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Timed intervention in COVID-19 and panic buying

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\textbf{ABSTRACT}

In view of 2020 outbreak of the pandemic COVID-19, the paper examines the relationship between government measures for combating the pandemic and their side effects. Panic buying is identified as one such side effect. Among various models and measures undertaken by government to manage the pandemic, timed-intervention policy (TIP) is manifested through phased lockdown and social distancing measure changes in accordance with different stages of lockdown (from allowing 500 individuals to gather to 100, 20, 10, then down to 2 individuals). TIP is regarded as a demand-management policy (Bin et al., 2020). The main purpose of this type of policy is to minimise negative impacts caused by the pandemic as well as to manage health-care system so that there are sufficient facilities, equipment, and resources to treat infected patients. This model has been implemented by most countries and regarded as being more realistic (e.g. Australia, USA, and UK). However, Bin et al. indicate that the timing of the implementation of this model is critical. Implementing the policy too early or too late may result in severe negative consequences. Timing is considered a relative concept, especially in the case of COVID-19, as the incubation period varies between individuals (e.g. 14 days, 21 days or up to 28 days has been reported) and exponential growth rate of the virus is rapid. The timing within this model is critical in managing the virus and its related impacts, as it triggers other undesirable consequences or side effects. The phenomenon of panic buying is just one of the outcomes associated with the implementation of TIP.

Panic buying is often a consequence of a large scale, severe disaster (e.g. hurricanes, snowstorms) or pandemics such as COVID-19. Consumers tend to stockpile staples (e.g. rice, pasta, flour) and other essential items that they perceive may help them sustain themselves through the crisis period and in anticipation of supply shortages (Yoona...
et al., 2018). Some may simply fear a significant price increase caused by the disaster (Su, 2010). Previous research has attempted to understand the causes and behaviours of panic buying (e.g. Wang et al., 2019; Xu et al., 2011; Zheng et al., 2020). From a social learning perspective, Zheng et al. (2020) pointed out that consumers tend to mimic others who are physically (in person) and virtually (online) influential and social media posts can play a significant role in the proliferation of mimicking and purchase behaviours. Fan indicates that panic buying is a psychological reaction to a current crisis and the fear of an interruption to the supply chain. However, very few studies have been undertaken to examine the relationship between government crisis intervention measures and panic buying. Therefore, understanding this relationship has implications for policy makers, the relevant authorities, and marketers to identify the most appropriate measures and strategies to mitigate the undesirable consequences and minimise the potential side effects.

consistent with foregoing discussion, this paper uses a mixed method approach to understand how government’s timed interventions, manifested by TIPs, are related to the panic buying, witnessed during the COVID-19 pandemic. The primary measures taken were timed lockdowns and social distancing. This research intends to address the effectiveness of these measures and reveal the timing effect on consumer behaviours with regard to panic buying.

To achieve this aim, three studies were undertaken in sequence. First, a semantic analysis was performed to examine whether there was a link between COVID-19 and panic buying. Second, secondary data analysis was conducted to identify the timing of government measures and panic buying with the intention to establish a connection between the two. Third, big data analytics were used to understand the timing effect of government measures and panic buying through sentimental analysis. The study is focused on the relationship between interventions associated with COVID 19 and consumer behaviour response, rather than on the pandemic per se. The rationale for the three studies is to progressively demonstrate the connection between the government staged interventions and panic buying. Semantic analysis has the merit of establishing the association between the key variables of interest. Secondary data research provides objective information to support this association. The sentiment analysis in Study 3 addresses the core research question. The sample frame is limited to Australia. Similar to other countries, Australia adopted TIP to manage or combat COVID-19. Panic buying has been a puzzling phenomenon during the pandemic in Australia and seemingly corresponded with government timed measures. This option can be a reference to countries that undertake TIP and are evident in panic buying.

STUDY 1: SEMANTIC ANALYSIS

2. Method

2.1. Sample and procedure

For the purpose of this study, Twitter posts were used to examine whether there was a link between government COVID-19 measures and panic buying. Twitter was chosen since it has public application programming interface API, which allows access to all tweets and wide opinion of people. Tweets can be used to access individuals’ opinions toward the government measures. First, a list of related keywords that reflect the research aims were identified to search relevant posts. We initially searched keywords such as “coronavirus” and “COVID” using twitter public API. In order to capture all relevant traffic, we extended the scope of the keywords to include government measures such as “lockdown”, “social distancing”, and “panic buying”. However, the volume of posts from the entire country was too large and unmanageable in this instance. We decided to include posts from one region only – Queensland. Preliminary analysis showed that this score was adequate to capture a baseline of pandemic related discussions over time but also provided a predefined set of tweets related to government measures. The social media data presented in this work covers the period from March 20 to April 9, 2020 as shown in Fig. 1.

Suitable keywords were identified by mapping assessments of sample tweets that were part of existing posts and by looking into the most commonly mentioned words in relevant topics. Drawing on these initial posts, more terms were added that formed part of relevant posts (e.g. “corona virus”, “pandemic”, etc). To capture posts that indicated government measures, we noted the occurrence of commonly used words, such as “social distancing”, “quarantine”, “buying”, “panic”, etc. The filtering process in most cases included words with leading and ending space. To ensure the capture of all relevant posts we relaxed the rule and selected all possible relevant words, for example if we searched for “frustrat” with no space at the end, words like ‘frustrated’ or ‘frustration’ were also collected. The full list of keywords were: “coronavirus”, “corona virus”, “COVID”, “pandemic”, “SARS”, “border”, “face mask”, “hand sanitiser”, “panic buying”, “toilet paper”, “lost job”, “job loss”, “unemployed”, “jobkeeper”, “jobseeker”, “travel ban”, “travelban”, “lockdown”, “quarantine”, “social distancing”, “shop”, “coles”, “woolworths”, “isolation”, “sacked”, “centrelink”, “landlord”, “rent”, “repayment”, “closure”, “closedown”.

3. Results

Semantic analysis is specifically undertaken to identify key topics and themes. A semantic network analyses the relationship of words in twitter posts. First, the node in the network represents a word and the links among nodes are the connections and represent how many times
both words are present in posts. If a word is used frequently, the size of
the node is bigger. The thickness of the connection between words also
reflects the number of connections the two words have in the twitter
posts. Semantic network analysis involves identifying the frequency and
associative patterns between words in the text. Fig. 3 shows the semantic
analysis of tweets relating to panic buying, which has been identified
through the filtering of relevant keywords (“panic buying”, “toilet
paper”, “shop”, “Coles”, “buy”, and “Woolworths”).

The semantic network was processed in Gephi (https://gephi.org/).
The colour of the nodes was based on a modularity calculation in Gephi,
which clusters nodes to the one community with the same colour.
Modularity is designed to measure the communities of division of a
network into a module. In this analysis, if the words are often used
together, they will be assigned to the same community with the same
colour. As shown in Fig. 2, people, “panic buying” and “toilet paper”,
rather than specific government measures and “panic buying” stand out
as three major communities.

However, the results (see Fig. 3) from the concept map that intended
to identify the most popular topics in the posts, show that “shop” and
“buying” overlap with “coronavirus”. This finding indicates correlation
and relevance in the same posts. Panic buying therefore can be seen as
a subset of buying. The topics related to COVID stand alone and could be
comments from media. Toilet paper, despite being most often mentioned
in posts, has no connection with other topics.

STUDY 2: SECONDARY DATA ANALYSIS

4. Method

4.1. Data collection

This study intended to identify whether there is link between Aus-
tralia’s timed measures for combating COVID-19 and panic buying.
Secondary data was searched to identify changes to government mea-
sures at different times, and whether these changes correspond to the
evidence of consumer behaviour. Panic buying within this research is
manifested by the stockpiling and hoarding of essential items, measured
by degree of change in retail revenues during the pandemic. We inten-
ded to identify how government measures are related to this panic
buying. Secondary data were primarily sourced from reliable e-news and
websites (e.g. The Guardian, ABC, Channel 7, 9, and 10), official reports
and government records.

4.2. The status quo of COVID-19 in Australia

The first COVID-19 case in Australia was diagnosed on January 25,
2020. By 15 April, there were nearly 6500 cases confirmed, with the
highest number of cases in New South Wales, with 2870 (Worldometers,
2020). The total number of new cases initially grew exponentially in
March, levelling out to about 360 per day around March 22, and with
figures starting to fall at the beginning of April. For this reason, the
secondary data search focused on the period from March to early April
when the research was conducted. The pandemic is still going on and the
situation may change in the near future. For the purpose of this study,
we focused on the key dates that pandemic was announced, key gov-
ernment interventions were enforced. The commencement date in
March was the day when the WHO announced COVID-19 as a pandemic.
The following section presents the primary government measures and
panic buying following a time sequence.

5. Results

5.1. Timing of government measures

5.1.1. Lockdown

Australia has passed through a number of stages of lock down, inter-
a lia, including national and state border closures at different times,
closure of various institutions, and the banning of cruise ships. On March
13, Australians were also urged not to travel overseas amid coronavirus
(COVID-19) fears (ABCnews, 2020b).

![Fig. 2. Semantic network analysis of panic buying.](image-url)
“We now advise all Australians to reconsider your need to travel overseas at this time, regardless of your destination, age or health”, “If your travel is not essential, consider carefully whether now is the right time”, the Prime Minister said (ABCnews, 2020b).

On March 20, the government advised all Australians not to travel overseas at this time. This is the highest advice level (level 4 of 4). If anyone already overseas wishes to return to Australia, the government recommended they do so as soon as possible by commercial means (Smarttraveller, 2020). On March 22, Australian states closed their borders, except to residents and essential workers, to slow the spread of the virus and all interstate arrivals were required to self-isolate for 14 days (SBS, 2020b). For instance, on March 22, the South Australian Chief Public Health Officer stated: “All of the cases we have investigated thus far have acquired the virus overseas, interstate or have been close contact with a known case. … There is no known community-acquired transition at this stage in South Australia, but we are still conducting contact tracing investigations. … It is a very serious situation we are now in, we have advanced our emergency declaration as a state and we are placing restriction on interstate travel” (Wills et al., 2020).

Western Australia also introduced border control on March 24, with the Premier announcing: “We will be introducing new border controls for Western Australia. These strict new border controls will apply to all access points; roads, rail, air, and sea. … Unless exempted, arrivals from inter-state will be ordered to self-isolate for 14 days. Exemptions will apply for essential services and essential workers. We are looking at acquiring very soon some hotels for self-isolation zones so that we can have places to quarantine people who have difficulty self-isolating or who will not self-isolate” (Mercer, 2020).

Following the closing of national borders on March 22, schools commenced moving towards online learning but remained open for students whose parents were essential workers. On March 23, non-essential services such as clubs, hotels, and casinos were required to shut down (Knaus et al., 2020). On March 25, a ban on Australian citizens travelling overseas came into force. “No-one should be getting on a plane and going overseas” the Prime Minister said (ABCnews, 2020a).

5.1.2. Social distancing
Social distancing corresponds to the lockdown measure. On March 15, all public events with more than 500 attendees were cancelled (Australian Associated Press, 2020). The order was enforceable by the Police. Violations of the order would carry a prison term of six months and/or an $11,000 fine (Australian Associated Press, 2020). On March 18, the government introduced a ban on non-essential gatherings of more than 100 people in indoor areas. In outdoor areas the ban remained for non-essential gatherings of more than 500 people (Fraser, 2020). On March 21, a social distancing rule of 4 square metres (43 sq ft) per person in any enclosed space was imposed by the Australian government (Burke, 2020). On March 29, the Prime Minister addressed a press conference following a National Cabinet meeting and announced that public gatherings would be limited to two people, while also urging Australians over the age of 70, those with chronic illness over the age of 60, and Indigenous Australians over the age of 50 to stay at home and self-isolate (McGowan and Doherty, 2020). The Prime Minister also clarified the only four acceptable reasons for Australians to leave their houses: shopping for essentials; for medical or compassionate needs; exercise in compliance with the public gathering restriction of two people; and for work or education purposes (ABCnews, 2020c). These measures were slightly different in the different States, but the two-person limit and 1.5 m distancing were universally applied (Dakin, 2020). Fines would be applied to those going out without acceptable reasons (White and Stackpool, 2020). In response to these measures, the virus has been reasonably well managed as shown in the Fig. 4.

5.1.3. Panic buying
Although the number of infected cases peaked towards the end of March, the confirmed cases had been decreasing. However, in line with the timing of the different measures, the phenomenon of panic buying emerged. Since intensification of the lockdown and social distancing
measures in mid-March, panic buying had increased. Panic buying and stock piling commenced in early March and increased sharply towards the end of the month when the lockdown scale was extended, and social distancing was tightened. The ANZ reported that the supermarket spend was up 40% from the same week ending March 16 the previous year. Fig. 5 shows how the weekly spend on essential items increased in relation to the changes in government measures over the period.

Items that were most popular were toilet paper, staples (e.g. rice, pasta), flu related medicine, long-life products, canned and frozen food, and consumer electronics. There was a 35% increase in retail food spending, a 60% jump in the pharmacy and toiletry spend, and a 22% rise in electronic purchases. Figs. 6 and 7 show how these items changed dramatically in March when government measures changed.

Among the items stockpiled, toilet paper was the common and greatest stockpiled item. This finding is consistent with that in the semantic analysis from Study 1. A few incidences occurred relating to this item. Figs. 8 and 9 demonstrate humorous examples of how toilet paper became the dominant panic buying item.

STUDY 3: BIG DATA ANALYTICS

Fig. 4. Timeline of coronavirus (COVID-19) and daily case count (source from Warrington, 2020)

Fig. 5. Weekly spending on essential items (Source, ANZ research 2020)
6. Method

This study applied big data analytics to understand the connection between government measures and panic buying by analysing consumers' responses and sentiments towards government measures. The same data collection procedure in Study 1 was undertaken for big data analytics. Data from Study 1 were stored for processing in a local MongoDB database located at the in-house big data cluster at Griffith University. To ensure the privacy of users, only date and location, when the account was opened, number of likes and retweets, along with the actual text from the posts were stored for data analysis.

7. Results

7.1. Temporal and sentiment analysis of the covid-19

Twitter posts were downloaded including the date of posting. This option enables the analysis of activities over time. Data were collected from March 20 to mid-April 2020. This period shows posts over this time, the topic trends, and the key dates of events, such as policy updates by the government. As shown in Fig. 10, there was a sharp increase in posts about the topic, which is in line with the government strict social distancing policy (McGowan and Doherty, 2020), as well the Australian government announcing the wage subsidy program to support economically impacted sectors on March 30 and 31.
Sentiment analysis on Twitter posts was performed to assess the tweets and mine the opinions of individuals towards the topic. Sentiment analysis basically refers to the use of computational linguistics and NLP to analyse text and identify its subjective information. Different sentiment analysis methods have been developed in various domains (Alaei et al., 2017; Becken et al., 2017). In this paper, a dictionary-based system, which relies on the use of comprehensive sentiment lexicon and sets of fine-tuned rules were applied. A sentiment lexicon can be created either by humans, by machine, or by both (semi-automatically). For instance, a dictionary may contain words such as “good”, “fantastic,” “bad”, or “ugly,” with their associated values of polarity. Few methods have been published for dictionary-based approaches and we relied on and extended the work of the Valence aware dictionary for sentiment reasoning (VADER) method, which has been tested and developed (Hutto and Gilbert, 2014). VADER combines a lexicon and a series of intensifiers, punctuation transformation, and emoticons, along with heuristics to compute sentiment polarity of text.

The positive sentiment is reflexed by 0–1 while negative sentiments were from -1 to 0. The results, also presented in Fig. 10, include the number of posts and sentiment over the time to show a comparison between them. Fig. 10 shows that the number of posts increased towards the end of March and beginning of April, nevertheless, the sentiment towards government measures decreased during the same period. This finding may indicate that people in Queensland were very concerned about coronavirus (COVID-19) as the number of infected cases peaked towards the end of March and also implied there were very controversial attitudes towards the government polices related to COVID19.

In order to assess individuals’ attitudes towards panic buying, we again calculated the sentiment analysis for the dataset that was only related to panic buying (based on the filtering key words mentioned

![Fig. 8. Showing desperation for toilet papers.](image_url)

![Fig. 9. Expensive toilet paper on e-Bay.](image_url)
earlier). The sentiment score presented in Fig. 11 shows how sentiment changed over time and attitudes towards the panic buying. It is interesting to see that the distribution of the sentiment shows a negative average sentiment at the beginning, when individuals tended to blame others for hoarding. However, latter sentiment showed an increasing trend, which could indicate more acceptance of panic buying behaviour as the evidence shows that the process might go up or have gone up on items in shortage.

Geographically, when looking into all comments related to coronavirus (COVID-19), the number of posts from certain area is directly correlated with the population density. However, this is not the case in panic buying dataset. The findings indicate that the panic buying related posts mostly only occurred in areas with higher density of population, for example from Brisbane, the Gold Coast, and the Sunshine Coast region in Queensland as is shown in Fig. 12.

8. Discussion

In view of the current COVID19 pandemic crisis, the paper deploys a mixed method approach to examine the relationship between government measures on managing the crisis and possible undesirable consequences. The models that have been generally utilised to manage such pandemics across the globe are the lock-down policy (LDP) and/or the timed intervention policy (TIP). The latter was adopted by many countries to minimise the severe economic impact from a complete lockdown policy. Despite similar inventions and measures being taken by different countries, the outcomes vary in relation to the increase in the number of infected cases and the number of deaths. For instance,
Italy, Spain, and the USA have been significantly affected; whereas other countries (e.g. Australia, China, India) have (at time of publication) managed the spread of the virus reasonably well. The different outcomes are largely accounted for by the timing of the interventions. Whilst the focus of these interventions is on controlling spread of the virus, the side effects from macro and micro levels such as economic, social, and individual impacts emerged. Inter alia, the phenomenon of panic buying stands out as an impact associated with timed intervention measures. The paper examines how TIP is related to panic buying in terms of timing effect with a focus on Australia. The findings from a range of methods including semantic analysis, secondary data, and big data analytics show that the timing of interventions corresponds with the scenario of panic buying.

Australia has undertaken different stages and levels of lockdown and social distancing measures to manage and control spread of COVID-19. The findings from the semantic analysis show that government measures associated with COVID-19 are related to panic buying. The secondary data analysis also demonstrated that when these measures had a smaller scope, focusing on travel bans and scaled quarantine in January and February 2020, Australian consumers engaged in their normal shopping and consumption routine. Panic buying then commenced in mid to late March when lock down was extended and social distancing was tightened. This phenomenon peaked in late March and early April when social distancing measures limited to a maximum of two people being able to gather in public, however panic buying appeared to slow in April. This may be accounted for by repeated assurances from government and the interventions practised by retailers or supermarkets. For instance, in late March, Australia Prime Minister asserted that the army could be used to help with food deliveries, if necessary, and stated: “Absolutely, of course it will. I’ve already had the Defence Forces being deployed into the states to assist with medical check-ups and chase-ups, contact tracing. Because some states, particularly New South Wales, have become overwhelmed. Now, it’s important that we provide that support and we’re there to help, and the Defence Forces are turning up, now, just like they were during the bushfires. But it’s a very different need.” Prime Minister said (Knaus et al., 2020; March 22).

Supermarkets were also urging Australians to stop their stockpiling behaviours. The retail giants, Coles, Woolworths, Aldi, and IGA indicated that they would do everything to ensure availability of stock (SBS, 2020a). Some pharmacies mitigated panic buying by increasing the price of face masks and hand sanitiser (Haggen, 2020). Supermarkets and chemists also placed purchase limits on panic buying items (Gillespie, 2020).

The sentiment analysis from the big data analytics revealed a number of findings: 1) the number of posts and comments on panic buying peaked in late March and early April; 2) sentiments were negative toward tightened social distancing and lockdown measures in the same period but improved towards the mid of April; and 3) sentiments towards panic buying were positive and high in that period, then turned to be negative and minor. Before mid-March while government measures were less strict, with a small number of infected cases, Australians may have appreciated that these measures were adequate to manage spread of the virus, but not so much that they would limit their daily life. When these measures were expanded and tightened toward the end of March with increased social distancing requirements, Australians did not appear to respond positively to these interventions, as was shown by the negative sentiments in social media posts. The expanded lockdown measure resulted in income reduction or job losses. In particular, significant fines and penalties were enforced for those violating the policies.

However, the sentiments in relation to government interventions appear to have been perceived more positively from early to mid-April. This may be accounted for by increased government support through financial subsidies and employment assistance and more transparent communication. Towards the end of March, the Australian government had also launched an app offering up-to-date advice and information on the COVID-19 pandemic. The Coronavirus Australia app, available on the Apple App Store and Google Play, was released alongside a new WhatsApp messaging feature (Mubin et al., 2020). The features of the app include a symptoms checker, register of isolation, the current status of the virus, advice, resources, news and media, and contacts and settings. A hotline was also established to help people seeking information on COVID-19, with the line operating 24 h a day, seven days a week (Department of Health, 2020b). The government also sent a SMS/text

Fig. 12. Spatial distribution of post locations with panic buying topic.
message to remind residents of control measures and information on COVID-19. The government frequently held press conferences (The guardian, 2020) and provided updates with information relating to the virus on a daily basis (Department of Health, 2020a). These initiatives were informative in nature and allowed Australians a degree of foreseability in relation to future measures and their timing.

Additionally, the government released an economic stimulus package to support those who had lost positions through the jobseeker payment. During mid-March, the government also announced a $17.6 billion stimulus package. The package consisted of a one-off $750 payment to welfare recipients, 700,000 grants capped to $25,000, and a 50% wage subsidy for 120,000 apprentices or trainees for up to 9 months. In addition, 1 billion dollars was allocated to support economically impacted sectors, regions and communities, $700 million to increase tax write-offs, and $3.2 billion to provide short-term small and medium-sized business investment (Prime Minister of Australia, 2020). On March 22, the government also announced a second stimulus package worth $66 billion, increasing the financial support to $89 billion. This increase was used to double income support for individuals on the jobseeker allowance, grants of $100,000 to small and medium-sized businesses, and $715 million to Australian airports and airlines. Individuals affected by the pandemic were also allowed to access up to $A10,000 of their superannuation and with the option to take the same amount again in the following year.

In contrast, the sentiment towards panic buying was negative before the end of March, then appeared to turn positive during the time when sentiment towards the government measures were negative. These findings indicate that panic buying appears to correspond to changes in government interventions and measures. Initially, Australians appeared to view such phenomenon as positive or “normal” in relation to the pandemic crisis. However, negative sentiment may have been triggered by the consequences of panic buying. These consequences included the shortage of essential items in the supermarkets and by retailers, erratic behaviour from panic buyers, such as brawling over toilet paper in supermarkets, excessive pricing of essential items for sale on e-Bay, social media jokes in relation to panic buying. However, sentiments turned positive again towards mid-April, most likely as a result of supermarket interventions.

9. Implications

This study examines the possible link between pandemic management and consumer behaviours with a focus on the timing effect. The findings show timing consistency between changes to government interventions and panic buying. This study contributes to crisis management and public policy literature, as well as consumer behaviour research. Previous research on pandemic crises is primarily approached from medical, economic, and political perspectives, and has focused on the effectiveness of various interventions and measures. This research provides a fresh perspective and integrates pandemic crisis management and consumer behaviour to understand the side effects of pandemic interventions and offers a potential measure to assess the effectiveness of government interventions. This study extends consumer behaviour research from the scope of business and marketing management to crisis management and public policy realm. Traditionally consumer behaviour study is embedded in the marketing discipline and approached from the organisational level (meso level). This research demonstrates that such research can be escalated to the macro level to understand the impact of national and/or international public policies on consumer behaviour.

The study therefore has practical implications for policy makers and marketers. The findings show that the relevant authorities must be aware of the side effects of their policies and interventions that are intended to focus on the pandemic crisis per se. Whilst focusing on the effectiveness of managing issues relating to a pandemic, other measures and contingent plans must be in place to minimise side effects such as panic buying and its related consequences. For practitioners, panic buying may bring instant benefits for supermarkets, retailers, manufacturers of stockpiled goods, and other related businesses (e.g. transportation). However, the marketers for these businesses must be aware of the immediate and long-term consequences of such behaviours. The immediate consequences may be a shortage of supplies and essential items. The long-term effects may include a decrease in revenue and unpredictable sales as a result of stockpiling and hoarding. Businesses and marketers must identify appropriate marketing strategies to manage panic buying and develop contingency plans that address erratic consumer behaviour. Organisations must work closely with the relevant authorities to mitigate aberrant consumer behaviour during pandemic or natural crises.

Additionally, research undertaken by McKinsey & Company (June 5, 2020) shows that consumer sentiment is evolving along with the changes of COVID 19 status quo. Their sentiments are related to their choice of purchase items and shopping channels. Those who remain pessimistic may continue stockpiling essential items and may prefer online shopping; whereas others who are optimistic may opt for non-essential goods and services through various commerce channels. Hence, it is imperative to understand and analyse consumer sentiment for marketers to develop a more accurate forecast for future sales.

10. Limitations and future research

Despite best efforts and the application of a range of methods within this paper, some limitations must be acknowledged. First, the research has focused on the Australian experience, therefore, interpretation and generalisation of the findings must be cautioned. Further research, including other countries and through comparison would add greater insights into the phenomenon. Second, whilst the study had intended to establish a link between timed-intervention policies and panic buying, we must emphasise that a causal relationship is not guaranteed based on the findings from secondary data and big data analytics. These findings on the claimed relationships can be used as a reference for practitioners and researchers. Future research may be able identify more appropriate methods to establish the existence of a causal relationship. Third, the sentiment analysis from the big data analytics was based on Twitter responses. The findings therefore may be biased and have limited generalisability. Including other social media and online platforms would provide greater insight to address the research questions.

Summary statement of contribution

In view of the current COVID19 pandemic crisis, the paper deploys a few methods including semantic analysis, big data analytics and secondary data research to examine the relationship between government measures on managing COVID 19 and panic buying behaviours. The study provides a fresh perspective on the unintentional consequences of timed interventions practiced by the government. This paper contributes to public policing and consumer behaviour research, as well as practical implications for the relevant authorities and marketers.

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Appendix A. Supplementary data

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