COVID-19, THE EFFECT OF LOCKDOWNS ON RETAIL EXPENDITURE AND DISPLACEMENT EFFECTS ON THE REGIONAL ECONOMY

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Abstract: The COVID-19 pandemic is exerting ongoing economic effects on communities locally and globally. Government responses to the ongoing crisis range from mere social distancing recommendations to lockdowns. In New Zealand, a strict lockdown regime was implemented for a 7-week period during which public activity was restricted and shopping limited to the nearest supermarket or pharmacy. During this period, overall retail spending declined substantially. This study employs a multi-region input-output (MRIO) model to investigate the impact of this reduced activity from an urban population on the wider-regional economy. The results reveal that the change in consumer spending and displacement has spilled over into the adjacent economies resulted in a shift in the regional economic landscape. Moreover, our results suggest that the effects of withheld spending during the lockdown propagate unevenly across retail sectors and beyond administrative boundaries once lockdown is lifted. Although millions of dollars remain unspent, the accelerated pace of consumer spending after lockdown reveals a shift from previous large-scale global shocks.

1. INTRODUCTION

The 2019 Novel Coronavirus (COVID-19) crisis and its aftermath are expected to exert significant social and economic disruptions in local and global communities. Ongoing research into its economic impact frequently relies on historical comparisons with the global financial crisis of 2008/2009, natural disasters such as earthquakes, or earlier epidemics such as the SARS outbreak or avian influenza. While these comparisons appear to be a helpful guide in estimating COVID-19's economic impact, the uniqueness and scale of the ongoing COVID-19 crisis require assessment that goes beyond the use of historical comparisons. The New Zealand government's policy response to the rapid increase of daily infections in March 2020 was a 7-week lockdown of significant parts of economic and social life, lasting from 25 March 2020 to 12 May 2020. This strict lockdown was the first of its kind in the Australasian region (Koh, 2020). The lockdown mandated the avoidance of any physical contact outside people's own household except for those employed in essential industries. The government developed a four-level alert system as a measure that responds to COVID-19 (see Table 1).

Consequently, a hitherto unprecedented disruption of economic activity ensued, bringing most of economic life (outside of 'essential industries') to a standstill. At the end of the 7 weeks, this policy approach had been labelled a success from an epidemiological perspective, with the number of fatalities being very small and daily new infections reduced to single digits at the end of the lockdown.

While this was undoubtedly considered a policy success from a public health perspective, it remains to be assessed what the impact of these stringent measures on the economic wellbeing of New Zealand communities was. Being deprived of the opportunity to spend money outside of essential goods, and mirroring consumer behaviour elsewhere in the world (Baker *et al.,* 2020), New Zealanders withheld a significant amount of expenditure that would otherwise have been spent in the economy. While there was some additional spending evident in the form of pent up demand immediately after the cessation of the lockdown, the

economic impact of a significant amount of 'unspent' money during the lockdown remains to be evaluated. In this study, retail spending data is sourced from Verisk to reveal the retail spending changes. The study further develops a multi-region input-output (MRIO) model to assess the economic flow-on effect of absent expenditure brought about by this unexpected event. Such models have been used to model inter-regional economic interdependence at the country and sub-regional level (Andrew and Peters, 2013; Hewings and Jensen, 1987). This study applies this method in the context of restricted economic activity caused by a global pandemic.

Table 1. New Zealand Four Level Alert System - Key Measures. Source: Unite against COVID-19, New Zealand Government, 2021.

Level	Measures
Alert level 1	• Border restriction with 14-day mandatory isolation • Face coverings on public transport
Alert level 2	• Alert level 1 measures plus • Physical distancing • Gatherings with a 100 person limitation
Alert level 3	• Alert level 2 measures plus • Stay within a household bubble • Regional travel is restricted • Gatherings up to 10 people allowed • Public venues must close • Work from home where possible • Restriction on business operations
Alert level 4	• Alert level 3 measures plus • Stay at home • No gatherings • All business closed, except for essential services • Education facilities are closed

The remainder of this paper is structured as follows: A review of the existing and expanding literature on consumer displacement combined with the methodology applied for this study is provided next. This is followed by a discussion on changes in consumer behaviour due to the

lockdown restrictions and reduced retail spending. The model results are then discussed and followed by a conclusion.

2. LITERATURE AND METHOD

The implementation of lockdowns as a response to reduce the risk of spreading COVID-19 is generally viewed as an effective measure from a health point of view (Lau *et al.,* 2020; Kharroubi and Saleh, 2020). The consequence of this measure on consumer behaviour resulted in renewed interest in understanding consumer consumption related to disasters and crises (Hall *et al.,* 2020). This has led to increasing studies to understand and measure how consumer spending has influenced as a result of the pandemic and how it has changed from pre-COVID trends, with the majority of studies focussing on panic-buying (Hall *et al.,* 2020; Hall *et al.,* 2021; Islam *et al.,* 2021).

A recent study by Hall *et al.* (2020) defines consumer displacement resulting from COVID-19 as a shift in consumption when the usual availability of goods changes due to an external event. Their study reveals how lockdown had an immediate impact on spending by consumers, with the hospitality industry, which includes both food services and accommodation, particularly negatively affected by the lockdown measures. Wang *et al.* (2020) show that consumers extended their food reserves from 3.37 to 7.37 days, which is an initial benefit for grocery retailers as consumers increase their food reserves. Dyason and Kleynhans (2021) reveal the effect of the lockdown on retail businesses for a city with a large presence of students. The study shows how a move from contact learning to online learning leads to displacement of retail spending from students in the host city with negative consequences on employment within the retail industry.

There is surprisingly little on the topic of consumer displacement of retail spending and its effect on the economy as a result of the pandemic and no evidence of studies applying longitudinal data to measure the effect at a regional level. This paper adds to the limited but growing literature on retail spending displacement during pandemics. The restrictions placed by the government and the consequent spending behaviour of consumers have a far larger effect on society through the forward and backward linkages within the economic system. These interactions are well documented in impact studies that measure the effect of a shock on the economy (Choi *et al.,* 2019; Galbusera and Giannopoulos, 2018). The economic system interaction leads to a spillover of the shock for connected activities over

time. The application of the MRIO model from retail spending aims to reveal how consumer spending displacement has far-reaching consequences and impacting employment in connected, but unsuspecting geographies, within the economy.

To quantify these potential intra-regional and inter-regional economic spillover effects within the Canterbury region of New Zealand, this research paper develops an MRIO model to assess the flow-on economic impact of this non-occurring expenditure. An augmented 2017 Canterbury Input-Output (IO) model is developed and used to integrate the government's policy decisions to respond to COVID-19 to estimate the impact on the Canterbury workforce.

Accuracy of models is often raised especially when it comes to estimating the impact of disasters. Okuyama's (2007) finding regarding economic modelling of disasters reveals that the main aim should be to observe how the results from the event change how the model would typically behave. Understanding what might happen as a result of the disaster, is as valuable, especially since a disaster in itself is already a deviation from conventional activity (Okuyama, 2007).

Lundberg *et al.* (1995) identified IO analysis as a mainstay method for assessing the economic impacts of external shocks to an economy. IO analysis is an analytical framework with the primary purpose of analysing the interdependence of industries in an economy (O'Connor and Henry, 1975:1). An IO model comprises a system of linear equations, each one of which describes the distribution of an industry's product throughout the economy. In other words, an IO traces the flow of money through the economy to capture how the output of one sector becomes the input of another, that is, how the industries in an economy are dependent on one another. An IO model makes provision for two kinds of activities on a sectoral level, namely 1) the purchase of intermediate inputs and 2) the supply of intermediate and final outputs. The total output/production of Sector 1 (X_1) is, therefore, the sum of the intermediate outputs, plus the final demand/output of Sector 1 (F_1), alternatively stated, final demand is the difference between output and intermediate demand (Van Wyk *et al.,* 2015):

$$F_1 = X_1 - a_{11}X_1 - a_{12}X_2 - a_{1n}X_n \qquad (1)$$

where $a_{ij} = \frac{x_{ij}}{X_j}$ is the technical coefficients defined as the quantity of intermediate inputs required by a particular sector from another sector to supply a one-dollar unit of output. To extend the application across all industries, equation (1) can be re-written in matrix format as:

$$F = (I - A)X \qquad (2)$$

where F is a vector of final demand, I is an $n \times n$ identity matrix, A is the technical coefficient matrix, and X is a vector of production. To determine the impact of a shock to final demand (F) on output or production (in this case, changes in consumer spending and displacement), the Leontief inverse is applied, that is:

$$X = (I - A)^{-1}F \tag{3}$$

The above general IO model framework makes it possible to quantify the economy-wide impact of a shock to the economy. This framework can also be extended and applied at different levels of an economy (that is, national, regional, county, district). Such regionalization of an IO model from one of a higher scope (in the current case, from regional to district level) can be done by applying several well-known variations of regionalization methods (see, e.g. Norbert, 2015 for a comprehensive summary). These can be divided into three central groups, namely 1) Survey, 2) Non-survey, and 3) Hybrid methods (Greenstreet, 1989). For the current study, a non-survey method, known as the FLQ formula (Flegg *et al.,* 1995) is applied.

The FLQ formula is derived from a popular non-survey method and is based on the well-known location quotient (LQ). The LQ is the relative concentration or density of a specific sector in the region versus the national average for that sector (Dunn, 1960). The LQ is used as an indicator of regional sectoral specialization, which in turn, is used to transform national technology into a regional one (Norbert, 2015). Flegg *et al*. (1995) proposed a new variant of the existing LQ method, known as the Flegg location quotient (FLQ) formula. The authors suggested an inverse relationship between a region's relative size and its propensity to import from other regions (Parra, 2018).

According to Flegg *et al*. (1995), the factors that can affect the self-supplying ability of a region expand by the relative size of the region. Thus, FLQ considers relative specialization, the size of the purchaser and producer sectors, and also the size of the region (Norbert, 2015). The FLQ formula is defined as:

$$FLQ_{ij}^r = CILQ_{ij}^r \times \lambda^r \tag{4}$$

where $CILQ$ is the inter-industry LQs for a given region r, that is, the relative importance of the supplying industry i with respect to the purchasing industry j (Schaffer and Chu, 1969), and λ captures the relative size of a region r. The latter can be calculated as:

$$\lambda^r = \left\{ \log_2 \left[1 + \left(\frac{x_E^r}{x_E^n} \right) \right] \right\}^{\delta}, 0 \leq \delta < 1 \tag{5}$$

where x_E^r and x_E^n are the respective regional and national totals for a given region r.

Based on equation (5), the quotient is not modified directly by the relative size, but by the logarithmic value of it, and thus ensuring that the scaling is not so intensive, and the whole expression is then raised to the power of δ, which is a sensitivity parameter. The larger the value of δ, the stronger the adjustment in FLQ (Norbert, 2015). For the current study, the sectoral share of each district's GDP is used as the value for δ. The quotient can then be applied like its predecessor:

$$a_{ij}^{rr} = \begin{cases} \left(FLQ_{ij}^r\right)a_{ij}^n, ha\ FLQ_{ij}^r < 1 \\ a_{ij}^n, ha\ FLQ_{ij}^r \geq 1 \end{cases} \tag{6}$$

For the diagonal ($i = j$) elements of the MRIO, the traditional LQ (see Table 2) can substitute the FLQ again (Norbert, 2015).

Table 2. Gross Domestic Product (GDP) Based LQs for the 9 Canterbury Districts in 2017. Source: Authors' calculations using data from Statistics New Zealand (2020b).

Sectors/Industries	Ashbur ton	Christchu rch City	Hur unui	Kaik oura	Mack enzie	Sel wyn	Tim aru	Waima kariri	Wai mate
Agriculture	4.49	0.13	5.64	2.20	3.42	3.57	1.34	1.48	8.32
Forestry, Fishing, Mining, Electricity, Gas, Water and Waste Services	1.94	0.61	2.39	1.89	5.28	0.85	1.89	2.45	1.16
Manufacturing	1.22	0.96	0.96	0.59	0.21	1.01	1.56	0.72	0.30
Construction	0.68	1.05	0.51	0.85	0.49	0.83	0.83	1.70	0.51
Wholesale Trade	0.89	1.14	0.52	0.46	0.09	0.62	0.76	0.52	0.14
Retail Trade	0.86	1.04	0.42	1.37	0.58	0.51	1.06	1.41	0.38
Accommodation	0.25	0.94	2.30	5.89	13.72	0.90	0.57	0.46	0.48
Food and beverage services	0.76	1.03	1.45	2.36	2.45	0.78	0.76	1.03	0.36
Transport, Postal and Warehousing	0.38	1.11	0.41	1.68	0.57	0.57	1.44	0.48	0.84
Financial and Insurance Services	0.66	1.20	0.12	0.76	0.13	0.21	0.70	0.66	0.24
Rental, Hiring and Real Estate Services	0.55	1.12	0.79	0.36	0.44	0.64	0.69	1.00	0.54
Owner-Occupied Property Operation	0.84	1.04	0.76	0.96	0.76	0.95	0.97	0.94	0.72
Professional, Scientific and Technical Services	0.36	1.23	0.20	0.09	0.13	0.78	0.38	0.47	0.40
Administrative and Support Services	0.70	1.21	0.13	0.37	0.96	0.26	0.60	0.53	0.12
Public Administration and Safety	0.37	1.02	0.37	0.94	0.37	2.45	0.74	0.72	0.41
Education and Training	0.56	1.01	0.69	1.03	0.74	1.67	0.77	1.28	0.85
Health Care and Social Assistance	0.48	1.17	0.28	0.83	0.08	0.28	1.03	0.53	0.31
Information Media, Telecommunications and Other Services	0.63	1.13	0.59	1.29	1.04	0.71	0.71	0.82	0.37

Our starting point for the current study is the Canterbury IO table (for the year ended March 2017, in NZ$ million), which is capable of depicting the inter-industry relationships of the whole Canterbury economy. By following the above methodology and approach, and using the calculated LQs (shown in Table 1), the initial 106 industry by 106 industry Canterbury IO table is aggregated to an 18 industry x 18 industry IO and converted to an MRIO model, capturing the intra-regional and inter-regional intermediate demand and supply in Canterbury, using the FLQ method. This level of sectoral aggregation allows for a standardised view across districts within the Canterbury region.

At this point, the estimated MRIO table is not consistent and requires a final adjustment. The columns satisfy regional intermediate use constraints (row total), but in the rows, intermediate supply is not guaranteed to be consistent. The final step is to balance the estimated MRIO matrix by using the RAS technique (Lahr and de Mesnard, 2004). The newly derived MRIO model is then converted to a Leontief model using equations (2) and (3), which is then applied for modelling the impact of an external shock to the Canterbury region and its various districts using the type I and II multipliers MRIO-based Leontief model.

Currie *et al*. (2020) promote the use of modelling and simulating to understand the complexity of COVID-19 and its effect on a system. These authors encourage the use of a qualitative approach, such as the one applied in this study, to inform future government policy, while repurposing existing models is, at this stage, the best quantitative approach to find answers (Currie *et al.,* 2020). This study applies the augmented 2017 Canterbury MRIO model, as discussed above, and integrates the policy decisions from the government to respond to COVID-19 to estimate the impact on the Canterbury hospitality workforce.

The rapid New Zealand government's policy response to COVID-19 was aimed to eliminate the virus from the country (Baker *et al.,* 2020). Evaluating the effect of this strategy on the workforce within the Canterbury region, which relies heavily on international visitors, is bound to elicit mixed views.

Data are sourced from Verisk Financial and based on the spending and transactions of BNZ and Paymark credit and debit (EFTPOS) cardholders and constitute a representative sample of consumer spending in New Zealand (Verisk, 2020).

The data used for this research paper considers only spending values from point-of-sale spending by Christchurch consumers, given the quick pace of global lockdown introductions and restriction to international

travel. Comparing consumer spending trends from local consumers provides the best indication of consumer spending changes during this period.

Christchurch is the largest city within the South Island of New Zealand with a population of 385 500 in 2019 (Statistics New Zealand, 2020a). Being the largest city within the South Island, changes in retail spending behaviour from the resident population is expected to influence the economy through the economic value chain beyond the administrative boundary of the city's economy. The results from the MRIO model are expected to reveal the magnitude of this impact on the regional economy.

Figure 1. Map of Canterbury with its Administrative Regions, New Zealand. Source: the Author and Statistics New Zealand, 2021.

3. THE 'UNSPENT' MILLIONS

Consumers react to the type of crisis and its aftermath in different ways, and this becomes evident through their spending (Finsterwalder, 2010; Potter *et al.,* 2015; Prayag *et al.,* 2019). Consumers represent the most significant economic role-player within the New Zealand economy. Changes in their spending habits will, therefore, have a considerable effect
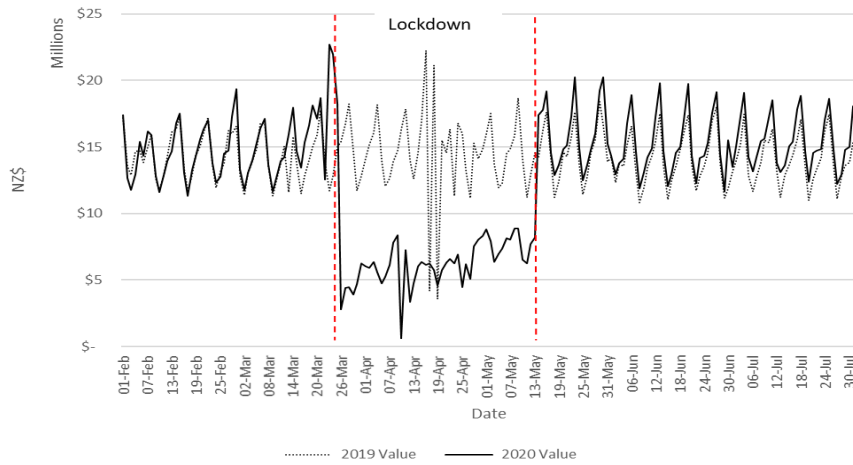
on economic activity, jobs and income levels, propagated through the various affected industries' value chains. In 2018, consumer spending represented nearly 60 percent of the country's economy (Statistics New Zealand, 2020b). Therefore, any regulation that limits spending is bound to influence economic activity (Hall *et al.,* 2020). The New Zealand government-imposed lockdown enforced regulation that directly influenced spending in retail. Hall *et al.* (2020) have shown these initial consumption changes within the context of COVID-19 for the Canterbury economy within New Zealand. The authors argue, using Christchurch as an example, that the effect of COVID-19 related government regulations elicited consumption displacement. This result suggests that the adjustments in consumer spending take place at an accelerated pace once lockdown lifts compared to a more extended return to everyday spending from shock such as the Great Recession (Mian *et al.,* 2013) the GFC in 2008 (Parker, 2017) or earthquakes (Prayag *et al.,* 2019).

Since the change in lockdown level and lift in regulation that limits movement, a longer period of spending encompassing the various stages of lockdown provides us with a better understanding of how consumer spending within Christchurch has progressed. The data provide insight into changing consumer spending at an aggregate and retail type level that allows analysis and implication formulation.
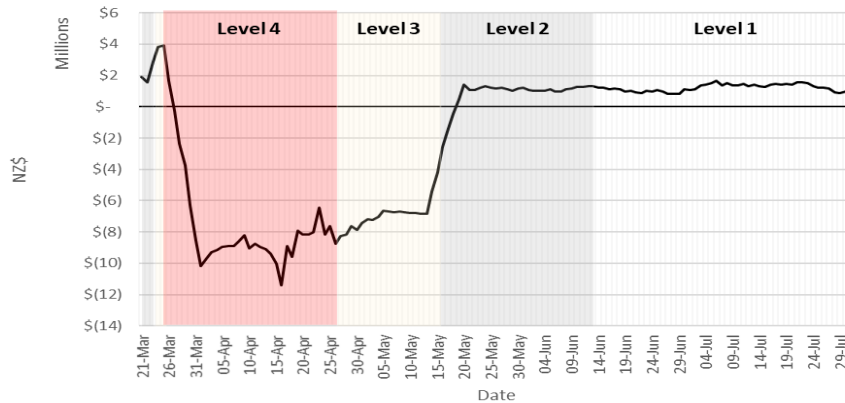
The consumers' spending reaction in the period before, during and after the lockdown for the Christchurch region and compared with 2019 is illustrated in Figure 2. The level three and four lockdown periods between 26 March and 26 April 2020 represent the stringent lockdown period, with strict regulations that limited trading and most retail activity. Immediately prior to the 26 March 2020 a surge in retail activity is evident, indicating panic buying of groceries as well as the purchase of do-it-yourself materials to be used during the announced lockdown. The lockdown level two period, after 13 May 2020, corresponds with a lifting of most of the regulations that limited trade, and consequently, spending bounced back. The increased spending was supported by, among other things, pent-up demand from the lower retail spending during level three and four lockdowns but also supported by a national marketing drive aimed at consumers to support local businesses by spending in the economy (Dyason, 2020).

A detailed analysis of the spending data reveals a spike in retail sales of 60 percent compared to the corresponding period in 2019 for the days before the level four lockdown. Only essential services were allowed to operate during the 7-week level three and four periods, and the daily

spending data shows the below-average spending in the city in this period. The regulations put in place by the government to stop the spread of COVID-19 were primarily focused on minimizing movement through the lockdown regulations (Henrickson, 2020). This has led to a dramatic drop in spending from Christchurch residents during lockdown levels three and four, with spending decreasing from $693 million in 2019 to $295 million in 2020, a difference of $397.5 million (CPI-adjusted) for the same period (see Figure 3).

Figure 2. Daily Retail Spending in Christchurch, New Zealand, 2019 vs. 2020. Source: Verisk Financial, 2020a.

Figure 3. Difference in Daily Spending, 2019 vs. 2020, 7-Day Rolling Average. Source: Verisk Financial, 2020a.

The period after level three is referred to as post-lockdown, given that most of the limitations that restricted retail activity had been relaxed and retail spending increased significantly. This rebound has widely been explained as pent-up demand in New Zealand and throughout the world (New Zealand Treasury, 2020; Hagan, 2020). The pent-up demand represents the temporal displacement of spending by consumers (Hall *et al*., 2020) with the money not spent (or saved) during the lockdown, being spent during the period after lockdown. Since the introduction of level 2 lockdown on 15 May, the Christchurch consumers have consistently spent more than the same period in 2019 up to 31 July 2020. Between 15 May and 31 July 2020, the total value in consumer retail spending is $90.8 million (CPI-adjusted) above the 2019 value for the same period.

Overall, the spending data from prior to the March 26th lockdown up to the end of July 2020 reveal that a total of $283.8 million (CPI-adjusted) has not been accounted for within the economy. It remains up for debate if this represents an uncertainty premium for consumers within the economy, which is being saved or kept for a proverbial 'rainy day' that could potentially re-emerge. Alternatively, it could also be used as deposits or down payment for residential property ownership. To this end, spending data from Verisk for Christchurch show that a significant amount of consumer spending has either been lost or displaced from the retail industry within the city.

At this point, it remains uncertain what the flow-on effect of this unspent retail-related spending implies for the Canterbury region through the various affected industries' value chains. The MRIO model, which allows us to quantify these inter-industry and inter-regional input-output linkages, provides key results and implications for Canterbury as a result of the lost millions. The analysis, therefore, enables us to identify both the intra-regional, as well as inter-regional economic impacts within Canterbury.

The unspent $283.8 million translates into a loss in gross value added (GVA) in Christchurch of $198 million or 3.1 percent of quarterly economic value and a total loss of $216 million or 2.4 percent for Canterbury. Furthermore, it translates into 3,605 lost jobs in Canterbury, with the majority of jobs lost concentrated in Christchurch (3,398) and followed by Ashburton (62) and Timaru (40). Household income throughout the regional economy has reduced by $127.8 million. This loss could potentially be limited by fiscal support from the national government in response to the lockdown regulation. In particular, the contribution of the wage subsidy scheme aimed to support directly affected businesses through a wage subsidy that would enable businesses that suffered a loss

in income to continue to provide wages, even if no output was produced, is likely to support retail spending further. The COVID-19 Wage Subsidy was introduced to assist businesses to pay their staff, allowing them to claim up to $585.80 per week per full-time employee and $350 per part-time employee) for up to 12 weeks (and a further 8 weeks with the Extended Wage Subsidy). If a business claimed the subsidy for an employee, they were required to protect that job while the support was in effect. As of 28 June, the Wage Subsidy and Extended Wage Subsidy has covered 1.7 million jobs (Ministry of Business, Innovation and Employment, 2020). Due to the wage subsidy, not all jobs may have been made redundant and more clarity could be had once the wage subsidy concludes.

The results from the MRIO model could shed light on the income support beneficiary data from the Ministry of Social Development (MSD) (2020) for the Canterbury region. The data reveal the continued impact of job losses as a consequence of lower economic activity due to the COVID-19 pandemic. Between March 2020 and July 2020, the total number of beneficiaries from the Jobseeker support and the COVID-19 income relief payment schemes in Canterbury has increased by 7,164. The MSD data does not show the jobs per industry affected. However, the results from this paper indicate that at least 50 percent of the lost jobs, at this point, could be attributed to the lost millions from lower retail spending by Christchurch consumers with a broader spillover to the rest of the Canterbury economy.

4. MRIO MODEL RESULTS ON RETAIL DISPLACEMENT

By mid-May 2020 and on the final day before the lifting of the hard lockdown (Levels 4 and 3) a total of $399.5 million of retail spending remained unaccounted for or unspent within the retail industry in Christchurch. However, this was about to change as retail spending over the next eleven weeks, coinciding with fewer restrictions, outpaced the spending of the same period of the previous year and the value of unspent retail purchases decreased to $283.8 million (see Figure 3) by the end of July 2020. Throughout this period, a change in retail spending is observed, with several retail types attracting higher spending values than in previous years.

As a result, the MRIO model is applied to reveal how the changing consumer spending patterns affect the larger regional economy.
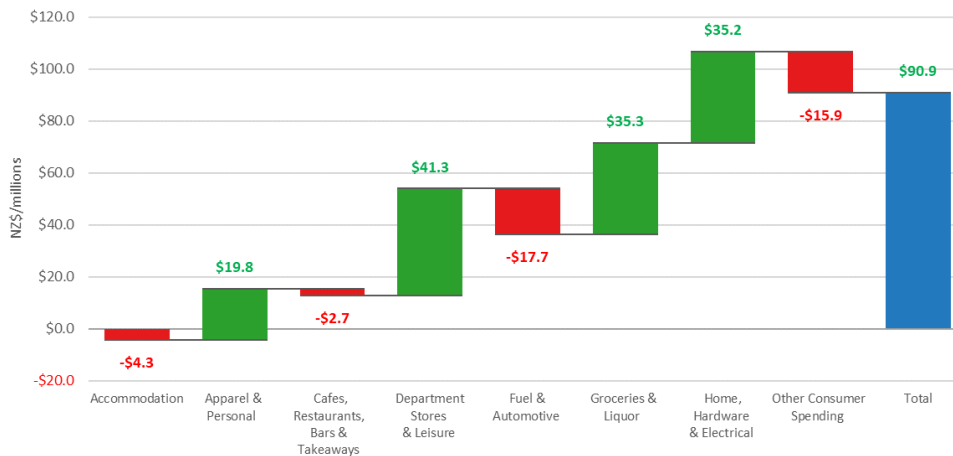
The spending data illustrate aspects of consumption displacement from one retail type to another once lockdown restrictions were lifted (i.e. levels

2 and 1). Figure 4 shows the retail spending displacement that has taken place between the retail types within Christchurch.

The initial change in consumer spending for the first 11-weeks after the hard lockdown reveals that accommodation, hospitality, fuel and other consumers' retail activity are lower compared to the same period in 2019. The opposite is evident for the other retail types that continued to receive a larger share of the spending. Several reasons could be put forward as to why these retail types have attracted more substantial spending, including *inter alia* displaced spending from planned holidays, changing consumer preferences, discretionary spending and price changes.

This paper does not speculate on the reason behind these changes but instead quantifies the effect that this displacement in spending may have on the Canterbury-wide economy. Furthermore, it is likely that some of the spending is deferred rather than a permanent loss. In this case, the results of this analysis remain relevant, given that businesses, through their intentions to employ will respond to current sending habits from consumers.

The net difference in spending between 2019 and 2020 for the period from 15 May to 31 July is used to quantify the flow-through effect on various segments of the economy on a district level within Canterbury. Total spending during this period is $91 million more than in 2019.

Figure 4. Retail Spending Displacement After Lockdown, Compared to the Same Period in 2019. Source: Author's calculations.

The MRIO model allows us to quantify the regional effect of consumer displacement from Christchurch city residents by estimating the downstream effect in the Canterbury regional economy (see Table 3).
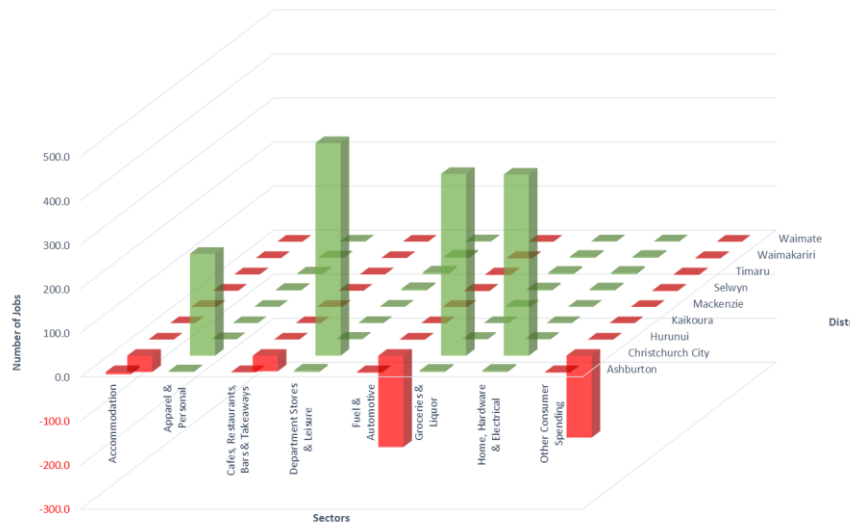
Table 3. Displacement Effect Result, NZ$/Millions. Source: Author's calculations based on the Canterbury MRIO.

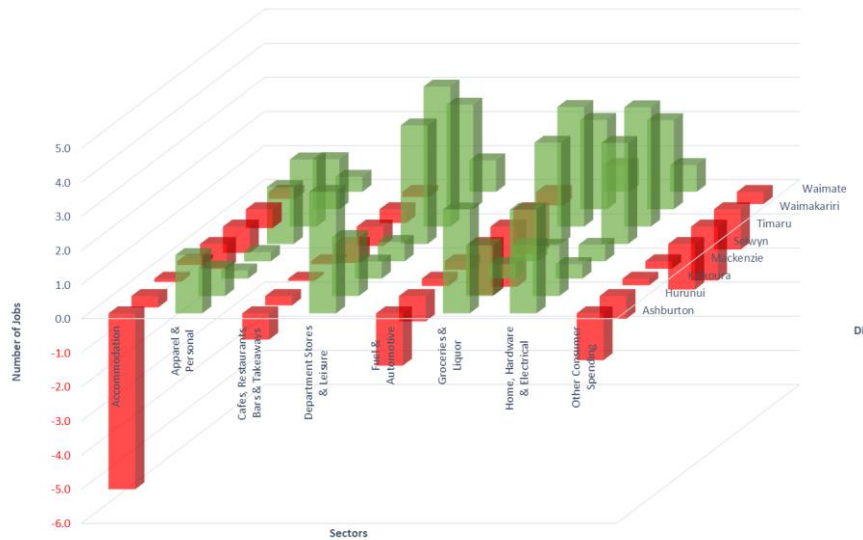| District	Output ($)	GVA ($)	Employment (#)	Household Income (%)	Tax ($)
Ashburton	$ 0.7	$ 0.2	3	$ 0.1	$ 0.0
Christchurch City	$ 136.4	$ 70.6	1,073	$ 42.1	$ 2.2
Hurunui	$ 0.8	$ 0.3	3	$ 0.2	$ 0.0
Kaikoura	$ 0.2	$ 0.1	1	$ 0.0	$ 0.0
Mackenzie	$ 0.3	$ 0.1	1	$ 0.1	$ 0.0
Selwyn	$ 1.6	$ 0.6	7	$ 0.3	$ 0.0
Timaru	$ 2.1	$ 0.8	8	$ 0.4	$ 0.0
Waimakariri	$ 1.6	$ 0.6	6	$ 0.3	$ 0.0
Waimate	$ 0.4	$ 0.2	2	$ 0.1	$ 0.0
Total	**$ 144.0**	**$ 73.5**	**1,104**	**$ 43.5**	**$ 2.4**

The change in retail spending from Christchurch residents not only affects the city's economy, but also the adjacent, smaller regional economies with Timaru, Selwyn and Waimakariri the economies affected (benefiting) most. The benefit of the MRIO model is that it reveals the extent of the economic interactions across geographies, resulting from displaced spending on retail.

Figure 5a shows this change in the economic landscape of the Canterbury region. As the largest concentration of job changes are in Christchurch City, it is possible to get a better view of the knock-on effects outside Christchurch by removing it. Accordingly, the bottom figure (see Figure 4b), highlights some clear winners and losers across sectors and districts from the changing spending that has occurred.

a)   With Christchurch City

b)   Without Christchurch City

Figure 5. Displacement Effect Result for Employment (Number of Jobs). Source: Author's calculations based on the Canterbury MRIO.

Note: Green bars represent job gains and red bars represent job losses.

The MRIO model reveals how changing consumer spending post-lockdown has shaped the recovery of the Christchurch economy, as well as the adjacent economies.

The model shows how these inter-and intra-regional economic interactions form part of the regional economy where administrative boundaries are often ignored by producing and consumer stakeholders. The results reveal how the adjacent economies, in particular Waimakariri, Selwyn and Timaru, are affected by changing retail spending by Christchurch residents in Christchurch. The administrative boundaries are disregarded within the economic system, where goods and services are procured from suppliers and where consumers are willing to traverse long distances to purchase.

The model accentuates the benefit of increased spending and is noticeable in the number of new jobs supported by the increased spending by the residents. The immediate response from consumers to spend has reduced the initial risk of large-scale job losses due to the lockdown. Even with the evidence of displaced retail spending between the various retail types, the net gain in the period after the lockdown remains positive for employment within the city and the region.

The increased spending post-lockdown has benefited the local and regional economy by mitigating the overall negative impact of a lockdown. The benefit of post-lockdown spending forces the economy to react immediately to increased demand and establish existing and new value chains to supply the increase in demand. This is best shown through the MRIO model with the support of jobs and household income within the regional economy.

It appears plausible that the general nature of the findings can be extended to other regions and in similar circumstances as well. We thus postulate that the main implications of our study, notably that the immediate spending by consumers have mitigated significant job losses in the city, but also within the regional economy once lockdown lifted and that displacement in spending from one retail type to another has varying effects on employment across geographies. These are generalisable features of pandemic induced lockdowns and subsequent changes in retail expenditure and its displacement effects on regional economies.

5. CONCLUSION

Retail spending data during the period leading up to and after the lockdown has revealed the far-reaching effect that government regulation to control COVID-19 has had on the regional economy. This study

demonstrated the inter-and intra-regional economic effects of the COVID-19 lockdown, focussing on retail spending patterns only. Significant effects are evident that go beyond territorial boundaries and propagate through to employment and household incomes. While the analysis in this paper has focused on the Canterbury region, it appears plausible that the effects demonstrated here are evident in other regions of New Zealand and Australasia, as the economy opens after lockdown, as well. Governments, including the New Zealand government, attempt to alleviate the economic effects of COVID-19 related countermeasures by increasing spending and, thus, public debt. Different governments have chosen different policy responses to address the challenges that this pandemic represents. These responses have ranged from reasonably drastic economic and social restrictions such as seen in New Zealand to a more equanimous approach such as taken in Sweden. From a public health perspective, New Zealand accomplished rapid success in eliminating the SARS-CoV-2 virus from within its borders. This was achieved at the great economic expense of rising business failures, unemployment and public debt. Since the cessation of the initial lockdown, there have already been several further smaller outbreaks of COVID-19 in localised clusters. The probability of additional flare-ups of COVID-19 can also not be excluded, and it appears socially, politically and economically less feasible that further large-scale lockdowns are implementable. At the time of writing, a potential end of the COVID-19 crisis is not in sight. In light of the sizeable economic expense of social and economic lockdowns, as demonstrated in this study and analysis of the impact on a single sector, retail, the possibility of further total lockdowns should be carefully evaluated concerning its potential knock-on effects in the broader economy. Subsequent research should build on these results, especially considering the effect of reinstating a lockdown scenario, or even have multiple such situations and its effect on the regional economy.

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