Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Uncovering people’s mask-saving intentions and behaviors in the post-COVID-19 period: Evidence from China

Hongyun Si a, Lin Shen b, c, Wenchao Liu c, Guangdong Wu d, *

a School of Public Administration and Policy, Shandong University of Finance and Economics, Jinan, China
b Humanities and Management School, Hebei Agricultural University, Cangzhou, China
c College of Economics and Management, Hebei Agricultural University, Baoding, China
d School of Public Affairs, Chongqing University, Chongqing, China

ARTICLE INFO

Keywords:
Mask saving
Intention
Behavior
COVID-19
Post-pandemic
China

ABSTRACT

The COVID-19 pandemic has caused a surge in the demand for medical masks over the past few months. Many countries and regions have experienced a shortage of masks and raw materials, as well as soaring prices. Understanding mask-saving behavior is an important way to help improve medical resource sustainability and respond to the outbreak. This study integrates the theory of planned behavior and normative activation to propose a new comprehensive theoretical framework, which aims to reveal people’s mask-saving intentions (MSI) and behaviors in the post-pandemic period. Using the partial least squares structural equation modeling method, a total of 1057 questionnaires randomly collected from China were measured and empirically analyzed. Results indicate the following: (i) Reducing the frequency of going-out is the main approach to saving masks in China, and the majority of people reuse a mask from two to five times. (ii) Personal norms, subjective norms, attitudes and perceived behavioral control all have significant positive effects on MSI; awareness of consequences and ascription of responsibility also indirectly affect MSI through personal norms. (iii) As for extended factors, environmental concerns, perceived risk and information publicity positively affect MSI, but supply chain performance does not have a significant role. (iv) Excessive information publicity may weaken the impact of personal norms, subjective norms and perceived risk on MSI. Given the above findings, some insightful management implications are proposed.

1. Introduction

Over the past few months, the COVID-19 pandemic has caused severe disruption to the global economy and society and has significantly challenged the running of urban areas (Antony, Velraj, & Haghighat, 2020; Gossling, Scott, & Hall, 2020; Wang, 2021). As of November 8, 2020, 49,578,590 people worldwide had been infected with COVID-19; the death toll has now exceeded 1,245,700 (WHO, 2020). To control the spread of COVID-19, masks have become one of the most indispensable forms of protective equipment for the public (Feng et al., 2020; Wang et al., 2020). Given that the second wave of the COVID-19 pandemic has struck and become more severe (Jadoo, 2020), the global demand for masks will continue to increase.

Since we eat and drink every day, we have to take our masks off many times a day. Throwing a mask away every time one is used is extremely wasteful, especially for ordinary residents. One can imagine how many discarded masks are generated every day around the world. The sheer volume of discarded masks poses a serious challenge to the earth’s environmental carrying capacity (Kalina & Tilley, 2020; Klemes, Pan, Tan, & Jiang, 2020). Moreover, any surge in the amount of medical waste can easily cause secondary infections (Yang et al., 2020). Therefore, saving masks is vital for the sustainable development of cities and society.

According to the “Guidelines for the Public Scientific Wearing of Masks”, issued by the National Health Commission of China, in low-risk areas or non-occupationally exposed groups, disposable and medical masks can be reused a limited number of times. However, the cumulative time spent wearing the mask cannot exceed eight hours (NHCRC (National Health Commission of the People’s Republic of China) (2020)). Professor Nanshan Zhong, the leader of the senior expert group responsible for fighting COVID-19 in China, suggested that disposable masks without obvious deformation and dirt can be reused; the premise

* Corresponding author.
E-mail address: gd198410@163.com (G. Wu).
Kampf, Scheithauer, Lemmen, Saliou, and Suchomel (2020) argued that, is that the user should not touch the outside of the mask (Zhong, 2020). Recent representative literature related to this article. Table 1

| Literature          | Topic                  | Specific behavior                              | Theory basis | Extended variables                  | Critical findings                                                                 |
|---------------------|------------------------|------------------------------------------------|--------------|-------------------------------------|-----------------------------------------------------------------------------------|
| Wang, Wang et al.   | Energy saving          | Habitual energy-saving behavior                | NAM          | Save money                          | Residents’ energy-saving behavior is driven by altruism. Social norms and policy environment are positively correlated with energy-saving behavior. |
| Wang, Guo et al.    | Waste management       | E-waste recycling intention                   | NAM          | Information publicity               | IP does not directly affect recycling intention, but indirectly affects it through PN and ATT. |
| Asadi et al. (2019) | Sustainable consumption| Green IT adopting intention                  | NAM          | Competitive advantage Managerial interpretation | Attitude, managerial interpretation, cost saving, AR, AC and PN are significant factors that affect the willingness to adopt. |
| Wang, Wang et al.   | Waste management       | Waste separation behavior                    | NAM          | Information publicity Information quality | IP has a significant direct impact on residents’ behavioral intention toward waste separation, and information quality positively moderates this impact. |
| Lopes, Kalid, de, Rodríguez, and Filho (2019) | Energy saving | Workers’ energy-saving behavior | NAM          | Performance shaping factors        | The impact of SN and performance shaping factors on energy-saving behavior is not significant. |
| Li et al. (2020)    | Sustainable mobility   | Shared use of electric bicycle                | TBP          | Service quality Past behavior      | Service quality has a positive impact on attitude and behavioral intention, but past behavior does not affect further behavior. |
| Si et al. (2020)    | Sustainable mobility   | Sustainable usage of bike sharing             | TBP          | Awareness of consequences Moral obligation | Perceived behavior control and moral obligation are the key drivers of behavioral intention, while the effect of AC is not significant. |
| Xu et al. (2020)    | Sustainable consumption| Purchase intention of green furniture        | TBP          | Past behavior Physical health concern | Perceived behavioral control, past behavior and physical health concern are positively correlated with purchase intention. |
| Zhang et al. (2020) | Waste management       | Smartphone recycling                         | TBP          | Risk perception Risk perception Conscientiousness | Risk perception negatively regulates the relationship between conscientiousness and ATT, SN, PBC and past behavior. |
| The present study   | Medical resource saving| Mask-saving intention                         | NAM          | Environmental concern Supply chain performance Perceived risk Information publicity | The present study aims to reveal the influencing factors and driving mechanisms of people’s MSI. |

is that the user should not touch the outside of the mask (Zhong, 2020). Kampf, Scheithauer, Lemmen, Saliou, and Suchomel (2020) argued that, in extreme cases where masks are in short supply, masks can be saved by extending the wearing time, and reusing, disinfecting or reprocessing the masks. Man et al. (2020) found that the sterilization of disposable masks using steam at 121 °C is economical and efficient and does not affect the safe reuse of masks. Rubio-Romero, Pardo-Ferreira, del, Torrecilla-García, and Calero-Castro (2020) pointed out that hydrogen peroxide vapor, ultraviolet radiation, damp heat, dry heat and ozone gas are all effective disinfection methods. Existing studies have made important contributions in explaining how to save masks. However, to date, research into people’s mask-saving behaviors and intentions is lacking.

Clarifying what factors drive public mask-saving intentions (MSI) can effectively guide people’s mask-saving behaviors, and help to formulate relevant policies that promote the economical use of masks and other medical resources. In the present research, mask-saving behavior is defined as an individual’s action and intention to use masks sparingly by reusing masks, avoiding going out unnecessarily, distinguishing wearing occasions and other health approaches. Correspondingly, MSI refers to the subjective probability or possibility that an individual will engage in mask-saving behavior. Hence, the main purposes of this study are to reveal people’s mask-saving intentions and behaviors in the post-COVID-19 period, and to provide useful implications for the government and health organizations in low-risk areas.

Specifically, this research attempts to construct a comprehensive theoretical framework, which is based on the normative activation model (NAM) and the theory of planned behavior (TPB). In light of the people’s complex psychology after the COVID-19 pandemic, the MSI may be affected by some specific factors, such as the information publicity related to global infections and deaths, the supply status of medical supplies, personal concerns regarding the environment, and perceived risks regarding the pandemic. Therefore, the present study incorporates information publicity (IP), supply chain performance (SCP), environmental concern (EC) and perceived risk (PR) into the integration model of the NAM and TPB, in order to comprehensively reveal the drivers and influence mechanism of MSI.

2. Literature review

The NAM originated from scholars’ studies of the factors that influence the helping of others. Schwartz (1977) claimed that the activation of personal moral obligation requires two important conditions. First, individuals must be aware that their potential behavior may affect the well-being of others. Second, individuals must be responsible for their behavior and consequences. Therefore, NAM is composed of three variables, namely, the awareness of consequences (AC), ascription of responsibility (AR), and personal norms (PN) (Schwartz & Howard, 1981). In practice, AC refers to an individual’s consciousness of causing undesirable consequences for others by not performing altruistic behaviors; AR refers to an individual’s sense of responsibility for adverse consequences. Finally, PN refers to the self-expectations and self-moral obligations of individuals to implement specific behaviors under specific circumstances.

According to the TPB, as a rational agent, individuals’ behavioral decision-making is affected by three factors, namely, attitude (ATT), subjective norms (SN), and perceived behavioral control (PBC) (Ajzen, 1991). In practice, ATT refers to the positive or negative evaluation of a certain behavior by individuals (Ajzen, 1985); SN refers to the social pressure individuals perceive from others regarding whether to carry out a certain behavior by others. Finally, PBC is the individuals’ perception of the relative difficulty of performing a certain behavior, based on existing experience; PBC is also an assessment of internal and external objective factors. Generally, the stronger the SN that is perceived by the individual, the more positive their ATT toward a certain behavior is and the easier the perceptual behavior is controlled, the stronger the willingness to act will be.

The NAM and TPB are two classic theories used to explain and predict an individual’s pro-environmental behavioral intentions (Si, Shi, Tang, Wu, & Lan, 2020). The NAM primarily explains behavioral intention from individual consciousness (Zhang, Liu, & Zhuo, 2018), whereas the TPB considers the impact of psychological and social factors...
(Ru, Qin, & Wang, 2019). Considering that NAM and TPB focus on different aspects of behavior interpretation (Wang, Wang, Guo, Zhang, & Wang, 2018), a growing number of researchers tend to integrate these two models (e.g., Asadi et al., 2019; Shi, Fan, & Zhao, 2017; Wang, Guo, Wang, Zhang, & Wang, 2018). Studies have also confirmed that the integrated model may have better interpretation effects when incorporating other variables (Han & Hyun, 2017; Kim, Woo, & Nam, 2018; Zhang, Geng, & Sun, 2017). As a result, NAM and TPB have been extensively applied in the study of individual pro-environmental behavior. Some recent representative literature related to this article is summarized in Table 1. For example, Wang, Wang et al. (2018) extended saving money to the integrated model of NAM and TPB, in order to investigate residents’ energy-saving behavior. This study found that external factors (social environment) have a significant impact on residents’ energy-saving behavior. Wang, Guo et al. (2018) added IP into a theoretical model integrating NAM and TPB, in order to examine residents’ willingness to recycle e-waste. The study found that IP indirectly affects intention through PN and ATT. Similarly, Wang, Wang, Zhao, and Yang (2019) included IP and information quality in NAM, in an attempt to understand residents’ waste separation behavior. Li et al. (2020) incorporated past behavior and service quality into the TPB model to explore the use behavior of shared electric bike users. The study found that service quality has a positive impact on ATT and behavioral intention, but past behavior does not affect future behavior in this case. Xu, Hua, Wang, and Xu (2020) added environmental consciousness, physical health concerns, and past experience to the TPB model, in order to explore the determinants of consumers’ willingness to purchase green furniture. Zhang, Wu, and Rasheed (2020) incorporated risk perception into the TPB model and investigated the factors affecting the public’s smartphone recycling behavior.

These existing studies have laid a solid theoretical and practical foundation for sustainable pro-environmental behaviors. However, no scholar to date has investigated people’s saving intentions with regard to medical resources. In this critical period of a global epidemic, understanding the public’s MSI and the driving mechanism is crucial to responding effectively to the pandemic. Thus, this study aims to fill this research gap through the integration and expansion of the NAM and TPB models. Unlike the extended factors of previous studies, in addition to environmental concerns and information publicity, the present study considers the impact of perceived epidemic risk and supply chain performance on saving intentions, as well as the moderating role played by information publicity.

3. Research hypothesis and integrated framework

3.1. The original predictors of NAM

According to the NAM, PN is a critical variable that drives individuals to develop pro-environmental behavior; PN is also affected and activated by individuals’ AC and sense of responsibility (Schwartz & Howard, 1981). Schwartz stated that, when individuals are aware of the result of an action (AC) and assign responsibility for this result to themselves (AR), their sense of moral obligation will likely be activated. They will also experience a strong sense of moral obligation to engage in environmentally responsible behavior (Schwartz, 1977).

As far as the MSI is concerned, PN refers to a sense of moral responsibility when individuals carry out mask-saving behavior. Hence, AC refers to the undesirable consequences that may occur, and that individuals are aware of, by wasting masks. In this context, AR refers to the responsibility that individuals should bear when they perceive adverse consequences. During the epidemic period, saving masks can improve the use efficiency of medical resources and reduce medical waste; thus, medical supplies can flow to countries and regions where they are more needed. When individuals realize that wasting (or not saving) masks may result in the waste of resources, environmental pollution and an uncontrolled epidemic, they will understand that they need to bear responsibility for this consequence. Thus, their sense of moral obligation to engage in saving behavior will be activated. This enhanced sense of moral obligation prompts individuals to have a strong saving intention (Gao, Wang, Li, & Li, 2017). Based on the above viewpoints, we postulate the following:

H1. AC significantly and positively affects PN.
H2. AR significantly and positively affects PN.
H3. PN significantly and positively affects MSI.

3.2. The original predictors of TPB

In light of Ajzen’s explanation of TPB, individual decision making is influenced by three factors, namely, SN, ATT and PBC (Ajzen, 1991). Here, SN is divided into mandatory norms and exemplary norms. The former mainly come from leaders and government departments, who influence individual decision-making through authority and by playing a leading role. The latter mainly come from social resources such as family members, neighbors, friends, classmates, and colleagues, all of whom influence individual decision-making through reference and demonstration. In the prediction research of consumer behavior, ATT is generally regarded as the decisive factor (Gkargkavouzi, Hallkos, & Matsiori, 2019). As a relatively stable psychological construction, the effect of ATT on behavioral intention has been confirmed in many previous studies (Si et al., 2019). While PBC reflects the influence of experience and future expectation on behavior (Ajzen, 1991). The more confident individuals are in their skills, or the more optimistic they are about their future expectations, the more willing they are to participate in a specific behavior. This view has been verified by some previous studies, such as battery pack recycling (Lizin, Dael, & Passel, 2017), waste separation behaviors (Ma, Hipel, Hanson, Cai, & Liu, 2018), and environmental behavior (Gkargkavouzi et al., 2019).

In this study, SN refers to the impacts of relatives, friends and other social networks on individuals’ mask-saving intentions. Under the unique Chinese cultural background, collectivism is encouraged by society (Shi et al., 2017). As such, individuals are more likely to be influenced by leaders or groups (Ru, Wang, & Yan, 2018). Here, ATT refers to individuals’ positive or negative evaluation of the economical use of masks. When individuals have a positive attitude toward mask saving, they will be willing to adopt saving behaviors (Lv et al., 2020). PBC refers to the ease or difficulty of saving masks as perceived by individuals. The more confident individuals are in their ability to save on masks and the smaller the expected obstacles they feel they may encounter, the stronger their MSI will be (Ma et al., 2018). Given the above discussion, we propose the following hypotheses:

H4. SN significantly and positively affects MSI.
H5. ATT significantly and positively affects MSI.
H6. PBC significantly and positively affects MSI.

3.3. Environmental concern (EC)

With the increasingly severe global environmental problems, the public’s awareness of environmental protection has gradually increased. A growing number of studies have explored the impact of EC on individual behavior (Tang, Warkentin, & Wu, 2019; Wu, Liao, Wang, & Chen, 2019). EC is defined as an emotional attitude towards the seriousness of environmental issues (Landry, Gifford, Milfont, Weeks, & Arnooy, 2018). People who are more concerned about the environment are more willing to respond to environmental issues and then take actions that are beneficial to the environment. Research have indicated that individuals with a high degree of EC are more inclined to adopt pro-environmental behaviors, such as sorting garbage (Ma, Wang, & Kong, 2020), purchasing green products (Maichum, Parichatnon, & Peng, 2016), and using energy-saving appliances (Song, Zhao, & Zhang,
In other words, the more individuals pay attention to environmental issues, the more willing they are to make efforts to change their behavior to improve environmental conditions (Verma, Chandra, & Kumar, 2019). Mask saving is a typical pro-environmental behavior. Therefore, the higher individuals’ EC, the stronger their MSI is. In the light of the preceding analysis, we propose the following hypothesis:

**H7. EC significantly and positively affects MSI.**

### 3.4. Supply chain performance (SCP)

In the current study, SCP refers to the performance of the production, supply and marketing of medical masks. This would include the supply condition of raw materials, product prices, and purchasing channels and convenience. Previous studies have found that market stimulus is an important cause of individual behavior (Xu, Ling, Lu, & Shen, 2017). Boey, Ekiz, and Kamarulzaman (2012) confirmed that price and service significantly affect passengers’ decision-making when it comes to adopting low-cost airlines. Reasonable commodity prices make obtaining goods relatively easy for consumers; stable purchase channels and a reliable supply of goods also reduce the perceived difficulties for consumers (Pan & Truong, 2018). Generally speaking, when something is easy to obtain, the degree of being treasured will decrease. Similarly, when the SCP of the mask is gradually improved, the mask acquisition will be easier, and the cost will be reduced. Thus, individuals may not be as concerned about saving masks as before. As Chinese medical companies resume work, the supply of masks is gradually becoming sufficient. People can easily buy cheap and high-quality masks through various countries around the world. The effective self-protection and preventive measures for public are also components of IP. According to the information behavior model, a person’s behavior is guided by the information they have been given (Pettigrew, Fidel, & Bruce, 2001); a lack of relevant information will become an obstacle to their behavior. For instance, non-familiarity with the standards of garbage classification, combined with a lack of relevant information, are both important reasons that hinder residents’ garbage classification behavior (Mickael, 2014). Similar to garbage sorting behavior, if people do not know whether disposable masks can be reused (or how to reuse them), their willingness to save masks may be weakened (Wang, Guo et al., 2018). In other words, propagandizing the economical use of masks and the current shortage of medical supplies will help increase individuals’ MSI.

When the IP level is high, people with stronger PN will believe that someone has more responsibility to use masks sparingly; they will likely be willing to save masks and appreciate their value (Song et al., 2019). From a cultural perspective, China advocates collectivism, and most people tend to subordinate the minority to the majority when making decisions (Shi et al., 2017). When the IP level is high, the influence of SN on the MSI at the social level may also be strengthened. Correspondingly, the higher the degree of IP there is, the greater the risk people will perceive, and concerns about the potential risk factors will increase people’s MSI. Based on preceding reasons, we make the following hypotheses:

**H10. IP significantly and positively affects MSI.**

**H11 a. IP positively moderates the impact of PN on MSI.**

**H11 b. IP positively moderates the impact of SN on MSI.**

**H11 c. IP positively moderates the impact of PR on MSI.**
In line with the preceding hypotheses, the comprehensive theoretical model of this study is shown in Fig. 1.

4. Methodology

4.1. Survey design

Considering the sensitivity and importance of COVID-19 research, the authors have reported this research to the school’s ethics academic committee, conducted the research under the committee’s supervision, and filed the final results for the record.

The first part of the questionnaire is a survey of socio-demographic characteristics and mask-saving behavior; the second part is the measurement items of the model’s 11 latent variables. The measurement items were designed based on previous maturity scales and related research, combined with the practice of mask saving in China. To ensure that the questionnaire was easy to understand, two professors, two doctoral students, and five undergraduate students formed a focus group. Three online discussions were held, and the questionnaire items were appropriately adjusted. Then, to conduct the pre-test, 220 questionnaires were randomly distributed via a snowball sampling method. According to the test results and feedback from the interviewees, we deleted two questions that could easily be deemed to cause ambiguity. The descriptions of items were optimized again, and finally, 43 items were finally generated. Detailed survey items and reference sources are shown in Appendix A. Multi-level scales can provide respondents with more options, thereby increasing the credibility of the survey data (Finstad, 2010). Therefore, the variables in the questionnaire are measured using a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree).

4.2. Data collection and descriptive analysis

The data collection was done via the largest questionnaire survey website in China, Questionnaire Star (WJX, 2020b). Since 2006, more than 78.28 million users have collected 6.14 billion questionnaires. To ensure data quality, this study used the paid sample service of Questionnaire Star (WJX, 2020a). The database of the paid sample service contains 2.6 million random members with different demographic characteristics. On average, over one million respondents fill out the questionnaire every day. The paid sample service has a strict questionnaire screening mechanism, which ensures that the data are true and reliable. First, the sample service only issues questionnaires to people who meet the requirements. Secondly, after completing the questionnaire, the system eliminates invalid questionnaires based on the users’ fill-in time, rules, and IP address. Finally, a customer service staff member conducts the final screening. As a result, those who have been screened and confirmed as having submitted valid questionnaires can be paid.

The questionnaire was completed from May 1st to 7th, 2020. Before completing the questionnaire, the interviewees were informed of its contents in advance. The purpose of this investigation is to understand relevant information after Wuhan was unblocked on April 8, that is, the mask-saving intentions and behaviors in the post-epidemic period. Ultimately, 1199 respondents answered the questionnaire; 142 invalid questionnaires were screened by the system (and manually), and 1057 valid questionnaires were obtained. Since all provinces in China have experienced the current epidemics (Ling, Joynt, Lipman, Constantin, &
Sustainable Cities and Society 65 (2021) 102626

H. Si et al.

Joannes-Boyau, 2020), the survey was random and was not limited to a specific area. The specific sample distribution is shown in Fig. 2. Detailed socio-demographic statistics are presented in Table 2.

Figs. 3 and 4 show the main ways of saving masks and the number of times mask use is repeated in the post-epidemic period. In terms of the saving approach, 56.8 % of the respondents saved masks by reducing the number of times they go out; 24.4 % saved masks by disinfecting and sun-cure, and 14.5 % saved masks by distinguishing their wearing occasions and locations (i.e., reuse in low-risk places). With regard to the number of times the same mask is used, 61.5 % of the respondents said that their masks were reused two to three times; 23.9 % said that their masks were reused four to five times, and 7.6 % said that their masks were reused more than six times.

### Table 2

Socio-demographic statistics.

| Characteristic     | Demographic       | Frequency | %    |
|--------------------|-------------------|-----------|------|
| Gender             | Male              | 491       | 46.5 |
|                    | Female            | 566       | 53.5 |
| Age (years)        | Under 20          | 127       | 12.0 |
|                    | 21-30             | 527       | 49.9 |
|                    | 31-40             | 306       | 28.9 |
|                    | 41-50             | 73        | 6.9  |
|                    | 51 and above      | 24        | 2.3  |
| Marital status     | Married           | 509       | 48.2 |
|                    | Unmarried         | 548       | 51.8 |
| Place of residence | Town              | 363       | 34.3 |
|                    | City              | 545       | 51.6 |
|                    | Public servant    | 654       | 61.9 |
|                    | Self-employed person | 102     | 9.6  |
| Occupation         | Student           | 252       | 23.8 |
|                    | Peasant           | 10        | 0.9  |
|                    | Others            | 39        | 3.7  |
| Education          | Senior high school or below | 111 | 10.5 |
|                    | Junior college    | 166       | 15.7 |
|                    | Bachelor’s degree | 700       | 66.2 |
|                    | Master’s degree or above | 80 | 7.6  |
|                    | Less than 50,000  | 349       | 33.0 |
|                    | 50,001–100,000    | 384       | 36.3 |
|                    | 100,001–200,000   | 285       | 27.0 |
|                    | More than 200,000 | 39        | 3.7  |

Fig. 3. People’s mask-saving approach.

Fig. 4. People’s repeated mask use frequency.

### 4.3. Research method

Partial least square structural equation modeling (PLS-SEM) and covariance based structural equation modeling (CB-SEM) are two typical and similar empirical analysis methods (Hair, Hollingsworth, Randolph, & Chong, 2017). Compared with CB-SEM, PLS-SEM does not require data to obey a normal distribution. Moreover, the latter is more suitable for predictive and exploratory research (Hair, Ringle, & Sarstedt, 2011), especially for a developmental theoretical framework. This study is an exploratory research that integrates two theories and four new variables. Besides, the filtered data may not conform to normal distribution. Thus,
5. Empirical analysis and results

5.1. Measurement model testing

Cronbach’s alpha and composite reliability are typically employed for reliability testing. As shown in Table 3, the Cronbach’s alpha values of all constructs are between 0.714 and 0.895, which are all higher than the 0.7 standard (Hair, Hult, Ringle, & Sarstedt, 2016). The composite reliability values of all constructs range from 0.846 to 0.927, which are also higher than the 0.7 standard (Hair et al., 2016). Consequently, the measurement model has good internal consistency and reliability.

The validity test of the measurement model mainly includes convergence validity, discriminative validity and construct validity.

| Construct | Cronbach’s alpha | Composite reliability | AVE | Communality |
|-----------|------------------|-----------------------|-----|-------------|
| AC        | 0.794            | 0.858                 | 0.547 | 0.547       |
| AR        | 0.819            | 0.874                 | 0.581 | 0.581       |
| PN        | 0.714            | 0.837                 | 0.632 | 0.632       |
| SN        | 0.861            | 0.906                 | 0.707 | 0.707       |
| ATT       | 0.895            | 0.927                 | 0.760 | 0.760       |
| PBC       | 0.798            | 0.881                 | 0.713 | 0.713       |
| EC        | 0.775            | 0.856                 | 0.597 | 0.597       |
| SCP       | 0.764            | 0.863                 | 0.677 | 0.677       |
| PR        | 0.763            | 0.861                 | 0.674 | 0.674       |
| IP        | 0.728            | 0.846                 | 0.647 | 0.647       |
| MSI       | 0.835            | 0.890                 | 0.668 | 0.668       |

Table 4

Square root of AVE and correlation coefficients.

| Construct | AC | AR | PN | SN | ATT | PBC | EC | SCP | PR | IP | MSI |
|-----------|----|----|----|----|-----|-----|----|-----|----|----|-----|
| AC        | 0.740 |    |    |    |     |     |    |     |    |    |     |
| AR        | 0.619 | 0.762 |    |    |     |     |    |     |    |    |     |
| PN        | 0.523 | 0.667 | 0.795 |    |     |     |    |     |    |    |     |
| SN        | 0.547 | 0.571 | 0.509 | 0.841 |    |     |    |     |    |    |     |
| ATT       | 0.631 | 0.508 | 0.489 | 0.628 | 0.872 |    |    |     |    |    |     |
| PBC       | 0.521 | 0.399 | 0.360 | 0.480 | 0.462 | 0.844 |    |     |    |    |     |
| EC        | 0.382 | 0.325 | 0.230 | 0.252 | 0.232 | 0.276 | 0.773 |    |    |    |     |
| SCP       | 0.227 | 0.272 | 0.309 | 0.225 | 0.181 | 0.228 | 0.219 | 0.823 |    |    |     |
| PR        | 0.244 | 0.204 | 0.176 | 0.154 | 0.148 | 0.154 | 0.341 | 0.102 | 0.821 |    |     |
| IP        | 0.572 | 0.609 | 0.602 | 0.510 | 0.486 | 0.410 | 0.389 | 0.302 | 0.233 | 0.804 |     |
| MSI       | 0.635 | 0.627 | 0.555 | 0.563 | 0.525 | 0.486 | 0.458 | 0.297 | 0.303 | 0.663 | 0.817 |

Fig. 5. Running results by Smart PLS 3.0.
Convergent validity is tested by the average variance extracted (AVE), which is equivalent to the communality (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). The discriminative validity is tested by comparing the square root of the AVE value with the correlation coefficients between other variables. According to Fornell and Larcker (1981), the correlation coefficient between each pair of latent variables should not be greater than the square root of the AVE value of the latent variable. As presented in Table 4. The correlation coefficients between other variables. According to Fornell and Larcker (1981), the outer loading of all items ranges from 0.707 to 0.886, which are all therefore greater than the cross-loading with other constructs. Moreover, the T-value for each item is over 25. These results indicate that the measurement model has good construct validity.

(5.2. Structural model testing)

The structural model is judged through $R^2$ and $Q^2$ (Hair et al., 2014). Here, $R^2$ means the explanation degree of the external dependent variable to the internal dependent variable, while $Q^2$ represents the predictive relevance of the structural model. A value of $R^2$ near 0.19 represents that the model has weak explanatory power, a value that is near 0.33 represents a medium explanatory power, and a value that is over 0.67 represents a strong explanatory power (Chin, 1998). Hair et al. (2012) argued that when $R^2$ exceeds 0.20, this represents a strong interpretation and prediction ability in consumer behavior research. As shown in Fig. 6, the $R^2$ of PN is 0.464, which means that AC and AR can explain 46.4% of the variance of PN. The $R^2$ of MSI is 0.593, which means that all external dependent variables can explain 59.3% of the variance of MSI. Therefore, the structural model of this study has strong explanatory power. Furthermore, the $Q^2$ indicator values are reported in Table 6. Both cross-validated communality and cross-validated redundancy values exceed the 0 standard proposed by Hair et al. (2014) and (2016), indicating that the structural model has good predictive power.

Employing 5000 resample bootstrap calculation of Smart PLS 3.0, the empirical results are shown in Table 7 and Fig. 5. Nine hypotheses are supported. Only HS is not supported; that is, the positive impact of SCP on MSI is not significant.

(5.2. Structural model testing)

The structural model is judged through $R^2$ and $Q^2$ (Hair et al., 2014). Here, $R^2$ means the explanation degree of the external dependent variable to the internal dependent variable, while $Q^2$ represents the predictive relevance of the structural model. A value of $R^2$ near 0.19 represents that the model has weak explanatory power, a value that is near 0.33 represents a medium explanatory power, and a value that is over 0.67 represents a strong explanatory power (Chin, 1998). Hair et al. (2012) argued that when $R^2$ exceeds 0.20, this represents a strong interpretation and prediction ability in consumer behavior research. As shown in Fig. 6, the $R^2$ of PN is 0.464, which means that AC and AR can explain 46.4% of the variance of PN. The $R^2$ of MSI is 0.593, which means that all external dependent variables can explain 59.3% of the variance of MSI. Therefore, the structural model of this study has strong explanatory power. Furthermore, the $Q^2$ indicator values are reported in Table 6. Both cross-validated communality and cross-validated redundancy values exceed the 0 standard proposed by Hair et al. (2014) and (2016), indicating that the structural model has good predictive power.
Fig. 6. a. Moderating effects of IP on the relationships between PN and MSI. b. Moderating effects of IP on the relationships between SN and MSI. c. Moderating effects of IP on the relationships between PR and MSI.
This research further examines the possible moderating effects of IP on the model. The testing results are shown in Table 8. Notably, IP has a significant negative impact on the relationship between PN and MSI (β = −0.064, T = 2.793, P < 0.01). Thus, H11a was negatively supported. Similarly, IP has a significant negative impact on the relationship between SN and MSI (β = −0.071, T = 2.362, P < 0.05) and on the relationship between PR and MSI (β = −0.058, T = 2.545, P < 0.01). Therefore, H11b and H11c are also negatively supported.

To present the moderating role of IP intuitively, according to Aiken and West (1991), a simple slope analysis is performed using SmartPLS 3.0. As shown in Fig. 6a, IP is divided into three levels, namely, high, medium, and low (i.e., IP at mean ± 1 standard deviation, IF at mean level, and IP at mean −1 standard deviation). When the IP level is high (green line), the influence of PN on MSI is less than when the IP level is low (blue line). In other words, an increase in the IP level weakens the impact of PN on MSI. Similarly, Fig. 6b and c, respectively, indicate that the influence of SN and PR on MSI also decreases in line with the increase of the IP level. Therefore, when the IP level is high, the positive effects of PN, SN and PR on MSI will be weakened.

### 5.3. Moderating effects of the IP

In terms of the specific variables in NAM and TPB, AC and AR had a significant positive impact on PN, while PN was found to play a significant driving role on MSI. Also, SN, ATT and PBC were confirmed to have positive correlations with MSI. The above findings support the original assumptions of the NAM and TPB models (Ajzen, 1991; Schwartz, 1977), indicating that these two models can be used as a theoretical basis for forecasting the people’s mask-saving intentions.

With regard to the extended variables, firstly, EC significantly positively affected MSI, which is consistent with previous studies (Liao, Zhao, & Zhang, 2018; Maichum et al., 2016). Saving masks not only improves the use efficiency of medical resources; this behavior but also reduces the amount of medical waste. Thus, people who pay more attention to the environment are more aware of the benefits of saving masks.

Secondly, PR had a significant positive effect on MSI. This finding is contrary to the results of Zhang et al. (2020), who investigated the influencing factors of smartphone recycling intentions. Unlike smartphone, however, masks are an indispensable form of protective equipment during the global pandemic (Wang et al., 2020), and one which is directly related to people’s health and life. On the one hand, people worry that the COVID-19 pandemic will become severe and possibly even become out of control. On the other hand, limited productivity and resources may lead to an insufficient supply of masks.

Thirdly, SCP had no significant negative impact on MSI. In other words, when many Chinese enterprises returned to work and production, the supply of medical masks was sufficient, but people’s MSI had not been significantly reduced. One possible explanation for this finding is that the COVID-19 outbreak has had an unprecedented impact on people’s lives. The psychological panic and worry brought about by this impact will last for some time. The significant impact of PR on MSI also confirms this viewpoint. Additionally, according to the survey results pertaining to saving behavior (i.e., Figs. 3 and 4), people have formed the habit of reusing and saving masks in the past few months. Given that the epidemic in many countries around the world has not been effectively controlled, the Chinese people will probably not lose or change this saving habit in the short term. Therefore, the optimistic

---

### Table 6

Empirical results of the structural model.

| Construct | R²       | Cross-validated communality | Cross-validated redundancy |
|-----------|----------|-----------------------------|----------------------------|
| AC        | 0.321    |                             |                            |
| AR        | 0.369    |                             |                            |
| PN        | 0.464    | 0.267                       | 0.284                      |
| SN        | 0.503    |                             |                            |
| ATT       | 0.586    |                             |                            |
| PBC       | 0.413    |                             |                            |
| EC        | 0.329    |                             |                            |
| SCP       | 0.347    |                             |                            |
| PR        | 0.346    |                             |                            |
| IP        | 0.299    |                             |                            |
| MSI       | 0.593    | 0.441                       | 0.389                      |

---

### Table 7

Verification of conventional hypotheses.

| Hypothesis | Path  | Standardized path coefficient | T-value | Confidence interval | Hypothesis supported |
|------------|-------|-------------------------------|---------|---------------------|----------------------|
| H1         | AC -> PN | 0.180***                      | 5.313   | 0.114 – 0.237       | Supported            |
| H2         | AR -> PN | 0.555***                      | 18.015  | 0.340 – 0.615       | Supported            |
| H3         | PN -> MSI| 0.137***                      | 4.306   | 0.074 – 0.197       | Supported            |
| H4         | SN -> MSI| 0.155***                      | 4.243   | 0.083 – 0.225       | Supported            |
| H5         | ATT -> MSI| 0.093**                      | 2.565   | 0.023 – 0.166       | Supported            |
| H6         | PBC -> MSI| 0.122**                      | 2.806   | 0.040 – 0.212       | Supported            |
| H7         | EC -> MSI | 0.177***                      | 5.756   | 0.119 – 0.239       | Supported            |
| H8         | SCP -> MSI| 0.035                        | 1.234   | −0.019 – 0.095      | Not supported        |
| H9         | PR -> MSI | 0.087***                      | 3.858   | 0.043 – 0.133       | Supported            |
| H10        | IP -> MSI | 0.307***                      | 8.358   | 0.231 – 0.376       | Supported            |

Annotation: *P < 0.05, **P < 0.01, ***P < 0.001.

### Table 8

Verification of moderating hypotheses.

| Hypothesis | Path  | Standardized path coefficient | T-value | Confidence interval | Hypothesis supported |
|------------|-------|-------------------------------|---------|---------------------|----------------------|
| H11a       | IP*PN -> MSI | −0.064**                     | 2.793   | −0.102 – −0.016     | Negatively supported  |
| H11b       | IP*SN -> MSI | −0.071*                      | 2.362   | −0.122 – −0.060     | Negatively supported  |
| H11c       | IP*PR -> MSI | −0.058*                      | 2.545   | −0.097 – −0.010     | Negatively supported  |

Annotation: *P < 0.05, **P < 0.01, ***P < 0.001.
performance of the mask market and supply chain has not significantly affected people’s MSI.

Lastly, IP has had a significant positive impact on MSI; this conclusion supports the research finding of Bernstad (2014). Meanwhile, IP played a negative moderating role in the impact of PN, SN, and PR on MSI. In other words, when the degree of IP related to mask saving was excessively high, the effects of PN, SN, and PR on MSI may have been weakened. This unexpected finding was contrary to the conclusion of Song et al. (2019), which emphasized that policy and propaganda positively moderate the impact of PN on energy-saving appliance purchase behavior. One possible reason for this result may be that excessive information propaganda may exaggerate the threat of the epidemic and aggravate people’s panic. The emergence of panic emotion prompts individuals to take more measures to achieve self-protection, which in turn leads to higher mask usage frequency and consumption. To some extent, excessive information propaganda appears to weaken the influence of personal moral obligation and value norms on people’s saving intentions. Similarly, the generation of panic affects individuals’ subjective evaluation of the COVID-19 risk; thus, the impact of risk perception on saving intentions is also weakened.

6.2. Contributions, limitations and future directions

After the outbreak of COVID-19, many studies have discussed measures to control COVID-19 from different perspectives (Leng, Wang, & Liu, 2020; Megahed & Ghoneim, 2020; Rahman et al., 2020; Sun & Zhai, 2020). Taking medical masks as an example, the present study investigates people’s intentions to save medical resources for the first time, effectively opening the black box of people’s saving behavior and complex psychology after the COVID-19 pandemic. This study reveals the critical factors that drive people’s MSI, and the conclusions and implications can help the government formulate specific policies to guide residents’ mask-saving behavior. At the theoretical level, this study extends the application boundary of NAM and TPB, and proposes a new integrated theoretical model with strong explanatory power. As such, this research lays an important foundation for future research on other medical resource-saving behavior.

It should be acknowledged that this research has some limitations that could be improved. First, this study mainly examines Chinese residents’ MSI; the conclusions and implications could provide insights to guide the saving behavior for groups in low-risk area or those with non-occupational exposure. Given the differences in the epidemic situation and cultural beliefs of different countries, the applicability of the present study toward other group types needs to be further explored. In follow-up research, the situation in high-risk areas or developed countries can be revealed, in order to perform a comparative study. Second, this study only investigates the antecedent variables of intention, but behavior is not investigated. Since there is a certain gap between intention and behavior (Hassan, Shiu, & Shaw, 2016), future research could attempt to reveal the behavior toward mask saving or the saving of other medical resources.

7. Conclusion and implications

In light of the severe situation of the current global epidemic, saving medical resources and reducing medical pollution are crucial. Combined with practice, EC, MS, PR, and IP are extended to the comprehensive theoretical model composed of NAM and TPB. The present study examines the driving factors of the people’s mask-saving intentions in the post-epidemic phase, through a survey of 1057 respondents in China. The results reveal that AC and AR are important antecedents of PN; PN, SN, AT, PC, EC, PR, and IP also have significant positive correlations with MSI. Among them, IP has the greatest impact on MSI, followed by EC, SN, PN, and PBC. One unexpected finding is that SCP has no significant effect on MSI. Moreover, excessive IP may weaken the relationships between PN, SN, PR, and MSI. Finally, based on these

---

| Table A1 | Survey items and reference sources. |
|----------|-----------------------------------|
| Construct | Items | References |
| Awareness of consequences | Saving masks can reduce resource consumption. | Zhang et al. (2017) and Song et al. (2019) |
| | Saving masks can reduce environment pollution. | |
| | Saving masks can save money. | |
| Ascription of responsibility | Everyone should be held responsible for environmental pollution caused by not saving masks. | Zhang et al. (2017) |
| | Everyone should be held responsible for the spread of COVID-19 caused by not saving masks. | |
| | I would feel proud of saving masks. | |
| Personal norms | I would feel guilty about not saving masks. | Schwartz (1977) and Kim and Seock (2019) |
| | Not saving masks is against my principles of environmental protection. | |
| | Most people who are important to me are in favor of me saving masks. | |
| | Most people who are important to me will save masks. | Paul, Modi, and Patel (2016) and Si et al. (2020) |
| Subjective norms | Most of the people who are important to me expect that I can save masks. | |
| | Most of the people who are important to me encourage me to save masks. | Shi et al. (2017) and Verma and Chandra (2016) |
| | I think saving masks is brilliant. | |
| | I think saving masks is very intelligent. | |
| | I think saving masks is very meaningful. | |
| | I think saving masks is very responsible. | |
| | As for me, saving masks is effortless. | |
| Perceived behavioral control | Whether to save masks depends entirely on me. | Wang, Guo et al. (2018) and Si et al. (2020) |
| | I can easily save masks as long as I want. | |
| | I can have relevant resources, time, and opportunity to save masks. | |
| | I think environmental issues are related to the survival of human beings. | Rajaie, Hoseini, and Malekmohammadi (2018), Wang, Wang, and Guo (2017) |
| Environment concern | I think everyone should contribute to environmental protection. | |
| | Human beings must live in harmony with nature in order to survive. | |

(continued on next page)
research findings, the specific management implications and policy recommendations are proposed as follows, to promote residents’ mask-saving intentions and behaviors.

Given that IP is the key driver of MSI, information disclosure and publicity in the post-epidemic period should be appropriately strengthened. Propaganda content makes the public more willing to save masks and also tells the public how to do so. Regarding the publicity approach, new social media could be fully utilized to expand the publicity scope. Nevertheless, excessive IP will weaken the promotion effect of PN, SN, and PR on MSI. Hence, the publicity for COVID-19 should be effective and appropriate, in order to avoid any unnecessary panic caused by excessive publicity. Moreover, AC and AR are important antecedents of PN, and PN and EC can considerably enhance MSI. Therefore, in future guidance measures, environmental issues can be taken as the breakthrough point; PN and MSI can also be improved by shaping the public’s awareness of consequences and moral responsibility. Specifically, typical cases of medical waste threatening the environment can be made into short videos, which can be broadcast on TV and social media. Knowledge contests, essay seeking activities, and theme education on environmental protection can also be held. These are effective ways to appeal to the public to pay attention to the environment and to advocate the reduction of medical waste.

Considering the significant influence of ATT and SN on MSI, the government should pay full attention to the leading role of external social norms on individual behaviors and attitudes. Especially in the era of mobile internet, the role of online opinion leaders should be developed. Those leaders could effectively appeal to their followers to save medical resources. Moreover, PBC has a significant positive impact on MSI. The initiative to save masks and the introduction of saving approaches can be printed on the outer packaging of masks or the garbage bins used to collect used masks. While popularizing conservation knowledge, the public should realize that saving masks is easy. The impact of PR on MSI is significant. In other words, the greater the risk people feel about the current or future epidemic, the stronger their MSI will be. Therefore, the actual situation of the epidemic and the shortage of medical resources in various countries around the world should also be promptly reported and made public. In this way, the public can be aware of the risks at the earliest possible stage and realize the importance of saving existing medical resources.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

This work was supported by the National Natural Science Foundation of China (NO. 71972018).

Appendix A

Table A1

| Construct                        | Items                                                                 |
|----------------------------------|----------------------------------------------------------------------|
| Supply chain performance         | The current supply of raw materials for medical masks is stable.     |
|                                  | The current purchasing channels of medical masks have returned to normal. |
|                                  | Sometimes, I worry about the comeback of COVID-19.                    |
|                                  | Sometimes, I fear the global epidemic will spiral out of control.     |
| Perceived risk                   | Sometimes, I fear there will be more asymptomatic infections cases.   |
|                                  | Sometimes, I worry about a shortage of masks in the future.          |
| Information publicity            | Information publicized about frugality will motivate me to save masks. |
|                                  | Information publicized about COVID-19 will motivate me to save masks.  |
|                                  | I would like to save masks.                                           |
|                                  | I will make an effort to save masks.                                  |
| Mask-saving intention            | I will insist on saving masks.                                        |
|                                  | I will try my best to save masks.                                     |

| References                       |                                                                      |
|----------------------------------|----------------------------------------------------------------------|
| Aiken, L. S., & West, S. G. (1991). | Multiple regression: Testing and interpreting interactions,          |
|                                   | From intentions to actions: A theory of planned behavior (pp. 11–39), |
|                                   | Theory of planned behavior. Organizational Behavior and Human          |
|                                   | Decision Processes, 50(2), 179–211.                                   |
| Antony, A. R. V., Velraj, R., & Haghighat, F. (2020). | The contribution of dry indoor built environment on the spread of Coronavirus: Data from various Indian states. Sustainable Cities and Society, 62(11), Article 102371. |
| Arai, S., Nilashi, M., Safaei, M., Abdullah, R., Saed, E., Yadegaridokht, E., & Samad, S. (2019). | Investigating factors influencing decision-makers’ intention to adopt Green IT in Malaysian manufacturing industry. Resources, Conservation, and Recycling, 148, 36–54. |
| Bag, S., Wood, L. C., Xu, L., Dhamija, P., & Kayikci, Y. (2020). | BIG data analytics as an operational excellence approach to enhance sustainable supply chain performance. Resources, Conservation, and Recycling, 253, Article 104559. |
| Berntad, A. (2014). | Household food waste separation behavior and the importance of convenience. Waste Management, 34(7), 1317–1323. |
| Boey, T. S., Ekiz, E. H., & Kamarulzaman, Y. (2012). | Factors determining choice of full service airlines and low cost carriers: The case of Malaysia. Asia-Pacific Journal of Innovation in Hospitality and Tourism, 1(2), 179–194. |
| Bonnin, G. (2020). | The roles of perceived risk, attractiveness of the online store and familiarity with AR in the influence of AR on patronage intention. Journal of Retailing and Consumer Services, 52, Article 101938. |
| Chin, W. W. (1998). | The partial least squares approach for structural equation modeling. Modern methods for business research, 295(2), 295–336. |
| Dissanayake, C. K., & Cross, J. A. (2018). | Systematic mechanism for identifying the relative impact of supply chain performance areas on the overall supply chain performance using SCOR model and SEM. International Journal of Production Economics, 201, 102–115. |
| Feng, S., Shen, C., Xia, N., Song, W., Fan, M., & Cowlign, B. J. (2020). | Rational use of face masks in the COVID-19 pandemic. The Lancet Respiratory Medicine, 8(2), 293–436. |
| Finstad, K. (2010). | Response interpolation and scale sensitivity: Evidence against 5-point scales. Journal of Usability Studies Archive, 5(3), 104–110. |
| Fornell, C., & Larcker, D. F. (1981). | Evaluating structural equation models with unobserved variables and measurement error. Journal of Marketing Research, 18(1), 39–50. |
| Gan, L., Wang, S., Li, J., & Li, H. (2017). | Application of the extended theory of planned behavior to understand individual’s energy saving behavior in workplaces. Resources, Conservation, and Recycling, 107, 113. |
| Giarcagkvouati, A., Hallcos, G., & Matisiori, S. (2019). | Environmental behavior in a private-sphere context: Integrating theories of planned behavior and value belief norm, self-identity and habit. Resources, Conservation, and Recycling, 145–156. |
| Gissling, S., Scott, D., & Hall, C. M. (2020). | Pandemics, tourism and global change: A rapid assessment of COVID-19. Journal of Sustainable Tourism, 1–20. |
| Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2016). | A primer on partial least squares structural equation modeling (PLS-SEM). Sage publications. |
| Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). | PLS-SEM: Indeed a silver bullet. The Journal of Marketing Theory and Practice, 19(2), 139–152. |
| Hair, J. F., Sarstedt, M., Pieper, T. M., & Ringle, C. M. (2012). | The use of partial least squares structural equation modeling in strategic management research: A review of
past practices and recommendations for future applications. Long Range Planning, 45 (6), 320–340.
Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM). European Business Review, 26(2), 106–121.
Han, H., & Hyun, S. S. (2017). Drivers of customer decision to visit an environmentally responsible museum: Merging the theory of planned behavior and norm activation theory. Journal of Travel Research, 56(3), 1155–1169.
Hassan, L. M., Shi, E., & Shaw, D. (2016). Who says there is an intention–behaviour gap? Assessing the empirical evidence of an intention–behaviour gap in ethical consumption. Journal of Business Ethics, 136(2), 375–396.
Jadoo, S. A. A. (2020). The second wave of COVID-19 is knocking at the doors: Have we learned the lesson? Journal of Ideas in Health, 3(3), 183–184.
Kalina, M., & Tilley, E. (2020). This is our next problem?: Cleaning up from the COVID-19 response. Waste Management and Research, 38(10), 1293–1297.
Kampf, G., Schüttehaut, S., Lemmen, S., Salion, P., & Suchomel, M. (2020). COVID-19-associated shortage of alcohol-based hand rubs, face masks, medical gloves and gowns–proposal for a risk-adapted approach to ensure patient and healthcare worker safety. The Journal of Hospital Infection, 105(3), 424–427.
Kim, S. H., & Sook, Y. K. (2019). The roles of values and social norm on personal norms and pro-environmentally friendly apparel product purchasing behavior: The mediating role of personal norms. Journal of Retailing and Consumer Services, 51, 85–90.
Kim, Y. G., Woo, E., & Nam, J. (2018). Sharing economy perspective on an integrative structural equation modeling (PLS-SEM). Sustainable Cities and Society, 45, 102626.
Kim, S. H., & Seock, Y. K. (2019). The roles of values and social norm on personal norms and pro-environmentally friendly apparel product purchasing behavior: The mediating role of personal norms. Journal of Retailing and Consumer Services, 51, 85–90.
Kim, Y. G., Wu, E., & Nam, J. (2018). Sharing economy perspective on an integrative structural equation modeling (PLS-SEM). Sustainable Cities and Society, 45, 102626.
Kim, S. H., & Seock, Y. K. (2019). The roles of values and social norm on personal norms and pro-environmentally friendly apparel product purchasing behavior: The mediating role of personal norms. Journal of Retailing and Consumer Services, 51, 85–90.
Yang, L., Yu, X., Wu, X., Wang, J., Yan, X., Jiang, S., & Chen, Z. (2020). Emergency response to the explosive growth of health care wastes during COVID-19 pandemic in Wuhan, China. *Resources, Conservation, and Recycling, 164*, Article 105074.

Zhang, X., Geng, G., & Sun, P. (2017). Determinants and implications of citizens’ environmental complaint in China: Integrating theory of planned behavior and norm activation model. *Journal of Cleaner Production, 166*, 148–156.

Zhang, X., Liu, J., & Zhao, K. (2018). Antecedents of citizens’ environmental complaint intention in China: An empirical study based on norm activation model. *Resources, Conservation, and Recycling, 121–128*.

Zhang, Y., Wu, S., & Rasheed, M. I. (2020). Conscientiousness and smartphone recycling intention: The moderating effect of risk perception. *Waste Management, 116–125*.

Zhong, N. (2020). *How to wear masks more scientifically and economically?*. [http://www.gov.cn/xinwen/2020-02/03/content_5474133.htm](http://www.gov.cn/xinwen/2020-02/03/content_5474133.htm).