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Panic Buying and Consumption Displacement during COVID-19: Evidence from New Zealand

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Abstract: Panic buying and hoarding behavior is a significant component of crisis- and disaster-related consumption displacement that has received considerable attention during the COVID-19 pandemic. Understanding such purchasing and stockpiling behavior provides critical information for government, disaster managers and the retail sector, as well as policy makers to adjust crisis response strategies and to better understand disaster management, including preparedness and response strategies. This study examines consumer purchasing behavior, retail spending and transactional data for different retail sectors between January 2017 and December 2020 using data for the greater Christchurch region in New Zealand. Once COVID-19-related panic buying began, overall spending increased sharply in anticipation of lockdowns. Transactional spending increased and subsided only slowly to a level higher than pre lockdown. The magnitude of the panic buying event far exceeded historical seasonal patterns of consumer spending outside of Christmas, Easter and Black Friday, although daily spending levels were comparable to such consumption events. The results of the study highlight the importance of comparing panic buying to other events in terms of purchasing motivations and also considering that so-called panic buying may contribute to greater individual and household resilience. The volume of sales alone is not adequate to define panic buying. Instead, the extent of divergence from the normal daily spending value per retail transaction of a given population provides a much more accurate characteristic of panic buying.

Keywords: panic-buying; displacement; stockpiling; COVID-19; retail spending

1. Introduction

Fear, panic and insecurity are an integral human response to crisis and disaster, with responses being dependent on a range of individual and socio-economic factors (e.g., culture, economic security, gender, personality) as well as proximity to the source of risk (Bonneux and Van Damme 2006; Michie and West 2020; Qian and Li 2020; Tan et al. 2020; Yang and Xin 2020). The understanding of such behaviors is regarded as critical in improving the quality of crisis and disaster response as well as individual, economic and regional resilience with respect to existing and future crisis events (Coles and Buckle 2004; Bristow 2010; Modica and Reggiani 2015; Karatzias et al. 2017; Van Bavel et al. 2020; Kowal et al. 2020; Ye et al. 2020; Benker 2021).

A topic that is a feature of disaster- and crisis-related insecurity is panic buying and stockpiling behavior, with such consumer and, to a lesser extent, organizational behavior being a widely reported response to COVID-19 intervention measures enacted by government (Remko 2020; Yoshizaki et al. 2020; Islam et al. 2021; Taylor 2021). Understanding such purchasing and stockpiling behavior provides critical information for government, disaster management organizations and the retail sector, as well as policy makers to adjust crisis response strategies (Wang et al. 2020; Wang and Hao 2020). From a business perspective it can also allow for better management and adjustment of inventory and can improve supply chain management while maintaining consumer satisfaction (Brandtner et al. 2021). Panic buying affects the shopper experience, with empty store shelves and an absence of required products, while hoarding behavior can threaten the stability of the food system (Wang et al. 2020; Wang and Hao 2020), especially in import-reliant cities and regions (Song et al. 2021). Experience with crises and disasters, including COVID-19, also indicates that product categories may be differentially affected over time (Kirk and Rifkin 2020).

Hoarding or stockpiling is the act of collecting and safeguarding a large quantity of possessions for future use (Chu 2018). Consumer hoarding during COVID-19 were likely to be primarily affected by government public health interventions that served to constrain consumers' normal consumption behaviors and practices (Hall et al. 2020), e.g., in terms of where, when and how to purchase; supply chain disruptions (Kirk and Rifkin 2020; and social media (Zhao and Zhou 2020; Leung et al. 2021), and sensationalist media reporting (Arafat et al. 2020b). This was manifested by product scarcity on shelves, most recognizably with respect to a seeming global concern with the availability of toilet paper (Garbe et al. 2020; Loxton et al. 2020; Yoshizaki et al. 2020; Leung et al. 2021; Taylor 2021), and aggressive instore consumer behavior. Perry and Lindell (2003) argued that in the event of a disaster most people do not develop panic flight responses. Instead, "behaviour in the disaster response period is generally pro-social as well as rational" (Perry and Lindell 2003, p. 50). However, although it is suggested that panic buying tends to influence a relative minority of people and disappears in a short time period (Ballantine et al. 2014; Yuen et al. 2020), Perry and Lindell (2003) were primarily writing in terms of specific disaster events of limited scale rather than a national and global event such as COVID-19. Panic buying is not necessarily caused by a supply deficit per se, although perceptions of a future deficit are significant, but by consumers' heightened anxiety and fear (Tsao et al. 2019). In the case of COVID-19, all of these factors were applicable. Various conceptual definitions of panic buying exist, with some focusing on the impulsive and obsessive behavior (Islam et al. 2021; Naeem 2020), others focusing on hoarding or stockpiling behavior (Wang et al. 2020). However, the majority attempted to define panic buying and hoarding from a perspective of consumer behavior and psychology and in isolation from the actual pattern of consumption over time which, arguably, is just as significant with respect to understanding the economic, social and organizational response implications of such behavior.

This paper therefore examines consumer purchasing behavior, retail spending and transactional data from the city of Christchurch in New Zealand for different retail sectors during the COVID-19 pandemic. However, unlike existing studies of panic buying, this research seeks to position the COVID-19 response within a longitudinal context so that the differences between panic buying and other periods of low frequency, high-magnitude consumption periods, such as Christmas, can be better identified and evaluated. In addition, we seek to identify if there are any longer-term implications of panic buying and hoarding on consumer purchasing behavior. This is also significant as previous research (Hall et al. 2020) has argued that disaster and crisis events, such as earthquakes and health crises, need to be better understood with respect to their capacity to displace consumption and be analyzed over the longer-term with respect to their effects on regional consumption and economic systems rather than as immediate events, as significant as they may appear at the time. Such a perspective is also far more in keeping with the different stages of a crisis or disaster that are recognized in disaster management (mitigation/prevention, preparedness,

response, and recovery) and which can be used to better prepare for future crises (Khan et al. 2008; Hall et al. 2016; Rahmi et al. 2019).

1.1. Panic Buying as a Consumer Response

Panic buying is a complex behavior fueled by diverse and multiple motives and psychological processes (Dholakia 2020; Yuen et al. 2020). It is usually regarded as a psychological reaction in response to stress, anxiety, depression, fear and uncertainty about the future (Dholakia 2020; Dubey et al. 2020; Mukhtar 2020). Food hoarding and stockpiling as exemplars of this behavior represent an attempt to take control of a chaotic situation, reduce fear and insecurity, and therefore represents a coping mechanism for individuals (Arafat et al. 2020a, 2020b). Stockpiling addresses two fundamental psychological needs of individuals (Lopes et al. 2020; Loxton et al. 2020; Zhang and Smith 2020; Herjanto et al. 2021). First, it allows individuals to feel that they have exerted a degree of control when the environment surrounding them is chaotic and they feel that the associated risks are uncontrollable, fatal or have catastrophic potential for themselves. Second, fear of the unknown that heighten risk perceptions during a crisis can also be attributed to panic buying (Slovic 1987; Yuen et al. 2020). A perception of relative scarcity is also potentially strongly linked to panic buying of particular product categories, while this behavior can also be driven by lack of trust and anticipation of a decline in consumption options (Dholakia 2020).

Panic buying has also been approached from several different theoretical perspectives of consumer behavior. Kirk and Rifkin (2020) argue that hoarding is the first of a three-stage process, where consumers react, then cope and in the long-term adapt to environmentally imposed constraints. In the short-term fear and anxiety, for example, prompt consumers to take action in the face of an imminent threat. These negative emotions also cause cognition and attention deployment, which can sway individuals toward focusing on immediate needs and protect themselves against future harm (Kemp et al. 2021). From a social learning theory perspective, people learn by observing the behaviors of others around them and gauge from their reactions the seriousness of a crisis (Arafat et al. 2020a, 2020b). From a psychological reactance theory perspective (Clee and Wicklund 1980), panic buying can be explained by the perceived need for a threatened object when the threat to product availability is experienced by consumers as a loss of control. It is often a self-fulfilling prophecy with the more that customers purchase impulsively and obsessively, the more anxiety consumers experience due to scarcity, and the more quickly products may get sold out (Islam et al. 2021). As such, panic buying is usually regarded as having both cognitive and affective aspects of non-normal consumer behavior.

Significantly, in terms of crisis and disaster management, panic buying is an expected response during disasters and crises as such events threaten both individual and society ability to cope with the unexpected and threatens the individual and social equilibrium (Arafat et al. 2020a, 2020b; Hall et al. 2020; Yuen et al. 2020). Indeed, Wordsworth et al. (2021) suggest that previous experience of disasters may predispose consumers to be better prepared and informed with respect to responding to new crises, including awareness of the items they may need to help get them through a disaster physically and psychologically. As such, some consumption which may be framed as panic buying by one set of researchers may be acknowledged as potentially rational and resilient by others (Hall et al. 2016; Kostev and Lauterbach 2020; Benker 2021; Wordsworth et al. 2021)

1.2. Panic Buying and Consumption Displacement during COVID-19

The burgeoning evidence on panic buying globally due to COVID-19 shows that stockpiling behavior of non-perishable food and bathroom products was not uncommon, with panic buying of toilet paper receiving considerable media publicity (Garbe et al. 2020; Kirk and Rifkin 2020; Loxton et al. 2020; Yoshizaki et al. 2020; Leung et al. 2021; Taylor 2021). Panic buying is part of the wider process of consumption displacement that occurs during disasters and pandemics. Consumption displacement refers to the shift in

consumption that occurs when consumers experience a change in the usual availability of goods, services and amenities as the result of an external event, and which is characterized by the points in space and time where consumption occurs and by the movements to, from, and between those points (Hall et al. 2020). In other words, the *when, where, what, why* and *how* that characterizes consumption during non-routine consumption (Hall et al. 2020).

Chronopoulos et al. (2020) suggest that overall, United Kingdom consumers respond to negative shocks by reducing spending although panic buying does occur in some product categories. In Germany, a 126% and 137% increase in sales of canned fruits and vegetables were noted during March and the average sales of non-perishable goods remained above the average thereafter (Lehberger et al. 2021). In a Chinese study, Wang et al. (2020) showed that after the outbreak of COVID-19, consumers extended their food reserves from an average of 3.37 to 7.37 days and were willing to pay a premium of 60.5% on fresh product reserves. Both media and governments have contributed to fears about the scarcity of food and other services (Dubey et al. 2020; Cato et al. 2021). In Canada, overall sales were 46% higher in grocery stores for the week ending 14 March in 2020 compared to 2019. In terms of specific grocery store product categories milk sales increased by 31%, butter by 76% and fresh chicken by 50% (Weersink et al. 2020).

However, there are substantial variations in the patterns of consumer expenditure during and between lockdowns both between and within countries. Spending is affected both by restrictions on consumer mobility and threats of impending government-imposed lockdowns (Chronopoulos et al. 2020; Hall et al. 2020; Kemp et al. 2021). Overall information regarding consumer response to pandemic interventions provides valuable short and long-term perspectives for government policy making during economic and health crises and also assists in disaster preparedness and management. This study therefore uses the daily collection and aggregation of transaction data from the retail sector to provide an assessment of the impact of COVID-19 on consumer spending and panic buying and consumption displacement within the context of longer-term expenditure patterns.

2. Data and Findings

To assess consumer purchasing behavior during the COVID-19 pandemic, retail spending and transactional data for different retail sectors for the period between January 2017 and December 2020 were sourced from Verisk New Zealand. This aligns with approaches used in previous studies (Wang et al. 2020). In the analysis, we limited data use to spending and transactional data by Christchurch residents in the Christchurch urban area and main retail type. Christchurch is New Zealand's second largest city and the largest urban center on New Zealand's South Island (Statistics New Zealand 2021). Annual retail sales in Christchurch amounted to NZD 5.4 billion in 2020, representing 9.1 percent of New Zealand's overall retail spending of NZD 59.5 billion.

2.1. Overall Retail Spending Patterns

Overall retail spending volume in New Zealand (NZ) Dollars since 2017 can be seen in Figure 1. Notable are the characteristic annual volume surges prior to Easter and Christmas holidays and their decline afterwards. The visible pre-Easter spikes signify amplified shopping volumes in preparation for mandatory shop closedowns on Good Friday and Easter Sunday, while trading volumes on Good Friday and Easter Sunday decline substantially due to such closures. Annual pre-Christmas shopping patterns include a steady rise of volumes, culminating in a peak on the day prior to Christmas. This is followed by a sharp drop on Christmas day, which is also due to mandatory closures of most retailers on Christmas day. Retail shopping volume patterns regarding Christmas and Easter repeat consistently in the first three years of the observation period, with only minor variations in magnitude.
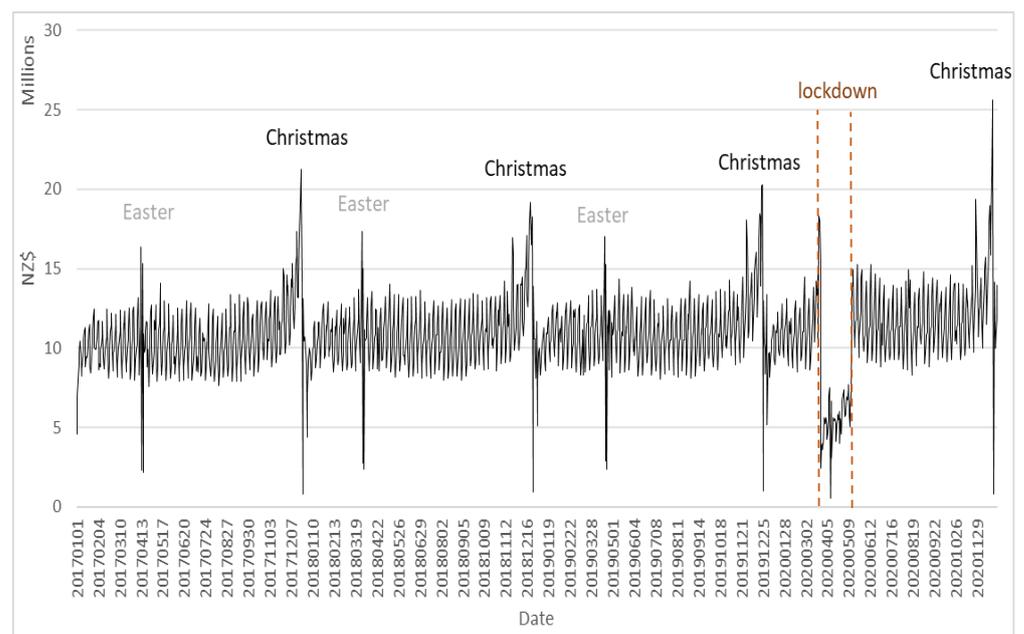
Figure 1. Daily retail spending, Christchurch residents, 2017–2020. **Source.** Authors, (Verisk New Zealand 2021).

The COVID 19 crisis started to emerge in China in late 2019 (Hall et al. 2020); however, the developing pandemic became publicly relevant in New Zealand only as its implications via potentially infected tourists arriving in the country became apparent (see Figure 2 refer to timeline graph). Overall retail spending in early 2020 thus exhibited the pattern that would normally be expected.
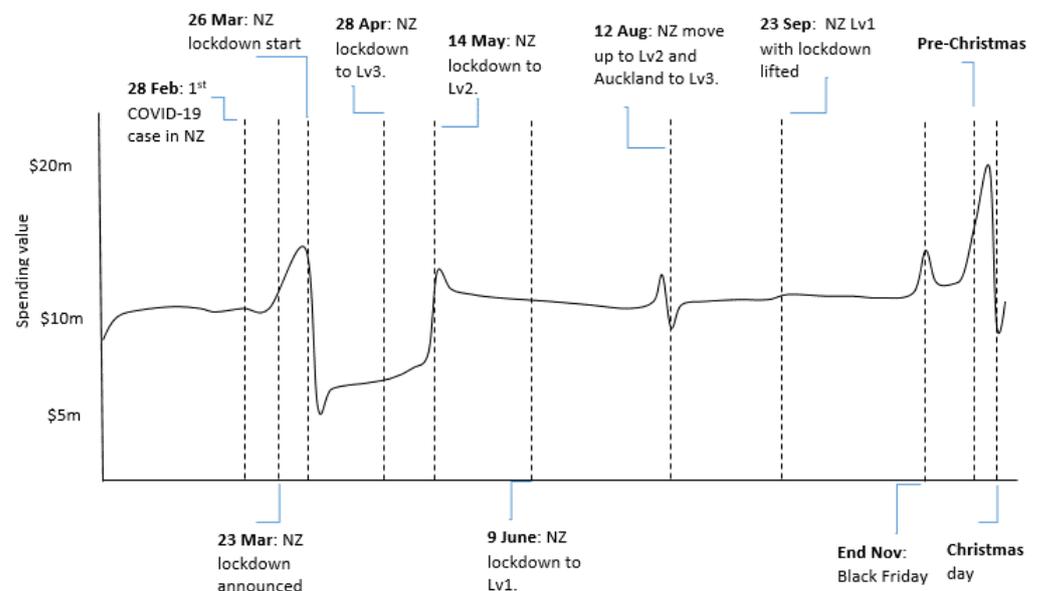
Figure 2. Timeline of COVID-19 in New Zealand and Christchurch retail spending, 2020. **Source.** Authors; (Verisk New Zealand 2021).

As worldwide media coverage of the spread of COVID-19 grew and local cases began to be reported, the New Zealand government announced and introduced various alert levels with measures in response to the pandemic (Table 1). On 23 March 2020, the government announced that the strictest lockdown level, Level 4, will apply from 26 March for the entire country. This resulted in an immediate increase in consumer spending in the

days leading up to the 26 (Gerritsen et al. 2020). As the alert levels changed from April, consumers reacted positively as the spending lifted and by 14 May, most restrictions were removed and retail spending remained high. On 13 August 2020, new community cases of COVID-19 forced another change in alert levels, with Auckland moving back to level 3 and the rest of New Zealand to level 2. This announcement again led to a drastic change in consumer purchases, even within Christchurch. Spending stabilized thereafter and the lifting of the lockdowns in September, coupled with Black Friday sales and the Christmas period saw spending grow for the remainder of the year.

Table 1. Alert levels, risk assessment and measures.

Alert Level	Risk Assessment	Measures Applied That Affect Consumption
Alert Level 1 *Prepare* Disease contained	Isolated household transmission could be occurring in New Zealand	Border entry measures to minimize risk of importing COVID-19 cases Self-isolation and quarantine required if sick Schools and workplaces open Physical distancing encouraged No restrictions on gatherings No restrictions on domestic transport
Alert Level 2 *Reduce* Disease is contained, but risk of community transmission remains	Household transmission could be occurring Single or isolated cluster outbreaks	People can be with friends and family, go shopping, or travel domestically, but should follow public health guidance Physical distancing of two meters, with one meter physical distancing in controlled environments like workplaces unless other measures are in place No more than 100 people at indoor or outdoor gatherings Sport and recreation activities are allowed subject to conditions, contact tracing and physical distancing Public venues must comply with public health measures Businesses open to the public, but must follow public health guidance including in relation to physical distancing and contact tracing Alternative ways of working encouraged Educational facilities open
Alert Level 3 *Restrict* High risk the disease is not contained	Community transmission might be happening New clusters may emerge but can be controlled through testing and contact tracing	People instructed to stay home in their bubble other than for essential personal movement Physical distancing of two meters outside home including on public transport, or one meter in controlled environments like schools and workplaces Bubbles must stay within their immediate household bubble, but can expand to connect with close family, bring in caregivers, or support isolated people. This extended bubble should remain exclusive People must work from home unless that is not possible Businesses can open premises, but cannot physically interact with customers Low-risk local recreation activities are allowed Public venues are closed (libraries, museums, cinemas, food courts, gyms, pools, playgrounds, markets) Gatherings of up to ten people are only allowed for weddings and funerals Inter-regional travel is highly limited to essential workers, with limited exemptions
Alert Level 4 *Lockdown* Likely that disease is not contained	Community transmission is occurring Widespread outbreaks and new clusters	People instructed to stay at home in their bubble other than for essential personal movement Safe recreational activity is allowed in the local area Travel is severely limited All gatherings cancelled and all public venues closed Businesses closed except for essential services, e.g., supermarkets, pharmacies, clinics, petrol stations and lifeline utilities Educational facilities closed Rationing of supplies and requisitioning of facilities possible

Source: After (Government of New Zealand 2020; Hall et al. 2020).

The total retail spending in Figure 1 consists of six sub-types of retail namely (i) apparel and personal, (ii) cafes, restaurants, bars and takeaways, (iii) fuel and automotive, (iv) groceries and liquor, (v) home and recreation and (vi) other consumer retail. We consider the spending behavior from consumers on the two largest sub-types, namely groceries and liquor and home and recreational purchases in our analysis. Combined they contribute 67 percent of total retail spending in the city for 2020. Figure 3 shows the cyclical nature of consumer purchase trends for the selected retail types during 2019 and 2020.
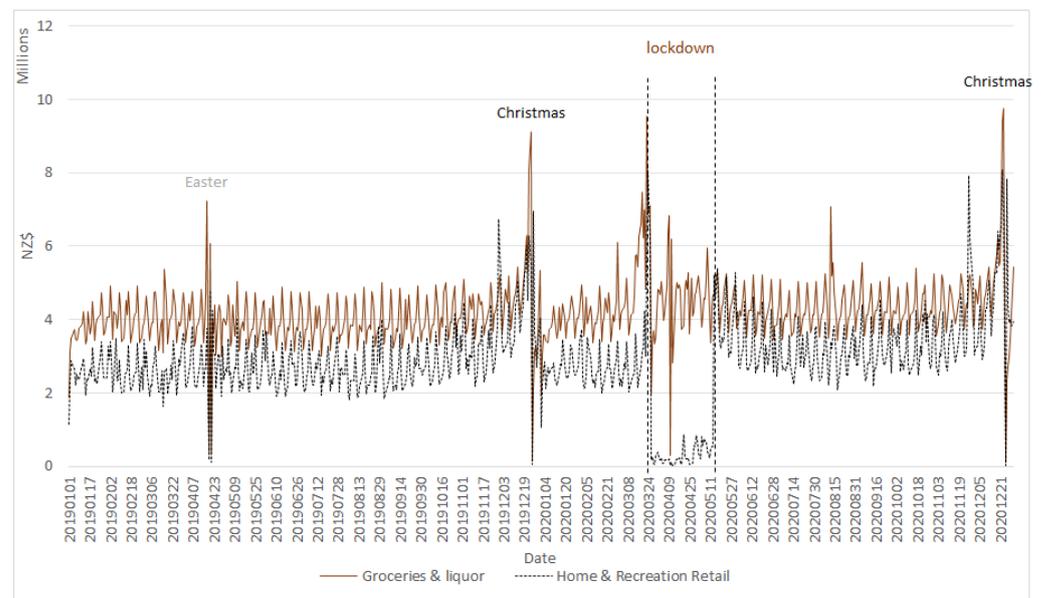

Figure 3. Daily spending per retail type, Christchurch residents, 2019–2020. **Source.** Authors; (Verisk New Zealand 2021).

The seasonal spending in both retail types mirrors the total retail spending, with a surge prior Easter and Christmas in 2019. During the level 4 lockdown, spending trends decouple for these retail types, as groceries and liquor remain high, while home and recreational spending reduce to almost zero. The difference cannot be more obvious during the level 4 lockdown period and once lockdown ends mid-May, we observe a recoupling of the trend. This change was as a result of the impositions and withdrawal of restrictions placed on activities considered to be non-essential.

At this point, the data suggest that surges in spending do occur annually at specific periods within the year, most notably Easter and Christmas. The period leading-up to lockdown, and more precisely the grace period provided by government from the day where the lockdown is announced up and to the day the lockdown is implemented, reflect a similar surge in spending. This surge in spending is a deviation from the norm.

Analysis of the standard deviation of the same data and retail types over the period 2018 to 2020 reveal the extent of the surge as a result of the lockdown. The trend beyond one standard deviation in spending for home and recreation (left) and groceries and liquor (right) is shown in Figure 4.

The daily standard deviation is calculated from the preceding 7-day moving average. This captures daily and weekly seasonality within the spending data and allows for comparison of spending over time. The results reveal relatively stable deviation at one deviation above the average, throughout the year, however, the effect of Christmas and Easter spending is still visible in the data (see Figure 4). The weeks following the closure of business at Easter and Christmas reveal significant variation due to the lower 7-day average for the week in which the comparison is provided.
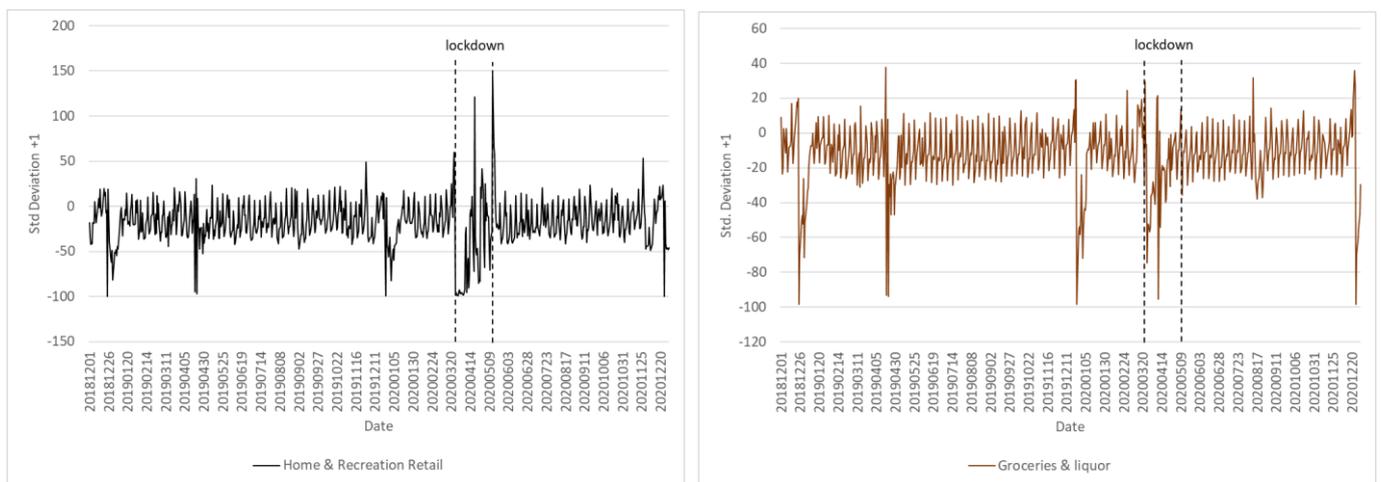
Figure 4. Std. Deviation +1, daily spending per transaction, Christchurch residents, 2018–2020. **Source.** Authors; (Verisk New Zealand 2021).

The deviation reveals that the initial lockdown in March and consequent spending surge is similar and within the same upper boundary to that experienced during Christmas and Easter. Furthermore, the lockdown announcement in August of 2020 and a move up the alert levels (Alert Level 3 for Auckland and 2 for the rest of New Zealand) had a similar immediate spike in the deviation in groceries and liquor. The deviation for home and recreational retail reveal two spikes within the lockdown period, one on 20 April, which does not relate to any government announcement and therefore likely due to essential service activity. The other instance with a spike in the deviation is on 14 May, the first day back down to Alert Level 2 where movement restrictions was lifted.

2.2. Transactions

The volume of transactions provides a further indication of consumer behavior. A combination of transactions and retail value reveal the spending value per transaction. We therefore postulate that during periods of increasing retail spending, such as Christmas and Easter, the value per transaction will be higher. The seasonal trend suggest that retailers will be prepared to accommodate this surge in spending by ensuring their value chain and logistics network based on just-in-time manufacturing and delivery is capable of supporting this short, but expected surge (Hobbs 2020).

We test this by estimating the daily spending value per transaction for each of the retail types. Figure 5 shows the daily spending value per transaction for groceries and liquor and home and recreational services from 2019 to 2020.

It is apparent that groceries and liquor values per transaction were very consistent throughout 2019 and exhibited minor breakouts only around Easter and Christmas. In 2020 a rapid rise in transaction value is evident from around mid-March as news from international lockdowns of countries started to emerge and continued to increase daily when the implementation of a lockdown became foreseeable. Due to the continued accessibility of grocery stores panic buying continued into the lockdown and began to subside slowly after the Easter weekend until it stabilized after the lockdown. Even then, a post lockdown level shift is clearly noticeable that continued until the onset of Christmas shopping toward the end of 2020.

The results reveal, quite clearly, that the surge in spending did not stop when lockdown took effect, in-fact, and consumers continued to spend more per transaction within the lockdown period.

Inflation, measured as a bundle of goods that consumers typically buy, remained low during the March and June quarters of 2020 at 2.5% and 1.5%, respectively (Reserve Bank of New Zealand 2021). Although, substitution of certain goods that were in limited supply

likely took place, the overall indication is that prices did not increase rapidly within this period that affected the increase in spending values. Rather, the behavior of consumers appears to have been the main driving force.
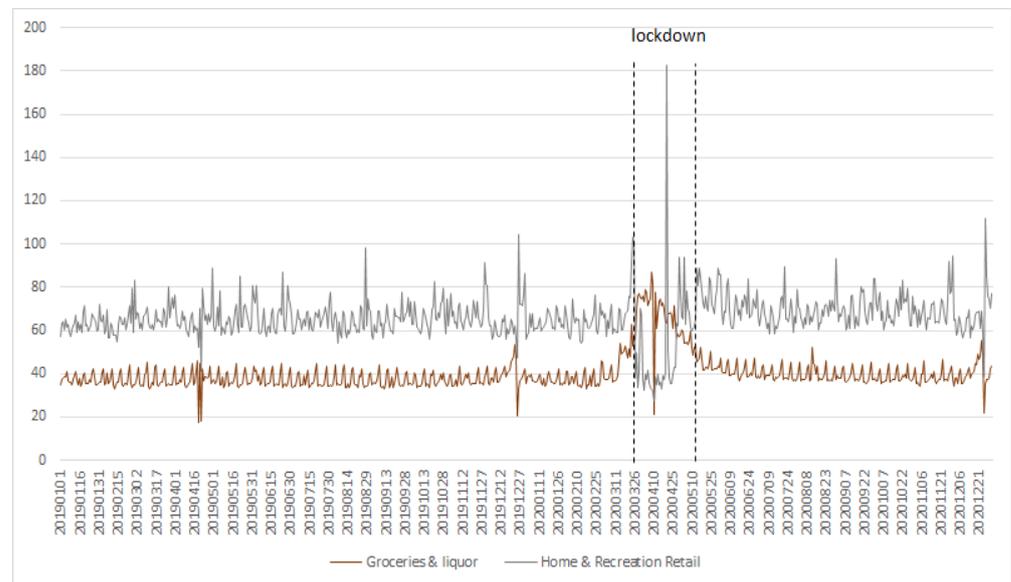
Figure 5. Daily spending per transaction, Christchurch residents, 2019–2020. **Source.** Authors; (Verisk New Zealand 2021).

3. Discussion

The patterns evident from the empirical analysis of data for the city of Christchurch reveal several characteristics that appear associated with lockdown-related panic buying:

1. The panic buying event is catalyzed by an unexpected and suddenly occurring crisis phenomenon that triggers a policy response (e.g., a partial or complete lockdown) which may impact on people's livelihood and their potential inability to provide for themselves in light of a prolonged crisis scenario.
2. Once a panic buying scenario is initiated, overall spending increases sharply in the lead up to anticipated lockdowns.
3. Transactional spending increases and subsides only slowly to a level higher than pre lockdown.
4. Different consumption categories exhibit vastly different patterns. Consumption displacement occurs as increased spending flows from non-essentials to necessities of life. This is exacerbated by hoarding of essential items and government mandated shutdowns of some non-essential retail sectors.
5. The magnitude of the panic buying event far exceeds historical seasonal patterns of consumer spending (outside of Christmas and Easter).

The Christchurch regional results regarding the relationship between COVID-19 lockdowns and consumer expenditure provide significant insights into panic buying and hoarding behavior. The results illustrate the changes in consumption displacement that occur over the life course of a crisis (Hall et al. 2020). The New Zealand experience of panic buying and hoarding behavior in the period prior to the imposition of lockdowns is similar to that of overseas (Garbe et al. 2020; Kirk and Rifkin 2020; Loxton et al. 2020; Yoshizaki et al. 2020; Leung et al. 2021; Taylor 2021). However, the overall longer-term pattern of expenditure during the pandemic is different from that experienced by several European countries which suggested that consumers reduce their expenditure as a response "to negative shocks increased uncertainty, financial constraints or declining expectations regarding future income prospects" (Chronopoulos et al. 2020, p. 151). This may well be correct in those countries with frequent lockdowns, but the present results suggest that

while consumers share common characteristics of panic buying and hoarding at the onset of a disaster, the understanding of consumer responses over the longer term needs to be more nuanced with respect to the nature and management of the disaster as well as the time period examined. Much of the UK and European experience (Chronopoulos et al. 2020) is of nations that experienced multiple major lockdowns. In contrast, the greater Christchurch region and most of New Zealand only experienced one severe extended lockdown leading to substantially different consumer behavior and confidence over the longer-term compared to international counterparts even when COVID management and alert levels were altered to respond to localized outbreaks (Hunt 2021).

From a theoretical perspective, similar to other studies (Dholakia 2020; Yuen et al. 2020), we argue that panic buying is non-routine consumption behavior that is driven by the psychological need to self-protect in relation to an external event (disasters and pandemics). Consumers hoard both essential and non-essential items in anticipation of the limited availability of these items in the short-term and even long-term depending on the scale, magnitude and duration of the disruptive event. In essence, the consumption displacement that occurs as a result of a disruptive event represents a coping mechanism for individuals (Arafat et al. 2020a, 2020b). Of interest, given that groceries and liquor sales exhibited panic buying behavior, have implications for how individuals cope with uncertainty and drinking behavior, in particular, could have long-term impact on individual and community wellbeing. The increase in home and recreation product sales indeed reflect individuals' need to undertake activities that keep them busy during and post-lockdown, highlighting perhaps another coping mechanism that is activated in response to COVID-19. A focus on self, from a psychological perspective, but also on self-possessions (material things, e.g., house) confirm that humans tend to self-protect during uncertain times.

4. Conclusions

This study has provided an examination of COVID-19-related panic buying and hoarding behavior within the context of longer-term consumption patterns for the greater Christchurch region of New Zealand. The results illustrate that the region shares similar panic buying and hoarding behavior at the onset of the imposition of substantial COVID-19-related mobility and social distancing restrictions (lockdown) but that longer term consumer expenditure is more positive than many European nations that have experienced multiple lockdowns. Reasons for this are potentially related to New Zealand's wider success in combating COVID-19 and the relatively short period of lockdown over the pandemic period. Another possible explanation, which deserves further study in a wider context, is that the region's previous experience with recovery from the impacts of a severe earthquake sequence may have meant that consumers were more experienced in dealing with disasters and their aftermath (Hall et al. 2016). Indeed, the large majority of studies of consumer hoarding tend to describe it in terms of panicked behavior without sufficient consideration of either the prior experiences of consumers with disasters and the retail and supply chain issues they create or the potential rationality and value of such an approach in some circumstances (Kostev and Lauterbach 2020). This is a significant point as behaviors that are often portrayed in a negative light may actually be a significant contributing factor to the increased resilience of individuals and households to external shock (Benker 2021). In addition, it is worth noting that hoarding behavior by businesses is seemingly ignored in research on panic buying and presents a significant research opportunity given the way in which it intersects with consumer purchasing and supply chain stress (Hall et al. 2020; Remko 2020).

The other dimension of the study that is of considerable importance in the broader context of understanding the economic behavior of consumers during crises and disasters is positioning COVID-19 panic buying prior to lockdown in a longitudinal context. Although COVID-19 panic buying clearly represents a form of consumption displacement (Hall et al. 2020) with respect to regular purchasing patterns and the imposition of restrictions on mobility and social distancing creates considerable turbulence and shifts in consumption

in the consumer ecosystem, it is noticeable that daily retail spend is little different from other peaks at Christmas, Easter and Black Friday. This finding suggests that researchers need to better examine crisis- and disaster-related panic buying in comparison with the consumer behaviors and expenditure related to major regular consumption events for a better understanding of such behaviors, including concerns over stockout (Ma et al. 2018; Kumar et al. 2021) and the various meanings associated with consumption (Tynan and McKechnie 2009; Veer et al. 2016). Indeed, in seeking to differentiate panic buying from other consumption events, it is clear that using the volume of sales alone is not adequate. Instead, we would advocate that any adequate economic definition of panic buying needs to recognize it in terms of the non-normal daily spending value per retail transaction of a given population. The conclusions of this study are, of course, only drawn from the one location that limits the potential applicability of the findings. The data do not reveal the effect of (food) waste associated with existing spending in particular for groceries that triggers a follow-up transaction. This could potentially explain the gradual increase in grocery spending over time during lockdown. The transactional data group all sales into the main retail sector and do not distinguish between spending on consumer goods, in particular the transactions on non-durable goods that could provide further insight into value-chain pressures during panic buying and stockpiling. Nevertheless, this study appropriately suggests that the study of panic buying requires that considerably more attention be given to the peculiarities of consumption displacement in terms of appropriate understanding of the crisis and location, both in a comparative context and over time.

Author Contributions: Conceptualization, C.M.H., P.F., G.P., D.D.; methodology, C.M.H., P.F., G.P., D.D.; software, P.F., D.D.; formal analysis, P.F., D.D.; data curation, P.F.; writing—original draft preparation, C.M.H., P.F., G.P., D.D.; writing—review and editing, C.M.H., G.P.; visualization, P.F. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to its commercial nature.

Conflicts of Interest: The authors declare no conflict of interest.

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