



Too generous to be fair? Experiments on the interplay of what, when, and how in data breach recovery of the hotel industry

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ABSTRACT

Although data breaches have become increasingly common, few studies have examined data breach recovery. Thus, this study aims to examine when (i.e., reactive versus passive) and how (i.e., public versus private) to conduct data breach recovery in the hotel industry, using different types of compensations. Based upon the fairness heuristic theory and the prospect theory, two experiments were conducted with university students as the samples. The results show that consumers' perceived justice with economic and social compensation is not significantly higher than that with either economic compensation or social compensation, under the public mode or the private mode. Furthermore, under the reactive mode participants' perceived justice with economic and social compensation is lower than that with just economic compensation. Our study expands the literature on service recovery to data breach recovery in the hotel industry. It also provides important practical guidelines for travel industry managers.

1. Introduction

Data breaches are the intentional or unintentional manipulation or disclosure of confidential data by unauthorized users (Fowler, 2016). They have become increasingly common in the travel industry. In 2019, data for 500 million Marriott guests were reported to have been breached (HNN, 2020). Princess Cruises and the Holland America Line also announced a data breach of customers' passport information in 2019 (CNBC, 2020). British Airways paid a fine of £183 million for a data breach incident (BBC, 2019). A data breach not only costs companies to lose financially, but also harms consumers' satisfaction and purchase intentions (Zhang et al., 2019). Prevention of data breaches has become a major concern in the travel industry (Vu et al., 2019), and firms are increasingly interested in how to best conduct data breach recovery.

Service recovery has been widely studied in the travel sectors (Guchait et al., 2019; Liu et al., 2019; Lu et al., 2021). Although such studies have advanced our understanding of regular service incident

recovery, the findings may not be applicable to data breach recovery in tourism, for two reasons. First, the number of victims in data breaches can be quite large (e.g., 500 million customers, in the Marriott example), making it impossible for firms to provide a large amount of economic compensation to each victim. Therefore, it is important to understand *what* types of compensation are effective in data breach recovery. Specifically, it is vital to assess whether a small amount of economic compensation can still be effective in data breach recovery. Second, consumers' losses due to data breaches are difficult to estimate (Acquisti et al., 2015), making it difficult to assess whether a data breach recovery is conducted fairly. Therefore, it is important to understand how consumers perceive compensations in different contexts. Specifically, it is vital to understand *when* and *how* data breach recovery should be conducted. To the best of our knowledge, however, few studies have focused on data breach recovery and examined what, when, and how its compensation should be conducted. Such an understanding is important for guiding companies in their efforts to best maintain their relationships with customers and/or regain customers' trust and satisfaction.

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Previous literature has suggested three types of compensation for service failure: economic compensation, social compensation, and economic and social compensation (Smith et al., 1999). However, different theories offer inconsistent predictions of their effectiveness. According to the expected utility theory, individuals prefer compensations with high utility (Mongin, 1997), implying that economic and social compensation will always be the preferred choice. However, the prospect theory (Kahneman & Tversky, 1979) argues that individuals may view economic and social compensation differently depending on their gains relative to a certain reference point, which implies that they may not always prefer economic and social compensation. To better resolve those conflicting views, it is important to understand the effect of economic and social compensation in data breach recovery.

In addition, the recovery mode may influence the effectiveness of the compensation offered. For example, offering the compensation in public is preferred when a group service failure has happened (Zhou et al., 2013). Furthermore, consumers may prefer to learn about the data breach incident from the service company rather than from the media (Guchait et al., 2019). Unfortunately, how these recovery modes influence the effectiveness of economic and social compensation has remained ambiguous. Thus, our study aims to advance the literature (Guchait et al., 2019; Zhou et al., 2013) by investigating various recovery modes: a reactive² mode versus a passive mode to examine *when* the economic and social compensation is more effective, and a public mode versus a private mode to understand *how* the economic and social compensation should be provided. Therefore, *our research objective is to examine how economic and social compensation influences individuals' justice perception in regard to data breach recovery, relative to economic compensation or social compensation in different recovery modes.*

Our study fills an important research gap regarding the effect of economic and social compensation in the context of the data breach. Specifically, by focusing on recovery modes, our study clarifies the boundary conditions regarding the effects of economic and social compensation. Because the expected utility theory and the prospect theory provide contradictory predictions, our study strives to reveal the dynamic effects of economic and social compensation on data breaches in tourism. We conducted two experiments using hotels as the context. Our research began with a pilot study to establish the baseline effects of economic and social compensation in data breach recovery. We then conducted two experiments to examine the effects of economic and social compensation under different recovery modes.

Overall, our study examines what, when, and how data breach recovery should be conducted in the hotel industry. Our study thus provides significant theoretical contributions, not only to the literature on tourism service recovery but also to the applications of the expected utility theory and the prospect theory in tourism. Meanwhile, the results can provide managers with important practical guidelines regarding how to conduct a data breach recovery in tourism.

2. Literature review and theoretical foundation

2.1. Service recovery

Service failures cannot be avoided, even by the best service providers. Service recovery refers to providers' actions designed and implemented to solve service problems to alter customers' negative attitudes and to prevent further negative outcomes (Miller et al., 2000). Service recovery is vital in calming frustrated consumers and in supporting their purchase intention in the future (Zhou et al., 2013).

² Our study uses the reactive mode to refer to the recovery mode where firms disclose their service failures and provide compensations before those failures are reported publicly. The literature has also used "the proactive mode" (Guchait et al., 2019). These two terms deal with the same scenario, and our paper uses "the reactive mode".

Table 1

Major findings of service strategies in the hospitality and tourism literature.

Studies	Recovery actions/Strategies	Major findings
Bae et al. (2021)	Compensation Apology Empowerment	One-time compensation at the point of the incident, cue-based apologies, and empowered servers are the most effective service-recovery strategies.
Guchait et al. (2019)	Stealing thunder (a strategy in which people who have made a mistake report it to the public before other people or the media expose the problem) Apology Compensation	Stealing thunder has a positive impact on loyalty; stealing thunder, apology, and compensation have a joint effect on loyalty
Liang and Liu (2014)	Apology Compensation Pre- and post-communication Timely response	Selecting appropriate recovery strategies can reduce the effect that violating the customer's psychological contract has on loyalty; among all strategies proposed, a timely response did not moderate the impact from psychological violation on loyalty.
Tsai and Su (2009)	Free food and beverages Discount Coupon Managerial intervention Replacement Correction Apology Doing nothing Imputing the failure to the customers	The study used critical incidents to summarize chain hotels' most common service failure and strategy categories; among the strategies that were identified, free food and beverages were the most common service recovery strategy in chain restaurants.
Silber et al. (2009)	Compensation Assistance No actions	Assistance strategy was the dominant resolution of service recovery in restaurants.
Hoffman and Chung (1999)	Compensatory responses Managerial responses Corrective responses Empathetic responses (Apology) No-action-taken responses	Using critical incidents, compensatory responses were found to be the most effective and no-action-taken responses were the least effective.

Previous studies on service failure and recovery in tourism have focused primarily on four areas: a) service quality, customer satisfaction, and loyalty; b) culture; c) equity, justice, and fairness; and d) attribution (Koc, 2017).

Service recovery involves service providers' actions to deal with service failures (Lin et al., 2011; Hoffman & Chung, 1999) and typically include certain compensations provided to consumers. A review of the previous studies on service recovery revealed that two general types of compensations exist in the hospitality and tourism service recovery (Table 1): economic compensation and social compensation (Smith et al., 1999). Economic compensation provides utilitarian resources such as refunds, vouchers, and discounts, whereas social compensation includes psychological or symbolic resources such as explanations and apologies (Smith et al., 1999). Because these two types of compensation can also be used together (Guchait et al., 2019), *our study examines the effect of economic and social compensation, relative to economic compensation and social compensation.*

With the development of information technology, social media have become a vitally influential factor in practicing service recovery. Because of the massive use of social media, customers often post their complaints online, and keeping a service failure secret is becoming increasingly challenging. Unlike traditional service recovery, firms' recovery approaches are visible to all customers on social media. Such scenarios have spawned an area of research that studies how to present service recovery virtually on social media and looks at how social media influences the effects of service recovery. The literature has shown that the more adaptive a recovery action is, the more effective it is for reducing customers' negative attitudes (Abney et al., 2017). Moreover,

managers that show high authenticity and transparency during online service recovery generate a high level of trust and satisfaction in their customers (Jeong & Lee, 2017).

It was well accepted that compensation is effective in solving service failures (Kim & Tang, 2016; Wirtz & Mattila, 2004; Liu et al., 2019), and recent studies have found that the level of compensation effectiveness is influenced by the delivery approach. Focusing on group service recovery, Zhou et al. (2013) examined the public and private modes of recovery and found that economic compensation was perceived to be more favorable under the public mode, whereas social compensation was more effective under the private mode. Here, the private mode of delivery refers to companies contacting each consumer individually and providing the compensation to that consumer specifically, whereas the public mode of recovery refers to the context in which companies contact a group of consumers and provide the compensation to each consumer via the group.

Albrecht et al. (2019) further discovered a nonlinear effect of compensation size on consumers' satisfaction with service recovery and also found a moderating effect from the public mode versus the private mode. By studying a fictitious service failure incident in a hotel, they revealed that the diminishment effect of reduced compensation size was less in the public mode than in the private mode. Specifically, because customers can compare their compensation with others' in the public mode, they are more likely to be satisfied with a smaller size of compensation (Albrecht et al., 2019).

In addition, Guchait et al. (2019) examined the effects of the reactive (i.e., the proactive or stealing thunder) mode and the passive recovery mode on the effects of compensation. Here, the reactive recovery mode refers to firms disclosing their service failures and providing compensations to consumers before those failures are reported publicly (e.g., through news reports), whereas the passive recovery mode refers to the scenario in which consumers come to know about the service failures from public sources, and then receive their compensations after the service failures have been reported (Williams et al., 1993). Guchait et al. (2019) found that the reactive recovery mode had a positive effect on loyalty. Because both sets of recovery modes are relevant to data breach recovery, *our study examines these four recovery modes and tries to understand how and when service recovery should be conducted.*

2.2. Data breach recovery

Although the literature has examined service recovery in various tourism contexts, including food dining (Guchait et al., 2019) and lodging (Liu et al., 2019), their findings regarding the effects of compensation may not apply to data breach recovery, for two primary reasons.

First, data breaches involve quite a large number of victims. For example, the data breach incidents that occurred in Choice Hotels and in Marriott Hotels affected 700 thousand and 500 million consumers, respectively (HNN, 2020). Although the literature has examined group service recovery, the number of consumers affected by those services is relatively small. For example, Zhou et al. (2014) examined group travel and considered a group of 50 members to be a large group, which is far fewer than the number of victims in data breach incidents. Unlike other service recoveries, in which firms can make the amount of the economic compensation relatively high or can even exceed the utility of services (i.e., overcompensation), firms cannot afford to do that in data breach recovery. In the example of the Choice Hotels data breach incident, even if the firm had only provided one dollar to each consumer, the total amount of compensation would have been 700 thousand dollars. Therefore, when a large number of victims is involved, firms that choose to provide economic compensation have little flexibility and can only afford a small amount of monetary compensation. It is thus important to understand whether a small amount of economic compensation can still be effective in data breach recovery.

Second, it is difficult to accurately estimate consumers' losses from a data breach (Acquisti et al., 2015; Acquisti & Grossklags, 2005). In the context

of other services, such as product purchases (Chen et al., 2018) and food dining (Guchait et al., 2019), at least some parts of consumers' losses can be estimated easily. Such losses when receiving defective products are valued at a certain proportion of products' value, depending on how severe the defect is. Take dining as an example. When the restaurants make mistakes during cooking, one part of consumers' losses is the value of food, which can be easily estimated. Meanwhile, it is possible that consumers are allergic to certain ingredients, and such mistakes can hurt their health, and such losses are hard to estimate, depending on the severity of the allergy. Therefore, consumers' losses involve both easily-estimated (i.e., the value of the food) and difficultly-estimated parts (i.e., impacts on health). However, in the context of a data breach, consumers' data are leaked, and the value of their personal information is difficult to estimate (i.e., do not involve easily-estimated losses). The losses incurred due to data breaches are complex and context-specific (Acquisti & Grossklags, 2005). Specifically, data lost can be financial data, user credentials, personally identifiable information, card tracking data, or a combination thereof (Trustwave, 2020, p. 2020). Consumers' losses thus depend on the specific types of data leaked and how the data will be misused later. For example, consumers' shopping data can be misused by other companies for product promotion, but the consumers may not have many tangible losses (Acquisti et al., 2015). However, in another scenario, consumers' financial data may be misused for unauthorized transactions, and those consumers can lose a large amount of money. It is also possible for lost data to be misused multiple times in different ways. Therefore, the losses due to data breaches are ambiguous, and consumers' perceptions regarding the fairness of a compensation probably vary across contexts. Thus, it is vital to understand how consumers perceive compensations in the different recovery modes.

2.3. Theoretical foundations

We introduce our theoretical foundations in this section. We first discuss fairness heuristic theory, which deals with perceived justice and its outcomes, and then explain the prospect theory, which focuses on how perceived justice is developed.

2.4. Fairness heuristic theory: justice in data breach recovery

The literature on justice in general, and on service recovery in particular, has identified three subdimensions of justice: distributive justice, procedural justice, and interactional justice (Maxham & Netemeyer, 2002; Smith et al., 1999). In the context of data breach recovery, we refer to distributive justice as the extent to which consumers perceive that they have been fairly treated regarding the *final* outcome of the data breach recovery (Maxham & Netemeyer, 2002). Firms can provide vouchers or other types of compensation following data breaches, and distributive justice represents the fairness of compensation regarding those data breaches (Alexander & Ruderman, 1987). When compensations are provided equitably (i.e., when they cover the losses incurred from the data breach), distributive justice is achieved (Ambrose & Arnaud, 2005).

Next, procedural justice refers to "the perceived fairness of policies and procedures" involving the effort of data breach recovery (Maxham & Netemeyer, 2002, p. 240), and such justice deals with "the means" of the data breach recovery (Niehoff & Moorman, 1993). When consumers are treated fairly during the process of data breach recovery, procedural justice is enhanced.

Finally, interactional justice refers to "the extent to which customers feel they have been treated fairly" during their interactions with firms regarding data breach recovery (Maxham & Netemeyer, 2002, p. 241). Hence, interactional justice deals with consumers' feelings about whether firms are treating them fairly during interactions. When interactions involve components such as courtesy and honesty and show that the firms are spending significant effort on data breach recovery

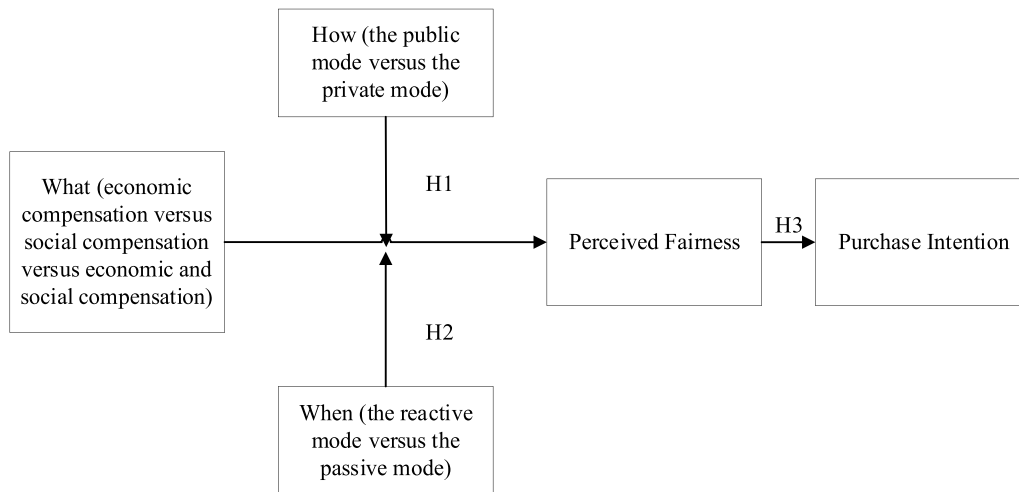


Fig. 1. Research model.

and that they care about their consumers' interests, interactional justice is supported (Smith et al., 1999). All three types of justice positively influence customers' revisit intention (Cai & Qu, 2018).

Fairness heuristic theory is a useful theoretical lens to understand service recovery (Hu et al., 2017; Ro et al., 2013). Following the fairness heuristic theory (Lind, 2001), consumers go through two stages in data breach recovery: the judgment stage and the use stage. During the judgment stage, consumers process justice-relevant information related to data breach recovery. Such processing leads to the consumers' general judgment about the justice of data breach recovery. Here, distributive justice judgment, procedural justice judgment, and interactional justice judgment represent subdimensions of general justice judgement. Therefore, our study uses perceived justice to represent consumers' overall justice judgment regarding data breach recovery, and models perceived justice as a second-order construct, with three subdimensions. Once the judgment stage is completed, consumers will use the general justice judgment they have formed to guide their subsequent decisions during the use stage.

In the context of data breach recovery, the fairness heuristic theory implies that perceived justice will influence consumers' subsequent perceptions and decisions. Our study focuses on purchase intention during the use stage. Purchase intention represents consumers' intention to purchase products or services again from firms in the future (Maxham & Netemeyer, 2002). We included purchase intention because it has important practical implications. Finally, individuals may also return to the judgmental phase when the nature of relationships has changed dramatically (Lind, 2001).

Although the fairness heuristic theory provides good explanations regarding how perceived justice results in various outcomes, it is less helpful for explaining how perceived justice is formed during data breach recovery. To address those limitations of the fairness heuristic theory, we draw upon the prospect theory.

2.4.1. The prospect theory

The prospect theory (Kahneman & Tversky, 1979) argues that individuals evaluate outcomes based on the outcomes' deviations from a certain reference point, instead of on the net value involved. The prospect theory has been used widely in the tourism literature for predicting human behaviors involving risks—for example, Tanford and Kim (2019) used prospect theory to explain the interacting effect between hotel location and reviews on hotel selections. Olya and Han (2020) used prospect theory to understand space travelers' intention and found that risk was the dominant antecedent of space travel.

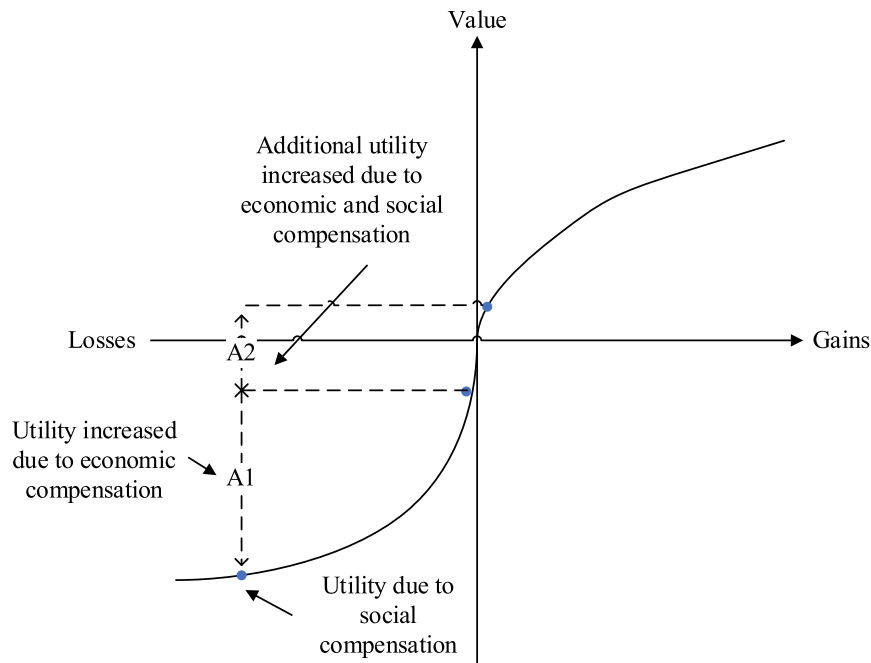
The prospect theory has four main arguments particularly relevant for understanding data breach recovery. First, the evaluation process

includes two phases: the editing phase and the evaluation phase (Edwards, 1996; McDermott et al., 2008). During the editing phase, individuals identify the reference point (Levy, 1992). According to Barberis (2013), the reference point is usually the individuals' expectations, or "beliefs... held in the recent past about outcomes" in specific contexts (p.179). During the evaluation phase, individuals frame outcomes as deviations (losses versus gains) from the reference point (Levy, 1992) and follow certain value functions to reach their evaluation conclusions (i.e., whether they have received gains or losses). Specifically, in the value function, gains and losses are framed as deviations from the reference point identified in the editing phase, rather than as their absolute utility. In other words, when the utility of an outcome is above the reference point, individuals evaluate the outcome to be a gain; otherwise, the outcome is evaluated to be a loss. Thus, consumers derive utility when their actual consumption is better than their expected consumption. In the context of data breach recovery, individuals expect that firms make a great deal of effort to resolve the issue and to cover their losses caused by the breach. Because the losses cannot be easily quantified, the reference point is ambiguous and can vary across contexts.

Second, the value function is generally concave for gains and convex for losses, and the function is steeper for losses than for gains (Tversky & Kahneman, 1981). Thus, individuals generally give losses more weight than gains. In the context of data breach recovery, this tendency indicates that consumers are more sensitive to losses caused by a data breach than to gains received for data breach recovery.

Third, the value function has diminishing sensitivity (Holmes et al., 2011). For example, when individuals receive gains and then additional increments of utility are provided, the additional utility has progressively smaller increments of value when the gains move farther from the reference point. In the context of data breach recovery, this implies that additional compensations increase consumers' utility to a lesser degree than the initial utility does.

Finally, individuals tend to avoid risk in connection with gains, but are tolerant and accept risk for losses (Kahneman & Tversky, 1979). In other words, individuals are more likely to engage in risk-seeking behaviors with a loss and to perform risk-averse behaviors with a gain (Edwards, 1996). With losses, individuals are eager to go back to the reference point. Therefore, they consider the possibility of returning to the reference point as the gain, even if that includes engaging in risky behaviors. However, with gains, individuals are more sensitive to losses because the loss will make them return to the reference point. Therefore, they try to engage in risk-averse behaviors to avoid going back to the reference point. In the context of data breach recovery, this indicates that consumers may have different perceptions about risk (i.e., possible losses) due to data breaches, depending on whether consumers are with



Note: The figure only aims to show the relative increase in utility (A1 versus A2).

Fig. 2. Increases in perceived justice (The Public Mode).

gains or with losses. Thus, the prospect theory is distinct from the expected utility theory (Mongin, 1997), which does not differentiate individuals' risk perceptions in different contexts.

The prospect theory has been widely applied in various contexts, including service recovery. For example, Liao (2007) showed that the positive effects of employee service recovery on customer satisfaction declined with repeated failures because losses have more weight than gains do. In another study, Noone (2012) applied the prospect theory and found that the monetary value of cash-based overcompensation did not significantly increase perceived justice, because the participants had a diminishing sensitivity to gains. Although these studies advance our understanding of service recovery, they have not addressed the uniqueness of data breach recovery discussed above. Next, we describe our model based upon the prospect theory and the fairness heuristic theory.

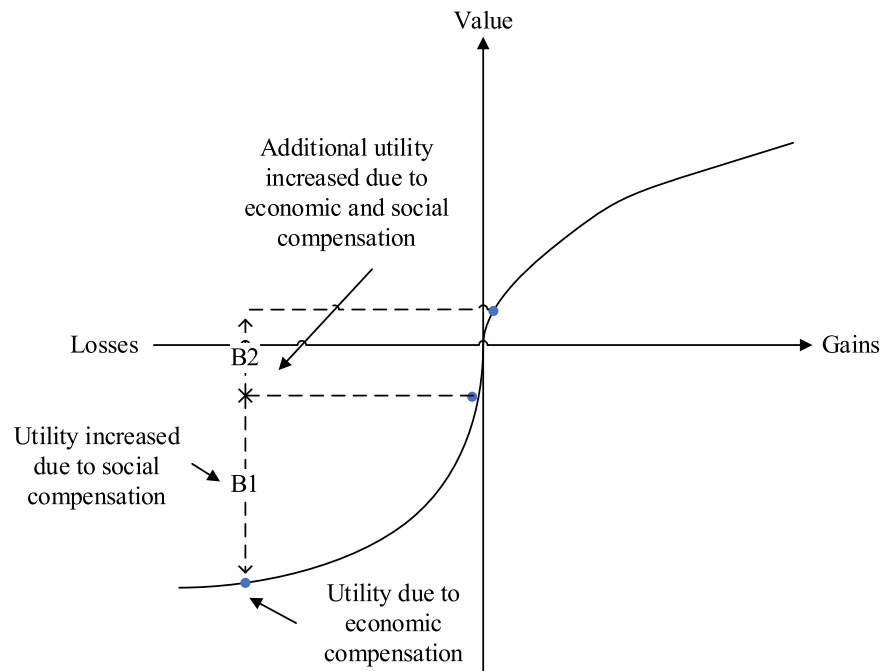
3. Research model and hypotheses development

Our model is depicted in Fig. 1. The model aims to show the boundary conditions regarding the effect of economic and social compensation relative to that of economic compensation or social compensation. Following the expected utility theory, economic and social compensation should have the highest level of utility, and that baseline effect was confirmed in our pilot study. However, the effect of economic and social compensation can differ under different recovery modes. Therefore, this study focuses on two pairs of recovery modes: public versus private modes, and reactive versus passive modes. The public mode versus the private mode is concerned with *how* the service recovery is conducted, whereas the reactive mode versus the passive mode focuses on *when* the service recovery is provided. Thus, our model includes what (the type of compensation), how (via a public mode versus a private mode), and when (as a reactive mode versus a passive mode) regarding service recovery. Perceived justice then enhances purchase intention. Next, we explain each hypothesis in more detail.

3.1. The moderating effect of the public mode versus the private mode

As we discuss above, consumers expect firms to make a significant effort to deal with a data breach and ensure that their losses due to the breach are covered. However, because consumers cannot easily estimate their losses, the reference point of the consumers' judgment process can be ambiguous and difficult to determine. When consumers receive economic compensation under the public mode, they can use the compensation that others receive as the reference point from which to evaluate their own compensation. With the perception that everyone receives the same economic compensation, consumers probably perceive that they are fairly compensated. Specifically, such a reference point can move consumers' preferences closer to the economic compensation. In contrast, consumers probably perceive social compensation less fairly when they simply receive standard messages that are the same as those received by everyone else. A unified and impersonal social compensation makes individuals feel that no extra effort or social resources are provided by the firms (Pelham & Wachsmuth, 1995). Therefore, consumers probably perceive economic compensation to have a higher level of justice than social compensation does (A1 in Fig. 2). The literature has also shown that economic compensation is more effective under the public mode (Zhou et al., 2013; Albrecht et al., 2018).

Because economic and social compensation is the combination of both of these elements, it probably results in additional utility under both the public mode and the private mode. However, according to the prospect theory (*argument three*), individuals have a diminishing sensitivity toward gains (Holmes et al., 2011). Noone (2012) found that due to a diminishing sensitivity to gains, cash-based overcompensation did not significantly increase perceived justice. Therefore, in the public mode, although economic and social compensation can bring additional utility, and perceived justice can increase additionally when moving from economic compensation to economic and social compensation (A2), such an increase is probably smaller than that between social compensation and economic compensation ($A1 > A2$ in Fig. 2). Therefore, we have:



Note: The figure only aims to show the relative increase of utility (B1 versus B2).

Fig. 3. Increases in perceived justice (the private mode).

H1a. The increase of perceived justice from economic compensation to economic and social compensation is less than the increase of perceived justice from social compensation to economic compensation under the public mode.

On the other hand, under the private mode, consumers cannot see the amount of economic compensation received by others, so their reference point is more ambiguous. They may thus feel it is difficult to evaluate whether the economic compensation received is fair (Van den Bos et al., 1997). As discussed above, during a data breach recovery, firms cannot provide a large amount of economic compensation to each consumer. Therefore, according to the prospect theory (Tversky & Kahneman, 1981), under the private mode consumers may give more weight to their losses due to the data breach relative to the small amount of economic compensation received. Therefore, consumers may not feel that their losses have been fairly covered, thus leading to a relatively lower level of perceived justice.

On the other hand, when consumers receive social compensation privately in data breach recovery, they can more easily interpret it as being genuine and sincere (Van den Bos et al., 1997). Therefore, consumers probably perceive that firms care about their interests and treat them fairly. Social compensation in the private mode probably leads to a higher level of perceived justice than economic compensation does (B1 in Fig. 3). Previous studies have also shown that social compensation is more positively perceived under the private mode (Zhou et al., 2013). Furthermore, individuals probably have a diminishing sensitivity toward gains (*argument three*) (Holmes et al., 2011). Therefore, economic and social compensation may not provide much additional benefit, and the increase in perceived justice from social compensation to economic and social compensation is probably smaller than the increase between economic compensation and social compensation ($B1 > B2$ in Panel B, Fig. 3). Thus, we hypothesize that:

H1b. The increase of perceived justice from the social compensation to the economic and social compensation is less than the increase of perceived justice from the economic compensation to the social compensation, under the private mode.

So far, the arguments regarding the effect of economic and social compensation following the prospect theory are consistent with those following the expected utility theory, because both theories predict that economic and social compensation is preferred under both the public mode and the private mode.

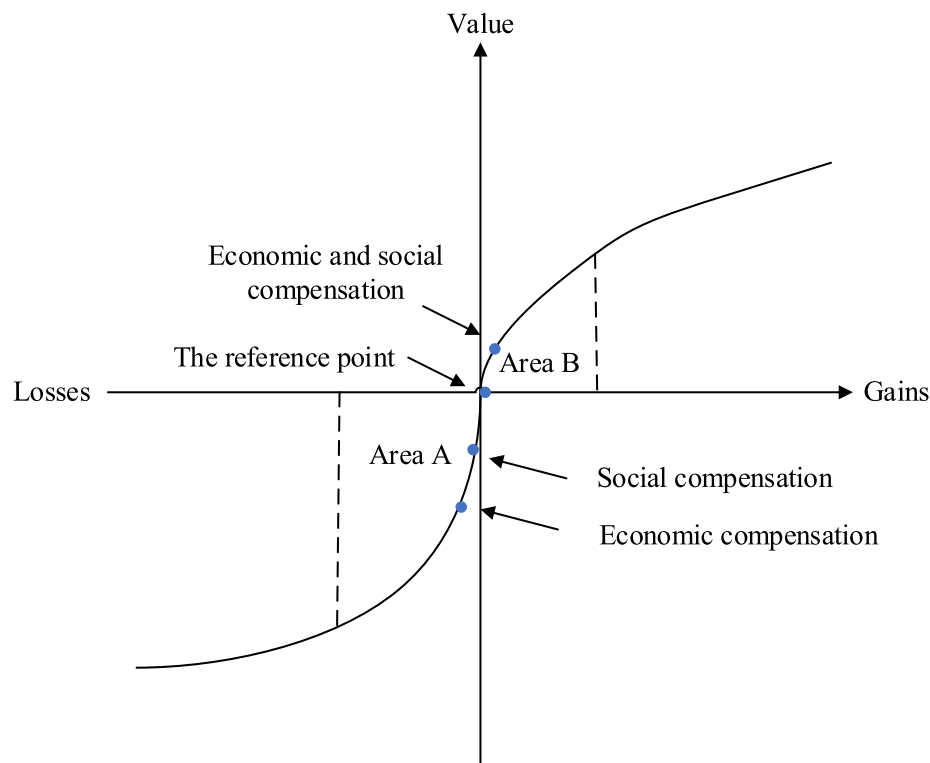
3.2. The moderating effect of the reactive mode versus the passive mode

The effect of compensation can also differ under the reactive mode versus under the passive mode (i.e., whether compensation is provided before or after a data breach incident is reported). Under the passive mode, consumers first see the news related to the data breach, and thus experience the loss due to the breach. For both economic compensation and social compensation, when consumers receive such compensation under the passive mode, the compensation provides utility and helps consumers move toward their reference point. However, because consumers give more weight to their losses than to their gains (Edwards, 1996; Tversky & Kahneman, 1981), they may still feel a loss (Area A in Fig. 4). Because the economic and social compensation is a combination of economic compensation and social compensation, it can provide consumers with more utility than either type of compensation alone, and may even exceed the reference point (Area B in Fig. 4). Therefore, we hypothesize that:

H2a. Perceived justice from economic and social compensation is greater than that from economic compensation under the passive mode.

H2b. Perceived justice from economic and social compensation is greater than that from social compensation under the passive mode.

In contrast, under the reactive mode, firms provide the compensation before the breach is reported publicly. Then, when the data breach incident is exposed by news reports, more information is released to the public, and the relationship between the firm and its consumers changes significantly. The fairness heuristic theory suggests when the relationships in question alter, individuals may return to the judgmental phases (Lind, 2001). Therefore, consumers probably return to the judgmental phase and reevaluate whether the compensation received is fair.



Note: The figure only aims to show that the utility from economic compensation or from social compensation is probably under the loss area, while the utility from economic and social compensation is probably under the gain area. It does not aim to show that the utility from social compensation is higher than that from economic compensation in the Reactive mode or the passive mode.

Fig. 4. Utility levels with different types of compensation (the passive mode versus the reactive mode).

Because consumers with economic compensation or social compensation are in the area of loss, they are more likely to tolerate risk (*argument four*) (Edwards, 1996). Thus, when they experience no further losses, those consumers probably feel that they are fairly treated, because their losses have been covered (i.e., they can move toward their reference point). Furthermore, firms' self-disclosure may increase consumers' positive perception of the firms' ethical standards. Firms can thus conduct effective service recovery and regain consumer satisfaction before the security failure becomes a major issue (Schweikhart et al., 1993).

However, when consumers first receive economic and social compensation, they may probably obtain some gains. Later, when the news about the data breach is reported publicly, consumers may reevaluate the incident and its associated losses. Because consumers are now in the gain area, they are more risk-averse (*argument four*) (Edwards, 1996). Specifically, by reevaluating the incident, consumers may feel that additional losses could occur, and they return to their reference point. Thus, they may feel that they are not treated fairly because their potential losses in the future will not be covered by economic and social compensation. Kőszegi and Rabin (2009) also suggested that consumers are more sensitive to news that consumption at some point later will be lower than expected. In the context of data breach recovery, consumers are sensitive to news that further losses can occur (i.e., reducing the utility of economic and social compensation), especially when they are in the gain area. Moreover, economic and social compensation can also be considered as overcompensation, which further implies the strong severity of the data breach incident. Therefore, we hypothesize that:

H2c. Perceived justice from economic and social compensation is lower than that from economic compensation, under the reactive mode.

H2d. Perceived justice from economic and social compensation is lower than that from social compensation, under the reactive mode.

For H2c and H2d, the predictions following the prospect theory are not consistent with those from the expected utility theory. Whereas the expected utility theory predicts that economic and social compensation will be preferred regardless of the specific recovery modes, the prospect theory argues that economic and social compensation will lead to a lower level of perceived justice under the reactive mode.

3.3. The effect of perceived justice

Consumers' perceived justice formed in the judgment stage can also influence their purchase intention during the use stage. Maxham and Netemeyer (2002) argued that consumers' justice judgment can enhance their satisfaction with the recovery and overall firm satisfaction. Indeed, when consumers feel that they have been treated fairly and have a high level of perceived justice, they will expect that their interests will be taken care of (Guchait et al., 2019) and that their losses will be compensated for in their future relationships with firms. Therefore, it is likely that customers will continue to purchase products or services from these firms. Therefore, we hypothesize that:

H3. Perceived justice is positively related to purchase intention.

Table 2
Measurements.

Construct	Items
Distributive Justice	DJ1: The outcome I received was fair. DJ2: I did not get what I deserved (R). DJ3: In resolving the problem, the hotel gave me what I needed. DJ4: The outcome I received was not right (R).
Procedural Justice	PJ1: The length of time taken to resolve my problem was longer than necessary (R). PJ2: The hotel showed adequate flexibility in dealing with my problem.
Interactional Justice	IJ1: The hotel employee was appropriately concerned about my problem. IJ2: The hotel employee did not put the proper effort into resolving my problem (R). IJ3: The hotel employee's communications with me were appropriate. IJ4: The hotel employee did not give me the courtesy I was due (R).
Purchase intention	PI1: In the future, I intend to use services from this hotel. PI2: If you were to travel, how likely would you be to use services from this hotel?

4. Methodology

We conducted two experiments during May 2020 to test our hypotheses. The first experiment aims to examine the effect of the public mode versus the private mode, and the second experiment aims to assess the effect of the reactive mode versus the passive mode. Below, we describe our two experiments in more detail.

4.1. Experimental context

The context of hotel data leaks is appropriate for examining data breach recoveries for three main reasons. First, data leaks are quite common in the hotel industry. According to a recent report, the hospitality industry ranks third for data breaches, and 13% of security incidents come from the hospitality industry (Trustwave, 2020, p. 2020). Second, when hotel data leaks occur, many customers can be affected (HNN, 2020). Third, the hotel data leaked can include data such as personally identifiable information (e.g., passport number), financial data, and user credentials (Trustwave, 2020, p. 2020), the losses of which are difficult to quantify.

Our study used university students as our sample. It was appropriate for our study for four reasons. First, a student sample has been used in the literature on service recovery (Kenesei & Bali, 2020; Zhou et al., 2014). Second, our study involves experiments, which are subject to the issue of selection difference: participants in various conditions may have unsuspected differences (Cozby & Bates, 2018). Using student samples can help alleviate that issue because students are relatively homogeneous and similar to each other. Third, our study was conducted during the outbreak of COVID-19, making it unsafe to conduct street intercept interviews. Fourth, a recent industrial report shows that students are a major group of consumers who book hotels online.³ Our study recruited only those who had previously visited hotels. To make the scenario more realistic, we also configured the price such that it was affordable for students.

4.2. Measures and manipulations

Our measures were adapted from the literature (Table 2). Specifically, items of perceived justice were adapted from Smith et al. (1999) and included three dimensions: distributive justice, procedural justice, and interactional justice. Items of purchase intention were adapted from Maxham and Netemeyer (2002). The second item of purchase intention

was measured by a seven-point Likert scale, ranging from 1 (very unlikely) to 7 (very likely); all other items were measured by seven-point Likert scales ranging from 1 (strongly disagree) to 7 (strongly agree). Items were first written in English, then one author translated them into Chinese, and finally, another author translated them back into English. Any inconsistencies were discussed and resolved.

We manipulated economic compensation by providing a 10 RMB (i.e., about \$1.5) voucher. We conducted a pilot test with 30 university students, and the results showed that the price they were willing to pay for data such as a phone number was roughly 10 RMB. Social compensation was manipulated by an apology message following Schumann (2014). The economic and social compensation was manipulated by combining the economic compensation and the social compensation described above.

4.3. Pilot study

Before conducting the two experiments, we first conducted a pilot study to establish the baseline effects of compensations for data breaches. The study was distributed through a social media platform and recruited 85 participants (58.9% female, mean age = 20.2 years) from a Chinese public university. We adopted a one-factor between-subjects design (compensation type: social compensation vs. economic compensation vs. economic and social compensation). The numbers of participants were 29 for social compensation, 27 for economic compensation, and 29 for economic and social compensation. Participants were randomly assigned to one of the three types of compensation conditions. We used a scenario that described a situation where the participant stayed in a hotel, and their personal information was provided at check-in. Specifically, the scenario was presented to participants as follows:

You stayed in ABC hotel (a chain hotel) during your trip to Hangzhou last month. You stayed for three days, and the price was 200 RMB per night. During your stay, you provided your name, phone number, and personal identification number. You also made some consumptions and requested an invoice before you left.

The scenario then described that their data was later leaked due to a hacker attack. Participants were then asked to rate their perceived justice of the compensation they received. The means of perceived justice of the three types of compensation are 3.06 (SD: 0.81) for the social compensation condition, 3.02 (SD: 1.01) for the economic compensation condition, and 3.55 (SD: 0.68) for the economic and social compensation condition.⁴ Independent *t*-tests showed no significant differences in perceived justice between social compensation condition and economic compensation condition ($t = 0.15, p > .05$), but revealed a significantly higher level of perceived justice in economic and social compensation condition than in social compensation condition ($t = 2.53, p < .05$) or economic compensation condition ($t = 2.30, p < .05$). The findings confirmed that the utility of economic and social compensation was higher than the utility of either social compensation or economic compensation, consistent with the expected utility theory (Mongin, 1997). Having established the baseline effects of different types of compensations, we then examined the boundary conditions of the effect of economic and social compensation by conducting two primary studies.

4.4. Study 1

4.4.1. Study procedure and sample

A 3 (economic compensation versus social compensation versus economic and social compensation) \times 2 (the public mode versus the private mode) experiment was conducted, and participants were

⁴ Because the sample size of the pilot study was relatively small, we validated our measures in our main studies.

³ http://pdf.dfcfw.com/pdf/H3_AP202004081377750374_1.pdf.

Table 3
Scenario design (study 1).

	The Public Mode	The Private Mode
Economic compensation	<p>From: customerservice@ABChotel.com To: Alice <ad345sg6658@163.com>; Helen <vn248696@qq.com>; Kevin <343731510@qq.com>; Ms.Lee <1793469068@126.com>; Lily <1362202880@qq.com>; Mr.Liu <311nvash369@yahoo.com>; Ms.Wang <470200299@qq.com>; Ben <dfasf9jll157@sina.com>; Peter <1602915548@qq.com>; Paul <248saddf696@139.com>; Jeffery <541158366@qq.com>; Mr.Zhao <179256968@qq.com>; William <3112247369@qq.com>; Irene <a470fdg299@163.com>; Mr.Liu <31fsd62h369@yahoo.com>;Ms.Deng <d2689jll157@qq.com> + 384 others^a</p> <p>Dear customers: Our hotel has been attacked by hackers, resulting in a leak of our guests' data, including yours. We are paying much attention to this incident. After careful consideration, we have decided to compensate you with a 10-yuan coupon. You can use it in any of our chain hotels or give it to your friends. We look forward to seeing you again, and we will provide you with the best services.</p> <p>Kind regards D Customer Service Manager</p>	<p>From: customerservice@ABChotel.com To: Nickname<541158366@qq.com>^b; Dear Nickname: Our hotel has been attacked by hackers, resulting in leakage of our guests' data, including yours. We are paying much attention to this incident. After careful consideration, we have decided to compensate you with a 10-yuan coupon. You can use it in any of our chain hotels or give it to your friends. We look forward to seeing you again, and we will provide you with best services.</p> <p>Kind regards D Customer Service Manager</p>
Social compensation	<p>From: customerservice@ABChotel.com To: Alice <ad345sg6658@163.com>; Helen <vn248696@qq.com>; Kevin <343731510@qq.com>; Ms.Lee <1793469068@126.com>; Lily <1362202880@qq.com>; Mr.Liu <311nvash369@yahoo.com>; Ms.Wang <470200299@qq.com>; Ben <dfasf9jll157@sina.com>; Pete r <1602915548@qq.com>; Paul <248saddf696@139.com>; Jeffery <541158366@qq.com>; Mr.Zhao <179256968@qq.com>; William <3112247369@qq.com>; Irene <a470fdg299@163.com>; Mr.Liu <31fsd62h369@yahoo.com>;Ms.Deng <d2689jll157@qq.com> + 384 others</p> <p>Dear customers: Our hotel has been attacked by hackers, resulting in a leak of our guests' data, including yours. We are really sorry for the inconvenience caused to you. This incident is entirely our fault. We will bear the responsibility to make up for the problem, and we guarantee we will avoid such incidents as far as possible in the future. We hope to earn your forgiveness! We look forward to seeing you again, and we will provide you with the best services.</p> <p>Kind regards D Customer Service Manager</p>	<p>From: customerservice@ABChotel.com To: Nickname<541158366@qq.com>; Dear Nickname: Our hotel has been attacked by hackers, resulting in a leak of our guests' data, including yours. We are really sorry for the inconvenience caused to you. This incident is entirely our fault. We will bear the responsibility to make up for the problem, and we guarantee we will avoid such incidents as far as possible in the future. We hope to earn your forgiveness! We look forward to seeing you again, and we will provide you with best services.</p> <p>Kind regards D Customer Service Manager</p>
Economic and social compensation	<p>From: customerservice@ABChotel.com To: Alice <ad345sg6658@163.com>; Helen <vn248696@qq.com>; Kevin <343731510@qq.com>; Ms.Lee <1793469068@126.com>; Lily <1362202880@qq.com>; Mr.Liu <311nvash369@yahoo.com>; Ms.Wan g <470200299@qq.com>; Ben <dfasf9jll157@sina.com>; Peter <1602915548@qq.com>; Paul <248saddf696@139.com>; Jeffery <541158366@qq.com>; Mr.Zhao <179256968@qq.com>; William <3112247369@qq.com>; Irene <a470fdg299@163.com>; Mr.Liu <31fsd62h369@yahoo.com>;Ms.Deng <d2689jll157@qq.com> + 384 others</p> <p>Dear customers: Our hotel has been attacked by hackers, resulting in a leak of our guests' data, including yours. We are really sorry for the inconvenience caused to you. This incident is entirely our fault. We will bear the responsibility to make up for the problem, and we guarantee we will avoid such incidents as far as possible in the future. We hope to earn your forgiveness! We are paying much attention to this incident. After careful consideration, we have decided to compensate you with a 10-yuan coupon. You can use it in any of our chain hotels or give it to your friends. We look forward to seeing you again, and we will provide you with the best services.</p> <p>Kind regards D Customer Service Manager</p>	<p>From: customerservice@ABChotel.com To: Nickname<541158366@qq.com>; Dear Nickname: Our hotel has been attacked by hackers, resulting in a leak of our guests' data, including yours. We are really sorry for the inconvenience caused to you. This incident is entirely our fault. We will bear the responsibility to make up for the problem, and we guarantee we will avoid such incidents as far as possible in the future. We hope to earn your forgiveness! We are paying much attention to this incident. After careful consideration, we have decided to compensate you with a 10-yuan coupon. You can use it in any of our chain hotels or give it to your friends. We look forward to seeing you again, and we will provide you with best services.</p> <p>Kind regards D Customer Service Manager</p>

^a Although the actual number of victims is probably much larger, each email has a limited number of allowed recipients. For example, 163 email, a popular email service in China, has a limit of 400 recipients per email sent. We used made-up names and email addresses to demonstrate the differences between the public mode versus the private mode.

^b Participants in this condition were first asked for their nicknames on their emails. The nicknames were then used in the message.

Table 4
The number of participants in each condition (Study 1).

Mode	Economic compensation	Social compensation	Economic and social compensation
The public mode	30	32	26
The private mode	30	25	31

Table 5
Items' loadings, reliabilities, and AVEs (Study 1).

Item	Mean	S.D.	Skewness	Kurtosis	Loading	Alpha	CR	AVE
DJ1	3.52	1.81	.35	-.81	.93	.94	.93	.76
DJ2	3.51	1.75	.33	-.73	.83			
DJ3	3.60	1.86	.21	-1.00	.93			
DJ4	3.46	1.77	.34	-.77	.79			
PJ1	3.97	1.76	.19	-.77	.70	.76	.77	.62
PJ2	4.34	1.78	-.14	-.94	.87			
LJ1	3.91	1.77	.04	-.91	.92	.89	.88	.66
LJ2	3.48	1.74	.27	-.88	.76			
LJ3	3.89	1.63	.03	-.58	.90			
J14	3.87	1.61	.10	-.65	.64			
PI1	3.65	1.92	.14	-1.10	.95	.95	.95	.91
PI2	3.70	1.92	.19	-1.03	.96			

Table 6
First-order constructs' loadings (Study 1).

First-order Constructs	Loadings
Distributive Justice	.65
Procedural Justice	.86
Interactional Justice	.82

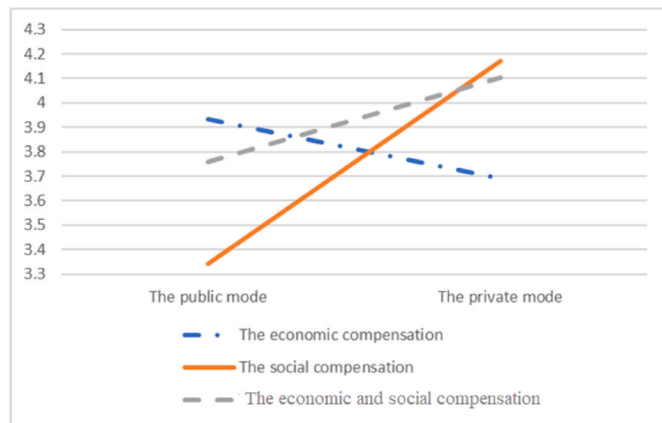


Fig. 5. Perceived justice under different conditions (Study 1).

recruited from a large Chinese university. The same scenario and recruiting procedure of the pilot study were used. In the public mode, participants read a compensation email sent from the hotel to a group of consumers, and in the private mode, participants read an email sent only to them individually. Those scenarios are presented in Table 3. We recruited 174 participants (59.1% female, mean age = 20.7 years) (Table 4). No significant differences were found among the participants for each condition regarding age and gender. Before conducting our experiment, we estimated the target sample size by conducting a prior power analysis (*F*-test [ANOVA: Fixed effects, special, main effects, and interaction]) with G*Power (Faul et al., 2009). The results showed that a sample size of 158 had sufficient power (0.80) to detect a medium effect, so our experiment had enough power (the same was the case in Study 2).

4.4.2. Analysis and results

We first assessed the validity of our measures. Perceived justice was measured as a second-order construct, and we assessed its validity with a second-order confirmatory factor analysis (CFA) (Prentice et al., 2020). The second-order CFA model fit was acceptable ($\chi^2 = 145.17$, d. f. = 33; CFI = 0.92; TLI = 0.90.). Loadings for each item (Table 5) and each first-order construct (Table 6) were also acceptable. These results support modeling perceived justice as a second-order construct.

We then conducted a CFA for purchase intention, and the loadings exceeded 0.60. Cronbach's alpha and composite reliabilities (CRs) were above 0.70, and the average variance extracted (AVE) values exceeded 0.50 (Table 5), thereby supporting convergent validity. Further, discriminant validity was supported, because the square root of AVE exceeded the correlations between that construct and any other construct. Therefore, our measures showed good psychometric properties.

The means of perceived justice in different conditions are presented in Fig. 5. A two-way ANOVA was first conducted,⁵ and the interaction of the compensation and the recovery mode was marginally significant ($F = 2.46$, $p < .10$). Under the public mode, perceived justice with economic and social compensation was lower than that with economic compensation, though the difference was not significant ($t = 0.46$, $p > .05$, Cohen's $d = 0.12$). On the other hand, perceived justice with economic compensation was marginally higher than that with social compensation ($t = 1.83$, $p < .10$, Cohen's $d = 0.46$). Therefore, the increase in perceived justice from social compensation to economic compensation was greater than that (which was negative) from economic compensation to that of economic and social compensation, thereby supporting H1a.

Under the private mode, perceived justice with economic and social compensation was lower than that with social compensation alone, but again the difference was not significant ($t = 0.17$, $p > .05$, Cohen's $d = 0.05$). On the other hand, perceived justice with social compensation was higher than that with economic compensation, though the difference was not significant ($t = 1.33$, $p > .05$, Cohen's $d = 0.35$). In other words, the increase in perceived justice from economic compensation to social compensation was positive, whereas that from social compensation to the economic and social compensation was negative. Therefore, the increase in perceived justice from economic compensation to that of social compensation was higher than that from social compensation to economic and social compensation, thus supporting H1b.

Finally, a linear regression analysis showed that perceived justice was positively related to purchase intention ($\beta = 0.65$, $t = 11.11$, $p <$

⁵ Because we used Likert scales to measure our variables, we also analyzed our data with non-parametric tests such as Kruskal-Wallis H tests and one-sample Wilcoxon signed-rank tests. The results were similar, and there were no qualitative differences. The results of the parametric tests are thus reported.



Fig. 6. Data breach news.

.001), thus supporting H3.

Additional analyses showed that under the public mode, perceived justice with economic compensation was marginally higher than that with social compensation ($t = 1.81, p < .10$, Cohen's $d = 0.46$, medium effect). On the other hand, under the private mode, although perceived justice with social compensation was higher than that with economic compensation, the difference was not significant ($t = 1.33, p > .05$, Cohen's $d = 0.35$, small-to-medium effect).

4.5. Study 2

4.5.1. Study procedure and sample

Study 2 adopted a 3 (economic compensation versus social compensation versus economic and social compensation) \times 2 (the reactive mode versus the passive mode) between-subjects design. We used the same scenario and recruiting procedure as that in Study 1. In the reactive mode, participants first read a compensation email from the hotel and then the news regarding the data leak. In the passive mode, participants first read the news and then the email. These scenarios are presented in Table 7. We recruited a total of 178 valid responses (Table 8). Among the participants, 59.5% were female, and their ages ranged from 18 to 24 years old. No significant differences were found among participants of each condition regarding age and gender.

4.5.2. Analysis and results

We followed the same process as that used in Study 1 to assess the measurements. Modeling perceived justice as a second-order construct was again supported, and the items also showed good construct validity (Table 9 and Table 10).

The means of perceived justice in different conditions are presented in Fig. 7. A two-way ANOVA was first conducted, and the interaction between the compensation and the recovery mode was significant ($F = 3.71, p < .05$). Under the passive mode, although perceived justice with economic and social compensation was higher than that with economic compensation or social compensation, the differences were not significant. Therefore, H2a and H2b were not supported. Furthermore, under the reactive mode, perceived justice with economic and social

compensation was significantly lower than that in economic compensation ($t = 2.46, p < .05$, Cohen's $d = 0.64$, medium effect), thus supporting H2c. Although perceived justice with economic and social compensation was also lower than that of social compensation, the difference was not significant ($t = 1.58, p > .05$, Cohen's $d = 0.40$, small-to-medium effect), thus not supporting H2d. Finally, the results showed that perceived justice had a significant effect on purchase intention ($\beta = 0.79, t = 17.18, p < .001$), thus supporting H3.

5. Discussions and conclusions

Our study aims to examine the interplay of what (the compensation), how (the public mode versus the private mode), and when (the reactive mode versus the passive mode) regarding data breach recovery. First, our results show that economic and social compensation does not have an incremental value that enhances perceived justice under the public mode or the private mode. These results are consistent with the prospect theory (*argument three*) (Holmes et al., 2011). Second, our study show that a combination of economic and social compensation can generate a lower level of perceived justice under the reactive model. Even under the passive mode, economic and social compensation is not significantly better than economic or social compensation. Third, our results show that perceived justice enhances purchase intention, consistent with the literature (Chen et al., 2018).

5.1. Implications for theory

Our study contributes to the literature by explaining the boundary conditions of economic and social compensation. Although economic and social compensation has the highest level of utility (as shown in our Pilot Study), it may not always be preferred by consumers. First, our study shows that economic and social compensation is not significantly better than the economic or the social compensation under the public or the private mode. These results reveal that the value of compensation has a diminishing sensitivity. In fact, our study finds that perceived justice with economic and social compensation is even lower (though not significant) than that with economic compensation under the public

Table 7
Scenario design (study 2).

	The reactive mode	The passive mode
Economic compensation	<p>From: customerservice@ABCChotel.com To: Nickname<541158366@qq.com>; Dear Nickname: Our hotel has been attacked by hackers, resulting in a leak of guests' data, including yours. We are paying much attention to this incident. After careful consideration, we have decided to compensate you with a 10-yuan coupon. You can use it in any of our chain hotels or give it to your friends. We look forward to seeing you again, and we will provide you with the best services. Kind regards D Customer Service Manager Soon afterward, the media also reported the data breach incident (Fig. 6).</p>	<p>Recently, you saw the news of a data breach in ABC hotel (Fig. 6). Soon afterward, you received an email from the hotel: From: customerservice@ABCChotel.com To: Nickname<541158366@qq.com>; Dear Nickname: Our hotel has been attacked by hackers, resulting in a leak of guests' data, including yours. We are paying much attention to this incident. After careful consideration, we have decided to compensate you with a 10-yuan coupon. You can use it in any of our chain hotels or give it to your friends. We look forward to seeing you again, and we will provide you with the best services. Kind regards D Customer Service Manager Recently, you saw the news of a data breach in ABC hotel (Fig. 6). Soon afterward, you received an email from the hotel: From: customerservice@ABCChotel.com To: Nickname<541158366@qq.com>; Dear Nickname: Our hotel has been attacked by hackers, resulting in a leak of guests' data, including yours. We are really sorry for the inconvenience caused to you. This incident is entirely our fault. We will bear the responsibility to make up for the problem, and we guarantee we will avoid such incidents as far as possible in the future. We hope to earn your forgiveness! We look forward to seeing you again, and we will provide you with the best services. Kind regards D Customer Service Manager</p>
Social compensation	<p>From: customerservice@ABCChotel.com To: Nickname<541158366@qq.com>; Dear Nickname: Our hotel has been attacked by hackers, resulting in a leak of guests' data, including yours. We are really sorry for the inconvenience caused to you. This incident is entirely our fault. We will bear the responsibility to make up for the problem, and we guarantee we will avoid such incidents as far as possible in the future. We hope to earn your forgiveness! We look forward to seeing you again, and we will provide you with the best services. Kind regards D Customer Service Manager Soon after, the media also reported the data breach incident (Fig. 6).</p>	<p>Recently, you saw the news of a data breach in ABC hotel (Fig. 6). Soon afterward, you received an email from the hotel: From: customerservice@ABCChotel.com To: Nickname<541158366@qq.com>; Dear Nickname: Our hotel has been attacked by hackers, resulting in a leak of guests' data, including yours. We are really sorry for the inconvenience caused to you. This incident is entirely our fault. We will bear the responsibility to make up for the problem, and we guarantee we will avoid such incidents as far as possible in the future. We hope to earn your forgiveness! We look forward to seeing you again, and we will provide you with the best services. Kind regards D Customer Service Manager</p>
Economic and social compensation	<p>From: customerservice@ABCChotel.com To: Nickname<541158366@qq.com>; Dear Nickname: Our hotel has been attacked by hackers, resulting in a leak of guests' data, including you. We are really sorry for the inconvenience caused to you. This incident is entirely our fault. We will bear the responsibility to make up for the problem, and we guarantee we will avoid such incidents as far as possible in the future. We hope to earn your forgiveness! We are paying much attention to this incident. After careful consideration, we have decided to compensate you with a 10-yuan coupon. You can use it in any of our chain hotels or give it to your friends. We look forward to seeing you again, and we will provide you with the best services. Kind regards D Customer Service Manager Soon after, the media also reported the data breach incident (Fig. 6).</p>	<p>Recently, you saw the news of a data breach in ABC hotel (Fig. 6). Soon after, you received an email from the hotel: From: customerservice@ABCChotel.com To: Nickname<541158366@qq.com>; Dear Nickname: Our hotel has been attacked by hackers, resulting in a leak of guests' data, including yours. We are really sorry for the inconvenience caused to you. This incident is entirely our fault. We will bear the responsibility to make up for the problem, and we guarantee we will avoid such incidents as far as possible in the future. We hope to earn your forgiveness! We are paying much attention to this incident. After careful consideration, we have decided to compensate you with a 10-yuan coupon. You can use it in any of our chain hotels or give it to your friends. We look forward to seeing you again, and we will provide you with the best services. Kind regards D Customer Service Manager</p>

Table 8
The number of participants in each condition (Study 2).

Mode	Economic compensation	Social compensation	Economic and social compensation
The passive mode	26	31	33
The reactive mode	29	30	29

mode. Because data breaches often involve a large number of victims, companies cannot provide a large amount of economic compensation during data breach recovery. However, according to our results, even a low level of economic compensation can be effective when data breach recovery is made in public.

Second, because consumers do not know the exact value of their losses resulting from data breaches, their reference point for data breach recovery is ambiguous and context-dependent. According to the prospect theory, under the passive mode, consumers probably use the data breach news as their reference point, and economic and social compensation can result in a higher level of perceived justice. However, counterintuitive results were also found—under the reactive mode,

consumers apparently reevaluate the possibility of risk when they view the data breach news. In such a context, they may feel more concerned about their possible losses in the future under economic and social compensation, leading to a lower level of perceived justice.

Meanwhile, because consumers are more tolerant of risks with losses, under the reactive mode economic compensation can lead to a higher level of perceived justice than economic and social compensation. *These results reveal an important paradox: When firms are more generous in their data breach recovery compensations after a breach is reported, consumers may actually perceive the data breach recovery to be less just.* These results again highlight that even a small amount of economic compensation can still make consumers feel that they are being treated fairly and will thus maintain their purchase intention. By confirming these effects, our study extends the literature on service recovery to the context of data breaches.

To summarize, our study contributes to the literature by highlighting the importance of the recovery modes (public versus private, and reactive versus passive) with economic and social compensation. Our results underscore that consumers may not always prefer economic and social compensation and that when conducted properly, a small amount of economic compensation can provide an equivalent or an even better effect than social and economic compensation.

Table 9
Items' loadings, reliabilities, and AVEs (Study 2).

Item	Mean	S.D.	Skewness	Kurtosis	Loading	Alpha	CR	AVE
DJ1	3.72	1.53	.11	-.66	.92	.90	.91	.72
DJ2	3.71	1.47	.11	-.46	.88			
DJ3	3.65	1.50	.18	-.61	.89			
DJ4	3.73	1.52	.38	-.37	.67			
PJ1	3.86	1.43	.24	-.44	.69	.70	.70	.53
PJ2	3.96	1.35	.22	-.45	.76			
IJ1	3.85	1.39	.12	-.37	.90			
IJ2	3.85	1.48	.02	-.74	.91	.90	.90	.70
IJ3	3.87	1.45	.16	-.51	.88			
IJ4	4.04	1.40	.31	-.49	.63			
PI1	3.63	1.55	.11	-.72	.96	.94	.94	.88
PI2	3.57	1.59	.10	-.72	.92			

Table 10
First-order constructs' loadings (Study 2).

First-order Constructs	Loadings
Distributive Justice	.88
Procedural Justice	.77
Interactional Justice	.86

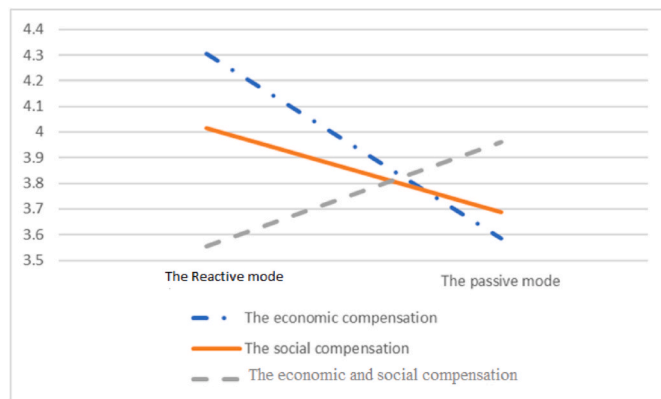


Fig. 7. Perceived justice in different conditions (Study 2).

5.2. Implications for practice

Our study also has important implications for the travel industry. First, our study shows that economic compensation is more beneficial under the reactive mode than under the passive mode. Therefore, when tourism companies find, during internal audits, that their data have been breached, they are advised to immediately provide economic compensation before the information is publicized. Furthermore, because economic compensation is more valued under the public mode than under the private mode, those early (reactive) compensations should be provided to consumers in groups (i.e., via a public mode) rather than individually. By providing economic compensation reactively and publicly, firms can enhance consumers' perceived justice, and that, in turn, will support consumers' future purchase intention. However, when firms provide compensation reactively, they should not be overly generous. A large amount of economic compensation can put consumers in gain, thus making them feel that the recovery is unfair when data breach news is reported later.

Second, when companies do not find out about data breaches until they are reported by the media, they can still provide compensation for the data breach recovery. According to our results, under the passive mode, economic and social compensation does not yield significantly better results than economic or social compensation. Therefore, in such situations, companies can choose either economic or social

compensation.

5.3. Limitations and opportunities for future studies

Our study has a few limitations. First, the context for our study was the hotel industry. Although that context was appropriate, our study may not be generalizable to other industries. Second, countries may have their own laws and regulations regarding service recovery, thus causing consumers' reference points regarding service recovery to vary accordingly. In countries with mature legal systems, consumers probably have a relatively higher level of expectation (i.e., reference points) regarding service recovery than consumers from countries with less mature legal systems. Because our data were collected from Chinese consumers, our results may not hold in other countries. Third, a variety of types of data can be breached, and consumers can experience different levels of losses. Therefore, our results may not hold when other types of data have been breached and lost.

Our study used scenario-based experiments to test our model. This approach has been widely used in the literature on information privacy and security (Choi et al., 2016; Gu et al., 2017) and service recovery (Kenesei & Bali, 2020; Zhou et al., 2014). Such an approach can help to establish the direction of cause and effect and to rule out the influence of confounding factors (Cozby & Bates, 2018). Moreover, data breaches in hotels (e.g., the Marriott case) do not happen often, so it is quite challenging to recruit participants to conduct qualitative interviews immediately after data breaches occur. Nevertheless, qualitative interviews can be helpful by providing additional insights, and we suggest that future studies further explore this issue by conducting qualitative interviews.

We selected university students as our sample. As we explained above, that was appropriate for our study, especially considering that the study was conducted during the outbreak of COVID-19. Nevertheless, although our study presents useful results, the findings may not be generalizable to other types of consumers. Future studies will be needed to replicate our study with a wider population.

Our study used purchase intention when predicting participants' attitudes toward service recovery. Although that was appropriate for our study, the literature has shown that individuals' intention may not accurately predict their actual behaviors (Chandon et al., 2005; Juvan & Dolnicar, 2014). Future studies are needed to assess the impact of data breaches with behavioral measures (e.g., number of visits after data breaches occur).

Because data breaches and recovery happen infrequently, our participants might not have developed their attitudes toward data breach recovery before our study. Thus, it is possible that our participants only developed their attitude as a result of finishing our experiments, thus leading to construct creation (Feldman & Lynch, 1988; Forbes & Avis, 2020). This is another limitation of our study. Future studies are needed to assess our model by recruiting participants with data breach experiences. Qualitative interviews can also be conducted to examine whether the responses are consistent with quantitative results.

Future studies can extend our work in several ways. First, longitudinal studies can be conducted to further examine the reactive mode versus the passive mode. It is possible that the length of the time period between the service recovery and the news of the breach can influence consumers' perceived justice. Second, because consumers' losses regarding data breaches are hard to quantify, firms may provide some justification regarding how their economic compensation is achieved. It is relevant to examine whether such justification can enhance consumers' perceived justice regarding economic compensation. Third, it would be interesting to examine how consumers from various demographic backgrounds establish their reference points of service recovery differently. Finally, the role of word of mouth should be examined for its influence during the process of data breach recovery.

Credit author statement

Xuhui Wang: Conceptualization, Supervision, Funding acquisition . Xuequn Wang: Conceptualization, Methodology, Writing- Original draft preparation, Writing- Reviewing and Editing, Formal analysis. Zilong Liu: Conceptualization, Methodology, Investigation, Funding acquisition, Supervision, Project administration. Wen Chang: Conceptualization. Writing- Original draft preparation, Writing- Reviewing and Editing. Yuansi Hou: Writing- Reviewing and Editing, Supervision. Zhihe Zhao: Investigation, Formal analysis, Visualization.

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Impact statement

Our study develops a systematic understanding of data breach recovery in the hotel context. These results can provide important strategic guidelines for hotel managers. Our results show that the economic and social compensation does not have any incremental value to enhance perceived justice under the public mode or the private mode. Further, the economic and social compensation can generate a lower level of perceived justice under the proactive model. Although the economic and social compensation leads to a higher level of perceived justice than the economic/social compensation under the passive mode, the differences are not significant. By informing hotel managers that how data breach recovery can be conducted, the results can help reduce customers' losses due to data breach and enhance hotel customers satisfaction.

Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tourman.2021.104420>.

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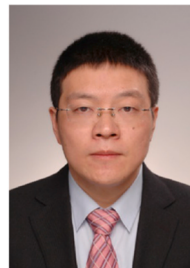
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