Consumer Stockpiling under the Impact of a Global Disaster: The Evolution of Affective and Cognitive Motives

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Abstract

Although consumer stockpiling is a prevalent phenomenon under the threat of a disaster, little is known about its underlying mechanisms. Leveraging consumer interviews, we build a theoretical framework that identifies two major motives for stockpiling: fear and expectations of a supply shortage. Using the COVID-19 pandemic as a viable context, through a global survey across 31 countries and search datasets from Google in the United States and 6 additional countries, we find that: (1) both fear and expectations of a supply shortage lead to stockpiling; (2) the relative prevalence of these motives evolves over the progression of the disaster, with the boost and subsequent reduction in fear being more pronounced than for expectations of a supply shortage; and (3) the impact of a disaster on fear is attenuated when consumers have high trust in the government. These findings can help retail managers and public policymakers to make more informed decisions.

Keywords: Consumer stockpiling; Affective processing; Cognitive processing; Disaster; COVID-19

1. Introduction

By the end of 2019, coronavirus disease 2019 (COVID-19) began to spread rapidly across the globe, and many consumers began to stockpile products, such as packaged foods and toilet paper, at unprecedented levels (Chalmers, 2020). In the United States (US), Walmart, the largest retailer in the country, experienced a 10% increase in same-store sales and a 74% increase in online sales in the first quarter of 2020, which was the company's largest growth rate in the US in almost two decades (Troy, 2020). Similarly, in the United Kingdom, in the four weeks ending on March 22, 2020, consumers spent a record of £10.8 billion in supermarkets, 20.6% more than the same period in 2019 (McKevitt, 2020). Beyond the turmoil of a pandemic, the consumer stockpiling phenomenon has also been observed in other types of disasters, such as earthquakes and hurricanes (Brackett, 2021; Hori & Iwamoto, 2014; Pan, Dresner, Mantin, & Zhang, 2020).

Consumer stockpiling is a highly prevalent behavior that emerges under the impact of a disaster; however, past research provides little insight into the underlying motives of such a behavior. Most prior studies focus on the influence of price promotions on consumer stockpiling (Bell, Chiang, & Padmanabhan, 1999; Gupta, 1988; Leeflang, Parreño Selva, van Dijk, & Wittink, 2008; Mela, Jedidi, & Bowman, 1998), which reveals little regarding how consumers would react during a disaster. Recently, under the impact of the COVID-19 pandemic, consumer stockpiling has attracted more research attention. First, the consumer stockpiling phenomenon during the pandemic has been well documented worldwide (Lehberger, Kleih, & Sparke, 2021; Micalizzi, Zambrotta, & Bernstein, 2021; Nam, Luu, Anh, Nguyen, & Doan, 2021; Sherman, Arthur, & Thomas, 2021; Wang, An, Gao, Kiprop, & Geng, 2020). Second, recent research has also identified various factors that have facilitated consumer stockpiling during the pandemic, including cultural values (Ahmadi, Habel, Jia, Lee, & Wei, 2021), religiosity (Minton & Cabano,

2021), personality traits (Dammeyer, 2020), affective factors (e.g., fear, anxiety; Dobbelstein & Naidoo, 2020), cognitive factors (e.g., perceived scarcity; Yuen, Leong, Wong, & Wang, 2021), and social influences (Dulam, Furuta, & Kanno, 2021). However, most existing studies collected data only at a single point in time during the pandemic and studied consumer stockpiling motives at a specific time. To the best of our knowledge, no existing research has taken a longitudinal perspective to examine how consumers' stockpiling motives evolve during a disaster. Given the longitudinal nature of a pandemic, it is critical to take a longitudinal approach to study the impact of the pandemic on consumer stockpiling.

Using the COVID-19 pandemic as a viable context, we investigate how natural disasters impact consumer stockpiling behavior on a global scale and for a long period. In particular, we aim to answer two questions: (1) what are the consumer motives for stockpiling while facing a natural disaster? (2) How do these motives evolve during the development of the disaster?

To address these questions, we first conduct a qualitative study involving in-depth interviews with consumers across 15 countries to explore their motives for stockpiling during the COVID-19 pandemic. We identify two major motives that drive stockpiling behavior: (1) fear of being infected with the COVID-19 virus (hereafter, fear), and (2) expectations of a supply shortage. Through the lens of dual-processing models (Epstein, Pacini, Denes-Raj, & Heier, 1996; Herzenstein, Dholakia, & Sonenshein, 2020; Loewenstein & O'Donoghue, 2004; Rottenstreich, Sood, & Brenner, 2007), we propose a theoretical framework to explain the influences of fear and expectations of a supply shortage on consumer stockpiling. In particular, we posit that both fear and expectations of a supply shortage drive consumer stockpiling, and, importantly, the influences of both motives on consumer stockpiling increase in the initial stages and thereafter decrease in the later stages of a disaster. These increase and decrease are greater

for fear than for expectations of a supply shortage. Moreover, consumers' trust in the government reduces their fear and consequently weakens their stockpiling behavior. The results of two studies—one utilizing a large-scale survey in 31 countries with over 1,800 consumers, and the other utilizing objective search datasets from Google in the US and 6 other English-speaking countries over 10 months—provide converging evidence for our hypotheses.

Our research makes three main theoretical contributions. First, we contribute to the literature on consumer stockpiling in general and during a disaster by offering insights into how consumers' stockpiling motives evolve over time. Recent studies have demonstrated various factors that influence consumer stockpiling during a pandemic (e.g., Ahmadi et al., 2021; Dammeyer, 2020; Garbe et al., 2020; Minton & Cabano, 2021). To the best of our knowledge, this is the first study to examine the longitudinal dynamics of consumer stockpiling motives. We reveal that the impacts of both affective (i.e., fear) and cognitive (i.e., expectations of a supply shortage) motives on consumer stockpiling increase at the onset and then decrease in later stages of the pandemic. Moreover, the affective motive increases and decreases more dramatically than the cognitive motive. Second, our research adds to the emerging literature on the impact of disasters on consumer behavior (Baker & Hill, 2013; Baker, Hunt, & Rittenburg, 2007) and extends this line of research by studying the dynamic influence of a disaster on consumer behavior. We also examine the impact of a disaster on a global scale. Third, the present work augments the literature on trust in government by showing that such trust reduces consumers' fear during a disaster as well as their stockpiling behavior.

Important practical implications are derived for consumers, retail managers, and public policymakers. First, our research findings can help consumers to better understand how a disaster, such as a pandemic, influences theirs and their peers' consumer stockpiling behavior.

Second, the results of this research indicate that retail managers should be mindful of their inventory levels at different stages of a disaster. Moreover, as consumers' trust in government tends to be stable over time (Jones, 2016), and we show that trust in government attenuates consumers' fear and their stockpiling behavior, retail managers should proactively maintain more supplies in countries or areas where consumers' trust in government is relatively low. Finally, to mitigate the potential adverse consequences of consumer stockpiling, public policymakers should focus on relieving consumers' fear and assuring them of the stability of supply. In the long run, public policymakers should seek to gain consumers' trust in government, as this can effectively counteract fear and the associated stockpiling behavior during a disaster.

2. Theoretical Background

Multiple streams of literature are relevant to our research—consumer stockpiling, disasters, and the dual processing model. First, we conduct a comprehensive literature review of consumer stockpiling and disasters. Thereafter, we focus on consumer motives for stockpiling and employ a dual processing model to build our theoretical framework.

2.1 Existing Research on Consumer Stockpiling and Disasters

According to Blattberg & Neslin (1990), consumer stockpiling is defined as consumers buying large quantities of products. Most prior studies on consumer stockpiling focus on the influence of price promotions (see Table 1; Bell et al., 1999; Gupta, 1988; Mela et al., 1998; Meyer & Assunção, 1990). For instance, Bell et al. (1999) examined the sales data for 173 brands across 13 different product categories and found that price promotions significantly increased consumers' stockpiling of products on sale. Regarding the consequences of consumer stockpiling, Chandon & Wansink (2002) report that stockpiling enhances product salience and increases people's consumption of stockpiled products (see also Ailawadi & Neslin, 1998).

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With the global disruption caused by the COVID-19 pandemic, recent studies have examined the impact of contagious diseases on consumer stockpiling (see Table 1). Researchers in different countries have reported that the COVID-19 outbreak has triggered consumers' stockpiling of food and other supplies (Ahmadi et al., 2021; Brizi & Biraglia, 2021; Hall, Fieger, Prayag, & Dyason, 2021; Lehberger et al., 2021; Nam et al., 2021; Sherman et al., 2021; Wang et al., 2020), thus indicating the global nature of the phenomenon. Recent research has also investigated various factors that influence consumers' stockpiling behavior during the pandemic. For example, Ahmadi et al. (2021) examined the role of cultural values and revealed that after WHO declared the COVID-19 outbreak a pandemic, consumer stockpiling was more pronounced in countries whose residents exhibited high uncertainty avoidance, high individualism, low long-term orientation, and low indulgence. Minton & Cabano (2021) revealed that because of the restrictions on religious gatherings during the pandemic, highly religious consumers experienced the greatest disruption to life, which led them to increase stability-seeking consumption. Regarding personality traits, Fischer, Twardawski, Steindorf, & Thielmann (2021) found that emotionality and victim sensitivity were positively correlated with consumers' stockpiling intentions during the pandemic (see also Dammeyer, 2020; Garbe et al., 2020). Researchers have also revealed that affective factors, such as fear, stress (Ben Hassen et al., 2021; Dobbelstein & Naidoo, 2020), and anxiety (Omar, Nazri, Ali, & Alam, 2021; Sherman et al., 2021), lead to consumer stockpiling. Regarding cognitive factors, perceived scarcity of the supplies, perceived severity of the situation (Garbe et al., 2020; Lehberger et al., 2021; Yuen et al., 2021), doomsday prepping beliefs (Smith & Thomas, 2021), and health locus of control (Syahrivar, Genoveva, Chairy, & Manurung, 2021) have been demonstrated to influence consumer stockpiling.

Consumers' stockpiling behavior is also impacted by social influences, such as others' stockpiling behavior (Roșu et al., 2021; Yuen et al., 2021), social media (Naeem, 2021), and government measures (Dammeyer, 2020; Prentice, Quach, & Thaichon, 2021). Finally, gender (Ben Hassen et al., 2021; Brizi & Biraglia, 2021) and income per capita (Yoshizaki, Brito Junior, Hino, Aguiar, & Pinheiro, 2020) have also been related to consumer stockpiling during the pandemic.

Although a significant amount of research has been conducted to understand consumer stockpiling behaviors during the pandemic, the existing research has three limitations. First, most of the extant studies focus on only one country and do not examine consumer stockpiling at the global level. Second, most existing studies employed only one method and conducted only one study in their research, and the survey method was used in most studies. This one-method one-study approach limits the validity of the findings. Finally, most existing research collected data only at a single point in time during the pandemic and did not investigate the dynamics of consumer stockpiling motives. We address these limitations in our study.

Beyond COVID-19, prior work on how consumers react to disasters is rather limited (see Iacobucci, 2019, for a brief review). First, most previous studies focus on natural disasters, such as tornados, hurricanes, and tsunamis (Baker et al., 2007; Baker & Hill, 2013; Guion, Scammon, & Borders, 2007; Klein & Huang, 2007). Second, the extant research was mainly conducted after a disaster occurred and focused on how consumers coped with the aftermath (Baker et al., 2007; Baker & Hill, 2013; Baker, Hill, Baker, & Mittelstaedt, 2015; Klein & Huang, 2007). For instance, Baker et al. (2007) conducted focus groups and interviews with residents of a community that had been hit by a tornado; they learned that community members shared the same experience of vulnerability, and their recovery efforts helped them to regain a sense of

control over their lives. Very little research has examined consumers' pre-disaster behavior. An exception is Kulemeka (2010)'s research that investigates how consumers prepare for seasonal disasters. Kulemeka (2010) observed consumers' behavior in supermarkets before a winter storm and found that most customers did not show panic or hoarding behaviors. However, after analyzing the retail scanner data from 60 US retail chains before 4 US continental hurricanes, Pan et al. (2020) demonstrated that consumers increased their stocks of bottled water before hurricanes.

Unlike the disasters examined in prior research that last for a short time, the COVID-19 pandemic has lasted much longer, and this provides us with an opportunity to study the dynamics of consumers' behaviors and their motives during a prolonged disaster. In this research, we examine why consumers respond to the COVID-19 pandemic by engaging in stockpiling behavior and the changes in their motives for stockpiling during the course of the pandemic.

2.2 Consumer Motives for Stockpiling

2.2.1 Initial Exploration of Consumer Stockpiling during a Global Disaster

To generate insights into how and why consumers stockpile under the impact of a global disaster, we conducted an exploratory study based on in-depth interviews with 15 consumers (see Supplementary Material A) across 15 countries when COVID-19 first hit human society. The insights obtained formed the foundation for the subsequent conceptual development.

We conducted the interview study in April 2020. To recruit participants, we used open sampling, exploiting the personal connections of the research team (Corbin & Strauss, 2015). Therefore, we actively recruited participants from various countries and with different demographics to glean diverse insights into the lived experiences of consumers. Theoretical saturation was achieved after 15 interviews, which resulted in a sample size that was consistent

with the recommendations in the literature (Zeithaml et al., 2020).

All the interviews followed a semi-structured approach. Specifically, we explored the following: (1) how consumers had changed their shopping behavior during the pandemic, (2) whether consumers were stockpiling, (3) if so, to what degree, and how they were stockpiling, and (4) what specific factors were driving their stockpiling behavior. We audiotaped all the interviews and transcribed them verbatim. Subsequently, using NVivo 12, we coded thought units in these interviews, following an iterative and recursive process. Thereafter, we clustered similar thought units in several steps to higher-level themes (see Fig. B.1 of Supplementary Material B; we also elaborate on how and why consumers stockpile in Supplementary Material B). As these themes recur across our interviews, we are confident that we capture the primary and generalizable motives for consumer stockpiling.

The interviews revealed two primary motives for consumer stockpiling. First, consumers experience fear that is related to potential threats to their lives (e.g., “I might catch the virus if I am not careful” – Interviewee N), which prompts them to increase the quantity of groceries purchased in each visit as well as the intervals between grocery store visits. Second, consumers form expectations of a possible supply shortage, which originate from retailers’ management of supply chain disruptions (e.g., “These stores aren’t open all the time and you never know what’s going to be there” – Interviewee A), and observations of others’ purchase behavior (e.g., “He left the store without any flour left!” – Interviewee D). These two motives map well to the dual processing model that structures consumers’ everyday decision-making (Epstein et al., 1996; Loewenstein & O'Donoghue, 2004; Rottenstreich et al., 2007). In particular, fear is an affective reaction that rises rapidly from the salient threats to human lives emerging in a disaster, whereas expectations of a supply shortage are cognitive analyses based on information about how retailers

and other consumers react in response to a disaster. Thus, building on the dual processing model that governs human decisions through both affective and cognitive factors, we argue that a disaster drives consumer stockpiling via fear and expectations of a supply shortage. Next, we briefly review the dual processing model and examine the theoretical premise of how both types of factors shape consumer stockpiling behaviors.

2.2.2 Fear

Prior research suggests that consumers' preferences and decisions are influenced by the interplay of dual processing. Affective processing is relatively effortless, intuitive, and holistic; conversely, cognitive processing is relatively effortful, deliberative, and analytic (Epstein et al., 1996; Loewenstein & O'Donoghue, 2004; Rottenstreich et al., 2007). Affective processing tends to rely heavily on emotions and feelings, whereas cognitive processing involves more analysis and forecasting of the situation, primarily utilizing objective information. We argue that consumer stockpiling during a disaster is jointly influenced by both affective and cognitive processing. Building on the findings of the initial study, we establish that affective processing refers to the emotional reaction consumers develop in response to the disaster (i.e., fear), while cognitive processing refers to expectations consumers form on the stock availability of supermarkets and grocery stores.

During a disaster, a key affective factor that influences consumer purchase decisions is fear, a high-arousal negative state that emerges in response to the experience of immediate danger or threat (Chen & Pham, 2018; Johnson & Tversky, 1983; Latour & Rotfeld, 1997; Lerner, Gonzalez, Small, & Fischhoff, 2003; Öhman & Mineka, 2001; Smith & Ellsworth, 1985). Prior research reveals that fear, as an integral affective feeling, is commonly experienced during a disaster with severe threats to life and property (Baker et al., 2007; Baker & Hill, 2013).

Consumers facing a fear-inducing threat are likely to be risk-averse and adopt self-protective strategies that allow them to avoid harm in the environment and/or the aversive state (Griskevicius et al., 2009; Lee & Andrade, 2011; Lerner & Keltner, 2001; Öhman & Mineka, 2001; Raghunathan & Pham, 1999). One common strategy that people employ is to consciously avoid contact with stimuli that portend fear (Terburg, Aarts, & van Honk, 2012). In addition, a stream of research argues that feelings can be used as a source of information that influences consumer decision-making. Fear, as an aversive state, can signal that the situation is of high uncertainty and beyond one's control (Öhman & Mineka, 2001; Raghunathan & Pham, 1999). Thus, consumers are motivated to take actions that allow them to protect themselves and mitigate uncertainty. For instance, consumers who experience fear are more likely to take precautionary measures against potential terrorist threats (Lerner et al., 2003).

Under the threat of a disaster, the fear that consumers experience prompts them to take precautionary actions to ensure their safety. One effective action is to stay at a secure location (e.g., home) until the disaster passes. To achieve this goal, consumers must stock groceries and essential supplies that they need to consume in everyday life. Our preliminary study provides support for this argument in the context of the COVID-19 pandemic. For instance, "Older people are more afraid to get the virus and thus start to stock up on food" (Interviewee F), and "I feel the need to buy more, stock more, because I don't want to go to the store and catch the virus, then spread it to my children and my husband" (Interviewee N).

Therefore, we argue that under the impact of a disaster, one major affective motive that drives consumer stockpiling is fear. Formally, we hypothesize that:

Hypothesis 1: Consumers experience fear under the impact of a disaster, and this motivates stockpiling.

2.2.3 Expectations of a Supply Shortage

As a force that balances the immediate and intuitive nature of affective processing, cognitive processing plays a vital role in consumer decision-making. Cognitive processing tends to be an analytical evaluation of the situation, considering the stimulus and objective information (Levin & Gaeth, 1988). Under the impact of a disaster, cognitive processing allows consumers to gather information from their immediate environment, including their own experience and the media, to form judgments about future grocery supplies, and thus make purchase decisions. This is in line with the findings of the preliminary study: consumers expect the pandemic to cause a shortage of supply, prompting them to engage in stockpiling. Consumers form these expectations of a supply shortage for two reasons.

First, the stability of grocery supplies is disrupted under the impact of a disaster. A disaster tends to disable transportation systems in the local area, thereby creating temporary issues with the supply chain for retailers. Thus, retailers can only supply limited groceries from their inventory before the supply chain recovers. Many retailers choose to set up restrictions on consumer purchases to manage disruptions in the supply chain. For instance, under the impact of the COVID-19 pandemic, many retailers set up new measures, including reducing operation hours, restricting the number of customers within a store at one time, and limiting the number of items one can purchase. Such restrictions not only imply that retailers face crises with inventory management but also impose negative impacts on consumers. Consequently, the restrictive measures backfire by increasing the costs for each shopping trip (more trips, more risk, etc.), thereby motivating consumer stockpiling.

Second, consumers may expect other consumers to engage in stockpiling behavior, which further contributes to supply shortage. This expectation of others' stockpiling behavior can ensue

from past experiences with other disasters or from media coverage. As many media platforms reported, consumers lined up in supermarkets and bought more groceries than usual (Chalmers, 2020; Kulemeka, 2010). The increased demand for groceries implies that supermarkets and grocery stores will face a shortage of inventory if they are unable to effectively adjust their supply chain. In addition, a disaster makes it difficult for consumers to visit grocery stores regularly, which also engenders stockpiling to mitigate potential inconveniences. For instance, when Hurricane Katrina hit the Southern US., most retail stores closed down, making it impossible for consumers to obtain everyday supplies. Therefore, consumers may hedge against these potential downsides by increasing the quantity of groceries they purchase in a single visit.

With such an expectation of a supply shortage, consumers worry that they may experience difficulties in getting what they need to consume for everyday life. To protect themselves against these potential problems, consumers are motivated to stockpile groceries and other necessary items. Ironically, such stockpiling behavior exacerbates supply shortage, which may reinforce consumers' expectations and bias their judgment in future disasters.

Therefore, under the impact of a disaster, another motivation that drives consumer stockpiling is the expectation of a supply shortage (i.e., cognitive motive). Specifically, we hypothesize as follows:

Hypothesis 2: Consumers expect a supply shortage during a disaster, which motivates stockpiling.

2.3 Temporal Dynamics of Dual Motives on Stockpiling

As both fear (i.e., affective motive) and expectations of a supply shortage (i.e., cognitive motive) can encourage consumer stockpiling, which is more salient over the progression of a disaster? Prior research has thoroughly discussed factors that impact the extent to which people

rely on affective processing versus cognitive processing (see the review by Greifeneder, Bless, & Pham, 2011). One crucial factor is saliency. Specifically, an extensive volume of research suggests that people tend to rely more on affective processing than cognitive processing when feelings are salient (e.g., Feldman & Lynch, 1988; Taylor & Fiske, 1978). For instance, making participants focus on their affective reactions explicitly increases the impact of affective cues on their attitudinal judgment (Albarracín & Kumkale, 2003). Similarly, when making decisions for themselves—for which their feelings are more accessible—consumers tend to rely more on affective processing than cognitive processing (Hsee & Weber, 1997; Raghunathan & Pham, 1999). In the early stages of a disaster, the feeling of fear is especially salient, and this encourages greater reliance on affective processing. Another trigger that promotes reliance on affective processing (over cognitive processing) is the experience of uncertainty (Rad & Pham, 2017). For most disasters, especially in the initial stages, their impacts on human society and how rapidly and effectively we can cope with them are unknown. Thus, the uncertainty consumers experience can prompt them to rely more heavily on affective processing than on cognitive processing. Consequently, we expect that consumers place more emphasis on fear in the early stages of a disaster.

However, while affective factors are strongly influential, they are transient and diminish rapidly (Taylor & Fiske, 1978). Conversely, cognitive factors, especially objective information, can persist over time and impact one's judgment at a later stage. For instance, Qiu & Yeung (2008) found that when multiple alternatives were presented in a sequence, incidental feelings influenced the evaluation of the very first alternative only, not the rest of the sequence. Similarly, Lee & Tsai (2014) found that price promotion increased consumption enjoyment via immediate affective processing, but it decreased enjoyment via delayed cognitive processing. Fear, as a

response to disasters, vanishes in a similar manner. As pointed out by Helsloot & Ruitenberg (2004), in a disaster situation, fear is the primary emotion that people experience in response to uncertainty, yet it quickly diminishes and is replaced by the cognitive processing of possible solutions. Contrariwise, expectations of a supply shortage, based on the cognitive processing of objective information, should endure and impose a stronger impact on consumer behavior in later stages.

Building on prior literature, we argue that in the early stages of a disaster, fear increases more rapidly than expectations of a supply shortage. With the progression of a disaster, fear diminishes, and the cognitive evaluation of grocery supplies becomes more salient. Hence, we propose the following hypothesis:

Hypothesis 3: In the early stage of a disaster, fear increases more rapidly than the expectations of a supply shortage. In the later stages, fear decreases more rapidly than the expectations of a supply shortage.

2.4 Trust in Government

Trust in government is the extent to which people believe that a government's operation meets people's normative expectations (Miller, 1974). It plays an essential role in the proper functioning of democracy. When people have high trust in government, they are more likely to give up freedoms in civil liberties in exchange for security (Davis & Silver, 2004; Hetherington, 1998; Weatherford, 1987) and support government policies (Hetherington & Husser, 2012).

Prior research suggests that trust in government plays a pivotal role in crisis and post-crisis countries. For instance, in the context of a financial crisis, trust in government allows political leaders to effectively retailor economic policies and even to rebuild political structures (Gallo, Stegmann, & Steagall, 2006). However, most discussions have been confined to the

context of economic crises. Our research contributes to this stream of literature by extending the discussion of trust in government to global disasters.

As described above, consumers are likely to experience fear stemming from the threat or dangerous onset of a disaster. Those who believe in potential solutions to help resolve such threats or dangers should experience less fear. In particular, consumers with high trust in government believe that political leaders can respond to the current disaster in an efficient, fair, and responsive manner and act in the best interests of the citizens (Miller & Listhaug, 1990; Newton & Norris, 2000), which should effectively counteract the threat or danger of a disaster. However, consumers with low levels of trust in government believe that political leaders cannot act in the citizenry's best interests, and thus, they have to confront and resolve the danger or threat themselves. Thus, consumers with high levels of trust in government should experience less fear than those with low levels of trust in government. Therefore, we hypothesize as follows:

Hypothesis 4: Trust in government attenuates the influence of a disaster on consumers' fear.

In what follows, using COVID-19 as the context for investigation, we present two studies designed to examine our theorizing. Study 1 explores how fear and expectations of a supply shortage influence consumer stockpiling, using a global survey across 31 countries during the period when COVID-19 first hit human society. In particular, we use a structural equation model to examine how the progression of the COVID-19 pandemic in a country shapes consumers' affective versus cognitive motives vis-à-vis stockpiling, through which it predicts stockpiling behavior. We also use natural language processing (NLP) to test the affective versus cognitive nature of the motives that drive stockpiling. Study 2 uses longitudinal Google search data in the US and six other English-speaking countries to provide further support for our propositions.

3. Study 1: An International Consumer Survey

The goal of this study is to test our hypotheses using an international consumer survey. We build on the fact that different countries have progressed through the COVID-19 pandemic at different speeds.

3.1 Data Collection

We built our dataset using two sources. First, we conducted an international survey using the online panel provider *Prolific* in April 2020. We recruited participants following three criteria: (1) we only admitted participants who were in charge of household spending decisions or had adequate information to answer questions about these decisions. (2) Given the rapid progress of the pandemic and our aim to avoid potential biases due to translation, we conducted the survey in English and recruited only participants who could communicate in English. (3) To investigate between-country differences in consumer motives and purchase behavior, we balanced the number of participants across countries. Of the 2,261 participants, we excluded 436 who failed attention checks (see Supplementary Material C for details on the exclusion criteria), resulting in a sample of 1,825 consumers from 31 countries across all continents except Antarctica (see sample characteristics in Table D.1 of Supplementary Material D).

Second, to operationalize each of these countries' states of pandemic progression, we collected identified COVID-19 cases from the European Union Open Data Portal (2020). This data source provides the daily number of cases worldwide, broken down by 214 countries and territories. Thus, while the data are provided by the European Union, they also comprise information on European countries outside the European Union (e.g., Switzerland) as well as the non-European countries in our sample (Australia, Canada, Chile, Israel, Japan, Mexico, New Zealand, South Africa, and the US). We matched the number of cases for the four weeks prior to

our survey with our dataset, using each participant's country of residence as a unique identifier. Thus, our dataset is hierarchical, with the number of COVID-19 cases on the between-level/level-2 and survey responses on the within-level/level-1 (Hox, 2010).

3.1.1 Measures

Growth rate of cases. As our key independent variable, we aim to use a measure that approximates the extent to which a country has progressed through the first wave of the COVID-19 pandemic at the time of our survey. We expect this variable to predict consumers' evolving motives for stockpiling. After carefully considering various options, we decided to operationalize the progression of the pandemic through the *compound daily growth rate of COVID-19 cases* at the time of our survey (April 10, 2020), calculated as (number of cases on April 10 / number of cases on April 3)$^{(1/7)}$ – 1. Thus, the compound daily growth rate indicated the rate at which the number of cases would have grown each day in the past week if the growth rate had been constant. A higher (lower) compound daily growth rate points to a country's earlier (later) stage of the pandemic (see Supplementary Material E).

Motives for stockpiling. We operationalized participants' fear using two survey items measured on 7-point Likert scales (1 = strongly disagree, 7 = strongly agree): "I am worried that I might catch the coronavirus" and "I am worried that somebody I am close to might catch the coronavirus." The scale achieved adequate reliability ($r_{Spearman–Brown} = 0.74$). Furthermore, we measured consumers' expectations of a supply shortage using the item "I think that grocery stores will run (or remain) out of stock." Our decision to use a single item is based on the notion that this construct is concrete and easy to grasp, thus rendering a multi-item scale "unnecessary" (Bergkvist & Rossiter, 2009, p. 607; see also Rossiter, 2002).

Stockpiling behavior. In the absence of an adequate scale in the prior literature, we

developed our own measure of stockpiling behavior (Churchill, 1979). Because stockpiling behavior can be subject to interpretation, we decided to measure this construct using a multi-item scale. To this end, we developed the following four-item measure: “I have recently bought much more than I used to,” “I have recently purchased large amounts of supplies,” “My supply cabinets are more full than usual,” and “I have recently stocked up heavily,” to be measured on 7-point Likert scales (1 = strongly disagree, 7 = strongly agree). We pretested the measure in a sample of 180 Mechanical Turk workers (58.9% male, M_{Age} = 37.42, SD_{Age} = 10.21), which verified adequate descriptive and psychometric properties of the stockpiling measure (M = 4.52, SD = 1.81, α = 0.954, AVE = 0.879). The same holds true for our main study (M = 3.91, SD = 1.75, α = 0.927, AVE = 0.761).

Moderator. To measure trust in government, we borrowed the following question from (Davis & Silver, 2004): “Would you say the government is pretty much run by a few big interests looking out for themselves, or that it is run for the benefit of all people?” on a 7-point Likert scale, anchored at “Run by a few big interests looking out for themselves” (= 1) and “Run for the benefit of all people” (= 7). The item has a mean value near the mid-point of the scale and differentiates well between low and high trust in government (M = 3.53, SD = 1.75). Table D.2 of Supplementary Material D provides the descriptive statistics and correlations.

Control variables. Considering the broad coverage of the sample, we controlled for variables that may impact our main results. First, to avoid individual differences affecting our interpretations, we controlled for participants’ age, gender, household size, and education. Furthermore, to isolate the influence of rationing introduced by supermarkets and grocery stores in a participant’s area, we controlled for a dummy variable indicating whether “Supermarkets and grocery stores in my area have limited their number of items one can purchase.” To further

isolate the impact of the growth rate of cases in our analysis, we controlled for the absolute number of COVID-19 cases per country (log-transformed) at the time of our survey. Finally, we control for countries' gross domestic product per capita, which is a well-accepted proxy for people's living standards (The World Bank, 2019).

3.1.2 Model Specification and Results

Model specification. For our main analysis, we specify a structural equation model that links the growth rate of cases to the two stockpiling motives (fear and expectations of shortage of supply), and these two motives to the ultimate stockpiling behavior. As outlined previously, our dataset is hierarchical, with the growth rate of cases at the country level, and motives as well as stockpiling at the participant level. To test whether a multilevel estimation is required, we inspect the intraclass coefficients (ICCs) of our dependent variables (Hox, 2010). While the ICCs of stockpiling and fear fall below the recommended threshold of 0.05 ($ICC_{stockpiling} = 0.048$, $ICC_{fear} = 0.043$), the ICC of expectations of a supply shortage substantially exceeds this value ($ICC_{expectations\ of\ a\ supply\ shortage} = 0.150$). Therefore, we carried out a multilevel estimation and specified our structural equation model with cross-level interactions as follows (for the sake of clarity, we omit control variables):

Within-level equations:

$$Stockpiling_{ij} = \beta_{stock,0j} + \beta_{stock,1i} \times Fear_{ij} + \beta_{stock,2i} \times Expectations_{ij} + \epsilon_{stock,ij} \quad (1)$$

$$Fear_{ij} = \beta_{fear,0j} + \beta_{fear,1i} \times Trust_{ij} + \epsilon_{fear,ij} \quad (2)$$

$$Expectations_{ij} = \beta_{exp,0j} + \beta_{exp,1i} \times Trust_{ij} + \beta_{exp,2i} \times Fear_{ij} + \epsilon_{exp,ij} \quad (3)$$

Between-level equations (random slopes):

$$\beta_{fear,1i} = \pi_{fear,00} + \pi_{fear,01} \times Growth_j + r_{fear,0j} \quad (4)$$

$$\beta_{exp,1i} = \pi_{exp,00} + \pi_{exp,01} \times Growth_j + r_{exp,0j} \quad (5)$$

Between-level equations (random intercepts):

$$\beta_{stock,0j} = \gamma_{stock,00} + \gamma_{stock,01} \times Growth_j + u_{stock,0j} \quad (6)$$

$$\beta_{fear,0j} = \gamma_{fear,00} + \gamma_{fear,01} \times Growth_j + u_{fear,0j} \quad (7)$$

$$\beta_{exp,0j} = \gamma_{exp,00} + \gamma_{exp,01} \times Growth_j + u_{exp,0j}, \quad (8)$$

where i indicates variables and coefficients on the level of participants, and j indicates variables and coefficients on the level of countries. Regression coefficients are given as β, π, and γ; ϵ, r, and u are error terms.

Results. We estimated the model using Mplus version 8.6 (Muthén & Muthén, 1998-2012). The results are provided in Table 2 and Model 1, and they reveal several key insights.

--- Insert Table 2 about here ---

First, the growth rate of cases is positively related to fear ($\beta_{\text{growth rate} \rightarrow \text{fear}} = 5.829$, $p = 0.002$; non-standardized coefficients) and expectations of a supply shortage ($\beta_{\text{growth rate} \rightarrow \text{expectations of a supply shortage}} = 7.921$, $p = 0.017$).

Second, both fear and expectations of a potential supply shortage are positively related to stockpiling behavior ($\beta_{\text{fear} \rightarrow \text{stockpiling}} = 0.213$, $p < 0.001$; $\beta_{\text{expectations of a supply shortage} \rightarrow \text{stockpiling}} = 0.071$, $p = 0.013$). These results provide strong support for Hypotheses 1 and 2.

Third, fear and expectations of a supply shortage fully mediate the relationship between growth rate and stockpiling. This is visible from the non-significant direct relationship between growth rate and stockpiling ($\beta_{\text{growth rate} \rightarrow \text{stockpiling}} = 1.423$, $p = 0.494$). Meanwhile, the mediation chains linking growth rate and stockpiling via fear and expectations of a supply shortage are significant and marginally significant, respectively ($\beta_{\text{growth rate} \rightarrow \text{fear} \rightarrow \text{stockpiling}} = 1.240$, $p = 0.001$, $\beta_{\text{growth rate} \rightarrow \text{expectations of a supply shortage} \rightarrow \text{stockpiling}} = 0.559$, $p = 0.092$). This further supports Hypotheses 1 and 2: the progression of the pandemic, as approximated by the growth rate of cases, triggers both fear and expectations of a supply shortage, which serve as key drivers of consumer stockpiling.

Fourth, the positive relationship between the growth rate of cases with fear is negatively

moderated by trust in government ($\beta_{\text{growth rate}\times\text{trust in government} \rightarrow \text{fear}} = -1.400$, $p = 0.034$), thereby supporting Hypothesis 4. It should be noted that trust in government does not moderate the relationship between the growth rate and expectations of a supply shortage ($\beta_{\text{growth rate}\times\text{trust in government} \rightarrow \text{expectations of a supply shortage}} = 0.231$, $p = 0.773$).

Fifth, the coefficient of the mediation chain via fear is larger ($b = 1.240 > 0.559$) and more significant ($p = 0.001 < 0.092$) than via expectations of a supply shortage. This suggests that during the early stage of the pandemic, fear plays a more important role in motivating consumers to build up stocks than the expectations of a supply shortage.

Lastly, note that our model includes a path from fear to expectations of a supply shortage. The coefficient of this path is significantly positive ($\beta_{\text{fear} \rightarrow \text{expectations of a supply shortage}} = 0.117$, $p < 0.001$), which suggests that fear might lead consumers to expect a supply shortage. Furthermore, the indirect effect of fear on stockpiling via expectations of a supply shortage is significant ($\beta_{\text{fear} \rightarrow \text{expectations of a supply shortage} \rightarrow \text{stockpiling}} = 0.008$, $p < 0.030$). However, the indirect effect of the growth rate on stockpiling via both mediation stages is insignificant ($\beta_{\text{growth rate} \rightarrow \text{fear} \rightarrow \text{expectations of a supply shortage} \rightarrow \text{stockpiling}} = 0.048$, $p = 0.108$).

Robustness check. Our measures captured *past* stockpiling behavior, but *current* levels of fear and expectations of a supply shortage. A potential reservation against our findings may be that they exhibit reverse causality. That is, perhaps the act of stockpiling raised the salience of both the health threat posed by COVID-19 and limited supply in grocery stores, thereby causing fear and expectations of a supply shortage. To rule out this potential reservation about reverse causality and test the validity of our findings, we included an additional intention measure of stockpiling ("I feel that I have to buy a lot of things right now," "I feel the urge to buy a lot of supplies," 1 = strongly disagree, 7 = strongly agree; $r_{\text{Spearman–Brown}} = 0.856$). We then replicated

our model using this measure as our ultimate dependent variable. The results in Table 2, Model 2, are fully in line with our previous findings. Thus, reverse causality does not seem to have biased our results.

3.1.3 Supplemental Analysis

The evidence in this study provides strong support for our theorizing. In particular, we found that both fear and expectations of a supply shortage motivated consumer stockpiling during the COVID-19 pandemic (Hypotheses 1 and 2). Importantly, compared to expectations of a supply shortage, fear increases more rapidly in the early stages of the COVID-19 pandemic and then decreases more rapidly in later stages (Hypothesis 3). Finally, trust in government weakens fear as the pandemic progresses (Hypothesis 4). In this supplemental analysis, we focus on Hypothesis 3. In particular, we aim to acquire more insights by exploring how consumers' affective versus cognitive motives for stockpiling shift, depending on the growth rate of cases, which approximates the progression of the pandemic. More specifically, focusing on consumers who engage in stockpiling, we utilize NLP to calculate and compare the degree to which a consumer's motives (provided in textual responses) are primarily affective versus cognitive over various stages of the pandemic. Employment of affective versus cognitive sentiment analysis gives us a higher level of objectivity (compared to the specific subjective measures introduced in the main analysis), which allows us to directly investigate the role of the suggested affective and cognitive motives underlying consumer stockpiling.

Data preparation. As the basis for our analysis, we focused on participants who stated that they purchased large amounts of supplies (see our four-item measure for stockpiling in the main analysis of Study 1). In particular, we focused on participants' written answers to the question, "In case you purchased more than usual of the previous supplies, please elaborate in

detail why you did so." Among the 1,825 participants, 1,258 written responses clearly indicated that they had stockpiled in the early stages of the pandemic, and these responses were included as the final sample for supplemental analysis.

Measures. First, to approximate the progression of the COVID-19 pandemic in each country, we relied on the same measure that we used in the main analysis—the compound daily growth rates of COVID-19 cases over one week. Second, we applied sentiment analysis to participants' written responses to discern the changes in consumers' motives. For this step, we refrain from relying entirely on standardized dictionaries, which typically present words in a context-free perspective that may not be in line with our specific context (Berger et al., 2020). Instead, we utilized established affective- and cognitive-related dictionaries from LIWC 2015 (Pennebaker, Boyd, Jordan, & Blackburn, 2015) and further enriched them with relevant words that were specific to our context.

To collect affective- and cognitive-related words in our context, we first identified the 100 most frequent words that appeared in written responses, which accounted for approximately half of the cumulative distribution frequency of words in the dataset. Second, we assigned these words to affective-related, cognitive-related, or "none" categories, based on the independent votes made by all the authors. Third, we supplemented established affective and cognitive dictionaries from LIWC 2015 with affective-related or cognitive-related words relevant to our context to create customized affective- and cognitive-related dictionaries. We then counted the number of affective- and cognitive-related words in each consumer's written response as proxies for affective or cognitive motives, respectively.

Model specifications and results. To investigate the evolution of consumers' motives for stockpiling, we z-standardized the number of affective and cognitive words in a consumer's

response and took their differences as our dependent variable. To determine how this difference changes depending on the growth rate of cases, we ran the following regression:

$$(\text{Affective - Cognitive})_i = \beta_0 + \beta_1 \times \text{Growth}_i + \beta_2 \times \text{Age}_i + \beta_3 \times \text{Gender}_i + \beta_4 \times \text{Household Size}_i + \beta_4 \times \text{Education}_i + \sum_{k=1}^{30} \gamma_k \times \text{Country}_{ik} + \epsilon_i, \quad (9)$$

where $(\text{Affective - Cognitive})_i$ is the difference between the (z-standardized) number of affective and cognitive cues (hereafter, the difference between affective and cognitive cues) in consumer i's written response; Growth_i approximates the pandemic progression as the compound daily growth rates of cases over one week in consumer i's country; Age_i and Household Size_i are (z-standardized) age and household size of consumer i, respectively; Gender_i and Education_i are variables controlling for consumer i's gender and education, respectively; Country_{ik} is a dummy variable that takes the value of one for country $k = \{1, 2, 3, \ldots, 30\}$ and zero otherwise for consumer i.

Our results from Equation (9) reveal that the difference between affective and cognitive cues is larger for higher growth rates ($\beta_1 = 40.309$, $p < 0.05$; see Supplementary Material F for the results from the model with all independent variables). Put differently, in the early stages of the pandemic, when the number of cases grows at a rapid pace, consumers use more affective-related words than cognitive-related words (which can be considered a good proxy for their affective and cognitive motives, respectively, thus indicating that affective motives increase at higher rates than cognitive motives). The difference between affective and cognitive cues decreases in the later stages of the pandemic, when growth in the number of cases declines.

These findings are in line with those of the main analysis of Study 1, showing that in the initial stages of the COVID-19 pandemic, consumers rely more on affective processing, whereas

with the progression of the pandemic, cognitive processing plays a more prominent role in purchase decisions.

3.2 Discussion

This study provides strong support for our hypotheses. First, both fear and expectations of a supply shortage drive consumer stockpiling (Hypotheses 1 and 2). Second, fear increases more rapidly when the pandemic has a rising growth rate of infection cases and decreases more rapidly once pandemic growth rates decline (Hypothesis 3). Our supplemental analysis provides support for the increased weight of cognitive words (a good proxy for consumers' cognitive motives) on engaging in stockpiling, along with the progression of the pandemic. Third, consumers who have high trust in government experience less fear and are thus less likely to stockpile, compared to those who have low levels of trust in government (Hypothesis 4).

Two limitations of this study are worth noting. First, as outlined previously, we recruit only participants who could communicate in English, even for countries where English is not a native language. This decision might have resulted in a sample of relatively well-educated consumers whose behavior is not necessarily representative of the general population of consumers. For example, these consumers may have above-average knowledge of the pandemic and the ability to process information about the pandemic more systematically, thus biasing their fear and expectations of a supply shortage. In Study 2, we aim to reduce such potential bias by using data from English-speaking countries.

Second, in this study, we examined consumers' fear and expectations of a supply shortage at a single point in time. The progression of a disaster was investigated based on the fact that different countries were at different stages of the pandemic (i.e., the number of people infected). To gain a better understanding of how fear and expectations of a supply shortage evolve over the

progression of a disaster, Study 2 explores such an evolution by utilizing longitudinal data.

4. Study 2: Revealed Motives Using Google Search Data

We use Google search data (derived from the web service, Google Trends), which has been hailed as "the most important dataset ever collected on the human psyche" (Stephens-Davidowitz, 2017, p. 14) because "people tell the giant search engine things they might not tell anyone else" (ibid., p. 5). Unlike other data sources that are prone to response biases, Google search provides objective records that reveal individuals' motives. Building on this notion, we aim to approximate fear and expectations of a supply shortage using Google search data. Specifically, we use Google Trends to measure the popularity of search terms indicating fear and expectations of a supply shortage, and we examine whether and how the popularity of those terms evolve with the progressing COVID-19 pandemic. To focus on English Google searches, we followed prior studies (e.g., Chae et al., 2015; Stephens-Davidowitz, 2014) and chose the individual US state as our unit of analysis.

4.1 Data Collection

Our data collection comprised four steps. First, to understand which Google search terms are likely to indicate fear or expectations of a supply shortage, we conduct a pretest with 200 US participants (51% female, $M_{\text{Age}} = 31.97$, $SD_{\text{Age}} = 11.27$) recruited through *Prolific*. They were randomly allocated to either the fear or the expectations-of-a-supply-shortage condition. In this pretest, the participants indicated a typical search term they would use if they were "worried that you or your loved ones might catch the coronavirus" (fear condition) or if they intended "to prepare for a shortage of supply because of the coronavirus" (expectations-of-a-supply-shortage condition). Because highly specific terms are unlikely to have received sufficient search volume and thus cannot be analyzed using data from Google Trends, we code the key search words in

each search term. This procedure resulted in 43 fear-related and 80 expectations-of-a-supply-shortage-related search terms (Supplementary Material G provides the full list of codes).

Second, we extracted the weekly search popularity for all coded search terms from Google Trends for the period from January 6, 2020 (i.e., the start of the first full week in 2020), to October 11, 2020 (i.e., the last completed week at the time of our analysis), broken down by the 50 states and the District of Columbia. These search popularities are presented as standardized scores between 0 and 100 in the state–week unit of analysis. A value of 100 means that a search term is the most popular in the respective state in the respective week compared to other weeks in the time frame under consideration. To aggregate the popularity scores from the different search terms, we z-transformed all scores within each state. Subsequently, we averaged the z-standardized fear- and expectation-related scores per state and week to obtain a proxy for people's fear and expectations of a supply shortage, respectively.

Third, we matched this dataset with the number of COVID-19 cases in each state for each week during the study period. We collected this data from *The New York Times'* GitHub repository (The New York Times, 2020). Fourth, we matched the data using a 50-state poll by Gallup (Jones, 2014). In this survey, Gallup had asked at least 600 residents in every state (except the District of Columbia) to evaluate the question, "How much trust and confidence do you have in the government of the state where you live when it comes to handling state problems?", with the choice of responses being 4 = "a great deal," 3 = "a fair amount," 2 = "not very much," and 1 = "none at all." Results are weighted to achieve representativeness in terms of gender, age, race, education, region, and population density, among other factors. Because trust in government has been shown to be relatively stable over time (Jones, 2016), we are confident that the data adequately approximate trust in government during the COVID-19 pandemic. We operationalized

trust in government as the mean value of the 4-point scale (M = 2.54, SD = 0.18). Summarily, our dataset comprises a balanced panel of 2,000 observations (i.e., 50 states over 40 weeks).

4.2 Data Analysis and Results

Our data analysis comprises three steps. First, we visually inspect how the popularity of fear-related search terms and expectations-of-a-supply-shortage-related search terms evolves within each state as the pandemic progresses. To this end, we juxtaposed these search popularities against each state's progression of the pandemic over time, operationalized as the state's cumulative number of COVID-19 cases per week (log-transformed to control for the exponential growth of cases).[1] Fig. 1 provides the smoothed conditional means for all states and shows that the popularity of both fear-related and expectations-of-a-supply-shortage-related search terms increases with the number of COVID-19 cases. Notably, both the initial growth and the subsequent decline are substantially steeper for fear-related search terms than for expectations-of-a-supply-shortage-related search terms (compare red and blue lines). This pattern corroborated our tentative findings from Study 1, where the progressing pandemic had a stronger relationship with fear than with expectations of a supply shortage.

--- Insert Fig. 1 about here ---

As the second step in our analysis, we visually inspected the same relationship between COVID-19 cases and search popularity for our data aggregated across states. Fig. 2 presents the corresponding scatter plot including smoothed conditional means for the popularity of fear-related (red) and expectations-of-a-supply-shortage-related (blue) search terms. Again, the pattern is similar to our previous results, with the popularity of fear-related search terms increasing and

[1] Note that in Study 1, we had operationalized the progression of the pandemic using the growth rate of cases, which was the best proxy given our use of cross-country and cross-sectional data. In the present study, we track the progressing coronavirus pandemic longitudinally on a state–week unit of analysis, for which the weekly number of cases provides an adequate proxy.

declining more strongly than the popularity of expectations-of-a-supply-shortage-related search terms. Furthermore, the error bands (95% confidence interval) show that these trends are significant; while the popularity of fear-related search terms is more pronounced than that of expectations-of-a-supply-shortage-related search terms in the earlier stages of the pandemic, they converge in later stages. Interestingly, there is some evidence that in the later stage of the pandemic, expectations-of-a-supply-shortage-related search terms become more popular than fear-related search terms.

--- Insert Fig. 2 about here ---

Third, we set out to model the non-linear relationship between the number of cases and the popularity of fear-related and expectations-of-a-supply-shortage-related search terms and, thereby, also consider the impact of trust in government. To this end, we specified the following fixed effects models:

$$\text{Fear}_{it} = \beta_0 + \beta_1 \times \text{Cases}_{it}^2 + \beta_2 \times \text{Cases}_{it} + \beta_3 \times \text{Trust}_i + \beta_4 \times \text{Cases}_{it}^2 \times \text{Trust}_i + \beta_5 \times \text{Cases}_{it} \times \text{Trust}_i + S_i + M_t + \epsilon_{it} \quad (10)$$

$$\text{Expectations}_{it} = \beta_0 + \beta_1 \times \text{Cases}_{it}^2 + \beta_2 \times \text{Cases}_{it} + \beta_3 \times \text{Trust}_i + \beta_4 \times \text{Cases}_{it}^2 \times \text{Trust}_i + \beta_5 \times \text{Cases}_{it} \times \text{Trust}_i + \beta_6 \times \text{Fear}_{it} + S_i + M_t + \epsilon_{it}, \quad (11)$$

where Fear_{it} and $\text{Expectations of a supply shortage}_{it}$ refer to the popularity of the respective search terms in state i and week t, Trust_i refers to the time-invariant state-level trust in government, S_i are state fixed effects, M_t are month fixed effects, and ϵ_{it} represents the idiosyncratic error term. We estimate the equations using R and summarize the results in Table 3.

--- Insert Table 3 about here ---

The number of cases exhibits an inverted U-shaped relationship with both the popularity of fear-related search terms ($\beta_1 = -0.012$, $p < 0.001$; $\beta_2 = 0.182$, $p < 0.001$) and that of expectations-of-a-supply-shortage-related search terms ($\beta_1 = -0.004$, $p < 0.001$; $\beta_2 = 0.083$, $p < 0.001$). Furthermore, the interaction of trust in government with the squared number of cases is

positively related to the popularity of fear-related search terms ($\beta_4 = 0.002$, $p = 0.002$) but not to that of expectations-of-a-supply-shortage-related search terms ($\beta_4 = 0.000$, $p = 0.178$). This suggests that as trust in government increases, the inverted U-shaped relationship between the number of cases and popularity of fear-related search terms flattens. To better illustrate this finding, we visualize this interactive relationship in Fig. 3.

--- Insert Fig. 3 about here ---

4.3 Check for External Validity

Our unit of analysis in this study was US state. Although this decision follows prior studies (e.g., Chae et al., 2015; Stephens-Davidowitz, 2014), the external validity of our results remains to be tested. Moreover, in the US, COVID-19 progressed in an idiosyncratic manner (Bendix & Gould, 2020). Therefore, we replicated the first and second steps of our analyses with six other English-speaking countries (i.e., Australia, Canada, Ireland, New Zealand, South Africa, and the United Kingdom). Owing to the low number of countries in this replication, we were unable to examine trust in government as a moderator.

Supplementary Material H presents the results, which strongly support the external validity of our previous findings. First, Panel A of Supplementary Material H shows that the evolution of fear-related and expectations-of-a-supply-shortage-related search terms within each of the countries follows a very similar trend, compared to that in the US. Second, Panel B of Supplementary Material H shows that across these countries, the popularity of fear-related search terms is more pronounced than that of expectations-of-a-supply-shortage-related search terms in the earlier stages of the pandemic (note the non-overlapping 95% confidence intervals), and that the popularity of both search terms reaches similar levels in the later stages of the pandemic.

4.4 Discussion

This study provides support for Hypothesis 3, which predicts how consumer motives for stockpiling evolve as a disaster progresses. Instead of focusing on fear and expectations at the individual level, this study focused on behavioral representations at the aggregate level. The results show that the popularity of both fear-related and expectations-of-a-supply-shortage-related search terms increases in the early stages of a pandemic, and decreases in the later stages. In line with our theorizing, the increase and decrease are greater for fear, leading to a more pronounced inverted U-shaped relationship compared to expectations of a supply shortage. Furthermore, supporting Hypothesis 4, the inverted U-shape for fear becomes flatter as a state's trust level in government heightens.

A limitation of this study is that the fear-related search terms we use are not necessarily related to fear—they could simply be indicative of consumers' information-seeking behaviors at the onset of the pandemic. Thus, while our results corroborate Study 1, they should be interpreted carefully.

5. General Discussion

Consumer stockpiling is a prevalent phenomenon with various disasters (McKevitt, 2020; Troy, 2020). In the absence of adequate insights on this behavior in the context of a disaster, we developed a theoretical framework and conducted a series of studies to enrich our understanding. First, through a qualitative study, we identified two major motives that drive consumers' stockpiling behavior: the affective motive of the fear of getting infected and the cognitive motive of the expectations of a supply shortage. Next, to quantify the impact of these two motives on consumer stockpiling and the evolution of these two motives during a disaster—in particular, the COVID-19 pandemic—we conducted a large-scale global survey (Study 1) and employed

objective behavioral datasets from Google (Study 2). The results of these studies reveal the following. First, both fear of getting infected and expectations of a supply shortage lead to consumer stockpiling (Hypotheses 1 and 2). Second, both motives increase in the initial stages of the pandemic (when the number of cases increases rapidly) and then decrease in the later stages (when the growth rate of cases decreases). However, fear increases and then decreases more rapidly than the expectations of a supply shortage (Hypothesis 3). Finally, consumers' trust in government weakens the impact of the COVID-19 outbreak on consumers' fear and their stockpiling behavior (Hypothesis 4).

5.1 Theoretical Contributions

Our research makes theoretical contributions to three streams of the literature. First, it extends the literature on consumer stockpiling in general and during a pandemic. Traditional research on consumer stockpiling mainly focuses on the influence of price promotions (Gupta, 1988; Mela et al., 1998). Recent research has examined how and why a pandemic impacts consumer stockpiling. Several recent studies have duly documented consumer stockpiling during the COVID-19 pandemic worldwide (Ahmadi et al., 2021; Brizi & Biraglia, 2021; Hall et al., 2021; Lehberger et al., 2021; Micalizzi et al., 2021; Nam et al., 2021; Sherman et al., 2021; Wang et al., 2020). These studies have also revealed various factors that cause consumer stockpiling during a pandemic, including affective (e.g., fear, stress, and anxiety; Ben Hassen et al., 2021; Dobbelstein & Naidoo, 2020; Omar et al., 2021; Sherman et al., 2021) and cognitive (e.g., perceived severity, perceived scarcity, and doomsday prepping beliefs Garbe et al., 2020; Lehberger et al., 2021; Smith & Thomas, 2021; Syahrivar et al., 2021; Yuen et al., 2021) determinants. However, none of the existing studies has taken a longitudinal perspective to examine the evolution of consumer stockpiling motives during the pandemic. Given that a

pandemic usually lasts for a long time, we argue that a longitudinal perspective is essential for us to fully understand the impact of the pandemic on consumer stockpiling. Our research fills this research gap and provides an overarching theory to explain and predict how a pandemic dynamically affects consumer stockpiling motives and behavior over the course of the event. Specifically, we show that the impact of a pandemic will trigger two major motives that lead consumers to stockpile: fear of the disaster and expectations of a supply shortage. Both fear and expectations of a supply shortage increase at the beginning of the pandemic and decrease at the later stages. However, the increase and decrease in fear are greater than those for expectations of a supply shortage.

Second, our research contributes to the literature on the impact of disasters on consumer behavior. Prior research on this topic is mainly focused on natural disasters, such as tornados and hurricanes, and uses qualitative methods to examine their impact on a single community (Baker et al., 2007; Baker & Hill, 2013). Our research examines the impact of a different type of disaster—a contagious-disease pandemic. We also study the impact of a disaster on consumer behavior on a global scale—we include 31 countries in Study 1 and 7 countries in Study 2—which increases the generalizability of our findings. Moreover, extending prior research, we examine the dynamic impact of disasters. Specifically, we reveal how consumers' motives change with the progression of a disaster. By doing so, this research enriches our understanding of the impact of disasters on consumer behavior and how consumers react to them (Kirk & Rifkin, 2020; Sheth, 2020).

Finally, our research extends the literature on trust in government. The concept of trust in government has attracted considerable attention in political research (Davis & Silver, 2004; Hetherington, 1998; Weatherford, 1987). Previous research has also examined the role of trust in

government during crises (Gallo et al., 2006). However, most of these crises are economic crises. Our research extends the extant literature by investigating the role of trust in government in the context of a global disaster and consumer research. We show that trust in government can also impact consumer behavior during a disaster by lowering their fear and reducing their stockpiling behavior.

5.2 Practical Implications

The present research has significant implications for consumers, retail managers, and public policymakers. For consumers, the findings of our research foster an understanding of their own reactions to disasters and stockpiling behaviors. We show that a disaster, such as the outbreak of the pandemic, causes consumers to experience fear and expect a shortage of supplies, which together drive stockpiling behavior. In addition to pandemics, our findings might be applicable to other types of disasters, such as tornados, hurricanes, tsunamis, and floods. During these uncontrollable events, we predict that consumers will also experience fear and expect a supply shortage, which might increase their stockpiling of essential items. Our research suggests that consumers should be conscious of their reactions to an ongoing disaster—in particular, the stronger impact of their affective reactions on their decision-making. The results of the current work also allow consumers to better understand how other consumers tend to react to a disaster and thus better protect themselves against others' stockpiling behavior.

This study has relevant managerial implications for retailers. First, we show that consumers' stockpiling behavior changes during a disaster: consumers are more likely to engage in stockpiling in the early stages and then reduce stockpiling in the later stages. Therefore, retail managers should adjust their inventory at different stages of a disaster. Second, our in-depth interviews with consumers reveal that retailers' actions in response to a disaster can impact

consumers' perception of the shortage of supplies and hence affect their stockpiling behavior (see Supplementary Material B). For instance, reduced operating hours of grocery stores can make consumers perceive that the supply might be unstable. Retailers' restrictions on shopping hours might also trigger psychological reactance from consumers. The psychological reactance theory suggests that when people's behavioral freedoms are reduced, they are motivated to regain them (Brehm, 1966; Brehm & Brehm, 2013). In the context of retailers reducing their operating hours, this restriction policy will limit consumers' shopping freedom and might trigger their psychological reactance (Clee & Wicklund, 1980), which could consequently lead consumers to stockpile even more. Therefore, retailers should be careful about their measures in response to a disaster and also try to communicate the stability of supply to consumers (Gheibi & Fay, 2020). Finally, we show that consumers' fear and stockpiling behavior tend to be higher in countries or areas where people have low trust in government. Therefore, during a disaster, retailers in such countries or areas should better prepare themselves for increased purchase demands and maintain a stable supply. Inevitably, consumers who have low trust in government may experience greater levels of fear. The stable supply provided by retailers might effectively help to reduce the fear that consumers experience during a disaster. In addition, retailers may consider alternative ways to offset fear, such as using marketing communications to foster trusting relationships with their customers during a disaster.

Finally, public policymakers can benefit from the findings of this study. We show that both fear and expectations of a supply shortage drive consumers' stockpiling behavior, with the former exhibiting a stronger influence than the latter in the initial stages of a pandemic. Based on these findings, public policymakers should focus primarily on mitigating people's fear in the early stages of a pandemic. However, policymakers have used several fear appeals in their public

communications during the COVID-19 pandemic. For instance, a policy advertisement used the following text: “Anyone can get it, anyone can spread it.” Another example is, “If you go out, you can spread it. People will die.” (itvNEWS, 2020). We argue that the use of fear appeals might backfire and increase people’s fear and their stockpiling behavior. Instead, we suggest that policymakers use hope appeals (e.g., “Stay Safe, Spread Hope”) to reduce people’s fear. Moreover, our research reveals that trust in government can reduce consumers’ fear and stockpiling behavior; thus, policymakers can design public communication paradigms to win consumers’ trust in government. Interestingly, hope-based messaging (i.e., using hope appeals) might increase consumers’ trust in government. This is because hope-based messaging can give people hope and make people stay positive and feel optimistic about their future, and prior research has shown that a positive mood might increase trust (Lount, 2010). Therefore, hope-based messaging might enhance people’s trust in government. Future research can test this idea.

5.3 Limitations and Avenues for Future Research

We have discussed the value and implications of our research, albeit we also recognize its limitations, which offer opportunities for future research. First, although the present research aims to elucidate why consumers stockpile during a disaster, empirical evidence is primarily established in the context of COVID-19 to maximize its generalizability across various cultures. We encourage future research to examine the robustness of our theorizing in relation to other disasters.

Second, while we were writing this paper, the COVID-19 pandemic was still ongoing. Therefore, our study provides only a partial picture of the changes in consumers’ motives for stockpiling. Specifically, we examine the effect of the “first wave” of the COVID-19 pandemic in 2020. Notably, the COVID-19 pandemic was characterized by various resurgences resulting from

seasonality as well as genetic mutations of the virus (e.g., the Delta variant, which gained significant traction in 2021). An interesting question entails how consumers respond to such resurgences of the virus. Did they engage in continued stockpiling or had they gotten used to the new reality and thus refrained from stockpiling? While our studies do not provide an empirical response to these questions, they allow us to speculate that stockpiling is less pronounced during the later waves of the pandemic. This is because anecdotally, we observe that the key drivers of stockpiling, that is, fear and expectations of a supply shortage, were subdued. By 2021, the fear of the virus had worn off to such an extent that many people even forwent vaccinations (Hyland et al., 2021). Similarly, the media have discontinued reports on stockpiling and panic buying, which might have decreased consumers' expectations of a supply shortage. With fear and expectations of a supply shortage on the decrease, consumers may have been less likely to engage in stockpiling. Future research may test these propositions and investigate consumer stockpiling over a longer period that spans more stages of a disaster.

Third, to examine our research questions, we employ multiple methods, including qualitative interviews, a large-scale global survey, and longitudinal state-level data. Although different methods provide converging evidence for our hypotheses, one limitation of our research is that we do not conduct experiments; therefore, our findings cannot fully demonstrate the causality. The lack of experiments is mainly due to the fact that we investigate the longitudinal impact of a disaster, and a disaster such as the COVID-19 pandemic cannot be manipulated in the laboratory. Evidently, consumers' fear and expectations of a supply shortage are largely shaped by their perceptions of the actual situation of a disaster situation, rather than by a simulated experiment. Future research can explore other possibilities to reveal causality.

Finally, in this research, we mainly focus on one key moderator that attenuates the

influence of a disaster on consumer stockpiling via fear. Other factors may impact how fear and expectations of a supply shortage influence consumer stockpiling. For instance, consumers who have lower levels of religiosity may be more likely to experience fear. Religiosity has been shown to enhance psychological well-being by reducing anxiety and increasing meaning and purpose (Petersen & Roy, 1985). Thus, religiosity should be effective in counteracting the anxiety associated with disasters and thus reduce the experience of fear. However, recent studies have found that restrictions on religious gatherings motivate stability-seeking consumption via the signaling of uncertainty in everyday life (Minton & Cabano, 2021). Future research can further explore how religiosity and religious activities impact consumer behavior during a disaster.

In addition, the need for cognition should predict greater expectations of a supply shortage. The need for cognition refers to the tendency to engage in and enjoy thinking (Cacioppo & Petty, 1982). People who are high in need for cognition are more likely to seek out information and engage in deliberation (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Thus, it is plausible that people who are high in need for cognition would factor in other consumers' purchase behavior and thus demonstrate higher expectations of a supply shortage. We encourage future research to investigate how these potential constructs can shape the impact of a disaster and influence consumer stockpiling.

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Table 1
Extant literature on consumer stockpiling

Author(s)	Key dependent variable(s)	Key independent variables under investigation	Empirical strategy	Nature of the dataset	Examination of pandemic	Examination of the dynamics of consumer motives
Prior Research on the Effects of Price Promotion on Stockpiling and the Consequences of Stockpiling						
Gupta (1988)	Stockpiling	Price promotions	Empirical modeling	Scanner panel data for regular ground coffee	No	No
Meyer & Assunção (1990)	Stockpiling	Price uncertainty	Analytical modeling; experiment	An experiment	No	No
Mela et al. (1998)	Stockpiling	The long-term impact of price promotions	Empirical modeling	Longitudinal scanner panel data for a frequently purchased, non-food, consumer-packaged-goods product	No	No
Bell et al. (1999)	Stockpiling & Consumption	Price promotions	Empirical modeling	Scanner panel data including 173 brands in 13 different product categories	No	No
Ailawadi & Neslin (1998)	Consumption	Stockpiling	Empirical modeling	Scanner panel data from two product categories: Yogurt and ketchup	No	No
Chandon & Wansink (2002)	Consumption	Stockpiling	Empirical modeling; experiments	Scanner panel data including all purchases of fruit juices, cookies, and liquid and powder laundry detergent; three experiments	No	No
Recent Research on Stockpiling during the COVID-19 Pandemic						
Wang et al. (2020)	Stockpiling of food	The COVID-19 pandemic	Empirical modeling	A survey with consumers in China	Yes	No
Micalizzi et al. (2021)	Stockpiling in general	The COVID-19 pandemic	Empirical modeling	A survey with consumers in the US	Yes	No
Nam et al. (2021)	Stockpiling in general	The COVID-19 pandemic	Empirical modeling	A survey with consumers in Vietnam	Yes	No
Hall et al. (2021)	Stockpiling in general	The COVID-19 pandemic	Empirical modeling	Retail spending and transactional data in New Zealand	Yes	No
Ahmadi et al. (2021)	Visits to grocery stores	Cultural values	Empirical modeling	Growth modeling based on Google Mobility data and Hofstede's cultural dimensions	Yes	No
Minton & Cabano (2021)	Stability-seeking consumption	Religiosity	Experiments; survey	A survey and two experiments	Yes	No
Fischer et al. (2021)	Stockpiling intentions	Personality	Empirical modeling	A survey with consumers in Germany	Yes	No
Dammeyer (2020)	Stockpiling in general	Personality traits; attitudes to the governmental response; panic; action	Descriptive analysis; correlations analysis	A survey with consumers in Denmark and the UK	Yes	No
Dulam et al. (2021)	Stockpiling of essential commodities	Individual, social & personal, psychological, and situational factors.	Empirical modeling	A survey with consumers in Japan	Yes	No
Sherman et al. (2021)	Stockpiling in general	COVID-19 information; anxiety; resilience	Empirical modeling	A survey with Muslim consumers in UAE	Yes	No
Ben Hassen et al. (2021)	Stockpiling of food	Negative emotions (fear, sadness, and depression); concerns of obtaining enough food and rising food prices; gender; household composition;	Empirical modeling	A survey with consumers in Serbia	Yes	No
Omar et al. (2021)	Stockpiling in general	Anxiety	Empirical modeling	A survey with consumers in Malaysia	Yes	No

Dobbelstein & Naidoo (2020)	Stockpiling in general	Fear; stress	Empirical modeling	A survey with consumers in Germany and South Africa	Yes	No
Garbe et al. (2020)	Stockpiling of toilet paper	Perceived threat of COVID-19; personality traits	Empirical modeling	A survey with consumers across 22 countries	Yes	No
Brizi & Biraglia (2021)	Stockpiling of food	Need for cognitive closure; gender	Empirical modeling	A survey with consumers in the US and India	Yes	No
Roșu et al. (2021)	Stockpiling in general	Negative attitude; others' behavior	Empirical modeling	A survey with consumers in Romania	Yes	No
Smith & Thomas (2021)	Stockpiling in general	Doomsday prepping beliefs	Empirical modeling	A survey with consumers in Australia	Yes	No
Lehberger et al. (2021)	Stockpiling of nonperishable food	Attitude; subjective norm; fear of future unavailability	Empirical modeling; qualitative analysis	A survey with consumers in Germany	Yes	No
Yuen et al. (2021)	Stockpiling in general	Normative social influence; observational learning; perceived severity; perceived scarcity	Empirical modeling	A survey with consumers in Singapore	Yes	No
Yoshizaki et al. (2020)	Stockpiling of toilet paper	Income per capita	Empirical modeling	Retail toilet paper transactions in Brazil	Yes	No
Prentice et al. (2021)	Stockpiling of sanitizers, staples, and toilet paper	Government measures; media and peer influence	Empirical modeling	A survey with consumers in the US and Australia	Yes	No
Naeem (2021)	Stockpiling in general	Social media	Qualitative analysis	Interviews with consumers	Yes	No
Syahrivar et al. (2021)	Stockpiling intentions	Health locus of control	Empirical modeling	A survey with educated consumers in Indonesia	Yes	No
Current study	**Stockpiling in general**	**The COVID-19 pandemic; fear of getting infected; expectations of a supply shortage**	**Empirical modeling; qualitative analysis; natural language processing**	**Consumer interviews; large-scale cross-country survey; Google search data**	**Yes**	**Yes**

Table 2

Study 1: Dual motives for consumer stockpiling with the progression of the pandemic

	Model 1: Stockpiling measured as past behavior	**Model 2:** Stockpiling measured as intention
Between-level paths		
Growth rate → Fear	5.829**	5.858**
Growth rate → Expectations of a supply shortage	7.921*	7.976*
Growth rate → Stockpiling	1.423	4.655
Within-level paths		
Trust in government → Fear	0.008	0.010
Trust in government → Expectations of a supply shortage	-0.090***	-0.089***
Fear → Stockpiling	0.213***	0.272***
Expectations of a supply shortage → Stockpiling	0.071**	0.172***
Fear → Expectations of a supply shortage	0.117***	0.117***
Cross-level interactions		
Growth rate × Trust in government → Fear	-1.400*	-1.358*
Growth rate × Trust in government → Expectations of a supply shortage	0.231	0.265
Between-level controls		
Number of cases → Fear	0.008	0.009
GDP per capita → Fear	-0.033	-0.034
Number of cases → Expectations of a supply shortage	0.112*	0.111*
GDP per capita → Expectations of a supply shortage	-0.068	-0.068
Number of cases → Stockpiling	0.047	0.053
GDP per capita → Stockpiling	-0.111**	-0.056
Within-level controls		
Age → Stockpiling	-0.013**	-0.008*
Age → Fear	0.012**	0.011*
Age → Expectations of a supply shortage	0.002	0.001
Household size → Stockpiling	0.060*	0.051
Household size → Fear	0.031	0.028
Household size → Expectations of a supply shortage	0.064**	0.062**
Rationing → Stockpiling	-0.048	0.047
Rationing → Fear	0.164*	0.156*
Rationing → Expectations of a supply shortage	0.512***	0.500***
Gender fixed effects → Stockpiling	✓	✓
Gender fixed effects → Fear	✓	✓
Gender fixed effects → Expectations of a supply shortage	✓	✓
Education fixed effects → Stockpiling	✓	✓
Education fixed effects → Fear	✓	✓
Education fixed effects → Expectations of a supply shortage	✓	✓
Number of observations	1,825	1,825

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Unstandardized coefficient.

Table 3

Study 2: The non-linear (inverted U-shaped) relationship between the number of cases and the popularity of fear-related and expectations-of-a-supply-shortage-related search terms

	Dependent variable	
	Popularity of fear-related search terms	Popularity of expectations-of-a-supply-shortage-related search terms
Number of cases^2	-0.012 ***	-0.004 ***
Number of cases	0.182 ***	0.083 ***
Trust in government	0.046	0.000
Number of cases^2 × Trust in government	0.002 **	0.000
Number of cases × Trust in government	-0.024 ***	-0.004
Popularity of fear-related search terms	—	0.535***
State fixed effects	✓	✓
Month fixed effects	✓	✓
R^2	0.816	0.899
Adj. R^2	0.810	0.896

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

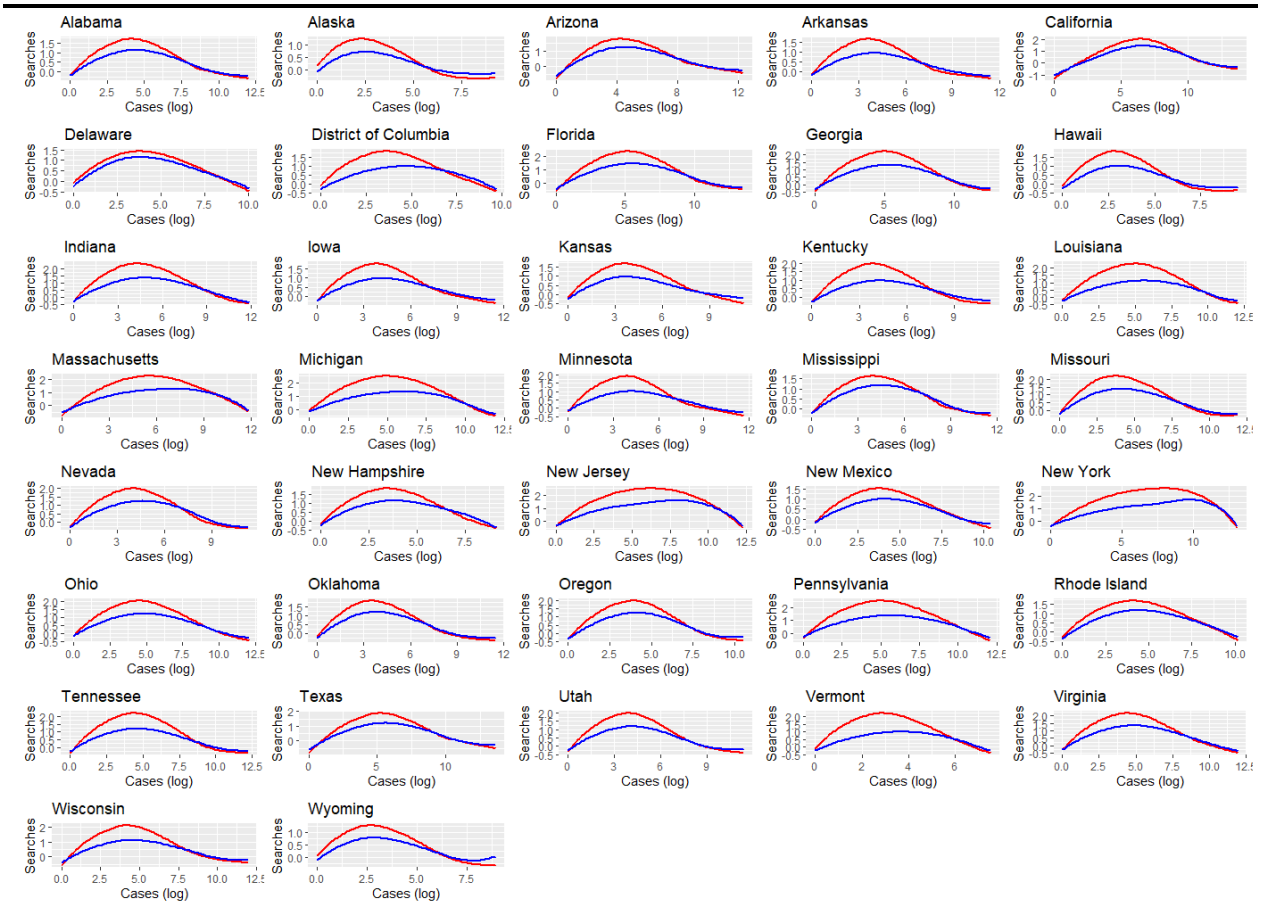

Fig. 1. Study 2: The popularity of fear-related and expectations-of-a-supply-shortage-related search terms (in each US state) versus the number of COVID-19 cases.

Notes. We plotted the smoothed conditional means of both fear-related searches (red) and expectations-of-a-supply-shortage-related search terms (blue) in the same plot per state and omitted the scatters for the sake of clarity. For all states, the results follow a similar pattern, with an inverted U-shape that is more pronounced for fear-related search terms than for expectations-of-a-supply-shortage-related search terms.

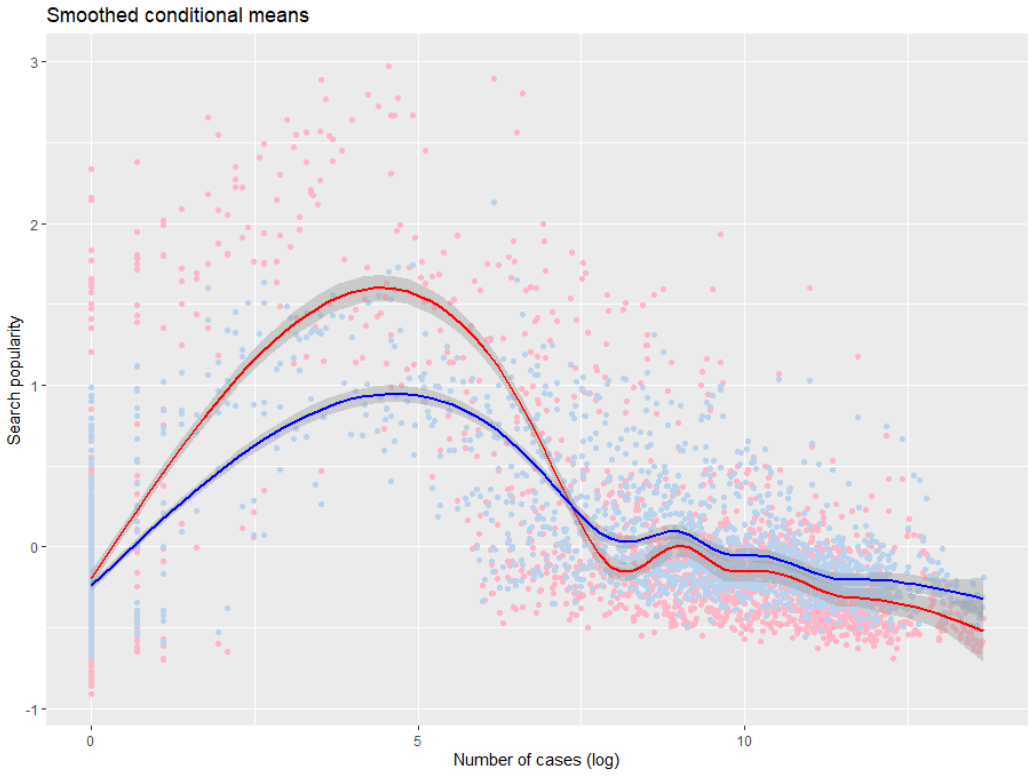

Fig. 2. Study 2: The popularity of fear-related and expectations-of-a-supply-shortage-related search terms (all the US states combined) and the number of COVID-19 cases.

Notes. Red (blue) scatters and lines pertain to fear-related and expectations-of-a-supply-shortage-related search terms.

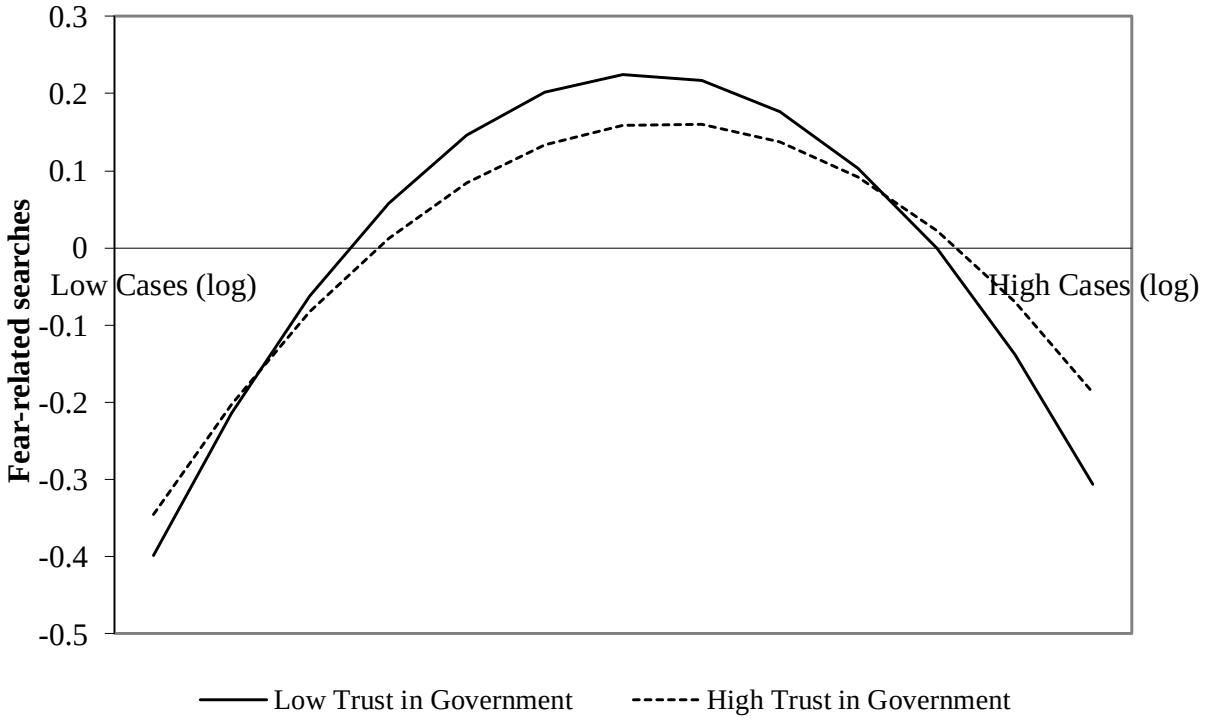

Fig. 3. Study 2: The moderating effect of trust in government on the (inverted U-shaped) relationship between the number of cases and the popularity of fear-related search terms.

Notes. Low/high refers to M –/+ 1*SD.