ASSESSING THE LABOUR MARKET RESPONSE DUE TO COVID-19 BORDER RESTRICTIONS: A CASE STUDY OF CANTERBURY, NEW ZEALAND

David Dyason*
Senior Lecturer, Department of Land Management and Systems, Lincoln University, Christchurch, Canterbury 85084, New Zealand. Email: David.Dyason@lincoln.ac.nz
TRADE Research Entity, School of Economic Sciences, North-West University, Potchefstroom 2520, South Africa.

Peter Fieger
Adjunct Associate Professor, Business School, University of New England, Armidale 2350, Australia. Email: pfieger2@une.edu.au
Senior Lecturer, School of Education, Federation University, Mount Helen, 3350, Australia.

John Rice
Professor, College of Business, Zayed University, Abu Dhabi 144534, United Arab Emirates. Email: john.rice@zu.ac.ae

*Corresponding Author

ABSTRACT: Labour markets respond to supply and demand changes caused by external shocks, including pandemics. In 2020 and 2021, the Coronavirus disease-2019 (COVID-19) pandemic caused a sudden reduction in labour demand in certain industries globally. As economies emerge into the post COVID-19 reality, a return of patterns caused by ongoing structural pressures return. In Canterbury, a region centred on Christchurch in New Zealand, these include migration demand pressures. This paper uses data from the Canterbury region, which is no stranger to disasters, as a case study. Two models are developed to estimate the future workforce requirements during the recovery period. A population growth model is utilised to test the regional labour market's limits, while an economic model estimates the required jobs for the regional economy. The paper finds that the lower economic activity resulting from COVID-19 has reduced the near-term employment demand. At the same time, labour force transition coupled with strict border controls reveals the need for labour force participation to adjust during the extended recovery period. Although short-term demand for skilled migration remains lower, those leaving the workforce will require replacing.

KEYWORDS: Labour market; COVID-19; border restrictions; regional; labour force participation; economy; pandemic.

1. INTRODUCTION AND MOTIVATION

Labour market changes have local, regional, national and international elements. Local disasters or economic shocks have a direct and often significant effect on the regional labour market as the economy adjusts to changing consumer behaviour (Dyason *et al.*, 2021). These shocks can be in the form of natural disasters, such as earthquakes or floods, which tend to be local, or more widespread, such as the recent pandemic.

Improvements in the status of the global working class and globalisation projects as highlighted by Munck (2018) have been negatively affected by recent Coronavirus disease-2019 (COVID-19) related border restrictions that have hindered labour movement. Within this limitation, the ability of the resident regional labour market requires attention. New Zealand's COVID-19 elimination strategy, which was utilised through much of 2020 and 2021, has proved popular in limiting the number of lockdowns and enabling movement of people and the economy in a slightly different way than in previous years. However, with regards to the international movement of people (for work and/or migration), border controls and exclusions have substantially lowered New Zealand's labour intake.

Reacting to these restrictions, the extant regional labour force would be the main source of human capital until border restrictions change. The Canterbury region within New Zealand provides an example to other areas, both in New Zealand and elsewhere, of how successive disasters influence the workforce and how the policy response to the pandemic may affect short to medium-term labour requirements.

Several significant events in recent times have impacted the economy of the Canterbury region. Following the Global Financial Crisis of 2007-2009, three large magnitude earthquakes hit the Canterbury region in 2010, 2011 and 2016. These generated substantial economic shocks caused by social and economic destruction, with the subsequent rebuilding efforts eliciting further economic transformation.

In this study, we use Canterbury economic data to assess the impact of the COVID-19 shock to assess the labour needs in the regional economy given short-term restrictions on immigration and the role of population growth for the regional labour market.

Due in major part to regular disasters, the population within the Canterbury region has changed significantly over the past decade. The

cataclysmic earthquakes had major impacts on the economy of the region and its workers. However, the rebuilding programme has waned as the Canterbury economy transitioned to 'business as usual' activity from around 2017. During this time migration has played a prominent role in population growth for the region. Canterbury is New Zealand's second-most populous region with nearly 600,000 people in 2018 (Statistics New Zealand, 2021a).

The 2018 census reveals internal migration trends between 2013 and 2018 with a slight in-flow of people from other regions in New Zealand to Canterbury (Statistics New Zealand, 2021a). This inflow amounting to a net total of 3,288 between 2013 and 2018 represents only 5.5 percent of population change over five years. On the other hand, the number of people that have settled in the region, during the same period, from overseas amounted to 42,192. This represents a significant inflow from the international labour market into Canterbury. Sub-national population estimated for 2021 from Statistics New Zealand (2021b) reveals a continuation of this trend from 2018. The population growth for the region between 2018 and 2020 is primarily driven by net-international migration, accounting for 80 percent of population change (Statistics New Zealand, 2021b).

Nationally, New Zealand's immigration policy continues to emerge and adjust in support of national and regional growth imperatives as the economy evolves (Bedford and Spoonley, 2014; Liu, 2017; Immigration New Zealand, 2020).

As is the case in the rest of New Zealand, the baby-boom generation's transition into retirement significantly changed the Canterbury workforce from the turn of the century onward. Figure 1 shows the transition over time of the population per age group within the region. The results of the 2006, 2013 and 2018 censuses show this transition. In 2006, the population was dominated by the age groups of 30 to 49 (29 percent). This transitioned 5-years later to the groups between the ages of 40 and 59 (28.3 percent). From the 2018 census, the largest age group was between 45 and 64 years (at 26 percent).

The effect of migration is evident in the age group of 20 to 34 in the 2018 census with significant domestic and international in-migration of people in this age group into the region. This movement's primary driver was the construction-related rebuilding activity after the 2010/11 and 2016 earthquakes, which attracted a large contingent of workers to the region.

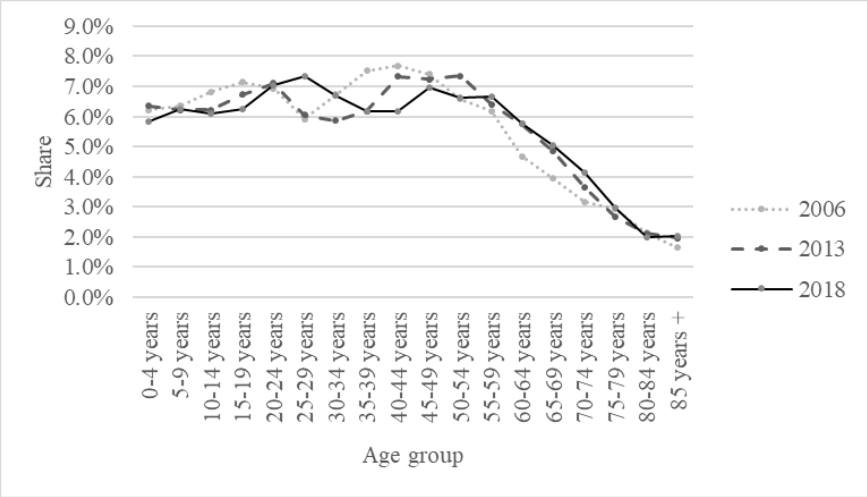

Figure 1. Age Composition in Canterbury - 2006, 2013 and 2018 Census.
Source: Statistics New Zealand (2021c).

Following the emergence of COVID-19, New Zealand adopted some of the strictest policies related to movement controls during 2020, limiting international movements into the country and implementing a 7-week lockdown (Hall *et al.*, 2020; Hall *et al.*, 2021). This placed an effective end to immigration and other international travel during most of 2020 and some limitation is expected to remain in place from 2021 onwards. At the time of writing, these restrictions are enduring to a great extent. Indeed, New Zealand has been one of the most cautious jurisdictions in limiting people's movement during the pandemic event. Future changes with regards to COVID-19 international movement regulations are challenging to predict. However, the Director-General of Health in New Zealand, suggested in late 2021 that restrictions may continue for a further three to five years (Daalder, 2021).

2. PRIOR LITERATURE

Economists axiomatically agree that there is an association between GDP and population (Headey and Hodge, 2009). The neoclassical growth model introduces population growth exogenously, with an implication that if population growth outstrips per-capita output, the economy is worse off (Peterson, 2017). Some studies have found opposing results when empirically studying the relationship between population changes and

economic changes, especially when comparing between different geographies (Sethy and Sahoo, 2015; Huang and Xie, 2013; Becker, 1999). Recently, Piketty (2014) observed that economic growth consists of both a population and economic element, with both exhibiting mutual complementarities and dual effects.

As a result, the relationship between population and economic growth is a contested one. Peterson (2017) argued that there appears agreement in the literature that population growth and output (per capita) are co-dependent. Furthermore, this relationship seems to depend very much on the age structure of the population. Peterson (2017) highlights that an aging population implies that a smaller number of working-age people will have to support growing numbers of retirees and likely slow economic growth, unless productivity increases.

While there is often a stated one-directional relationship between population growth and economic growth (Kapuria-Foreman, 1995; Chang *et al.*, 2014), this is not always the case. Morley (2006) for instance, finds that immigration-based population growth is not exogenous to economic growth as growth runs from GDP to immigration, and not vice versa.

This study acknowledges the existence of this relationship through the models presented. In order to position this paper in the current literature, economic growth is built on the Keynesian assumption that aggregate demand influences output within the economy. For this reason, relationships between the various economic actors within the economy are assumed to stay relatively stable. The Input-Output model is an example of this approach where future demand in the economy is assumed to have similar relationships based on current endogenous input data. This approach is used extensively within the current literature to measure impacts within the economy and refers to the linear response theory (Klimek *et al.*, 2019).

In the analyses of population and economic growth, the international, national and regional economies are inexorably linked. When confronted with an unforeseeable and contractionary exogenous shock like COVID-19, economies and labour markets tend to react negatively before returning to some normality and later recovery (Bonaccorsi *et al.*, 2020). However, regional growth shocks driven primarily by local factors tend to create national and international economic responses such that the negative impacts are cushioned or moderated.

The ability of regional economies to bounce back after a disaster event has been studied in several contexts. Rose and Liao (2005) analysed regional economic resilience following the impact of earthquake-induced disruptions to water supply in Oregon. Their findings imply that economic

resilience and the ability of regions to bounce back is a function of pre-event mitigation and post-event inherent and adaptive resilience. In an empirical study of the resilience of the Buffalo-Niagra Falls region to weather-related disasters, Foster (2007) finds that the economic recovery prospects of a region are dependent on prevailing local and general economic trends at the time. The ability of regional Japanese labour markets to recover from earthquakes was analysed by Oliva and Lazzeretti (2018) who found that economic resilience and the ability to recover correlated with their respective degree of urbanisation although they stress that conclusions have to be seen in the context of economic conditions in individual regions. This should also be considered in the present study.

For example, when Canterbury suffered dual earthquakes in 2010/11 and 2016, the national and international economies quickly responded in the provision of labour and materials. However, when a global exogenous shock occurs (as was the case with COVID-19), a different response path may be anticipated by a regional economy and labour market. By mid-2020, international labour and migration movements effectively came to a halt. This had substantial flow-on effects on the supply of labour for regional and national economies. Border closures during the 2020 pandemic, and the prospect of greater labour mobility restrictions in future, will have long-term impacts on economic growth, potential labour demand and future labour availability globally.

In this paper, we anticipate a more 'coupled' economic, population and job growth trajectory post-COVID-19 than was observed after the 2010/11 and 2016 earthquakes. However, the ability to fill the new jobs will likely be affected by the openness of borders and the ability of labour to freely move while assuming no further exogenous and local shocks.

3. METHOD AND DATA

This study develops two separate but complementary models to determine the labour force requirements for the regional economy of Canterbury in New Zealand. This is done to exclude the interrelationship between economic output and population in identifying a growing economy's needs and requirements. These analyses aim to highlight the workforce requirements or workforce gap (if any) over time. It is not insinuated that the borders will continue to be closed for the next decade, and international labour movements will cease. The analysis goes beyond this and identifies to what extremes the local, regional labour market can support a growing economy, assuming that the human capital can be

sourced locally. The analysis also identifies the limits within the regional labour force that has previously had to adapt to the outcomes of numerous natural disasters by identifying how the market will have to adapt to changing circumstances, which in this instance is restricted borders.

Population Model

The population model aims to quantify the future population in the region. Our study employs a cohort-component model that originated from the classic work by Cannan (1895). The baseline data is sourced from Statistics New Zealand (2021c) and weighted on the 2013 census results. The model includes fertility and deaths, with both sets of assumptions based on an assessment of historic and current trends. The fertility rate is assumed to be age-related and applied to new births for the area in each time period. The mortality rate is derived by the age-specific survival rate for each period and assumed to align with historical trends. This rate is applied for each period to give the number of people that survive each period. Migration is purposefully excluded from the analysis in order to identify the resident workforce for the region and the likely required migrant population to support the regional workforce.

The population forecast is on five-year intervals aligning with the New Zealand census. The approach is summarised by Wilson (2011) and measures the population at intervals for each age group, while the change in the cohort number is applied through a Cohort Change Ratio (CCR).

$$P_x(t) = P_{x-5}(t-5)\, CCR_{x-5,x}(t-5, t)$$

All cohorts except births during the interval are the population of the cohort age x-5 to x at time t-5 is the population of that cohort aged x to x+5 at time t multiplied by the CCR. The CCR in this study represents the cohort's survival rate based on historical mortality rates per age group sourced through Statistics New Zealand and the District Health Boards.

$$CCR_{x-5,x}(t-10, t-5) = \frac{P_x(t-5)}{P_{x-5}(t-10)}$$

Births are calculated using a fertility rate applied to the age group of 15 to 44 years, developing the child to adult ratio (CAR). Therefore, to project the population aged 0-4 requires:

$$P_0(t) = P_{15-44}(t)\, CAR(\mathrm{t})$$

where P_0 represents the new births during period t and $P_{15\text{-}44}$ the adult population with CAR the ratio at time t.

This model is preferred over other widely-used models including a regression model, ARIMA model or a trends extrapolation method where

mathematical functions are utilised. These models tend to extend the historical trend observed into the future and as a result, fail to account for population changes at age groups that affect the population (Wilson, 2011).

The age-group transition relationship from historical censuses reveals the strong relationship in age group movements over time (see Figure 2).

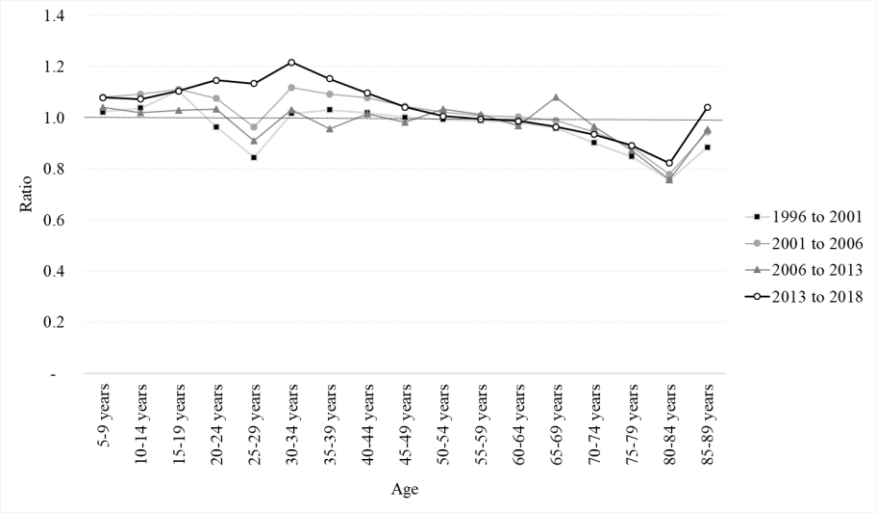

Figure 2. Age Group Transition Relationship. Source: Statistics New Zealand (2021c).

The 2013 to 2018 period corresponds to the Canterbury earthquake rebuild and as a result, the trend does take a different shape compared to the census data in previous years. The large-scale impact on the Canterbury economy from the earthquakes led to in-migration, particularly an increase in the number of people aged 20 to 39 years.

Economic Model

A second model is developed to estimate the relationship between the economy and the labour force. We use quarterly regional filled jobs data from the Linked Employer-Employee Data (LEED) (Statistics New Zealand, 2021d). The dataset is constructed from individual administrative data drawn from Inland Revenue's taxation system and business data from Statistics New Zealand's Business Frame and consists of 82 observations of quarterly data from March 2000 up to September 2020. Vector autoregressive (VAR) analysis is employed to estimate and forecast the

level of employment within the regional economy using employment main sector level and GDP data. The economic structure for Canterbury as well as the employment within the region is used in the model estimation. The interrelationship between employment and GDP is captured by the time-series data and presented in the VAR model with quarterly input data for both employment and GDP. The VAR model enables us to regress a vector of time series variables on lagged vectors of the variables and represent a matric form like this:

$$\begin{pmatrix} Y1,t \\ Y2,t \end{pmatrix} = \begin{pmatrix} A1,1 & A1,2 \\ A2,1 & A2,2 \end{pmatrix} \begin{pmatrix} Y1,t-1 \\ Y2,t-1 \end{pmatrix} + \begin{pmatrix} e1,t \\ e2,t \end{pmatrix}$$

Where Y is total employment and A is a vector of time series variables applied in the analysis. The lag incorporated within the model is indicated through the lagged variables denoted as *t-1*. The model estimates total employment through employment in primary, goods-producing and services activity and the level of gross domestic product with quarterly data for the regional economy up to September 2020 (see Figure 3).

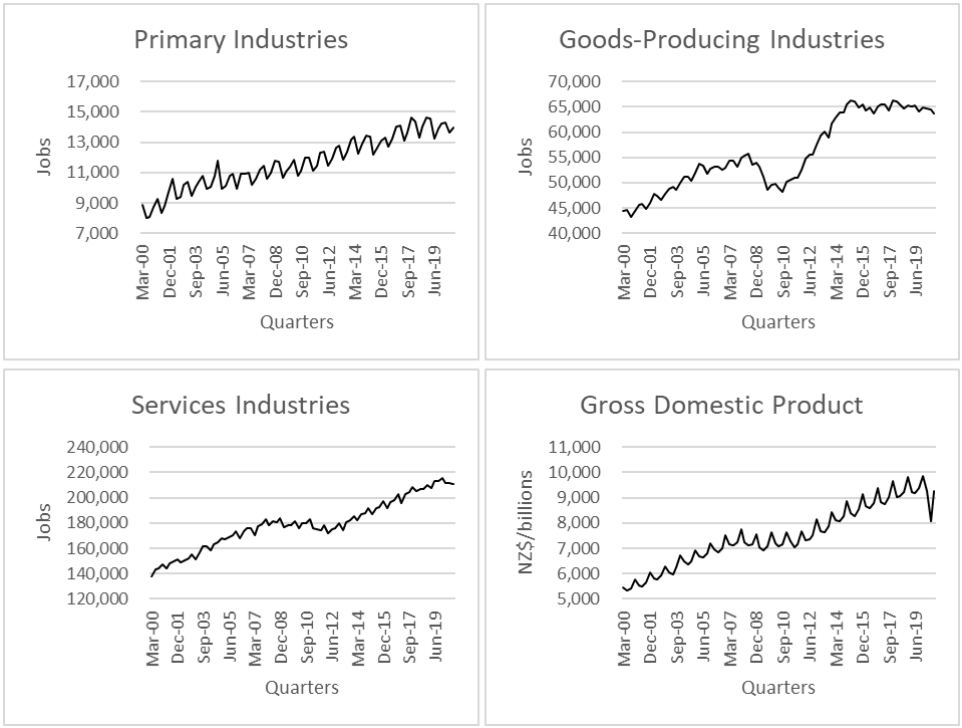

Figure 3. Jobs and Real GDP in Canterbury, 2000 – 2020, Quarterly. Source: Statistics New Zealand (2021d) and Infometrics (2021).

The lag order tests suggest an optimal lag of three. Given this proposed lag order the total employment model can be described as:

$$Total\ employment = [Emp\ Primary + Emp\ Producing + Emp\ Service + Region\ GDP + const]$$

Where

$$Primary = Primary.l1 + Producing.l1 + Service.l1 + GDP.l1 + Primary.l2 + Producing.l2 + Service.l2 + GDP.l2 + Primary.l3 + Producing.l3 + Service.l3 + GDP.l3 + + const + trend$$

and

$$Producing = Primary.l1 + Producing.l1 + Service.l1 + GDP.l1 + Primary.l2 + Producing.l2 + Service.l2 + GDP.l2 + Primary.l3 + Producing.l3 + Service.l3 + GDP.l3 + + const + trend$$

and

$$Service = Primary.l1 + Producing.l1 + Service.l1 + GDP.l1 + Primary.l2 + Producing.l2 + Service.l2 + GDP.l2 + Primary.l3 + Producing.l3 + Service.l3 + GDP.l3 + + const + trend$$

and

$$GDP = Primary.l1 + Producing.l1 + Service.l1 + GDP.l1 + Primary.l2 + Producing.l2 + Service.l2 + GDP.l2 + Primary.l3 + Producing.l3 + Service.l3 + GDP.l3 + + const + trend$$

To ensure the stability of the VAR model the time-series data is transformed into stationary data. Autocorrelation is tested through the Portmanteau test and with a p-value of 0.43 this reveals no autocorrelation. Testing for Heteroscedasticity reveals a p-value of 1 and therefore passes the test. Testing for the normal distribution of residuals, reveals p-values smaller than 0.05 and as a result, does not pass the normality test. However, this is not seen as a major problem for the VAR model and is explained by the COVID-19 effect of lockdown, during 2020, on the GDP and employment data used in the model.

Estimating the required workforce to support an economy from 2020 onwards is achieved by combining economic and population models' outcomes. This approach aligns with the current literature stated earlier in this paper that economic change is a driving force for demographic change (Beaumont, 1989; Headey and Hodge, 2009).

The population model, estimated through the cohort-component model, excludes international and national migration, to control for the existing population to identify the supply-effect of the local labour market due to

international labour movement restrictions. The results could also be used to extrapolate the effect of localised lockdowns, as recent COVID-19 events in New Zealand have led to regions being locked down at different alert levels with travel restrictions in place.

Finally, by overlapping the results from the two models, the labour requirements for the Canterbury region is provided for the medium term.

3. RESULTS

Forecasting the level of economic activity during a one in hundred-year pandemic presents complex forecasting challenges. The uncertainty regarding COVID-19 and its continued effects on economic activity, coupled with the stringent response from the New Zealand government, adds to the challenges of estimating the GDP impact on the regional economy. The major commercial banks in New Zealand expected an annual contraction for 2020 of between 2.5 percent and 3.5 percent followed by a sharp and quick rebound in mid-2021 to 2023 and low but stable growth from 2024 onwards (Westpac, 2021). Following these assumptions, we expect in our model a similar outcome.

Labour Needs

The economic model estimates the required employment for the regional economy from 2020 onwards. Thus, conservative estimates, aligning with current estimates by the Reserve Bank of New Zealand (RBNZ, 2021) and most commercial banks within New Zealand, are preferred. The RBNZ forecast acknowledges that border restrictions will continue to hamper international tourism and migration.

Our model reveals the initial impact of lockdowns due to COVID-19 as a negative short-term impact on employment levels and supports existing findings elsewhere for the Canterbury region (Dyason *et al.*, 2021). Additionally, there is a marked increase in fluctuations in the employment forecast from 2020 onwards as a result of the shock on the economy, with residual values increasing from the 2020 quarterly data. As more data becomes available in the future, these fluctuations might easy sightly. However, it does reflect the uncertainty of the current environment. The 12-month employment average reveals a continued strong demand for employment as the economy continues to expand at conservative growth of 1 percent annually as a midpoint forecast, with upside and downside growth possible. Figure 4 shows the employment forecast for Canterbury up to 2029.

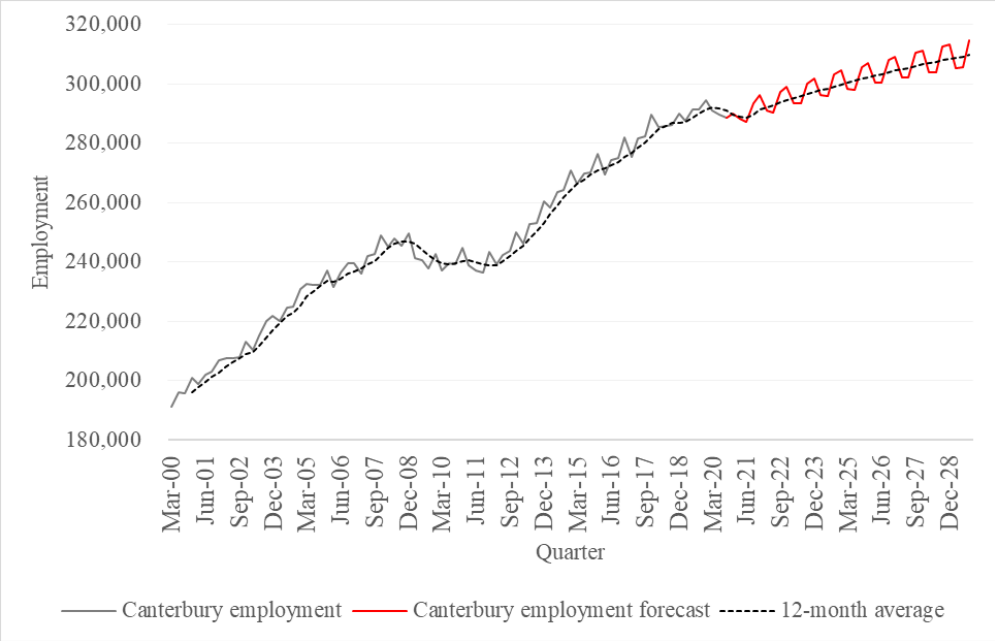

Figure 4. Canterbury Employment Forecast, up to 2029. Source: Statistics New Zealand (2021d) and Author's Calculations.

Population

The population model results are illustrated in Figure 5 and show the total resident population forecast up to 2048 at 5-year intervals. The peak in population is forecast to be near 648,000 people in 2038 for the region. Reiterating that the resident population excludes migration.

The working-age population, representing the people aged 15 and 64, is expected to peak earlier, around 2023. The model reveals the growing share of people above the age of 65, while the working-age population and people under 15 are predicted to decline gradually.

We are combining the results from both models to reveal the workforce requirements and the extent of regional and national regulatory intervention required to support or address any potential workforce gap for the regional economy. COVID-19 continues to emphasise the importance of a quick regulatory response to support regional economic activity.

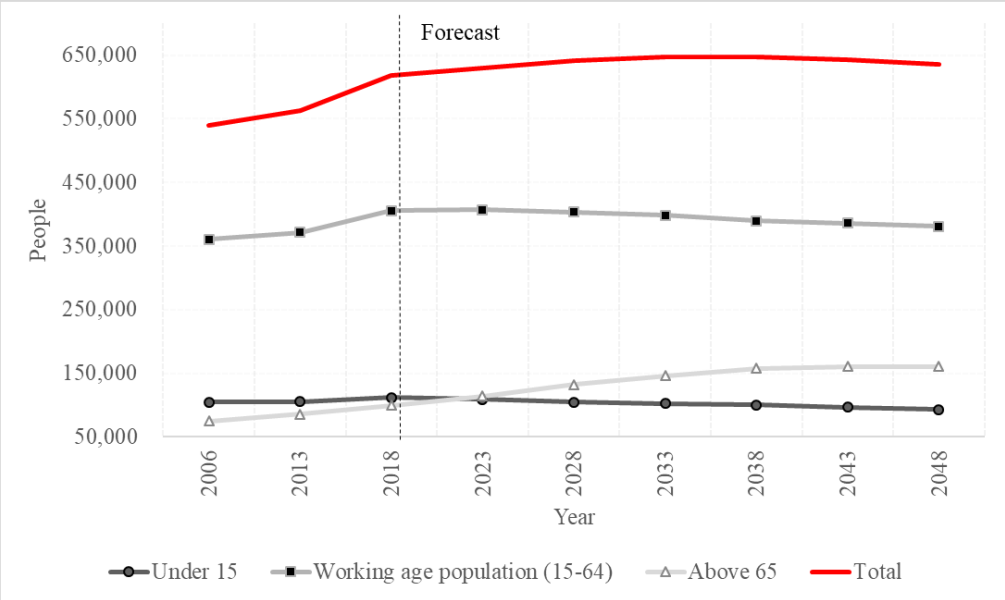

Figure 5. Population Composition Forecast, up to 2048. Source: Statistics New Zealand (2021a) and Author's Calculations.

Future Workforce Requirements

As New Zealand borders were closed for all but essential and specialised skills during the pandemic (Immigration New Zealand, 2020), the existing resident population remained the main source of labour. New Zealand has relied extensively on migration to support the economy through the provision of skilled- and seasonal visas. During the height of COVID-19, this source of labour supply came to an almost complete stop. This context is more relevant than before to understand the current population composition and workforce requirement within an economy where the international labour movement is limited.

The two models' combined results are represented in Figure 6, showing the historical and future level of employment and the workforce with the total population for the Canterbury region up to 2029.

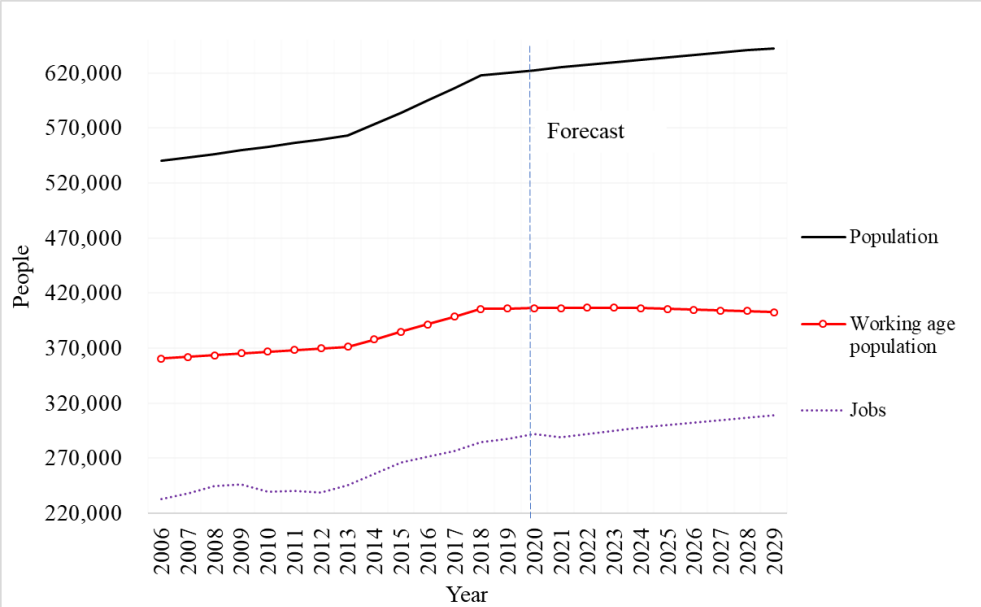

Figure 6. Canterbury Workforce Projections, up to 2025. Source: Author's Calculations.

Figure 6 reveals a distinctive trend. The population is forecast to continue to increase, while the working-age population will peak near 2023. Secondly, the economy, assuming a modest rebound in 2021 and growth at 1 percent annually from 2022, will continue to require labour, with more jobs demanded over the long term. The limitation of the regional labour market becomes clear within the analysis and while the local labour force is likely to provide the required capacity for the foreseeable future in most industries, gaps are likely to start emerging in specialised or seasonal labour markets.

Recently, the labour market participation rate has been near 70 percent. Assuming that this represents the long-term full employment equilibrium within the Canterbury economy, deviation from this level is likely to result in increased demand for labour as participation breaches the mark or alternatively results in lower demand for labour participation is below.

Figure 7 reveals the historical and estimated future workforce required within the region with labour force participation at the average level (i.e. 70 percent participation). The graph reveals the estimated employment requirements that relate to the economy up to 2029 given the model

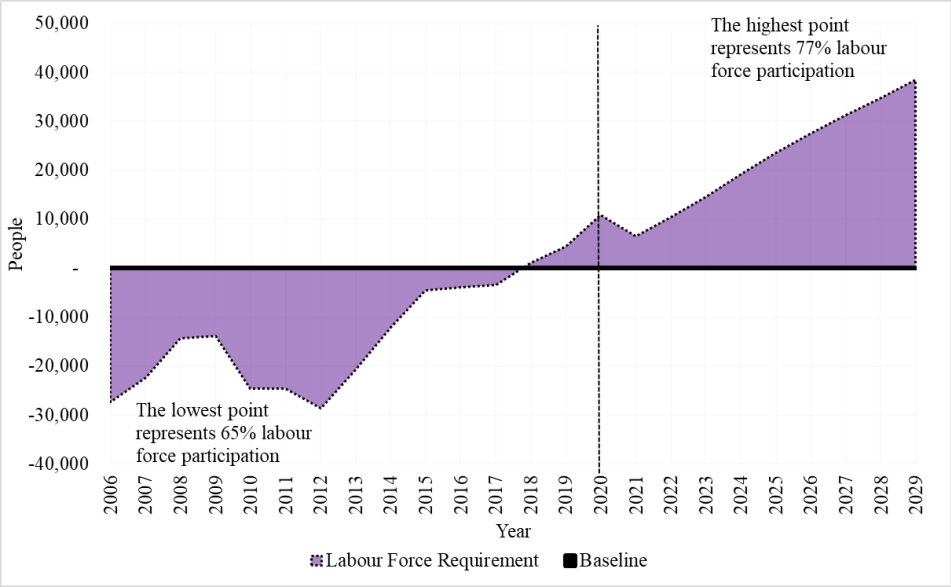

Figure 7. Working-age Population Gap, up to 2029. Source: Author's Calculations.

specifications. The baseline (solid black line on the y-axis) represents labour force participation at 70 percent. Any deviation from this line represents over- and under-supply within the labour market and deviation from the baseline is expected to occur. The labour market takes time to respond to new employment opportunities. These may also create fluctuations in the labour market with periods of higher (above 70%) participation, but also lower (below 70%), as evident in the fluctuation on both sides of the baseline between 2006 and 2020. In the period between 2015 to 2019, labour force participation remained close to 70 percent with an increase throughout 2019 and 2020. This is a likely indication that the economy was gaining traction after the earthquake's significant investment.

However, we note that the economic shock from COVID-19 decreased participation rates, especially within the second and third quarters of 2020, but rebounded in the final quarter to reveal a slight decrease on an annual basis in Figure 7. The combined result from the modelling suggests that demand for labour is not expected to deteriorate soon. Labour force participation is expected to continue to be above 70 percent and increase. This result is further supported by recent household labour force survey findings for Canterbury, revealing labour force participation in 2021 has

increased from around 69 percent in 2019 to 71 percent in 2021 (Statistics New Zealand, 2021e). The results suggest that labour force capacity is shrinking. The growing regional economy coupled with border restrictions is likely to result in increasing levels of participation as the local labour market pool stabilise and more importantly reduce due to population transitioning. This would suggest that other actions are required to increase the workforce. In-migration could be one possible response.

Therefore, much of the workforce for the next couple of years could be sourced locally, however, the long-term demand for jobs would require sourcing labour from outside the region.

5. DISCUSSION

The above analysis indicates a substantial emerging labour force gap in the coming decades in the Canterbury region. Assuming the absence of substantial productivity growth, current patterns in natural population growth will not be sufficient to satisfy the demand for labour over the medium term for Canterbury. Local and regional policymakers are thus limited to the following options regarding labour force development: devise policies that stimulate natural population growth, devise policies aimed at increasing domestic in-migration into Canterbury, devise policies aimed at reviving a larger share of international immigration into New Zealand, devise policies aimed at retention of potential outward migrants leaving Canterbury. The workforce model discussed above excludes migration and here we briefly discuss how suited the existing migration framework is to address the projected labour shortfall.

Current economic conditions and government policy both play a significant role in the migration to New Zealand. The current workforce is supported by migration from outside national borders and it is anticipated that this will continue to be an important source for skills within the economy once growth turns positive in the economy. COVID-19 has had a significant effect on migration throughout the world and New Zealand and Canterbury have been similarly affected. Recent migration has not only provided the required skills for the growth in the economy, but it has also replaced the retiring human capital within the workforce. Recent, pre-pandemic annual net migration for Canterbury increased from 3,500 in 2013 to 8,100 in 2018.

Uncertainty about international immigration will remain and is dependent on the longevity of COVID-19, border restrictions and economic growth within New Zealand and Canterbury.

Both national in-migration and international immigration have contributed to an estimated 9,800 people moving into the Canterbury region between 2017 and 2018. These have represented a significant contribution to population increases for the region. These flows are expected to remain one of the primary sources to fill the workforce expected in the regional economy.

The Canterbury labour market has previously shown resilience by adjusting to demands and difficulties associated with natural disasters. During that time, the ability to attract labour from outside the region has provided the required skill to support the economy. For a region that relied heavily on the international labour market, the border restrictions as a result of the COVID-19 pandemic could potentially be disastrous if restrictions remain in the long run. However, the results from the analysis reveal that the pre-pandemic labour inflow coupled with the lower near-term economic activity has created a labour buffer for the region, but this is quickly reducing.

The regional labour market pipeline remains strong in the short term and labour force participation rates are likely to edge higher as new employment opportunities emerge which could potentially mean people entering the labour force earlier (i.e. school leavers) or those that are nearing retirement would consider remaining in the labour force longer.

A further consequence of a growing economy is increasing internal migration into Canterbury from regions where the labour market pressure is low. Localised and regional lockdowns in response to COVID-19 are another possible restriction to labour market movements. Although the extent and duration of localised lockdowns are more flexible, it is expected that these will influence labour movement between regions.

Finally, as the labour force shrink and unemployment remain low, pressure on industry-specific labour supply pipelines is expected to emerge. Competition among industries to source students, both in high school and the university is expected to increase as the labour supply tightens. This has further implications on wage and salary increases which is again affecting inflation. The effect of tighter labour markets and their effect on the wider economy provide scope for further research on a regional level.

6. CONCLUSION

The effect of border restriction due to the pandemic is assessed for Canterbury, a region that has relied upon migration to support regional economic activity post-earthquake. In order to estimate the effect of

restricted borders on a regional economy's labour market, this paper assessed both population change and economic change over time international labour movement restrictions are in place.

The results present both opportunities and challenges for policymakers as targeted support for the region post-earthquakes will reduce as the national post-COVID recovery gains traction.

Canterbury, a region familiar with disruption through disasters and recently with the COVID-19 pandemic, has over the past decade relied upon a significant inflow of labour through international migration but will have to rely on other sources in the near term as a result of policy.

The paper finds that the steady pre-pandemic inflow of international labour has provided a short-term buffer that is likely to keep labour force participation rates close to 70 percent in 2021 and 2022. This is further supported by the lower short-term economic activity resulting from COVID-19 with reduced demand pressure on the workforce. However, a rebound and consistent economic growth from 2021 is expected to increase labour demand, with a continued increase in labour force participation required to support economic activity. The current population structure should be able to support economic activity, but this could vary depending on actual growth and employment requirements. Recent labour market results already suggest that capacity within the labour market is shrinking and pressure on relaxing the strict border requirements is needed to support the economy. Migration is seen as an important source of population and workforce to replace retirements and support the growing economy. This migration is initially likely to be driven by internal migration within New Zealand and between regions, while international migration is seen as the long-term solution.

The workforce gap is expected to increase annually and the initial gap would require net inward migration of the working-age population to average at least 10,000 per year, from national or international sources. Migration is the likely primary source to support this workforce gap since the local labour market requirements would have to be sourced from outside the region to sustain continued economic growth. Without significant changes in productivity or natural population growth, regions and countries that historically relied on immigration to support the economy are likely to continue to rely on migration as a labour source.

This paper provides avenues for future research, especially with regards to the structure of the regional economy and how the tradeable and non-tradeable industries of the regional economy rely on migration. In other words, some sectors within the economy are likely more reliant on labour

that originate from outside the region than within. Due to the shock, the concept of coupling and decoupling between economic and population growth could be prevalent and potential future research to develop this further is suggested.

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