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Reacting to the scope of a data breach: The differential role of fear and anger

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ABSTRACT

We investigate how fearful and angry consumers react to the scope (number of customers affected) of a data breach. In two laboratory studies, we show that whereas fear makes consumers scope sensitive such that their intentions not to purchase from the affected retailer increases with scope, anger makes consumers scope insensitive and their repurchase intentions scope invariant. Process tests show that whereas scope indirectly affects the repurchase intentions of fearful consumers by making the mental image of the breach more vivid to them, scope does not affect how angry consumers imagine the breach nor their repurchase intentions. We find similar results in a field study, analyzing approximately 12,000 news stories of data breaches, showing that scope affects stock market reactions when the stories stress fear over anger but not when they stress anger over fear.

1. Introduction

A data breach is a confirmed incident of unlawful access/disclosure of sensitive, confidential or otherwise protected data, including personal health or personally identifiable information, trade secrets, or intellectual property ("Data Breach,", 2017). Some high-profile data breach cases in recent years include Facebook (in 2018, affecting 87 million records), Uber (2017, 57 million), Equifax (2017, 143 million), Yahoo (2016, 3 billion), Target (2013, 40 million), and LinkedIn (2012, over 100 million) (Fiegerman, 2017). Such breaches have high costs and consequences for the focal company. For example, a 2017 Data Breach Study sponsored by IBM Security estimates that the average company has a 30% chance of experiencing a data breach in the next two years, resulting in an abnormal customer churn rate of 3.4% and a per capita cost of $225 ("Cost of Data Breach Study,", 2017).

As illustrated above, the scopes of data breaches can vary, affecting just a few, or a large number, of customers/accounts, and recent research has focused on how releasing such scope information can trigger market reactions at the aggregate level. For example, Martin, Borah, and Palmatier (2017) show that scope negatively affects the stock market prices of the focal firms who are victims of the breach, but positively affects those of their rival firms. However, there is much less research investigating how consumers, at the individual level, react to such scope information. Since the news of a data breach can evoke a variety of affective reactions – such as anger and fear – it is quite possible that scope can have different impacts on the consumers' reactions, such as their intentions not to repurchase from the focal retailer once we factor in the discrete emotions. For example, research shows that fear and anger prompt very different cognitive appraisals of a situation (Smith & Ellsworth, 1985). Fear makes consumers feel less in control of a situation, making their risk assessments sensitive to what has happened to others. Anger, on the other hand, makes consumers feel more in control and makes their risk assessments independent of what has happened to others (Fischhoff, Gonzalez, Lerner, & Small, 2005; Lerner, Gonzalez, Small, & Fischhoff, 2003; Lerner & Keltner, 2000, 2001).

In this paper, we study two distinct emotions – fear and anger – that a consumer typically experiences when he or she hears about a data breach. We test, and find support for, our main proposition: whereas fear makes consumers scope sensitive, such that their intentions not to purchase from the affected retailer increases with scope, anger makes consumers scope insensitive and their repurchase intentions scope invariant. Process tests show that whereas scope indirectly affects the repurchase intentions of fearful consumers by making the mental image of the breach more vivid to them, scope does not affect how angry consumers imagine the data breach nor their repurchase intentions. Our results, therefore, suggest that not all consumers react to the scope of a data breach in the same way. They show that how a consumer uses scope information will depend upon the discrete emotion he or she experiences (fear or anger) when he or she first hears the news of the breach.

We organize the rest of the paper as follows. In the next section, we

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identify fear and anger as two discrete and prevalent emotions associated with data breach incidents. Next, we briefly review the literature on fear and anger, focusing on how the two can lead to different cognitive appraisals of the event, particularly concerning the dimensions of control and risk/uncertainty (Smith & Ellsworth, 1985). We use these differences in cognitive appraisals to justify our hypothesis regarding how scope affects repurchase intentions differently among fearful and angry consumers. Thereafter, we introduce readers to the affect heuristic (Slovic, Finucane, Peters, & MacGregor, 2002), which describes how consumers often use a prototypical image of an event as a judgment instrument, and use it to propose a process explanation of our hypothesis. Finally, we report three studies testing our hypotheses and their underlying process, and we conclude by discussing some of the practical and theoretical implications of our results.

2. Theory

2.1. Fear and anger

The news of a data breach can evoke a variety of affective reactions among consumers, including surprise, frustration, anxiety, anger, and fear. In this paper, we focus on fear and anger, as they are two very common reactions to news of data breaches. For example, after analyzing almost 30,000 tweets immediately following data breach incidents at Home Depot and JPMorgan Chase, Syed and Dhillon (2015) identify anger as the primary motivator behind tweets spreading negative word of mouth. Similarly, research/survey evidence finds fear to be a very common reaction to data breaches. For example, consumers fear that a breach can compromise their personal information if it occurs at a store that they visit regularly (Chakraborty, Lee, Bagchi-Sen, Upadhyaya, & Rao, 2016). A recent survey of over 10,000 customers found that seven out of ten customers expressed fear for the security of their personal information (Tannam, 2017).

Many things are common about fear and anger. For example, they are the innate defense mechanisms of an individual anticipating an imminent threat (Danesh, 1977), and they result in instinctive/impulsive behavior, with fear triggering flight and anger triggering retaliation (Loewenstein & Lerner, 2003, Zeelenberg, Nelissen, Breugelmans, & Pieters, 2008). However, many things are different about fear and anger, as well. For example, depending upon whether they are fearful or angry, consumers may end up with very different thoughts, or cognitive appraisals, about their situations (Roseman, 1984; Schachter & Singer, 1962; Scherer, 1982). These thoughts mostly focus on three dimensions – attention, control, and risk/uncertainty. For example, consumers may want to pay more attention to the data breach or ignore it completely. They may think that they are in control of the situation or that someone or something else is. Finally, they may feel certain about what is going to happen to them or not certain at all (see Smith & Ellsworth, 1985). We turn to these different cognitive appraisals next, arguing that a fearful consumer and an angry consumer will react differently to the scope of a data breach because fear and anger will make them create different appraisals of the situation.

2.1.1. Fear and anger – different cognitive appraisals

Research indicates that the cognitive appraisals underlying fear and anger are similar for the attention dimension but different for the control and risk/uncertainty dimensions. For example, when Smith and Ellsworth (1985) asked their participants to think about events that made them either fearful or angry, the participants reported giving the same amount of attention to both, but they felt more in control and more certain of the situation during events that made them angry compared to events that scared them.

Other studies also attest to the different control/risk appraisals among fearful and angry consumers. For example, some studies show that, while angry consumers are more aggressive towards the source of danger, thereby inviting even more danger and risk, fearful consumers are more defensive towards the source of their fear, thereby trying to minimize risk and uncertainty (Roseman, 1984; Zeelenberg et al., 2008). Other studies indicate that, while fear makes consumers blame themselves for their situations (Janoff-Bulman, 1979), anger prompts consumers to blame others (Tiedens & Linton, 2001). The implication is that, compared to an angry consumer, a fearful consumer is more likely to think that negative events affecting others will also affect him or her (Fischhoff et al., 2005; Lerner et al., 2003), and more likely to make risk averse judgments (Lerner & Keltner, 2000, 2001).

In the context of a data breach, the above discussions suggest that fearful and angry consumers will form different cognitive appraisals about their situations and will react in their own unique ways to scope information. Consider consumers who become more fearful than angry when they hear that a data breach has occurred at a retailer and may have compromised their personal information. The focus of their fear is on themselves, and not on the retailer. When they appraise their own situations, they may feel a lack of control and/or blame themselves for what has happened (Janoff-Bulman, 1979). For example, fearing that the breach may have compromised their personal information, they may fault themselves for not being more careful with their information, and, at the same time not quite know what they should do next. If so, the scope of the breach is likely to affect their subsequent behavior, such as deciding not to repurchase from the retailer. The logic is that, if the breach has affected many consumers instead of a few, fearful consumers will see themselves at greater personal risk and deem it more prudent not to give their personal information to, and purchase from, the retailer again (Fischhoff et al., 2005; Lerner et al., 2003).

Conversely, consider consumers who become more angry than fearful when they hear about a data breach at a retail store. They blame the retailer for not protecting their data, and direct their anger at the retailer (Tiedens & Linton, 2001). When they appraise their own situations, they do not feel that what has happened to others can happen to them as well (Fischhoff et al., 2005, Lerner et al., 2003). If so, the scope of the breach is unlikely to affect their decision about doing business again with the retailer. To them, it does not matter whether the scope is small or large; the retailer has let them down and must bear the consequences.

To summarize, we hypothesize that:

H1a. Fear will make consumers scope sensitive such that their intentions not to purchase from the affected retailer will increase with the scope of the breach.

H1b. Anger will make consumers scope insensitive and their repurchase intentions scope invariant.

2.2. The affect heuristic – a process explanation

Our first hypothesis proposes that fear will make a consumer's repurchase intentions scope sensitive while anger will make a consumer's repurchase intentions scope insensitive. In this section, we borrow from the affect heuristic (Slovic et al., 2002) to propose a process explanation of how this may happen.

The affect heuristic is a mental shortcut to decision-making wherein a consumer uses his or her affective reactions, such as fear and anger, to judge an event (Slovic et al., 2002). According to this heuristic, a consumer creates a prototypical mental image about an event based upon how he or she feels about it, and then uses the image as a judgment instrument (Kahneman & Frederick, 2002). The assumption implicit in the affect heuristic is that the prototypical mental image is scope invariant – meaning that the image the consumer creates about the event does not change, even when the scope of the event does. For example, Desvousges et al. (1993) found that separate groups of participants donate almost identical amounts ($80, $78, $88) to save 2000, 20,000, or 200,000 migrating birds from drowning in oil ponds. This is because, as Kahneman, Ritov, and Schkade (1999) suggest, all

respondents react with sympathy using the same, scope invariant, prototypical image of "an exhausted bird, its feathers soaked in black oil, unable to escape" (p. 212) to decide how much to donate. Other research also shows that a focus on feelings drives scope insensitivity. Hasford, Farmer, and Waites (2015) found that whether the pledges made by participants to save one versus four bald eagles were scope insensitive or sensitive depended upon how much the participants understood their own feelings about the event. For example, when we extrapolate their data (Fig. 2, p. 437), we can see that those scoring +15 above threshold on the emotional understanding scale were scope insensitive, pledging $7 and $8 to save one versus four birds, while those scoring −15 below threshold were scope sensitive, pledging $1 and $11 to save one versus four birds.

The affect heuristic has two implications for the process underlying our first hypothesis. First, it implies that consumers create a mental image about the breach when they hear about it and use the image as their judgment instrument. However, and second, whether the scope will change that image (e.g., make it more vivid) and indirectly affect their judgment will depend upon the specific emotion they experience. Since fear makes consumers sensitive to variations in scope, we expect that scope will indirectly affect the repurchase intentions of the fearful consumers by making the image more vivid to them. However, since anger makes consumers insensitive to scope variations, we expect that scope will not affect how the angry consumers imagine the breach nor their repurchase intentions.

The above discussion implicates a moderated mediation process (see Fig. 1) involving the scope of a data breach (larger, smaller), the discrete emotion the consumers experience when they hear about the breach (fear, anger), how vividly they imagine the breach affecting them, and their intention not to repurchase from the focal retailer. Specifically, we hypothesize that:

H2a. The scope of a data breach will indirectly affect the repurchase intentions of fearful consumers by making the mental image of the breach more vivid to them.

H2b. The scope of a data breach will not affect how angry consumers imagine the breach nor their repurchase intentions.

2.3. Overview of the studies

We conducted three studies to test our hypothesis and its corresponding process. Study 1 is a laboratory study, wherein we described a hypothetical data breach scenario at a retail firm, varying in scope, to the participants. We measured how much fear and anger they felt upon hearing the news, as well as their intentions not to repurchase from the affected retailer. Study 2 is also a laboratory study replicating Study 1, with two modifications. First, we manipulated fear and anger instead of measuring participants' self-reported expressions of these emotions. Second, we tested for the underlying process by asking the participants how vividly they could imagine the incidence affecting them. Finally, Study 3 is a field study, in which we identified fear and anger related keywords across approximately 12,000 news stories about data breaches and compared how scope affects stock prices when the news stories stress fear over anger and when they stress anger over fear.

3. Study 1

3.1. Objective

The purpose of Study 1 was to test H1 – i.e., whereas fear makes consumers scope sensitive such that their intentions not to purchase form the focal retailer increases with scope, anger makes consumers scope insensitive and their repurchase intentions scope invariant.

3.2. Participants and design

Three hundred and ninety-six M-Turk volunteers [182 (46%) males, 214 (54%) females, average age: 52 years] participated in an online study assessing how they would react upon hearing about a data breach incident. We manipulated scope at two levels: small, affecting 100 customers, and large, affecting 10 million customers. We randomly assigned the participants to these two conditions.

3.3. Stimuli and measures

The participants imagined that they were consumers of a retail company (RETAILCO), and, like other shoppers, they had their personal and credit card information stored at its website. Next, they read a news story that a data breach had occurred in the security and payment system at RETAILCO about a year ago, which may have compromised their personal information. At this point, we measured, on nine-point scales (anchored on very much/not at all), how angry and scared they felt upon hearing the news (anger: angry, mad, rage, $\alpha = 0.90$; fear: scared, dread, fearful, $\alpha = 0.92$).

Thereafter, the participants went on to read that the data breach had (possibly) compromised the personal information of either 100 customers (small scope) or 10 million (large scope). As a manipulation check, we asked their opinion about the severity of the data breach on three, nine-point items (large/small event, serious/not serious event, many/very few people affected; $\alpha = 0.94$).

Finally, we measured their intentions of *not* repurchasing from the focal retailer with two items: how likely they were to remove their personal information from the RETAILCO site, and how likely they were to stop buying from RETAILCO altogether (both nine-point, very likely/not at all likely, scales; $\alpha = 0.74$).

3.4. Analysis and results

3.4.1. Manipulation check for scope

The manipulation check for scope was significant in the predicted direction. An ANOVA of the composite manipulation check measure, with scope as the predictor and controls for anger and fear, returned a significant main effect of scope ($F(1,393) = 487.97$, $p < .0001$). The mean for the small-scope condition ($M = 4.26$) was significantly less than the scale's mid-point of 5.0 ($t(198) = 4.86$, $p < .0001$), whereas the mean for the large scope condition ($M = 8.01$) was significantly

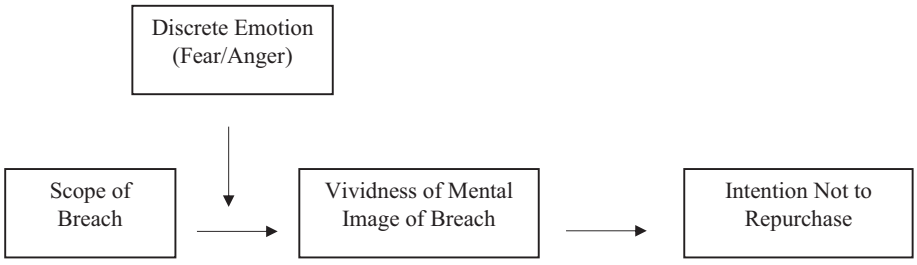

Fig. 1. A process model.

greater than the scale's mid-point of 5.0 ($t(197) = 32.12$, $p < .0001$).

3.4.2. Discriminant validity between fear and anger

Since our composite measures of fear and anger are somewhat correlated with each other ($r = 0.59$, $p < .0001$), they might have created confusion among the participants. Therefore, we tested for discriminant validity by conducting a chi-squared difference test. Specifically, we ran confirmatory factor analyses on two models. In the first model, we had all six fear/anger items load on a single construct, while in the second model we had two constructs with the three items for fear and the three items for anger loading separately on the two. We found that the difference in model fit between the first model ($\chi_9^2 = 622.48$, $p < .0001$) and the unrestricted model ($\chi_8^2 = 22.81$, $p = .003$) is statistically significant ($\chi_1^2 = 599.67$, $p < .0001$), indicating that there is enough discrimination between the two constructs.

3.4.3. Scope and repurchase intentions: fear/anger as a moderator

To test H1, we created a difference measure of affect for each participant by taking the difference between his/her fear and anger scores. A positive number indicated that the participant felt more fearful than angry, whereas a negative number indicated the opposite. Thereafter, we conducted a moderation test with the affect (difference) score moderating scope's impact (dummy variable: large/small scope as 1/0 values) on repurchase intentions (Hayes, 2018; see Table 1). We found that, conditional on neutral affect (fear – anger = zero), scope significantly increased intentions *not* to repurchase from the focal retailer; i.e., it reduced repurchase intentions ($\beta = 0.66$, $t = 2.81$, $p = .01$). However, and consistent with H1, the scope by affect interaction was positive and significant ($\beta = 0.23$, $t = 2.05$, $p = .04$), indicating that repurchase intentions were further reduced upon transitioning from neutral affect to fear (fear – anger > 0).

Fig. 2 is a visual representation of the conditional effects of scope on repurchase intentions among consumers varying in affect (fear – anger). A spotlight analysis showed that, scope reduced repurchase intentions at one standard deviation above the mean affect value supporting H1a (fear – anger = 2.85; *M*'s of 6.53 and 5.22, $\beta = 1.31$, $t = 4.48$, $p < .0001$). Scope, however, had no effect on repurchase intentions at one standard deviation below the mean affect value supporting H1b (fear – anger = −0.84; *M*'s of 6.88 and 6.41, $\beta = 0.47$, $t = 1.59$, $p = .11$). A more sensitive floodlight analysis, at different points of the affect scale, showed an inflection point at −0.56. Scope significantly reduced repurchase intentions when "fear – anger > –0.56" but it did not change repurchase intentions when "fear – anger ≤ –0.56".

Table 1
Study 1: Repurchase intentions.

Dependent variable: Intention not to repurchase from retailer				
	Coefficient	Standard Error	t	p
Constant	6.1419	0.1637	37.5276	0.0000
Scope (Large = 1, Small = 0)	0.6566	0.2338	2.8082	0.0052
Affect (Fear – Anger)	−0.3225	0.0828	−3.8944	0.0001
Scope × Affect	0.2292	0.1120	2.0461	0.0414

Conditional effects of scope for affect ± 1 SD above/below mean				
Affect	Effect (Scope coefficient)	Standard error	t	p
1 SD Above (Fear > Anger)	1.3092	0.2922	4.4801	0.0000
1 SD Below (Anger > Fear)	0.4631	0.2910	1.5913	0.1123

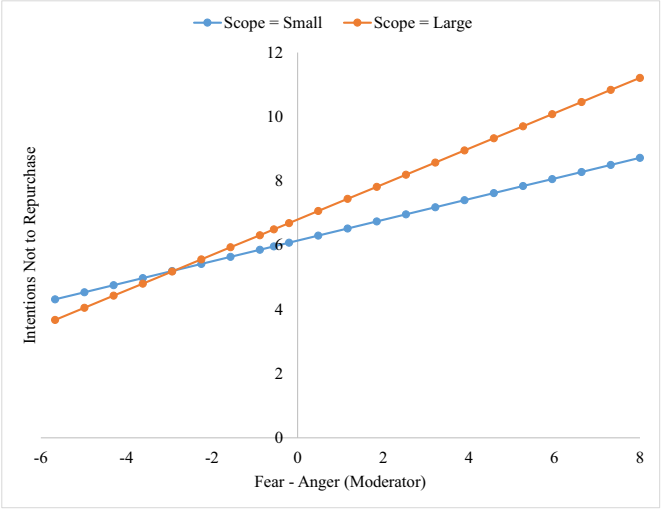

Fig. 2. Study 1: Scope × Affect interaction on predicted intentions not to repurchase.

3.5. Discussion

In Study 1, we created an affect score for each participant by taking the difference between their self-expressions of fear and anger and measured if affect changed how they reacted to the news of a data breach varying in scope. We found that whereas fear made consumers scope sensitive such their repurchase intentions reduced with scope, anger made consumers scope insensitive and their repurchase intentions scope invariant. In Study 2, we attempt to replicate our findings while making two important changes. First, instead of measuring participants' self-reported expressions of fear and anger, we manipulate those emotions; second, we test for a process explanation by examining if scope indirectly affects repurchase intentions of the fearful consumers by making the mental image of the breach more vivid to them.

4. Study 2

4.1. Objective

Study 2 had two purposes. First, we re-tested H1 by manipulating fear and anger across the study participants, and second, we tested for the process underlying H1. Specifically, we examined if fear (bot not anger) made consumers scope sensitive such that their repurchase intentions reduced with scope, and if scope indirectly affected repurchase intentions of the fearful consumers by making the mental image of the breach more vivid to them.

4.2. Participants and design

Four hundred and three M-Turk volunteers [193 (48%) males, 210 (52%) females; average age 42 years] participated in an online study assessing how they would react upon hearing about a data breach incident. We randomly assigned them to one of four manipulated conditions of the study obtained by crossing two conditions of the data breach's scope (small and large) with two conditions of emotions (fear and anger).

4.3. Stimuli and measures

As in Study 1, the participants imagined that they were consumers of a retail company (RETAILCO), and, like other shoppers, they had their personal and credit card information stored at its website. Next, they read a news story that a data breach had occurred in the security

and payment system at RETAILCO about a year ago, possibly compromising their personal information. At this point, we primed some participants to feel angry by describing the scene outside the RETAILCO headquarters as follows:

Our staff reporter reported that many customers were expressing their anger in front of RETAILCO headquarters in Cupertino, California. One demonstrator told us, "I am outraged and want the CEO to resign." Another demonstrator said, "I am furious at their handling of the situation." While another grumbled, "I am very mad how RETAILCO handled our credit card information".

We primed other participants to feel fear by describing the scene outside the RETAILCO headquarters as follows:

Our staff reporter found a sense of fear prevailing with customers gathered in front of RETAILCO headquarters in Cupertino, California. One customer told us, "I am panicking and not sure what steps to take to protect my credit card details." Another customer confided, "I am so scared that my credit card will be misused by bad people." While another said, "I am very frightened how my credit ratings will be affected by this incident."

Following the manipulation, we checked, on a 9-point scale (anchored on very much/not at all), how much fear (for the "fear" conditions) and how much anger (for the "anger" conditions) the participants felt upon hearing the news that RETAILCO may have compromised their personal information.

The participants then went on to read that the data breach had possibly compromised the personal information of either 100 customers (small scope) or 10 million customers (large scope). As in Study 1, we checked their opinions about the severity of the data breach using same three, 9-point scale items as in Study 1 ($\alpha = 0.95$). Thereafter, we measured how vividly the participants could imagine the data breach affecting them using two items: (1) how easily/not easily they could create a mental image of the data breach affecting them and (2) how clearly/not clearly they could imagine the data breach affecting them (9-point scales, $\alpha = 0.83$, Babin & Burns, 1998, Reisberg & Heuer, 1988). We ended by measuring their repurchase intentions with the same two 9-point items as in Study 1 ($\alpha = 0.80$).

4.4. Analysis and results

4.4.1. Manipulation checks

The manipulation checks for emotion (fear and anger) were significant in the predicted direction. We conducted an ANOVA of the intensity of participants' feelings (anger in the "angry" conditions and fear in the "fear" conditions) across the affect (fear, anger) and scope (small, large) conditions. The only significant effect was an affect main effect ($F(1,399) = 6.55$, $p = .02$). The feeling of anger among the angry-group participants was more intense than the feeling of fear among the fear-group participants (M's of 6.2 and 5.69). However, we should note that both anger and fear means were significantly above 5.0 or the scale's mid-point (for anger: $t(204) = 8.89$, $p < .0001$; for fear: $t(197) = 4.56$, $p < .0001$).

The manipulation check for scope (large and small) was also significant in the predicted direction. An ANOVA treating data breach severity as the dependent variable, and the scope (small, large) and affect (fear, anger) as predictors, returned a significant main effect of scope ($F(1, 399) = 395.81$, $p < .0001$). The mean for the small-scope condition was significantly less than the scale's mid-point of 5.0 ($M = 4.59$, $t(202) = 2.81$, $p = .01$), whereas the mean for the large-scope condition was significantly greater than the scale's mid-point of 5.0 ($M = 8.10$, $t(199) = 30.28$, $p < .0001$).

4.4.2. Scope and shopping intentions: fear/anger as moderator

To test H1, we conducted an ANOVA on the repurchase intentions with affect (fear, anger) and scope (small, large) as predictors, followed by planned comparisons across small and large scope conditions. We found a significant main effect of affect ($F(1, 399) = 7.07$, $p = .01$); the "angry" participants were more likely not to repurchase from the retailer compared to the "fearful" participants (M's of 6.55 and 6.01). We found a significant main effect of scope ($F(1, 399) = 18.46$, $p < .0001$); the participants were more likely not to repurchase from the retailer following the "large" breach compared to the "small" breach (M's of 6.71 and 5.85). Finally, and consistent with H1, we found a significant scope by affect interaction ($F(1, 399) = 4.74$, $p = .03$). Planned comparisons showed that, consistent with H1a, fearful consumers were more likely not to repurchase from the retailer after a large breach than a small breach (M's of 6.66 and 5.36, $t = 4.54$, $p < .0001$). However, and consistent with H1b, angry consumers were equally likely not to repurchase from the retailer across large and small breaches (M's of 6.76 and 6.33, $t = 1.51$, $p = .43$).

Table 2
Study 2: Vividness of mental image as a mediator of scope effects on repurchase intentions.

Dependent variable: Image vividness

	Coefficient	Standard error	t	p
Constant	6.9417	0.1686	41.1792	0.0000
Scope (Large = 1, Small = 0)	0.3230	0.2390	1.3514	0.1773
Affect (Fear = 1, Anger = 0)	−0.6267	0.2402	−2.6095	0.0094
Scope × Affect	0.5814	0.3410	1.7053	0.0889

Dependent variable: Intention not to repurchase from retailer

	Coefficient	Standard error	t	p
Constant	2.3265	0.3732	6.2341	0.0000
Scope (Large = 1, Small = 0)	0.5309	0.1843	2.8802	0.0042
Image vividness	0.5323	0.0529	10.0704	0.0000

Conditional indirect effect of image vividness on scope to repurchase intentions

Affect	Indirect effect	SE	95% Bootstrapped lower limit	95% Bootstrapped upper limit
Fear	0.4814	0.1332	0.2327	0.7587
Anger	0.1719	0.1267	−0.0763	0.4172

4.4.3. The indirect effect of image vividness

To test H2, we ran a moderated mediation model (Hayes, 2018). We treated scope (small/large as 0/1 variable) as the predictor, the vividness of the mental image of the breach (a composite of the two items) as the mediator, repurchase intentions (a composite of two items) as the outcome, and fear/anger (1/0 variable) as the moderator of the scope-to-image path. Table 2 shows the results.

Table 2's top panel shows that, conditional on anger (affect = 0), scope does not change the vividness of the mental image of the breach ($\beta = 0.32$, $t = 1.35$, $p = .18$). However, the scope by affect interaction is positive, approaching statistical significance ($\beta = 0.58$, $t = 1.71$, $p = .09$), indicating that scope increases the vividness of the mental image as we transition from anger to fear. Fig. 3 is a visual representation of the scope effect on image vividness conditional on the discrete emotion (fear, anger). Scope makes the mental image of the breach more vivid in the fear conditions (M's of 6.32 and 7.22 for the small and large conditions; $\beta = 0.90$, $t = 3.72$, $p = .0002$) but not in the anger conditions (M's of 6.94 and 7.26; $\beta = 0.32$, $t = 1.35$, $p = .18$).

The middle panel of Table 3 shows that image-vividness significantly changes repurchase intentions, even after we control for scope effects ($\beta = 0.53$, $t = 10.07$, $p < .0001$), establishing image-vividness as a possible mediator of the scope to repurchase intentions path. Finally, the bottom panel shows that the significance of the indirect paths is conditional on fear and anger. Consistent with H2a, we find that scope indirectly affects the repurchase intentions of the fearful

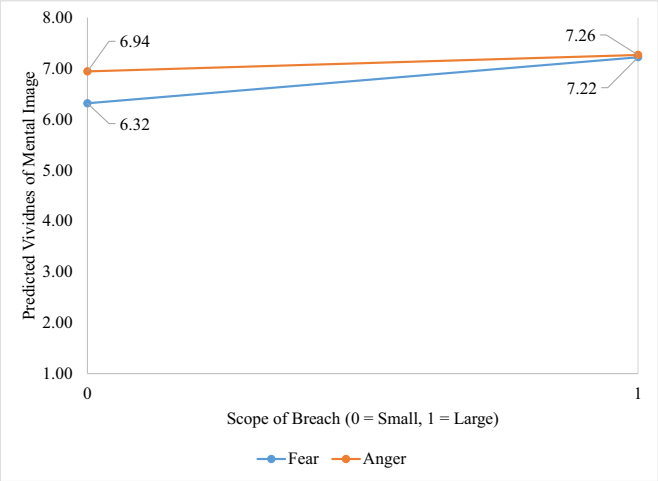

Fig. 3. Study 2: Scope × Affect interaction on the predicted vividness of the mental image of a data breach.

consumers by making the image more vivid to them, with the 95% bootstrapped confidence interval for the indirect effect lying fully outside zero (0.23, 0.76). However, and consistent with H2b, we find that scope does not have a corresponding indirect effect on the repurchase intentions of the angry consumers, with the 95% bootstrapped confidence interval for the indirect effect straddling zero (−0.08, 0.42).

4.5. Discussion

In Study 2, we manipulated fear and anger and replicated the main result of Study 1. Whereas fear made consumers sensitive to scope, such that their intentions not to repurchase from the focal retailer increased with scope, anger made consumers scope insensitive and their repurchase intentions scope invariant. We also tested a process model and found that scope indirectly affected the repurchase intentions of the fearful consumers by making the mental image of the breach more vivid to them.

One criticism of both studies is that they are conducted in a laboratory setting and do not have external validity as in field studies. Therefore, in our third and final study, we collect and analyze secondary data about real data breaches to determine if there is evidence of fear/anger-driven scope sensitivity/insensitivity in stock market reactions to data breaches.

5. Study 3

5.1. Objective

Study 3 is an event study where we track stock price movements before and after actual data breach announcements to investigate how stock prices react to data breaches. The purpose of conducting an event study is to obtain convergent validity to our laboratory results, assuming that changes in stock prices reveal the underlying consumer reactions to news of a data breach. For example, if consumers decide not to repurchase from the firm, the news should reduce the firm's expected cash flows and, thereby, reduce the value of its stock. In Study 3, we investigated if the decline in stock value following a data breach

Table 3
List of data breach announcements.

Date	Name	Affected customers	Emotion	Date	Name	Affected customers	Emotion
01/28/13	RR Donnelley	8911	Fear	04/08/15	AT&T	280,000	Fear
02/14/13	Kindred Healthcare, Inc.	716	Anger	05/01/15	Walgreen Co.	1138	Anger
03/08/13	Stanley Black & Decker, Inc.	944	Anger	05/04/15	Sally Beauty Holdings	62,210	Anger
07/05/13	Morningstar Inc.	2300	Neutral	05/15/15	AFLAC	6166	Fear
08/09/13	Northrop Grumman	70,000	Fear	05/31/15	Heartland Payment Systems, Inc.	2200	Neutral
08/26/13	Republic Services	82,160	Anger	06/26/15	CVS Health	12,914	Fear
10/03/13	Adobe	2,900,000	Fear	07/17/15	CVS	4,500,000	Neutral
10/03/13	CSX Transportation	279	Fear	08/07/15	Walgreen Co.	8345	Anger
11/05/13	DaVita	11,500	Neutral	08/13/15	Quad/Graphics	693	Anger
12/05/13	JP Morgan, Chase & Co.	465,000	Anger	08/18/15	Web.com	93,000	Neutral
12/19/13	Target	39,400,000	Fear	08/19/15	Genworth	2500	Anger
01/24/14	Coca-Cola Company	74,000	Anger	09/17/15	Molina Healthcare	54,203	Neutral
02/05/14	Home Depot	30,000	Neutral	10/01/15	T-Mobile/Experian	15,000,000	Neutral
03/04/14	Timken Company	4987	Anger	11/02/15	Dow Corning Corp.	4000	Anger
03/05/14	Sally Beauty Holdings	25,000	Anger	12/02/15	Citizens Financial Group, Inc.	498	Anger
05/02/14	Molina Healthcare	4744	Anger	02/03/16	Rite Aid Store	976	Anger
05/14/14	Monsanto	1300	Fear	03/02/16	Wal-Mart Stores, Inc.	4800	Anger
05/19/14	Lowe's	35,000	Fear	03/15/16	PerkinElmer	2738	Anger
05/23/14	Humana	2962	Neutral	03/21/16	Landstar System, Inc.	1362	Anger
05/27/14	Home Depot	30,000	Neutral	04/05/16	Pacific Gas and Electric Company	2426	Fear
06/03/14	Akorn Inc.	50,000	Anger	05/02/16	Brunswick Corp./Mercury Marine	13,000	Neutral
07/07/14	AECOM	1892	Fear	05/04/16	UnitedHealth Group	5330	Neutral
07/29/14	Northern Trust	10,172	Fear	05/11/16	MYR Group	6878	Anger
08/18/14	Community Health Systems	4,500,000	Neutral	05/16/16	Surgical Care Affiliates	9009	Fear
08/20/14	United Parcel Service	105,000	Fear	05/20/16	AFLAC	930	Neutral
08/27/14	JPMorgan Chase	1,000,000	Neutral	06/08/16	Wal-Mart	27,393	Fear
09/03/14	Home Depot	56,000,000	Neutral	06/15/16	Multi-Color Corp.	4602	Anger
10/06/14	AT&T	1600	Fear	08/25/16	Exterran	10,844	Fear
10/21/14	Staples	1,200,000	Neutral	09/22/16	Yahoo	500,000,000	Fear
01/05/15	Morgan Stanley	350,000	Fear	10/26/16	Anthem, Inc.	3525	Neutral
01/08/15	Aetna	133	Fear	11/04/16	Wal-Mart Stores, Inc.	771	Anger
02/04/15	Anthem, Inc.	78,800,000	Neutral	11/28/16	Aetna Inc.	18,854	Anger
02/24/15	Anthem, Inc.	8,800,000	Neutral	12/05/16	CVS Health	626	Anger
03/01/15	Amedisys	6909	Anger	12/12/16	Quest Diagnostics	34,055	Fear
03/23/15	AT&T Group Health Plan	50,000	Neutral	12/19/16	Humana Inc.	3674	Anger
04/02/15	Equifax	300	Neutral	12/20/16	Western Union	15,700	Fear

announcement is sensitive/insensitive to the scope of the data breach in a way that parallels the fear/anger sentiments of the market.

5.2. Data and measures

5.2.1. Data

We constructed our study sample by obtaining data breach events announced between January 2013 and December 2016 reported by the Identify Theft Resource Center (https://www.idtheftcenter.org/). After dropping private companies and outlier events that affect extremely large (above the 99th percentile) or small (below the first percentile) numbers of customers, the final sample included 72 observations. Within these, the mean number of customers affected was 10 million, and the median number of customers affected was 10,000. (See Table 3 for details).

5.2.2. Abnormal stock returns

Our dependent variable was the daily abnormal stock return of the focal company, which we defined as the difference between a realized return and the required return of a stock, based on its riskiness. We computed the abnormal stock return using the three-factor model of Fama and French (1993). As described in the Appendix A, we computed a cumulative abnormal return (CAR) of the focal stock during the four-trading-day window straddling the data breach announcement date. This event window began a day before the announcement date, to account for possible information leakage before the actual announcement, and it ended within three days of the announcement, to allow investors time to learn about the data breach and reflect their expectations in stock prices through trading. The mean CAR in our sample was −0.30%, and the median CAR was −0.45%.

5.2.3. Proxies for fear and anger

We constructed a real-world measure of fear/anger felt by stakeholders through a textual analysis of news reports covering the data breach. Our approach parallels other studies that have used news-based measures to proxy for investor sentiments (Antweiler & Frank, 2004; Kearney & Liu, 2014; Tetlock, 2007).

We searched for data breach news, appearing during a one-week period after the breach announcement, for our sample of 72 companies through the Nexis Uni online service. We began with the news stories that first reported a data breach at the focal firm. From these 72 seed stories, we generated a list of keywords related to the data breach relying on the text analysis service provided by Voyant Tools (https://voyant-tools.org/). Table 4 gives examples of these data breach keywords. We used the keyword list to expand our search for each company over a seven-calendar-day period following the announcement of the data breach. From our expanded search, we identified 11,928 news stories, or an average of 166 news stories per company. We sifted through the stories to ensure that they addressed the data breach and not something else.

Next, we grouped these news stories using keywords related to fear and anger from the word list provided by Shaver, Schwartz, Kirson, and O'connor (1987), see Table 4 for details). Out of the 11,928 news stories related to the data breach events, we found 1921 stories containing only fear-related keywords, 632 stories containing only anger-related keywords, 677 stories containing a mix of fear- and anger-related keywords, and 8698 news stories containing no fear- or anger-related keywords at all.

5.2.4. Relative sentiment (anger ratio minus fear ratio)

We constructed our measure of the fear and/or anger felt by the stakeholders corresponding to a focal firm's data breach by taking the ratio of the number of its data breach news stories mentioning fear and/or anger keywords to the total number of breach news articles. The “fear” group included stories that mentioned fear only, as well as those that mixed fear and anger. Similarly, the “anger” group included stories that mentioned anger only, as well as those that mixed anger and fear. In our sample, the mean of fear ratios was 0.16, and the median was 0.15; the mean of anger ratios was 0.10, and the median was 0.14.

Next, we constructed a (difference) affect score for each data breach event as the difference between its fear and anger ratios. The mean of the affect score was 0.055, and the median was 0.058. We classified each data breach event into three groups, based on a tripartite split of the difference scale. Stories scoring at or above the 66th percentile of the difference scale formed the fear group (fear > anger). Stories scoring at or below the 33rd percentile of the difference scale formed the anger group (anger > fear). The stories falling in the middle third of the scale formed the neutral group. Table 3 provides the list of data breach events classified into fear, anger, and neutral subsamples.

5.2.5. Scope

We modeled the scope effects in two ways. First, we took the raw number of consumers affected by the data breach (raw scope) as reported by the Identity Theft Resource Center. However, to get a better idea of the severity of the data breach, we needed to scale the raw number of customers affected by the focal company's total number of customers (customer base). Since the customer base data was not readily available, we used firm size (i.e., the dollar value of the company's assets as reported in their balance sheets, obtained from the COMPUSTAT database) as a proxy for customer base. In our dataset, the mean of the number of affected customers scaled by each focal firm's assets was 0.22×10^{-3}, and the median was 0.72×10^{-6}. Accordingly, and second, we took the total number of customers affected divided by the dollar value of each focal company's assets (scaled scope).

5.3. Analysis and results

We used a double moderation model, with fear and anger, coded as dummy variables, moderating how scope affects CAR. Table 5 reports the regression results. The dependent variable was CAR, and the independent variables were scope (raw scope in Regression 1 and scaled scope in Regression 2), fear and anger dummies, and their interactions with scope. Since some firms in our sample were subject to multiple data breaches, we clustered the regression standard errors at the firm level to correct for the influence that within-firm correlations might have had on our statistical inferences.

The coefficient estimates of the raw scope (Regression 1; $\beta = -0.03$, $t = -3.40$, $p < .05$) and the scaled scope (Regression 2; $\beta = -0.0015$, $t = -3.59$, $p < .05$) were both negative and significant.

Table 4
Study 3: Keywords.

Example keywords: Data breach	Example keywords: Fear	Example keywords: Anger
Data breach, privacy, confidentiality, personal information, unencrypted, data protection, victim, data security, data compromise, investigation, and confidentiality	Worry, alarm, shock, fear, fright, horror, terror, panic, hysteria, mortification, anxiety, nervousness, tenseness, uneasiness, apprehension, distress, and dread	Aggravation, anger, irritation, agitation, annoyance, grouchiness, exasperation, frustration, rage, outrage, fury, wrath, hostility, ferocity, bitterness, hate, loathing, scorn, spite, vengefulness, dislike, resentment, disgust, revulsion, contempt, envy, jealousy, and torment

Table 5
Study 3: Results.

Regression 1 on cumulative abnormal stock returns [−1, 2]

	Coefficient	Standard error	t	p
Constant	−0.0059	0.0037	−1.5771	0.1206
Scope	−0.0342	0.0101	−3.4024	0.0013
(Number of customers affected)				
Fear-dummy	0.0081	0.0062	1.3009	0.1988
Anger-dummy	0.0049	0.0082	0.6046	0.5480
Scope × Fear-dummy	−0.2660	0.1256	−2.1181	0.0388
Scope × Anger dummy	−20.8393	21.1591	−0.9849	0.3291

Regression 2 on cumulative abnormal stock returns [−1, 2]

	Coefficient	Standard error	t	p
Constant	−0.0059	0.0037	−1.5882	0.1181
Scope	−0.0015	0.0004	−3.5891	0.0007
(Number of customers affected/assets)				
Fear-dummy	0.0081	0.0062	1.3019	0.1985
Anger-dummy	0.0039	0.0080	0.4892	0.6267
Scope × Fear-dummy	−0.0121	0.0059	−2.0624	0.0440
Scope × Anger dummy	0.0518	0.1007	0.5147	0.6089

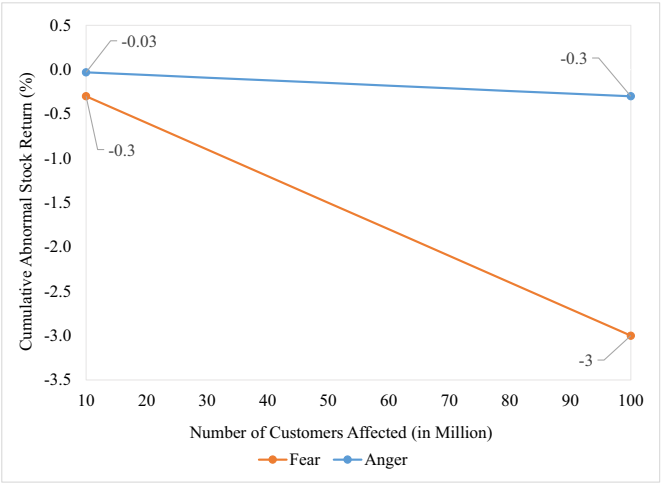

Fig. 4. Study 3: Scope × Affect interaction on predicted cumulative abnormal stock returns.

This implies that scope decreased the focal firm's stock value when affect was neutral. More importantly, we found that the interactions of scope and fear was negative and significant (raw scope, $\beta = -0.27$, $t = -2.12$, $p < .05$; scaled scope, $\beta = -0.01$, $t = -2.06$, $p < .05$). These coefficient estimates suggest that, consistent with the nature of H1a, as market sentiments transitioned from neutral to fear, scope reduced stock value even more. However, the interactions of scope and anger was insignificant (raw scope, $\beta = -20.84$, $t = -0.98$, $p = .33$; scaled scope, $\beta = 0.05$, $t = 0.51$, $p = .61$). These estimates suggest that, consistent with the nature of H1b, scope did not affect stock value when market sentiments transitioned from neutral to anger.

Fig. 4 is a visual representation of the raw-scope effect on CARs conditional on the contents of news stories (fear and anger). We should note that we obtained the predicted values of CARs by using the significant coefficient estimates reported in Table 5.

5.4. Summary

In Study 3, we measured two things. First, we measured the stock market reactions to data breach announcements, which roughly parallels the intentions of consumers to stop buying from a focal firm. Second, we measured the fear and anger expressed by these consumers using the proportion of data breach news stories mentioning fear and anger related keywords. We mimicked fear and anger markets by looking at the top third and bottom third of the distribution of news stories stressing fear over anger. We found results that support our laboratory studies: fear makes the stock market reactions sensitive to the scope of a data breach, while anger makes the stock market reactions insensitive to the scope of a data breach.

6. General discussions

6.1. Summary

Across three studies, we found support for our main proposition. Whereas fear makes consumers scope sensitive such that their intentions not to purchase form the retailer increases with scope or the size of the breach, anger makes consumers scope insensitive and their repurchase intentions scope invariant. We found support for our proposition in Study1, where we measured how much fear and anger the participants felt upon hearing the news, and in Study 2, where we manipulated fear and anger (instead of using self-reported expressions of anger and fear). In Study 2, we also tested for a process explanation, and found that scope indirectly affected the repurchase intentions of the

fearful consumers by making the mental image of the breach more vivid to them.

Study 3 showed convergent validity of our laboratory findings in a field setting. We measured stock market reactions to data breach announcements, which roughly parallels the intentions of consumers to stop buying from a focal firm. We analyzed approximately 12,000 news stories spanning seven calendar days following a data breach announcement and isolated stories that stressed fear, anger, or struck a balance between the two. The results mimicked our laboratory studies, showing that, whereas scope exacerbates stock market reactions when news stories stress fear, it does not change stock market reactions when news stories stress anger.

6.2. Theoretical implications

To the best of our knowledge, this is the first study showing that how the scope of a data breach affects repurchase intentions can vary depending upon the specific emotion, fear or anger, experienced by consumers. Although research has long noted that fear and anger elicit quite different cognitive appraisals of situations, we show that these cognitive appraisals make consumers use information about the scope of data breach in very different ways. For example, fear leads to feelings of less control over, and more uncertainty about, the situation. Therefore, scope significantly affects the threat assessments of fearful consumers, who assume that what has happened to others is likely to happen to them as well. Anger, on the contrary, leads to feelings of more control over, and less uncertainty about, the situation. Therefore, scope does not affect the threat assessments of angry consumers, who assume that what has happened to others is unlikely to happen to them.

Our research provides an alternate interpretation of the affect heuristic as well. The key features of the affect heuristic are that (a) consumers create mental images of focal events and use those images as judgment instruments, but (b) these mental images do not change with scope. However, our research shows that fear makes the image scope sensitive such that it becomes more vivid with scope, but anger makes the image scope invariant.

6.3. Managerial implications and future research

Our research has two implications for managers attempting to minimize the fallout of data breach incidents once they have released scope information. First, when a company releases the raw number of compromised accounts, should it also consider releasing a proportion number as well? To date, the biggest data breach incident happened at Yahoo in 2014, affecting 3 billion users. However, Yahoo changed that number three times. In September 2016, Yahoo reported that the breach had compromised 500 million accounts; in December 2016, the company upped the number to 1 billion; and, finally, in October 2017, Yahoo admitted that the breach had compromised all of their 3 billion accounts (Armerding, 2018). Retrospectively, if Yahoo had announced that 500 million consumers were affected, and that that number was only 16% of its total customer base, would some consumers have focused on the smaller number (16%) to conclude that they might not have been at much risk? Our results suggest that such reframing might minimize the threat to fearful consumers, but it would probably not affect how angry consumers appraise the situation.

Second, our results show that scope does not change how angry consumers imagine a data breach incident. The challenge for marketers, then, is how to soften this image and make it less threatening to angry consumers, particularly when the breach is small. We propose that a company can do this over time by starting a dialogue with its consumers from the first day. This dialogue could include education about disaster recovery plans the company has in place, just in case a data breach happens (D'Arcy, Hovav, & Galletta, 2009). It could also involve training customers in the simple basics of data security (e.g., complex passwords giving them a sense of control over their own information). If a breach occurs, the dialogue should immediately extend to meaningful protection services offered by the company (e.g., free credit monitoring and fraud protection services). To what extent would these tactics soften the mental (prototypical) image of a data breach among angry consumers is an interesting avenue for future research.

6.4. Limitations

We conclude by addressing some limitations of our research. First, we measure if consumers intend to repurchase from the affected retailer in our two laboratory studies, and we look at the stock market reaction to data breaches in our field study. Neither of the two are “real” behavioral measures of individual consumers quitting a firm. Future research may look at field data on consumer quitting decisions and test if these decisions are contingent upon the affect experienced and/or the scope of the breach.

Second, as we have indicated elsewhere, consumers can experience a variety of emotions such as surprise, anxiety, frustration, fear, and anger when they hear about a data breach. In our studies, we focused on just two – anger and fear. Future research could study if other emotions also make consumers sensitive to the scope of data breaches. Surprise, for example, is an important emotion to study because although surprise is one of the six basic-level emotions (joy, love, anger, sadness, and fear being the others; Ekman et al., 1987), the emotion itself is neutral and amplifies or intensifies the emotion that follows. In our context, if the data breach catches consumers by surprise, the surprise might amplify the fear to the extent that the fearful consumers may now feel threatened by small breaches as well. In other words, would surprise turn the scope sensitive consumer to a scope insensitive consumer – this would be an interesting avenue for future research.

Third, we found that scope makes the mental image of a breach more vivid among fearful consumers. However, our research does not address what the mental image contains. Future qualitative research can utilize in-depth interviews to ascertain how consumers form their mental image about a breach, what the image contains, and how the contents affect their repurchase decisions. For example, there are surveys that measure what consumers fear about data breaches (“Consumers Fear Data Theft More Than Losing Their Wallets, Survey Shows,”, 2018). What consumers fear most is the theft of their social security numbers (54%), followed by banking information (18%), credit card number (9%), health records (9%), private cryptocurrency key (4%), passport information (3%), and driver's license (2%). One implication is that the mental image may be softer and the reaction milder if a data breach compromises, say, driver's license numbers compared to social security numbers.

Fourth, future research could examine individual difference/situational factors that could moderate the observed fear/anger effects in our research. For example, recent research suggests that a consumer's concern for privacy may affect how she or he reacts to the news of a data breach (Martin & Murphy, 2017). We could speculate that consumers who value privacy and fear losing it through a data breach are more likely to be scope insensitive to the extent that they will consider even a small breach as a betrayal of trust between the consumer and the retailer. However, even here, the scope effects on negative reaction may be moderated by how much the consumer trusts the retailer and to what extent she or he believes that it is unfair to blame the retailer if the retailer has taken all the necessary safeguards (Culnan & Armstrong, 1999).

Fifth, in Study 2, we used different descriptors to prime fear and anger among our study participants. We described situations with angry “demonstrators” to prime anger and fearful “consumers” to prime fear, and the demonstrator/consumer distinction may have led to different arousal levels. Future studies may wish to use stronger, but equivalent, forms of priming anger and fear (e.g., showing graphic videos) and then examine how the judgments of these two groups change with the scope of the data breach incident.

Finally, we recruited the participants from the M-Turk pool, and there are advantages and disadvantages to M-Turk-based studies (Peer, Vosgerau, & Acquisti, 2014). Thus, future research may want to replicate the findings using the more traditional subject pools of student participants.

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Appendix A

According to the Fama and French (1993) model, three factors determine the required return for a stock. They are (1) a market factor (e.g., risks that investors cannot diversify away, such as political instability), (2) a size factor (small-cap stocks tend to outperform large-cap stocks) and (3) a value factor (value stocks tend to outperform growth stocks). The market factor is the market risk premium computed as the return on the market portfolio minus the risk-free rate, whereas the size and value factors represent the premium earned by small firms (difference in stock returns of small and large firms) and value firms (difference in stock returns of firms with high and low market-to-book ratios). We obtain these factors from the CRSP database.

To compute the abnormal returns for the stocks in our sample, we first estimate the factor loadings (i.e. sensitivities to factors) for each stock over the $[-252, -21]$ trading-day period relative to the data breach announcement date by running the following regression equation:

$$r_{i,t} - R_{f,t} = \alpha_i + \beta_i^m (R_{m,t} - R_{f,t}) + \beta_i^{smb} (SMB_t) + \beta_i^{hml} (HML_t) + \varepsilon_{i,t} \quad (1)$$

where $r_{i,t}$ is the return on stock i on day t, $R_{f,t}$ is the one-month risk-free rate, α_i is the intercept, $R_{m,t}$ is the return on the equally-weighted market index, SMB_t (Small Minus Big) is the size factor, HML_t (High Minus Low Book-to-Market Ratio) is the value factor, $\varepsilon_{i,t}$ is the error term, and β_i^m, β_i^{smb}, and β_i^{hml} are the loadings on the market, size, and value factors, accordingly.

We require stocks to have at least 63 non-missing (approximately three calendar-months) returns to be able to estimate the factors accurately. We then compute the abnormal return for stock i on day j as:

$$A_{i,j} = r_{i,j} - R_{f,j} - \hat{\beta}_i^m (R_{m,j} - R_{f,j}) - \hat{\beta}_i^{smb} (SMB_j) - \hat{\beta}_i^{hml} (HML_j) \quad (2)$$

We define the cumulative abnormal return (CAR) as the sum of $A_{i,j}$ during the four-trading day window $[-1, 2]$ surrounding the data breach announcement date.

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