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Article

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MANAGEMENT | RESEARCH ARTICLE

Contagion risk: How stakeholders mediate the impact of rivals' misfortunes on firms

Alireza Azimian^{1*}

Abstract: This study aims to investigate the dynamics of contagion and its impact on firms, specifically focusing on how a rival's failure to control an event can have adverse consequences for other firms. Through a comprehensive analysis of relevant theories, literature, and real-world cases, the study identifies key factors that contribute to the contagion process and proposes a framework for assessing the associated risk. The research highlights the crucial role of stakeholders in mediating the effects of rivals' misfortunes on other firms and emphasizes how stakeholders' identities shape their risk evaluations, thereby affecting the occurrence of contagion. This study contributes to the existing literature by providing a conceptualization of the contagion process and introducing the concept of "stakeholder identity" within the context of organizational and operational risk management. The findings offer practical insights to firms by emphasizing the significance of contagion risk, which is often overlooked in operational risk management strategies. Additionally, the study provides valuable guidance on how firms can effectively assess their vulnerability to contagion, enabling them to proactively manage and mitigate their risk.

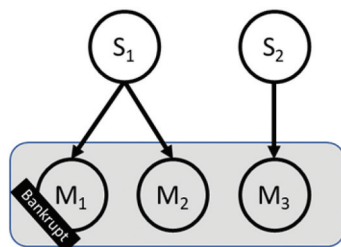
Subjects: Organizational Studies; Risk Management; Organizational Theory & Behavior;

Keywords: contagion risk; stakeholder identity; signal value; lay and expert stakeholders

1. Introduction

Operational failures can have far-reaching impacts beyond the affected firms, causing significant harm to an entire industry. This phenomenon, known as "contagion", was exemplified in 2003 when a case of mad cow disease was detected on a farm in northern Alberta. The incident led to international customers ceasing the purchase of Canadian beef, resulting in industry losses exceeding \$7 billion (Statistics Canada, 2004). The definition of contagion is not universally agreed upon in the literature, but it generally refers to the spread of negative impacts throughout a network. According to Azimian et al. (2016), "contagion risk" can be defined as the likelihood of contagion resulting from an adverse event or event type. "Contagion effect" and "competitive effect" are the two distinct components of the spillover effect (Lang & Stulz, 1992), with the contagion effect referring to the negative impact transmitted across a network and the competitive effect referring to the positive impact. These effects are also referred to as the "negative spillover effect" and the "positive spillover effect" (Yu et al., 2008), respectively.

Figure 1. Social vs. fundamental contagions.

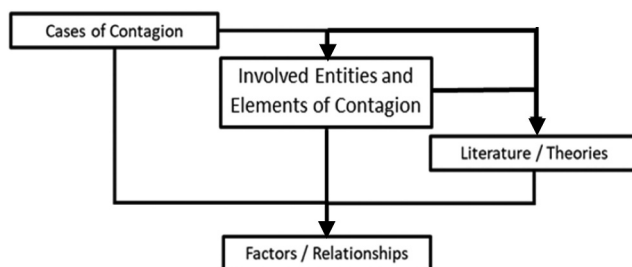


Contagion effects can be transmitted through two types of mechanisms: behavioral and fundamental (Trevino, 2020). Fundamental mechanisms involve automatic transmission, whereas behavioral mechanisms rely on the judgment of decision-makers.¹ When contagion occurs through fundamental mechanisms, the impact is proportionate to the severity of the initiating event (Allen & Gale, 2000). However, contagion occurring through behavioral mechanisms can still have significant effects even with non-severe initiating events (Gai & Kapadia, 2010). It is important to note that these two types of contagion are not mutually exclusive. However, when the initiating event is small and the impact is significant, it is likely that only behavioral mechanisms are involved. For the purpose of this study, we specifically focus on contagion that occurs through behavioral mechanisms.

Although contagion can have far-reaching effects on firms, it has not yet been recognized as a source of risk originating from rivals within the realm of organizational and operational risk management. Furthermore, there is currently no established framework for assessing and addressing this specific risk. Instead, the majority of research efforts have primarily focused on managing risks that stem from customers (e.g., Breiter & Huchzermeier, 2015; Gümüş, 2014; Hendijani et al., 2020; Sodhi, 2005; Treville et al., 2014; Wang & Webster, 2022) or suppliers (e.g., Chaturvedi & Martínez de Albéniz, 2011; Gurnani et al., 2014; Santillán-Saldivar et al., 2021; Shahi et al., 2017; Wang et al., 2010). This study aims to fill this gap and provide assistance to firms in assessing their susceptibility to contagion by addressing the following research questions: (a) How does contagion form? (b) What factors contribute to contagion risk? (c) Why do some events result in contagion while others do not? and (d) What factors make certain industries more vulnerable to contagion than others? To address these questions, we develop a conceptual model that incorporates empirical evidence from contagion cases across various industries and theoretical constructs from decision-making, cognitive psychology, risk management, and organizational management literature.

The methodology employed in this study entails the analysis of contagion cases to identify the elements and entities involved in the contagion process. Subsequently, these findings are utilized to identify relevant theories and literature. By integrating the cases, involved elements and entities, and relevant literature, we conceptualize the contributing factors to the contagion process and examine their relationships. This approach facilitates a comprehensive and integrated understanding of the contagion process, which is essential for the development of effective strategies for mitigating contagion risk (refer to Figure 2).

Figure 2. Summary of the methodology.



To provide a more comprehensive analysis of the complex phenomenon of contagion, we adopt a mixed-level strategy proposed by Coleman (1986) that allows us to move between individual and macro levels of analysis. This approach is appropriate, given the diverse set of stakeholders and the various scopes of contagion effects. By examining both the micro-level and macro-level factors that contribute to contagion, we can provide a deeper understanding of this phenomenon.

This study makes several significant contributions to the field of organizational and operational risk management. Firstly, it highlights the importance of recognizing contagion as a distinct source of risk and offers a comprehensive framework for assessing a firm's vulnerability to contagion. Secondly, it deepens our understanding of contagion by examining the factors that contribute to the contagion process and investigating why certain events trigger contagion while others do not. Thirdly, it presents a conceptual model that integrates empirical evidence and theoretical constructs from decision-making, cognitive psychology, and risk management literature, laying a solid groundwork for future research on contagion in various industries. In addition to its theoretical contributions, this paper carries practical implications for organizations. Our findings underscore the need for decision-makers to be aware of contagion and to proactively implement measures to mitigate its risks. Moreover, this study offers valuable insights on how organizations can assess their susceptibility to contagion, empowering them to adopt proactive risk management strategies and mitigate their contagion risk.

The paper is structured as follows. Section 2 delves into the contagion process, examining the factors that contribute to its occurrence and its transmission dynamics. In Section 3, we provide an overview of the relevant studies in the field and highlight the distinctive aspects of our research. Section 4 explores the differentiation between subjective and objective approaches to risk assessment and their relevance to contagion. Section 5 presents the theoretical framework, elucidating the interplay between the contributing factors and contagion. Section 6 discusses the management of contagion risk, encompassing the identification of potential contagion sources and the implementation of strategies to mitigate its risk. Finally, Section 7 concludes the paper by summarizing the key findings and discussing their practical implications.

2. Contagion process and types

Contagion, as described by Azimian et al. (2016), is typically sparked by an “initiating event,” which can subsequently lead to a “triggering event” that causes a broad and significant impact (see Figure 3). For instance, the Canadian mad cow crisis of 2003 was initiated by the contamination of cattle feed with prion protein, which resulted in the infection of a cow, subsequently triggering an international sanction on Canadian beef. The distinction between initiating and triggering events is important from a risk management perspective because once a triggering event occurs, the contagion effect becomes almost inevitable.

Drawing on our analysis of cases of contagion, we have identified three distinct types of contagion based on the nature of the initiating event. One type of contagion occurs when the magnitude of the initiating event exceeds the pre-event forecast, rendering control measures unable to cope with it. For instance, the Fukushima Daiichi nuclear disaster in 2011, which had profound ramifications for the nuclear power industry (Basse Mama & Bassen, 2013), was initiated by tsunami waves that exceeded the maximum height the power plant was designed to withstand (Fukuji, 2019).

The other type of contagion occurs when a non-extreme initiating event results in a high social impact triggering event, as exemplified by the 2003 Canadian mad cow crisis (Tse & Hackard, 2006). In such instances, control measures may prove ineffective due to inadequate compliance

Figure 3. Sequence of events in the contagion process (Azimian et al., 2016).



with standard requirements or improper implementation. For instance, during the 2003 Mad Cow crisis in the U.S., an active mad cow disease screening program was in place, but no animal was tested at the slaughterhouse where the mad cow case was identified (UPI, 2015). Similarly, the Three-Mile-Island crisis was triggered by the plant operators' inability to recognize the situation as a loss-of-coolant accident due to inadequate training (Walker, 2004).

Contagion can also occur through fraudulent practices of competitors. Eckert et al. (2019) found that severe internal fraudulent practices in investment banks have a negative impact on other banks. Similarly, Mews (2021) found that the Volkswagen (VW) emission scandal in 2015 negatively affected other German car manufacturers such as BMW and Mercedes-Benz, as VW deliberately programmed their diesel engines to activate certain emissions controls only during laboratory emissions testing. These examples illustrate how fraudulent activities by competitors can undermine control measures and trigger contagion, leading to a negative impact on the entire system.

Our examination of contagion cases has also allowed us to identify three discernible forms in which contagion effects can manifest: demand disruption, supply disruption, and an escalation in operating costs. Additionally, we have identified three principal categories of triggering events that can give rise to contagion, namely product harm events, operational events, and social/environmental events. By considering the interplay between the triggering event and the manifestation of contagion effects, we have classified contagion into nine distinct types, as summarized in Table 1.

3. Overview of relevant literature

Contagion is a widely recognized concept, particularly in the field of financial economics. A considerable body of literature on contagion risk has empirically examined the potential for crisis events to create contagion and has identified the factors that influence such effects (Cummins et al., 2012; Goins & Gruca, 2008; Szewczyk, 1992). These studies have explored various factors, including structural similarity (Xu et al., 2006), distance to the affected firm (Barth et al., 2022), size (Pino & Sharma, 2019), industry leverage (Lang & Stulz, 1992), asset type (Fenn & Cole, 1994), reputation of the industry (Polonchek & Miller, 1999), rating of the firms (Szewczyk et al., 1997), and market overlap (Bosch et al., 1998). However, these studies have typically focused on specific events or types of events and have not aimed to provide a comprehensive model of the contagion process. Moreover, they have considered only objective factors, such as size, distance, and financial measures, and have overlooked subjective factors such as, power, trust, perceived similarity, and the identity of stakeholders, which are crucial in the contagion process.

The theoretical literature on contagion aims to understand the underlying mechanisms that drive contagion. A notable study in this field is the work by Yu et al. (2008), which explains how the negative impacts of an organizational crisis can spread to other organizations within the same industry. Their model identifies three key factors that influence contagion: the characteristics of the organization that has been affected, the characteristics of other organizations within the industry, and the characteristics of the industry itself.

While, like our study, Yu et al. acknowledge the role of stakeholders as agents of contagion, their framework primarily emphasizes the "organizational form" of firms and overlooks the significance of "stakeholder identity," failing to consider the diverse range of stakeholders. Furthermore, similar to the empirical studies, Yu et al. do not account for the influence of subjective factors. These limitations are noteworthy as they may result in incomplete assessments of contagion risk and inadequate measures to effectively mitigate such risk.

The study by Azimian et al. (2016) is another relevant work to our study as both investigations address contagion as an operational threat. Azimian et al. introduce the concepts of "initiating event" and "triggering event," which we have incorporated into our framework. However, the two studies differ in terms of their objectives and approaches. Azimian et al. is an analytical modeling

Table 1. Examples of contagion types

Form of Contagion Manifestation			
Triggering Event Type	Product-Harm Events	Demand Disruption	Supply Disruption
		In 2003, following the detection of a single case of mad cow disease on a farm in northern Alberta, international customers stopped buying Canadian beef (Statistics Canada, 2009).	In 2015, after a shipment from India was found to contain a foreign insect, Vietnam stopped importing peanuts from India (VBN, 2015). The failure of an importer to control its shipments disrupted supply to all other importers.
		In 2011, following an accident in a Fukushima nuclear power plant designed by GE, Germany and Switzerland decided to phase out nuclear power entirely, and Italy decided to abandon plans to build new nuclear plants (Kagramanyan, 2012). GE's design failure affected the demand for other technology providers.	Following the crash of two American Airline flights into World Trade Center towers on 11 September 2001, the private insurance market stopped providing insurance coverage for airlines (Kunreuther & Michel-Kerjan, 2004). American Airline's security failure affected the insurance coverage of other airlines.
	Operating Events	entirely, and Italy decided to abandon plans to build new nuclear plants (Kagramanyan, 2012). GE's design failure affected the demand for other technology providers.	In 2010, a fire on an oil rig chartered by BP caused insurance premiums for deep water oil exploration to increase (Kollewe, 2010).
Social/Environmental Events	Social/Environmental Events	Following the death of more than 1,000 garment workers in the collapse of the Rana-Plaza building which housed several separate garment factories, Disney stopped buying from its Bangladeshi manufacturers, although none of them were associated with the event (Greenhouse, 2014).	After the spill of about 5 million barrels of oil into the Gulf of Mexico in 2010, the U.S. government tightened offshore oil and gas regulations, costing the industry hundreds of millions of dollars (Enerkol Research, 2015).

paper that aims to mitigate contagion risk through investments in the safety of rivals, while our study is a conceptual paper that aims to identify contributing factors and assess contagion risk.

4. Objective vs subjective risk assessment

The approach used to assess risk can have significant implications for the outcomes of decisions made based on the risk assessment. Two broad approaches to risk assessment are subjective and objective approaches (Rejda and McNamara, 2020). The subjective approach to risk assessment involves individuals making judgments and decisions based on their beliefs, values, and emotions. It often involves using heuristics, mental shortcuts, and intuition to evaluate risk, rather than relying on empirical data and statistical analysis.

The literature suggests that various factors can influence an individual's risk perception and subsequent behavior. For instance, research has indicated that personality traits like sensation-seeking, impulsivity, and neuroticism may impact how individuals perceive risk and behave accordingly (Chapman & Coups, 2006). Moreover, emotions like fear, anxiety, and anger can also significantly influence how people view risks (Lerner & Keltner, 2001). Furthermore, cognitive biases, such as overconfidence, optimism bias, and confirmation bias, may distort one's risk perception and decision-making (Slovic et al., 2004).

The objective approach to risk assessment is characterized by its reliance on empirical data, statistical analysis, and expert opinion to evaluate risk. This approach involves the quantification of risk, providing a numerical representation of the likelihood and potential consequences of an event occurring. Factors that can influence the objective approach to risk assessment include data quality, information availability, and the level of uncertainty associated with the data. Research has demonstrated that the objective approach can offer a more accurate and reliable assessment of risk, particularly in situations where subjective judgments may be prone to cognitive biases or lack sufficient information (Liu et al., 2021).

However, some scholars believe that the availability of information can influence the adoption of an objective approach to risk assessment. For example, Kahneman et al. (1982) and Henrion and Fischhoff (1986) argue that experts often rely on intuition and extrapolation when they are required to go beyond the bounds of available information. As a result, they are susceptible to the same biases and heuristics as the general public.

Furthermore, studies suggest that the adoption of subjective or objective approaches to risk assessment may vary depending on whether an individual is a layperson or an expert (Gigerenzer et al., 2007; Morgan et al., 2002; Renn et al., 2011; Slovic, 2016). Laypeople may rely more on personal factors, such as emotions and intuition, while experts may rely more on cognitive factors, such as scientific evidence and data analysis. For example, one study found that laypeople tend to use heuristic shortcuts and gut feelings when assessing risks, while experts rely on analytical thinking and systematic risk analysis methods (Slovic, 2016). Another study found that experts are more likely to use objective approaches to risk assessment, while laypeople are more likely to use subjective approaches (Renn et al., 2011). However, individual variation exists within both groups, and cultural values and personal experiences can also influence an individual's risk assessment approach, regardless of their level of expertise (Renn et al., 2011).

For the purposes of this study, we define the term "lay" as individuals or organizations that predominantly rely on subjective approaches for risk assessment. Conversely, we define "expert" as those who predominantly rely on objective approaches to assess risk.

5. Theoretical framework

The proposed sequence of events in the contagion process by Azimian et al. (2016) and the framework developed by Yu et al. (2008) suggest the involvement of at least two events and three agents in the contagion process: (a) the initiating event, (b) the triggering event, (c) the

Figure 4. Contagion process and the involved actors.

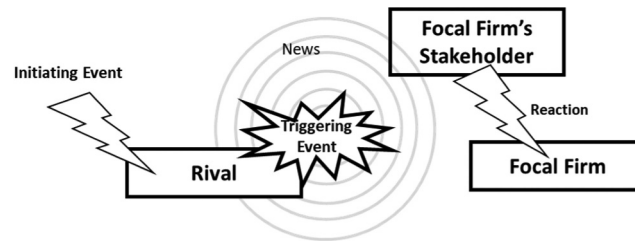
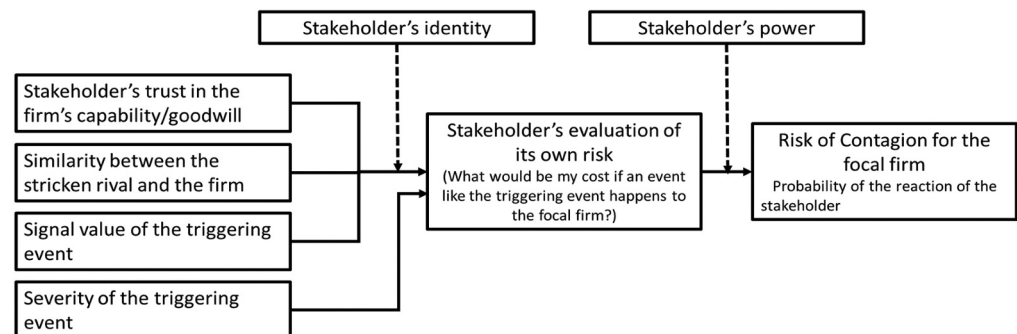


Figure 5. Relationship between contagion risk and the contributing factors.



stricken rival, (d) the focal firm, and (e) the stakeholder of the focal firm. In our study, we argue that the stakeholder plays a central role in the contagion process. Here, the term “stakeholder” refers to any group or individual who can affect or is affected by the achievement of the firm’s objectives, as defined by Freeman (2010). Since organizations rely on individuals to undertake activities such as risk assessment, we draw upon individual-level cognitive theories of risk behavior to conceptualize the factors that contribute to the stakeholder’s decision-making process.

As depicted in Figure 4, when an initiating event leads to a triggering event and negative publicity spreads, the stakeholder of the focal firm undertakes a reassessment of the risk associated with similar future events affecting both the focal firm and themselves. If this reassessment reveals a heightened level of risk compared to before the triggering event, the stakeholder may choose to modify their relationship with the focal firm as a means to mitigate their own risk. Such modifications can encompass minor adjustments, such as introducing specific clauses into contracts or reducing transaction frequency or scale, as well as more substantial changes like imposing stricter safety requirements or even terminating the entire relationship.

One theoretical perspective that provides a rationale for this process is agency theory (Jensen & Meckling, 2019). According to agency theory, relationships between parties involve a principal and an agent. The principal delegates decision-making authority to the agent while aiming to minimize the risk of the agent prioritizing their own interests over those of the principal. In the context of the described process, the stakeholder assumes the role of the principal, and the focal firm becomes the agent. The stakeholder re-evaluates the risk of the focal firm prioritizing its own interests over those of the stakeholder based on the initiating event and negative publicity concerning a rival. The stakeholder’s adjustments to their relationship with the focal firm aim to address this risk and ensure that the focal firm acts in the best interests of the stakeholder.

Furthermore, institutional theory (Powell & DiMaggio, 2012) can provide additional support for this process. Institutional theory emphasizes the significance of adhering to social norms and expectations within a specific institutional environment. In the context of the described process, stakeholders of the focal firm may adjust their relationship with the firm in response to negative publicity involving a rival, as a means of conforming to social norms and

expectations within their institutional environment. These modifications in the relationship with the focal firm can serve as signals to others within the institutional environment, indicating that the stakeholder is mindful of and responsive to potential risks, and is taking appropriate actions to address them.

Building upon the previous discussion, it is important to note that the response of stakeholders to risk assessments may differ based on their expertise and the approach they employ. Expert stakeholders, who employ objective approaches in risk assessment, tend to maintain their assessments unless the severity of an event exceeds their initial forecasts. On the other hand, lay stakeholders, relying on subjective approaches, may revise their risk evaluations even without a severe event occurring (Slovic, 2016). Heuristic theory (Gilovich et al., 2002) explains that these subjective evaluations can cause lay stakeholders to perceive infrequent events as unlikely before they happen but likely after. Furthermore, lay stakeholders may attach greater significance to a recent event with a history of notable impacts, even if it is non-severe, compared to expert stakeholders. This approach can lead to an overestimation of the focal firm's vulnerability to an event, particularly if it shares similarities with the stricken rival.

Figure 5 illustrates our conceptual model, which outlines the contagion risk faced by a focal firm resulting from a potential triggering event. This risk is contingent upon the stakeholder's risk assessment and their ability to enact desired modifications. According to Brun (1994), both subjective and objective risk assessment approaches encompass dimensions of event severity and uncertainty. The stakeholder's evaluation of uncertainty comprises two facets: (i) the likelihood of the event occurring for the focal firm, and (ii) the probability of the focal firm losing control over the event. Additionally, the severity dimension of the stakeholder's evaluation is reflected by (iii) the potential impact of the event on the stakeholder. Our conceptual model proposes that these three components of stakeholder risk evaluation are respectively assessed by (a) similarity between the affected rival and the focal firm, (b) the stakeholder's trust in the focal firm's capability and goodwill, and (c) the perceived severity of the triggering event.

The roles of similarity, trust, and perceived severity in the stakeholder's assessment of risk are also supported by the social amplification of risk framework and risk perception theory. According to the social amplification of risk framework (Kasperson et al., 2012), individuals tend to be more concerned about threatening situations that resemble their own circumstances, especially when the potential impact is perceived as severe or when the entities involved in managing or mitigating the risk are not trusted. Risk perception theory (Slovic et al., 2016) also suggests that people often rely on heuristics, such as similarity, and trust to assess risk.

The influence of a stakeholder's identity on their approach to risk assessment can be supported by several theories, including dual-process theory (Evans, 2018). Dual-process theory posits that individuals employ two distinct cognitive processes, namely the intuitive/emotional process and the analytical/rational process, when making decisions. In the context of risk assessment, stakeholders who possess expertise in a specific domain are more likely to rely on objective approaches. These approaches involve meticulous analysis of available data and careful consideration of potential outcomes. On the other hand, lay stakeholders tend to rely more on subjective approaches, which entail swift and intuitive judgments based on past experiences, emotions, and cognitive heuristics. These differential cognitive processes can give rise to disparate risk perceptions among stakeholders and subsequently impact their evaluations of risk.

In the following sections, we further employ theories to conceptualize the relationship between factors influencing stakeholder risk evaluation and the contagion risk encountered by the focal firm. Subsequently, we discuss strategies that firms can adopt to effectively manage contagion risk.

5.1. Stakeholder identity

Stakeholder identity represents the extent to which a stakeholder relies on objective or subjective approaches to assess risk and is shaped by a combination of subjective and objective factors that stakeholders bring to the risk evaluation process. Objective factors, such as knowledge, experience, and expertise, interact with subjective factors like personal beliefs and values to shape stakeholder identity.

The term “stakeholder identity” has been used in various ways by different scholars. For instance, some researchers have used the term to refer to the sense of belonging or identification of stakeholders with a particular organization (Ashforth & Mael, 1989), while others have used it to refer to the social identity of stakeholders or their sense of belonging to a particular group (Tajfel & Turner, 1979). However, in the context of this paper, the definition of “stakeholder identity” is focused specifically on the cognitive orientation of stakeholders and their tendency to rely on either objective or subjective approaches when assessing risk.

The construct of “stakeholder identity” can be conceptualized through several theories. For individual stakeholders, social identity theory (Hogg, 2016) provides a useful framework. Social identity theory suggests that individuals develop their identity through their membership in social groups, and that their identity influences their attitudes and behaviors. Applied to stakeholder identity, this theory suggests that stakeholders develop their identity through their membership in stakeholder groups and that their identity influences their approach to risk assessment. For example, a stakeholder’s membership in an environmental advocacy group may influence their subjective approach to risk assessment, while membership in a professional organization that emphasizes evidence-based decision-making may lead to a more objective approach.

The cognitive theory of risk (Slovic et al., 2016) can also shed light on how objective factors interact with subjective factors to influence risk assessment. According to this theory, subjective factors such as personal values and beliefs play a significant role in shaping individual stakeholders’ perception and evaluation of risk. However, objective factors such as knowledge, experience, and expertise can mitigate the limitations of subjective factors and enable stakeholders to approach risk assessment in a more objective manner.

For organizational (non-individual) stakeholders, institutional theory (Powell & DiMaggio, 2012) and the resource-based view (RBV) of the firm (Kraaijenbrink et al., 2010) provide relevant frameworks for conceptualizing stakeholder identity. Institutional theory suggests that non-individual stakeholders are subject to institutional pressures that shape their stakeholder identity and their approach to risk assessment. According to institutional theory, organizations strive to conform to prevailing norms and expectations within their institutional environment to gain legitimacy and maintain social standing. These institutional norms shape the behaviors and actions of organizational stakeholders. In the context of stakeholder identity, institutional theory suggests that stakeholders’ risk assessments are influenced by the norms and values prevalent in their institutional context. These norms and values can shape stakeholders’ perceptions of what is considered risky or acceptable within their industry or community. Stakeholders may align their risk assessments with the institutional expectations and norms as they seek to conform to the established practices and gain legitimacy within their social environment.

RBV suggests that a firm’s competitive advantage and performance are derived from its unique bundle of resources and capabilities. These resources can include tangible assets, such as financial capital and physical infrastructure, as well as intangible assets, such as knowledge, expertise, reputation, and relationships. In the context of stakeholder identity, RBV suggests that stakeholders bring their own unique set of resources to the risk evaluation process, which influences their risk assessment approaches and shapes their identity. For example, stakeholders with extensive knowledge and experience in a particular industry or domain may rely more on objective approaches, such as data analysis and expert opinions, to assess risk. On the other hand,

stakeholders with strong personal beliefs and values may lean towards subjective approaches, such as intuition and personal judgment, in their risk assessment. Furthermore, RBV emphasizes the heterogeneity of stakeholders' resources. Different stakeholders may possess different combinations of resources, leading to variations in their risk assessment approaches and identities. Stakeholders with unique resources and capabilities may have a distinct perspective on risk, which influences their identity and their role in managing risk within the firm.

The concept of stakeholder identity is well-established in management literature. Empirical support for this concept comes from Thirumalai and Sinha's (2011) study, which found that market penalties for medical device recalls were not significant, unlike in the pharmaceutical and automotive industries where recalls negatively impact not only the recalling firms but also the entire industry, as previous research has shown (Dranove & Olsen, 1994; Liu & Varki, 2021).

The customer base of the medical device industry primarily consists of providers such as hospitals and physicians who also play a role in guiding patients' decisions, particularly for certain categories of devices like pacemakers. Additionally, both providers and patients are influenced by insurance providers and regulatory bodies (Thirumalai & Sinha, 2011). These dynamics suggest that the customer base in the medical device industry has a stronger affiliation with an "expert" identity. This closer alignment with expertise enables customers to recognize that product failures are inherent in the product development process, given the nature of research and development in this industry. Hence, customers within the medical device industry demonstrate a heightened awareness that failures are an inherent part of the innovation process. Consequently, in the event of a product recall, customers in this industry exhibit a propensity to maintain their existing risk evaluations, unaffected by the recall itself or their perception of the recalling firm. Conversely, customers in the pharmaceutical and automotive industries, which predominantly comprise laypersons, tend to reassess their risk evaluations following recalls, which often leads to subsequent shifts in their demand patterns.

Although Thirumalai and Sinha's study did not directly address the concept of contagion, it provides compelling empirical evidence supporting the influence of stakeholder identity on risk evaluation and response of stakeholders. Based on our discussion, it can be inferred that stakeholders exhibit varying degrees of reliance on subjective and objective measures when assessing risks. Therefore, we propose the following proposition:

Proposition 1: "Stakeholder identity" can be positioned along a continuum between "lay" and "expert" endpoints, where a lay stakeholder relies predominantly on subjective measures and an expert stakeholder relies primarily on objective methods to evaluate risk.

As discussed, stakeholders with a stronger "lay" identity are likely to prioritize subjective factors, such as trust, similarity, and signal value, in their evaluation of risks associated with an event. This inclination can result in an overestimation of risk and an increased susceptibility to contagion. Conversely, stakeholders with a stronger "expert" identity are more inclined to rely on objective methods and data in their risk assessments, leading to a more precise evaluation of the associated risks. Consequently, stakeholder identity serves as a critical moderator in the relationship between subjective factors and stakeholder's risk evaluation. Based on these insights, we propose the following:

Proposition 2: Stakeholder identity plays a moderating role in the relationship between subjective factors, such as trust, similarity, and signal value, and stakeholder's risk evaluation, thereby influencing the risk of contagion.

5.2. Signal value

Signal value is a well-studied concept in the context of risk perception and decision-making theories supported by the psychometric paradigm of risk perception (Slovic et al., 1981). The psychometric paradigm is based on the notion that individuals without expertise in objective risk assessment, commonly known as laypeople, evaluate risks based on two primary factors: the perceived magnitude of the consequences and the perceived probability of occurrence (Slovic, 1987). However, this paradigm acknowledges that other factors, such as familiarity with the risk, voluntariness of exposure, dread, and controllability, can also shape risk perceptions. Within this framework, signal value plays a pivotal role by influencing individuals' perception of future risks similar to the event at hand (Slovic, 1987). The psychometric paradigm proposes that individuals often employ signal value as a cognitive heuristic, or mental shortcut, to evaluate the probability and severity of future events. For example, when a stakeholder perceives an event to possess high signal value, they may infer that similar events in the future are also highly likely to transpire and have significant consequences, even if the actual probability of occurrence is low.

Other relevant theoretical frameworks that provide insights into the concept of signal value include the social amplification of risk framework (R. E. Kasperson et al., 1988) and the culture theory of risk (Douglas & Wildavsky, 1982). The social amplification of risk framework suggests that risk perceptions can be influenced and magnified by various social and cultural factors. Factors such as media coverage, public opinion, and institutional responses can amplify or mitigate the perceived significance and consequences of an event. In other words, the way in which an event is communicated and interpreted within society can impact its signal value and subsequent risk perceptions.

Additionally, the culture theory of risk emphasizes the role of cultural values, beliefs, and norms in shaping individual and collective risk perceptions and decision-making processes. According to this theory, risk perceptions are not solely determined by objective assessments but are also influenced by cultural frameworks and social contexts. Cultural values, social structures, and historical experiences shape individuals' interpretations of risks, their evaluation of potential consequences, and the significance they assign to specific risk events.

The relationship between the signal value of an event and stakeholders' perception of risk can also be explained by sensemaking theory (Weick, 1993). According to this theory, individuals and organizations make sense of complex and ambiguous situations by interpreting cues and signals from their environment. When it comes to risk perception, stakeholders rely on signals or events as indicators of potential risks and use them to form judgments and assessments. Sensemaking theory suggests that stakeholders attribute meaning to events based on their salience, relevance, and impact. When stakeholders encounter a signal that suggests the presence of a potential threat, they engage in sensemaking processes to understand the nature, implications, and significance of the event. The signal value of an event plays a crucial role in this sensemaking process. Stakeholders may perceive high signal value events as indicative of significant threats or vulnerabilities, leading to an increased perception of risk.

The concept of signal value is exemplified by two notable cases: the Canadian Mad Cow case (Statistics Canada, 2004) and the Three Mile Island nuclear accident (Walker, 2004). In the Canadian Mad Cow case, the triggering event was the discovery of a single cow infected with bovine spongiform encephalopathy (BSE), commonly known as Mad Cow Disease. Although the actual risk of contracting BSE was low, the potential consequences of a widespread outbreak were catastrophic, including the possibility of human transmission and fatalities. Consequently, the event carried high signal value due to its catastrophic potential and severe consequences. This high signal value resulted in a ban on Canadian beef exports and significant economic repercussions for the Canadian agricultural industry.

The Three Mile Island nuclear accident was triggered by the partial meltdown of the reactor core, which resulted in the release of radiation. While the released radiation remained within the permissible limits established by regulatory authorities, the potential consequences of a full-scale nuclear meltdown were perceived as catastrophic. This perception of catastrophic potential increased the signal value of the event. Widespread panic and fear ensued, fueled by media coverage and the perceived lack of control over the situation. Although the actual harm caused by the accident was limited in terms of radioactive contamination, injuries, or deaths, the signal value was driven by the public's perception of the event and its potential consequences.

Based on the theoretical frameworks discussed above, and the case examples provided, we propose the following proposition:

Proposition 3: A triggering event with higher signal value is more likely to increase the perceived risk of similar future events among stakeholders, potentially leading to a higher contagion risk.

5.3. Similarity

The similarity heuristic is a cognitive shortcut utilized by individuals to evaluate risk and shape responses when dealing with complex and numerous negative events. It pertains to how individuals make judgments based on the similarity between current situations and other situations, aiming to maximize productivity through a favorable experience while avoiding repeating an unfavorable experience (Kahneman et al., 1982). However, relying on this heuristic can result in systematic deviations from logic, probability, or rational choice, leading to cognitive biases. These biases include ignoring prior probabilities, assuming that similarity in one aspect leads to similarity in other aspects, and assuming that a small sample is representative of a much larger population (Tversky & Kahneman, 1985).

In the context of our conceptual framework, stakeholders may use the similarity between a focal firm and a stricken rival as a heuristic or mental shortcut to assess the risk associated with the focal firm. If the rival has experienced a significant negative event or crisis, stakeholders may perceive that the focal firm is also prone to similar negative outcomes, provided they perceive a similarity between the two firms in terms of industry, practices, or other relevant factors. One cognitive bias resulting from the similarity heuristic is that stakeholders may perceive a focal firm as susceptible to the same negative events that affected the stricken rival, even if the focal firm belongs to a population containing relatively safe firms. This phenomenon can be explained by the representativeness heuristic (Tversky & Kahneman, 1974), which refers to how individuals judge the probability of an event based on its representativeness or similarity to a stereotype. Therefore, stakeholders may perceive the similarity between the stricken rival and the focal firm as an indicator of high risk, despite any objective evidence to the contrary.

Additionally, institutional theory (Powell & DiMaggio, 2012) provides insights into how organizational (non-individual) stakeholders perceive risk in the context of similarity between a stricken rival and the focal firm. Institutional theory suggests that organizations seek to conform to established norms, values, and practices within their institutional environment to gain legitimacy and maintain their social standing. These norms and expectations shape the behaviors and actions of organizational stakeholders. When stakeholders perceive a similarity between the focal firm and a stricken rival, they become aware of the negative event and its consequences for the rival organization and its stakeholders. This awareness triggers institutional pressures, particularly mimetic pressures, wherein stakeholders feel compelled to imitate the responses and behaviors of the affected stakeholders of the stricken rival. The imitation of the stricken rival's stakeholders is driven by two factors. First, stakeholders recognize that the similar risk faced by the stricken rival could also affect their focal firm. By imitating the responses and behaviors of the affected stakeholders, they aim to adapt to the perceived risks and challenges, enhance their preparedness, and mitigate potential negative outcomes. Second, stakeholders imitate the affected stakeholders of the stricken rival to conform to institutional expectations and norms. In an institutional

environment where certain behaviors or responses are considered appropriate or legitimate during times of crisis, stakeholders imitate those responses to gain legitimacy and maintain their social standing within the industry or sector.

The impact of similarities between stricken rivals and focal firms on the perceived risk of stakeholders can be observed in various industries. For example, in the automobile industry, industry rivals that produce similar lines of cars suffer declines in sales following serious automobile recalls (Crafton et al., 1981; Reilly & Hoffer, 1983). Furthermore, in a notable case, the public associated other Asian automakers, including Honda, Hyundai, and Nissan, with Toyota's accelerator pedal problems in 2009, perceiving a similarity based on their Asian origin. This perceived similarity led to the belief that these companies might also have similar quality issues (Automotive News, 2010).

Another illustrative example relates to the food industry in 2006 when an E. coli outbreak was traced back to packaged spinach manufactured by Natural Selection Foods LLC. This incident resulted in a significant recall and had far-reaching consequences for rival companies within the spinach industry. The outbreak eroded consumer confidence in packaged spinach, leading not only to financial losses for Natural Selection Foods LLC but also impacting other companies operating in the spinach market (Calvin, 2007).

Drawing from the aforementioned theoretical frameworks and case examples, we put forward:

Proposition 4: Stakeholders are more likely to perceive higher risk in the aftermath of a triggering event when their firm shares more similarities with the stricken rival, potentially resulting in a higher contagion risk.

5.4. Trust

Trust is a complex and multifaceted construct with various definitions in the literature. In the context of this paper, trust is defined as the level of confidence that a stakeholder has in the focal firm's capability and goodwill to mitigate the risk of a particular event. Capability trust refers to the expectation that a firm possesses the necessary competencies to perform a task satisfactorily, while goodwill trust pertains to the firm's good faith, good intentions, and integrity. Goodwill trust becomes particularly important when the event is intentional, such as in cases of fraud.

Several theories explain the relationship between trust and risk perception. One of the extensively studied theories is the psychometric paradigm, which suggests that individuals' perceptions of risk are influenced by two key factors: the characteristics of the hazard or risk itself, such as the likelihood and severity of harm, and the characteristics of the individual perceiving the risk, such as their attitudes, beliefs, and values, which collectively shape their perception of trustworthiness in others (Slovic, 1987). According to this paradigm, stakeholders' trust in a focal firm can affect their perception of risk by acting as a cognitive filter through which they interpret and evaluate risk-related information. When stakeholders trust a firm, they may be more inclined to perceive the risks associated with that firm as lower, aligning their perception with their positive beliefs about the firm's abilities, intentions, and overall trustworthiness. On the other hand, lower levels of trust can lead to higher risk perceptions as stakeholders may interpret information in a way that confirms their negative beliefs or suspicions about the firm's trustworthiness.

Stakeholder theory is another theory that addresses the function of trust in risk perception. The theory suggests that organizations have a responsibility to consider and manage the interests and concerns of various stakeholders and recognizes that stakeholders can significantly influence an organization's success and sustainability. In the context of stakeholder trust and risk perception, stakeholder theory proposes that when stakeholders have a higher level of trust in a firm, they are more likely to perceive the firm as reliable, ethical, and competent. This trust can positively

influence their perception of risks associated with the firm. Stakeholders with higher trust are more likely to believe that the firm will act responsibly, take necessary precautions, and handle risks appropriately, which may result in lower risk perceptions. Conversely, if stakeholders have lower levels of trust in a firm, their perception of risks associated with the firm may increase. A lack of trust can lead stakeholders to question the firm's intentions, competence, and ability to manage risks effectively, thereby amplifying their perception of risks.

Trust levels can be influenced by a firm's history of crises, as demonstrated in the case of Jack in the Box's restaurants. Seo et al. (2014) discovered that after the E.Coli outbreak in Jack in the Box's restaurants in 2003, the company's stock prices reacted negatively to other firms' food crises that occurred between 2004 and 2010. This shows the lasting impact of low trust and how past crises can shape stakeholders' perception of future risks. The crucial role of trust in stakeholders' risk assessment is also evidenced by the rise in domestic beef consumption despite the international ban on Canadian beef in 2003 (Statistics Canada, 2004). While the decrease in domestic beef prices due to the decline in international demand may have played a part, the primary factor driving the increased consumption was consumers' trust in the industry's dedication to upholding food safety standards. Without such trust, consumers would be reluctant to consume domestic beef.

Building on the theoretical frameworks and case examples discussed above, we propose:

Proposition 5: When stakeholders lack trust in their firm's capability or goodwill, they are more likely to perceive greater risk in the aftermath of a triggering event, potentially increasing the risk of contagion.

5.5. Power

The role of power in the contagion process is significant, as stakeholders lacking power would be unable to effectively enforce desired changes in their relationships with firms. Two theories that offer valuable insights into the influence of stakeholder's power on the interplay between stakeholder's perceived risk and their propensity to react are resource dependence theory and stakeholder salience.

Resource dependence theory (Pfeffer & Salancik, 1978) focuses on the interdependencies between organizations and external stakeholders, particularly concerning resources. It posits that organizations actively manage their external dependencies to ensure access to critical resources. Regarding stakeholder's power and risk perception, resource dependence theory highlights that stakeholders controlling vital resources necessary for an organization hold greater power and influence. Consequently, the theory suggests that stakeholders with resource control are more inclined to react strongly to perceived risks due to their leverage over the organization.

Stakeholder salience theory (Mitchell et al., 1997) emphasizes the significance of stakeholder's power, legitimacy, and urgency. It asserts that stakeholders possessing more power are more likely to be influential and prominent. In the context of stakeholder's risk perception and propensity to react, this theory argues that stakeholders with greater power are more prone to exhibit strong reactions to perceived risks. Stakeholder's power may be determined by factors such as control over critical resources, access to decision-making processes, or robust social influence. Stakeholder salience theory provides insights into the importance of stakeholder power dynamics in shaping reactions to perceived risks.

Powerful stakeholders may not always exercise their power over firms. The management literature has identified several situations in which powerful stakeholders may choose not to exert their power. One such situation is referred to as "joint dependence," where both the firm and the stakeholder are mutually reliant on each other to achieve their respective goals (Emerson,

1962). In such cases, stakeholders may hesitate to exert power over the firm due to potential negative consequences for the relationship and their own interests. For instance, suppliers and customers often share a relationship of joint dependence with firms, as each party relies on the other to generate revenue (Clarkson, 1995). Consequently, powerful suppliers or customers may refrain from exerting their power over the firm to avoid damaging the relationship and risking the loss of future business opportunities (Clarkson, 1995).

The concept of joint dependence sheds light on why Walmart not only refrained from terminating its relationship with its suppliers following the Rana Plaza building collapse in 2013 in Bangladesh but also took steps to enhance factory safety and worker well-being among its suppliers (Westhead, 2013). Walmart's business model heavily relies on a global supply chain, creating a significant level of interdependence between the company and its suppliers. Walmart depends on its suppliers for a reliable and cost-effective supply of goods, while the suppliers rely on Walmart as a major customer for their products. Consequently, severing these relationships could have potentially jeopardized Walmart's access to critical resources. As a result, Walmart may have been hesitant to exert power over its suppliers due to concerns about damaging the relationship and losing future business opportunities.

In contrast, the joint dependence between Disney, which discontinued its operations in Bangladesh after the Rana Plaza disaster, and its suppliers may have been lower compared to Walmart due to the nature of Disney's supply chain, which primarily revolves around licensing and merchandising rather than manufacturing. This aspect of Disney's supply chain could have made it relatively easier for the company to sever its ties with suppliers, as such a decision may not have had a significant impact on Disney's access to critical resources.

Another situation in which powerful stakeholders may choose not to exert their power is when the stakeholder's reputation is at stake (Bitektine, 2011). For example, if a stakeholder's reputation is closely tied to the firm's performance, they may hesitate to exercise power and risk damaging their own reputation. Similarly, stakeholders who are publicly associated with the firm, such as board members or major shareholders, may be reluctant to exert power and be perceived as acting against the firm's interests.

Additionally, stakeholders may opt not to exert their power when they perceive that the costs outweigh the benefits (Mitchell et al., 1997). For instance, stakeholders may refrain from exercising power if they believe that severing ties with the firm or pursuing legal action would incur excessive costs, or if they perceive the likelihood of success to be low.

Drawing upon the theoretical frameworks outlined above, we propose:

Proposition 6: The likelihood of a stakeholder exerting their power in response to a triggering event is positively associated with the stakeholder's power over a firm. However, this relationship is contingent upon various factors, including the presence of joint dependence, the potential impact on the stakeholder's reputation, and the perceived costs and benefits of taking action.

6. Management of contagion risk

6.1. Risk identification

According to Kern et al. (2012), the initial three stages of the risk management process involve risk identification, risk assessment, and risk mitigation. Within the context of our framework, the primary sources of uncertainty include (i) relevant rivals, (ii) stakeholder's identity, and (iii) potential initiating events. Therefore, to successfully manage contagion risk, it is crucial to first identify these sources of uncertainty.

To identify relevant rivals, the existing literature suggests using an analytical approach in which the industry is viewed as a network and the strength of each link is determined based on various factors such as size, similarity, and geographical distance (Eckert, 2020). Rivals with stronger links are considered more likely to cause contagion and are therefore deemed more relevant in the context of contagion risk.

To assess the strength of the lay identity of stakeholders, one approach is to utilize a scenario-based questionnaire. This method involves surveying stakeholders and presenting them with hypothetical triggering events of different types and severity levels. By analyzing the collected responses, firms can identify the stakeholders who predominantly rely on subjective factors when assessing risk.

The identification of potential initiating events depends on their nature and characteristics. As previously mentioned, there are three types of initiating events. The first type includes extreme events, such as the tsunami that caused the Fukushima disaster in Japan in 2011. These events are rare and challenging to predict and can only be recognized after they have occurred.

The second type of initiating events consists of non-extreme events that have the potential to trigger secondary events with significant social impact. These events are usually rare, and no firm in the market may have encountered them before. However, their potential can be inferred by examining cases of contagion that have occurred in other markets or industries in the past. For instance, although there have been no reported instances of Mad Cow disease in Australia, by studying the mad cow crises in Canada and the USA in 2003, an Australian firm can identify the importation of contaminated feed by a rival as a potential initiating event.

The third type of initiating events encompasses major frauds, which are distinct from the other two types in that they are committed deliberately by rivals. Predicting fraud involves recognizing and monitoring patterns and antecedents. For example, the Volkswagen emission scandal in 2015 was not the first instance of a well-known European brand being involved in an operational breach. In 2013, beef burgers sold under Tesco Supermarket's Everyday Value brand were found to contain undeclared horse meat, and investigations revealed that some suppliers were fraudulently labeling horse meat as beef. Although Volkswagen and Tesco operate in different industries, both companies produce products that are fiercely competitive and have volatile prices and long, complex supply chains, which increase the risk of opportunism. Thus, after the Tesco horse meat scandal in 2013, the occurrence of an operational breach in the automotive industry, such as the Volkswagen emission scandal in 2015, was foreseeable.

6.2. Risk mitigation

To mitigate the risk of contagion, one potential strategy is to form alliances with rivals and collectively enhance the reputation of the industry (Barnett & Hoffman, 2008). This can be achieved by either defending current industry practices (Desai, 2011) or advocating for changes (Greenwood & Suddaby, 2006). Firms can also utilize a range of tactics, such as excuses, justifications, or apologies, to avoid sanctions from stakeholders (Chatman et al., 1986) or establish new industry standards to distinguish themselves from affected competitors (Pozner & Rao, 2006).

Another viable approach is referred to as “preferential detachment,” where firms aim to increase their independence by reducing their connections with other firms in the industry (Baniak & Grajzl, 2013). This strategy requires a high level of transparency to enable stakeholders to identify and distinguish the differences between firms.

Transferring risks through reputation-risk insurance is another potential tactic. According to Gatzert et al. (2016), several existing insurance products cover financial losses caused by contagion. However, it should be noted that most policies only cover crisis-management costs (Eckert, 2020), so they are more suitable as a complementary measure to other strategies.

Lobbying and negotiation can also be employed as strategies to manage contagion risk. Lobbying refers to the process of influencing decisions made by government officials, such as legislators and regulatory agency members. Although not explicitly mentioned in the literature as contagion management strategies, lobbying and negotiation are commonly practiced in the industry. For example, pharmaceutical companies frequently engage in lobbying activities to advocate for stricter regulations on the import and sale of potentially unsafe drugs which could negatively impact the industry's reputation. Lobbying has also been used to prevent stricter regulations after an extreme event. The meat industry, for instance, utilized lobbying to halt the implementation of new food safety regulations proposed by the U.S. Department of Agriculture in response to the Jack in the Box E. Coli outbreak in 1993. Similarly, the U.S. government resolved the ban on American beef, which was imposed following a Mad Cow recall in 2003, through negotiation with major customers (Hanrahan & Becker, 2006).

Finally, Azimian et al. (2016) propose a collaborative strategy to decrease the likelihood of contagion when the initiating event is not extreme. The study argues that investing in the safety measures of less safe rivals can mitigate the contagion risk of an event. According to the study, current safety requirements may not be stringent enough to prevent contagion, and therefore firms must over-comply. Since over-compliance may not be economically feasible for some rivals, collaborative investments can be advantageous for both the investing firm and the invested rival.

While the above strategies are not mutually exclusive, their effectiveness may vary depending on the type of contagion being addressed. For instance, reducing linkages or perceived similarities to the affected competitor may not be effective in cases where the initiating event is extreme, as all firms may be equally susceptible to such events. Similarly, collaborative investment may prove ineffective when the magnitude of extreme events outweighs the impact of preventive measures. Furthermore, lobbying and negotiation strategies are only applicable when a sufficient number of firms are involved. Besides, these approaches may carry the risk of negative publicity if the industry is perceived as resisting changes that could enhance safety in the eyes of the public. Moreover, lobbying and negotiation may not be viable options when the contagion effect is abrupt or primarily driven by individual stakeholders.

7. Summary and conclusion

The present study aims to provide a comprehensive understanding of the contagion effects that propagate through social mechanisms. This type of contagion is considered more serious than the type resulting from fundamental links, as it has the potential to adversely impact other firms, even when the triggering event is relatively mild. Furthermore, it may stem from stakeholders' misjudgments of the susceptibility and capability of the firm they are associated with. While contagion is well-documented to have industry-wide or market-wide consequences, it can also manifest in smaller segments of the industry or market. However, it is worth noting that the media often focuses on events with widespread effects, potentially leading to an underestimation of the frequency of contagion.

Based on a survey of cases of contagion and a literature review, this study addresses the questions of when, why, and how a rival's failure to control an event can unfavorably affect other firms within the same industry or market. In doing so, the study makes several contributions. First, the research introduces a new area of risk to the operations risk management literature, as prior studies have mainly focused on operational threats stemming from buyers or suppliers. Second, the study classifies contagion based on (i) the mechanisms through which it propagates, (ii) the forms it takes, and (iii) the types of initiating events. This classification helps managers identify the source of contagion and select the appropriate risk management strategy. Third, the study conceptualizes several key social factors that contribute to contagion risk, including the signal value of the triggering event, perceived similarity between the stricken rival and the focal firm, and stakeholders' trust in the focal firm. The study argues that stakeholders rely on subjective measures to assess their own risk and suggests that the impacts of subjective factors are positively

influenced by the strength of the stakeholder's "lay" identity. Lastly, this study contributes to the literature on organizational theory by extending the concept of "stakeholder identity" to the context of risk assessment. While previous studies have examined the link between organizational identity and risk-taking decisions, this study is the first to discuss the relationship between organizational identity and risk-evaluation approaches.

The practical implications of this study are significant, especially for firms that prioritize safety. It demonstrates that such firms may still face the impacts of the events that have already been addressed if they occur to their rivals. The findings underscore the crucial role of contagion risk assessment and highlight key factors involved in the process, specifically ascertaining the identities of stakeholders, evaluating the signal values of potential triggering events, and recognizing similarities with less safe rivals. Implementing these steps enables firms to develop robust risk management strategies and safeguard themselves against the adverse impacts of contagion.

This study opens up several avenues for future research. Firstly, it is important to empirically test the validity of the study's propositions. For example, the concept of "stakeholder identity" can be further examined by analyzing the differential purchasing decisions of individual and organizational customers following specific events like product recalls. Secondly, there is a need to quantify contagion risk using a combination of analytical and empirical approaches. This would allow for the development of models that capture the relationship between various contributing factors and contagion risk. Moreover, such quantification can inform the design of new insurance policies that effectively address contagion risk. Lastly, future research can explore the application of data science, advanced analytics, and deep learning techniques to predict fraudulent activities at both inter-organizational and intra-organizational levels. However, this endeavor comes with its own set of challenges, including the rarity of major fraudulent events and the constant evolution of fraudster schemes.

A potential limitation of this study is its multi-layered and multi-theoretic structure. The research draws upon theories from various disciplines, which may pose challenges for readers in fully comprehending the arguments and conceptual model. However, this is unavoidable as contagion is a complex concept, and its components are best understood in relation to one another. To mitigate this potential issue, the study provides clear definitions and explanations of key concepts and offers a detailed conceptual model that illustrates the relationships between contagion risk and the contributing factors.

Overall, this study contributes significantly to the literature on contagion effect and its impact on firms. The proposed framework and classification of contagion, along with the insights into the social factors contributing to contagion, provide valuable guidance to managers aiming to mitigate the negative impacts of this phenomenon.

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Note

1. Consider a hypothetical market comprising three manufacturers and two suppliers, where manufacturer M1 has recently filed for bankruptcy (as shown in Figure 1). The bankruptcy of manufacturer M1 leads to financial distress

for supplier S1, which is closely associated with M1. If S1's financial distress causes it to cease operations, it will no longer be able to supply manufacturer M2, resulting in a negative contagion effect that spreads through a fundamental mechanism. However, if S1 remains operational but decides to halt supply to M2, possibly due to concerns about M2's bankruptcy, then the negative contagion effect is transmitted through a behavioral mechanism. Furthermore, if supplier S2, which is not fundamentally linked to manufacturer M1, stops supplying to manufacturer M3 out of fear of M3's bankruptcy, it represents a contagion effect that spreads through a behavioral mechanism. It is essential to differentiate between fundamental and behavioral mechanisms to comprehend how negative contagion effects propagate.

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