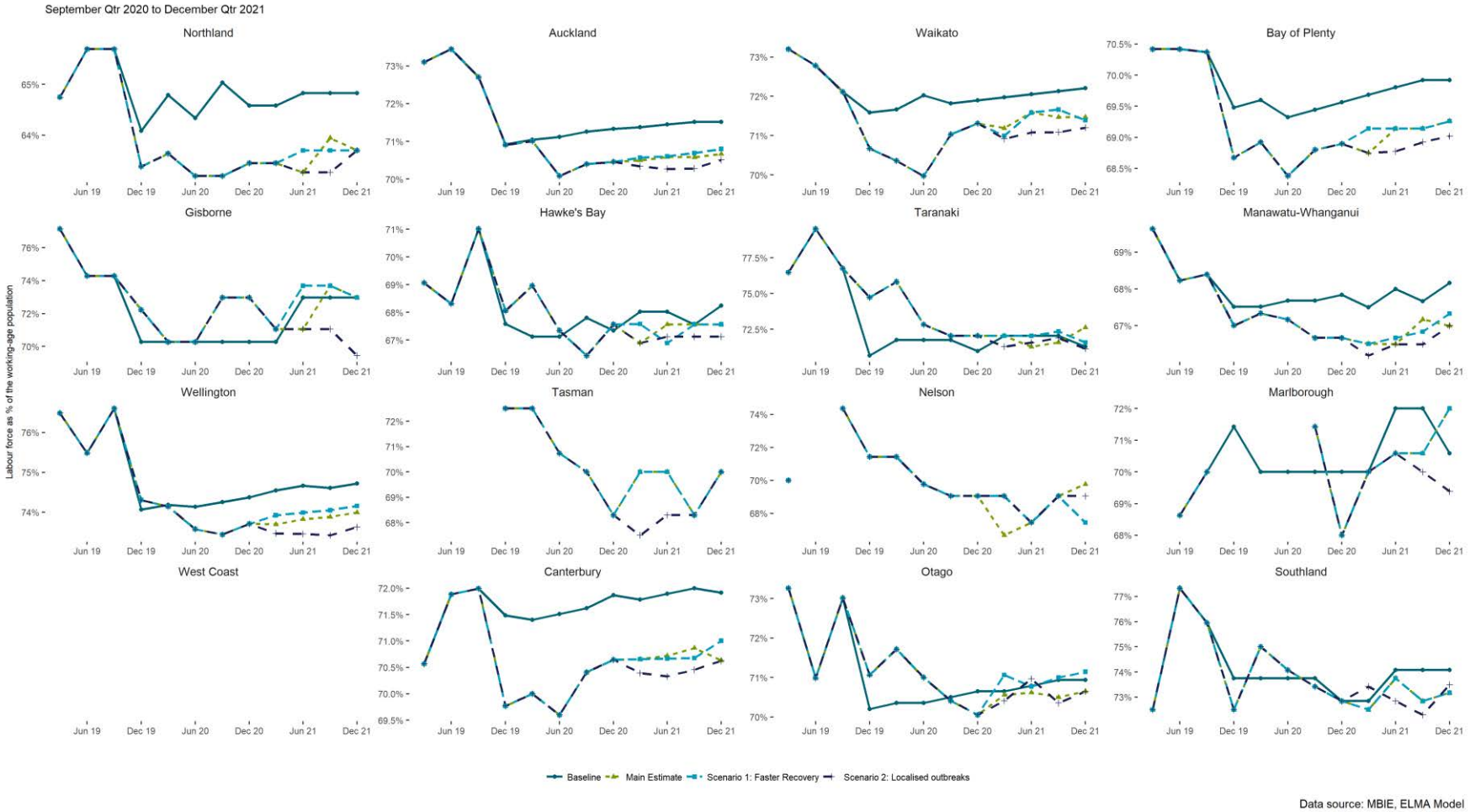
Data source: MBIE, ELMA Model

Figure 12: Estimates of unemployment rates by region



Note: Unemployment estimate for West Coast region is supressed

Figure 13: Estimates of labour force participation rates by region



Note: Participation rate estimates for West Coast region do not appear in the chart because unemployment numbers were supressed.