UNIVERSITAT RAMON LLULL

Organizations in nature: how nature shapes organizational practices

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DOCTORAL THESIS

Title	Organizations in nature: how nature shapes organizational practices
Presented by	Lucrezia Nava
Centre	Esade Business School
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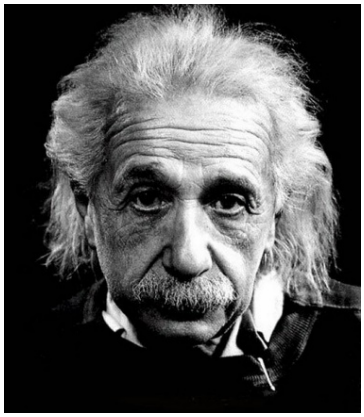
Directed by	Dr. Maja Tampe Dr. Kenichi Matsuno



“A human being is a part of the whole called by us universe, a part limited in time and space. He experiences himself, his thoughts and feeling as something separated from the rest, a kind of optical delusion of his consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest to us. Our task must be to free ourselves from this prison by widening our circle of compassion to embrace all living creatures and the whole of nature in its beauty.”

— Albert Einstein

I dedicate this Ph.D. thesis to those who are able to widen their circle of compassion to embrace the whole of nature in its beauty.

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Forgive me for using the already much abused metaphor of a journey to describe my doctorate, but the more than three years leading up to the writing of this thesis have been an incredible journey. Having almost reached my destination, it behooves me to thank those who made this journey possible and enriched it with discoveries, excitement, and learning. My sincerest thanks go to *those who have guided me* on this journey. First and foremost, to my first supervisor, **Dr. Maja Tampe**, who, with a good deal of patience, helped me grow, not only as an academic but also and especially as a person, showing a genuine interest in nurturing my all-around potential. You have done far more than what is required of a supportive supervisor to help me through even the most difficult times with your great empathy and caring. We are different and complementary in certain aspects, but you are a great example for me of how it is possible to combine curiosity, sharp intelligence, success, passion, and care for others and the planet. I couldn't have relied on better hands. Many thanks also to my second supervisor, **Dr. Ken Matsuno**, who opened the doors of his home to me twice: By inviting me to join him at Babson College in Boston for my visiting but also by inviting me to spend Thanksgiving in his home with a unique and warm welcome. It has been an exciting few months in the US and I am so honored to have had the opportunity to work with you. Thank you for the support you have given me as well as for your confidence in my abilities and my ideas. Finally, I want to thank my other two guides: **Dr. Tobias Hahn**, who has always made me feel like one of his students, advising me in any choices I made and promptly helping me with thoughtful, sharp, and developmental comments about my projects, and **Dr. Ruth Aguilera**, who through practical and direct advice and her example showed me how achieving success is not independent from being helpful and supportive to others.

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Third, as for all journeys, I want to thank those who allowed me to expand my horizons and challenge myself. I was pretty scared when I left for data collection in Brazil, a new country, doing interviews for the first time, in a language learned online in a few weeks, and in a context, the one of rural producers, that I knew so little about. Yet the wonderful people I met in those two months soon put any concerns I had to rest. My heartfelt thanks, therefore, go to all of these people. To **Dr. Jorge Chiapetti** and his family, for welcoming me into their home like a daughter, to the agronomists who helped me during my fieldwork in Brazil, especially **Alessandro and Tayrone**, for letting me fully enjoy every long chat, every new fruit tasted, every new scent, and every new Brazilian folk song, in the long hours spent driving through the breathtaking landscapes that the Bahia coastline offers. And to **all the producers** I met, for their willingness to dedicate their time to share a piece of their story (and occasionally even a glass of cachaça) with me, a young foreigner with a broken Portuguese. Obrigada do fundo do coração!

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Sixth, without solid roots, branches can only go little far. Therefore, I want to thank those who have provided me with solid roots. First of all, **my parents**, who first pushed me to always ask myself questions and passed on to me the curiosity and desire to discover the world. My sister, who taught me that always helping is never wrong. **My grandparents and extended family**, who even though "but are you still studying? Shouldn't you start working?" have always loved and supported me. **My lifelong friends**, because no matter how long I'm away, when I'm with you I feel like I have never left. **Giampaolo**, because maybe sometimes we have to lose each other in order to find each other again. Thank you for everything you have done for me over the years. I couldn't have asked for a better mate. My city, **Bergamo**, because although being battered in this horrible 2020, *noter am mola mia*.

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Abstract

Environmental sustainability issues, such as climate change, are often global in scale but necessarily local and material in their manifestations. Yet the sustainability and the management literature has paid little attention to how the natural environment affects organizations and their operations. A burgeoning view in the sustainability literature portrays organizations as embedded in nature and allows for a deeper look at the local interrelations between organizations and the surrounding natural environment. This Ph.D. thesis adopts this perspective to provide a better understanding of how organizations and their members understand and interpret the natural environment in which they are embedded, and how these interpretations shape organizational practices. To that purpose, qualitative and quantitative research methodologies are applied to examine to what extent and how the direct experience of natural phenomena, such as climate change effects or natural disasters, affects organizational responses and outcomes. A first mixed-methods study of cocoa producers in Brazil explores how decision makers in vulnerable contexts experience the consequences of climate change and how their different interpretations shape organizational adaptive responses. This study focuses on the immediate organizational responses to adverse natural phenomena. A second study empirically investigates the long-term effects of experiencing natural phenomena on the organizational outcomes. Based on analyzing quantitative data on Japanese companies in the context of the Great East Japan Earthquake, this study proposes the concept of organizational post-traumatic growth to capture the emerging change in organizational values and responsiveness to social needs following the natural disaster. These studies hone in on local interrelations between organizations and the natural environment in which they are embedded. While this approach contributes to the burgeoning literature on organizations and the natural environment, it also implies a risk to get lost in the myriad of specificities and interpretations that characterize each context and that need to be integrated with the global scale of sustainability issues. Reconciling the local and global scale that are both required to address these sustainability challenges is far from trivial. Therefore, a third study aims to make a theoretical contribution to the tensions emerging between the local implementation of sustainable practices and the need for global coordination in the context of voluntary sustainability standards. Together, the three studies of this Ph.D. thesis aim to delve into the local interrelation between organizations and the natural system in which they are embedded, to

understand how organizational interpretations of local natural phenomena affect organizations and how tensions between local and the global levels can be effectively addressed. The main arguments are grounded in both theory and empirical evidence, thereby providing a comprehensive methodological approach apt to make substantial contributions to the study of organizations and the natural environment.

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Preface

I wish I could say that I am the one who shaped the content of this thesis. Instead, upon reflection, it seems more accurate to say that it was the content of this thesis that shaped me. When I first became passionate about sustainability issues, I could not have known how much it would change the way I relate to nature. The more I learned about nature and how it works, the more I realized that my happiness is closely connected to direct contact with it. For over 200,000 years, humans exactly like us have lived in total connection with nature. Our DNA hasn't changed since then, but our lifestyle has dramatically. This creates some major dissonances that are hard to deal with, especially since we are destroying the last few remaining populations that could teach us how to restore that connection. Our bodies are made to be immersed in nature, and it was perhaps during my fieldwork in Brazil, among the many hours immersed in the countryside, that I truly understood this. Talking with those who live in close contact with nature, the producers I interviewed for one chapter of this project, I perceived that their way of relating to it was very different from mine. Instinctively I started asking for more, as if I wanted to discover the secret of such an intense relationship, often described by the producers themselves as a love story. While this relationship (and its implications on the organization) are the subject of an ongoing study that is not part of this thesis, the increased awareness and sensitivity to nature has accompanied and guided me in the development and writing of this work. Digging deep into my relationship with nature in the search for a deeper connection with it also led me to make life and consumption choices that were difficult in some ways. Yet, I could not be happier. My hope, therefore, is that this thesis will inspire the readers to strengthen and nurture their loving relationship with nature.

1.
Introduction

This chapter introduces the topic of the Ph.D. thesis
and presents its structure and content.

1.1 Introduction to the topic of the Ph.D. thesis

We are all part of nature, although we tend to forget it (Schultz, 2002). Human survival is directly tied to our relationship with the natural environment (Adger, 2003). The relationship between human beings and nature has been at the center of an intellectual debate in Europe for centuries. Starting from Greek philosophers to the Romantic period, there has always been a discussion about human relationship with nature, either positive, as a consolation for human troubles, or negative, as a misanthropic entity condemning human beings to tribulations. However, with industrialization, we started developing technology to protect ourselves from the elements of nature, and, nowadays, most people in industrialized nations are largely alienated from nature (Schultz, 2002).

Management literature reflects this alienation. Most of the conversation regarding sustainability focused on either the organizational perspective (see Bocken, Short, Rana, & Evans, 2014 for a review) or the natural environment (Foley et al., 2011; Tilman et al., 2011, 2002). Examined separately, these approaches can hardly shed light on the relationship between the social and the natural systems, fundamental in the sustainability discourse. In this thesis, I adopt an emerging approach in the sustainability literature that views organizations as embedded in the social and natural systems surrounding them (Marcus, Kurucz, & Colbert, 2010). As it is possible to infer from this view, it is only in the situated and local interrelationship between human activities and the natural system in which the social system is embedded that organizational practices are enacted and unfolded (Seager, 2008). The issues linked with environmental sustainability (e.g., water or land pollution, resource depletion, ecosystem vulnerability) are global in scale but necessarily local and material in their manifestations (Marsden, 2012). Therefore, the solutions to these problems in the form of organizational practices involve the interaction between the physical and the human elements that occurs in a specific context.

Yet, in the management literature, organizations are often, if not always, portrayed as free-floating entities, separated from the natural landscape they occupy (Guthey, Whiteman, & Elmes 2014). The dominant focus on multinational companies did not help to build a more integrated understanding of organizations' interrelations with their natural surroundings, since these companies are, by definition, global and not tied to a specific place. This place-less character creates the illusion that organizations are not affected by

the natural environment surrounding their operations (Guthey et al., 2014; Shrivastava & Kennelly, 2013). Yet, despite the scarce consideration, organizations are interrelated with the natural environment they are embedded in (DeBoer, Panwar, & Rivera, 2017; Whiteman & Cooper, 2000). Organizations affect, and are affected by, elements of the natural environment, as much as they affect and are affected by other aspects of the organizational environment that, instead, have been well emphasized in the management literature, such as economic, political, and technological aspects (Shrivastava & Kennelly, 2013). While the extant literature focuses on discussing the effects of organizational practices on nature considering the natural and the business systems as different, although related, the emerging embedded approach described by Marcus and colleagues (2010) allows for a deeper and more realistic look at the local interrelations between organizations and the surrounding natural environment, able to explain to a better extent not only how organizational practices affect nature but also what are the effects of nature and its elements on organizational practices. An understanding of how organizations and their members understand and interpret the natural environment in which they are embedded, and what are the consequences of it on organizational practices, is still lacking in the management and, surprisingly, even in the sustainability literature.

Accordingly, the first overarching research objective of this Ph.D. thesis is to empirically investigate how natural environmental stimuli are interpreted by organizational members and how their interpretation affects organizational practices and outcomes. In doing so, we dig into the local manifestations of the interrelations between business and the social and natural systems in which they are embedded. To achieve this first overarching research objective, qualitative and quantitative research methodologies are applied to explore whether and how the direct experience of natural phenomena, such as climate change effects or natural disasters, affects organizational responses and outcomes.

However, the recognition of the local interrelations between organizations and the natural environment in which they are embedded opens a Pandora's box. The risk is to get lost in the myriad of specificities and interpretations that characterize each context. In the meantime, the grand challenges of our century are global in scale and require strong coordination to solve (Ferraro, Etzion, & Gehman, 2015). Reconciling the necessary local nature of organizational practices and issues manifestation with the global scale required to address these challenges is far from trivial (Huising & Silbey, 2011; Wijen, 2014).

Accordingly, the second overarching research objective of this Ph.D. thesis is to discuss what tensions emerge between the specificities of the local context in which sustainable practices are implemented and the global scale of grand challenges, and how these tensions can be reduced. To achieve this second overarching research objective, theoretical arguments are built to discuss these tensions in the context of voluntary sustainability standards.

All in all, this Ph.D. thesis adopts an embedded view of organizations in the social and natural system. The aim is to delve into the local interrelation between organizations and the natural system in which they are embedded, to understand how the local natural phenomena and their interpretation affect organizations and how the local and the global levels can be reconciled. The main arguments are grounded both in theory and empirical evidence thereby providing a comprehensive methodological approach.

1.2 Structure and content of the Ph.D. thesis

To address these overarching objectives and explore how the adoption of an embedded view can illustrate the relationship between organizations and nature, this Ph.D. thesis includes three essays written for publication. The first two essays, Chapter 3 and Chapter 4, underline the potential of this emerging view to provide a better understanding of the local interrelationships between organizational practices and the natural system in which organizations are embedded, thus addressing the first overarching research objective. Specifically, Chapter 3 focuses on the effects of natural phenomena on organizational practices, while Chapter 4 explores their long-term consequences on organizational outcomes. The third essay, Chapter 5, moves the discussion towards a reconciliation of the local manifestations and the global scale of sustainability issues, a challenge emerging from the adoption of an embedded approach, thus addressing the second overarching research objective. The structure of the next chapters of the thesis and their roles are presented below. References are listed at the end of each chapter.

Chapter 2 contains the overarching framework of this Ph.D. thesis. Specifically, it discusses what the dominant approach is in the literature on organizational sustainability, identifies what problems emerge from this approach, and describes the alternative emerging approach, the embedded view of organizations in nature, that this research aims

to contribute and the opportunities and challenges spurring from the adoption of this emerging view, addressed in the following chapters. It concludes by presenting the specific focus, methodology, and contribution of Chapters 3, 4, and 5.

Chapter 3 adopts the embedded view of organizations described in the previous chapter to empirically examine how decision makers in vulnerable contexts experience the consequences of climate change and how their different interpretations shape the organizational adaptive responses. In doing so, this chapter addresses the first overarching research objective of this Ph.D. thesis by exploring the potential of adopting an embedded view of organizations in nature to further understand how organizational practices are shaped by natural phenomena. The chapter is based on a mixed-methods study of cocoa producers in Brazil and is entitled "The Grasshopper and the Ant: Explaining the Variation in Organizational Adaptive Responses to Climate Change."

Chapter 4 also addresses the first overarching research objective of this Ph.D. thesis. While Chapter 3 focuses on the immediate organizational responses to adverse natural phenomena, Chapter 4 aims to empirically investigate the long-term effects of experiencing natural phenomena on the organizational outcomes. Exploring quantitative data on Japanese companies in the context of the Great East Japan Earthquake, this chapter proposes the concept of organizational post-traumatic growth to capture the emerging change in organizational values and responsiveness to social needs following the natural disaster leading to a faster growth. The chapter is entitled "Organizational Post-Traumatic Growth: How Disasters Affect Responsiveness to Environmental Opportunities and Threats."

Chapter 5 addresses the second overarching research objective of this Ph.D. thesis. While the previous two chapters underline the potential of an embedded view to shed light on the relationship between organizations and nature, this chapter addresses the challenge emerging from this approach. Specifically, it aims to theoretically discuss the tensions emerging between the local implementation of sustainable practices and the need for global coordination in the context of voluntary sustainability standards. The chapter is entitled "The Challenge of Implementing Voluntary Sustainability Standards: A Dynamic Framework on the Tension between Adherence and Adaptation".

Chapter 6 presents the conclusion of this Ph.D. thesis. It includes an integrated discussion of the theoretical and practical contributions, limitations, and future research directions emerging from the previous three chapters.

1.3 References

Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulme, M. 2003. Adaptation to climate change in the developing world. ***Progress in Development Studies***, 3: 179–195.

Bocken, N. M. P., Short, S. W., Rana, P., Evans, S. 2014. A literature and practice review to develop sustainable business model archetypes. ***Journal of Cleaner Production***, 65: 42-56.

DeBoer, J., Panwar, R., & Rivera, J. 2017. Toward a place-based understanding of business sustainability: The role of green competitors and green locales in firms' voluntary environmental engagement. ***Business Strategy and the Environment***, 26(7): 940–955.

Ferraro, F., Etzion, D., & Gehman, J. 2015. Tackling grand challenges pragmatically: Robust action revisited. ***Organization Studies***, 36(3): 363-390.

Foley, J. A., Ramankutty, N., Brauman, K. A., Cassidy, E. S., Gerber, J. S., Johnston, M., Zaks, D. P. M. 2011. Solutions for a cultivated planet. ***Nature***, 478(7369): 337–342.

Guthey, G. T., Whiteman, G., & Elmes, M. 2014. Place and Sense of Place. ***Journal of Management Inquiry***, 23(3): 254–265.

Huising, R., & Silbey, S. S. 2011. Governing the gap: Forging safe science through relational regulation. ***Regulation & Governance***, 5(1): 14-42.

Marcus, J., Kurucz, E. C., & Colbert, B. A. 2010. Conceptions of the business-society-nature interface: Implications for management scholarship. ***Business & Society***, 49(3), 402-438.

Marsden, T. 2013. Sustainable place-making for sustainability science: the contested case of agri-food and urban–rural relations. ***Sustainability Science***, 8(2): 213-226.

Tilman, D., Balzer, C., Hill, J., & Befort, B. L. 2011. Global food demand and the sustainable intensification of agriculture. ***Proceedings of the National Academy of Sciences***, 108(50): 20260–20264.

Tilman, D., Cassman, K. G., Matson, P. A., Naylor, R., & Polasky, S. 2002. Agricultural sustainability and intensive production practices. ***Nature***, 418(6898): 671–677.

Shrivastava, P., & Kennelly, J. J. 2013. Sustainability and Place-Based Enterprise. ***Organization & Environment***, 26(1): 83–101.

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., … Sörlin, S. 2015. Planetary boundaries: Guiding human development on a changing planet. ***Science***, 347(6223).

Whiteman, G., & Cooper, W. H. 2000. Ecological Embeddedness. ***Academy of Management Journal***, 43(6): 1265–1282.

Wijen, F. 2014. Means versus ends in opaque institutional fields: Trading off compliance and achievement in sustainability standard adoption. ***Academy of Management Review***, 39(3): 302–323.

2.
Overarching Framework

This chapter discusses the dominant approaches to sustainability and presents the emerging approach this thesis adopts. It also presents the specific research objectives and methodologies that will be addressed in the chapters 3, 4, and 5.

2.1 Dominant approaches in the sustainability literature

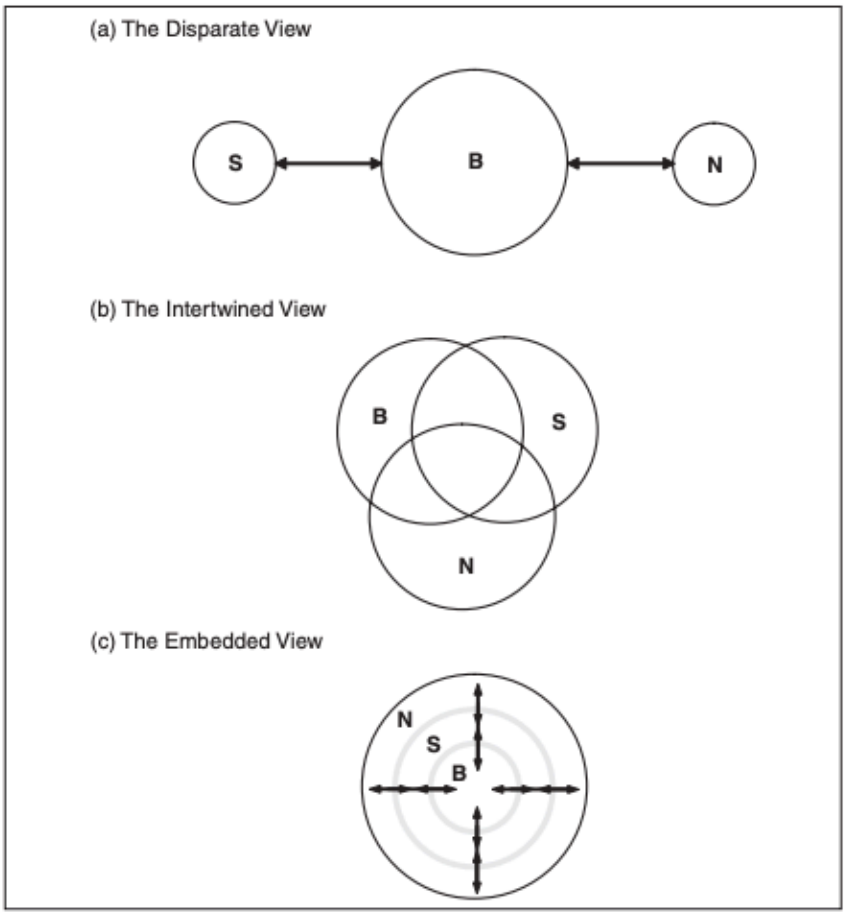
The relationship between business, nature, and society has been discussed in the management literature since the 1960s (Whiteman, Walker, & Perego, 2013). Over the years, there has been an evolution in the approaches to examine these relationships. Marcus, Kurucz, and Colbert (2010) distinguish three approaches, represented in Figure 1. The first one is a *disparate view* (Figure 1a), in which business is perceived as a separate entity from society and nature. Such a view assumes that organizations should prioritize financial or economic interests over the interests of society and nature. This approach builds on the traditional management studies and neoclassical economic orientations and it has been dominant in the management literature since its emergence. Even in the sustainability literature, scholars have long discussed the "business case" for sustainability (see Salzmann, Ionescu-Somers, & Steger, 2005 for a review), underlining and praising the potential economic and financial benefits of implementing a sustainability strategy for organizations (Ambec & Lanoie, 2008; Dixon-Fowler, Slater, Johnson, Ellstrand, & Romi, 2013; Hart & Ahuja, 1996; King & Lenox, 2001; Orsato, 2006), thus implicitly or explicitly adopting this view.

The second view is the *intertwined view* (Figure 1b), in which the social and natural systems are recognized as important and interrelated with the business sphere (Marcus et al., 2010). In this view, the business is recognized to have a positive or negative effect on the social and natural systems as well. By recognizing the interrelationships among these three systems, those who adopt this view encourage organizations, if not to achieve net positive effects, at least to limit the negative effects of business activity on nature and society, regardless of financial considerations (Figge, Hahn, Schaltegger, & Wagner, 2002; Busco & Quattrone, 2015; Pérez, Montequin, Fernandez, & Balsera, 2017). This view is dominant in the current sustainability literature, where frameworks such as the Triple Bottom Line have emerged to encourage organizations to embed environmental and social sustainability in the business agenda (Gimenez, Sierra, & Rodon, 2012; Elkington, 1998; Slaper & Hall, 2011).

Yet, Marcus and colleagues propose a third view, called *embedded view* (Figure 1c), in which businesses are understood as part of complex nested systems involving society and nature and in which each element (business, society, and nature) is acknowledged

and sustained by the other parts of the system. As a system, the three dimensions are seen as interdependent or interrelated objects comprising and functioning as a whole. In this view, nature should be prioritized over social and business concerns. While the embedded view is considered the more effective than the other two in dealing with current grand challenges, such as climate change effects (Marcus et al., 2010), it has only recently emerged in the sustainability literature. This thesis adopts this view as the one that more accurately reflects the phenomena studied. This section describes the dominant approaches to sustainability (i.e., the disparate and intertwined views), underlining the problems linked with these conceptualizations, before digging into the third emerging approach in the next section.

Figure 1. Alternate views on the relationship between business, society, and nature



From Marcus et al. (2010)
Note: B=Business, S=Society, N=Nature

The *disparate view* considers business, nature, and society as three totally distinct and independent spheres, each characterized by its own functions, elements, and processes (Marcus et al., 2010), what has been called the atomistic approach. Following a

neoclassical economic perspective, this view portrays the economy as a close system where goods are produced and exchanged (Gladwin, Kennelly, & Krause, 1995). Whatever lies outside this closed system, including the natural element, is considered exogenous. All exchanges between and within systems happen through the market. Therefore, the relationships between the economic and the social or natural systems are loosely coupled and purely transactional (Marcus et al., 2010). Various authors underline how the objective of businesses should be to maximize the financial performance and to provide value to the owners (Jensen, 2002). The arguments in support of this view are centered on the fact that owners are residual claimants (i.e., they receive what is left after other stakeholders have been rewarded), and therefore they have incentives to maximize the value of the company (Sundaram & Inkpen, 2004). As organizations generate value by responding to societal needs, promotors of this view argue that, by focusing on creating value for the owners, businesses contribute to the society as well. It is in the interest of businesses to fulfill the individual interests of consumers. Yet, when the interests of society and nature are not aligned with the business imperative, this view favors economic organizational outcomes over environmental and social aspects (Hahn & Figge, 2011).

The disparate view portrays nature as a source of resources used to generate economic value and the storage of by-products and wastes generated during production (Marcus et al., 2010). Yet, as natural resources are crucial for firm performances (Barney, 1991), some scholars propose that investing in sustainability is mainly driven by the motivation to enhance the financial performances of business (Cormier & Magnan, 2007; Milne, Tegidga, & Walton, 2009). Proponents of the "business case" for sustainability underline that implementing sustainable practices can lead to obtaining a competitive advantage, due to the enhanced company's reputation in the eyes of investors and consumers (Stanwick & Stanwick, 2000; Nakao, Amano, Matsumura, Genba, & Nakano, 2007; Mahoney & Roberts, 2007) or to the lower costs of more efficient resource usage (Pagan & Prasad, 2007; Burnett & Hansen, 2008). Yet, this approach is controversial as it ignores social and environmental issues that are hard to quantify in financial terms or that are in contradiction with the economic value objective (Hahn, Preuss, Pinkse, & Figge, 2014; Van der Byl & Slawinski, 2015).

The second approach, the *intertwined view,* has been proposed by some management scholars to overcome the lack of descriptive validity and the evident discounting of social

and natural factors emerging in the disparate view (Marcus et al., 2010). In this view, the natural and social elements are essential and interdependent from the business activity, so that the three domains should receive equal attention while carrying on any human activity (Isil & Hernke, 2017). Independently from the immediate financial returns, organizations should take into account the effects of their activities on nature and society and try to minimize the negative externalities (Dyllick & Hockerts, 2002). The three dimensions of business, society, and nature are often portrayed as three intersecting circles, partially overlapping, by the proponents of the intertwined view (Dalal-Clayton & Bass, 2002; Stead & Stead, 2009). As business value creation results from the transformation of social and natural capital, the three objectives should be pursued simultaneously, thus operating at the interception between the three spheres and eventually balancing the contraposed demands of each sphere (Cohen, Smith, & Mitchell, 2008; Stead & Stead, 2009).

In this view, nature is seen as a distinct yet interrelated system whose needs and interests should be integrated into business practices (Marcus et al., 2010). While investing in preserving the natural environment and minimizing the negative externalities of business activities on the natural environment might represent an immediate cost for the organization, proponents of this view underline how economic growth and sustainable practices do not conflict in the long-run but are rather mutually enhancing. Organizations gain legitimacy from the implementation of sustainable practices by reflecting the social norms, institutional values, and government regulations (Hoffman & Ventresca, 1999; Kolk & Pinkse, 2007; Levy & Kolk, 2002). Nature is often perceived as an increasingly important *social* issue that companies should integrate into their strategy for legitimacy purposes (Marcus et al., 2010; Meyer, 2002).

Therefore, unlike the disparate view, this view does not only acknowledge values that are economically quantifiable but it recognizes intrinsic value in protecting and preserving the natural and the social systems. Companies should therefore aim to at realizing "win-win-win" outcomes by "doing well (financially) and doing good (socially and environmentally)" (Marcus et al., 2010, p. 417). Yet, different scholars pointed out that obtaining "win-win-win" outcomes is rare and that, on the contrary, it is often the case that trade-offs and tensions emerge when trying to address the economic, social, and natural demands simultaneously (Hahn et al. 2014; Van der Byl & Slawinski, 2015).

Balancing the three domains, therefore, seems far from trivial, and the complexity favors what Hahn and Figge (2011) refer to as a "systematic lopsidedness on corporate sustainability" towards the economic imperative. In other words, businesses are likely to translate social and environmental concerns into "business as usual" (Wright & Nyberg, 2017). Despite being the dominant view in the sustainability discourses, therefore, the intertwined view is not exempt from limitations (Marcus et al., 2010).

Doubts about the potential of this widely adopted view in sustainability to guide organizations and managers on how to effectively deal with the world grand challenges, including climate change and increasing inequality, have started to emerge (Guthey et al., 2014; Guthey & Whiteman, 2009). Despite the increasing focus of organizations to integrate social and environmental concerns in their agenda (Howard-Grenville, Buckle, Hoskins, & George, 2014; Kolk, 2003), there is still corroborating evidence that businesses' profit-seeking behavior has devastating effects on the social and natural systems, making the effects of climate change and social inequality more and more severe (Marsden, 2007). One potential explanation is that this dominant view in sustainability portrays the natural, social, and economic systems as distinct domains that, although overlapping, still possess an area that is unique and separated from the rest. This image is not accurate to represent a reality in which the natural system posits the boundaries within which the social system can grow and thrive and in which the existence of the business system is dependent on functional social and natural systems (Marcus et al., 2010; Steffen et al., 2015). Moreover, this view portrays the three systems as having equal relevance and importance and does not provide a hierarchy but leaves the task on the decision maker to deal with potential tensions and trade-offs. By leaving prioritization arbitrary, the intertwined view also opens the space to continue prioritizing economic factors (Marcus et al., 2010). Therefore, while this view is more progressive than the disparate one, it fails to represent some critical features of the real-world relationship between business, society, and nature.

To overcome those issues, a third view, the embedded view, is proposed, which is discussed in the next section. Table 1 summarizes the main characteristics of the three views proposed by Marcus and colleagues, underlining their differential approaches to the interactions and priorities between the economic, natural, and social spheres.

Table 1. Main characteristics of the disparate, intertwined, and embedded views

	Disparate View	**Intertwined View**	**Embedded View**
Approach	Atomistic	Systemic	Holarchical
Business	Separable. Business is perceived as self-contained and self-regulating.	Partially separable. Equal status to society and nature.	Inseparable. A partial system contributing to societal welfare within the biosphere.
Society	Separate and exogenous. The aggregation of individual interests.	Separate but endogenous. Society is part of the stakeholder system.	Inseparable. Society includes all human systems and activities, including business.
Nature	Separate and exogenous. Source of resources and waste disposal.	Separate but endogenous. Natural capital and business value are mutually enhanced.	Inseparable. Nature is a life-sustaining system in which society is nested.
Relevant value domains	Economic	Unordered multiform: economic, social, and environmental	Ordered multiform: nature, society, business
Relational principle	Independence	Interdependence	Dependence

Adapted from Marcus et al. (2010)

2.2 A new integrated approach: Organizational embeddedness in nature

Given the limitations of both the disparate and the intertwined view in representing the real-world relationship between nature, society, and business, scholars with a stronger environmental orientation have recently proposed a third view of the relationship between these three systems. In this view, called the embedded view, these three domains are represented as nested systems (Porrit, 2006; Victor, 2008), so that business exists within society, and society is also nested in the broader system of the natural environment (Marcus et al., 2010). This view builds on and further develop the work of economists like Kenneth Boulding and Herman Daly, adapted to the corporate setting by Stead and Stead (2013). Proponents of this view point out that it is more accurate in representing reality because human activities exist and are enacted within the limits of the space and

resources provided by the Earth's natural system. It follows that considering the natural and social dimensions as distinct systems, albeit interrelated, is a distortion of reality. By taking an embedded approach, it is possible to identify a hierarchy that prioritizes the natural system, as a functional and balanced natural system allows the social system nested in it – and its subset of business activities – to exist and thrive.

To date, the embedded view is still little represented in the management and even in the sustainability literature (Marcus et al., 2010), that instead tend to portray organizations as separated from the natural and, although to a lesser extent, the social environment in which they are embedded (Guthey et al., 2014). Yet, adopting a perspective of organizations as embedded in nature brings a twofold contribution to the sustainability theories. At the *macro level*, the embedded view recognizes that the natural domain represents the "real physical limits within which business and society exists" (Marcus et al., 1010, p. 422) setting the boundaries to the social and economic systems' survival and growth (Steffen et al., 2015). Indeed, anything in the smaller nested system that weakens the larger system is undermining its own foundations (Marcus et al., 2010) and, similarly, a fallacy in the larger system undermines the smaller systems nested in it.

Following this macro-orientation, more and more scholars have stressed the necessity to adopt a systemic view of business sustainability, which is able to take into account the "whole system" in which economic activities are embedded (Giddings, Hopwood, & O'Brien, 2002). For instance, Williams, Whiteman, and Kennedy (2019) underline how organizational resilience to changes in the environment has to consider a systemic view, in order to be effective in the long term. Using the illustrative example of Unilever's palm oil production in Borneo, these authors underline how adopting a managerial vision that is not exclusively centered on the organization but on the entire socio-ecological system in which it is inserted allows to identify slow changes in the environment and to recognize the overlapping and complementarity between systems, ultimately increasing the organization's ability to respond to the external environment.

At the *micro level*, the embedded view overcomes the human/non-human separation, which is common in the post-enlightenment Western culture, and recognizes all types of human activities and relationships, including organizations, as examples of locally manifested interactions between and within natural elements (Plumwood, 2002). Embeddedness at the organizational level refers to not only the sense of embeddedness

of owners, managers, and other organizational members in the place (i.e. the physical presence and connection with the natural and social elements of the place, and the high identification and emotional attachment to it) but also to the embeddedness of the organizational activities and resources used in the natural or social elements of the place (Shrivastava & Kennelly, 2013). A sense of embeddedness in the natural elements of the place can shape managerial cognition and beliefs about the sustainability of value chains, stimulating a deeper understanding of the local socio-ecological conditions and the complexity of the managerial problems regarding sustainability, therefore initiating and guiding the implementation of sustainable practices (Guthey et al., 2014).

Following this micro-orientation, Shrivastava and Kennelly (2013) introduced the concept of place-based enterprises, enterprises whose resources, productive activities, and ownership are deeply rooted in a specific local place and whose members possess a sense of embeddedness in the place. Examples of these locally rooted enterprises are the cheese or the wine industry in France and Italy. Out of necessity, these organizations become more involved in sustainability to preserve the local resources that are essential for their identity and existence. However, more than the instrumental attachment to place, linked with the usage of resources, what motivates higher sustainability of practices seems to be the emotional attachment to nature (Kibler, Fink, Lang, & Muñoz, 2015). Similarly, Whiteman and Cooper (2011) found how embeddedness in the social and ecological systems helps to make sense of and interpret weak environmental cues, therefore fostering a higher awareness and sensitivity towards emerging ecological problems and a higher ability to spot and address them in a timely manner.

Both macro and micro-level studies underline an important element. Organizations are highly affected by the elements of the natural environment in which they are embedded and a higher sense of embeddedness in nature is relevant for responding to the changes in the natural environment surrounding the organization (DeBoer, Panwar, & Rivera, 2017; Whiteman & Cooper, 2000). Organizational response cannot be separated from members' interpretation of the phenomena occurring in the social and natural systems in which they are embedded. The dominant views in the sustainability literature have failed to accurately represent the existential dependency between human activities and the natural context in which they are embedded. The negative consequences of this oversight are visible: at a time when organizations are increasingly challenged by climate change,

natural disasters, and pandemics, current management theories do not seem to be able to guide organizations towards better understanding and effective responses.

Various opportunities to provide relevant contributions to sustainability and management theories spur from this view. The embedded views reveals how society (and therefore organizations) are at one with the natural environment in which they are embedded, providing an alternative, more accurate, view of the relationship between nature, society, and business. This view paves the way to a better understanding of how natural phenomena affect, enable, and constrain organizations, with the potential to develop important contributions on how organizations perceive and interpret the changes in the natural environment in which they are embedded and how this interpretation, in turn, affect organizational responses to these changes.

Yet, the embedded view is not exempt from potential challenges, and especially the need to combine local interpretations and responses with a need of global coordination to ensure that the social and business systems are not, as a whole, undermining the natural one. As much as current grand challenges such as climate change are on a global scale, this view underlines how their manifestations, such as recurrent droughts or floods, are local (Marsden, 2012). Organizational responses depend on the local actors' interpretation and framing of the changes and dynamics of the social and natural systems in which they are embedded. At the macro level, however, the entire system of human activity can unfold and flourish only if it remains within the limits imposed by the systems in which it is embedded. If human activities as a whole undermine the functioning of the natural system, they undermine their own possibility to exist. The challenge of the embedded view is therefore to reconcile the micro-manifestations of the relationship between organizations and nature with a need for global coordination to ensure that the limits imposed by the planet are not exceeded, jeopardizing the viability of the social and business systems.

In sum, as this section underlines, the discussion around sustainability cannot prescind from recognizing the embeddedness of business and social activities into the natural environment. At the macro level, this view recognizes that human activity exists within the resources and limits of the natural system, which it is therefore a priority to preserve.

At the micro level, it has the potential to show how organizational response to natural phenomena depends on the interpretation of these phenomena at the local level. While both approaches open up numerous opportunities for a deeper understanding of the relationship between organizations and nature, reconciling the two approaches presents a challenge for this view. The next paragraph digs into an opportunity and a challenge of such view, illustrating the gaps in the literature that this thesis addresses.

2.3 An opportunity and a challenge for the embedded view

2.3.1 Organizational members' interpretation and response to natural phenomena

The view of organizations as nested in the social and natural system requires scholars to reevaluate many of the preconceptions and assumptions of management literature. This view can, better than the dominant approaches, assist scholars in investigating how organizations can carry on their activities within the limits to their existence and survival set by the social and natural systems. One potential development, the most considered so far, involves a more detailed understanding of how organizations affect the social and natural systems in which they are embedded, leading to the development of more accurate indicators and outcomes (Marcus et al., 2010). On the one hand, scholars examine companies' role in anthropogenic climate change, deforestation, and unsustainable resource usage (Ser Huay Lee et al., 2014), and, on the other hand, they discuss their role in reforestation, Corporate Social Responsibility (CSR) initiatives, and ecological restoration (Lambin et al., 2018). Yet, another, less explored, research avenue stemming from such a view is to explore the other side of the relationship between organizations and nature, that is how organizations interpret the changes in the natural environment in which they are embedded and adjust their practices accordingly.

This avenue is particularly promising and timely now that pandemic viruses, earthquakes, hurricanes, sea level rise, frequent flooding, extreme droughts, and other natural phenomena are challenging, more than ever, organizational survival (Alexander, 2006). Learning how to respond to these disasters is not anymore an option, but an imperative for survival. Only in the United States two months after the outbreak of the COVID-19 pandemic, 2% of businesses had already closed forever (Bartik et al., 2020). Despite the

urgency to deal with these phenomena through radical actions, organizational responses have been inadequate (Wright & Nyberg, 2017). An embedded view of organizations in the natural system can, better than the other two approaches, elucidate how the members of the organization interpret the changes in the natural environment surrounding the organization and their potential effects on the organization and how this interpretative process enables or hinders different organizational outcomes. This view is necessary not only in order to distinguish the multiple trajectories through which responses are implemented, but also *what* responses are implemented, with important implications.

Indeed, while the literature focuses on the study of antecedents to organizational response to natural phenomena, such as the effects of climate change or natural disasters, at the organizational (Scott & McBoyle, 2007; Scholten, Scott, & Fynes, 2019) and institutional (Eakin, 2000; Pinkse & Kolk, 2012) levels, in-depth studies of the interpretation of organizational members and their perceptions of changes and phenomena in the surrounding natural environment have only recently started to emerge (Linnenluecke, Griffiths, & Winn, 2013). This oversight is surprising because, as discussed, the natural phenomena of the environment in which human activities are embedded exert a strong influence over the practices implemented by the organization (DeBoer et al., 2017; Whiteman & Cooper, 2000) through the interpretation and emotional reaction of organizational members (Kibler et al., 2015). Through the adoption of the embedded view, it is thus possible to shed light on these dynamics and delve into what kind of responses, if any, are enacted by the members of the organization.

Chapters 3 and 4 of this thesis aim at addressing this gap by exploring how the natural phenomena occurring in the organizational environment are interpreted by the organizational members and how, in turn, this interpretation shapes the organizational responses and the implementation of sustainable practices.

Specifically, Chapter 3 focuses on the interpretation of climate change effects by vulnerable organizations. Anthropogenic climate change is the biggest challenge humanity is facing (Wright & Nyberg, 2017). This is especially true for the rural population in developing countries, where livelihood is highly dependent on natural resources that are increasingly threatened by climate change (Adger et al., 2003). In this context, the impact of extreme climate events perpetuates poverty and inequality (Dercon,

2002) and threatens food security for the growing population, and the sustainability of many supply chains (Shiferaw, Prasanna, Hellin, & Bänziger, 2011). However, the implementation of these practices as a reaction to environmental struggles depends on how vulnerable organizational members understand and frame the ongoing changes in the physical world in which they are embedded and the risks associated with them (Adger et al., 2003). Through an embedded view of organizations in nature, it is possible to distinguish different types of adaptive responses to climate change (ecosystem-based, technology-based, and maladaptive), with different temporal orientation and also different effects on the natural system in which the organization is embedded. A cognitive model that builds on Protection Motivation Theory is developed to explain the difference in adaptive responses, based on the differences in risk and coping appraisals and the psychological barriers to these two processes. Based on these results, the chapter distinguishes decision makers within organizations into different archetypes. The setting of this project is Brazilian cocoa producers, highly affected by the consequences of climate change. Inferences are developed from interviews conducted with producers and experts collected during my two months field visit in Bahia and four survey rounds collected from over 3000 producers over four years. The main contribution of this work is to show how adaptation is not binary: different adaptive responses require different cognitive factors, thus providing a more nuanced approach to climate change adaptation with relevant policy and managerial implications to foster adaptive responses with long-term positive effects on the natural environment.

Chapter 4 focuses on the long-lasting consequences of the experience and interpretation of disruptions in the natural environment in which they are embedded, beyond the immediate adaptive response analyzed in Chapter 3. In the aftermath of a natural disaster affecting the organization, anecdotical evidence shows that some companies are not only able to recover and return to the pre-disaster status quo, but they are also able to boost their capacity to face future similar threats (Rerup, 2009) and to re-innovate and "build back better" (Christianson, Farkas, Sutcliffe, & Weick, 2009). It follows that dealing with natural phenomena is not merely a matter of adapting and surviving in the face of disruptions, but it can also generate a more extensive set of desirable outcomes for the affected organization. Specifically, this chapter explores how organizations can be built back better after a disaster, with improved vision, capabilities, and responsiveness to their environment, using survey and database data on 545 companies. The context of this study are Japanese companies affected by the Great East Japan Earthquake (GEJE) in 2011.

Results indicate that the companies affected the most by GEJE experienced faster revenue growth, compared to the pre-disaster level, in the nine years following the disaster. The mechanism behind organizational post-traumatic growth is identified with a change in the organizational values and beliefs to adjust to the new worldviews emerging after a disaster that increases the organizational sensitivity to the environment. By developing more altruistic values and beliefs, the organization is better able to respond to social needs such as population aging and growing environmentalism. This study is the first study exploring empirically how organizations can learn from disasters beyond preparedness to face future disruptions, thus introducing in the literature the concept of organizational post-traumatic growth, building on the parallel literature at the individual level. This chapter also offers important managerial implications, especially in light of the COVID-19 pandemics, by proposing insights on the conditions under which, and mechanisms through which, organizational post-traumatic growth occurs.

Together, these two chapters adopt an embedded perspective to analyze how organizational practices are affected by the natural environment in which they are embedded through the perception and interpretation of organizational members. Therefore, they address the first overarching objective of this thesis that aims at exploring how the stimuli of the natural system in which the organization is embedded are interpreted by organizational members and how this interpretation affects the implementation of organizational practices. In doing so, we dig into the local manifestations of the interrelations between business and the social and natural systems in which they are embedded, underlining the immediate and long-term responses to natural phenomena enacted by the organizations affected by them. Yet, although the embedded view allows for a more accurate account of the local relationship between the natural environment surrounding the organization, and the changes in it, as well as the organizational practices, there are also potential challenges emerging from this view, presented next

2.3.2 Reconciling local embeddedness and global challenges

One of the challenges that adopting an embedded view posits is that the relationship between a specific organization and the natural environment in which it is embedded necessarily develops and manifests at the local level, where the natural phenomena and

the organizational activities take place. Yet, when we move from the organizational level to the system level, there is a need to coordinate all the different local relationships to ensure that the whole business system is not collectively undermining the social and natural system in which it is embedded (Marcus et al., 2010). As discussed, weakening the natural system would be, for the systems embedded in it, a way to destroy its own foundations. In other words, there is a mismatch between the lived experience of embeddedness in nature by members of the organization, which is necessarily local, and the fact that the natural system, as well as the business system, is made up of the sum of all these local realities. While interrelations between organizations and nature happen at the local level, the constraints and limits placed on the expansion and survival of systems embedded in the natural system are at the global level (Ferraro, Etzion, & Gehman, 2015).

There is therefore a need to coordinate the entire business system to guarantee that the boundaries of the natural system are not exceeded, or at least that the natural system is not, as a whole, irreparably harmed. As national governments failed to provide such coordination at the global level (Aravind & Christmann, 2011; Montiel, Christmann, & Zink, 2019), voluntary sustainability standards have been often proposed as an alternative to encourage such coordination and promote the wide geographic diffusion of practices aimed at limiting the damages to the natural system (Behnam & MacLean, 2011; Gilbert, Rasche, & Waddock, 2011). Yet, even in the context of voluntary sustainability standards, reconciling the local manifestation of embeddedness in nature and organizational practices with the global need for coordination and standardization is problematic (Huising & Silbey, 2011; Wijen, 2014). As this tension between local level specificities and the requirement of global coordination to address global challenges has been little explored to date, the second overarching research objective of this Ph.D. thesis is to uncover this tension and especially its dynamic evolution in the context of voluntary sustainability standards.

Specifically, Chapter 5 applies a knowledge transfer lens to theorize why voluntary sustainability standards often do not live up to their potential of guiding organizations towards ethical behavior and accountability for their actions (Behnam & MacLean, 2011; Gilbert et al., 2011). Although these standards remain an important alternative to national and international governance to regulate social and environmental performances of organizations, empirical evidence shows a limited implementation of their requirements

and uneven effectiveness (Wijen, 2014). To explain these outcomes, a conceptual framework is developed that articulates different phases in the implementation of voluntary sustainability standards (adoption and integration phases) and the tensions emerging within and between phases. These tensions reveal an underlying tension between the need to adapt to local specificities, where nature and the organization interact, and the need to adhere to universal imperatives to protect the natural system as a whole, a business priority for the embedded view of organizations. This framework provides a better conceptual understanding of sustainability standards implementation and it reveals how decoupling frequently occurs between the formal adoption of voluntary sustainability standards and their effective implementation as a result of the above-mentioned tension between adherence to universal rules and adaptation to local context specificities. After the identification of such tension and its dynamic evolution, this chapter applies the framework for different types of sustainability standards, paving the way to tailored solutions able to boost the standards' effectiveness and to recouple their formal adoption with the outcome of diffusing a desirable set of practices around the globe, with important practical implications.

In sum, adopting a perspective in which the organization is nested in the nature system allows to dig deeply into the relationship that develops between organizational members and the natural environment surrounding their activities, especially with regard to the interpretation of and subsequent response to changes in the natural environment, such as the effects of climate change or natural disasters. Following this promising yet little explored avenue, the first overarching objective of this work aims at uncovering this relationship using qualitative and quantitative methods from two different empirical contexts: The interpretation and responses of Brazilian cocoa producers to the effects of climate change (Chapter 3) and the change in values and beliefs and the potential of achieving organizational post-traumatic growth for Japanese organizations following the Great East Japanese Earthquake (Chapter 4). Yet, digging into the local interrelationships between the natural element and organizational practices conflicts with the need to coordinate globally to guarantee that the whole natural system is not compromised, preventing serious consequences for the business and social systems embedded in it. Therefore, the second objective is to delve into these conflicting demands. Chapter 5 develops a theoretical framework to uncover and unfold this tension in the context of voluntary sustainability standards, guiding how to overcome it. Both the overarching and

the specific research objectives of this Ph.D. thesis and the methodologies with which these objectives are addressed are presented in Table 2.

Table 2. Research objectives and methodologies

Ch.	Overarching research objectives	Specific research objectives	Methodologies	Context
3	To empirically investigate how organizational members interpret the stimuli of the natural environment in which they are embedded, and how this interpretation, in turn, shapes organizational (sustainable) practices.	To empirically investigate how decision makers within organizations cognitively frame the effects of climate change affecting them and how this interpretation leads to different adaptive responses for the organization, with different time horizons and effects on nature.	Qualitative and quantitative	Cocoa producers in South of Bahia, Brazil
4		To empirically examine the long-term consequences of a natural disaster on organizations and especially the opportunity to achieve organizational post-traumatic growth.	Quantitative	Japanese companies affected by the Great East Japan Earthquake
5	To theoretically examine the tension emerging between the local manifestation of the relationship between organizations and nature and the need to reach global coordination	To adopt a knowledge transfer lens to theoretically describe in a cohesive framework the different phases of voluntary sustainability standards implementation and uncover how the tension between the need to adapt to local specificities and to adhere to universal rules plays out in each phase.	Conceptual	Global supply chains

As the table shows, this Ph.D. thesis applies various methods across varied contexts to pursue the research objectives while adopting a view of organizations as embedded in the wider natural system. The subsequent chapters 3, 4, and 5 present the core empirical and conceptual work that sustains this Ph.D. thesis, pursuing the overarching goal to contribute to literature on the relationship between organizations and nature, before the thesis is concluded with the chapter-specific and transversal theoretical contributions and implications in the final chapter.

2.4 References

Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulme, M. 2003. Adaptation to climate change in the developing world. ***Progress in Development Studies***, 3: 179–195.

Alexander D. E. 2006. Globalization of disaster: trends, problems and dilemmas. ***Journal of International Affairs,*** 59(2), 1–22.

Ambec, S., & Lanoie, P. 2008. Does it pay to be green? A systematic overview. ***The Academy of Management Perspectives***, 45-62.

Aravind, D., & Christmann, P. 2011. Decoupling of standard implementation from certification: does quality of iso 14001 implementation affect facilities' environmental performance? ***Business Ethics Quarterly***, 21: 73–102.

Barney, J. 1991. Firm resources and sustained competitive advantage. ***Journal of Management***, 17, 99-120.

Bartik, A.W., Bertrand, M., Cullen, Z.B., Glaeser, E.L., Luca, M. and Stanton, C.T. 2020. How are small businesses adjusting to COVID-19? Early evidence from a survey. ***National Bureau of Economic Research***.

Behnam, M., & MacLean, T. L. 2011. Where is the accountability in international accountability standards?: A decoupling perspective. ***Business Ethics Quarterly***, 21(1): 45-72.

Burnett, R. & Hansen, D. 2008. Eco-efficiency: Defining a role for environmental cost management. ***Accounting, Organizations and Society***, 33(6), 551-581.

Busco, C., & Quattrone, P. 2015. Exploring how the balanced scorecard engages and unfolds: Articulating the visual power of accounting inscriptions. ***Contemporary Accounting Research***, 32(3), 1236-1262.

Christianson, M. K., Farkas, M. T., Sutcliffe, K. M., & Weick, K. E. 2009. Learning through rare events: significant interruptions at the Baltimore & Ohio Railroad Museum***. Organization Science***, 20(5), 846-860.

Cohen, B., Smith, B., & Mitchell, R. 2008. Toward a sustainable conceptualization of dependent variables in entrepreneurship research. ***Business Strategy and the Environment***, 17, 107-119.

Cormier, D., & Magnan, M. 2007. The revisited contribution of environmental reporting to investors' valuation of a firm's earnings: An international perspective. ***Ecological Economics***, 62(3), 613-626.

Dalal-Clayton, B., & Bass, S. 2002. ***Sustainable development strategies: a resource book*** (No. P01 201). OECD, París (Francia) UNDP, New York (EUA).

DeBoer, J., Panwar, R., & Rivera, J. 2017. Toward A Place-Based Understanding of Business Sustainability: The Role of Green Competitors and Green Locales in Firms' Voluntary Environmental Engagement. ***Business Strategy and the Environment***, 26(7): 940–955.

Dercon, S. 2002. Income Risk, Coping Strategies, and Safety Nets. ***The World Bank Research Observer***, 17(2), 141–166.

Dixon-Fowler, H. R., Slater, D. J., Johnson, J. L., Ellstrand, A. E., & Romi, A. M. 2013. Beyond "does it pay to be green?" A meta-analysis of moderators of the CEP–CFP relationship. ***Journal of Business Ethics***, 112(2), 353-366.

Dyllick, T., & Hockerts, K. 2002. Beyond the business case for corporate sustainability. ***Business Strategy and the Environment***, 11(2), 130-141.

Eakin, H. 2000. Smallholder Maize Production and Climatic Risk: A Case Study from Mexico. ***Climate Change***, 45(1), 19-36

Elkington, J. 1998. Partnerships from cannibals with forks: The triple bottom line of 21st-century business. ***Environmental Quality Management***, 8(1), 37-51.

Ferraro, F., Etzion, D., & Gehman, J. 2015. Tackling grand challenges pragmatically: Robust action revisited. ***Organization Studies***, 36(3): 363-390.

Figge, F., Hahn, T., Schaltegger, S., & Wagner, M. 2002. The sustainability balanced scorecard–linking sustainability management to business strategy. ***Business Strategy and the Environment***, 11(5), 269-284.

Giddings, B., Hopwood, B., & O'brien, G. 2002. Environment, economy and society: fitting them together into sustainable development***. Sustainable Development***, 10(4), 187-196.

Gilbert, D. U., Rasche, A., & Waddock, S. 2011. Accountability in a global economy: The emergence of international accountability standards. ***Business Ethics Quarterly***, 21(1): 23-44.

Gimenez, C., Sierra, V., & Rodon, J. 2012. Sustainable operations: Their impact on the triple bottom line. ***International Journal of Production Economics***, 140(1), 149-159.

Gladwin, T. N., Kennelly, J. J., & Krause, T. S. 1995. Shifting paradigms for sustainable development: Implications for management theory and research. ***Academy of Management Review***, 20(4), 874-907.

Guthey, G. T., Whiteman, G., & Elmes, M. 2014. Place and Sense of Place. ***Journal of Management Inquiry***, 23(3): 254–265.

Guthey, G. T., & Whiteman, G. 2009. Social and ecological transitions: Winemaking in California. ***Emergence: Complexity and Organization***, 11(3), 37-48.

Hahn, T., & Figge, F. 2011. Beyond the bounded instrumentality in current corporate sustainability research: Toward an inclusive notion of profitability. ***Journal of Business Ethics,*** 104(3), 325-345.

Hahn, T., Preuss, L., Pinkse, J., & Figge, F. 2014. Cognitive frames in corporate sustainability: Managerial sensemaking with paradoxical and business case frames. ***Academy of Management Review***, 39(4), 463-487.

Hart, S. L., & Ahuja, G. 1996. Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance. ***Business Strategy and the Environment***, 5(1), 30-37.

Hoffman, A. J., & Ventresca, M. J. 1999. The institutional framing of policy debates: Economics versus the environment. ***American Behavioral Scientist***, 42, 1368-1392.

Howard-Grenville, J., Buckle, S. J., Hoskins, B. J., & George, G. 2014. Climate change and management: From the Editors. ***Academy of Management Journal***, 57, (3), 615-623.

Huising, R., & Silbey, S. S. 2011. Governing the gap: Forging safe science through relational regulation. ***Regulation & Governance***, 5(1): 14-42.

Isil, O., & Hernke, M. T. 2017. The triple bottom line: A critical review from a transdisciplinary perspective. ***Business Strategy and the Environment***, 26(8), 1235-1251.

Jensen, M. C. 2002. Value maximization, stakeholder theory, and the corporate objective function. ***Business Ethics Quarterly***, 12, 235-256.

Kibler, E., Fink, M., Lang, R., & Muñoz, P. 2015. Place attachment and social legitimacy: Revisiting the sustainable entrepreneurship journey. ***Journal of Business Venturing Insights***, 3, 24-29.

King, A. A., & Lenox, M. J. 2001. Does it really pay to be green? An empirical study of firm environmental and financial performance: An empirical study of firm environmental and financial performance. ***Journal of Industrial Ecology***, 5(1), 105-116.

Kolk, A. 2003. Trends in sustainability reporting by the Fortune Global 250. ***Business Strategy and the Environment***, 12, 279-291.

Kolk, A., & Pinkse, J. 2007. Multinationals' political activities on climate change. ***Business & Society***, 46, 201-228.

Lambin, E. F., Gibbs, H. K., Heilmayr, R., Carlson, K. M., Fleck, L. C., Garrett, R. D., … Walker, N. F. 2018. The role of supply-chain initiatives in reducing deforestation. ***Nature Climate Change***, 8(2), 109–116.

Levy, D. L., & Kolk, A. 2002. Strategic responses to global climate change: Conflicting pressures on multinationals in the oil industry. ***Business and Politics***, 4, 275-300.

Linnenluecke, M. K., Griffiths, A., & Winn, M. I. 2013. Firm and industry adaptation to climate change: a review of climate adaptation studies in the business and management field. ***Wiley Interdisciplinary Reviews: Climate Change***, 4(5), 397-416.

Mahoney, L., & Roberts, R. W. 2007. Corporate social performance, financial performance and institutional ownership in Canadian firms. ***Accounting Forum***, 31(3), 233-253.

Marcus, J., Kurucz, E. C., & Colbert, B. A. 2010. Conceptions of the business-society-nature interface: Implications for management scholarship. ***Business & Society***, 49(3), 402-438.

Marsden, T. 2013. Sustainable place-making for sustainability science: the contested case of agri-food and urban–rural relations. ***Sustainability Science***, 8(2): 213-226.

Meyer, J. W. (2002). Foreword. In A. J. Hoffman & M. J. Ventresca (Eds.), ***Organizations, policy and the natural environment: Institutional and strategic perspectives*** (pp. xiii-xvii). Stanford, CA: Stanford University Press.

Milne, M.J., Tegidga, H., & Walton, S. 2009. Words not actions! The ideological role of sustainable development reporting. ***Accounting, Auditing and Accountability Journal***, 22(8), 1211-1257.

Montiel, I., Christmann, P., & Zink, T. 2019. The effect of sustainability standard uncertainty on certification decisions of firms in emerging economies. ***Journal of Business Ethics***, 154(3): 667-681.

Nakao, Y, Amano, A, Matsumura, K, Genba, K, & Nakano, M. 2007. Relationship between environmental performance and financial performance: An empirical analysis of Japanese corporations. ***Business Strategy and the Environment***, 16(2), 106-118.

Orsato, R. J. 2006. Competitive environmental strategies: when does it pay to be green?. ***California Management Review***, 48(2), 127-143.

Pagan, B. & Prasad, P. 2007. The Queensland food eco-efficiency project: Reducing risk and improving competitiveness. ***Journal of Cleaner Production***, 15(8), 764-771.

Pérez, C. Á., Montequín, V. R., Fernández, F. O., & Balsera, J. V. 2017. Integration of balanced scorecard (BSC), strategy map, and fuzzy analytic hierarchy process (FAHP) for a sustainability business framework: a case study of a Spanish software factory in the financial sector. ***Sustainability***, 9(4), 527.

Pinkse, J., & Kolk, A. 2012. Addressing the climate change—sustainable development nexus: The role of multistakeholder partnerships. ***Business & Society***, 51(1), 176-210.

Plumwood, V. 2002. ***Feminism and the Mastery of Nature***. Routledge.

Porrit, J. 2006. ***Capitalism: As if the world matters***. Sterling, VA: Earthscan.

Rerup, C. (2009). Attentional triangulation: learning from unexpected rare crises. ***Organization Science***, 20(5), 876-893.

Salzmann, O., Ionescu-Somers, A., & Steger, U. 2005. The business case for corporate sustainability: literature review and research options. ***European Management Journal***, 23(1), 27-36.

Scholten, K., Sharkey Scott, P., & Fynes, B. 2019. Building routines for non-routine events: supply chain resilience learning mechanisms and their antecedents. ***Supply Chain Management: An International Journal***, 24(3), 430-442.

Scott, D., & McBoyle, G. 2007. Climate change adaptation in the ski industry. ***Mitigation and Adaptation Strategies for Global Change***, 12(8), 1411.

Ser Huay Lee, J., Abood, S., Ghazoul, J., Barus, B., Obidzinski, K., Pin Koh, L., 2014. Environmental Impacts of Large-Scale Oil Palm Enterprises Exceed that of Smallholdings in Indonesia. ***Conservation Letters***, 7(1), 25–33.

Shiferaw, B., Prasanna, B. M., Hellin, J., & Bänziger, M. 2011. Crops that feed the world: Past successes and future challenges to the role played by maize in global food security. ***Food Securit***y, 3(3), 307–327.

Shrivastava, P., & Kennelly, J. J. 2013. Sustainability and Place-Based Enterprise. ***Organization & Environment***, 26(1), 83–101.

Slaper, T. F., & Hall, T. J. 2011. The triple bottom line: What is it and how does it work. ***Indiana Business Review,*** 86(1), 4-8.

Stanwick, S.D., & Stanwick P. A. 2000. The relationship between environmental disclosures and financial performance: An empirical study of US firms. ***Eco-Management and Auditing***. 7(4), 155-164.

Stead, J. G., & Stead, W. E. 2009. ***Management for a small planet***. Armonk, NY:M. E. Sharpe.

Stead, J. G., & Stead, W. E. (2013). ***Sustainable strategic management***. M.E. Sharpe.

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., … Sörlin, S. 2015. Planetary boundaries: Guiding human development on a changing planet. ***Science***, 347(6223).

Sundaram, A. K., & Inkpen, A. C. 2004. The corporate objective revisited. ***Organization Science***, 15(3), 350-363.

Van der Byl, C. A., & Slawinski, N. 2015. Embracing tensions in corporate sustainability: A review of research from win-wins and trade-offs to paradoxes and beyond. ***Organization & Environment***, 28(1), 54-79.

Victor, P. A. 2008. ***Managing without growth: Slower by design, not disaster***. Northampton, MA: Edward Elgar.

Whiteman, G., & Cooper, W. H. 2000. Ecological Embeddedness. ***Academy of Management Journal***, 43(6), 1265–1282.

Whiteman, G., & Cooper, W. H. 2011. Ecological sensemaking. ***Academy of Management Journal,*** 54(5), 889-911.

Whiteman, G., Walker, B., & Perego, P. 2013. Planetary boundaries: Ecological foundations for corporate sustainability. ***Journal of Management Studies***, 50(2), 307-336.

Wijen, F. 2014. Means versus ends in opaque institutional fields: Trading off compliance and achievement in sustainability standard adoption. ***Academy of Management Review***, 39(3): 302–323.

Williams, A., Whiteman, G., & Kennedy, S. 2019. Cross-scale systemic resilience: Implications for organization studies. ***Business & Society***, 60(1) 95–124.

Wright, C., & Nyberg, D. 2017. An inconvenient truth: How organizations translate climate change into business as usual. ***Academy of Management Journal***, 60(5), 1633-1661.

3.

The Grasshopper and the Ant: Explaining the Variation in Organizational Adaptive Responses to Climate Change

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This chapter aims to address the first overarching research objective of this Ph.D. thesis, by empirically investigating how the decision makers experience and interpretation of the local effects of climate change determine the type of adaptive responses to it.

3.1 Abstract

Increasingly visible effects of climate change highlight the need to understand how organizational decision makers respond to this challenge. Although we know that decision makers' experience and interpretation of climate change crucially influences the likelihood to engage in adaptation, little is known about what types of adaptive responses these factors enable and through what mechanism adaptive responses emerge. Drawing on a four-year longitudinal and unique dataset of over 3000 agricultural producers in Brazil, a particularly vulnerable context to climate change, and using a mixed-methods approach, we develop a framework to explain why decision makers vary in their climate change adaptation responses. We consider three types of adaptive responses (*ecosystem-based, technology-based, and maladaptive*) with different temporal orientations and ecosystem effects. Drawing on Protection Motivation Theory (PMT), we examine two crucial mechanisms (*risk appraisal* and *coping appraisal*) through which experiencing the direct effects of climate change shapes the choice of adaptive responses, and we also delineate psychological barriers that influence these two mechanisms. A key finding is that coping appraisal is more likely to contribute to long-term adaptive responses than risk appraisal. Based on our findings, we develop a framework that distinguishes archetypes of decision makers based on their risk and coping appraisal and that suggests which types of adaptive responses they are likely to take. We conclude with the theoretical and practical implications for the study of organizational responses to climate change.

Keywords: climate change adaptation, risk appraisal, coping appraisal, mixed-methods, Brazil.

3.2 Introduction

"What!" cried the Ants in surprise, "haven't you
stored anything away for the winter? What in the world
were you doing all last summer?"
"I didn't have time to store up any food,"
whined the Grasshopper; "I was so busy making music
that before I knew it the summer was gone."
Aesop, 620-564 BC

The consequences of climate change are already inexorably altering the organizational environment, placing unprecedented stress on many organizations and sectors (Howard-Grenville et al., 2014). Especially in tropical countries, adaptation is no longer a strategic choice (Gasbarro et al., 2016; Porter & Reinhardt, 2007), but a prerogative for the survival of entire supply chains. Organizational activities are increasingly threatened by scarce access to resources, such as water and fertile land (Adger et al., 2003; Freier et al., 2011; Harris et al., 2006; Linnenluecke et al., 2011; Shiferaw et al., 2011), as well as more frequent floods, wildfires, and hurricanes (Alexander, 2006). Although these climate change trends are likely to worsen, there is a lot of variation in the type and effectiveness of adaptive responses implemented (Galbreath, 2011). Much like the characters in Aesop's fable, some decision makers, like the ants, invest in advance to be prepared even for particularly adverse consequences of climate change, while others, like the grasshopper, implement more timid and marginal responses that will become ineffective with more severe effects of climate change (Park et al., 2012). For example, an agricultural producer facing desertification may invest in more resilient crops or irrigation technologies that are effective in the medium-term, with only mild effects of climate change, or in protecting springs and waterways as a longer-term solution.

Adaptation is defined as the adjustment of actions in response to actual or expected climatic stimuli to moderate harm or to exploit opportunities (IPCC, 2012). Several studies have sought explanations for the variety of organizational responses to climate change (see Linnenluecke et al., 2013 for a review). Scholarly efforts to solve this puzzle have focused on institutional-level factors (Eakin, 2000: Pinkse & Kolk, 2012a), organizational-level factors (Scott & McBoyle, 2007), or industry-level factors (Agrawala et al., 2011). Although such a radical and unprecedented change requires a new approach to decision making (Howard-Grenville et al., 2014), the micro level of analysis is still understudied (Linnenluecke et al., 2013). The few studies that consider

organizational decision makers' experience and perception (Berkhout, 2012; Grammatikopoulou et al., 2016; Pinkse & Gasbarro, 2019; Tam & McDaniel, 2013; Tucker et al., 2010; Slawinski et al., 2017) tend to focus on the choice between adapting or not adapting to climate change instead of the choice between different adaptive responses that vary in scope and time orientation. This binary view of adaptation is inadequate to capture what influences the decision makers' choices among different alternative adaptation pathways that are often viable for organizations. As each response has a different temporal orientation and different effects on the organization and the ecosystem, it behooves scholars to shed light not only on what drives adaptive responses, but also on what drives *long-term* adaptive responses.

This study aims to bridge this gap by developing a framework to understand how decision makers affected by the consequences of climate change engage in different types of adaptive responses. Specifically, we aim to answer the following overarching question: "*What explains what type of adaptive response decision makers are most likely to pursue in response to the effects of climate change?*" To answer this question, we use a mixed-methods approach that combines quantitative and qualitative empirical analyses of cocoa producers in Bahia, Brazil. In the first study, we conduct a four-round survey of a large sample of cocoa producers (N = 3045) to track the evolution of adaptive responses over four years. We consider three types of adaptive responses: (1) *ecosystem-based*, such as reforestation near water sources; (2) *technology-based*, such as implementing an irrigation system; and (3) *maladaptive*, such as cutting forest trees to make room for livestock. We draw on Protection Motivation Theory (PMT) (Rogers, 1975, 1983) to analyze two main mechanisms through which the experience of climate change affects adaptive response: an assessment of future risk (risk appraisal) and an assessment of one's ability to cope with it (coping appraisal). Results suggest that these two mechanisms have different effects on the type of response implemented: while coping appraisal encourages all types of responses, risk appraisal predominantly leads to short-term responses. In the second study, we collect qualitative data from a purposively selected subsample of producers and experts (N=44), to further refine the mechanisms by examining psychological barriers that influence risk and coping appraisals, such as denial or fatalism. Drawing on both analyses, we develop a dynamic framework that distinguishes decision makers into different archetypes and explains their likelihood to engage in each type of adaptive response.

Our study has the potential to make several contributions to the literature on organizational adaptation to climate change. First, by considering different types of adaptive responses with varying effects and temporal orientation, we move beyond a binary view of adaptation. In doing so, we depart from previous literature by incorporating not only the time horizon but also the effects of adaptive responses not only on the organization but also on the ecosystem. In contrast, most previous studies have taken an organization-centered approach to evaluate the effectiveness of adaptive responses (Okereke et al., 2012). Second, by integrating PMT into the management literature, we delve into decision makers' interpretation of the effects of climate change to distinguish two different mechanisms, risk and coping appraisals, that lead to adaptive responses. We also highlight how these mechanisms have different effects on the types of responses implemented and the psychological barriers affecting each of them. While previous studies often propose risk appraisal as a powerful catalyst for adaptation (Bazerman, 2006; Berkhout, 2012; Bleda & Shackley, 2008; Pinkse & Gasbarro, 2019), our fine-grained approach reveals that long-term adaptive responses are instead primarily favored by coping appraisal, scarcely considered in the literature (Grothmann & Patt 2005). Notably, our contributions build on a rich unique dataset from a context—Bahia in Brazil—where organizations and decision makers already experience major effects of climate change, such as severe and recurring droughts. Although vulnerable contexts, such as the one studied here, represent more informative and compelling settings to investigate adaptation (Adger et al., 2003; Pinkse & Kolk 2012b), most adaptation studies so far have been conducted in temperate climates where the need for adaptation is still marginal (Linnenluecke et al., 2013).

The chapter is organized as follows. In the next section, we review the literature on organizational adaptation to climate change, highlighting the different types of adaptive responses that organizations can implement, and we introduce Protection Motivation Theory, used to develop our hypotheses. Next, we present the setting and its relevance for a study on adaptation to climate change as well as the methodology, before presenting the quantitative study results in which the hypotheses are tested. Then, we refine these results with the qualitative study, further digging into the mechanisms and boundary conditions of the effects found, and merge both results to build a cohesive framework to illustrate what factors influence the implementation of different adaptive responses by the decision maker. We conclude with the theoretical and practical implications of our study to organizational adaptation to climate change.

3.3 Theoretical context and hypotheses development

3.3.1 Organizational adaptation to climate change and the challenges for decision making

Organizational adaptation to the surrounding environment is a widely studied topic in the strategic and organizational literature (Sarta et al., 2021). The increased adaptive capacity allows organizations not only to seize new opportunities (Eggers, 2012) and to gain competitive advantage (Eggers & Kaplan, 2009) but also, in a rapidly changing world, to ensure their survival. Now that resource depletion has reached or crossed critical boundaries (IPCC, 2014; Mann et al., 2014; Rockström et al., 2009) and that climate change already has devastating effects on ecosystems, communities, and organizations in many parts of the world (Adger et al., 2003; Harris et al., 2006; Howard-Grenville et al., 2014; Kolbert, 2012; Shiferaw et al., 2011; Winn et al., 2011), the interest in organizational adaptive responses is gaining momentum (Gasbarro & Pinkse, 2016; Nitkin et al., 2009). Adaptation is often the only tool available to small and medium-sized organizations, especially those located in tropical areas, to deal with climate change. For them, unlike large companies, there is less flexibility to relocate to where the effects of climate change are less prominent or to mitigate its effects by cutting emissions.

Given the growing interest in the topic, several studies have explored the antecedents of adaptive responses. A first stream investigates the relationship between adaptive responses and the characteristics of the institutional environment (Eakin, 2000), emphasizing the importance of governance and policymakers' support (Arnell & Delaney, 2006; Hall et al., 2015; Pinkse & Kolk, 2012a; Sullivan & Gouldson, 2016) and of institutional pressure (Galbreath, 2014; Tingey-Holyoak & Pisaniello, 2015) in fostering adaptation to climate change. A second group of studies looks for the antecedents of adaptation in industry characteristics, such as the type and level of climate risk for the industry (Agrawala et al., 2011). Finally, a third group of studies investigates the organizational characteristics that trigger adaptive responses, including organizational structure and incentives (Bazerman, 2006; Busch, 2011; Lee & Klassen, 2016; Smit et al., 2000).

Although characteristics at the institutional, industrial, and organizational levels are crucial in defining the adaptive responses implemented by the organization, the focus on these levels has overshadowed the discourse on factors affecting adaptation at the micro level, which has only recently emerged (Linnenluecke et al., 2013). This lack of attention is surprising given the stress that climate change is placing on decision makers within organizations (Howard-Grenville et al., 2014). The challenge of climate change stems from its global reach and the magnitude of its effects, which are often beyond the control of individual organizations. Yet relatively few studies have explored the micro level to date. Among these studies, some underline the role of risk perception and awareness as catalysts for adaptive responses (Berkhout, 2012; Tam & McDaniel, 2013; Tucker et al., 2010). Other studies focus on perceived vulnerability and adaptive capacity (Adger, 2006; Smit & Wandel, 2006). Finally, some studies emphasize the role of the experience and attitudes of decision makers as important for triggering adaptation. Linnenluecke and colleagues (2012) and similarly Haight and Griffiths (2012) underline the role of experience of climate change-related events, and the following sense-making process, in fostering adaptation to future events. While some studies focus on each of these factors separately, most studies on the topic propose models that include risk perception and awareness, vulnerability and adaptive capacity, experience, and attitudes (Bleda & Shackley, 2008; Gasbarro & Pinkse, 2016; Hoffman et al., 2009). These studies are instrumental in laying the foundation for an emerging field. What they have in common, however, is a tendency to consider how micro-level factors influence the implementation of an adaptive response, without analyzing and discussing what types of adaptive responses are stimulated.

So far the literature has established that there is great variety in the adaptive responses of organizations even in comparable contexts, ranging from marginal changes in the existing routines that lead to inadequate protection and "business as usual" (Hertin et al., 2003; Pinkse & Gasbarro, 2019; Weinhofer & Baush, 2013; Wright & Nyberg, 2017), to radical changes not only in the production activities but also in the identity of the organization (Adger et al., 2003; Linnenluecke et al., 2011). What emerges is that the organization is often faced with several potential adaptive responses, with different costs and benefits depending on the magnitude of the effects of climate change in the future. For example, residents and organizations in the coastal areas of the Netherlands, faced with continued and repeated flooding due to rising water levels, might invest in a system of dams,

which would only be beneficial in the event of a non-excessive rise in sea level, or to opt for the more drastic and costly decision of building stilts where they can conduct their activities, as many have done (Kolbert, 2012). Just as the literature has found that the choice between adapting or not adapting to climate change depends on a number of micro-level factors that we presented above (Bleda & Shackley, 2008; Gasbarro & Pinkse, 2016; Hoffman et al., 2009), it is reasonable to think that the choice between alternative responses is also strongly tied to the decision maker's experience and interpretation of current and future events. However, we still know very little about this process. In the next sections, we discuss some of the decision-making factors that influence the choice between three different types of adaptive responses, presented next.

3.3.2 Types of adaptive responses to climate change

There have been several approaches in the literature to classify types of adaptive responses to climate change (Berkhout et al., 2006; Frankhauser et al., 1999; Gasbarro & Pinkse, 2016; Gasbarro et al., 2016). In this chapter, we complement the literature that distinguishes responses based on their time horizon (Slawinski & Bansal 2012) with a consideration of the effects of the adaptive response on the natural environment. Slawinski and Bansal (2012) propose a temporal perspective to categorize organizational responses to climate change, emphasizing the trade-off between speed and effectiveness of responses. Some responses, such as the introduction of formal risk assessment, are immediately protective but their effectiveness decreases over time. In contrast, other responses may take longer to be effective, as in the case of developing resource-saving innovations, but also ensure long-term effectiveness. We further develop this trade-off by incorporating ecosystem effects into the analysis.

The adaptation literature focuses on the benefits or harms of potential adaptive responses on the organization rather than the ecosystem, which has been left out of the picture (Okereke et al., 2012). We argue that introducing the effects on the natural environment of different types of climate change responses provides a more realistic and complete picture of the costs and benefits of each alternative, which is essential for shedding light on decision making. Integrating temporal time trade-offs and ecosystem effects, we

distinguish three types of responses: (1) ecosystem-based responses, i.e., those responses that have positive effects on the ecosystem and thus are long-term oriented although often not immediately protective, such as reforestation near waterways; (2) technology-based responses, i.e., those responses that have mixed effects on the ecosystem and also mixed records of effectiveness and immediacy of protection, such as implementing an irrigation system; and (3) maladaptive, i.e., those responses that give immediate protection but in the long run further damage the ecosystem and the organizations embedded in it, as in the case of choosing to deforest to make room for livestock.

The first type of adaptive responses, *ecosystem-based adaptive responses*, are able to restore damaged ecosystems. Ecological restoration has long been proposed as one of the most effective responses to mitigate climate change by reducing CO2 emissions (Harris et al., 2006). However, it can be an adaptive response as well, as it can limit the damages provoked by the effects of climate change (Crosthwaite & Macleaod, 2000; Dorrough et al., 2008). These responses combine mitigative effects for the ecosystem with adaptive effects able to protect human activities and are therefore particularly effective in the long run as they can both solve the symptoms and the root causes of climate change (Pinkse & Kolk, 2012a). However, building on the trade-off between speed and effectiveness underlined by Slawinski and Bansal (2012), these responses are not immediately protective, as they generally take years in order to be effectively implemented (Cluff & Semple, 1994). Responses in this category include, but are not limited to, reforestation of areas near watersheds to maintain soil moisture or fishing moratoriums that allow fish stocks to recover (Dorrough et al., 2008).

The second type of adaptive responses are *technology-based adaptive responses*. These responses involve the acquisition of new technology, such as an irrigation system, new machinery that allows for recycling or more efficient use of resources, or planting more resilient crops (Agrawala et al., 2011; Arnell & Delaney, 2006; Deressa et al., 2009). These responses have mixed effects on the ecosystem, depending on the technology. Two examples can illustrate this point (Agrawala et al., 2011). The mining company Rio Tinto, which has been severely affected by desertification given the location of its operations in arid areas, has invested heavily in new adaptive technologies to minimize water loss, thus achieving positive effects on the ecosystem due to the lower resource use. In contrast, the British utility Severn Trent, faced with the same threats, has invested in barrier and

waterproofing infrastructure to protect facilities from flooding. The responses adopted by this company are effective in the medium-term, but only if sea level rise remains within a certain range, and do not reduce water use, leading to further strain on the ecosystem. In sum, while these responses are generally immediately protective once implemented, their mixed effects on the ecosystem often make them less effective in the long-term, especially as the effects of climate change worsen.

Finally, the third type of responses are the *maladaptive* ones. Maladaptive responses to climate change are defined as "actions, or inaction, that may lead to increased risk of adverse climate-related outcomes, increased vulnerability to climate change, or diminished welfare, now or in the future" (IPCC, 2014). For example, Barnett and O'Neill (2010) report how, in the wake of a long drought, the City of Melbourne decided to invest in desalination of seawater. However, in addition to having high costs, the desalination plant proved to be highly polluting, negatively affected Aboriginal communities living near it, and it reduced incentives for long-term adaptation (Barnett & O'Neill, 2010). Such responses seem like a short-term fix, but have a long-term negative effect on the ecosystem. However, especially in more vulnerable contexts, maladaptive responses are widespread due to a lack of financial resources, information, and risk management capacity, as well as weak governance systems (IPCC, 2014). Table 1 summarizes the characteristics of each type of adaptive responses considered in our study.

Table 1. Type of adaptive responses to climate change

	Temporal Horizon	**Speed of Response**	**Effects on Ecosystem**
Ecosystem-based Adaptive Responses	Long-term Effectiveness	Delayed	Positive
Technology-based Adaptive Responses	Medium-term Effectiveness	Immediate	Mixed
Maladaptive Responses	Short-term Effectiveness	Immediate	Negative

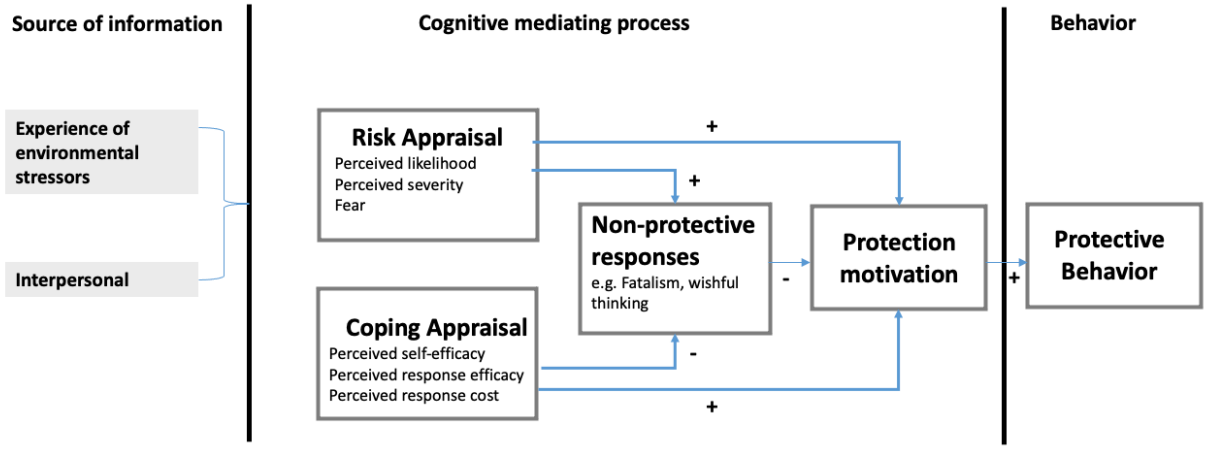
In conclusion, organizations often have several adaptive responses to choose from, varying in time horizon and effects on the organization and ecosystem. It seems plausible that decision makers' interpretations of the effects of climate change and beliefs about future scenarios not only influence whether or not the organization adapts to climate change, as often discussed in the existing literature, but also how to choose among the different alternatives available. Yet we know very little about how decision makers choose an adaptive response when affected by the consequences of climate change. What intrigues us most is understanding how decision makers' interpretation and perceptions influence the implementation of effective adaptive responses in the long run. The current study aims to fill this gap by integrating PMT and management literature to help explain how different factors operating at the micro level shape the implementation of different types of responses. The introduction of PMT is relevant to answering our research question because this theory has great explanatory power, confirmed by several meta-analytic studies (Floyd et al., 2000; Milne et al., 2000), and is comprehensive, as it includes several factors and barriers that may foster or hinder the implementation of protective responses at the individual level.

3.3.3 Protection Motivation Theory and hypotheses development

PMT was introduced by Rogers in 1975 to integrate in a cohesive framework the socio-cognitive factors that explain the engagement in protective behaviors and especially health-related protective behaviors. This theory predicts that characteristics of the external environment are used to extract information that is then analyzed through a cognitive mediating process that includes appraisals of the threats or risks and of one's capacity to cope with them. Based on the outcome of this mediating process, the individual will or will not develop the protection motivation and, ultimately, the protective behavior (Rogers, 1975, 1983). Figure 1 illustrates the PMT model. Since it was first proposed, PMT has been applied to predict engagement in protective responses to a variety of health-related threats (Beck & Lund, 1981; Flynn et al., 1995; Pechmann et al., 2003; Tulloch et al., 2009; Yan et al., 2014). Two meta-analyses conducted in 2000 found support for the model (Floyd et al., 2000; Milne et al., 2000). Given its unique power to explain the engagement in protective behavior, PMT has also been applied in

other contexts, such as antinuclear behaviors (Axelrod & Newton, 1991; Wolf et al., 1986), natural disaster preparedness (Mulilis & Lippa, 1990), water conservation (Kantola et al. 1983), information system security policy compliance (Ifinedo, 2012), and recently also individual adaptation to climate change (Grothmann & Reusswig, 2006; Grothmann & Patt, 2005; Le Dang et al., 2014). We believe that integrating this theory into the management literature can shed light on the factors that influence the types of adaptive responses to climate change adopted by organizational decision makers, thus helping to answer the research question, for two reasons. First, PMT seems suitable because the adaptive response to climate change is a type of protective response to an external threat and thus falls within the explanatory power of this theory. Second, the comprehensiveness of this theory is useful for capturing the cognitive processes that lead to the decision to engage (or not) in different protective responses.

Figure 1. Protection Motivation Theory model



Adapted from Milne et al., 2020

As shown in Figure 1, environmental factors and experiences are the starting point of the social-cognitive process that leads to the decision to implement protective behavior (Milne et al., 2000). Experiencing a stressful event acts as a catalyst for protective motivation because it forces one to pay attention to the threat and the possibility that it will recur in the future (Hertwing et al., 2004; Weber, 2006; Weber & Stern, 2011). Especially for climate change, research shows that the decision to engage in protective responses is often experience-based more than information-based (Weber, 2006, 2010).

Unless an individual experiences the consequences of climate change, directly or vicariously, a protective response is unlikely to emerge (Weber & Stern, 2011). For example, exposure to frequent flooding triggers in individuals the cognitive process that leads to the implementation of adaptive responses (Grothmann & Reusswig, 2006). Similarly, Demski and colleagues (2017) found evidence that, in a sample of UK households, individuals personally affected by flooding are more likely to engage in climate change adaptation, including non-flood related adaptation, and to support mitigation policies than a nationally representative sample. Even in the organizational context, it seems plausible that there is a relationship between direct experience with the effects of climate change and engagement in adaptive responses. Indeed, some studies have pointed out that, when faced with stark effects of climate change, organizational attention is channeled toward climate phenomena, prompting the organization to notice, and thus respond to, environmental cues that would otherwise go unnoticed (Pinkse & Gasbarro, 2019). Therefore, we propose the following:

Baseline hypothesis: Experiencing the direct consequences of climate change increases the likelihood to implement all types of adaptive responses.

Building on this relationship, PMT's major contribution is shedding light on the cognitive process by which the events in the surrounding environment influence the decision to engage in protective behavior. Specifically, this theory emphasizes two mediating cognitive processes through which the individual processes external threats and develops or not the motivation to implement protective behaviors: risk appraisal and coping appraisal (Rogers, 1975, 1983).

The first mediating cognitive process is risk appraisal (also referred to as threat appraisal), defined as an individual's assessment of the likelihood and severity of the threat in the future, assuming no change in behavior (Grothman & Path, 2005; Swim et al., 2009). It consists of three subcomponents: the perception of the probability of the risky event; the perception of the severity of the risky event; and the level of fear associated with the risk (Grothmann & Reusswig, 2006; Grothmann & Patt, 2005; Milne et al., 2000). Feelings are essential components of risk appraisal, and the decision to take action is often spurred by the desire to reduce negative feelings (Loewenstein et al., 2001). While risk appraisal

is positively related to the engagement in protective behaviors, this theory shows that it is also related to the implementation of non-protective responses, such as wishful thinking and fatalism (Milne et al., 2000). Like protective responses, non-protective responses reduce the feeling of discomfort associated with risk. However, unlike protective responses, they are not able to effectively protect the individual from the threat (Grothmann & Reusswig, 2006). This evidence suggests that high risk appraisal prompts the implementation of responses that alleviate the feelings of worry and fear, but do not necessarily protect the individual.

An appraisal of climate change risks is essential for determining adaptive response also for decision makers within organizations, as emphasized by several studies (Bazerman, 2006; Berkhout, 2012; Bleda & Shackley, 2008; Pinkse & Gasbarro, 2019; Weinhofer & Baush, 2013). PMT insights help us understand what types of adaptive responses are likely to result from risk appraisal. This theory reveals how high risk appraisal drives the search for immediately effective solutions to reduce the fear associated with risk, albeit not necessarily protecting against the risk (Grothmann & Reusswig 2006). It is reasonable to think that high risk appraisal drives the implementation of responses that have the ability to protect immediately but, given the trade-off between speed and effectiveness (Slawinski & Bansal 2012), are not necessarily effective in the long run. In support of this argument, a number of empirical studies have found no confirmation that risk perception increases engagement in adaptive responses that are effective in the long run (Cavatassi et al., 2011; Hoffman et al., 2009; Jianjun et al., 2015; Tucker et al., 2010). For example, in a study of coffee farmers in Latin America, Tucker and colleagues (2010) found that farmers who associate climate change with high risk are not more likely to adapt to it. Among the types of responses considered in this study, the immediately protective adaptive responses, although not the most effective in the long run, are technology-based and maladaptive. Therefore, based on the insights from PMT, we expect that a high risk appraisal will lead to the implementation of these two types of responses, given their immediacy. Furthermore, because risk appraisal arises from the experience of a threat (Milne et al., 2000), we hypothesize that risk appraisal is the mechanism through which the experience of the effects of climate change leads to engagement in technology-based and maladaptive responses. Specifically, we hypothesize the following:

H1a: Higher risk appraisal leads to a higher likelihood of implementing immediately effective responses (technology-based adaptive responses and maladaptive responses).

H1b: Experiencing the direct effects of climate change leads to a higher likelihood of implementing technology-based adaptive responses and maladaptive responses through the mediation of a higher risk appraisal.

The second cognitive process identified by PMT as a mechanism by which individuals process their experience and decide whether to engage in protective behavior is coping appraisal. Coping appraisal is defined as an individual's assessment of his or her ability to cope with the threat and avoid being harmed by it, along with an assessment of the costs of coping strategies (Grothmann & Patt, 2006). It is composed of two sub-components: perceived self-efficacy (i.e., the perception of one's ability to cope with the threat) and an assessment of the cost and effectiveness of potential responses (Grothmann & Reusswig 2006; Grothmann & Patt 2005; Milne et al., 2000; Swim et al., 2009). Unlike risk assessment, this mechanism is negatively, instead of positively, correlated with engagement in non-protective responses, such as wishful thinking and fatalism (Milne et al., 2000).

Similarly, in the organizational setting, it stands to reason that a high coping appraisal of the decision maker leads to the implementation of adaptive responses, and specifically the most effective adaptive responses. Coping appraisal involves a cost-benefit assessment of the potential responses that can be adopted. In line with PMT insights, this assessment leads to responses that are effective to protect from the threat, while decreasing the likelihood of engaging in ineffective responses (Milne et al., 2000). Although coping appraisal has been less considered than risk appraisal in climate change adaptation studies (Grothmann & Reusswig, 2006), some organization-level studies have linked higher perceived self-efficacy with engagement in effective adaptive responses. For example, Smit and Wandel (2006) relate effective adaptation to coping appraisal, showing that vulnerability is a function of both sensitivity to climate change events and the ability to cope with them. In this light, adaptive responses depend on the adaptive capacity of the system, as adaptation is primarily a response aimed at reducing vulnerability. Based on PMT insights and this empirical evidence, we therefore hypothesize that a high coping appraisal leads to the implementation of the most effective responses, i.e., ecosystem-based and technology-based adaptive responses. In addition,

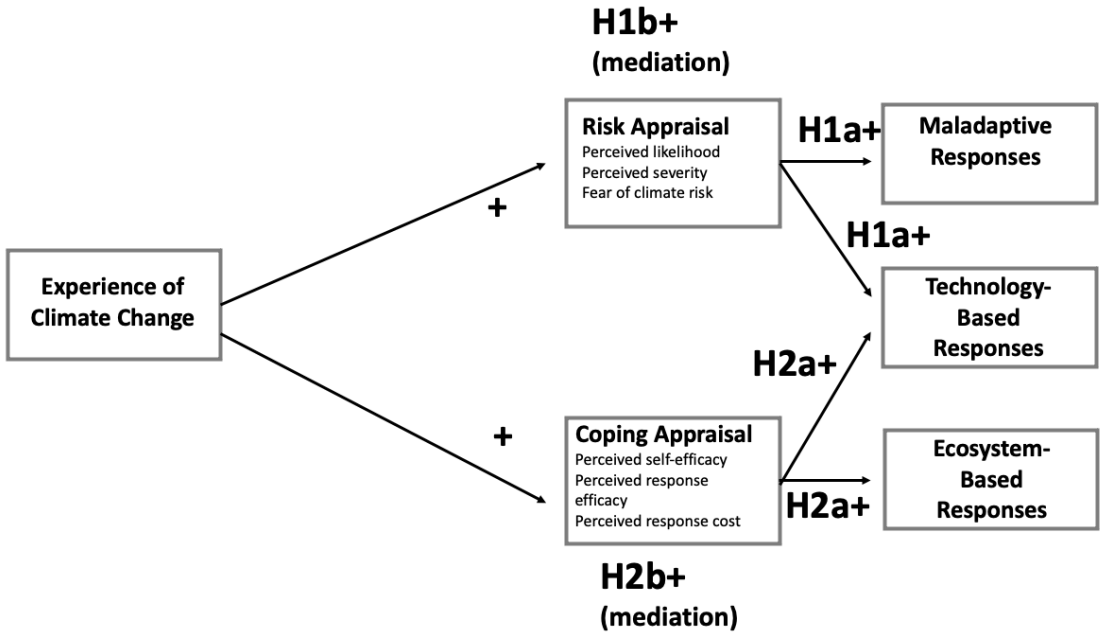
as postulated by PMT, coping appraisal emerges as a result of the experience of the climate change effects that prompt an assessment of one's ability to respond and of the effectiveness of available responses. We therefore argue that coping appraisal is the mechanism through which decision makers process the experience of climate change and decide to implement effective adaptive responses to this threat. Specifically, we hypothesize:

H2a: Higher coping appraisal leads to a higher likelihood of implementing longer-term oriented responses (technology-based and ecosystem-based adaptive responses).

H2b: Experiencing the direct effects of climate change leads to a higher likelihood of implementing technology-based and ecosystem-based adaptive responses through the mediation of a higher coping appraisal.

Figure 2 illustrates our model and hypotheses.

Figure 2. Conceptual model and hypotheses



3.4 Context and sample: Brazilian cocoa producers

To test our hypotheses, we are interested in studying a context in which the negative effects of climate change are already salient. Many of the existing studies of adaptive responses to climate change involve industrialized countries and, by the authors' admission, the emerging lack of adaptive responses can also be explained by less direct experiences with the effects of climate change (Galbreath, 2014; Weinhofer & Baush, 2013). Since climate change is a gradual and relatively slow environmental change, in many parts of the world the experience with its consequences is still limited, dramatically reducing the intention to engage in protective responses (Weber, 2010; Weber & Stern, 2011). Therefore, developing countries in tropical areas are relevant contexts to study adaptation to climate change because not only is climate change affecting those places with particular intensity (Dercon, 2002; IPCC, 2014; Pinkse & Kolk, 2012b), but organizations in such contexts also have fewer tools and resources to mitigate the risk. Thus, we chose to set the study in the context of cocoa producers in the state of Bahia, Brazil.

Brazil used to export cocoa as a source of wealth and employment (Willumsen & Dutt, 1991). Especially the southern region of Bahia, Brazil's historical cocoa region, contributed more than two-thirds of Brazil's cocoa production. Since the late nineteenth century, cocoa was the main source of wealth and livelihood in the region, leading Southern Bahia to progress and prosper. Yet a recent drought of unprecedented severity has severely damaged cocoa production in the region, worsening an ongoing economic crisis (Bedran-Martins et al., 2018; Gateau-Rey et al., 2018). The drought began in 2015 as a consequence of El Niño. In one year, it killed more than 40 million cocoa trees in the region (15% of total trees) and caused an 89% drop in productivity (Gateau-Rey et al., 2018). Since 2015, the region's weather pattern has been highly unstable, with extreme weather events becoming more frequent.

The hydric crisis has been exacerbated by the ongoing process of deforestation. Southern Bahia, embedded in the middle of the Brazilian Atlantic forest with very high biodiversity, has in cocoa plantations one of the most relevant land uses to support

agroforestry and a forest landscape (Chiapetti et al., 2020). Cocoa lives in symbiosis with the Atlantic forest and produces well in the shade of other trees (Bertol-Rocha, 2008). Therefore, it is a crop that can support producers' livelihoods while preserving the water cycle typical of a forested region. In fact, among forest countries around the world, Brazil is one of the countries that has suffered most from the global loss of forest cover (Simonet et al., 2019). The context of our study has not been immune from deforestation. As shown in Appendix A, forest cover in the municipalities participating in our study has progressively thinned over the period between 1990 and 2018, with 3770 hectares of forest loss in the period between 2010 and 2018 alone (Chiapetti et al., 2020). Deforestation occurs when producers, who cannot obtain sufficient income from cocoa due to the ongoing crisis, cut their trees to sell timber and make way for pasture and livestock (Chiapetti et al., 2020).

Despite the combined effects of drought and deforestation, the Southern Bahia region is still the seventh largest cocoa-producing region in the world and an important player in the international cocoa market, although it is far from restoring its former glory. Given its vulnerability to the effects of climate change and its relevance in the international chocolate supply chain, this context is particularly appropriate for investigating the mechanisms behind decision makers' choice among adaptive responses to climate change. Vulnerability increases when one considers that, unlike other tropical crops, cocoa production in this context is highly fragmented, with most producers being small family farms with limited access to resources and markets (UNCTAD, 2016). Today there are an estimated 32000 producers in Southern Bahia and a total of 200000 people directly involved in cocoa production (Tampe, 2016).

To answer our research question, we develop a mixed-methods study with analysis of both qualitative and quantitative data. Since the topic of organizational adaptation to climate change is a complex and under-researched phenomenon (Linnenluecke et al., 2013), a mixed-methods study can improve our understanding and gain a comprehensive view of the phenomenon, while offsetting the disadvantages of each of these methods (Lee, 1991, 1999; Teddlie & Tashakkori, 2003, 2009; Venkatesh et al., 2013). Therefore, we employ a QUAN-QUAL development approach, in which the quantitative study is

used to assess predominant patterns of adaptive responses and mechanisms while the qualitative study is used to get a more nuanced understanding of decision makers' interpretations. The qualitative study also helps to uncover the boundary conditions of the picture that emerges from the quantitative analysis (Molina-Azorin, 2015; Venkatesh et al., 2013). In doing so, we adopt a pragmatic epistemological stance, as advocated by Johnson and Onwuegbuzie (2004) for this type of research. While acknowledging the different philosophical paradigms underlying the two methods we adopt, we believe that combining them allows us to triangulate our inferences and to answer our research question more fully and accurately.

Quantitative data were collected under the supervision of two of the authors on a representative sample of 3045 agricultural producers (farm owners), based on the mapping of 9500 small producers (farm size less than 300 ha) in the 26 municipalities that constitute the cocoa region of Southern Bahia. The area is divided by local institutions into 500 sectors, 150 of which were randomly selected to participate in the study using statistical software (Appendix B shows the selected sectors). In the next step, 20 farms were randomly selected in each sampled sector, for a total of 3000 farms (3% of the total cocoa producers in Brazil). Unavailable producers were replaced with others from the same sector so that the final sample included 3045 producers. Each producer was visited annually for four years, from 2015 (the first year of the drought) to 2019, by a team of highly qualified agronomy researchers hired full-time for the four years of the project. We tested the representativeness of our sample by comparing the distribution of sample producers by size and municipality to that of the entire population based on a national census done in 2017 by IBGE (*Instituto Brasileiro de Geografia e Estatística*) and found no significant differences (Chiapetti et al., 2020). In addition, the total cocoa production in the area for 2018 estimated using our sample (39997 tons) is very similar to data collected by IBGE (40887 tons). The data used in this project are part of a larger project on cocoa production co-organized by the Santa Cruz State University of Bahia, the Federal University of Southern Bahia in Brazil, and Brown University in the United States, with the help of local non-governmental institutions. Producers were asked to respond to questions included in a comprehensive survey that tracked their farming practices, socioeconomic condition, and individual characteristics. Panel data collection is essential to answering the research question, as it can track new practices that producers implement in response to increasing climate risk.

A subsample of 38 cocoa producers was purposely selected for qualitative data collection, from among the producers who participated in the study. The sampling logic was to select producers in the municipalities most severely affected by the 2015 drought in each of the four study areas (North, South, East, West). This choice was motivated by the greater relevance of this subsample for investigating responses to climate change and individual-level interpretations and the mechanisms that foster them, while maintaining the geographic distribution of the total sample. In-depth interviews with these producers (24 hours of interviews in total) and 6 cocoa production experts (5 hours of interviews) were conducted by the first author in March and April 2019, and observations and field notes were also analyzed (180 pages). All interviews were conducted in Portuguese, recorded, and verbally transcribed. The purpose of the semi-structured interviews was to delve into producers' interpretation of the effects of climate change and their perceptions of the related risk and potential responses available. The interview protocol consists of questions regarding agricultural practices and changes implemented after 2015, perceptions about climate change (about the phenomenon, causes, consequences, and possible responses to it), and attitudes towards it (feelings, beliefs, and intention to respond - see Kothandapani, 1971).

3.5 Quantitative study: Testing the hypotheses

3.5.1 Variables and methods

The dependent variable is engagement in adaptive responses. Consistent with our literature review, we measure three types of adaptive responses: Ecosystem-based adaptive responses, technology-based adaptive responses, and maladaptive responses. For all of these variables, we constructed a measure that tracks the change in the implementation of each response over the 4 years of the study, from 2015, when climate instability began with an extreme drought, to 2019. A dataset collected over multiple years is therefore critical to tracking the evolution of responses.

As the most prominent example of ecosystem-based adaptive responses, we measure reforestation. As found in previous literature (Pereira et al. 2014), reforestation, especially when close to water sources, helps maintain soil moisture and conserve water supplies.

Leveraging our panel data, we use a dummy variable that takes the value of 1 if the producer increased the percentage of its farmland covered by forest (forest area/total farm size) by more than 1%, to account for reporting error, in the four years of the study; 0 otherwise. For robustness, we repeated the analysis considering a 5% and a 10% increase as a cut-off point to create the dummy, without finding notable differences in the significance level and coefficients of the variables of interest. We found that 33% of producers in our sample engaged in reforestation during the study period, with a steady increase over the years.

As a technology-based adaptive response, we measure the introduction of irrigation. Again, we rely on our panel dataset to measure this type of adaptive response with a dummy variable that tracks the introduction of irrigation after 2015. Among the different technology-based adaptive responses, we chose irrigation following previous studies on the topic (Deressa et al., 2009). Prior to 2015, only 2% of producers in our sample had irrigation systems, a percentage that increased to 13% in 2019 (6% in 2017, also showing a steady increase).

Finally, to measure maladaptive responses, we consider the change in activity from cocoa to pasture, as previous studies in our context have found that this change involves cutting cocoa and forest trees to convert land to livestock, thus worsening the hydric crisis in the long run (Chiapetti et al., 2020). Similar to the reforestation measure, we create a dummy variable with value 1 if the producer increased the percentage of its farmland devoted to pasture in the four years of the study (pasture area/total farm size) by more than 1%, to account for measurement error; 0 otherwise. Again, we repeated the analysis considering a 5% and a 10% increase as a cut-off point to create the dummy, and significance level and coefficients of the variables of interest did not noticeably change. We found that 32% of the producers engaged in this type of response in the four years of our study and about 13% had already implemented the response in 2017.

It is worth noting that these adaptive responses are not mutually exclusive. The same mechanism can lead to different types of adaptive responses, so we expect some combination of responses. While 54% of the producers in our sample implemented one or more responses, 16% combined two different responses, and only 2% combined the three. However, the fact that the evolution of all three responses over the years of the

study is linear suggests that there is no progression between the three responses, and we can therefore rule out that the responses are systematically implemented in a temporal order by producers. Similarly, the steady increase reduces the plausibility of a strong peer influence component, as it would lead to exponential growth in our data (Cai et al., 2015). However, we control for the geographic location of the farm to account for this effect, in addition to clustering standard errors at the municipality level.

The independent variable, direct effects of climate change, and specifically of drought as the most relevant climate change effect in our context, is measured by comparing the rainfall data for the municipality where the farm is located before and during the drought. We calculate the percentage drop in rainfall for the entire year 2015, the first year in which the drought was particularly persistent, compared to the average level of rainfall from 1981 to 2013. Data on the level of precipitation by municipality were provided at the request of the authors by CEPLAC, (*Comissão Executiva do Plano da Lavoura Cacaueira*), a local government agency that measures and researches cocoa trends in the region and has meteorological stations in each of the 26 municipalities in our study. Therefore, this variable was calculated at the municipality level, not the farm level, as there is no reliable rainfall data at the farm level. However, it is reasonable to assume that there is no significant variation in precipitation within the same municipality. In addition, the illustrative map represented in Appendix C shows that there is variation in drought intensity among the municipalities included in our study. The map represents the drought situation in the Northeast of Brazil in the exemplary month of December 2015. On the left, the map shows the drought intensity, and on the right, the percentage of agricultural production affected. The magnification in the red rectangle shows our study area.

Risk appraisal, one of the two mediators, is measured following the method used by Eakin and colleagues (2010). In line with PMT, risk appraisal involves the perceived likelihood and severity of future climate instability for the region and the fear associated with it. In the first round of the survey (2015), producers were asked to indicate the greatest future challenges for the region through an open-ended question. We create a dummy variable with a value of 1 if the respondent indicated a risk associated with extreme climate events and drought, and 0 otherwise. By measuring this variable in the same year as the initial drought, and prior to the implementation of any adaptive response (all measured as the difference between farm conditions in 2015 and subsequent years), we reduce the possibility of reverse causality in our analysis.

Similarly, the other mediator of our analysis, coping appraisal, was measured in the 2018-2019 survey round. As this variable captures producers' perception of their ability to deal with the effects of climate change, we measure it by their response to the open-ended question, "What can you and other producers do to address the struggles you are facing?" We created a dummy variable with a value of 0 if the respondent indicates that there is nothing producers can do; 1 otherwise. This measure was intentionally kept broad and not specific to climate instability. Measuring coping appraisal for general struggles instead of climate change-related struggles reduces the risk of reverse causality, as the perception of one's ability to cope with a specific struggle may depend on the responses already implemented. In addition, by measuring coping appraisal and risk appraisal in different rounds, we avoid the risk of inflating the correlation between risk and coping appraisals, so that we can better analyze the effects of each of these mechanisms separately.

We control for risk attitude, measured in the 2016 survey round using the method developed by Binswanger (1980). Respondents were presented with six bisected circles and asked to choose one of these circles. Producers received payment written on the right or left based on the color of an object thrown by the interviewer, with one side black and one side white. One circle represents a zero-risk option (same payoff). Moving clockwise, the payoffs become increasingly uncertain, with the expected value and variance increasing linearly. A second round was designed to include loss aversion, the only difference being that, in this case, respondents were not paid the corresponding amount. Finally, producers were asked to compare the circles in pairs, indicating their preferences. Based on their responses, producers were clustered into six levels of risk aversion ranging from very low to very high.

Additional controls included in the analysis, following the model developed by Deressa and colleagues (2009), are producer age (year of birth), gender, and number of years of formal education. We also control for the average (over the four years of the study) of the following variables, as declared by the producers in the survey: total farm size in hectares, number of contract employees, annual household income (calculated by summing all sources of income of family members living with the producer), and annual profits of the farm. In addition, we calculated dependence on the farm, i.e., the proportion of household income coming from the farm. Finally, we control for the area in which the farm is located

within the region of our study, the average level of rainfall in the municipality before the first drought (1981-2013), the initial level of technology (possession of five types of advanced mechanization tools) and facilities (having piped water and electricity on the farm), both measured in 2015, possession of open lines of credit (2015), receiving regular technical assistance (2015), membership in producer associations (2015), main crop (2015), and possession of water sources and channels on the farm (2015).

Given the original sample size, we use listwise deletion to deal with missing values, following the method suggested by Allison (2001). The choice of using alternative methods for missing values was not motivated by power issues and we controlled (with ANOVA) that missing values in predictors are independent from the level of the dependent variable. Therefore, our final sample includes 1572 observations for which we have complete data in the variables of interest and the controls. We keep the same sample for all models, despite having different dependent variables, to report a single correlation matrix and to facilitate the replication of results. Nevertheless, for robustness, we also tested the hypotheses using listwise deletion within each model (thus allowing for different sample sizes in each model), and we found no difference in the significance and magnitude of the effects of the variables of interests. Appendix D reports the mean and the standard deviation of each variable of the study and the correlation matrix. The average age of the producers in our sample is 57 years, with less than 7 years of education, and 16% of the producers are women. Most producers do not employ any workers other than family members. The average farm size is 31 hectares.

To test hypotheses 1a and 2a on the direct effects of risk and coping appraisals on adaptive responses, we develop linear logistic regression models, described in detail in the following section. The logistic model is recommended when the dependent variables are dichotomous (Tansey et al., 1996). In addition, because the independent variable is measured at the municipal level, we clustered robust standard errors by municipality to avoid bias in our estimates (whereas the sign and significance of the variables of interest are unaffected with unclustered robust standard errors). To test hypotheses 1b and 2b on the mediated effect of experiencing the direct effects of climate change on adaptive responses, we perform a bootstrap analysis with 5000 replications following the method indicated by Hayes and Scharkow (2013). The advantage of this method is that it is not sensitive to the underlying data distribution and does not assume normality to calculate

the standard error of the estimates (Hayes & Scharkow, 2013). The results of both analyses are shown below.

3.5.2 Results

Table 2 presents the results of the different linear logistic regression models built to test hypotheses 1a and 2a (the coefficients with respective p-values and robust clustered standard errors). For readability reasons, we omitted non-significant controls and location dummies.

H1a postulates that greater risk appraisal leads to a greater likelihood of implementing technology-based and maladaptive responses. Confirming this hypothesis, our results show that higher risk appraisal leads to a significantly higher probability (from Model 6, 0.536 higher log odds, around 13% increase in probability) of implementing technology-based adaptive responses ($p < 0.05$, Model 6 and Model 8) and maladaptive responses (from Model 10, 0.462 higher log odds, around 11% increase in probability, $p < 0.05$, Model 10 and Model 12). In addition, in line with our hypotheses, risk appraisal has no significant effects on the implementation of ecosystem-based adaptive responses. This finding reveals that high risk appraisal leads to the implementation of solutions that are immediately effective, although not protective in the long-term and able to further worsen climate risk in the region.

H2a posits that greater coping appraisal leads to increased implementation of longer-term adaptive responses. Partially confirming this hypothesis, our results show that coping appraisal has a positive and highly significant effect on ecosystem-based adaptive responses (from Model 3, 0.403 higher log odds, around 10% increase in probability, $p < 0.01$, Model 3 and Model 4) and technology-based adaptive responses (from Model 7, 0.654 higher log odds, around 16% increase in probability, $p < 0.01$, Model 7 and Model 8). Unexpectedly, we found that coping appraisal also has a significant effect on maladaptive responses (from Model 11, 0.440 higher log odds, around 11% increase in probability, $p < 0.01$, Model 11 and Model 12). Thus, producers who perceive that they have the capacity to cope with the consequences of climate change are more likely to implement all types of adaptive responses, from long-term to short-term oriented and maladaptive, and not just long-term as we hypothesized.

Table 2. Confirmatory study results

Dependent Variable	MODEL 1 **Reforestation**	MODEL 2 **Reforestation**	MODEL 3 **Reforestation**	MODEL 4 **Reforestation**	MODEL 5 **Irrigation**	MODEL 6 **Irrigation**	MODEL 7 **Irrigation**	MODEL 8 **Irrigation**	MODEL 9 **Change activity**	MODEL 10 **Change activity**	MODEL 11 **Change activity**	MODEL 12 **Change activity**
Risk Appraisal		-0.106		-0.144		0.536**		0.483**		0.462**		0.431**
		(0.12)		(0.12)		(0.18)		(0.17)		(0.14)		(0.14)
Coping Appraisal			0.403***	0.411***			0.654***	0.620***			0.440***	0.419***
			(0.09)	(0.09)			(0.12)	(0.14)			(0.12)	(0.12)
Experience of Climate Change	-0.044	-0.011	-0.345	-0.307	1.455	1.289	1.050	0.926	1.220	1.098	0.905	0.807
	(0.65)	(0.63)	(0.69)	(0.67)	(0.96)	(0.92)	(0.94)	(0.91)	(0.99)	(0.88)	(0.96)	(0.86)
Dependence from Farm	-0.228	-0.225	-0.279	-0.276	0.534**	0.509**	0.453*	0.441*	0.009	-0.002	-0.040	-0.045
	(0.24)	(0.24)	(0.23)	(0.23)	(0.25)	(0.26)	(0.26)	(0.27)	(0.26)	(0.26)	(0.27)	(0.27)
Technical Assistance	0.196*	0.193*	0.189*	0.185*	-0.180	-0.159	-0.198	-0.177	-0.218*	-0.205*	-0.228**	-0.216*
	(0.12)	(0.12)	(0.11)	(0.11)	(0.18)	(0.18)	(0.19)	(0.19)	(0.12)	(0.12)	(0.11)	(0.12)
Average Precipitation (pre 2015)	-0.023	-0.025	-0.022	-0.025	-0.031	-0.015	-0.028	-0.013	-0.037*	-0.028	-0.037*	-0.028
	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)	(0.05)	(0.05)	(0.05)	(0.02)	(0.02)	(0.02)	(0.02)
Gender	0.071	0.070	0.052	0.049	-0.029	-0.021	-0.067	-0.056	0.241**	0.250**	0.226**	0.235**
	(0.20)	(0.20)	(0.20)	(0.20)	(0.22)	(0.23)	(0.23)	(0.24)	(0.12)	(0.12)	(0.11)	(0.11)
Age	-0.008*	-0.008*	-0.008*	-0.008*	-0.002	-0.003	-0.001	-0.002	0.000	-0.000	0.001	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Association Membership	0.313**	0.311**	0.292**	0.289**	0.164	0.179	0.131	0.144	-0.217	-0.209	-0.246*	-0.237*
	(0.14)	(0.14)	(0.13)	(0.13)	(0.16)	(0.15)	(0.17)	(0.16)	(0.14)	(0.14)	(0.15)	(0.14)
Education Years	0.022*	0.022*	0.022*	0.022*	0.005	0.006	0.004	0.005	0.010	0.011	0.010	0.011
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Size ha	0.002	0.002	0.002	0.002	-0.004	-0.005*	-0.004	-0.004	-0.000	-0.001	-0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Facility	0.193*	0.191*	0.187	0.185	0.213	0.223	0.208	0.214	0.068	0.076	0.065	0.073
	(0.12)	(0.12)	(0.12)	(0.12)	(0.17)	(0.17)	(0.17)	(0.17)	(0.13)	(0.13)	(0.13)	(0.13)
Technology Level	-0.019	-0.022	-0.022	-0.026	0.225**	0.239***	0.220**	0.232**	0.024	0.037	0.020	0.033
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)
Cacao Main Activity	-0.221	-0.230	-0.228	-0.240*	-0.428*	-0.374	-0.439*	-0.392*	0.002	0.044	-0.004	0.035
	(0.14)	(0.14)	(0.14)	(0.14)	(0.23)	(0.23)	(0.23)	(0.23)	(0.11)	(0.11)	(0.11)	(0.11)
_cons	-0.172	-0.088	-0.565	-0.460	-0.331	-0.838	-0.980	-1.400	0.652	0.281	0.235	-0.089
	(0.43)	(0.43)	(0.42)	(0.42)	(1.01)	(0.92)	(1.00)	(0.92)	(0.49)	(0.49)	(0.51)	(0.51)
N	1572	1572	1572	1572	1572	1572	1572	1572	1572	1572	1572	1572

*P-value: * 0.10 ** 0.05 *** 0.001, robust standard errors clustered by municipality in parentheses*

Omitted not significant and location variables

The control variables that significantly explain the implementation of ecosystem-based responses are, not surprisingly, membership in associations, higher education level, younger age, and technical assistance. This confirms that the implementation of ecosystem-based adaptive responses requires a higher level of knowledge about the ecosystem (gained through associations, technical assistance, and education) and a long-term orientation typical of younger producers. The implementation of technology-based solutions is negatively associated with cocoa as the main farming activity, as other crops might benefit even more from irrigation, and positively associated with the technology level and farm income dependence, suggesting that irrigation is implemented by producers with a greater interest in increasing their productivity. Membership in associations and technical assistance are negatively associated with maladaptive responses, showing that when producers do not receive adequate support, they tend to implement less protective and shorter-term adaptive responses. Additionally, and surprisingly, women are more likely to implement such responses, likely due to less interest in actively managing the farm.

To test the mediation hypotheses (hypotheses 1b and 2b), we run a bootstrap analysis (with 5000 replications) following the method indicated by Hayes and Scharkow (2013) to calculate bias-corrected confidence intervals for the estimates. The analysis is performed with the same sample (N=1572) and controls of the logit regressions. For ecosystem-based adaptive responses, the confidence interval reported by the bootstrap analysis is [-.031; .009] for the coefficient of the risk appraisal mediated path. As this interval includes 0, we conclude that experiencing the direct effects of climate change does not lead to a higher likelihood of implementing ecosystem-based adaptive responses through the mediation of risk appraisal, consistent with our expectations that risk appraisal leads to shorter-term responses. Confirming H1b, the bias-corrected confidence interval for the coefficient of the path mediated by coping appraisal [.028; .117] and the one for the total effect [.016; .110] suggest that there is a significant positive relationship between experiencing the direct effects of climate change and engaging in ecosystem-based adaptive responses mediated by higher coping appraisal. When considering technology-based adaptive responses, the bias-corrected confidence intervals for the mediated effects of risk appraisal, coping appraisal, and the total effect are [.006 .044], [.022 .082], and [.037 .106] respectively, confirming the mediation effect for both variables. Finally, when testing the mediated path to maladaptive responses, the bias-

corrected confidence intervals are [.010; .062] for the path mediated by risk appraisal, [.030; .119] for the path mediated by coping appraisal, and [.053; .152] for the total model. All the paths, therefore, are significant. Taken together, these results also support our Baseline Hypothesis that experiencing the direct effects of climate change increases the likelihood of implementing any type of (mal)adaptive response.

While we found confirmation for our hypotheses that experiencing the consequences of climate change activates the implementation of different types of adaptive responses through the mediation of risk and coping appraisals, it would be naïve to assume that this process occurs automatically under such circumstances. Moreover, these two mediators, as we have shown, do not necessarily lead to the implementation of longer-term responses (technology-based or ecosystem-based) as, somewhat surprisingly for the case of coping appraisal, both mechanisms also lead to the implementation of maladaptive responses as well. Given the importance of adapting to climate change for many vulnerable organizations (Adger et al., 2003; Pinkse & Kolk, 2012b), it is important to dive deeper into these relationships to understand what hinders the emergence of risk and coping appraisals (i.e., the boundary conditions of our framework) and how the combination of these mediating mechanisms leads to the implementation of different types of responses (i.e., further refine the mechanisms). In order to do this, we develop the qualitative study described below.

3.6 Qualitative study: Uncovering the psychological barriers to adaptation

3.6.1 Methods and analysis

Our qualitative data were analyzed using the five-step process developed by Ritchie and Spencer (1994). This method is widely used to abductively generate inferences from qualitative data and has the advantage of being systematic, comprehensive, and dynamic (Srivastava & Thomson, 2009). We started by familiarizing ourselves with the data collected, translating and reading all the interview transcripts and fieldnotes several times, and noting emerging themes. In a second step, we looked extensively in the literature for theoretical frameworks matching the emerging themes of our data. We found that the

framework proposed by Gifford (2011), reporting a list of "dragons of inactions" (i.e., 29 psychological barriers that prevent individuals from taking actions against climate change), presents many similarities to our emerging themes. In a third step, we used NVivo to abductively code each interview, using the framework identified in the previous step as the basis for the coding structure, but inductively refining it based on the data to faithfully adhere to the informant's terms and words (Strauss & Corbin, 1998). The result of this process is a list of 13 psychological barriers, 7 of which overlap with Gifford's framework and 6 newly proposed or named based on similarities with extant literature. In the fourth step, we grouped these psychological barriers based on whether they affect risk appraisal, for example uncertainty, denial, and future discounting, or coping appraisal, for example ignorance, status quo bias, or lack of collectivism. The resulting categorization is represented in Table 3, which lists the barriers that affect each subcomponent of risk and coping appraisals, along with their definition and an illustrative quote from producers.

The final step, called mapping and interpretation (Ritchie & Spencer, 1994), involves the analysis of the key factors that emerge from the previous step. The aim is to grasp the relationships linking the different factors in a schematic diagram of the phenomenon under study that facilitates the interpretation of the data (Ritchie & Spencer, 1994). Specifically, we considered the relationship between the experience of climate change and each of these barriers and we distinguish them into dynamic and persistent, as discussed in the next section.

3.6.2 Barriers to risk and coping appraisals

Our analysis reveals that decision makers often have psychological barriers that influence both risk and coping appraisals. Some of these barriers are dynamic and diminish as producers experience the effects of climate change. The decrease in these dynamic barriers enriches the results of our quantitative study by explaining how experiencing the effects of climate change increases both risk and coping appraisals, the two main mediators through which adaptive responses are implemented. However, there are other barriers that tend to be persistent, despite the experience of climate change.

Table 3. Psychological barriers to risk and coping appraisals

Mechanism	Component	Barrier Definition	Illustrative Quote from Producers
Risk Appraisal	Affecting perceived likelihood and severity of future climate events	Uncertainty: Uncertainty about climate change (from Gifford, 2011)	*"Because I think that the climate is something really complex. It is not something that you can say: In the next three years there will be a draught. It will depend a lot from the region and from various other factors that might change in the meanwhile, so... We should change some daily practices...but will this have an impact? This I do not know."*
		Denial: Denying the existence of climate change (from Gifford, 2011)	*"Here... weather will recover, will come back to normality, before 2021 or 2022."*
		Normality Bias: Reconduct extraordinary events to normality (from Omer & Alon, 1994)	*"It [the drought] can repeat, but it also had a drought, if I'm not mistaken, in the 80s, I think...it was also very strong a while ago and it will always have some of these cycles of climate, right?!"*
	Affecting level of fear	Future Discounting: Being more concerned with the present than with the future (from Gifford, 2011)	*"I see this [climate risk] in a more distant future. Nowadays, I only work in the short-term. I am worried with this drought of today, isn't it? I do not start thinking about the drought of the next year or in the next two years."*
		Optimism Bias: Being too optimistic about one's future (from Gifford, 2011)	*"I have water here always, even if this professor has this idea, this water will never dry, because this river never dried!"*
		Risk Tolerance: Accept risk as part of organizational activity	*"For the other crops I planted...depends on the weather: If it rains, they live, if it is not raining, they die."*
Coping Appraisal	Affecting self-efficacy	Ignorance: Not knowing how to respond (from Gifford, 2011)	*"Here now I have two fountains that withered away, I don't know why. I need experts to come and tell me what to do. I am working without technical help, only with my knowledge, with our practices...we are continuing doing the practices that we learnt in the past, so, we are moving forward really slowly."*
		Perceived Inequality: It is someone else's responsibility to respond (from Gifford, 2011)	*"In this case are the big ones that are damaging the small producers, because the big ones are only worried in increasing the pasture area [and therefore they deforested] ...We need big producers to take out a part of their propriety and pay someone to replant...But they don't do it"*
		Fatalism: Belief in destiny/ God will	*"Guys, the drought is happening because it has to happen."*
		Hopelessness: Feeling there is nothing one can do	*"Producers could not see the end of the tunnel... Many producers are still demoralized, they still haven't recovered, they don't believe in agriculture anymore."*
	Affecting response efficacy and cost	Status Quo Bias: Tendency to favor the status quo (from Samuelson & Zeckhauser, 1988)	*"We continue with cocoa because...we are used to work with it, we are now used to it."*
		Response Risk: Perceived risk of response (from Gifford, 2011)	"*Yeah, I can open the artesian well here and suddenly I can have brackish water that's not good for irrigation."*
		Lack of Collectivism: For the response to work, the entire community should act	*"As a story says: one little swallow do not make summer. I can do my part, but I would like that everyone else would do their parts too, to allow us to keep this precious good that is water."*

When persistent barriers are in place, even the experience of very salient effects of climate change, such as a massive and prolonged drought, is unlikely to result in increased risk or coping appraisals, affecting the type of adaptive responses implemented.

Dynamic and persistent barriers to risk appraisal

Our analysis shows that experiencing the effects of climate change reduces some of the psychological barriers to risk appraisal. This is the case for barriers that affect the perceived likelihood and severity of future climate events, namely uncertainty, normality bias, and denial of climate change. A prime example of a dynamic barrier is uncertainty about climate change, which impedes adaptation initially but can get reduced easily. For example, some producers emphasize the uncertainty in predicting future droughts, thus negating the need for action, as evident in what this producer told us:

"*If the drought was something that happened more often, I would advise installing an irrigation system. But…there is a prediction for 2022.... It would be near now, right?! But it's not 100% certain; it's just according to data, NASA's history, statistics and such.*" – P38

This quote illustrates a belief that these predictions lack a sufficient level of confidence, which some producers use to assure themselves that a response is unnecessary:

"*We haven't changed much [in response to the drought]. Because the weather here, when the weather is good, everything goes back to normal, right? It's back to normal. Now, it's been a little sunny again, but that's how it is*." – P25

However, as producers observe that drought episodes are becoming more frequent, their uncertainty about it gets reduced. For instance, this producer reflects on his experience with drought, which initially was out of the ordinary but then became an ongoing condition:

"*El Niño, it was a surprise. Now here for our region here, the drought literally began in 2013. From 2013 to 2017, the volume of water was much lower than normal.*" – P11

As these events are becoming regular and tangible, uncertainty about them is reduced and producers are being pushed to accept long periods of drought as no longer exceptional events. When comparing with the past, the change in the weather pattern becomes clear, as reflected in this producer's account:

"And today we don't have rain like we used to… When my father used to work, we would leave the house everyday wearing a raincoat and come back wearing a raincoat. Now we have gone through a real drought here [in 2015], it was 11 months of sunshine. Now [in 2019] we already have had continuous sunshine for four or five months." – P18

Accordingly, experience reduces uncertainty, normality bias, and denial of climate change. While these quotes illustrate how the experience of climate change tends to dynamically shift or remove some barriers to risk appraisal, there are other barriers that are less likely to change with experience. These more persistent barriers relate primarily to the level of fear associated with climate change, such as optimism bias, future discounting, and risk tolerance. For instance, some producers remain inactive, despite the experience of drought, because they are normalizing the risk or because they are exclusively focused on the short-term, discounting the importance of future events. For example, this producer told us:

"The problem is: does he [the agricultural producer] die now or does he die later? Now, he dies of hunger. Later, he dies of thirst. Right?! He prefers to die later of thirst." – P34

Because they are oriented only to the present need to have a sufficient income for their subsistence, these producers are less concerned about the future problems brought by the water crisis. Therefore, they are unlikely to increase their risk appraisal for the future, despite experiencing the climate change effects.

Dynamic and persistent barriers to coping appraisal

As with risk appraisal, some of the barriers we identify for coping appraisal are dynamic and decrease as producers experience the consequences of climate change. Dynamic barriers include ignorance and perceived inequality for barriers that affect self-efficacy perception, as well as status quo bias, response risk perception, and lack of collectivism for barriers that affect the perceived response efficacy and cost. To illustrate this

argument, we use the example of ignorance (i.e., the lack of knowledge about how to respond to the effects of climate change). Some producers perceive that they lack the knowledge needed to cope with climate change, as this one expressed:

"In the dry season here, I would say pineapple does well in the dry, but we'll have to study what these fruits are. We still don't know the crops, we have to research and see which crop will really be productive now, so that we can plant and produce." – P17

While this producer justifies holding back with a lack of knowledge, our analysis reveals that, in most cases, experiencing extraordinary climate events drives producers to seek new and better knowledge about how to deal with them, thus increasing their coping appraisal. This producer, for example, expressed this quest for knowledge as a way to deal with the drought:

"*But for everything there is a way out, right? You have to find a way out. The way out is not selling the property…the way out is you seeking knowledge to learn how to live with this situation.*" – P19

Such new knowledge is either acquired from fellow producers, experts, government, or local NGOs, or from participating in association activities aimed at diffusing best practices. Reports from producers indicate that, when they experienced the unprecedented effects of climate change, producers began actively seeking new techniques and practices to save production, for instance by contracting technical assistants. The progression from inaction to action spurring from the higher coping appraisal becomes apparent in this producer's account of a verbal exchange with his son:

"*I say: -Aníbal Filho [son], the farm is in a situation that I don't know how we will go. Then...he turned to me, he told me: -Look Anibal, my father, I have a friend in those people from Água Viva [experts in water solutions], I'll send a technician there to take a look. There, they came and searched here the whole area [for underground water], the well is there*" – P13

This producer proceeded to show the new well to the first author. Moreover, once producers implement an effective response, they also become more confident that they

will be able to adapt in the future, reinforcing their coping appraisal, as apparent in the words of this producer:

"*Nature is strong, it does what it wants. But we have been doing things like this here [a new well], because we need to have the water, right?! If it happens, we know what to do again.*" – P28

Thus, coping appraisal increases as producers experiment with potential adaptations and engage in effective responses. In contrast, other barriers to coping appraisal, such as fatalism and the belief that drought is God's punishment for human misbehavior, are unlikely to be overcome as producers experience the dramatic consequences of climate change. God is believed to be both the cause and the potential solution to extreme climate events. Several producers made statements along these lines, for example:

"*That's the end of the world... When God filled the world with water, He repented and said that He was going to end it with fire. And we see it there. You see it. So, this is it. This is with God's approval, we should just stay in our position*." – P2

These producers believe there is nothing they can do other than to respect God's will. Despite experiencing the effects of climate change, their coping appraisal is kept at the minimum. It seems that producers with such beliefs do not take action beyond waiting for God's action, as this producer (P5) remarks: "*Now I can't do anything! Just wait for the Lord!*" Accordingly, producers who have fatalistic beliefs are less likely to act upon their experience.

In sum, our qualitative analysis reveals that there are psychological barriers that affect risk and coping appraisals, and thus responses. Some of these barriers are dynamic since they are reduced by the experience of climate change. The evidence for dynamic barriers lends further support to the results of the quantitative analysis, which indicate that the experience of climate change increases risk and coping appraisals. In contrast, other barriers are more persistent and are not or less likely decreased through the experience of climate change. The evidence for persistent barriers helps explain why, despite the experience of climate change, some producers engage in no adaptive or in maladaptive responses. In the next section, we merge the results of our quantitative and qualitative

study to develop a cohesive framework that illustrates what explains the implementation of different types of responses.

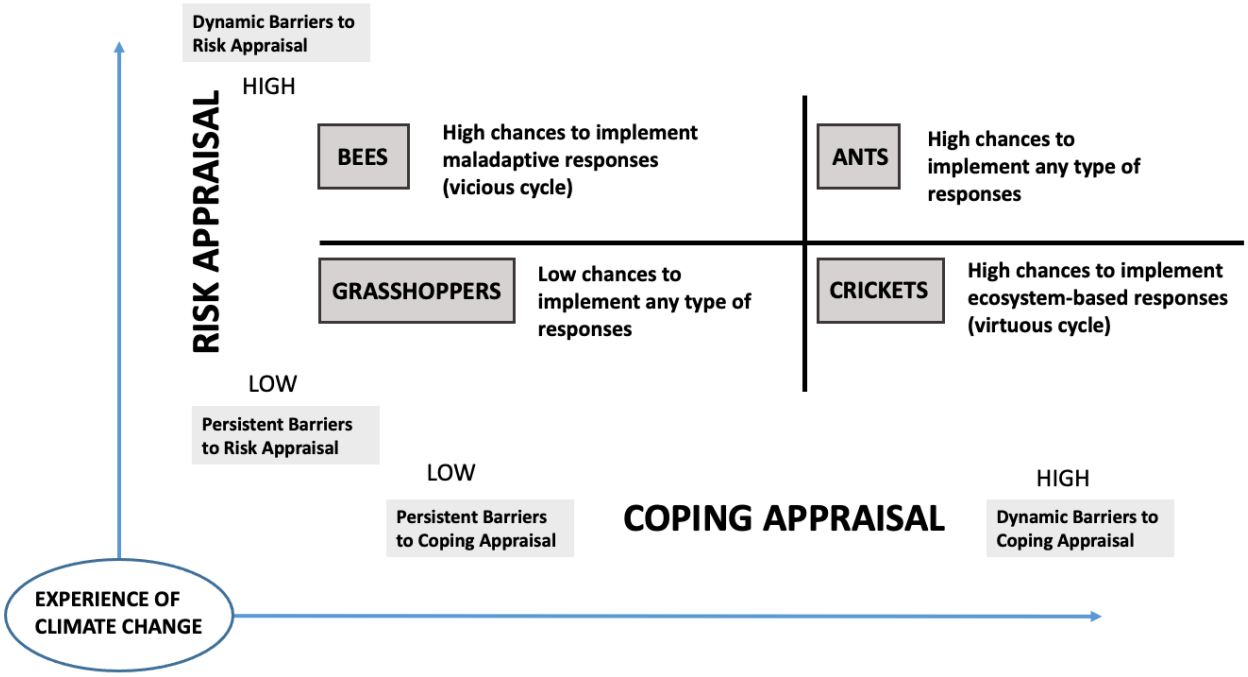
3.7 Archetypes of decision makers and their adaptive responses

Our quantitative results suggest that the direct experience with the effects of climate change increases the likelihood of implementing different types of adaptive responses, including the most effective and long-term oriented (i.e., the ecosystem-based responses), such as watershed reforestation, the medium-term oriented technology-based adaptive responses, such as irrigation, and the least effective and maladaptive ones, such as abandoning cocoa cultivation in favor of livestock farming. However, the mechanisms through which experiencing the effects of climate change stimulates these types of responses are different. On the one hand, this relationship occurs through greater appraisal of the decision maker's ability to cope with future climate events, or coping appraisal, which leads to the adoption of long-term oriented responses with positive effects on the ecosystem, such as reforestation, or medium-term oriented responses, such as the adoption of new technologies, and, surprisingly, even maladaptive responses. On the other hand, the relationship is mediated by an increased assessment and fear of climate risk, or risk appraisal, which leads instead to responses that are effective immediately but not necessarily in the long run, such as the adoption of new technologies or the change in production activity. These two mechanisms, risk and coping appraisal, are therefore important in determining not only whether an organization adapts, but also the type and the effectiveness of adaptive responses that are implemented. In addition, our qualitative analysis reveals that there are psychological barriers affecting these appraisals, some of which are reduced when decision makers experience climate change effects, while others are more persistent and prevent the emergence of either risk or coping appraisals despite direct experience with the severe consequences of climate change.

To explain what decision-making factors influence the choice between different types of responses, we merge the results of our qualitative and quantitative analysis into a cohesive framework. Specifically, we distinguish decision makers into four archetypes (*grasshoppers, bees, crickets, and ants*), which we characterize next, according to their

level of risk and coping appraisal based on the dummy variables in our quantitative analysis. Figure 3 illustrates the building blocks of our framework, presenting the four archetypes of decision makers and their likelihood of implementing different responses, but also the dynamics triggered by the experience of climate change and the psychological barriers present. These archetypes capture the theoretical expectations for the different types of decision makers.

Figure 3. Archetypes of decision makers responding to climate change



To empirically ground the framework, we report the results of the quantitative study for how frequently the different archetypes chose the different adaptive responses. Furthermore, we illustrate these archetypes with evidence from the qualitative interviews, where we categorized interviewees based on their results on risk and coping appraisal in the quantitative study.

The grasshopper archetype: Low risk appraisal and low coping appraisal

The first archetype of decision makers, and keeping the analogy with Aesop's fable, are the *grasshoppers*, decision makers who do not perceive or fear climate risk (low risk appraisal) and also have little confidence in their means to cope with it (low coping

appraisal). In line with our quantitative study, showing that risk and coping appraisals foster the engagement in all types of responses, these decision makers are relatively less inclined to implement the three types of adaptive responses considered in this study. In our quantitative sample, we found that 23% implemented maladaptive responses, 7% implemented technology-based responses (irrigation), and 27% of decision makers in this group implemented ecosystem-based adaptive responses (reforestation), which are the lowest adoption numbers compared to other archetypes.

Therefore, despite the experience with climate change, most producers in this archetype are less worried about the situation and less inclined to implement responses because of the presence of barriers to both risk and coping appraisals. In our qualitative study, we found confirmation that the lower level of concern with climate change characterizing this archetype, together with their perceived lower capacity to cope with it, make these decision makers reluctant to invest in any type of responses, which is considered less of a priority. As one producer in this archetype told us, when talking about reforestation:

"*Because the person doesn't even have anything to eat, he doesn't even have anything good to offer to his children. Will the person have an incentive to plant, to do other things? They don't! They don't even have the incentive to work, let alone to reforest.*" – P4

These decision makers are characterized by a lower tendency to take any action to adapt to climate change, and they prefer to wait for more favorable conditions to happen naturally. One producer in this group underlined his intention to patiently wait for the rain patterns to be restored, instead of changing his practices.

"*I haven't changed anything yet, but if it doesn't rain to refresh it, then it will be a problem... I can't do anything...we have to leave it like it is. Now, if it rains, everyone will work.*" – P1

However, as our analyses show, when decision makers experience the effects of climate change on their activities, many of them tend to increase their risk and coping appraisals because some of the psychological barriers to these mechanisms, the dynamic barriers, are reduced. Depending on the presence and level of psychological barriers to risk or coping appraisals (or both) that are persistent despite the experience of climate change,

these decision makers can either continue to be grasshoppers (if barriers to both risk and coping appraisal are persistent) or move into a situation where one appraisal is high and the other is low (if only the barrier to either risk or coping appraisal is persistent) or where both appraisals are high (if no barriers are persistent), thus changing the archetype. Therefore, decision maker archetypes are not static, but instead portray the dynamic evolution of decision makers' interpretations of their experience with the effects of climate change and the consequent evolution of their risk and coping appraisals.

The bee archetype: High risk appraisal and low coping appraisal

The second archetype, the *bees* (insects that are particularly vulnerable to climate change), emerges when decision makers develop greater risk appraisal following the experience of climate change, but when there are barriers to an increased coping appraisal. The bees are decision makers who perceive a high risk of suffering the effects of climate change (high risk appraisal) but do not believe they have the appropriate tools to respond (low coping appraisal). In this sense, they are the category that feels most vulnerable to the effects of climate change (Adger, 2006). In our quantitative sample, we found that these decision makers are the most inclined to implement maladaptive responses (45% of decision makers in this archetype converted land to pasture)—a significantly higher percentage than the grasshoppers as resulting from ANOVA at 5% confidence level—while they are as likely as the grasshoppers to implement ecosystem-based responses (30%). Moreover, 16% of decision makers in this archetype implement technology-based responses (a higher percentage than grasshoppers but significantly lower than other archetypes).

Our qualitative analysis reveals that decision makers in this group are often trapped in vicious cycles that push them to implement short-term responses that may make their situation worse in the future. Experiencing the effects of climate change increases their risk appraisal and especially the fear of major economic losses, eventually losing their livelihood, as this producer in this archetype comments:

"*As we live from agriculture, cocoa, when we see something like this [the drought] we get desperate, you know? Because there are expenses with the farm, with the workers, all that stuff, this really makes us desperate with the drought*." – P15

The demoralization, spurring from the experience of climate change and its effects, leads some to look for easy and low-cost ways out, such as deforestation to make space for cattle. One producer in the bee archetype sees the practice of deforesting to make space for cattle as the trend in the region and as something she would also like to implement, if the family members would agree:

"*He [the neighbor] cut everything down to make pasture for raising cattle…That seems to be the trend... If it [the farm] was [only] mine, I would have already looked for some places, I would have thrown some vegetation on the ground, burned it… so I could raise cattle too. Fattening cattle*." – P2

This choice is justified by the higher short-term profitability of livestock, which also requires less investment than technology-based solutions. As another producer in this archetype rationalized, raising livestock is less risky and can yield a more stable and immediate income:

"*Planting cocoa and then it dies… The cattle got higher price… At the end of the week, they have 800,000 Reais. And the cocoa is down there… and they wait, you plant to wait 5 or 8 years... it's not an advantage.*" – P29

For this reason, despite the negative long-term effects, this response is very tempting for producers who have high risk appraisal and yet, due to barriers to coping appraisal, do not see alternatives. Waiting for the effects of reforestation near water sources, instead, is perceived as a less viable option to deal with the situation, as it is not immediately effective, as one producer in this archetype shared:

"*Because it [the forest] in order to arrive at its optimal level it takes minimum 70 years…will I live that long? Clearly, I won't be alive by then.*" – P15

Therefore, demoralization and despair driven by the combination of high risk appraisal and low coping appraisal foster the implementation of maladaptive and shorter-term oriented responses, despite the awareness of the long-term negative consequences of such actions that are likely to increase the climate risk for the region.

The cricket archetype: Low risk appraisal and high coping appraisal

The third archetype, the *crickets* (insects that in many cultures symbolize wisdom) are those where decision makers develop a high coping appraisal, based on the experience of climate change, but where barriers exist to high levels of risk appraisals. In other words, crickets do not perceive high climate risk (low risk appraisal) but have confidence in their ability to deal with adverse climatic events (high coping appraisal). These decision makers are particularly inclined to adopt effective, long-term adaptive responses, as the lower urgency due to low risk appraisal leads to a greater lucidity to adopt solutions that are long-term oriented, even if less immediate. In fact, the cricket decision makers are significantly (as resulting from ANOVA) more likely to implement ecosystem-based adaptive responses (39%) than the two archetypes described before, while they are as likely as the bees to implement technology-based responses (15%) but significantly less likely to implement maladaptive responses (35%).

Our qualitative data reveal that virtuous cycles can emerge for this archetype of decision makers. When persistent barriers to risk appraisals are combined with high coping appraisals, decision makers tend to implement long-term oriented effective solutions, such as the ecosystem-based ones. These producers tend to see the ongoing water crisis as an opportunity for change, a way they can learn from their mistakes and adopt more effective responses.

"*Every crisis is pedagogical, you have to take a lesson from that. I hope that all men learn a lesson from what happened, so that we can review this situation, so that we come prepared, right?! Because just as this prolonged drought came, it may come again.*" – P19

Possessing a higher level of confidence in their ability to cope with drought, these producers show greater intention to wait for the effects of longer-term solutions such as reforestation near dry springs, even if not immediately protective. One producer reported about the necessity to reforest not only to secure current water supplies, but also for future generations, denoting the long-term orientation of these decision makers:

"*7 years old, 8 years old, 4 years old children, they can go through problems if we do not take conscience to preserve the springs and reforest the riverbeds, plant trees to be able to maintain this environmental balance. Even if we cannot restore all the necessary trees, we as small farmers have this obligation to help nature, to plant these trees that are so necessary to maintain this precious liquid that is water!*" – P14

Thus, when high coping appraisal is combined with lower risk appraisal, decision makers tend to implement long-term responses with positive effects on the ecosystem, creating virtuous cycles for the region.

The ant archetype: High risk appraisal and high coping appraisal

The last archetype are decision makers with high risk and high coping appraisals, which we call the *ants*, again in line with Aesop's fable. The ants are decision makers who, due to their high appraisal of risk and of their ability to cope with it, are particularly likely to implement any type of adaptive and maladaptive responses. This archetype likely arises when the experience of climate change reduces the barriers both to risk and to coping appraisals and when there are no persistent barriers. In percentage terms, from our quantitative study sample, we find that 38% of the decision makers in this group implemented ecosystem-based adaptive responses, 26% technology-based adaptive responses, and 42% maladaptive responses, showing a significantly higher probability than our baseline archetype, the grasshoppers, of implementing any type of response.

Ant decision makers perceive adaptation as fundamental for their survival, and they tend to consider and implement all types of responses. Their high risk appraisal makes them particularly prone to take action. Yet, similarly to the crickets, their high coping appraisal makes them quite lucid about the pros and cons of different actions. For instance, one producer in the ant archetype moved to cattle farming, despite being aware of the long-term negative consequences, which he is trying to mitigate by also engaging in reforestation:

"*In the old days, this was all cocoa. Today this is a cattle ranching region... It's good and bad at the same time. The bad thing is the deforestation. But it is a good activity, I particularly identify myself more with cattle breeding than with cocoa... Now, today you*

can also work with alternatives. Which is precisely taking care of the cattle and having enough trees and forest." – P11

This producer tries to find a balance between different types of responses. Another producer, representative of the ant archetype, considers irrigation as his preferred adaptative response, while cognizant of certain limitations:

"*I think we are going to try to use irrigation, to use these slightly more advanced technologies... But from the moment that you use water to irrigate the crops, there will be a lack of water for people. Water is not something that renews itself so quickly. If it doesn't rain, there is no water!*" – P3

As these quotes illustrate, the ant decision makers are confident in their ability to prepare and to brace themselves for adverse conditions, much like the ants in Aesop's fable.
In sum, we show that the different archetypes of decision makers choose different types of adaptive responses, in line with their risk and coping appraisal. Table 4 summarizes the likelihood of implementing each type of response for the different archetypes and the classification of the producers interviewed into the four archetypes.

Table 4. Archetype engagement in each response and interview categorization

	Grasshoppers* (Low risk, low coping appraisals)	**Bees*** (High risk, low coping appraisals)	**Crickets*** (Low risk, high coping appraisals)	**Ants*** (High risk, high coping appraisals)
Ecosystem-based	27%	30%	**<u>39%</u>**	**38%**
Technology-based	7%	**16%**	**15%**	**<u>26%</u>**
Maladaptive Responses	23%	**<u>45%</u>**	**35%**	**42%**
Qualitative Sample Producers**	P1, P4, P5, P17, P33, P34	P2, P15, P29	P6, P8, P9, P10, P12, P14, P19, P20, P23, P25, P26, P27, P30, P31, P35, P37	P3, P7, P11, P13, P16, P18, P22, P24, P28, P32, P36

*In bold the values significantly different from the grasshoppers (ANOVA, 5% confidence level), underlined the highest value across groups
**For P21 and P38 data on risk and coping appraisals are missing

3.8 Discussion and conclusion

The literature on organizational adaptation to climate change at the micro level expects that responses vary due to underlying differences in risk perception, adaptive capacity, and attitudes (Bleda & Shackley, 2008; Gasbarro & Pinkse, 2016; Hoffman et al., 2009). However, the literature has oversimplified the types of responses into adaptation versus no-adaptation. In contrast, our study disentangles different types of responses and helps explain the underlying mechanisms as well as psychological barriers to adaptation. Specifically, our work distinguishes four archetypes of decision makers and helps visualize what role the mechanisms of risk appraisal and coping appraisal play in shaping different types of responses. What emerges clearly is that the interpretive assessments of decision makers matter not only in explaining whether or not the organization will adapt after experiencing the effects of climate change, but also what adaptive response is implemented. The appraisal of climate risk alone is insufficient to foster effective adaptive responses, and can even be detrimental if not accompanied by a positive coping appraisal. When decision makers perceive that they are very vulnerable to climate risk and they perceive to lack the ability to cope with it, they are more likely to implement short-term oriented responses that worsen the future risk to the organization and to the socio-ecological system in which the organization is embedded. Such appraisals create vicious cycles that explain why some decision makers are implementing ineffective responses, despite the visible effects of climate change.

Breaking these vicious cycles is essential especially in contexts vulnerable to climate change, such as the one studied here. Tropical countries and especially the agricultural context represent a compelling setting for investigating adaptive responses. Yet research in these contexts has been limited, also due to logistical difficulties and high costs of data collection, whereas this study is based on a great effort in creating a multi-method dataset that is unique in its data richness. Such extraordinary access to data allows us to analyze adaptation in a truly vulnerable context (Adger, 2006; Adger et al., 2003; Pinkse & Kolk, 2012b), given the strength of climate change effects in the region and the small size and limited resources of the organizations considered. In addition, combining qualitative and quantitative data helped us triangulate our inferences and delve further into the mechanisms and boundary conditions of our proposed relationships in order to answer

our research question more fully and to overcome concerns about either method. Studying vulnerable contexts is highly informative for adaptive responses, since, for those organizations, adapting is a matter of life and death. With our study, we overcome the methodological concern raised to studies that focus on industrialized countries with temperate climates and less experience of the effects of climate change (Linnenluecke et al., 2013). As the experience of the effects of climate change is essential to motivate the engagement in protective responses (Weber, 2010; Weber & Stern, 2011), many studies in industrialized contexts have not found evidence of adaptive responses (Galbreath, 2014, Weinhofer & Baush, 2013).

Our contributions to the literature on adaptation to climate change are twofold. First, we integrate insights from PMT (Rogers, 1975, 1983) to develop a framework that shows how the direct experience of the effects of climate change stimulates two psychological mechanisms, risk and coping appraisal. These two mechanisms shape the type of response with varying temporal orientation and varying effects on the organization and on the ecosystem. By integrating the PMT lens into the adaptation literature, we obtain a more detailed understanding of the crucial role of decision makers' interpretation in determining which responses are implemented. We confirmed a finding on the importance of risk appraisal in stimulating organizational adaptive responses (Bleda & Shackley, 2008; Pinkse & Gasbarro, 2019; Weber, 2006; Weinhofer & Baush, 2013). However, while previous studies did not distinguish different types of responses, our analysis sheds light on what type of responses this mechanism shapes. Importantly, we find that, in the absence of a high level of coping appraisal, high risk appraisal leads to responses that are not effective in the long-term and that may even be maladaptive and worsen future climate change. In contrast to existing literature where coping appraisal has received less consideration (Grothmann & Reusswig, 2006), we find that this mechanism is fundamental to trigger the implementation of all responses, and especially when not accompanied by high risk appraisal can foster long-term oriented decisions. Moreover, by identifying specific barriers to both risk and coping appraisals and explaining how these barriers are relevant to defining which responses are implemented, we provide a more nuanced and dynamic explanation of how decision makers' interpretation of the experience of climate change and perception of future events affects which adaptive responses are implemented. Building on both qualitative and quantitative data, we build a cohesive framework for what explains decision makers' choice among different types

of adaptive responses, with a short-, mid-, or long-term orientation and with positive or negative effects on the ecosystem and the organization.

The second contribution is to move beyond a binary view of adaptation, which is dominant in the literature on adaptation to climate change at the individual level, and we propose a categorization of three types of adaptive responses to climate change— ecosystem-based, technology-based, and maladaptive— that takes into account both the temporal orientation, building on the Slawinski and Bansal's (2015) trade-off between effectiveness and speed, and the effects on the ecosystem. As mentioned before, several studies have characterized different possible adaptive responses (Berkhout et al., 2006; Frankhauser et al., 1999; Gasbarro et al., 2016; Slawinski & Bansal, 2015; Weinhofer & Baush, 2013). Yet, our study intersects the temporal dimension of the benefits brought by adaptation with the ecological dimension, thus responding to Okereke and colleagues' (2012) call for more attention to the ecological aspect in the study of adaptive responses. In our categorization, we considered not only the speed and effects of each type of response on the organization, but also their immediacy and effects on the ecosystem. Although we do not claim generalizability of this categorization across all contexts, we believe that, in addition to agriculture, other sectors that are equally highly affected by climate change and highly dependent on natural resources, such as winter tourism (Hoffman et al., 2009) and energy and utilities (Busch, 2011), face similar alternatives.

We want to highlight the following limitations. First, although we triangulated our inferences using a wide range of different qualitative and quantitative data and excluded potential alternative explanations by controlling for a variety of factors, our analyses are correlational and cannot claim causality. We invite future research to test our hypotheses through a randomized field experimental design, by manipulating the risk and coping appraisals related to a particular environmental challenge and by measuring different response types. Studies of this type can be implemented, for instance, in light of COVID-19 or natural disasters. In this context, it is possible to manipulate, through differentiated messages, both risk and coping appraisals and subsequently to measure the type of protective measures implemented by organizational decision makers.

A second limitation lies in the operationalization of some constructs. Specifically, coping and risk appraisals should not be considered binary variables. There is a continuum

between the extreme poles and most decision makers have a mix of possessing a high risk and coping appraisals and presenting certain psychological barriers to these mechanisms, creating a complex set of nuances. Yet, for analytical purposes, we considered only two levels for these variables to test our hypotheses and to build archetypes of decision makers. We invite future research to develop and validate new measures for these constructs.

Finally, we purposely selected a study context that exhibits extreme characteristics in relation to climate change, with its major effects already negatively affecting production along with the greater vulnerability typical of small businesses. Although we defend this choice as relevant for gaining valuable insights into adaptation to climate change, answering the call for a deeper consideration of vulnerable contexts (Linnenluecke et al., 2013), we cannot confidently claim the generalizability of our inferences outside the context of small businesses located in tropical regions. Concomitantly, the choice of this context was instrumental in isolating factors affecting adaptation at the decision-making level and shedding light on the psychological factors and barriers involved in the process. The context of small family-owned enterprises is well suited for this purpose, as it is characterized by simpler decision-making processes where decisions are often made by a single individual. We claim that micro-level factors are important in more complex organizational contexts as well. However, studies in these contexts should also consider other relevant organizational and institutional factors affecting decision making.

Climate change increasingly requires organizations to adapt to a changing environment, and it is known that organizational adaptive responses to climate change can push organizations into vicious cycles that make them and the surrounding communities increasingly vulnerable (Haider et al., 2018). Our study shows that decision makers' interpretation of their experience with climate change is crucial in determining whether they implement effective, less effective, or even maladaptive responses to it. We found that organizations with a more direct experience of climate change are pushed toward a greater appraisal of risk. Contrary to what has been often stated in the literature that encourages to evoke visceral scenarios in order to increase the appraisal of climate change risk (Weber, 2006), we found that when risk appraisal is not accompanied by a greater appraisal of their ability to cope with it due to the persistence of psychological barriers, it only leads to shorter-term adaptive or even maladaptive responses, increasing the future

vulnerability of the entire community. Therefore, an important practical implication of our analysis is that approaches to foster long-term adaptive responses in vulnerable contexts should target coping appraisal. A possible way to break the cycle could be to spread a more positive and informed view of what can be done effectively to address risks and to reduce persistent psychological barriers to coping appraisal. In light of our findings, policymakers, activists, and multinational organizations working in such contexts should provide communication and supportive tools that, instead of focusing on increasing the perception of climate change risk through apocalyptic scenarios, move in the direction of helping decision makers perceive that effective adaptive responses to climate change exist, which can be implemented even in vulnerable contexts and, thus, reduce barriers to coping appraisal. Such measures have the potential to stimulate more effective and long-term adaptive responses, with benefits for the organization, communities, and the ecosystem. In sum, to take effective actions, we must wholeheartedly believe that climate change is a problem we can address.

3.9 References

Adger, W. N. 2006. ***Vulnerability. Global Environmental Change***, 16, 268–281.

Adger, W. N., Huq, S., Brown, K., Conway, D., and Hulme, M. 2003. Adaptation to climate change in the developing world. ***Progress in Development Studies***, 3, 179–195.

Agrawala, S., Carraro, M., Kingsmill, N., Lanzi, E., Mullan, M., and Prudent-Richard, G. 2011. ***Private sector engagement in adaptation to climate change: approaches to managing climate risks.*** OECD Environment Working Papers.

Alexander D. E. 2006. Globalization of disaster: Trends, problems and dilemmas. ***Journal of International Affairs***, 59(2), 1–22.

Allison, P. D. 2001. ***Missing data*** (Vol. 136). Sage publications.

Arnell, N. W., and Delaney, E. K. 2006. Adapting to climate change: public water supply in England and Wales. ***Climatic Change***, 78(2-4), 227-255.

Axelrod, L. J., and Newton, J. W. 1991. Preventing nuclear war: Beliefs and attitudes as predictors of disarmist and deterrentist behavior. ***Journal of Applied Social Psychology***, 21,29-40.

Barnett, J., and O'Neill, S. 2010. Maladaptation. ***Global Environmental Change***, 20, 211–213

Bazerman, M. H. 2006. Climate change as a predictable surprise. ***Climatic Change***, 77(1-2), 179-193.

Bedran-Martins, A. M., Lemos, M. C., and Philippi, A. 2018. Relationship between subjective well-being and material quality of life in face of climate vulnerability in NE Brazil. ***Climatic Change***, 147(1–2), 283–297.

Berkhout, F. 2012. Adaptation to climate change by organizations. ***Wiley Interdisciplinary Reviews: Climate Change,*** 3(1), 91-106.

Berkhout, F., Hertin, J., and Gann, D. M. 2006. Learning to adapt: Organisational adaptation to climate change impacts. ***Climatic Change***, 78(1), 135-156.

Bertol-Rocha, L. 2008. ***A região cacaueira da Bahia – dos coronéis à vassoura-de-bruxa : saga, percepção, representação***. Ilhèus, BA: UESC Editora

Binswanger, H. P. 1980. Attitudes toward Risk: Experimental measurement in Rural India. ***American Journal of Agricultural Economics***, 62(3), 395.

Bleda, M., and Shackley, S. 2008. The dynamics of belief in climate change and its risks in business organisations. ***Ecological Economics***, 66(2-3), 517-532.

Busch, T. 2011. Organizational adaptation to disruptions in the natural environment: The case of climate change. ***Scandinavian Journal of Management***, 27(4), 389-404.

Cai, J., De Janvry, A., and Sadoulet, E. 2015. Social networks and the decision to insure. ***American Economic Journal: Applied Economics***, 7(2), 81-108.

Cavatassi, R., Lipper, L., and Narloch, U. 2011. Modern variety adoption and risk management in drought prone areas: insights from the sorghum farmers of eastern Ethiopia. ***Agricultural Economics***, 42(3), 279–292.

Chiapetti, J., Barbosa da Rocha, R., Santos da Conceição, A., Baiardi, A., Szerman, D., and VanWey, L. 2020. Panorama da cacauicultura no Território Litoral Sul da Bahia 2015-2019. In: ***Revelando desafios e oportunidades sociais, econômicas, e ecológicas para restauração de florestas em propriedades rurais na Mata Atlântica do Sul da Bahia.*** Instituto Floresta Viva: Ilhéus, BA, 2020.

Cluff, D. and Semple, W.S. 1994. Natural regeneration: 'mother nature's' own time. ***Australian Journal of Soil and Water Conservation***, 7, 28–33.

Crosthwaite, J. and Macleod, N.D. 2000. ***Retaining native vegetation on farms: understanding its private value.*** Nature Conservation 5: Nature Conservation in Production Environments (eds J.L. Craig, N. Mitchell and D.A. Saunders), pp. 662–669. Surrey Beatty and Sons, Chipping Norton.

Demski, C., Capstick, S., Pidgeon, N., Sposato, R. G., and Spence, A. 2017. Experience of extreme weather affects climate change mitigation and adaptation responses. ***Climatic Change***, 140(2), 149-164.

Dercon, S. 2002. Income Risk, Coping Strategies, and Safety Nets. ***The World Bank Research Observer***, 17(2), 141–166.

Deressa, T. T., Hassan, R. M., Ringler, C., Alemu, T., Yesuf, M. 2009. Determinants of farmers' choice of adaptation methods to climate change in the Nile Basin of Ethiopia. ***Global Environmental Change***, 19 (2), 248-255.

Dorrough, J., Vesk, P. A., and Moll, J. 2008. Integrating ecological uncertainty and farm-scale economics when planning restoration. ***Journal of Applied Ecology***, 45(1), 288-295.

Eakin, H. 2000. Smallholder Maize Production and Climatic Risk: A Case Study from Mexico. ***Climate Change***, 45(1), 19-36

Eakin, H., Tucker, C. M., and Castellanos, E. J. 2010. Perceptions of risk and adaptation: Coffee producers, market shocks, and extreme weather in Central America and Mexico. ***Global Environmental Change***, 20(1), 23–32.

Eggers, J. P. 2012. All experience is not created equal: Learning, adapting, and focusing in product portfolio management. ***Strategic Management Journal***, 33: 315-335.

Eggers, J. P., and Kaplan, S. 2009. Cognition and renewal: Comparing CEO and organizational effects on incumbent adaptation to technical change. ***Organization Science***, 20: 461-477.

Floyd, D. L., Prentice-Dunn, S., and Rogers, R. W. 2000. A meta-analysis of research on protection motivation theory. ***Journal of Applied Social Psychology***, 30(2), 407-429.

Flynn, M. F., Lyman, R. D., and Prentice-Dunn, S. 1995. Protection motivation theory and adherence to medical treatment regimens for muscular dystrophy. ***Journal of Social and Clinical Psychology***, 14,61-75.

Freier, K. P., Bruggemann, R., Scheffran, J., Finckh, M., and Schneider, U. A. 2012. Assessing the predictability of future livelihood strategies of pastoralists in semi-arid Morocco under climate change. ***Technological Forecasting and Social Change***, 79(2), 371-382.

Galbreath, J. 2011. To what extent is business responding to climate change? Evidence from a global wine producer. ***Journal of Business Ethics***, 104(3), 421-432.

Galbreath, J. 2014. Climate change response: Evidence from the Margaret River wine region of Australia. ***Business Strategy and the Environment***, 23 (2), 89-104

Gateau-Rey, L., E. V. J. Tanner, B. Rapidel, J-P. Marelli, and S. Royaert, 2018. Climate Change Could Threaten Cocoa Production: Effects of 2015-16 El Niño-Related Drought on Cocoa Agroforests in Bahia, Brazil. ***PLOS ONE*** 13(7):e0200454.

Gasbarro, F., and Pinkse, J. 2016. Corporate adaptation behaviour to deal with climate change: the influence of firm-specific interpretations of physical climate impacts. ***Corporate Social Responsibility and Environmental Management***, 23(3), 179-192.

Gasbarro, F., Rizzi, F., and Frey, M. 2016. Adaptation measures of energy and utility companies to cope with water scarcity induced by climate change. ***Business Strategy and the Environment***, 25(1), 54-72.

Gifford, R. 2011. The dragons of inaction: psychological barriers that limit climate change mitigation and adaptation. ***American Psychologist***, 66(4), 290.

Grammatikopoulou, I., Pouta, E., and Myyrä, S. 2016. Exploring the determinants for adopting water conservation measures. What is the tendency of landowners when the resource is already at risk?. ***Journal of Environmental Planning and Management***, 59(6), 993-1014.

Grothmann, T., and Reusswig, F. 2006. People at risk of flooding: Why some residents take precautionary action while others do not. ***Natural Hazards***, 38 (1-2), 101-120

Grothmann, T., and Patt, A. 2005. Adaptive capacity and human cognition: The process of individual adaptation to climate change. ***Global Environmental Change***, 15(3), 199-213.

Haider, L. J., Boonstra, W. J., Peterson, G. D., and Schlüter, M. 2018. Traps and sustainable development in rural areas: a review. ***World Development***, 101, 311-321.

Haigh, N., and Griffiths, A. 2012. Surprise as a catalyst for including climatic change in the strategic environment. ***Business and Society***, 51(1), 89-120.

Hayes, A. F., and Scharkow, M. 2013. The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis: Does method really matter?. ***Psychological Science***, 24(10), 1918-1927.

Harris, J. A., Hobbs, R. J., Higgs, E., Aronson, J. 2006. Ecological Restoration and Global Climate Change. ***Restoration Ecology***, 14 (2), 170-176

Hertin, J., Berkhout, F., Gann, D., and Barlow, J. 2003. Climate change and the UK house building sector: perceptions, impacts and adaptive capacity. ***Building Research and Information,*** 31(3-4), 278-290.

Hertwig, R., Barron, G., Weber, E. U., & Erev, I. 2004. Decisions from experience and the effect of rare events in risky choice. ***Psychological Science***, 15(8), 534-539.

Hoffmann, V. H., Sprengel, D. C., Ziegler, A., Kolb, M., and Abegg, B. 2009. Determinants of corporate adaptation to climate change in winter tourism: An econometric analysis. ***Global Environmental Change***, 19(2), 256-264.

Howard-Grenville, J., Buckle, S. J., Hoskins, B. J., and George, G. 2014. Climate change and management. ***Academy of Management Journal***, 57 (3), 615-623

Ifinedo, P. 2012. Understanding information systems security policy compliance: An integration of the theory of planned behavior and the protection motivation theory. ***Computers and Security***, 31(1), 83-95.

Intergovernmental Panel on Climate Change 2012. ***Fourth assessment report: climate change 2012.*** Cambridge, UK: Cambridge University Press.

Intergovernmental Panel on Climate Change 2014. ***Sixth assessment report: climate change 2014.*** Cambridge, UK: Cambridge University Press.

Jianjun, J., Yiwei, G., Xiaomin, W., and Nam, P. K. 2015. Farmers' risk preferences and their climate change adaptation strategies in the Yongqiao District, China. ***Land Use Policy,*** 47, 365-372.

Johnson, R. B., and Onwuegbuzie, A. J. 2004. Mixed methods research: A research paradigm whose time has come. ***Educational Researcher***, 33(7), 14-26.

Kantola, S. J., Syme, G. J., and Nesdale, A. R. 1983. The effects of appraised severity and efficacy in promoting water conservation: An informational analysis. ***Journal of Applied Social Psychology,*** 13, 164-182.

Kolbert, E. 2012. Field Notes from a Catastrophe: Climate Change-Is Time Running Out?. ***Bloomsbury Publishing, London*** (UK).

Kothandapani, V. 1971. Validation of feeling, belief, and intention to act as three components of attitude and their contribution to prediction of contraceptive behavior. ***Journal of Personality and Social Psychology***, 19(3), 321-333.

Le Dang, H., Li, E., Nuberg, I., and Bruwer, J. 2014. Understanding farmers' adaptation intention to climate change: A structural equation modelling study in the Mekong Delta, Vietnam. ***Environmental Science and Policy***, 41, 11-22.

Lee, S. Y., and Klassen, R. D. 2016. Firms' response to climate change: The interplay of business uncertainty and organizational capabilities. ***Business Strategy and the Environment***, 25(8), 577-592.

Lee, A. 1991. Integrating positivist and interpretive approaches to organizational research. ***Organization Science***, 2, 342–365.

Lee, A. 1999. ***Using qualitative methods in organizational research***. Thousand Oaks, CA: Sage.

Linnenluecke, M. K., Griffiths, A., and Winn, M. I. 2013. Firm and industry adaptation to climate change: a review of climate adaptation studies in the business and management field. ***Wiley Interdisciplinary Reviews: Climate Change***, 4(5), 397-416.

Linnenluecke, M. K., Griffiths, A., and Winn, M. 2012. Extreme weather events and the critical importance of anticipatory adaptation and organizational resilience in responding to impacts. ***Business Strategy and the Environment***, 21(1), 17-32.

Linnenluecke, M. K., Stathakis, A., and Griffiths, A. 2011. Firm relocation as adaptive response to climate change and weather extremes. ***Global Environmental Change***, 21(1), 123-133.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. 2001. Risk as feelings. ***Psychological Bulletin***, 127(2), 267.

Mann, M.E., Steinman, B.A., and Miller, S.K., 2014. On forced temperature changes, internal variability and the AMO, ***Geophysical Research Letters*** ("Frontier" article).

Milne, S., Sheeran, P., and Orbell, S. (2000). Prediction and intervention in health-related behavior: A meta-analytic review of protection motivation theory. ***Journal of Applied Social Psychology***, 30(1), 106-143.

Molina-Azorin, J. F., 2015. Mixed methods in strategy research: applications and implications in the resource-based view. ***Research Methodology in Strategy and Management***, 4, 37–73.

Mulilis, J. P., and Lippa, R. 1990. Behavior changes in earthquake preparedness due to negative threat appeals: A test of protection motivation theory. ***Journal of Applied Social Psychology***, 20,619-638.

Nitkin, D., Foster, R., and Medalye, J. 2009. ***A systematic review of the literature on business adaptation to climate change.*** London, Canada: Network for Business Sustainability.

Okereke, C., Wittneben, B., and Bowen, F. 2012. Climate change: Challenging business, transforming politics. ***Business and Society***, 51(1), 7-30.

Omer, H., & Alon, N. 1994. The continuity principle: A unified approach to disaster and trauma. ***American Journal of Community Psychology***, 22(2), 273-287.

Pechmann, C., Zhao, G., Goldberg, M. E., and Reibling, E. T. 2003. What to convey in antismoking advertisements for adolescents: The use of protection motivation theory to identify effective message themes. ***Journal of Marketing***, 67(2), 1-18.

Pereira, D. R., Quintao de Almeida, A., Aparecido, M. M., Quintao Rosa, D. R. 2014. Impacts of deforestation on water balance components of a watershed on the Brazilian East Coast. ***Revista Brasileira da Ciências do Solo***, 38 (4).

Pinkse. J. and Gasbarro, F. 2019. Managing Physical Impacts of Climate Change: An Attentional Perspective on Corporate Adaptation. ***Business and Society***, 58 (2), 1-36.

Pinkse, J., and Kolk, A. 2012a. Addressing the climate change—sustainable development nexus: The role of multistakeholder partnerships. ***Business and Society***, 51(1), 176-210.

Pinkse, J., and Kolk, A. 2012b. MNES and climate change: exploring institutional failures and embeddedness. ***Journal of International Business Studies***, 43, 332-341.

Porter, M. E., and Reinhardt, F. 2007. GRIST: a strategic approach to climate. ***Harvard Business Review, Forethought Special Report.***

Ritchie, J., and Spencer, L. 1994. Qualitative data analysis for applied policy research. In, Bryman A, Burgess RG, eds. ***Analyzing Qualitative Data***. Abindgon: Routledge, 173-94.

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., Lambin, E. F., ... and Nykvist, B. 2009. A safe operating space for humanity. ***Nature,*** 461(7263), 472-475.

Rogers, R. W. 1975. A protection motivation theory of fear appeals and attitude change. ***The Journal of Psychology***, 91,93- 114.

Rogers, R.W. 1983. Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In B. L. Cacioppo and L. L Petty (Eds.), ***Social psychophysiologv: A sourcebook*** (pp. 153-176). London, UK: Guilford.

Samuelson, W., and Zeckhauser, R. 1988. Status quo bias in decision making. ***Journal of Risk and Uncertainty***, 1(1), 7-59.

Sarta, A., Durand, R., and Vergne, J. P. 2021. Organizational Adaptation. ***Journal of Management,*** 47(1), 43-75.

Scott, D., and McBoyle, G. 2007. Climate change adaptation in the ski industry. ***Mitigation and Adaptation Strategies for Global Change***, 12(8), 1411.

Shiferaw, B., Prasanna, B. M., Hellin, J., and Bänziger, M. 2011. Crops that feed the world: Past successes and future challenges to the role played by maize in global food security. ***Food Security***, 3(3), 307–327.

Simonet, G., J. Subervie, D. Ezzine-de-Blas, M. Cromberg, and A. E. Duchelle. 2019. Effectiveness of a REDD+ project in reducing deforestation in the Brazilian Amazon. ***American Journal of Agricultural Economics***, 101(1), 211-229.

Slawinski, N., and Bansal, P. 2015. Short on time: Intertemporal tensions in business sustainability. ***Organization Science***, 26(2), 531–549.

Slawinski, N., Pinkse, J., Busch, T., and Banerjee, S. B. 2017. The role of short-termism and uncertainty avoidance in organizational inaction on climate change: A multi-level framework. ***Business and Society***, 56(2), 253-282.

Smit, B., and Wandel, J. 2006. Adaptation, adaptive capacity and vulnerability. ***Global Environmental Change***, 16, 282–292.

Smit, B., Burton, I., Klein, R. J., and Wandel, J. 2000. An anatomy of adaptation to climate change and variability. In ***Societal adaptation to climate variability and change*** (pp. 223-251). Springer, Dordrecht.

Srivastava, A. and Thomson, S. B. 2009. Framework Analysis: A Qualitative Methodology for Applied Policy Research. ***JOAAG***, 4 (2).

Strauss, A., and Corbin, J. 1998. ***Basics of qualitative research: Techniques and procedures for developing grounded theory***. Thousand Oaks, CA: Sage Publications, Inc.

Sullivan, R., and Gouldson, A. 2016. Comparing the climate change actions, targets and performance of UK and US retailers. ***Corporate Social Responsibility and Environmental Management,*** 23(3), 129-139.

Swim, J., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J., ... & Weber, E. 2009. Psychology and global climate change: Addressing a multi-faceted phenomenon and set of challenges. A report by the American Psychological Association's task force on the interface between psychology and global climate change. ***American Psychological Association***, Washington.

Tam, J., and McDaniels, T. L. 2013. Understanding individual risk perceptions and preferences for climate change adaptations in biological conservation. ***Environmental Science and Policy***, 27, 114-123.

Tampe, M. 2016. ***(Trans)National Rules and Local Performances: Sustainability Standards in the Cocoa Sector of Ghana, Ecuador, and Brazil***. MIT, Cambridge.

Tansey, R., White, M., Long, R. G., and Smith, M. 1996. A comparison of loglinear modeling and logistic regression in management research. ***Journal of Management***, 22(2), 339-358.

Teddlie, C., and Tashakkori, A. 2003. Major Issues and Contro- versies in the Use of Mixed Methods in the Social and Behavioral Sciences. in ***Handbook of Mixed Methods in Social and Behavioral Research,*** A. Tashakkori and C. Teddlie (eds.), Thousand Oaks, CA: Sage Publications, pp. 3-50.

Teddlie, C., and Tashakkori, A. 2009. ***Foundations of Mixed Methods Research***, Thousand Oaks, CA: Sage Publications.

Tingey-Holyoak, J. L., and Pisaniello, J. D. 2017. Strategic responses to resource management pressures in agriculture: Institutional, gender and location effects. ***Journal of Business Ethics***, 144(2), 381–400.

Tucker, C. M., Eakin, H., and Castellanos, E. J. 2010. Perceptions of risk and adaptation: coffee producers, market shocks, and extreme weather in Central America and Mexico. ***Global Environmental Change***, 20(1), 23-32.

Tulloch, H., Reida, R., D'Angeloa, M. S., Plotnikoff, R. C., Morrina, L., Beatona, L., ... and Pipe, A. 2009. Predicting short and long-term exercise intentions and behaviour in patients with coronary artery disease: A test of protection motivation theory. ***Psychology and Health***, 24(3), 255-269.

UNCTAD. 2016. ***Cocoa Industry: Integrating Small Farms into the Global Value Chain. Special Unit on Commodities***. UNCTAD/SUC/2015/4. New York and Geneva: UNCTAD.

Venkatesh, V., Brown, S. A., and Bala, H. 2013. Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. ***MIS quarterly***, 21-54.

Weber, E. U. 2006. Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet). ***Climatic Change***, 77(1), 103-120.

Weber, E. U. 2010. What shapes perceptions of climate change?. Wiley Interdisciplinary Reviews: ***Climate Change***, 1(3), 332-342.

Weber, E. U., & Stern, P. C. 2011. Public understanding of climate change in the United States. ***American Psychologist***, 66(4), 315.

Weinhofer, G., and Busch, T. 2013. Corporate strategies for managing climate risks. ***Business Strategy and the Environment***, 22(2), 121-144.

Willumsen, M. J. and A. K. Dutt., 1991. Café, Cacau e Crescimento Econômico No Brasil. ***Revista de Econômia Política*** 3(43):49–67.

Winn, M. I., Kirchgeorg, M., Griffiths, A., Linnenluecke, M. K., and Günther, E. 2011. Impacts from climate change on organizations: A conceptual foundation. ***Business Strategy and the Environment***, 20, 157-173.

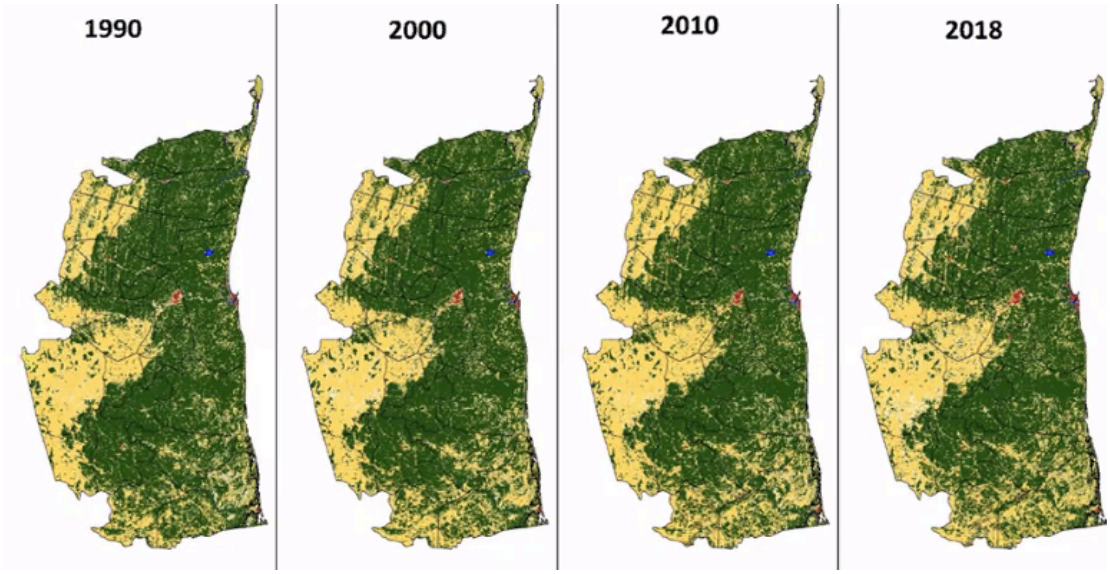
Wolf, S., Gregory, W. L., and Stephan, W. G. 1986. Protection motivation theory: Prediction of intentions to engage in anti-nuclear war behaviors. ***Journal of Applied Social Psychology***, 16, 3 10-321.

Wright, C., and Nyberg, D. 2017. An Inconvenient Truth: How organizations translate climate change into business as usual. ***Academy of Management Journal***, 60(5), 1633–1661.

Yan, Y., Jacques-Tiura, A. J., Chen, X., Xie, N., Chen, J., Yang, N., ... and MacDonell, K. K. 2014. Application of the protection motivation theory in predicting cigarette smoking among adolescents in China. ***Addictive Behaviors***, 39(1), 181-188.

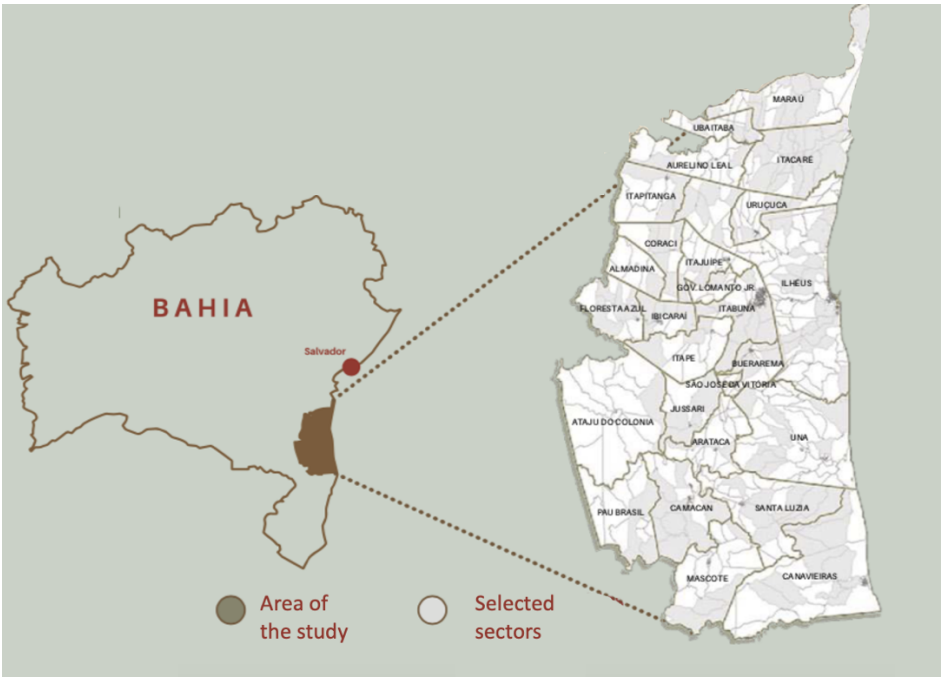
3.10 Appendices

Appendix A: Ongoing deforestation in the municipalities included in our study



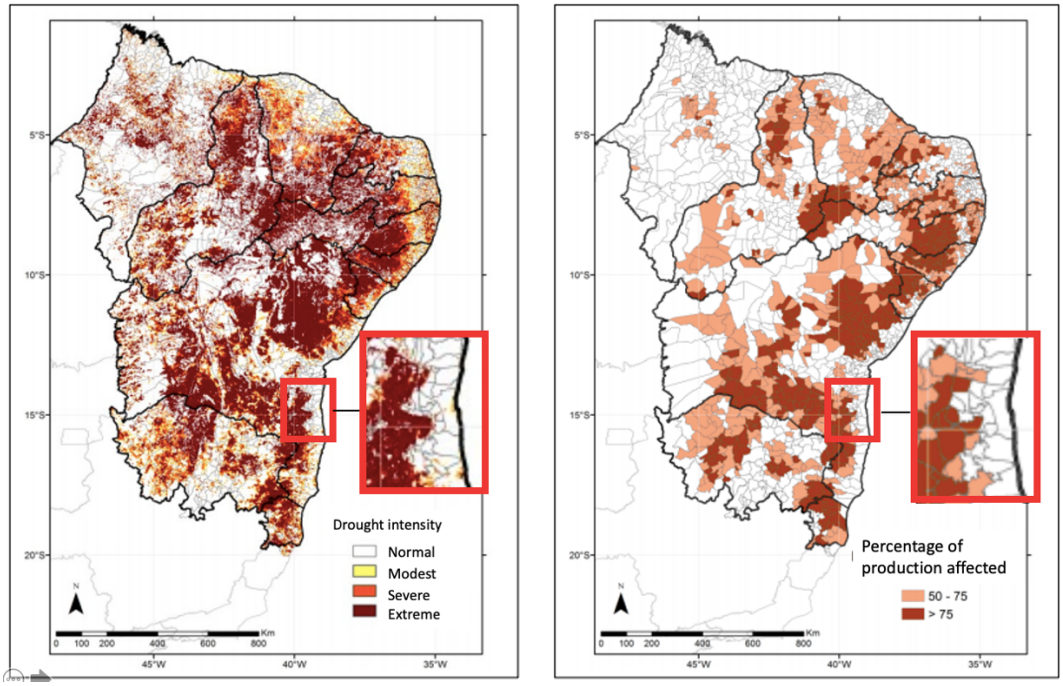
Source: Projeto MAPBIOMAS - coverage and land use collection of the annual series of coverage and land use maps in Brazil. https://mapbiomas.org/colecoes-mapbiomas-br

Appendix B: Sectors randomly selected for the study sample



Source: Chiapetti et al., 2020

Appendix C: Severity of drought (left) and percentage of agricultural production affected in each municipality (right) in December 2015 in the North-East of Brazil – Zoom on the study context



Source: Centro Nacional de Monitoramento e Alertas de Desastres Naturais (Cemaden) http://www.cemaden.gov.br/secaeimpactos/arquivos/Boletim_Mensal_Monitoramento_Impactos_Seca_dezembro_2015.pdf

Appendix D: Descriptive statistics and correlation matrix

	Mean	SD	Min	Max	Reforestation	Irrigation	Maladaptation	Risk Appraisal	Coping Appraisal	Experience of Climate Change	Risk Aversion	Dependence from farm	Credit line	Technical assistance
Reforestation	0,334	0,472	0	1	1									
Irrigation	0,134	0,341	0	1	0,04	1								
Maladaptation	0,319	0,466	0	1	0,18	0,02	1							
Risk Appraisal	0,202	0,401	0	1	0,02	0,13	0,12	1						
Coping Appraisal	0,544	0,498	0	1	0,12	0,13	0,11	0,11	1					
Experience of Climate Change	-0,298	0,150	-0,79	-0,07	-0,03	0,06	0,02	0,01	0,09	1				
Risk Aversion	3,569	1,886	1	6	-0,02	-0,02	-0,03	-0,02	0,05	0,01	1			
Dependence from farm	0,395	0,321	0	1	0,00	0,08	0,00	0,04	0,09	-0,06	-0,01	1		
Credit line	0,351	0,478	0	1	0,06	0,03	-0,01	0,03	0,07	0,01	-0,05	0,07	1	
Technical assistance	0,245	0,430	0	1	0,10	0,00	-0,03	-0,02	0,06	-0,08	-0,03	0,11	0,18	1
Association membership	0,346	0,476	0	1	0,08	0,03	-0,06	-0,04	0,08	0,01	-0,02	0,05	0,23	0,21
Precipitation average	15,668	4,089	9	23	-0,11	-0,13	-0,11	-0,25	-0,04	0,18	0,04	-0,05	0,01	-0,10
Gender	0,158	0,365	0	1	0,00	-0,01	0,04	0,00	0,01	0,03	0,04	-0,13	0,00	-0,03
Age	57,457	13,027	16	95	-0,06	-0,05	-0,01	0,03	-0,07	-0,01	0,05	-0,19	0,07	-0,05
Education years	6,800	5,728	0	30	0,13	0,02	0,03	0,08	0,06	-0,12	-0,06	0,15	0,03	0,22
Size ha	30,807	40,871	1,75	297,50	0,10	-0,01	0,03	0,01	0,04	-0,01	0,01	0,24	0,03	0,13
Household income (x1000 R$)	3,492	4,874	0,015	45	0,10	-0,02	0,01	0,01	0,05	-0,06	-0,04	-0,07	0,09	0,14
Farm profits (x1000 R$)	1,264	2,086	0	24,23	0,08	0,04	0,01	0,06	0,09	-0,05	-0,04	0,40	0,09	0,17
Workers number	0,654	1,496	0	22,5	0,08	-0,03	0,02	0,00	0,05	-0,06	0,00	0,19	0,06	0,20
Source of water	0,885	0,319	0	1	0,03	-0,03	-0,01	-0,05	0,00	0,05	0,01	0,03	0,01	-0,02
Facility	0,567	0,496	0	1	0,07	0,05	0,02	-0,03	0,03	-0,09	0,00	0,06	0,06	0,17
Technology level	1,053	1,179	0	5	0,06	0,09	0,01	-0,06	0,06	0,01	0,01	0,16	0,07	0,15
Cacao main	0,596	0,491	0	1	-0,08	-0,14	-0,04	-0,15	-0,02	-0,12	0,01	0,05	0,00	0,08

	Association membership	Precipitation average	Gender	Age	Education years	Size ha	Household income (x1000R$)	Farm profits (x1000R$)	Workers number	Source of water	Facility	Technology level	Cacao main
Reforestation													
Irrigation													
Maladaptation													
Risk Appraisal													
Coping Appraisal													
Direct Effects of Climate Change													
Risk Aversion													
Income dependency from farm													
Credit line													
Technical assistance													
Association membership	1												
Precipitation average	0,05	1											
Gender	0,00	-0,02	1										
Age	-0,08	0,01	0,02	1									
Education years	0,05	-0,11	-0,04	-0,24	1								
Size ha	-0,04	-0,14	-0,10	0,09	0,42	1							
Household income (x1000 R$)	0,00	-0,05	-0,10	0,04	0,47	0,46	1						
Farm profits (x1000 R$)	0,03	-0,07	-0,09	0,01	0,40	0,59	0,65	1					
Workers number	-0,01	-0,05	-0,10	0,08	0,45	0,64	0,54	0,62	1				
Source of water	0,00	0,03	-0,06	0,09	0,06	0,14	0,05	0,07	0,09	1			
Facility	0,07	-0,04	0,02	0,03	0,14	0,12	0,13	0,13	0,14	0,01	1		
Technology level	0,05	0,01	-0,11	-0,07	0,35	0,30	0,33	0,37	0,35	0,10	0,21	1	
Cacao main	0,01	0,20	-0,01	0,08	-0,01	-0,05	0,01	-0,02	0,09	0,01	-0,02	-0,09	1

4.

Organizational Post-traumatic Growth: How Disasters Affect Responsiveness to Environmental Opportunities and Threats

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This chapter aims to address the first overarching research objective of this Ph.D. thesis, by empirically examining the long-term effects of experiencing a natural disaster on organizational values and beliefs and responsiveness to unrelated environmental forces.

4.1 Abstract

Prior studies have emphasized the role of resilience and learning from disasters as crucial to face similar threats. Yet, despite the increasing frequency of such events, our understanding of the wider effects of natural disasters on organizational capabilities and potential to "build back better" is limited. Natural disasters can radically change societal worldviews. This change is likely to affect organizations far beyond preparedness to face future disasters threats. Triggered by this intuition and guided by additional conjectures, we explored and found that the organizations hit the most by a natural disaster, the Japanese earthquake of 2011, experienced a faster revenue growth (2010-2019) compared to the pre-disaster level than the less affected ones. To explore the potential mechanisms behind this differential growth, we build on unique survey data to propose that being affected by a natural disaster triggers a change in organizational values and beliefs that, in turn, favors organizational exploration and sensitivity to the environmental latent threats and opportunities, such as population aging and growing environmentalism of consumers. To capture these effects, we propose the concept of organizational post-traumatic growth. Through this richer explanation and empirical assessment, we contribute to a greater clarity of how some organizations are able to rise from their ashes with renewed capabilities and strength.

Keywords: Natural disaster, organizational change, resilience, organizational post-traumatic growth, organizational learning.

4.2 Introduction

Her fetters burst, and just releas'd from prison,
A virgin phoenix from her ashes risen.
Lord Byron, in English Bards and Scotch Reviewers (1809)

In February 2003, due to a severe snowstorm, the roof of the Baltimore & Ohio Railroad Museum Roundhouse collapsed, destroying most of the artifacts on display within its walls, right before a major fundraising event for the museum. Yet, when the museum reopened its doors a few months later, it was larger, appealing to a wider audience, better able to attract donations, and more likely than ever to foster an open culture among employees (Christianson, Farkas, Sutcliffe, & Weick, 2009). A few years earlier, in 1989, the Loma Prieta earthquake struck San Francisco and severely damaged the Embarcadero Freeway, a highway that cut through the city's waterfront. Instead of repairing it, the mayor decided to demolish the highway, despite facing resistance from the business community, and develop modern facilities in its place. The area is still a model for urban planning today, attracting billions of dollars of investment. "Don't put things back the way they were automatically," said the mayor in office at the time, as reported in newspapers, "There may be a better way" (Farmer, 2013). How could the Baltimore & Ohio Railroad Museum Roundhouse and the city of San Francisco not only recover after being struck by a disaster, but also be reborn with improved vision, capabilities, and performance, like a phoenix from the ashes?

Not counting viruses and pandemics, each year natural disasters kill approximately 90 thousand people and affect 160 million people by destroying their physical, biological, and social environments (World Health Organization, 2020). These phenomena are more frequent every year (Alexander, 2006), pushing organizations to face profound crises due to unexpected changes in the natural environment (Guion, Scammon, & Borders, 2007; Sahebjamnia, Torabi, & Mansouri, 2015). In the United States alone, two months after the outbreak of the COVID-19 pandemic, 2% of businesses had already closed their doors forever (Bartik, Bertrand, Cullen, Glaeser, Luca, & Stanton, 2020). Against this backdrop, more and more scholars from various disciplines are questioning whether organizations can not only survive these events, but also be "built back better" (Clark & Gruending, 2020; Klassen & Murphy, 2020). This possibility is also at the heart of current

commentary and conversations in the field of management (Foss, 2020; Gutierrez-Gutierrez, Castillo, & Montiel, 2020; Hamann, 2020; Meyer, Lund Pedersen, & Ritter, 2020), often evoked as a hope or chimera, rather than a true opportunity. In fact, with a few notable exceptions that illustrate this phenomenon through empirical case studies, such as the Baltimore & Ohio Railroad Museum Roundhouse case (Christianson et al., 2009) presented above, the extant literature falls short of explaining how, when, and how often this eventuality materializes. The literature on organizational response to disasters focuses on resilience, i.e. the ability to quickly recover and return to the pre-disaster situation (Beunza & Stark, 2003; Kendra & Wachtendorf, 2003; Nishiguchi & Beaudet, 1998; Williams, Gruber, Sutcliffe, Shepherd, & Zhao, 2017), or learning from disasters, i.e. the improved ability to cope with similar threats in the future (Carley & Harrald, 1997; Madsen, 2009; Oetzel & Oh, 2013; Scholten, Scott & Fynes, 2019). Neither of these two streams of literature, however, can explain a deeply ingrained change in the organization that would allow it to grow and improve after a disaster, beyond its ability to deal with similar threats.

As we explored the long-term organizational consequences of the Great East Japan Earthquake (GEJE or 東日本大震災) of 2011, the costliest disaster in history according to the World Bank, one piece of evidence surprised and intrigued us: the companies that had suffered the most from the disaster had grown faster in terms of revenue compared to pre-disaster values than companies that had been less affected. An intriguing question arose spontaneously: is it therefore possible for an organization to improve and come out stronger, not merely survive, after being hit by a disaster? While the possibility of post-traumatic growth at the individual level has been extensively studied, there is a lack of empirical studies on whether and how a similar phenomenon can occur for organizations (Maitlis, 2020).

Individual post-traumatic growth has been widely supported by evidence in the clinical psychology literature and refers to the growth process through which survivors of a life-threatening event are transformed as a result of their struggles in the aftermath of the traumatic experience (Jayawickreme & Blackie, 2014; McMillen & Fisher, 1998). As many as 70% of the survivors of a life-threatening event perceive some sort of positive transformation as a result of their struggles during and after the traumatic experience

(Linley & Joseph, 2004). Natural disasters, then, are a fertile ground for individual post-traumatic growth. The central idea is that, due to the recognition of the lability of life following such disasters, the dominant materialistic worldview gives way to a new altruistic worldview in which human relationships and sense of belonging to society become central to give meaning to existence, thus prompting individuals to reinforce altruistic values and beliefs (Chamlee-Wright & Storr, 2011; Cohn, Mehl, & Pennebaker, 2004; Frazier, Greer, Babrielsen, Tennen, Park, & Tomich, 2013; Li, Li, Decety, & Lee, 2013; Oishi, Yagi, Komiya, Kohlbacher, Kusumi, & Ishii, 2017; Tiefenbach & Kohlbacher, 2015; Uchida, Takahashi, & Kawahara, 2014). While it is likely that this phenomenon affects individuals within organizations as well, cross-level inferences may not be analytically accurate and should not be assumed without further consideration (Mossholder & Bedeian, 1983).

This is why, in this study, we analyze the response of Japanese companies to the 2011 GEJE to understand not only whether organizational post-traumatic growth exists beyond a few isolated cases, but also what the plausible underlying mechanisms are. Specifically, our research question is: *are natural disasters a catalyst for organizational growth? If so, what are the underlying mechanisms of organizational post-traumatic growth?* To answer these questions, we draw on both archival database data from 2009 to 2019 and survey data collected the year after the disaster, in 2012, from a representative sample of 575 Japanese companies operating in various industries. What emerges is that, in the aftermath of the disaster, the most affected companies are more likely to develop more altruistic values and beliefs that, in turn, prompt them to explore their external environment and become more responsive to latent opportunities and threats in it, ultimately achieving faster long-term growth in their revenues.

Our study represents, to the best of our knowledge, the first attempt to quantitatively explore how the experience of a natural disaster can act as a catalyst for a positive organizational change and, ultimately, faster growth. While scholars have acknowledged the potential of learning from a disaster that results in greater preparedness to deal with similar threats in the future, we propose that organizations undergo much more profound changes. Disaster preparedness and resilience are undoubtedly essential for organizations, especially when they are located in a disaster-prone area, but we argue that the prevailing focus on the iceberg's tip of resilience and preparedness has led the field to largely ignore the hidden mass beneath which lie additional and collateral changes that radically affect

an organization that survives a natural disaster (Lampel, Shamsie, & Shapira, 2009), with profound implications for organizations facing disasters or the COVID-19 pandemic. Second, we provide new insights into the mechanisms of such change by showing in quantitative terms that the experience of a natural disaster prompts organizations to question their purposes and adjust their values and beliefs accordingly to the new quest for meaning. Disasters represent an ineluctable force for change (Argote & Miron-Spektor, 2011; Barnett & Pratt, 2000; Christianson et al., 2009; Turner, 1976; Weick, Sutcliffe, & Obstfeld, 1999) and we show how the values and beliefs change triggers a long-term transformation process in the organization by stimulating its responsiveness to environmental opportunities and threats.

In the next section, we concisely present key insights from the literature on resilience and learning from disasters, emphasizing that, despite advances, these two streams are not sufficient to adequately explain the phenomenon of post-traumatic growth at the organizational level. We then present the study context and the methodology. After presenting the results of the analysis, we discuss the scope of our main discovery, i.e. the potential for organizational post-traumatic growth following a change in organizational values and beliefs, and the conditions under which it occurs, before concluding with the implications and contribution of our discovery and further questions to the existing literature and future research avenues.

4.3 Existing theories: Resilience and learning

The literature has explored two main questions related to organizational response to a disaster. The first question is related to what accounts for organizational capacity to cope with the aftermath of a major disaster, which is central to the resilience literature (see Williams et al., 2017 for a review). Organizations must build and use their capabilities to adapt during and after a disaster and facilitate a rapid recovery. The second question relates to how the direct or vicarious experience of a disaster affects organizations' preparedness to face similar threats in the future, which is central in the literature on learning from disasters (Smith & Elliott, 2007). After experiencing such a rare event, the perception of the likelihood of a similar event occurring in the future increases (Viscusi & Zeckhauser, 2006), redirecting organizational attention to these phenomena and fostering organizational planning and preparedness (Carley & Harrald, 1997).

4.3.1 Resilience literature: Fast recovery to the previous status quo

The resilience literature focuses on the ability to cope with disasters as they occur by facing the emergency and quickly recovering to the previous status quo. Resilience is defined as "the process by which an actor builds and uses its capabilities to interact with the environment in a way that positive adjusts before, during, and after an adversity" (Williams et al., 2017). Achieving resilience involves the presence of latent organizational resources and capabilities that can be activated, combined, and recombined when disruptions emerge (Vogus & Sutcliffe, 2007). For instance, the trading room at the New York World Trade Center was able to resume operations only six days after 9/11 terroristic attack due to the strong personal ties and heterarchical structures that favored self-organization (Beunza & Stark, 2003). Similarly, the Emergency Management Organization of New York, also located in the World Trade Center, entirely restored operations to another location only 96 hours after the building collapsed (Kendra & Wachtendorf, 2003). Despite these organizations could not foresee and were not prepared for such a disaster, the high degree of improvising, flexibility, and commitment to the goal of restarting operations as quickly as possible allowed for an exceptionally rapid recovery to the previous status quo.

Flexibility in resource recombination is essential in determining organizational responses (Matsuno & Kohlbacher, 2020). The more malleable and convertible the combination of organizational resources, the greater the chance that the organization can cope with and adapt to disaster (Sutcliffe & Vogus, 2003). Resilience is, therefore, not a capability that develops during disaster response, but a preexisting feature of organizational structure and dynamics that manifests itself in challenging times. It is conceptually different from learning in that the degree of self-reflection and analysis required for rapid recovery is kept to a minimum, as actions are often required before the problem is fully understood (Weick, 1988) and previous contingency plans are rarely followed (Carley & Harrald, 1997). Yet, it can be the outcome of a learning process (Weick et al, 1999).

4.3.2 Learning literature: Better preparedness to face future disruptions

Organizational learning is defined as the process of "encoding inferences from history into routines that guide behaviors" (Levitt & March, 1988, p. 320). Disasters have often

been recognized as powerful drivers for organizational learning (Schein, 1972). The experience of a disastrous event, such as a natural disaster or terroristic attack, deprives the organization of its certainties and leads it to reassess its capabilities and its limits (Christianson et al., 2009). If up until the moment of disruption a certain type of response was automatically and blindly following a certain stimulus in the organization, a disaster can break the stimulus-response link, revealing the inadequacy of the responses in place and forcing the organization to critically reconsider and re-structure them (Barnett & Pratt, 2000). Thus, disasters are catalysts of organizational awareness, they bring light to the submerged, taken-for-granted aspects of organizational life, and disconfirm existing heuristics and rules of thumb by revealing organizational vulnerability to external threats (Beck & Plowman, 2009; Rerup, 2005, 2009). This process facilitates error discovery and correction by allowing organizational members to realize interrelationships between events that had previously been left out of the spotlight (Weick et al., 1999).

This increased awareness of organizational vulnerability prompts organizations to adjust their routines to be better prepared for similar threats in the future. For instance, after experiencing a critical situation, Novo Nordisk became more sensitive to the environmental threats and improved its capability to detect weak signals in the environment and prevent recurrence of crises (Rerup, 2009). Similarly, after suffering from Hurricane Katrina in 2005, Cisco improved its supply chain capabilities and resilience to the point that six years later it was barely affected by GEJE (Scholten et al., 2019). This process explains why companies that have survived natural disasters are more likely to invest in countries where these disasters are more frequent, suggesting a better, at least perceived, ability to cope with them (Oetzel & Oh, 2013). Learning from disasters requires a degree of self-reflection as the organization understands what went wrong and what can be improved if a similar circumstance reoccurs in the future (Beck & Plowman, 2009; Rerup, 2005). However, learning from disasters does not necessarily require direct experience with the dramatic consequences of a disaster. Learning from disasters can also occur through the vicarious experiences of similar organizations (Madsen, 2009), especially when the organizations directly affected by the disaster have similar processes or are market leaders (Hora & Klassen, 2013). Moreover, learning from disasters is often reported to be superficial and quickly diminishes over time as organizational memory of the experience becomes labile (Madsen, 2009; Smith & Elliott, 2007; Starbuck, 2009).

4.3.3 Post-traumatic growth: Uncovering the unexplained

While preparedness and resilience for future natural disasters are undoubtedly essential for organizations, especially when they are in a disaster-prone area, neither of these two streams of literature explains how and under what circumstances organizations can improve and grow after being impacted by a disaster and develop new vision and capabilities that extend beyond immediate response capacity or improved preparedness for future disaster threats. Resilience is based and built on a system of pre-existing cognitive, behavioral, and financial capabilities (Fiksel, 2015; Williams et al., 2017) and not on the development of new capabilities following a disaster. It also explains a rapid return to the initial status quo and not a radical change at the organizational level compared to pre-disaster. In contrast, learning from disasters as currently theorized involves a change at the organizational level, a questioning of organizational capabilities and limitations that results in the establishment of a new set of routines or the restructuring of existing ones (Barnett & Pratt, 2000; Christianson et al., 2009). However, these improved routines are related to crisis management and are created so that mistakes are not repeated in similar circumstances in the future (Scholten et al., 2019). Oetzel and Oh (2014) showed that learning from disasters is more effective when future disruptions are of the same type and magnitude as the ones already faced, while their relevance gradually decreases the further the new disruption moves away from past experiences. Therefore, this stream of literature do not explain a better ability to respond to unrelated and dissimilar environmental opportunities and threats.

Yet, it seems reasonable to think that facing a disaster entails deeper and more radical changes in the organization and its members. As the literature on post-traumatic growth at the individual level postulates (Jayawickreme & Blackie, 2014; McMillen & Fisher, 1998), in the aftermath of a disaster, the dominant materialistic worldview gives way to a new altruistic worldview in which human relationships and a sense of belonging to society become central to making existence meaningful, thus prompting individuals to reinforce altruistic values and beliefs (Cohn et al., 2004; Frazier et al., 2013; Oishi et al., 2017; Uchida et al., 2014). Values are defined as "a desirable trans-situational goal varying in importance, which serves as a guiding principle in the life of a person or other social entity" (Schwartz, 1992, p. 21). Altruistic values are those that reflect concerns for

the well-being of others, such as inclusiveness, solidarity, respect for life and human dignity, and concern for people in need and the natural environment (De Groot & Steg, 2007). As values change, more altruistic beliefs are formed to guide decision making and promote prosocial behaviors. For example, Oishi and colleagues (2017) found that, following an earthquake, there is a boom in the number of people engaged in prosocial jobs, such as firefighting, especially in the worst affected areas. Similarly, more people were reported to have traveled with their families during the summer following the GEJE than the previous summer (Uchida et al., 2014), suggesting a strengthening of family ties.

The central mechanism is that, in the aftermath of a disaster, individuals are prompted to deeply and mindfully reflect on what the true meaning of life is and how fleeting it is (Linley & Joseph, 2011). Individuals are forced to come to terms with their own mortality and the rampant sense of injustice that comes with it (Oishi et al., 2017). Unexpectedly, in a very short amount of time, entire families, their homes, and their business activities can be destroyed, and all that people have built over years of daily efforts may remain nothing more than piles of rubble and despair. The world becomes random and chaotic, strongly threatening the existing order and triggering a quest for new meanings (Stephens, Fryberg, Markus, & Hamedani, 2012). Therefore, after a traumatic experience that makes mortality and fairness more salient, surviving individuals develop a greater appreciation of ordinary life, knowing how fragile it is (Uchida et al., 2014), greater closeness with others and the community (Rao & Greve, 2018; Stephens, Hamedani, Markus, Bergsieker, & Eloul, 2009), greater sensitivity to the needs of others and engagement in prosocial behaviors (Frazier et al., 2013), and greater engagement with spiritual questions and new life priorities (Jayawickreme & Blackie, 2014; McMillen & Fisher, 1998; Stephens et al., 2012). Even more so than for other types of trauma that are individual, such as an illness, or caused by human malice, such as a terrorist attack, a natural disaster, being a collective phenomenon and mostly unrelated to human guilt, can lead to a sense of unity and belonging to society (Oishi et al., 2017; Rao & Greve, 2018). These new perspectives provide a strong impetus to progressively move away from a materialistic view of life and its purpose toward a greater focus on human values and a higher conception of belonging in society (Chamlee-Wright & Storr, 2011). Uchida and colleagues (2014) found that the GEJE reduced individuals' hedonic well-being (i.e. happiness intended as the presence of pleasure and the absence of pain), but surprisingly increased eudemonic well-being (i.e. happiness intended as self-realization and a sense of meaning and purpose in one's life).

While the literature studying the implications of this phenomenon at the organizational level is still very scarce, it is hard to believe that organizations are unaffected by the trauma and changes that occur at the societal level. Following a disaster, employees and other stakeholders will most likely have suffered irreparable losses, both material and human, and the survival of the organization may be seriously threatened, particularly when the magnitude of the disaster is significant. Recent studies have explored the role of death salience within organizations, revealing its effects on employee behaviors (Grant & Wade-Benzoni, 2009). Therefore, organizations affected by a disaster may also receive a push to adjust their values and beliefs according to new altruistic worldviews, reflecting the changes taking place in society (Birkmann et al., 2010; Carr, 1932). The increased sensitivity to societal needs is likely to make the organization more eager to explore environmental opportunities and threats (Miao & Popp, 2014; Raisch & Birkinshaw, 2008). Exploration refers to the capacity to discover new domains and experiment with new alternatives to existing or established technologies or procedures (March, 1991). As a result, the organization may become more responsive to its stakeholders' needs, ultimately leading to faster revenue growth. To the best of our knowledge, there are no current studies investigating what the effects of such changes are for the organization, proposed by Mailtis (2020) as a promising, yet unexplored avenue for future research. In this study, we aim to explore these additional, positive changes that might radically affect an organization surviving a natural disaster and lead to organizational post-traumatic growth.

4.4 Context and methods

We explore this idea in the context of the Great East Japan Earthquake, which occurred in March 2011. With damages estimated at $235 billion according to the World Bank, it is considered the costliest disaster of the past centuries, as the initial earthquake provoked a tsunami of historic magnitude that killed more than 15,000 people and caused the meltdown of the Fukushima Nuclear Power Plant (Tiefenbach & Kohlbacher, 2015). In addition, Japan is a particularly suitable setting to study responses to natural disasters given its susceptibility to major earthquakes. According to the Earthquake Research Committee, a Japanese agency that assesses seismic activity, in June 2020 alone, 159 earthquakes of magnitude greater than 4.0 struck the country and surrounding area, while

the probability of major earthquakes (with magnitude greater than 8.0) in the next 30 years reaches 80% in some areas.

First, we contacted a representative sample of 3404 Japanese companies built using the data included in the Teikoku Data Bank database (TDB), the most comprehensive corporate-level business database available in Japan. This database includes approximately 120000 companies with 20 or more employees, encompassing both manufacturing (approximately 48000) and service (approximately 72000) companies. 575 of these companies agreed to participate in our study (16% response rate). To investigate the phenomenon of interest, we used two sets of data: (1) a questionnaire aiming at exploring the changes occurring in the organization in the aftermath of the disaster and (2) TDB panel data. The questionnaire was translated in Japanese by bilingual students and researchers, including two of the authors, to avoid linguistic biases. As a result, we had senior marketing executives from these 575 companies answering the questionnaire in 2012, one year after the disaster.

The choice to have marketing directors, or another senior corporate marketing executive with corporate-level rank and authority, respond to the survey was made to combine and maximize the respondents' knowledge about both corporate-level strategy formulation and marketing functional-level execution processes, which is important because we want to understand potential revenue growth. As found in past research (Hambrick, 1981), top managers are the most likely to be knowledgeable about a broad variety of important changes within the organization. Moreover, the use of single key informants within organizations is justified by an extensive tradition in the literature on organizational change using that uses retrospective reports of single key informants to supplement panel data (Glick, Huber, Miller, Doty, & Sutcliffe, 1990). Building on this well-established tradition, the key informants' role is to provide descriptive information about the organization rather than her or his perceptions (Glick, 1985). While the use of multiple informants could help test the validity of the information reported, there is a trade-off between the number of informants and their knowledge of both corporate and marketing strategy that is necessary to provide accurate accounts of the changes the organization is undergoing.

Our questionnaire mostly include multi-item measures sourced from extant literature and validated through various analyses. However, an appropriate measure for the change in values and beliefs following a disaster was not available in the literature. Based on a review of the relevant literature, we therefore generated a set of items to address this gap. All multi-item scales were purified by considering both substantive (e.g., breadth, consistency, clarity, and comprehensiveness of theoretical content coverage) and statistical (e.g., descriptive statistics, fits, and reliability coefficient) criteria. Appendix A provides the after-purification measurement items for the relevant constructs, together with the literature source for the scale, the standardized factor loadings and their significance and error, the composite reliability (CR), and the average variance extracted (AVE) of each variable included in our model.

To measure the effects of the natural disaster on the company, we develop a single-item construct that captures the percentage of revenues generated in the area affected by the GEJE disaster, on a 10-point scale. Since this variable is exogenous and it lacks the complexity of most psychological constructs (Hair, Black, Babin, & Anderson, 2010), a single-item measure is preferable (Petrescu, 2013). For robustness, we also used two different measures for the effects of the natural disaster: the percentage of profits generated in the area affected by GEJE and the percentage of production and procurement dependent on an area affected by GEJE, both variables also measured as 10-point scales.

To measure the change in values and beliefs following a natural disaster, which had never been measured before but was expected to drive organizational change in the aftermath of a disaster, we developed a seven-point scale consisting of five items that capture the change in organizational sensitivity to its stakeholders and their needs. Specifically, the scale measures the increased solidarity, respect for human dignity, attention to employees' well-being, and concern for the natural environment. The number of items was reduced to five based on the results of exploratory and confirmatory factor analyses. We eliminated two items because of too high correlation with another item (above 80%) or because of loading into a different factor. We checked the quality of these new items by estimating random and method measurement errors (the difference between the true score and the observed value and the difference between the construct of interest and the true score, respectively) using the Survey Quality Predictor database (Saris & Gallhofer,

2014). For all items, the total quality (random * method errors) was above 60%, satisfying the threshold.

We measure exploration capability, expected to play a role in explaining organizational post-traumatic growth, by using the seven-point scale developed by Jansen and colleagues (2006, 2009). The scale consists of four items that refer to the production and commercialization of new products and services, the use of new distribution channels, and the ability to grasp new opportunities.

In line with our conjecture about the mechanisms of post-traumatic growth, we measure organizational responsiveness to environmental threats and opportunities. Specifically, we consider two environmental forces underlined in prior publications as the most relevant social changes affecting Japan, namely the growing environmentalism, i.e. the growing consumers' demand for sustainable products and processes (Smith & Kohlbacher, 2019), and the population aging (Matsuno & Kohlbacher, 2019). To measure organizational responsiveness to population aging and the growth of environmentalism, we use the seven-point scale developed by Matsuno and Kohlbacher (2019). This scale explicitly assesses the degree to which the concern about an emerging external phenomenon outside of the control of the organization is integrated in the organization's goals and strategic and marketing planning processes. These are used as reflective and manifest items of the organizational response to the phenomenon. We include both the items measuring corporate level responses, incorporated into the company's strategy, and marketing responses, incorporated into products and services, since all these items load into a single factor. We deleted one item from the original scale because of high similarity (correlation above 85% for both environmental trends) with another item. Therefore, the final scale includes six items.

As other potentially relevant variables, we measure learning orientation (using the seven-point scale developed by Sinkula and colleagues in 1997), defined as the degree to which an organization is satisfied with its theory in use, mental models, and dominant logics (Baker & Sinkula, 1999). Furthermore, informed by the resource-dependence theory (Pfeffer & Salancik, 2003), we measure the percentage of domestic and international revenues, Japanese operations' annual Research & Development expenditure as a percentage of sales, average growth of revenues and employees (from Dess & Beard,

1984), customer satisfaction, customer attraction, customer retention, and overall business performance assessment relative to competitors (Matsuno & Mentzer, 2000). We believe that these variables might positively affect the organizational responses to environmental opportunities and threats following a disaster and thus need to be accounted for to understand the phenomenon of organizational post-traumatic growth.

For the five multi-item latent constructs (i.e., learning orientation, change in values and beliefs, exploration, and responses to population aging and growing environmentalism), we assessed reliability and validity through a confirmatory factor analysis measurement model with Mplus 8, using robust maximum likelihood. Each measurement item loads significantly on its expected latent construct at $p < .001$. As reported in Appendix A, all constructs present an acceptable degree of reliability (CR>0.8 for all variables), convergent validity (AVE>0.5 for all variables), and discriminant validity (the square root of AVE is greater than inter-variable correlations in all cases), satisfying all the thresholds for reliability and validity suggested by Hair and colleagues (2010).

Moreover, we control for non-response bias by comparing the responses to the items measuring organizational responses to population aging and growing environmentalism for early (before follow-up) and late respondents (after follow-up), without finding significant differences. In addition, we control for attrition bias and we did not find differences in the distribution of both industry classification and company size between the 575 companies who responded to the survey and those who did not. We also control for common method bias by following the procedure suggested by Podsakoff and colleagues (2003), who suggest introducing a common latent factor capturing the common variance among all the observed variables. When comparing the loadings of the models with and without the common latent factor, no relevant differences were found (all differences were below 0.15 in absolute values), suggesting that this bias is not affecting our results.

The second set of data are data included in the TDB's archival database. For each of the 575 organizations participating in the study, we collected pre-disaster data (referring to the fiscal year of 2009 and 2010 – and when available also 2008 data) and post-disaster data (referring to the fiscal year of 2019) about their revenues, number of employees,

capital stock, and financial variables. Our variable of interest, growth in revenues between 2010 (year before the disaster) and 2019, was measured as revenues of 2019 minus revenues of 2010, divided by the revenues of 2010. For robustness, we also conduct the analysis using a different year range (2009-2019).

Moreover, we collected further information about the company such as industry classification, location of the headquarter (region and whether in a metropolitan or rural area), year of foundation, and whether the company is public or not. The main objective of this further data collection is both to have verifiable control measures and to measure the potential of differential growth rates for the organizations that were most affected by GEJE. We measure post-disaster values in 2019 for two reasons. First, because 2020 and the following years' measures are likely to be affected by the current COVID-19 pandemic situation and therefore biased, while no major macroeconomic shocks happened in Japan between GEJE and 2019. Second, because measuring the post-disaster variables in the few years following GEJE might also lead to biased estimates as the most affected companies were likely still dealing with the direct consequences of the disaster, while we are interested in measuring the long-term effects of the disaster on the organizational growth, after the recovery phase ends. Table 1 reports the descriptive statistics of the companies in our sample for this set of variables and the other variables of interest included in our models.

Table 1. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Revenue Growth (2010-2019)	0.103	0.64	-0.987	2.895
Revenue Growth (2009-2019)	0.123	0.63	-0.994	2.840
Revenues Affected by GEJE (%)	1.547	1.50	1	10
Profits Affected by GEJE (%)	1.480	1.45	1	10
Production Affected by GEJE (%)	1.692	1.68	1	10
Average Pre-disaster Revenues (millions of yen)	48577	183424	62.33	2597571
Average Pre-disaster Employee Number	389	1717	15	35927
Average Pre-disaster ROA (profits/assets)	0.610	3.38	-14.5	35.51
Revenues 2019 (millions of yen)	22254	102374	51	1430266
Company Age	52.513	22.27	10	119
Public (Dummy)	0.076	0.26	0	1
Average Percentage of Domestic Revenues	95.927	12.15	20	100
Rural (Dummy)	0.427	0.50	0	1

4.5 Findings

4.5.1. Step 1: Evidence of post-traumatic growth

The first step in our analysis is to explore whether organizations that suffered the consequences of GEJE in 2011 experienced a higher revenue growth than the others in the following nine years, compared to the pre-disaster levels. We thus regressed our dependent variable, the growth in revenues between 2010 and 2019 (measured using TDB data), on our independent variable, the percentage of revenues affected by GEJE in 2011 (measured in the 2012 survey). Using the variables included in the TDB database, we control for the pre-disaster log levels of revenues, employee number, and the ROA (profits/assets). We averaged the values of pre-disaster years (2009, 2010, and 2008 when available) to improve accuracy. Moreover, also using TDB variables, we control for the region of the headquarter, the industry, the foundation year, and other variables such as whether the company is publicly traded or not, whether the headquarter is in the rural area or not. In addition, we included controls from the survey data collected in 2012, specifically the average percentage of domestic (versus international) revenues, the average overall business performances relative to competitors, average Research & Development expenditure as a percentage of sales, and average growth of revenues and employees.

Table 2 shows the results of the OLS regression models (estimates and robust standard errors). As it is possible to see from Model 2, the percentage of revenues affected by the disaster are significantly explaining the positive revenue growth of the next nine years compared to the pre-disaster level (p=0.021). Other highly significant variables are the pre-disaster levels of revenues and profitability (-), employee number (+), the company age (-), the average growth pre-disaster (+), and the R&D expenditure (+). Our model explains around 33% of the variation in the dependent variable (R2=0.3323). Given the original sample size, we use listwise deletion to deal with missing values, following the method suggested by Allison (2001).

Yet, 74 of the companies in our 2010 sample did not exist anymore in 2019 (either because they have been acquired/consolidated or because of failure). Therefore, our results suffer from sample selection bias. We first checked whether the probability of survival is dependent on the value of independent variables, the percentages of revenues affected by GEJE. The ANOVA finds no significant difference between the organizations that survived and that did not survive in this regard. Furthermore, to further control for selection and heterogeneity bias, we performed the Heckman test. In cross-sectional studies, the Heckman test, consisting of a two-step procedure that first estimates the probability of the dependent variable to be observed and then embeds this into the main model, has been found to outperform the use of instrumental variables with respect to less biased estimates, as well as power for detecting either a sampling effect or unobserved confounding (DeMaris, 2014). We estimated the probability of the company to still exist in 2019 using the level of revenues (log), ROA, and employee number (log) for the years before the disaster (2008-2010), the age of the company, but also the ROI, the relative business performance, customer satisfaction, customer attraction, and customer retention measured through our questionnaire in 2012. As it is possible to see from Model 3, presenting the 2SLS results, results are robust to this test as the percentage of revenues affected by GEJE is still significant (p=0.015).

As an additional robustness test, to exclude the risk that the results are due to extreme values of the independent variable (effects of the disaster), we transform this variable from discrete (10-point scale) to dummy (values greater than or equal to 5) and repeat the analysis. Model 4 presents the results. Results are robust to this different operationalization of the independent variable (p=0.003).

Table 2. OLS and Heckman test results

	MODEL 1 OLS results	MODEL 2 OLS results	MODEL 3 Heckman results	MODEL 4 OLS results	MODEL 5 OLS results
Revenue Growth (2010-2019)					
Revenues affected by GEJE [a]		0.052*	0.052*		
		(0.02)	(0.02)		
Revenues affected by GEJE > 50% (dummy) [a]				0.496**	
				(0.17)	
Response to Opportunities/Threats [a]					0.005*
					(0.00)
Learning Orientation [a]					-0.011
					(0.01)
Average Pre-disaster Log Revenues (millions of yen) [b]	-0.111**	-0.112**	-0.114**	-0.108**	-0.118**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Average Pre-disaster Log Employee Number [b]	0.113**	0.113*	0.114**	0.106*	0.116*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
Average Pre-disaster ROA (profits/assets) [b]	-0.014†	-0.015*	-0.015*	-0.015*	-0.015*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Company Age [b]	-0.004**	-0.004**	-0.004**	-0.004**	-0.004**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Public (Dummy) [b]	0.003	0.012	0.014	0.024	0.017
	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
Average Percentage of International Revenues [a]	0.003	0.003	0.003	0.003	0.003
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Average Relative Business Performance [a]	0.021	0.026	0.026	0.026	0.010
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Rural (Dummy) [b]	-0.027	-0.033	-0.038	-0.023	-0.023
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Average Revenues Growth [a]	-0.003	-0.007	-0.010	-0.003	-0.008
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Average Employee Number Growth [a]	0.062*	0.060*	0.063*	0.050†	0.077**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Average Annual R&D/Revenues [a]	0.054*	0.053*	0.053*	0.053*	0.057*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Industry control [b]	YES	YES	YES	YES	YES
Region control [b]	YES	YES	YES	YES	YES
_cons	0.398	0.335	0.373	0.428†	0.457†
	(0.26)	(0.26)	(0.26)	(0.26)	(0.27)
N	338	330	328	330	319
R2	0.320	0.332		0.342	0.353

† p < .10
* p < .05
** p < .01

(Robust Standard Errors in Brackets)
[a] Data collected in 2012 survey
[b] Data from TDB (fiscal years 2008, 2009, and 2010)

For robustness, we repeat our analysis with alternative measures for the independent variable. Instead of measuring the effects of GEJE on the organization as the percentage of affected revenues, we measured the percentage of profits and production/procurement operations generated in the area affected by GEJE. Appendix B shows the results of these further analyses. Models 6 and 8 presents the OLS results respectively when the independent variables are measured as the percentage of profits and production/procurement generated in the area affected by GEJE (10-point-scale). Our results are robust to these alternative measures as the effects of GEJE measured in both ways are significantly explaining the growth in revenues from 2010 to 2019 ($p=0.017$ and $p=0.054$ respectively). Models 7 and 9 reports the Heckman test results for the two alternative measures of the independent variables, as these measures are also subject to selection bias, confirming the robustness of the results also for this test ($p=0.011$ and $p=0.044$ respectively).

Second, we measured the dependent variable by considering a different range of years, to reduce the risk of the specific years chosen would drive our results. We measure the growth in revenues considering 2009, instead of 2010, as the baseline (revenues of 2019 minus revenues of 2009, divided by the revenues of 2009). Models 10, 11, 12, and 13 in Appendix C report the results for this dependent variable, respectively for when the independent variable is measured as the percentage of sales affected by GEJE (OLS in Model 11 and Heckman test in Model 12) or as a dummy variable (Model 13). While in the first case the significance is slightly lower ($p=0.066$ and $p=0.055$ respectively), the effects of disasters measured with the dummy variable are particularly significant ($p < 0.01$), suggesting that the results are not driven by extreme values of the independent variable. Results are robust even when measuring the independent variable as the percentage of profits and production/procurement generated in the area affected by GEJE, as both these variables have significant ($p<0.10$ in all models) effects on the revenue growth in the period between 2009 and 2019.

4.5.2. Step 2: Exploring the mechanisms for growth

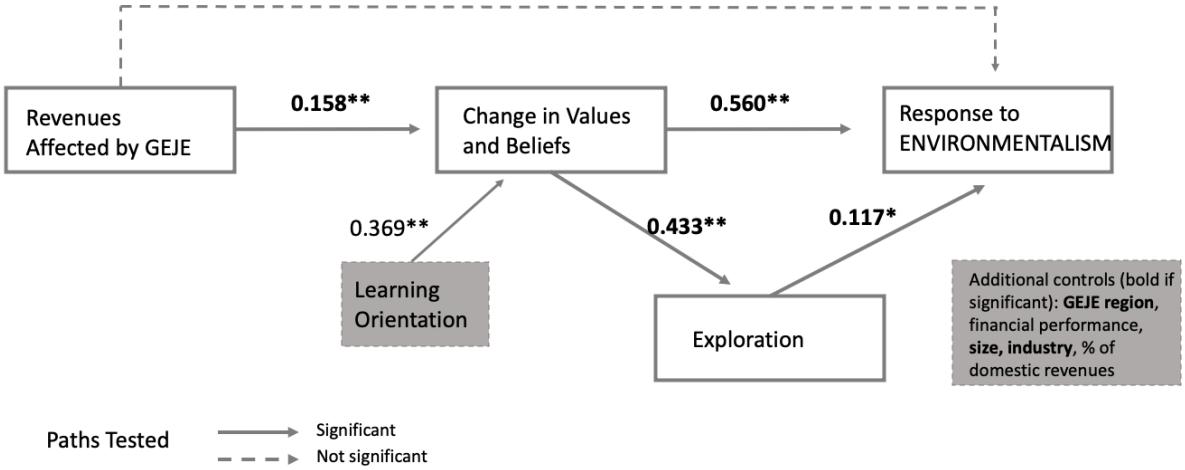
In the subsequent step, we want to understand what the mechanisms behind this differential growth rate are. Informed by the literature on post-traumatic growth at the

individual level, we explore whether the experience of the direct effects of a disaster leads to a change in the values and beliefs of the organization toward higher altruism, which in turns can prompt the organization to become more sensitive to its environment and explore the latent opportunities and threats in it. As we collected information about the responsiveness to two environmental opportunities and threats (population aging and growing environmentalism of consumers) we have two models. Figures 1 and 2 present the Mplus8 estimates (completely standardized) using robust maximum likelihood for the two empirical models calculated using structural equation modeling. Figure 1 shows the results for the model predicting response to growing environmentalism. The overall model fit is acceptable (X2(254) = 616.303; RMSEA = .055; CFI = .936; SRMR=0.062) and the model explains 43% of the variance in the dependent variable (R2=0.426). No additional paths can improve the model fit significantly. The percentage of revenues affected by GEJE positively fosters the change in values and beliefs to adjust to the worldviews emerging after the disaster (StdBeta 0.16, $p < .001$). In turn, the change in values and beliefs following a natural disaster affects the response to growing environmentalism both directly (StdBeta 0.56, $p < .001$) and indirectly, through the mediating effect of higher exploration (StdBeta 0.12, $p < .005$). Among controls, the industry classification and the company size significantly affect responses to growing environmentalism. It is worth noting that there is no direct effect of the revenues affected by the natural disaster on the response to growing environmentalism, and the relationship is entirely mediated by the change in values and beliefs of the organization following the disaster. Results are robust to the different operationalizations of the effects of GEJE (on profits and production/procurement), with only a small variation in the coefficients.

Figure 2 shows the results for the model predicting response to population aging. Even for this model, the overall model fit is acceptable (X2(254) = 606.980; RMSEA = .054; CFI = .936; SRMR=0.061) and the model explains 30% of the variance in the dependent variable (R2=0.297). In this model, however, differently from the previously described model, the change in values and beliefs following a natural disaster affects the response to population aging only directly (StdBeta 0.48, $p < .001$), but not indirectly, through the mediating effect of higher exploration. Among the controls, industry classification, financial performances, and company size significantly affect responses to population

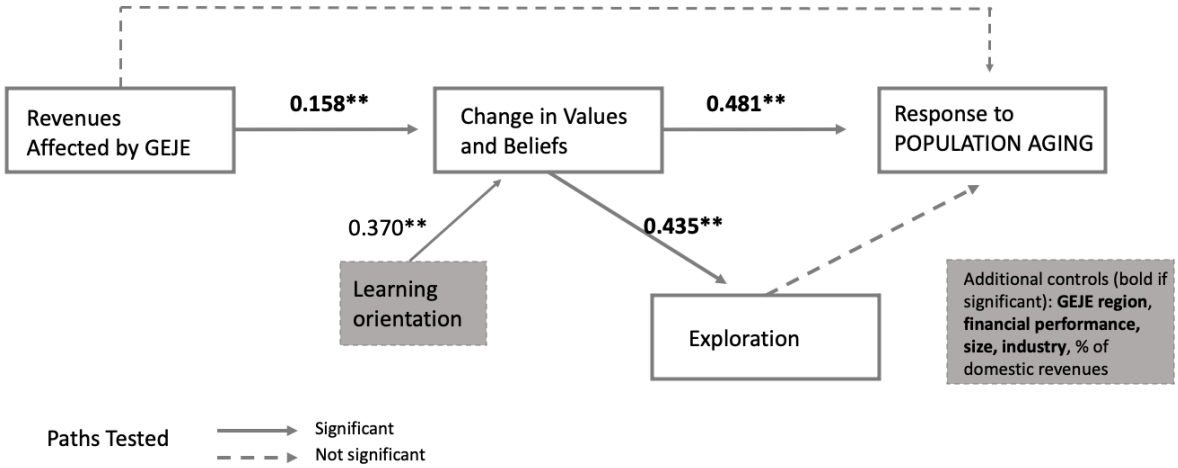
aging. Similarly to the growing environmentalism model, there is no direct effect of the percentage of revenues affected by the natural disaster on the response to population aging, as the effect is entirely mediated by the change in values and beliefs. No additional paths can improve the fit significantly. Results are robust to alternative measures of the effects of GEJE (on profits and production/procurement), with small variation in the coefficients.

Figure 1. Model results for response to growing environmentalism



* p < .05
** p < .01

Figure 2. Model results for response to population aging



* p < .05
** p < .01

Collectively, our results indicate that the organizations affected by a disaster are more likely to develop higher altruistic values and beliefs, which in turn increases exploration and the responsiveness to unrelated environmental opportunities and threats, namely growing environmentalism and population aging. The change in values and beliefs affects the organizational responsiveness to environmental forces both directly, through a higher intention to address the societal needs, and indirectly, by developing the capability to explore the environment. This higher responsiveness to the environment leads the organization to experience a growth in revenues in the years following a disaster. In Table 2 (Model 5), we show the significant and positive relationship ($p<0.043$) between responsiveness to population aging and growing environmentalism of consumers (sum of all items of both responses) and revenues growth in the years included in our study, while controlling for learning orientation (sum of all items) as in the structural equation models.

4.6 Towards an understanding of organizational post-traumatic growth

We found corroborating evidence that, following a disaster, the organization may undergo a wider set of positive changes that go beyond learning to prepare for similar disruptions in the future. Mimicking what happens to organizational members, some organizations develop greater altruistic values and sensitivity to their environment and the needs of the employees, community, and society. This change enhances the organizations' sensitivity to stakeholders' needs and advances the ability to identify potential threats and opportunities arising from weak cues in the environment, making organizations more inclined to respond to them. As can be inferred from our arguments, like the corresponding concept at the individual level, by organizational post-traumatic growth we do not merely mean growth in size or financial performance, but also a metaphoric growth, the discovery of a new sense of existence, the attribution of a renewed and higher value to the life of the organization and its purpose. However, as we showed, this process also leads to the growth of the organization in financial terms. This positive transformation in values and beliefs leads the organization to explore new possibilities and develop a greater awareness of its environment and a greater ability to respond to the opportunities and threats found there, compared to the pre-disaster level. To capture these effects, we propose the concept of organizational post-traumatic growth, building on the parallelism with individual post-traumatic growth. We define organizational post-

traumatic growth as *the process by which an organization changes its values and beliefs accordingly to the more altruistic and enlightened worldviews emerging after a catastrophic event and become more sensitive and responsive to the threats and opportunities in its environment, far beyond resilience or future adjustments to adversity.*

However, despite the potential of disastrous events to trigger organizational post-traumatic growth, it would be naive and certainly simplistic to assume that organizational post-traumatic growth occurs automatically when a disaster strikes the organization. In the attempt to delineate what factors facilitate organizational post-traumatic growth, we find two streams of literature particularly insightful and relevant. The first is the literature on organizational learning. Like post-traumatic growth, learning is a path to organizational change that can follow a disaster. Although the outcome of this process, as described in the literature, is focused on an improved ability to cope with similar disruptions through a change in processes and routines, and not a general change in the organization's values and beliefs, the similarities are apparent.

What we know from this literature is that learning from disasters is often the exception and not the rule (Antonacopoulou & Sheaffer, 2014). Several forces, both internal and external to the organization, challenge organizational capacity to learn from disasters (Choularton, 2001; Smith & Elliot, 2007). Instead of engaging in a critical assessment of organizational capabilities and restructuring of organizational responses, organizational members might respond to the disaster with greater wishful thinking (Stephens et al., 2012) and reliance on prior and existing beliefs (Starbuck, 2009). Therefore, learning from such events only occurs when organizations engage in critical, mindful reflection to interpret the catastrophic experience and its deeper causes and effects (Beck & Plowman, 2009; Rerup, 2005). In most cases, learning occurs through a sensemaking phase in which organizations are prompted to mindfully reconsider who they are and what they can do (Argote & Miron-Spektor, 2011; Barnett & Pratt, 2000; Christianson et al., 2009; Weick et al., 1999; Turner, 1976). The triggering event alone, therefore, is not a sufficient condition for learning to occur and, in the absence of this conscious analysis and self-reflection, learning is likely to be only superficial (Choularton, 2001).

If this is true for changing organizational practices and routines to better cope with disruptions, it is even more true for achieving an even deeper change in organizational values and beliefs that, as we have proposed, are necessary for organizational post-traumatic growth. The first condition for the manifestation of organizational post-traumatic growth, then, is likely to be the capacity to challenge existing assumptions and question the entire organization, an ability that requires a strong dose of improvisation, empowerment based on expertise rather than hierarchy, and above all a culture of rich thinking that accepts criticism and proposals at all levels. A change in the societal worldview, even if it is shared by the organizational members, cannot be translated at the organizational level if organizational members engage in automatic behaviors or lack the power to modify existing routines and propose changes that reflect the new worldview (Rerup & Levintal, 2014).

The second stream of literature is that of individual post-traumatic growth. Importantly, this literature also confirms, in line with the organizational learning literature, that achieving post-traumatic growth requires a high degree of cognitive effort and sensemaking (Cohn et al., 2004; Linley & Joseph, 2011). Rumination, the recurrent event-related thinking, is a necessary step in making sense of the negative event and initiating the process of growth (Tedeschi & Calhoun, 2004). In support of this argument, Li and colleagues (2013) found that the emergence of more altruistic values and behaviors following a disaster is common in 9-year-olds, but it is not significant in 6-year-olds, underscoring the need for increased cognitive capacity to achieve this change. However, these studies also emphasize that post-traumatic growth is not merely the result of cognitive reflection. The transformative experience emerges from the strong affective and emotional component that spurs in the aftermath of a disaster and plays a crucial role in it (Tedeschi & Calhoun, 2004). Overcoming emotional distress through affection and external support is a critical step in achieving post-traumatic growth (Tedeschi & Calhoun, 2004). Social sharing of emotions, especially when the trauma is collective as in the case of a natural disaster, enhances relatedness and interpersonal relationships. Ultimately it is the emotional sharing that fosters the manifestation of solidarity and the emergence of more altruistic values and beliefs (Rimé et al., 2010).

Building on this literature, we conjecture that an organizational environment that embraces and allows for the social sharing of emotions is an important catalyst for organizational post-traumatic growth. At the team level, it requires the creation of a space to communicate, express, and manage emotions, with the team leader playing a crucial role in developing such space (Ashkanasy, 2003). At the organizational level, it requires organizational policies and routines to favor an organizational climate in which emotions can be expressed and in which work-associated stress is periodically evaluated and actions are taken to maximize the well-being of employees and other stakeholders (Ashkanasy, 2003). Emotional prevalence is a crucial distinction between the process of learning from disasters and organizational post-traumatic growth. It explains why, while learning from disasters can occur through vicarious experiences of similar companies as far as a thoughtful reflection about others' experiences takes place (Madsen, 2009), organizational post-traumatic growth most likely requires direct experience of the consequences of trauma and subsequent emotional arousal. Despite often neglected in organization studies, emotions influence how organizational members make sense of traumatic situations, how the process develops, and its final outcomes (Maitlis & Christianson, 2014; Maitlis & Sorenshein, 2010). Therefore, we posit that emotions, and especially how they are managed at the organizational level, play a crucial role in the achievement of organizational post-traumatic growth.

4.7 Theoretical contribution and implications

This study has the potential to make several contributions to the literature on organizational response to natural disasters. First, although previous case studies and various anecdotal evidence suggest the existence of this phenomenon (Christianson et al., 2009), this study is, to the best of our knowledge, the first attempt to quantitatively explore positive changes in disaster-affected organizations beyond their better ability to respond to other disaster threats. In doing so, we provide evidence and describe the mechanisms underlying organizational post-traumatic growth. While the literature has primarily focused on either explaining the immediate response and resilience of the organization to quickly rebound and recover to the pre-disaster level (Beunza & Stark, 2003; Kendra & Wachtendorf, 2003; Williams et al., 2017) or the improved

capacity to deal with future similar threats when hit by a disaster (Carley & Harrald, 1997; Madsen, 2009; Rerup, 2005, 2009; Oetzel & Oh, 2013; Scholten, Scott & Fynes, 2019), we found a third positive way in which disasters affect organizations: greater responsiveness to unrelated environmental opportunities and threats, and the associated revenue growth that emerges post-disaster.

While we consider this study an initial exploration in this direction, we encourage future research to further explore organizational post-traumatic growth under different circumstances. Future research questions worth answering include, among others: how do the process and outcome of organizational post-traumatic growth change when different types of disasters are considered? Is it possible to achieve organizational post-traumatic growth for events that, unlike natural disasters, do not affect the entire society, but only the organization, such as a major organizational crisis? How long-lasting are the effects of organizational post-traumatic growth? What are the organizational antecedents of this phenomenon? Further explanation of the mechanisms and boundary conditions of organizational post-traumatic growth, as much as of the potential and limits of its generalizability across countries and traumatic experiences, is also highly encouraged. In particular, the COVID-19 pandemic represents an interesting context to further explore organizational post-traumatic growth given its length, magnitude, and global scale, making cross-country comparisons possible.

Second, we contribute to the conversation about whether it is possible to "build back better" after a disaster by providing a richer explanation and empirical assessment of the mechanisms behind it. Specifically, we offer greater insight and understanding of how organizations change in this context by demonstrating, for the first time in quantitative terms, how disaster triggers a fundamental shift in worldviews and, consequently, an adjustment in organizational values and beliefs. We propose this process as a promising mechanism through which post-traumatic growth occurs and organizations can improve their responsiveness to environmental threats and opportunities. In addition, we develop a scale to measure this mechanism. We also conceptually distinguish the process of post-traumatic growth from the process of organizational learning: while both processes or changes that emerge after disaster rely on a strong dose of sensemaking and mindful reflection (Argote & Miron-Spektor, 2011; Barnett & Pratt, 2000; Christianson et al.,

2009; Turner, 1976; Weick et al., 1999), the emotional dimension is crucial in post-traumatic growth, leading to the development of more altruistic values and beliefs (Ashkanasy, 2003; Tedeschi & Calhoun, 2004). Thus, the result is not a better preparedness for future disruptions, but greater sensitivity to social needs and responsiveness to environmental opportunities and threats. We encourage future research to further explore this mechanism and refine the measurement of values and beliefs change following a disaster, through qualitative and quantitative analyses.

Our analysis also shows some unexpected results. We found that the change in values and beliefs following a natural disaster affects organizational responses to population aging only directly, and not through enhanced exploration as in the case of growing environmentalism. To speculate on the reasons behind this unexpected result, we should first discuss what the fundamental differences are between the environmental forces we consider in our analysis: growing environmentalism and population aging. Both of these environmental forces are similar in the sense that they are continuous and profound changes that extend beyond the direct influence of the organization. However, population aging is a highly predictable but extremely gradual and nearly irreversible change over several decades in the society. The challenge for the organization, in this case, is primarily to recognize the existence of this change and to identify the potential implications in terms of opportunities and threats (Matsuno & Kohlbacher, 2019, 2020). Growing environmentalism is also a continuous social change, like population aging, but its salient trend and trajectory have been widely recognized and discussed relatively more recently. Based on this distinction, we can speculate that exploration might not be relevant to responding to changes that are nearly imperceptible in nature, such as population aging. Exploration capacity, then, might be more relevant for discovering and exploring ways to grasp the emerging opportunities in the environment or respond to emerging threats, like the growing environmentalism of consumers, but not for spotting new opportunities or threats that are nearly undetectable, like population aging.

Our work has important managerial implications, especially in light of the COVID-19 pandemic that is bringing the entire world to its knees at the time the authors are writing this chapter. The narrative gaining traction in many companies is that the challenges of the beginning of 2020s can be an opportunity for rebirth and growth, leading the

organization to strengthen its competitive positioning (McKinsey & Company, 2020). For example, the Chief Financial Officer of Coca-Cola said at the Deutsche Bank Global Consumer Conference in June 2020 “There's broad alignment and an objective to emerge from the crisis with an even stronger leadership position.” However, following a recession, only a small percentage of organizations are able to grow rapidly and exceed pre-recession levels. According to a study by Bain & Company, 415 companies in the sample considered experienced revenue growth after the 2008 recession, with an average growth rate of 14% between 2007 and 2017 (Holland & Katzin, 2019). In contrast, the remaining 3449 organizations included in the study achieved zero growth. Thus, it is essential for managers to understand what antecedents drive post-traumatic growth. With the results of our study, we would argue that corporate culture is essential to foster the change in values and beliefs necessary to achieve this outcome. Specifically, a culture devoted to openness, reflection on current events, and mindfulness promotes the cognitive processes necessary for growth. It is also essential to create a space within the organization where emotions are expressed, understood, and valued, to activate a collective process that transforms the sense of injustice and despair into a greater altruistic sensitivity to the needs of society.

We certainly do not presume that our work is exempt from limitations. First, we explored the mechanisms underlying post-traumatic growth only using cross-sectional data from the year after GEJE. A longitudinal design, however, would be ideal not only to strengthen the confidence of causal claims, but also to understand how stable the change in values and beliefs that emerges in the aftermath of a disaster is. A longitudinal study is recommended in order to shed further light on the process that leads to an improvement in organizational capabilities and organizational responsiveness after the change in values and beliefs. Second, the generalizability of our inferences to natural disasters that are different from GEJE in extent and predictability should not be taken for granted. In particular, the profound transformation of values and beliefs following a disaster might only occur when the disaster is truly catastrophic, as in the case of GEJE, whereas organizational post-traumatic growth might be rarer for minor disasters, such as those that cause only material damages but no human loss. In addition to addressing the aforementioned limitations, future research should continue to explore how and what organizations learn from catastrophic experiences, and how, amidst piles of debris and

rubble, some organizations are able to innovate and renew themselves, raising from their ashes with new capabilities and an improved capacity to meet new challenges.

4.8 Conclusion

Our study highlights how, even in the most disastrous human experiences, there is silver-lining. A profound crisis represents an energetic stimulation to go beyond one's boundaries. Surviving a potentially deadly event represents a strong impetus for rebirth. We show how disasters can act as catalysts for positive changes for the surviving organizations, opening the opportunity to reemerge stronger when organizational values and beliefs are changed through the experience of a disaster. After organizations experience a catastrophic event, they are likely to elaborate more altruistic, as contraposed to materialistic, worldviews and to develop more altruistic values and beliefs as a result. When this process occurs, a whole new world of possibilities may open up for the organization, as increased sensitivity to social needs implies greater openness to the environment and greater capacity to innovate and regenerate to best meet social needs and the new organizational purpose. The result is faster, long-term growth. Therefore, a natural disaster leaves not only rubble and despair, but also a wave of change among the survivors, whose world has collapsed and who must reinvent themselves and be able to rise from their ashes, like a phoenix, with new capabilities and a better ability to perceive and face environmental forces.

4.9 References

Alexander, D. E. 2006. Globalization of disaster: Trends, problems and dilemmas. ***Journal of International Affairs***, 59(1): 1–22.

Allison, P. D. 2001. ***Missing data*** (Vol. 136). Sage publications.

Antonacopoulou, E. P., & Sheaffer, Z. 2014. Learning in crisis: Rethinking the relationship between organizational learning and crisis management. ***Journal of Management Inquir***y, 23(1): 5-21.

Argote, L., & Miron-Spektor, E. 2011. Organizational learning: From experience to knowledge. ***Organization Science***, 22: 1123-1137.

Ashkanasy, N. M. 2003. Emotions in organizations: A multilevel perspective. ***Research in Multi-level Issues***, 2: 9-54.

Baker, W. E., & Sinkula, J. M. 1999. The synergistic effect of market orientation and learning orientation on organizational performance. ***Journal of the Academy of Marketing Science***, 27: 411-427.

Barnett, C. K., & Pratt, M. G. 2000. From threat-rigidity to flexibility: Toward a learning model of autogenic crisis in organizations. ***Journal of Organizational Change Management***, 13(1): 74-88.

Bartik, A.W., Bertrand, M., Cullen, Z.B., Glaeser, E.L., Luca, M. & Stanton, C.T. 2020. How are small businesses adjusting to COVID-19? Early evidence from a survey. ***National Bureau of Economic Research***.

Beck, T. E., & Plowman, D. A. 2009. Experiencing rare and unusual events richly: The role of middle managers in animating and guiding organizational interpretation. ***Organization Science***, 20: 909-924.

Beunza, D., & Stark, D. 2003. The organization of responsiveness: innovation and recovery in the trading rooms of Lower Manhattan. ***Socio-economic Review***, 1(2): 135-164.

Birkmann, J., Buckle, P., Jaeger, J., Pelling, M., Setiadi, N., Garschagen, M., ... & Kropp, J. 2010. Extreme events and disasters: a window of opportunity for change? Analysis of organizational, institutional and political changes, formal and informal responses after mega-disasters. ***Natural Hazards***, 55: 637-655.

Carley, K. M., & Harrald, J. R. 1997. Organizational learning under fire: Theory and practice. ***American Behavioral Scientist***, 40(3): 310-332.

Carr, L. J. 1932. Disaster and the sequence-pattern concept of social change. ***American Journal of Sociology***, 38(2): 207-218.

Chamlee-Wright, E., & Storr, V. H. 2011. Social capital as collective narratives and post-disaster community recovery. ***The Sociological Review***, 59(2): 266-282.

Choularton, R. 2001. Complex learning: organizational learning from disasters. ***Safety Science***, 39(1-2): 61-70.

Christianson, M. K., Farkas, M. T., Sutcliffe, K. M., & Weick, K. E. 2009. Learning through rare events: Significant interruptions at the Baltimore & Ohio Railroad Museum. ***Organization Science***, 20(5): 846-860.

Clark, H., & Gruending, A. 2020. Invest in health and uphold rights to "build back better" after COVID-19. ***Sexual and Reproductive Health Matters***, 28(2): 1781583.

Cohn, M. A., Mehl, M. R., & Pennebaker, J. W. 2004. Linguistic markers of psychological change surrounding September 11, 2001. ***Psychological Science***, 15: 687–693.

De Groot, J. I., & Steg, L. 2007. Value orientations and environmental beliefs in five countries: Validity of an instrument to measure egoistic, altruistic and biospheric value orientations. ***Journal of Cross-Cultural Psychology***, 38(3): 318-332.

DeMaris, A. 2014. Combating unmeasured confounding in cross-sectional studies: Evaluating instrumental-variable and Heckman selection models. ***Psychological Methods***, 19(3): 380.

Dess, G. G., & Beard, D. W. 1984. Dimensions of organizational task environments. ***Administrative Science Quarterly***, 52-73.

Farmer, L. 2013. Three cities that used natural disasters to revitalize their futures. ***Governing the States and Localities***.

Fiksel, J. 2015. From risk to resilience. In ***Resilient by design*** (pp. 19-34). Island Press, Washington, DC.

Frazier, P., Greer, C., Babrielsen, S., Tennen, H., Park, C., & Tomich, P. 2013. The relation between trauma exposure and prosocial behavior. ***Psychological Trauma: Theory, Research, Practice and Policy***, 5: 286–294.

Foss, N.J., 2020. The impact of The Covid-19 pandemic on firms' organizational designs. ***Journal of Management Studies***.

Glick, W. H. 1985. Conceptualizing and measuring organizational and psychological climate: Pitfalls in multilevel research. ***Academy of Management Review***, 10(3), 601-616.

Glick, W. H., Huber, G. P., Miller, C. C., Doty, D. H., & Sutcliffe, K. M. 1990. Studying changes in organizational design and effectiveness: Retrospective event histories and periodic assessments. ***Organization Science***, 1(3): 293-312.

Grant, A. M., & Wade-Benzoni, K. A. 2009. The hot and cool of death awareness at work: Mortality cues, aging, and self-protective and prosocial motivations. ***Academy of Management Review***, 34(4): 600-622.

Guion, D. T., Scammon, D. L. & Borders A. L. 2007. Weathering the storm: A social marketing perspective on disaster preparedness and response with lessons from Hurricane Katrina. ***Journal of Public Policy & Marketing***, 26 (1): 20–32.

Gutierrez-Gutierrez, L., Castillo, A., & Montiel, I. 2020. Companies vs. coronavirus: A call for rapid responsible innovation. Retrieved from: https://one.aom.org/covid-19-insights-from-business-sustainability-scholars/gutierrez-gutierrez-castillo-montiel

Hair, J., Black, W., Babin, B., and Anderson, R. 2010. ***Multivariate data analysis*** (7th ed.): Prentice-Hall, Inc. Upper Saddle River, NJ, USA.

Hamann, R. 2020. Coronavirus will have long-term implications for business leaders. Here are the top five. Retrieved from: http://one.aom.org/covid-19-insights-from-business-sustainability-scholars/covid-19-insights-hamann

Hambrick, D. C. 1981. Environment, strategy, and power within top management teams. ***Administrative Science Quarterly***, 253-275.

Holland, T., Katzin, J. 2019. Beyond the downturn: Recession strategies to take the lead. ***Bain & Company Report.***

Hora, M., & Klassen, R. D. 2013. Learning from others' misfortune: Factors influencing knowledge acquisition to reduce operational risk. ***Journal of Operations Management***, 31(1-2): 52-61.

Jansen, J. J., Tempelaar, M. P., Van den Bosch, F. A., & Volberda, H. W. 2009. Structural differentiation and ambidexterity: The mediating role of integration mechanisms. ***Organization Science***, 20: 797-811.

Jayawickreme, E., & Blackie, L. E. 2014. Post-traumatic growth as positive personality change: Evidence, controversies and future directions. ***European Journal of Personality***, 28: 312-331.

Kendra, J. M., & Wachtendorf, T. 2003. Elements of resilience after the world trade center disaster: reconstituting New York City's Emergency Operations Centre. ***Disasters***, 27(1): 37-53.

Klassen, S., & Murphy, S. 2020. Equity as both a means and an end: Lessons for resilient food systems from COVID-19. ***World Development***, 136: 105104.

Lampel, J., Shamsie, J., & Shapira, Z. 2009. Experiencing the improbable: Rare events and organizational learning. ***Organization Science***, 20: 835-845.

Levitt, B., & March, J. G. 1988. Organizational learning. ***Annual Review of Sociology***, 14: 319-338.

Li, Y., Li, H., Decety, J., & Lee, K. 2013. Experiencing a natural disaster alters children's altruistic giving. ***Psychological Science***, 24: 1686–1695.

Linley, P. A., & Joseph, S. 2004. Positive change following trauma and adversity: A review**.** ***Journal of Traumatic Stress: Official Publication of the International Society for Traumatic Stress Studies***, 17(1): 11-21.

Madsen, P. M. 2009. These lives will not be lost in vain: Organizational learning from disaster in US coal mining. ***Organization Science***, 20: 861-875.

Maitlis, S. 2020. Posttraumatic growth at work. ***Annual Review of Organizational Psychology and Organizational Behavior***, 7: 395-419.

Maitlis, S., & Christianson, M. 2014. Sensemaking in organizations: Taking stock and moving forward. ***Academy of Management Annals***, 8(1): 57-125.

Maitlis, S., & Sonenshein, S. 2010. Sensemaking in crisis and change: Inspiration and insights from Weick (1988). ***Journal of Management Studies***, 47(3), 551-580.

Matsuno, K., & Kohlbacher F. 2019. Firms' (Non)responses: The role of ambivalence in the case of population aging in Japan. ***Long Range Planning***, 52(2): 236-254.

Matsuno, K., & Kohlbacher, F. 2020. Proactive marketing response to population aging: The roles of capabilities and commitment of firms. ***Journal of Business Research***, 113: 93-104.

Matsuno, K., & Mentzer, J. T. 2000. The effects of strategy type on the market orientation–performance relationship. ***Journal of Marketing***, 64(4): 1-16.

March, J. G. 1991. Exploration and exploitation in organizational learning. ***Organization Science***, 2(1): 71-87.

McKinsey & Company, 2020. The Next Normal. Retrieved from https://www.mckinsey.com/featured-insights/the-next-normal

McMillen, J. C., & Fisher, R. H. 1998. The Perceived Benefit Scales: Measuring perceived positive life changes after negative events. ***Social Work Research***, 22(3): 173-187.

Meyer, K., Lund Pedersen, C., & Ritter, T. 2020. The coronavirus crisis: A catalyst for entrepreneurship. Retrieved from http://one.aom.org/covid-19-insights-from-business-sustainability-scholars/meyer-covid19-insights

Miao, Q., & Popp, D. 2014. Necessity as the mother of invention: Innovative responses to natural disasters. ***Journal of Environmental Economics and Management***, 68: 280-295.

Mossholder, K. W., & Bedeian, A. G. 1983. Cross-level inference and organizational research: Perspectives on interpretation and application. ***Academy of Management Review***, 8(4): 547-558.

Nishiguchi, T., & Beaudet, A. 1998. The Toyota group and the Aisin fire. ***Sloan Management Review***, 40(1): 49.

Oetzel, J. M., & Oh, C. H. 2013. Learning to carry the cat by the tail: Firm experience, disasters, and multinational subsidiary entry and expansion. ***Organization Science***, 25: 732-756.

Oishi, S., Yagi, A., Komiya, A., Kohlbacher, F., Kusumi, T., & Ishii, K. 2017. Does a major earthquake change job preferences and human values? ***European Journal of Personality***, 31(3): 258-265.

Petrescu, M. 2013. Marketing research using single-item indicators in structural equation models. ***Journal of Marketing Analytics***, 1(2): 99-117.

Pfeffer, J., & Salancik, G. R. 2003. ***The external control of organizations: A resource dependence perspective***. Stanford University Press.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y., and Podsakoff, N.P. 2003. Common method biases in behavioral research: A critical review of the literature and recommended remedies***. Journal of Applied Psychology***, 88: 879.

Raisch, S., & Birkinshaw, J. 2008. Organizational ambidexterity: Antecedents, outcomes, and moderators. ***Journal of Management***, 34(3): 375-409.

Rao, H., & Greve, H. R. 2018. Disasters and community resilience: Spanish flu and the formation of retail cooperatives in Norway. ***Academy of Management Journal***, 61(1): 5-25.

Rerup, C. 2005. Learning from past experience: Footnotes on mindfulness and habitual entrepreneurship. ***Scandinavian Journal of Management***, 21(4): 451-472.

Rerup, C. 2009. Attentional triangulation: Learning from unexpected rare crises. ***Organization Science***, 20: 876-893.

Rerup, C., & Levinthal, D. A. 2014. Situating the concept of organizational mindfulness: the multiple dimensions of organizational learning. In ***Mindful change in times of permanent reorganization*** (pp. 33-48). Springer, Berlin, Heidelberg.

Rimé, B., Páez, D., Basabe, N., & Martínez, F. 2010. Social sharing of emotion, post-traumatic growth, and emotional climate: Follow-up of Spanish citizen's response to the collective trauma of March 11th terrorist attacks in Madrid. ***European Journal of Social Psychology***, 40(6): 1029-1045.

Sahebjamnia, N., Torabi, S. A., & Mansouri, S. A. 2015. Integrated business continuity and disaster recovery planning: Towards organizational resilience. ***European Journal of Operational Research***, 242(1): 261-273.

Saris, W. E., & Gallhofer, I. N. 2014. ***Design, evaluation, and analysis of questionnaires for survey research***. John Wiley & Sons.

Schein, E. 1972. ***Organizational psychology***. Englewood Cliffs, N.J.: Prentice-Hall.

Scholten, K., Sharkey Scott, P., & Fynes, B. 2019. Building routines for non-routine events: Supply chain resilience learning mechanisms and their antecedents. ***Supply Chain Management: An International Journal***, 24(3): 430-442.

Schwartz, S. H. 1992. Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. ***Advances in Experimental Social Psychology***, 25(1): 1-65.

Sinkula, J. M., Baker, W. E., & Noordewier, T. 1997. A framework for market-based organizational learning: Linking values, knowledge, and behavior. ***Journal of the Academy of Marketing Science***, 25(4): 305.

Smith, D., & Elliott, D. 2007. Exploring the barriers to learning from crisis: Organizational learning and crisis. ***Management Learning***, 38(5): 519-538.

Smith, A., Kohlbacher, F. 2019. Sustainability Means Business: Japan's place in the push for sustainability and ESG in ***Asia, Economist Corporate Network (ECN)***.

Starbuck, W. H. 2009. Perspective—Cognitive reactions to rare events: Perceptions, uncertainty, and learning. ***Organization Science***, 20: 925-937.

Stephens, N. M., Fryberg, S. A., Markus, H. R., & Hamedani, M. G. 2012. Who explains Hurricane Katrina and the Chilean earthquake as an act of god? The experience of extreme hardship predicts religious meaning-making. ***Journal of Cross-Cultural Psychology***, 44: 606–619.

Stephens, N. M., Hamedani, M. G., Markus, H. R., Bergsieker, H. B., & Eloul, L. 2009. Why did they "choose" to stay? Perspectives of Hurricane Katrina observers and survivors. ***Psychological Science***, 20: 878–886.

Sutcliffe, K. M., & Vogus, T. J. 2003. Organizing for resilience. ***Positive Organizational Scholarship: Foundations of a New Discipline***, 94: 110.

Tedeschi, R. G., & Calhoun, L. G. 2004. Posttraumatic growth: Conceptual foundations and empirical evidence. ***Psychological inquiry***, 15(1): 1-18.

Tiefenbach, T. & Kohlbacher F. 2015. Disasters, donations, and tax law changes: Disentangling effects on subjective well-being by exploiting a natural experiment. ***Journal of Economic Psychology***, 50: 94–112.

Turner, B. A. 1976. The organizational and interorganizational development of disasters. ***Administrative Science Quarterly***, 378-397.

Uchida, Y., Takahashi, Y., & Kawahara, K. 2014. Changes in hedonic and eudaimonic well-being after a severe national disaster: The case of the Great East Japan Earthquake. ***Journal of Happiness Studies***, 15: 207–221.

Vogus, T. J., & Sutcliffe, K. M. 2007. Organizational resilience: towards a theory and research agenda. In 2007 IEEE ***International Conference on Systems, Man and Cybernetics*** (pp. 3418-3422). IEEE.

Viscusi, W. K., & Zeckhauser, R. J. 2006. The perception and valuation of the risks of climate change: A rational and behavioral blend. ***Climatic Change***, 77(1-2): 151-177.

Weick, K. E. 1988. Enacted sensemaking in crisis situations. ***Journal of Management Studies***, 25: 305-317.

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. 1999. Organizing for high reliability: Processes of collective mindfulness. ***Crisis Management***, 3(1): 81-123.

Williams, T. A., Gruber, D. A., Sutcliffe, K. M., Shepherd, D. A., & Zhao, E. Y. 2017. Organizational response to adversity: Fusing crisis management and resilience research streams. ***Academy of Management Annals***, 11(2): 733-769.

World Health Organization, 2020. ***Environmental health in emergencies.***

4.10 Appendices

Appendix A: Measurement model

Construct, label, # of items, Composite Reliability (CR), AVE*	Variable Label	Item	Standard Loadings (error term)	Source
Control variable: Learning Orientation (LO) 4 items CR: .85 AVE: .59 7-point scale (strongly agree/strongly disagree)	LOCL01	To what extent do you agree with the following statements? Managers basically agree that our organization's ability to learn is the key to our competitive advantage.	.69 ** (.030)	Source: Sinkula et al., 1997
	LOCL02	The basic values of this organization include learning as key to improvement.	.80 ** (.023)	
	LOCL03	The sense around here is that employee learning is an investment, not an expense.	.71 ** (.027)	
	LOCL04	Learning in my organization is seen as a key commodity necessary to guarantee organizational survival.	.86 ** (.021)	
Independent variable: % Sales affected by GEJE disaster area 1 item 10-point scale	MDDSsal	Approximately what % of your Japanese operations' revenues was generated in the area affected by the Great East Japan Earthquake? [1= 0-10%, 2=11-20%, 3=21-30%, 4=31-40%, 5=41-50%, 6=51-60%, 7=61-70%, 8=71-80%, 9=81-90%, 10=91-100%]	-	New Measure
Dependent variable: Corporate-level response – Aging 6 items CR: .93 AVE: .59 7-point scale (strongly	MRACS01	Our firm has integrated issues concerning the population aging phenomenon into our strategic planning process.	.87** (.012)	Source: Matsuno and Kohlbacher, 2018
	MRACS02	In our firm, total quality management includes reducing the negative impact of the population aging phenomenon on products and processes.	.83** (.015)	
	MRACS03	At our firm we make every effort to link objectives pertaining to the population aging phenomenon with our other corporate goals.	.90** (.011)	

agree/strongly disagree)	MRAMS01	Issues concerning population aging are always considered when we develop new products.	.79** (.019)	
	MRAMS02	We emphasize the relevant aspects of population aging in our products and services advertising.	.76** (.021)	
	MRAMS03	Our marketing strategies for our products and services have been considerably influenced by concerns about population aging.	.81** (.017)	
Dependent variable: Corporate-level response – Environmental ism 6 items CR: .93 AVE: .59 7-point scale (strongly agree/strongly disagree)	MRECS01	Our firm has integrated issues concerning the growing environmentalism phenomenon into our strategic planning process.	.89** (.011)	Source: Matsuno and Kohlbache r, 2019
	MRECS02	In our firm, total quality management includes reducing the negative impact of the growing environmentalism phenomenon on products and processes.	.86** (.013)	
	MRECS03	At our firm we make every effort to link objectives pertaining to the growing environmentalism phenomenon with our other corporate goals.	.91** (.010)	
	MREMS01	Issues concerning growing environmentalism are always considered when we develop new products.	.81** (.016)	
	MREMS02	We emphasize the relevant aspects of growing environmentalism in our products and services advertising.	.79** (.018)	
	MREMS03	Our marketing strategies for our products and services have been considerably influenced by concerns about growing environmentalism.	.81** (.016)	
Mediating variable: Change in values and beliefs after a disaster 5 items CR: .87 AVE: .57 7-point scale (strongly agree/strongly disagree)	PosDS01	Our company now cares more about the people who are less fortunate since the Great East Japan Earthquake.	.71** (.025)	New Measure
	PosDS02	Sustainability issues have become more important for our company since the Great East Japan Earthquake.	.68** (.027)	
	PosDS03	Protecting the environment has become more important for our company since the Great East Japan Earthquake.	.78** (.021)	
	PosDS04	Corporate Social Responsibility has become more important for our company since the Great East Japan Earthquake.	.84** (.017)	
	PosDS05	Our company has begun thinking about how we can contribute to people's happiness in this country since the Great East Japan Earthquake.	.77** (.022)	
Mediating variable: Exploration Capability 4 items CR: .84 AVE: .57 7-point scale (strongly agree/strongly disagree)	EXCA01	Our organization accepts demands that go beyond existing products and services.	.52** (.035)	Source: Jansen et al., 2009
	EXCA02	We commercialize products and services that are completely new to our organization.	.74** (.024)	
	EXCA03	We frequently utilize new opportunities in new markets.	.92** (.022)	
	EXCA04	Our organization regularly uses new distribution channels.	.79** (.020)	

* AVE: Average Variance Extracted
** p-value < .01

Appendix B: Alternative measures of effects of disasters

	MODEL 6 OLS results	MODEL 7 Heckman results	MODEL 8 OLS results	MODEL 9 Heckman results
	Revenue Growth (2010-2019)			
Profits affected by GEJE [a]	0.054* (0.02)	0.054* (0.02)		
Production affected by GEJE[a]			0.035† (0.02)	0.035* (0.02)
Average Pre-disaster Log Revenues (millions of yen) [b]	-0.112** (0.03)	-0.113** (0.03)	-0.124** (0.03)	-0.126** (0.03)
Average Pre-disaster Log Employee Number [b]	0.112* (0.04)	0.113** (0.04)	0.119** (0.04)	0.120** (0.04)
Average Pre-disaster ROA (profits/assets) [b]	-0.015† (0.01)	-0.015* (0.01)	-0.014† (0.01)	-0.015* (0.01)
Company Age [b]	-0.004** (0.00)	-0.004** (0.00)	-0.004** (0.00)	-0.004* (0.00)
Public (Dummy) [b]	0.015 (0.14)	0.017 (0.14)	0.027 (0.14)	0.029 (0.13)
Average Percentage of International Revenues [a]	0.003 (0.00)	0.003 (0.00)	0.003 (0.00)	0.003 (0.00)
Average Relative Business Performance [a]	0.026 (0.03)	0.027 (0.03)	0.027 (0.03)	0.028 (0.03)
Rural (Dummy) [b]	-0.031 (0.06)	-0.036 (0.06)	-0.052 (0.06)	-0.058 (0.06)
Average Revenues Growth [a]	-0.007 (0.02)	-0.010 (0.02)	-0.006 (0.02)	-0.009 (0.02)
Average Employee Number Growth [a]	0.060* (0.03)	0.063* (0.03)	0.059* (0.03)	0.062* (0.03)
Average Annual R&D/Revenues [a]	0.055* (0.02)	0.055** (0.02)	0.056* (0.02)	0.056** (0.02)
Industry control [b]	YES	YES	YES	YES
Region control [b]	YES	YES	YES	YES
_cons	0.325 (0.25)	0.368 (0.27)	0.403 (0.26)	0.435 (0.29)
N	331	329	332	330
R2	0.334		0.339	

† p < .10
* p < .05
** p < .01

(Robust Standard Errors in Brackets)
[a] Data collected in 2012 survey
[b] Data from TDB (fiscal years 2008, 2009, and 2010)

Appendix C: Alternative year range for revenue growth

	MODEL 10 OLS results	MODEL 11 OLS results	MODEL 12 Heckman results	MODEL 13 OLS results
	Revenue Growth (2009-2019)			
Revenues affected by GEJE		0.047† (0.03)	0.046† (0.02)	
Revenues affected by GEJE > 50% (dummy)				0.538** (0.20)
Average Pre-disaster Log Revenues (millions of yen) [b]	-0.107** (0.03)	-0.107** (0.03)	-0.108** (0.03)	-0.102** (0.03)
Average Pre-disaster Log Employee Number [b]	0.102* (0.05)	0.099* (0.05)	0.100* (0.05)	0.092* (0.05)
Average Pre-disaster ROA (profits/assets) [b]	-0.015* (0.01)	-0.015* (0.01)	-0.016* (0.01)	-0.015* (0.01)
Company Age [b]	-0.006** (0.00)	-0.006** (0.00)	-0.006** (0.00)	-0.006** (0.00)
Public (Dummy) [b]	0.005 (0.16)	0.014 (0.16)	0.012 (0.15)	0.029 (0.16)
Average Percentage of International Revenues [a]	0.007† (0.00)	0.006† (0.00)	0.006† (0.00)	0.007† (0.00)
Average Relative Business Performance [a]	0.087** (0.03)	0.091** (0.03)	0.087** (0.03)	0.093** (0.03)
Rural (Dummy) [b]	0.032 (0.07)	0.024 (0.07)	0.021 (0.07)	0.034 (0.07)
Average Revenues Growth [a]	0.012 (0.03)	0.008 (0.03)	0.006 (0.023	0.011 (0.03)
Average Employee Number Growth [a]	0.041 (0.03)	0.036 (0.03)	0.038 (0.03)	0.024 (0.03)
Average Annual R&D/Revenues [a]	0.068* (0.03)	0.070* (0.03)	0.069* (0.03)	0.070* (0.03)
Industry control [b]	YES	YES	YES	YES
Region control [b]	YES	YES	YES	YES
_cons	0.462 (0.29)	0.425 (0.29)	0.534† (0.29)	0.514† (0.29)
N	334	326	324	326
R2	0.326	0.334		0.346

† p < .10
* p < .05
** p < .01

(Robust Standard Errors in Brackets)
[a] Data collected in 2012 survey
[b] Data from TDB (fiscal years 2008, 2009, and 2010)

5.

The Challenge of Implementing Voluntary Sustainability Standards: A Dynamic Framework on the Tension between Adherence and Adaptation

This chapter also aims to address the second overarching research objective of this Ph.D. thesis, by theoretically examining the tension emerging between the need to establish global regulations and practices to face global issues and the need to adapt them to the local specificities of the contexts in which global issues manifest.

5.1 Abstract

Voluntary sustainability standards (VSS) aim to encourage ethical behaviors and solid accountability of organizations. Yet studies show that many certified organizations do not live up to these promises. Existing literature typically attributes the reasons to either intentional decoupling due to a lack of adhering to standard requirements or to means-end decoupling due to a lack of adapting to the local context. However, little is known about how the contradictory needs of adherence and adaptation evolve over the course of VSS implementation. Building on the knowledge transfer literature, we develop a dynamic conceptual framework that distinguishes two phases of VSS implementation. Specifically, we theorize how tensions emerge between phases since the first phase primarily calls for adherence versus the second phase for adaptation. Applying this framework, we illustrate how these tensions relate to different VSS dimensions. The chapter concludes with implications and future research directions for governance and sustainability standards scholarship.

Keywords: Voluntary sustainability standards; decoupling; organizational tensions; knowledge transfer, dynamic perspective.

5.2 Introduction

"Opposition brings concord. Out of discord comes the fairest harmony, and everything happens according to contention."
Heraclitus, ca 500 BC

Voluntary sustainability standards (VSS) have grown rapidly over the past decade, both in geographic diffusion and number (Bowler, Castka, & Balzarova, 2017; Reinecke, Manning, & Von Hagen, 2012). Their growth reflects that organizations are increasingly expected to demonstrate ethical behavior and accountability for their actions (Gilbert, Rasche, & Waddock, 2011) since national governments and multilateral organizations are unable or unwilling to regulate social and environmental dimensions of international business activities (Aravind & Christmann, 2011; Montiel, Christmann, & Zink, 2019). Addressing such governance voids is a core normative goal of VSS, reflected also in their definition as "voluntary predefined rules, procedures, and methods to systematically assess, measure, audit, and/or communicate the social and environmental behavior and/or performance of firms" (Gilbert et al., 2011, p. 24).

Yet evidence suggests that VSS do not live up to the promises and that reaching the desired sustainability goals is the exception, not the norm (Dietz, Estrella Chong, Grabs, & Kilian, 2020; Giuliani, Ciravegna, Vezzulli, & Kilian, 2017; Waldman & Kerr, 2014). A prominent explanation proposed for this lack of effectiveness is a lack of adherence to the VSS requirements. Intentional decoupling happens when an organization formally adopts the VSS but chooses not to properly implement the requirements, taking advantage of weaknesses in the monitoring process (Behnam & MacLean, 2011; Brunsson, Rasche, & Seidl, 2012; Christmann & Taylor, 2006). Yet too strict adherence to the requirements can backfire, resulting in means-end decoupling, which happens when the organization complies with the VSS requirements, but still fails to obtain the desired outcomes. This kind of decoupling occurs because rigid requirements cannot encompass the adaptations needed to reach the goals given context specificities (Bromley & Powell, 2012; Wijen 2014). Therefore, a tension emerges between the need to foster adherence to VSS requirements to reduce the risk of intentional decoupling and the need to allow for

adaptation to reduce the risk of means-end decoupling (Christensen, Morsing, & Thyssen, 2017; Rasche, 2010; Sandholtz, 2012; Wijen, 2014).

While scholars are cognizant of this tension (Brunsson et al., 2012; Christensen et al., 2017) and have called for further research into the dynamics of standards (Brunsson et al., 2012), existing literature of VSS implementation has not examined whether and how this tension between adherence and adaptation evolves over time. Most decoupling studies treat VSS implementation as static and do not include a temporal dimension (Aravind & Christmann, 2011; Barrientos & Smith, 2007; Giuliani et al., 2017). VSS implementation is thus viewed as an act and not as a process that unfolds over time. This oversight is problematic for two main reasons. First, it conflicts with empirical evidence showing that organizational members accept and integrate standards requirements slowly over time, as they resolve emerging difficulties (Lazaric & Denis, 2005; Sandholtz, 2012). Second, a static perspective disguises both the sources of and the potential ways to address the tension between adherence and adaptation while a dynamic perspective can shed light on how the tension evolves and on how to address it more effectively.

Addressing this oversight, we ask the following research question: how does the tension between adherence and adaptation evolve dynamically during the implementation of VSS? To answer this question, we build on the insights from the knowledge transfer literature (D'Adderio, 2014; Szulanski, 2000, 1996; Szulanski, Winter, Cappetta, & Van den Bulte, 2002). This literature is particularly suitable to theorize the tension between adherence and adaptation because it integrates a temporal, dynamic dimension. Specifically, we delineate two phases of VSS implementation—adoption and integration—and theorize how the needs of adherence and adaptation evolve during these phases. We begin by examining what mechanisms foster adherence and adaptation respectively in each phase. We propose that within each phase, the dominant need for adherence and adaptation needs counterbalancing mechanisms to equilibrate the competing needs. Furthermore, we show that tensions come to the fore particularly in the transition between phases when the emphasis shifts from adherence in the adoption phase to adaptation in the integration phase. Specifically, we identify three tensions—a tension of proximity, of autonomy, and of interpretability, emanating from the source of knowledge, the recipient of knowledge, and the knowledge transferred respectively.

Therefore, we argue that effective VSS implementation will depend on the degree to which the contradictory demands of adherence and adaptation are managed. Finally, we apply this framework to different VSS dimensions to illustrate which tensions are particularly salient for different levels of VSS scope, enforcement, and stringency.

Our study contributes to the multidisciplinary scholarly conversation on VSS in two ways. First, by introducing insights from the knowledge transfer literature, we move beyond the dominant static perspective on VSS and instead theorize VSS implementation as a process evolving dynamically over time. Notably, our framework delineates different phases and identifies adherence and adaptation mechanisms according to the main need of each phase, illustrating how these needs are not stable. Our second contribution is to the literature on decoupling (Aravind & Christmann, 2011; Behnam & MacLean, 2011; Brunsson et al., 2012; King, Lenox, & Terlaak, 2005; Wijen, 2014). In developing our framework, we aspire to unify the two divergent explanations of the literature on VSS implementation, highlighting either intentional decoupling or means-end decoupling, and we illustrate how these types of decoupling are interrelated and occur over time. In particular, we show how the risk of intentional decoupling decreases over time, while the one of means-end decoupling increases. These contributions provide relevant pathways for scholars, practitioners, and standard-setters alike who are interested in finding solutions to the social and environmental challenges present in global business.

In the next section, we introduce our theoretical foundation from the literature on VSS implementation and decoupling as well as knowledge transfer. In the subsequent section, we develop our dynamic framework proposing two phases of VSS implementation with their respective need for adherence and adaptation and the tensions emerging between the two phases. We then move to illustrate how the general framework applies to different dimensions of VSS and finally discuss our contributions as well as boundary conditions and directions for future research

5.3 Theoretical background

5.3.1 VSS implementation and decoupling

VSS are a form of governance developed to hold organizations accountable for their practices, as they represent a way to evaluate the environmental, ethical, or social performances of an organization and to communicate it to third parties (Gilbert & Rasche, 2007). VSS are developed by international organizations, multi-stakeholder initiatives, NGOs, industry associations, or companies, and can either emit certifications upon verifying the implementation of requirements or rely on voluntary disclosure and self-reporting (de Bakker et al., 2019; Gilbert et al., 2011; Pope & Lim, 2020). Examples of schemes that emit certifications are ISO 14001, an environmental management system (Aravind & Christmann, 2011; King et al., 2005); SA8000 for labor rights (Gilbert & Rasche, 2007); or Fairtrade for a fairer distribution of value within supply chains (Schuler & Christmann, 2011). Examples of voluntary disclosure and self-reporting schemes are the United Nations Global Compact (UNGC), which stipulates ten universally accepted principles including both social and environmental dimensions (Rasche & Kell, 2010; Leisinger, 2007), or the Global Reporting Initiative (GRI) for disclosing non-financial performance (Lim & Tsutsui, 2012; Shanahan & Khagram, 2006).

However, scholars have documented multiple cases where VSS have failed to result in more responsible social and environmental behaviors. For instance, in the coffee value chain, neither Fairtrade nor Organic standards have succeeded in preserving biodiversity in the highlands of Chiapas, Mexico (Philpott, Bichier, Rice, & Greenberg, 2007). The effects of VSS are disappointing for social and labor practices, too (Giuliani et al., 2017). In Kenya, coffee producers' marginal income increased only 10% due to participation in VSS programs and in Uganda, only Fairtrade, out of the major VSS programs, has been found to improve living conditions (Van Rijsbergen, Elbers, Ruben & Njuguna, 2016). Similarly disappointing results have been documented in various industries including soybean production (Waldman & Kerr, 2014), fisheries (Tolentino-Zondervan et al., 2016), and apparel (Locke et al., 2009).

The traditional explanation for such limited effectiveness is that organizations decouple the formal adoption of VSS from the implementation of the requirements (Brunsson et al., 2012; Christmann & Taylor, 2006; King et al., 2005). Some organizations adopt VSS to grasp the benefits in terms of higher legitimacy and signaling benefits, without bearing the costs of (full) implementation (Aravind & Christmann, 2011; Egels-Zandén, 2014; King et al., 2005). For instance, Aravind and Christmann (2011) conclude that a low-quality implementation of ISO 14001 requirements explains the lack of environmental performance improvements. Similarly, in his longitudinal study of Chinese toy suppliers, Egels-Zandén (2014) found that external pressure for adherence to requirements and a less ceremonial auditing process are essential to motivate the implementation of VSS requirements and to reduce violations. Enforcement mechanisms, such as monitoring and sanctions, are recommended to overcome this type of decoupling, assuming that this would motivate adopters to fully adhere to the requirements (Aravind & Christmann, 2011; Benham & MacLean, 2011; Christmann & Taylor, 2006; Egels-Zandén, 2014).

Recently, some authors have pointed out that the focus on adherence is not necessarily desirable and may undermine rather than enhance the effectiveness of VSS (Christensen et al., 2017; Rasche, 2010, 2012; Wijen, 2014). A second type of decoupling, called means-end decoupling, spurs from too strict adherence to the letter of VSS requirements, which may not be adequate for leading to the desired social and environmental outcomes in the local context of implementation (de Bakker et al., 2019; Christensen et al., 2017; Wijen, 2014). From this perspective, reaching the VSS goals requires carefully adapting the requirements of VSS to the specific context, as VSS are typically implemented in contexts that differ significantly in their technologies, ecological and social systems, resources, and capabilities (Corredoira & Mcdermott, 2014; Perez-Aleman, 2011, 2013). For example, the amount of water needed for irrigation depends on the soil and climate conditions of the specific region (Wijen, 2014), requiring an adaptation of outcome-based regulations of water usage to different contexts. To overcome this type of means-ends decoupling, scholars propose adapting requirements to fit the specificities of the implementation context (Brunsson et al., 2012; Christensen et al., 2017; Wijen, 2014).

Read together, there is a tension between the need for adherence and the need for adaptation. On the one hand, VSS have been developed to diffuse standardized practices, and adherence is key to achieving these. On the other hand, reaching uniformity across

time and space is often an impossible task as each context represents unique characteristics (Thévenot, 2009). The literature on VSS has started acknowledging this tension and the need to balance adherence and adaptation in order to foster the effectiveness of VSS (Brunsson et al., 2012; de Bakker et al., 2019; Rasche, 2010, 2012). Solutions to address this tension include recommendations to establish a climate of openness to dialogue and participation to balance divergent needs, and including different stakeholder involved in the decision process in a climate of fairness, consensual orientation, and transparency (de Bakker et al., 2019; Mena & Palazzo, 2012; Overdevest & Zeitlin, 2014).

While VSS and decoupling studies have highlighted and theorized important aspects of VSS implementation, they adopt a static rather than a dynamic perspective on VSS implementation, leading to calls for more attention to the dynamics of standards (Brunsson et al., 2012). The need for adherence and adaptation, and the tension between these two demands, are implicitly represented as constant from the time the standard is formally adopted until it is discontinued. This lack of a dynamic perspective is also evident in the methodology used by most empirical studies on the topic, which are often cross-sectional and capture VSS implementation and its effectiveness at a specific point in time (Aravind & Christmann, 2011; Barrientos & Smith, 2007; Giuliani et al., 2017), recognized as a major shortcoming in VSS theorization (Egels-Zandén, 2014).

A static perspective contrasts with empirical evidence coming from a few longitudinal studies that instead show how standards implementation is a long and complex process (Egels-Zandén, 2014; Lazaric & Denis, 2005; Sandholtz, 2012). We know that the adopters of standards often face steep learning curves for disrupting their old practices and adapting them to the ones required by VSS (Huising & Silbey 2011; Perez-Aleman 2011). For instance, a longitudinal study on implementation of the UTZ standard in Brazil illustrates how cocoa producers needed to first build a new health and safety practice and later to keep supervising the new practice until it became habitual (Tampe, 2021). Therefore, a dynamic view of VSS implementation and its decoupling risks is likely to be more accurate than a static view.

To conclude, the literature on decoupling and VSS implementation has made significant headway in elucidating reasons for why VSS can fail to have the desired results. What is missing, however, is a deeper, more theoretically grounded understanding of the tension between adherence and adaptation and of how this tension manifests over time. We propose that a dynamic perspective of VSS implementation can help to analytically unravel how the contradictory demands of adherence and adaptation arise and can be managed over time. In particular, a closer look at the literature on knowledge transfer (D'Adderio, 2014; Szulanski, 2000, 1996) gives valuable insights for VSS implementation. Crucially, the knowledge transfer literature has long discussed how the tension between adherence and adaptation manifests dynamically over the knowledge transfer process. This literature is a suitable lens since VSS also function as a tool to transfer knowledge from standards-setters to VSS adopters (Giuliani et al., 2017; Perez-Aleman, 2011, 2013; Tolentino-Zondervan et al., 2016). VSS represent a possible pathway for transferring the knowledge needed to behave more sustainably in time and space (Corredoira & Mcdermott, 2014; Gereffi & Lee, 2016), as they require the implementation of a set of practices designed in developed nations but then applied by different actors in heterogeneous contexts and at different times (Perez-Aleman, 2011, 2013).

5.3.2 Knowledge transfer as a lens for VSS implementation

The literature on knowledge transfer provides the conceptual tools to unpack the evolution of the tension between adherence and adaptation over time, which emerges when knowledge and practices are transferred within different geographic units of the same organization or between different organizations in networks (D'Adderio, 2014; Szulanski & Jensen, 2006). The knowledge transfer literature refers to this tension as the "replication dilemma" (Winter & Szulanski, 2001, p. 737). On the one hand, the knowledge transfer should adhere faithfully to the original template since altering a proven knowledge template without having an accurate understanding of the cause-effect relationships involved is likely to undermine the effectiveness of the new knowledge (Jensen & Szulanski, 2004; Winter, Szulanski, Ringov, & Jensen, 2012). On the other hand, the pressure to strictly adhere to the template can undermine the knowledge transfer effectiveness because it prevents local innovation and adaptation to the local context, crucial especially for cross-

border transfers, where the characteristics of the recipient environment are different from the source environment on multiple dimensions, like culture, regulatory environment, and market forces (Ansari, Fiss, & Zajac, 2010; Onkvisit & Shaw, 1987). on multiple dimensions, like culture, regulatory environment, and market forces (Ansari, Fiss, & Zajac, 2014; Onkvisit & Shaw, 1987).

Unlike the VSS literature, the knowledge transfer literature adopts a dynamic perspective on this tension by distinguishing two phases of knowledge transfer implementation (Chandler, 2014; D'Adderio, 2014; Kostova, 1999): (1) an initial phase (often referred to as transfer phase), that spans from when the source of knowledge initiates the knowledge transfer to when the recipient starts to implement the new knowledge, and (2) a second phase (often referred to as post-transfer or integration phase), when the knowledge recipient continuously uses the newly acquired knowledge and integrates it with existing routines (D'Adderio, 2014; Szulanski, 2000, 1996).

In the initial phase, the success of the transfer depends on the capacity and willingness of the actors involved to bridge the knowledge gap (Szulanski, 2000, 1996; Szulanski et al., 2002). As Gondo and Amis (2013) point out, the main challenge in this phase is the lack of acceptance of the new knowledge by the recipient leading to a conscious decision to decouple practices from the knowledge transferred. Problems arise when the source of knowledge lacks the motivation or authority to transfer the knowledge, when the recipient lacks absorptive capacity (i.e., the capacity to acquire and retain new knowledge) or perceives the source of knowledge as not reliable, or when the knowledge transferred is unproven or ambiguous (Szulanski et al., 2002). Overcoming such barriers requires an emphasis on adherence to the knowledge template (DAdderio, 2014) and on monitoring the faithful implementation by the source of knowledge (Szulanski, 2000, 1996).

In the second phase, the recipient is responsible for the continuous use of the new knowledge until it is fully integrated into the organization's routines (Kostova, 1999). Empirical evidence from knowledge transfers within eight multinational firms suggests that this task is far from trivial (Szulanski et al., 2002). Inconsistencies between the new knowledge and the existing organizational practices inevitably emerge, as the knowledge transferred is developed in one context and implemented in a different one (Szulanski,

1996). The recipients' role, and especially their retentive capacity (i.e., the ability to retain the knowledge within its practices), becomes more prominent, as the recipients need to adapt the new knowledge to fit with the context. As Gondo and Amis (2013) suggest, the lack of fit between the new knowledge and the existing practices emerging in this phase leads to unintentional decoupling, where the recipients try to implement the new practices but are not able to gain the expected benefits from the new knowledge.

Importantly, recent findings on the micro-dynamics of knowledge transfer show that the recipients of knowledge deal with the competing goals of adherence and adaptation not in a sequential way, but instead they "selectively perform (enact, rather than simply pay attention to) contrasting goals simultaneously," and specifically they "energized one goal (which was made more prominent) while backgrounding the other (which was not, however, entirely suppressed as in sequential attention)" (D'Adderio, 2014, p. 1346). In other words, in both phases, both adherence and adaptation are pursued, albeit to a different extent. In the initial phase, counterbalancing mechanisms for adaptation complement the focus on adherence, whereas in the later phase, the mechanisms supporting adaptation gain more ground while counterbalancing adherence mechanisms help to control that adaptations of the new knowledge are aligned with the intended knowledge transfer (D'Adderio, 2014).

In sum, the knowledge transfer literature brings a dynamic perspective on the adherence-adaptation tension evolution over time. This literature illuminates how the needs for adherence and adaptation are not stable but rather change dynamically over time (Gondo & Amis, 2013). The literature also establishes that actors must selectively yet simultaneously enact multiple mechanisms to address the primary demands of each phase while maintaining counterbalancing mechanisms in order to enhance the effectiveness of the knowledge transfer (D'Adderio, 2014).

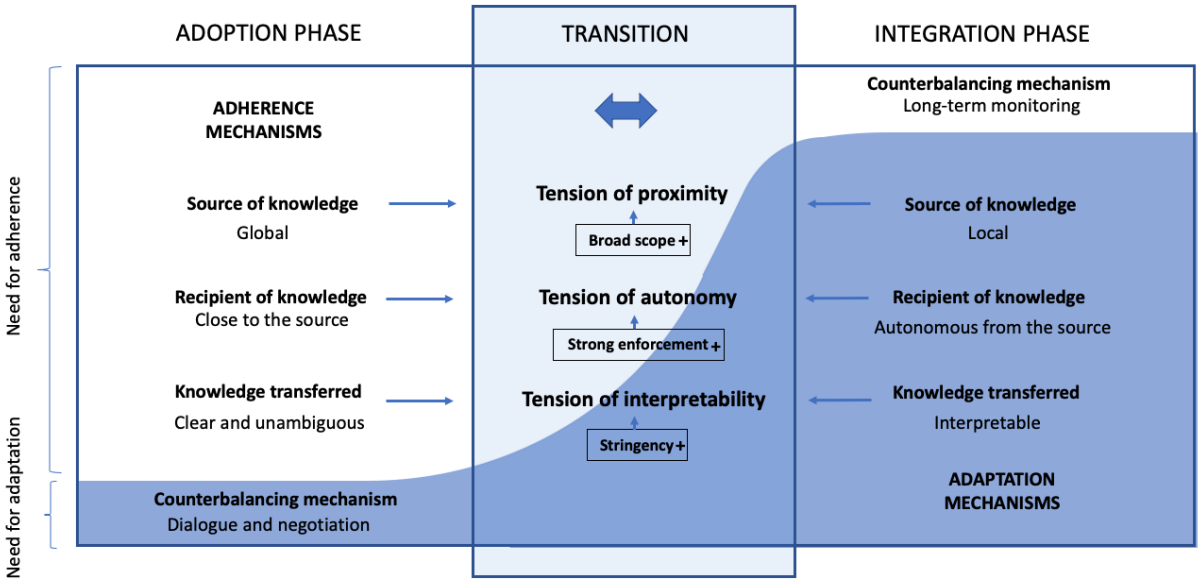
Thus, the knowledge transfer literature provides important conceptual underpinnings for VSS implementation by theorizing the phases and the tension between adherence and adaptation, but further conceptual work is needed regarding two aspects. First, both streams of literature expect an overarching tension between adherence and adaptation. However, there are differences between the VSS context and the contexts of investigation of the

knowledge transfer literature, mainly the transfer between the headquarter and the subsidiaries of multinational companies, between a franchisor and franchisees, or between organizations in alliances, partnerships, and acquisitions. Therefore, we know little about how this tension might dynamically play out in the VSS context, which is generally characterized by high field opacity and causal complexity, making it difficult to establish the characteristics of the prevailing practices, to identify causal relationships between VSS and outcomes, and to measure the results of VSS implementation (Wijen, 2014). Therefore, we can expect the tension between adherence and adaptation to be more prominent in the VSS than in the corporate context, despite the enforcement mechanisms that apply for some VSS, as these mechanisms are generally unable to encompass the challenges of VSS implementation (Aravind & Christmann, 2011). Second, the knowledge transfer literature has paid attention to theorizing the phases, which has yielded a theoretically grounded understanding of the tension between adherence and adaptation. However, by honing in on key elements of the transfer—source of knowledge, recipient of knowledge, and the knowledge itself—we aspire to elucidate how this tension manifests in the context of VSS implementation.

5.4 A dynamic framework of VSS implementation

In this section, we develop a framework to illustrate how the tension between adherence and adaptation dynamically evolves during the implementation of VSS. First, we distinguish two different phases in the implementation of VSS, adoption and integration, the first characterized by a higher risk of intentional decoupling and thus calling for higher adherence, and the second by a higher risk of means-end decoupling, thus calling for higher adaptation. We then discuss what mechanisms support the focus on adherence and adaptation in the two phases respectively, before elaborating on the tensions that emerge in the transition between phases. Figure 1 shows our framework, illustrating how tensions emerge as the actors implementing VSS try to overcome both intentional and means-end decoupling.

Figure 1. A dynamic framework of VSS implementation



5.4.1 The phases of VSS implementation

Mirroring the knowledge transfer literature, we propose that the implementation of VSS is constituted by two main phases. The first phase, which we call *adoption*, starts with the recipient's decision to adopt the standard and ends with the formal adoption which, for certification schemes, coincides with the certification award. If intentional decoupling does not occur, this phase is marked with the initial implementation of the requirements. That said, the implementation process is ongoing and, without a formal adoption marker in time, the transition to the second phase is more gradual. In those cases, we consider the adoption phase to end when the adopter communicates the formal adoption of the VSS and the implementation of the requirements, even if in incomplete or unfaithful enactments.

During the adoption phase, most of the knowledge on how to implement the VSS requirements is transferred from the source of knowledge, generally the standard-setter or a buyer, to the adopting organization. For example, in the case of ISO 14001, the adopting organization receives a document from ISO with an explanation and rationale of each requirement. Subsequently, the organization must assess the current status of the

organization, develop an implementation and training plan to meet the requirements set by the standard, and then pass a site and document review by an accredited monitoring and assessment body that decides on whether to emit the ISO certificate (Font, 2002).

Particularly challenging aspects for the adoption phase are, the distance between the requirements and adopters' existing practices, as documented for Nicaraguan cheese producers (Perez-Aleman, 2011), or when the adopters are isolated, without role models for ideas on how to implement VSS requirements, as shown for cocoa producers adopting the UTZ standard (Tampe, 2021). For instance, in the case of the United Nations Global Compact (UNGC), the recipient business may be at a loss on how to operationalize very broad principles, especially if they are disconnected from opportunities to brainstorm with other adopters (Rasche & Waddock, 2014).

In line with the knowledge transfer literature, the adoption phase implies a high risk of intentional decoupling. The adopters might be tempted to formally adopt the standard for reputation and signaling benefits without meeting all requirements. The organization often has to shoulder substantive upfront investments to implement VSS without a clear payoff (Goedhuys & Sleuwaegen, 2013; Kumar, Thapa, Roy, & Joshi, 2017). Monetary and time investments are needed to improve existing technology, infrastructures, reporting procedures, to increase salaries, or to improve working conditions and training for the employees (Benham & MacLean, 2011; Yeung & Mok, 2005). Moreover, as the requirements are initially implemented, there is likely high resistance from some organizational members to accept and modify their existing practices and high discomfort generated by the required changes in behaviors (Lazaric & Denis, 2005). All these factors create incentives for the organization to intentionally decouple the adoption of the standard without implementing the requirements, requiring mechanisms to foster adherence.

In comparison, the risk of means-end decoupling is low but not absent in the adoption phase, as the effectiveness of the newly implemented practices will take time to manifest. While some unintended consequences spurring from the implementation of VSS requirements in the local context are easy to identify beforehand, it is often the case that, to assess the effects of the implementation of the requirements, the adopters need to become familiar with them. To improve effectiveness of the VSS in the local context, the

adopter needs to understand the underlying cause-effect relationships and unintended consequences of the VSS implementation (Sutter, Kistruck, & Morris, 2014), a process needing time. Moreover, leaving ample room for adaptation when there is a high risk of intentional decoupling is problematic, as organizational members may adapt certain requirements due to their resistance to change or unwillingness to invest time and money in fully implementing the requirements (Boiral, 2003).

The second phase, which we call *integration*, begins after the initial implementation of the requirements and ends when the requirements are continuously applied, routinized, and fully integrated by the adopter. A study of how Defial, a French meat producer, implemented the ISO9002 standard (Lazaric & Denis, 2005) illustrates how, in the four years following the certification award, the organization underwent a series of organizational adaptations, even if the company was formally complying with the requirements of the standard during the first months. For example, Defial adjusted its quality control process by internalizing the analysis lab and hiring more employees, and thus was able to improve, codify, and routinize the ISO-required practices over time. While the integration phase has received less attention in the VSS literature, a recent study shows that challenges in this phase emerge in particular when supporting management practices are not in place, such as human resource practices to retain workers trained in VSS requirements and innovation practices to continuously improve working processes (Tampe, 2021).

In line with the knowledge transfer literature, we argue that, in this phase, the risk of means-end decoupling becomes prominent, as the effectiveness of the new practices in the context is evaluated. Over time, adopters are likely to realize that some simplifications and adaptations are necessary to improve the effectiveness of VSS in the local context and to reduce potential unintended consequences. For instance, Fairtrade prescribes cooperatives as a way to empower producers and to instill workplace democracy but African investigative journalists have criticized this requirement as aggravating problems with exploitation and abuse in the African context (Wijen, 2014). Since assessing the adopters' overall well-being takes time, the actors likely cannot assess a mismatch between the VSS goals and the effects in the local context during the initial adoption phase.

The risk of intentional decoupling, although still present, is less prominent than in the previous phase. While there is a risk that newly implemented practices may be discontinued (Staats, Dai, Hofmann, & Milkman, 2017), the costs and efforts required for implementation have, in most cases, already been incurred. For instance, the cost of updating the technologies and systems used, of employee training, and of communication efforts to overcome initial resistance are upfront costs that the adopter has to bear when the requirements have been initially implemented. The presence of substantive upfront investments reduces the incentives to decouple VSS adoption and implementation after the initial implementation. Given the high risk of means-end decoupling and relatively low risk of intentional decoupling, this phase calls for higher adaptation. A strict focus of adherence in this phase may not only be unnecessary but can even undermine the effectiveness of VSS in the local context.

Crucially, these two phases, adoption and integration, are not to be understood as clearly separable and distinguishable phases but rather, as represented in Figure 1, as intermingled with a gradual transition between the two. Next, we discuss what mechanisms support the focus on adherence and adaptation respectively before we turn to the specific challenges that occur in the transition.

5.4.2 Mechanisms in the adoption phase

Drawing on the knowledge transfer literature, we distinguish a set of mechanisms that foster adherence in the adoption phase of VSS implementation, referring to the source of knowledge (i.e. the standard-setter, a buyer, or a third-party organization), the recipient of knowledge (i.e. the adopter), or the knowledge transferred (i.e. the VSS requirements), respectively.

First, the literature on knowledge transfer underlines how the authority and motivation of the source of knowledge are important to foster the acceptance of the new knowledge in the initial phase (Szulanski, 1996, 2000). In the VSS context, the knowledge source is usually standard-setters or buyers, who sometimes collaborate with development agencies or with third-party organizations to transfer the relevant knowledge about the VSS requirements. We argue that a *global source of knowledge* facilitates adherence. A widely recognized global source of the VSS conveys legitimacy and increases acceptance of the

requirements. Global sources transmit preferences for more responsible social and environmental practices from geographic areas with higher sensitivity to responsible behaviors to areas with loose regulations or enforcement for social and environmental practices. Given the pressure from final consumers and civil society organizations that hold organizations responsible for sustainable practices along their value chain and the related reputational damage risk for both buyers and standard-setters (Donaghey, Reinecke, Niforou & Lawson, 2014; Josserand & Keine, 2016; Schuler & Christmann, 2011), global actors are more motivated to impose the implementation of VSS requirements (Delmas & Montiel, 2009). Supporting evidence comes from a study conducted by Christmann and Taylor (2006), who found that certified organizations in emerging countries are more likely to implement VSS requirements when they sell a larger proportion of their output to global or industrialized countries' buyers than when they sell primarily to markets in emerging countries.

Second, the knowledge transfer literature posits that, in the initial phase, the recipient of knowledge needs to possess absorptive capacity and perceive the source as trustworthy in order to accept the new knowledge (Szulanski, 1996, 2000). In the VSS context, trust and absorptive capacity are enhanced when the adopter interacts frequently with the source of knowledge, mainly the standard-setter or the buyer. The *adopter's closeness* to the source of knowledge, in the form of frequent interactions and monitoring, increases the motivation of the adopter to implement the requirements and thus reduces the risk of intentional decoupling for two reasons. First, close relationships with the source of knowledge foster better communication, higher problem-solving, higher acceptance of advice from the source of knowledge, and lower rejection of not well-understood requirements (Locke, 2013; Josserand & Kaine, 2016; Pipkin & Fuentes, 2017). When such relationships are in place, the source of knowledge allocates more effort to transfer the relevant knowledge and to explain the requirements and the steps needed for their implementation, stimulating the absorptive capacity of the adopter. Second, frequent interaction with the source of knowledge increases the risks and cost of non-compliance for the adopter (Delmas & Montiel, 2009; Riisgaard & Hammer, 2011; Tolentino-Zondervan et al., 2016). Supporting evidence comes from a longitudinal study of labor standards in Chinese toy suppliers, which found that frequent interactions with buyers and industry actors is an important catalyst for overcoming intentional decoupling (Egels-Zandén 2014).

Finally, the knowledge transfer literature underlines that the recipient's understanding of the transferred knowledge is a necessary condition for its acceptance (Szulanski, 1996, 2000). Similarly, in the context of VSS, the *clarity of requirements* facilitates the successful transfer of knowledge and reduces the risk of intentional decoupling (Behnam & MacLean, 2011; Egels-Zandén, 2014; Giuliani et al., 2017; Wijen, 2014). The reasons are twofold. First, clear VSS requirements increase acceptance by providing step-by-step guidelines that are easy to understand and enforce without requiring a high level of pre-existing knowledge. For instance, a study on labor rights found that VSS requirements on health and safety standards, such as protective equipment, fire safety, or drinking water, were often implemented, while VSS requirements on freedom of association or collective bargaining had little or no impact in practice, partly because the latter do not provide clear and detailed enough guidelines for processes or outcome expectations (Barrientos & Smith, 2007). Second, setting unambiguous expectations related to compliance and detailed procedures also reduces the possibility of opportunistic interpretations where certified organizations can take advantage of broad and unclear requirements to pass the auditing process without changes in practice (Behnam & MacLean, 2011).

At the same time, it is important to remember that an exclusive focus on adherence is not advisable in the adoption phase, given that the risk of means-end decoupling is not absent. When taken to an extreme, these three mechanisms become counterproductive, for example when a global source of knowledge is too far removed to grasp the challenges from recipients' reality (Heimer, 2013); when the recipient's closeness to the source of knowledge is not by choice but due to market power of lead buyers who make VSS participation de facto mandatory and thus demotivating (Ponte & Ewert, 2009); or when the requirements manage every detail of implementation and risk to stifle all local innovation (D'Adderio, 2014). Therefore, there is still the need to allow for some counterbalancing adaptation mechanisms. Specifically, this means that there is room for discussing the adaptation of specific requirements between the global source of knowledge and a recipient that is willing to comply. From existing research, we know that spaces to discuss emerging barriers to the implementation of requirements are useful to strike a balance between adhering to the requirements and adapting for local realities (Coslovsky, 2013; Christensen et al., 2017) and to "govern the gap" between the standard and reality, rather than eliminate the gap (Huising & Silbey, 2011). Therefore, we propose that spaces for an *open dialogue and negotiation* between the source of knowledge and

the adopter help improving the implementation of requirements while reducing the risk of opportunistic interpretation of the requirements. Importantly, such spaces allow the recipient to propose adaptations and the source of knowledge to give or deny permission for the proposed adaptations.

5.4.3 Mechanisms in the integration phase

Here again, building on the knowledge transfer literature, we distinguish a set of mechanisms related to the source of knowledge, the recipient of knowledge, and the knowledge transferred, but in this phase with a focus on adaptation, given the prominent risk of means-end decoupling.

Mirroring the knowledge transfer literature, in this phase, the role of the source of knowledge becomes less prominent, while the role of the recipient is key to perform the requirements daily (Szulanski, 1996, 2000). Global sources of knowledge are likely to be substituted by local networks for knowledge creation and diffusion, such as the local networks for the case of the UNGC or the Data Partners of the GRI. *Local sources of knowledge*, including local governmental actors, companies, and NGOs, help to increase the fit between the VSS and the context of implementation and to support a tailored implementation as they are better positioned than global actors to support the local adaptation of VSS requirements. They possess superior knowledge of the local context and can reduce the burden on adopters to identify the best ways to adapt the VSS requirements to the local context and to steer the certified organizations away from misguided adaptation. Especially interactions with peers foster understanding, interpretation, experiential learning, and the diffusion of best practices, leading to an intelligent adaptation of the VSS requirements to the local context (Perez-Aleman, 2011). Supporting evidence comes from Coslovsky (2014), where he found that Bolivian nut producers succeeded in meeting stringent EU food safety standards because they were able to cooperate with each other to implement the VSS requirements. Similarly, in the dairy sector in Nepal, Kumar and colleagues (2017) found that cooperatives performed best among the different possible coordination arrangements.

As posited by the knowledge transfer literature, the knowledge recipient plays a more crucial role in this second phase (Szulanski & Jensen, 2006). The knowledge recipient needs to possess retentive capacity, which is the capability to fully integrate the new knowledge into daily routines (Szulanski, 1996, 2000). We argue that the adopter's autonomy in the integration of VSS favors effective adaptation and the routinization of the new practices for two reasons. First, *higher autonomy from the source of knowledge* allows for the participation in local networks and the production of local knowledge that can diffuse best-adapted practices and reduce the risk of means-end decoupling. The risk of close relationships with global sources of knowledge is an overreliance on the existing transferred knowledge that can undermine the creation of the new local knowledge essential to overcome means-end decoupling (Wijen, 2014) and that may alienate the recipient from local networks where consensus-building around the norms propagated by the source of knowledge may still be nascent (Rasche & Waddock, 2014). Second, those responsible for implementing VSS requirements have to exercise considerable agency and creativity to "wrangle" external requirements into the realities of their organizations, facing the internal push for adapting the requirements to the local context while at the same time ensuring the proposed adaptations are functional to make the VSS more effective. Illustrative evidence comes from the case of HIV clinics in East Africa, where Heimer (2013) describes how the integration of standardized practices requires a great deal of interpretative work from the adopters to adjust the regulations to their local conditions and to embed them into local practices. Such autonomy is needed especially when the standard-setter has an inaccurate picture of the context of implementation and lacks the capacity to guide the local adaptation and integration of practices, as it is often the case for VSS that are implemented in widely differing contexts.

Finally, the knowledge transfer literature posits that a certain degree of flexibility and interpretability increases the fit between the new knowledge and the local context, overcoming material and institutional barriers (Ansari et al., 2010). In the VSS context as well, the high *interpretability of requirements* is beneficial to overcome the means-end decoupling since, as Wijen (2014) points out, mere compliance may not yield the desired goals in opaque contexts of implementation. In this phase, the possibility to discuss diverging interpretations of the requirements can also stimulate the discussion on how to effectively reach the final goal of the VSS given the context specificities. In line with our argument, Christensen and colleagues (2017) argue that the possibility to interpret VSS

requirements in multiple ways is not a barrier, but a catalyst for reaching the ultimate goals of VSS, because open-ended requirements trigger a discussion among different actors that sensitizes them to the goal, rather than to the letter of the requirements. Keeping an active discussion on how to interpret the requirements can therefore push the adopter to adapt the requirements to maximize their effectiveness.

While these three mechanisms favor adaptation, reducing the risk of means-end decoupling, they should be counterbalanced by maintaining adherence mechanisms, as the intentional decoupling risk persists in the integration phase. The risk is that a certain implementation and supervision fatigue sets in as initial attention to VSS requirements wears off. The higher allowance for adaptation of requirements may become a way to hide a substantive dismissal of the new practices before their integration (Bowler et al., 2017; Lazaric & Denis, 2005). Therefore, there is a need to counterbalance the internal pressure for adapting the practices to the local context with *long-term monitoring from external actors*, often the source of knowledge, to ensure that the proposed adaptations are functional to boost VSS effectiveness in the local context. VSS schemes often include ways to monitor the continuous implementation of practices. Certification schemes, by design, require periodic monitoring, encouraging long-term engagement and a balance between a sanctioning and a problem-solving orientation (Coslovsky, 2013; Josserand & Kaine, 2016; Locke, 2013; Locke et al., 2009). For VSS that do not have a formal auditing mechanism, the role of verifying that requirements are met over time is generally left to self-reporting documents where organizations report their progress in meeting VSS goals (Pope & Lim, 2020). Still, the GRI encourages monitoring from external actors by challenging companies to also report on negative aspects of sustainability performance (Hahn & Lülfs, 2013).

In sum, the risk of intentional and means-end decoupling is not uniform during VSS implementation. The introduction of the knowledge transfer lens and the distinction of implementation into two phases suggests that, in each phase, the actors involved should favor the primary need (adherence and adaptation respectively in the two phases), while ensuring the presence of counterbalancing mechanisms that, albeit in the background, favor the opposite need. In the next section, we unpack the tensions that exist between the mechanisms favoring adherence and adaptation in the two phases from a dynamic perspective along the transition from the adoption to the integration phase.

5.4.4 Tensions between phases

When comparing the mechanisms required to overcome the prominent risks of intentional decoupling in the adoption phase and means-end decoupling in the integration phase, it becomes evident that each phase requires mechanisms that are oppositional to each other. Adopting a dynamic perspective draws attention particularly to the transition between phases when the actors need to change how they enact VSS implementation and when the knowledge transferred benefits from a shift in its nature. In this transition from the adoption to the integration phase, three tensions emerge for the mechanisms required in each phase.

First, *a tension of proximity* emerges because the source of knowledge needs to be global initially and local later on. Global sources of knowledge are beneficial in the adoption phase to provide globally relevant rules and the motivation to monitor the correct implementation of requirements (Amengual & Chirot, 2016; Donaghey et al., 2014; Josserand & Kaine, 2016), while in the second phase global sources of knowledge should leave room to local sources who are better apt to guide the adopters in their adaptation efforts (Corredoira & Mcdermott, 2014; Locke, 2013; Perez-Aleman, 2011, 2013). Yet, to prevent adaptation from becoming a strategy to hide the early dismissal of the requirements, global sources should retain some control over the adopter's adaptations. The transition between the two phases is therefore particularly challenging for the global actors enforcing the VSS implementation, since they need to pass from exerting a high degree of control to taking a more marginal role to allow for local experimentation, while still monitoring the adaptation of requirements as a counterbalancing mechanism for adherence.

Second, *a tension of autonomy* arises because the recipient organization needs to first be close to the source of knowledge, and then negotiate more autonomy to experiment and explore locally suitable adaptations, without fully dismissing the role of external actors exerting control. Closer relationships with thr source of knowledge increases the acceptance of requirements and the adherence to them (Josserand & Kaine, 2016; Thorlakson, Hainmueller, & Lambin 2018), while local autonomy is beneficial in the integration phase to develop local knowledge and increase the fit of VSS with the local context (Perez-Aleman, 2011, 2013). The transition between the two phases is therefore

particularly challenging for the adopter, who needs to move the internal focus from accepting pressures for adhering to requirements to experimenting with bottom-up innovations, while still allowing for some external control to prevent opportunistic adaptation.

Finally, *a tension of interpretability* occurs because VSS requirements need to be clear in the adoption phase and open to interpretations later on. Clear and specific requirements are beneficial in the adoption phase to improve adopters' understanding and acceptance of the certified organization and to reduce opportunistic interpretations and intentional decoupling (Behnam & MacLean, 2011; Egels-Zandén, 2014; Giuliani et al., 2017), while interpretable requirements facilitate the fit between the VSS and the various contexts of implementation in the integration phase, thus reducing the means-end decoupling risk (Ansari et al., 2010; Wijen, 2014). Yet, while taking a more prominent role, the interpretability of requirements should not fully undermine clarity in the integration phase, still needed to prevent the adopters from an adaptation of requirements that is too far from the spirit of the VSS.

Given the co-existing needs for adherence and adaptations during VSS implementation, the tension between these two needs is ever-present. Yet the tensions of proximity, autonomy, and interpretability come to the fore especially when shifting from the adoption to the integration phase and pose management challenges for the VSS actors. The adoption of a dynamic perspective reveals how, to favor an effective implementation of the standards, it is necessary to put the emphasis on one mechanism and then switch it to the oppositional mechanism during the transition from adoption to integration. Obstacles are likely to arise. For example, employees of the organization adopting the VSS will initially be given precise directives on the new practices to be implemented, with frequent checks to verify adherence to requirements, while later they are given more space to experiment and improve the effectiveness of the practices. The transition between these two phases can lead to discomfort and confusion, as it is not clear to what extent and at what point discretion to adapt certain practices is granted.

Therefore, we argue that the three tensions we underline in our framework contribute to providing a more comprehensive explanation for the lack of VSS effectiveness emerging

empirically (Giuliani et al., 2017; Locke et al., 2009; Tolentino-Zondervan et al., 2016; Waldman & Kerr, 2014). The lack of effectiveness of VSS does not only emerge from the lack of acceptance of the VSS requirements, as suggested by the literature describing intentional decoupling (Benham & MacLean, 2011; Christmann & Taylor, 2006; King et al., 2005), nor from the lack of fit between the VSS requirements and the local context, as theorized in the means-end decoupling (Christensen et al., 2017; Rasche, 2010; Wijen, 2014), but also from the inevitable tensions emerging when the actors try to address both those types of decoupling and shift the focus from addressing intentional decoupling to addressing means-end decoupling. These tensions reveal an important pattern for VSS implementation that has remained underexplored in existing theory. However, it would be simplistic to assume that these tensions play out identically for different types of VSS, considering the diversity of standards that fall under this umbrella. In the next section, we discuss the contingencies of the three tensions outlined based on VSS dimensions, adding further nuance to our framework.

5.5 Applying the framework to different VSS

Our framework underlines three tensions that emerge as the actors shift from an initial focus on adherence to a later focus on adaptation when they become more familiar with the requirements. Yet these tensions are likely to manifest differently for different types of VSS, varying in scope, enforcement mechanisms, and stringency (de Bakker et al. 2019; Potoski & Prakash, 2009; Rasche, 2010). VSS represent an umbrella of institutions that are different in various dimensions. VSS vary in scope from broad to narrow: some are specific to certain sectors or geographic areas, such as the Rainforest Alliance, which promotes the protection of tropical forests (Southey, 2020), while others, such as the ISO 14001, are developed for adoption in a wide variety of contexts (Aravind & Christmann, 2011; King et al., 2005). Some VSS include stringent enforcement mechanisms, through certifications, frequent monitoring, and public disclosure and punishment for noncompliance, as in the case of the International Sustainability and Carbon Certification (ISCC) (ISCC, 2016), while others have weak or no enforcement and rely on the adopter's commitment to comply with guidelines and improve its sustainability, as in the case of UNGC (Pope & Lim, 2020). Finally, some VSS have ambitious and stringent

requirements, requiring that a certain outcome be achieved, as in the case of the European Union Eco-Management and Audit Scheme (EMAS), while others provide lenient and easier-to-implement guidelines, as in the case of ISO14000 (Aravind & Christmann, 2011; King et al., 2005). The purpose of this section is twofold. One aspect that we discuss is which tension is particularly salient for VSS with broad versus narrow scope, strong versus weak enforcement, and stringent versus lenient requirements. While other factors, outside the control of VSS, can affect the tensions of proximity, autonomy, and interpretability, our focus here is on what key feature of VSS likely foreground or background each tension. The other aspect is that we seek to illustrate how exemplary VSS manage the transition from adherence to adaptation and assess those examples through the lens of our framework.

The first tension that our framework identifies, the tension of proximity, stems from the source of knowledge that needs to pass from global to local. This tension is particularly relevant for those VSS that have a *broad scope*, both geographically and across industries. The tension of proximity is heightened for these standards given the lower familiarity of the source of knowledge (i.e. the standard-setter) with the context of implementation. VSS with a broad scope also more likely have a standard-setter or other source of knowledge that is less available to and more remote from the adopters. Given the more dominant role of local sources of knowledge especially in the second phase of VSS implementation, the transition from the global source to a local source, therefore, is particularly difficult. The key challenge is how to incorporate more local sources of knowledge to support adaptation while not losing touch with the global source of knowledge.

In contrast, VSS with a narrow scope are industry and sector-specific, such as for the textile industry (e.g., codes of conduct of the Fair Labor Association or Worker Rights Consortium), electronics, (e.g., the Responsible Business Alliance Code of Conduct), or for coffee and palm oil (e.g., Nespresso's AAA Program or the Roundtable on Sustainable Palmoil). The reason why the tension of proximity appears to a lesser degree compared to VSS with a broad scope is that the design of these standards is tailored to the specific context already, which implies a less prominent role of local sources of knowledge and, consequently, a smoother transition. To the extreme, narrow scope VSS are designed by large, risk-aware companies take increasingly active roles in managing VSS for their suppliers, including through their own company-led programs (Bager & Lambin, 2020;

Thorlakson, 2018), providing context specific guidelines while maintaining a presence in the integration phase of VSS implementation, too.

We illustrate our argument with the case of a broad scope VSS, the ISO 14001, a generic environmental management system that can be used in a broad range of contexts upon the certification granted through independent third-party auditors (Aravind & Christmann, 2011; King et al., 2005). For this standard, the international source of knowledge is the standard-setter, the ISO, which in the adoption phase provides information about the requirements to the applicant (i.e. the standard guidelines), to start the applicant's self-assessment. However, the ISO is not involved after the certification is granted. Accordingly, in the integration phase, local third-party auditors become the source of knowledge. In light of our framework, that shift from a global to a local source of knowledge is problematic because the global source of knowledge should maintain a peripheral role during the integration phase to secure some level of adherence as a counterweight to adaptation. In addition, local auditors tend to have looser ties with the global source of knowledge, the ISO, than with the adopters, raising concerns about their independence and potential conflicts of interests (Aravind & Christmann, 2011; Christmann & Taylor, 2006). In short, we argue that the ISO has not adequately solved the tension of proximity and has gone too far in ceding to local sources of knowledge. Other VSS, such as the ISCC, reduce these concerns by complementing third-party monitoring with occasional monitoring from the global source, the ISCC itself.

The second tension identified in our framework, the tension of autonomy, emerges for the recipient of knowledge who needs to change from being close to the source of knowledge to autonomous from it. This tension is particularly relevant for VSS with *strong enforcement* mechanisms as the transition to a high level of autonomy has a high cost and risk for the adopter. Potoski and Prakash (2009) distinguish three main enforcement mechanisms: independent third-party monitoring, public disclosure of audit information, and penalties if poor compliance is detected. When strict adherence mechanisms are in place, there is a risk that implemented adaptations are perceived as non-compliant by the auditors and punished accordingly. Therefore, in the transition to the integration phase, the needed autonomy of the adopter can be undermined by strict monitoring and punishment mechanisms. This expectation is in line with the proposition that using force for affecting change in someone else's behaviors is likely associated with

a low level of stability of the intended behavior (Lawrence, Winn, & Jennings, 2001).

In comparison, the tension of autonomy is less pronounced for VSS with weak enforcement, such as the UNGC. The purpose of such principle-based VSS is more to stimulate a conversation, outside and within organizations, about duties and responsibilities to employees, society, and the environment, and to guide organizational action than to enforce specific rules (Gilibert et al., 2011). As these VSS do not guarantee to external actors that the requirements are met, there are low reputational benefits and low pressures from external actors to impose their implementation (Potoski & Prakash, 2009) resulting in a low risk of intentional decoupling and limited need for closeness to external actors in the adoption phase. Moreover, VSS with weak enforcement grant significant autonomy to the adopters throughout the process, allowing for adaptation to the local context. Therefore, as the need for both adherence and adaptation is low, the tension of autonomy is reduced for these VSS.

To illustrate our argument, we use the ISCC, a multi-stakeholder initiative sponsored by the European Commission that aims to ensure the sustainable sourcing of raw materials and assesses the social and environmental impact of the entire supply chain. The enforcement mechanisms of this certification scheme are particularly rigorous, as they include periodic audits by accredited third parties and occasional audits also by ICSS. In addition, a list of all certified organizations can be found on the ICSS website and there are sanction mechanisms that can lead to the non-compliant organization being placed on a "blacklist" on the ICSS website and having its certification revoked for up to 60 months (ISCC, 2016). While these enforcement mechanisms facilitate initial adherence, they increase the cost and risk of engaging in adaptation. Even when adaptations are needed to reach the effectiveness of the requirements in the local context, adopters are likely reluctant to engage in any adaptation to avoid the severe punishments, at the expense of VSS effectiveness. One way in which the ICSS handles the particularly challenging transition from recipients being close to ICSS and compliant to autonomous and innovative, albeit still compliant, is through regional stakeholder dialogues—which the ICSS holds regularly—where the recipients of knowledge, the standard-setter, auditors, and other stakeholders can discuss implementation challenges.

Finally, the third tension, the tension of interpretability, affects the VSS requirements where the change is from an emphasis on clarity to interpretability. Out of the different dimensions on which VSS requirements can be classified, we argue that the *stringency of the requirements* is particularly relevant for the interpretability tension, because stringent requirements have a high need for both adherence and adaptation. In this chapter, we adopt the conceptualization of stringency proposed by Potoski and Prakash (2009). These scholars take public law as the benchmark where lenient means requiring little beyond what is demanded by public regulation and stringent refers to requirements that go well beyond public regulation.

The implementation of stringent VSS is challenging, as Dietz and colleagues (2019) pointed out: more stringent requirements may result in worse implementation because adopters are unwilling to live up to these demands, increasing the need for clarity as an adherence mechanism. Moreover, the adopter might be unable to implement stringent requirements, that are by definition ambitious, and, especially when there is a lack of fit between the VSS requirements and the characteristics of the adopter, they are likely to need a high degree of interpretability in order to be applied (Ansari et al., 2010). Empirical evidence from agricultural producers in South Africa supports this point. A study that measured the implementation of different VSS requirements—lenient ones required by law and stringent ones going beyond the law—shows that lenient practices are more likely to be implemented than stringent ones, although producers with a longer tenure in the program also show small improvements on stringent requirements (Thorlakson et al., 2018). Therefore, we expect this tension of interpretability to come to the fore for stringent VSS since they require both a higher initial focus on adherence and higher following focus on adaptation, especially when stringent VSS are implemented by adopters with weak relevant technological capabilities and weak fit with their interests and values. The challenge, therefore, for this type of VSS is to start with high clarity of the requirements in the adoption phase and then shift to a high interpretability of requirements. In contrast, lenient VSS are less challenging to apply. As these requirements are often mimicking government regulations, they are likely to be more familiar to the adopter and therefore to require a lower degree of clarity to be understood and correctly implemented. Moreover, as they involve generally accepted principles that are parts of public regulations in most contexts, they require less adaptation and, therefore, less interpretability. Therefore, the tension of interpretability is kept at the minimum for these requirements.

We illustrate this argument using the case of a stringent VSS, the verification-based EMAS from the European Union. The EMAS targets organizations that have already achieved good environmental management performance and have obtained less stringent certifications, such as ISO 14001, but want to take it a step further and commit to higher environmental performance. To facilitate the transition between clarity and interpretability, the EMAS introduces innovative solutions. It does not impose specific outcome-based measures, but requires adopters to define and commit to clearly defined targets for their environmental performances, through a concertation with employees, which should be updated from year to year to become more and more stringent, fostering continuous improvement. As the adopter is responsible for defining and upgrading the targets based on local context conditions, this solution reduces incentives to shirk on adherence or on adaptation and thus facilitates the transition between the two phases. Indicative of the relative success in straddling the tension of interpretability is a large-N study on over 30,000 European firms, which finds that the "adoption of EMSs can improve the overall innovation activity of the firms" (Montobbio & Solito, 2018, p. 97).

In this section, we examined how our framework applies to VSS with broad or narrow scope, strong or weak enforcement, and stringent or lenient requirements. An important caveat, however, is that each of the three VSS dimensions, scope, enforcement, and stringency, should be interpreted as continua between extreme values. Each VSS can be positioned on these three continua. Furthermore, the effects of each of these three dimensions on the presence of the three tensions between adherence and adaptation are combined, with important implications for managing the transition between the adoption and the integration phase. For instance, the ISO 14001 certificate has a broad scope, increasing the tension of proximity, medium enforcement mechanisms, as the monitoring and punishment is not particularly strict, moderately increasing the tension of autonomy, and lenient process-based requirements, reducing the tension of interpretability. Accordingly, the source of knowledge faces the greatest challenge in the transition, as the standard-setting body ISO needs to find a balance between enforcing globally comparable requirements and also leaving enough room for locally situated sources of knowledge without letting the local enactment become unfaithful to the requirements.

The UNGC presents some similarities and differences in the combined effects of the tensions. It also presents a broad scope, and therefore a higher tension of proximity. This

tension arises because the UNGC's ten principles are very broad and universal yet an important role for facilitating their implementation falls to country-level and local networks that are independent from the UNGC's headquarters. At the same time, the tension of proximity needs to be seen in conjunction with the UNGC's lack of enforcement and lenient requirements, which reduce the tensions of autonomy and interpretability.

Returning to the distinction introduced earlier between VSS that include certification versus VSS that rely on voluntary disclosure, we conclude that by design, for certification-based VSS, the tension of autonomy relating to enforcement is much more prominent than for disclosure-based VSS. By contrast, the tensions of proximity and interpretability can arise both for certification-based and disclosure-based VSS. We consider it possible that the three tensions intersect in ways that can facilitate or undermine the actors' ability to effectively manage the tensions but that additional layer of theorization remains beyond the scope of this study.

5.6 Discussion and conclusion

Why have VSS, despite their potential, not lived up to the promises of better social and environmental performance? In light of the mixed and complex track record of VSS implementation, scholars have offered two alternative explanations, namely intentional decoupling and means-end decoupling, calling respectively for higher adherence or higher adaptation of requirements. Yet theory development is lacking on how the tension between adherence and adaptation evolves during the implementation of VSS. By adopting a dynamic perspective on the implementation of VSS and related tensions, our analysis and resulting framework make two contributions.

First, while the VSS literature has recognized difficulties in the implementation of VSS due to a tension between adherence and adaptation (Brunsson et al., 2012; de Bakker et al., 2019; Wijen, 2014), our framework goes beyond extant literature by providing a dynamic approach to this tension, illustrating its evolution over the VSS implementation. Thanks to the adoption of a knowledge transfer lens, we move beyond the dominant view

of VSS implementation as an act. While a few studies have started taking a longitudinal approach over VSS implementation (Egels-Zandén, 2014; Lazaric & Denis, 2005; Sandholtz, 2012), our work theorizes different phases in VSS implementation and discusses their differential needs for adherence and adaptation, overcoming the static view dominant in the extant literature that would either suggest a stable focus on adherence (Aravind & Christmann, 2011), on adaptation (Wijen, 2014), or on balancing these two needs without taking into account different phases of implementation (de Bakker et al., 2019; Mena & Palazzo, 2012; Overdevest & Zeitlin, 2014). Our framework also shows how three different kinds of tensions manifest particularly in the transition from the adoption to the integration phase, when the emphasis needs to shift from adherence to adaptation needs. This more fine-grained understanding of VSS implementation provides additional insights into how tensions between adherence and adaptation manifest more specifically for different types of VSS, based on their scope, enforcement, and stringency. Bringing out these tensions and contradictory needs explicitly adds to our understanding of why VSS implementation has been so difficult to achieve in practice (Giulian et al., 2017; Locke et al., 2009; Tolentino-Zondervan et al., 2016). More awareness of these challenges also opens up avenues for more productively tackling them. While the framework itself does not include solutions, empirical research on how actors deal effectively with competing needs and tensions suggests that they need to embrace them, adopt a "both/and" rather than an "either/or" stance, and pursue a balance between these conflicting, yet coexisting needs through enacting mechanisms that address the competing needs (D'Adderio, 2014; Hahn, Pinkse, Preuss, & Figge, 2016).

Second, we contribute to the literature on decoupling in VSS (Aravind & Christmann, 2011; Behnam & MacLean, 2011; Brunsson et al., 2012; King et al., 2005) by offering a more parsimonious and unified explanation of how the different kinds of decoupling are interrelated and occur over time. Our framework shows how decoupling of VSS and outcomes is not merely the results of lack of adherence to the requirements (Aravind & Christmann, 2011; Benham & MacLean, 2011; Christmann & Taylor, 2006; Egels-Zandén, 2014), nor lack of adaptation to local specificities (Christensen et al., 2017; Rasche, 2010; Sandholtz, 2012; Wijen, 2014), but it can also spur from the difficulties in reaching and maintaining the balance between the contradictory needs of adherence and adaptation dynamically over time. Moreover, both kinds of decoupling play a role within phases but with different importance: the focus on adherence to overcome the prominent

risk of intentional decoupling during the adoption phase requires adaptation mechanisms as well to counterbalance. Similarly, in the integration phase of implementation, a focus on adaptation is needed to overcome means-end decoupling, and yet adherence mechanisms should be present to counterbalance. Thus, we theorize how the different kinds of decoupling intertwine and evolve over the course of VSS implementation.

Two boundary conditions are worth noting, which call for further refinement. First, we are aware that the knowledge transfer lens that we bring to the analysis emphasizes the cognitive dimension of VSS implementation. It considers the dynamics inherent in knowledge and capability-building but backgrounds other important aspects. For instance, we know that there is a strong element of contestation in VSS (Levy, Reinecke & Manning, 2016), which has been shown to shape standard implementation, for example in Vietnamese apparel factories (Kim, 2013). Our framework also leaves aside the meaning-making and cultural or material aspects of VSS implementation. Consequently, other lenses that emphasize the political, cultural, and material aspects might yield insights into additional tensions. Moreover, when building our arguments based on this lens, we rely on the assumption that the adherence-adaptation tension faced in VSS implementation is parallel to the one faced during knowledge transfer within or across organizations. This seems plausible because early stages of VSS implementation draw on existing knowledge of the implementing organization while later stages require experimentation to tailor VSS. However, further empirical research is needed to validate this underlying assumption.

Second, our framework does not fully unpack nuances for each type of VSS. Instead, we simplify manifold VSS initiatives into three dimensions—namely the geographic and sector scope, strength of enforcement, and stringency of requirements—and describe the archetypical characteristics of each of them, illustrated with empirical examples. We use these dimensions for analytical reasons to explain which VSS, along these three dimensions, is most susceptible to which tension. We also discussed how scope, enforcement, and stringency need to be considered as continua rather than binomial distinctions and how the effects of different tensions can be combined. However, VSS can be categorized along other dimensions that are orthogonal to the ones we propose (Gilibert et al., 2011; Pope & Lim, 2020; Sethi & Schepers, 2014). For example, VSS can be distinguished based on the number of actors involved in the VSS governance (de Bakker et al., 2019) or on their orientation towards processes or outcomes (Brunsson et

al., 2012). Therefore, while we have included the VSS dimensions that are most likely to affect the tensions emerging from our discussion, our framework does not encompass all the distinctions among VSS. Still, we consider our work as a valuable first step into building a dynamic framework of VSS implementation that takes into account key dimensions of VSS, while further theorization is required to discuss how the framework may vary for additional dimensions.

Our framework opens up avenues for further research on VSS implementation. First, it provides an important step towards understanding the temporal dynamics of VSS implementation. Yet more ground needs to be covered to understand the process of VSS implementation. Therefore, we encourage future research to adopt a process perspective on VSS implementation, through longitudinal case studies, ideally with a comparative approach across cases (Langley, 1999; Langley, Smallman, & Tsoukas, 2013). Besides that, such studies could address a survivor bias in the literature, which, so far, provides limited insight into how frequently and early VSS practices are dismissed. A longitudinal approach would also be appropriate to test our insights on how the tensions between adherence and adaptation evolve and develop dynamically over time and how that might shape VSS implementation strategies.

Second, our framework speaks to decoupling as an impediment to VSS implementation and reveals new insights into tensions that arise from the contradictory needs to foster and enforce adherence and to encourage adaptation and experimentation. A significant follow-up question is how VSS actors could recouple standard requirements and outcomes and how they could deal with these tensions. Currently, there is little research on recoupling in business organizations (for exceptions see de Bree & Stoopendaal, 2020; Egels-Zandén, 2014; Jackson & Stoel, 2011). The literature on tensions is more advanced but has often been applied to corporate sustainability generally (Hahn, Pinkse, Preuss, & Figge, 2015; Van der Byl & Slawinski, 2015) and not to different types of VSS. Therefore, future research could empirically test how the different types of VSS can recouple and deal with these tensions. Two research questions seem relevant: how do VSS actors deal with tensions dynamically over time? And what enables or hinders the development of recoupling strategies? Ethnographic approaches can dive into the micro-mechanisms that actors use to reconcile competing needs (D'Adderio, 2014). Additionally, quantitative research comparing different VSS based on the tensions faced and recoupling strategies in place can shed light on what strategies are most effectively

leading to recoupling VSS and outcomes. Moreover, we encourage a comparative approach to identify what explains successes and failures in the development or deployment of strategies to recouple adoption and outcomes for VSS.

Despite the need to further investigate solutions to the challenges of VSS implementation, our framework, together with extant literature on VSS implementation, provides practical implications for standard-setters and actors interested in fostering VSS effectiveness. What emerges from our framework is that tensions accompany the entire duration of VSS implementation. From existing literature, we know that recoupling can be positively influenced by higher demands for adherence from the source of knowledge (Egels-Zandén, 2014), by higher empowerment of the recipient to self-regulate (de Bree & Stoopendaal, 2020), by training and empowering workers (Kim, 2013; Egels-Zenden, 2014) and by trusting relationships between the source of knowledge, such as a buyer or standard-setters, and the recipient of knowledge (Egels-Zandén, 2014; Pérezts & Picard, 2015). Considering these findings and our theorization of VSS implementation, we propose that a potential recoupling strategy to manage the transition between the two phases can be the gradual empowerment of adopters. More specifically, a way to enhance a smooth transition between adoption and integration phase could be to segment adopters in low, middle, and high-performing categories based on their performance regarding VSS requirements. For standards with certification, this could be measured through compliance outcomes and, for self-reporting standards, through the robustness of the internal management and reporting system. This segmentation could then influence the speed at which the adopter "graduates" from the adoption phase with a focus on adherence to the integration phase with more room for autonomy and experimentation. Concomitantly, throughout the process of VSS implementation, building mutual trust between the source and the recipient of knowledge seems an essential ingredient, given the need to have spaces to discuss specific situations that arise from the process of implementing VSS requirements (de Bree & Stoopendaal, 2020; Pérezts & Picard, 2015). Taking such measures is aligned with governance and ethics studies that highlight the relational nature of putting standard requirements into practice (Coslovsky, 2014; Heimer, 2013; Huising & Silbey 2011).

To conclude, VSS—despite their uneven track record in encouraging ethical and responsible behaviors—remain an important pathway toward a more sustainable future.

As VSS initiatives have high opportunity costs for the certified organizations, it behooves scholars and practitioners alike to minimize such failed undertakings. This chapter highlights different kinds of tensions between adherence and adaptation as a key obstacle to the successful implementation of different types of VSS and unpacks these tensions by adopting a dynamic perspective. Naturally, a key task for VSS actors is to manage tensions effectively, taking into account the different adherence and adaptation needs in each phase and managing the transition between the conflicting, yet interrelated demands of each phase. We hope that our theorizing on VSS implementation dynamics will inspire further conceptual and empirical work on how actors can do so, since developing a deeper understanding of possible ways to address tensions is essential for VSS to live up to their promise of fostering ethical and responsible behaviors in practice.

5.7 References

Amengual, M., & Chirot, L. 2016. Reinforcing the state: Transnational and state labor regulation in Indonesia. ***ILR Review***, 69(5): 1056-1080.

Ansari, S. M; Fiss, P. C., & Zajac, E. J. 2010. Made to fit: How practices vary as they diffuse. ***Academy of Management Review***, 35(1): 67–92.

Aravind, D., & Christmann, P. 2011. Decoupling of standard implementation from certification: does quality of iso 14001 implementation affect facilities' environmental performance? ***Business Ethics Quarterly***, 21: 73–102.

Bager, S. L., & Lambin, E. F.. 2020. Sustainability strategies by companies in the global coffee sector. ***Business Strategy and the Environment***, 29(8):3555–70.

Barrientos, S., & Smith, S. 2007. Do workers benefit from ethical trade? Assessing codes of labour practice in global production systems. ***Third World Quarterly***, 28(4): 713-729.

Behnam, M., & MacLean, T. L. 2011. Where is the accountability in international accountability standards?: A decoupling perspective. ***Business Ethics Quarterly***, 21(1): 45-72.

Boiral, O. 2003. ISO 9000: Outside the iron cage. ***Organization Science***, 14(6): 720-737.

Bowler, K., Castka, P., & Balzarova, M. 2017. Understanding firms' approaches to voluntary certification: evidence from multiple case studies in FSC certification. ***Journal of Business Ethics***, 145(2): 441–456.

Bromley, P., & Powell, W. W. 2012. From smoke and mirrors to walking the talk: Decoupling in the contemporary world. ***Academy of Management Annals***, 6(1): 483–530.

Brunsson, N., Rasche, A., & Seidl, D. 2012. The dynamics of standardization: Three perspectives on standards in organization studies. ***Organization Studies***, 33(5-6): 613-632.

Chandler, D. 2014. Organizational susceptibility to institutional complexity: Critical events driving the adoption and implementation of the ethics and compliance officer position. ***Organization Science***, 25(6): 1722–1743.

Christensen, L. T., Morsing, M., & Thyssen, O. 2017. License to critique: A communication perspective on sustainability standards. ***Business Ethics Quarterly***, 27(2): 239-262.

Christmann, P., & Taylor, G. 2006. Firm self-regulation through international certifiable standards: Determinants of symbolic versus substantive implementation. ***Journal of International Business Studies***, 37(6): 863–878.

Corredoira, R. A., & Mcdermott, G. A. 2014. Adaptation, bridging and firm upgrading: How non-market institutions and MNCVSS facilitate knowledge recombination in emerging markets. ***Journal of International Business Studies***, 45(6): 699–722.

Coslovsky, S. 2013. Enforcing food quality and safety standards in Brazil: The case of COBRACANA. ***Annals of the American Academy of Political and Social Science***, 649(1): 122–138.

Coslovsky, S. V. 2014. Economic development without pre-requisites: How Bolivian producers met strict food safety standards and dominated the global Brazil-nut market. ***World Development***, 54: 32–45.

D'Adderio, L. 2014. The replication dilemma unraveled: How organizations enact multiple goals in routine transfer. ***Organization Science,*** 25(5): 1325-1350.

de Bakker, F. G., Rasche, A., & Ponte, S. 2019. Multi-stakeholder initiatives on sustainability: A cross-disciplinary review and research agenda for business ethics. ***Business Ethics Quarterly,*** 29(3): 343-383.

de Bree, M., & Stoopendaal, A. 2020. De- and recoupling and public regulation. ***Organization Studies***, 41(5):599–620.

Delmas, M., & Montiel, I. 2009. Greening the supply chain: when is customer pressure effective? ***Journal of Economics and Management Strategy***, 18(1): 171-201.

Dietz, T., Estrella Chong, A., Grabs, J., & Kilian, B. 2020. How effective is multiple certification in improving the economic conditions of smallholder farmers? Evidence from an impact evaluation in Colombia's Coffee Belt. ***The Journal of Development Studies***, 56(6), 1141-1160.

Donaghey, J., Reinecke, J., Niforou, C., & Lawson, B. 2014. From employment relations to consumption relations: Balancing labor governance in global supply chains. ***Human Resource Management***, 53(2): 229-252.

Egels-Zandén, N. 2014. Revisiting supplier compliance with MNC codes of conduct: Recoupling policy and practice at chinese toy suppliers. ***Journal of Business Ethics***, 119(1): 59–75.

Font, X. 2002. Environmental certification in tourism and hospitality: progress, process and prospects. ***Tourism Management***, 23(3): 197-205.

Gereffi, G., & Lee, J. 2016. Economic and social upgrading in global value chains and industrial clusters: Why governance matters. ***Journal of Business Ethics***, 133(1): 25–38.

Gilbert, D. U., & Rasche, A. 2007. Discourse ethics and social accountability: The ethics of SA 8000. ***Business Ethics Quarterly***, 17(2): 187-216.

Gilbert, D. U., Rasche, A., & Waddock, S. 2011. Accountability in a global economy: The emergence of international accountability standards. ***Business Ethics Quarterly***, 21(1): 23-44.

Giuliani, E., Ciravegna, L., Vezzulli, A., & Kilian, B. 2017. Decoupling standards from practice: The impact of in-house certifications on coffee farms' environmental and social conduct. ***World Development***, 96(1): 294–314.

Goedhuys, M., & Sleuwaegen, L. 2013. The impact of international standards certification on the performance of firms in less developed countries. ***World Development,*** 47: 87–101.

Gondo, M. B., & Amis, J. M. 2013. Variations in practice adoption: The roles of conscious reflection and discourse. ***Academy of Management Review***, 38(2): 229–247.

Hahn, R., & Lülfs, R. 2014. Legitimizing negative aspects in GRI-oriented sustainability reporting: A qualitative analysis of corporate disclosure strategies. ***Journal of Business Ethics***, 123(3): 401-420.

Hahn, T., Pinkse, J., Preuss, L., & Figge, F. 2015. Tensions in corporate sustainability: Towards an integrativeframework. ***Journal of Business Ethics***, 127: 297–316.

Hahn, T., Pinkse, J., Preuss, L., & Figge, F. 2016. Ambidexterity for corporate social performance. ***Organization Studies***, 37(2), 213-235.

Heimer, C. A. 2013. Resilience in the middle: contributions of regulated organizations to regulatory success. ***The Annals of the American Academy of Political and Social Science***, 649(1), 139-156.

Huising, R., & Silbey, S. S. 2011. Governing the gap: Forging safe science through relational regulation. ***Regulation & Governance***, 5(1): 14-42.

ISCC, 2016. ***ISCC 102 Governance 3.0***. Retrieved from: https://www.iscc-system.org/wp-content/uploads/2017/02/ISCC_102_Governance_3.0.pdf

Jensen, R., & Szulanski, G. 2004. Stickiness and the adaptation of organizational practices in cross-border knowledge transfers. ***Journal of International Business Studies***, 35(6): 508- 523.

Josserand, E., & Kaine, S. 2016. Labour standards in global value chains: Disentangling workers' voice, vicarious voice, power relations, and regulation. ***Industrial Relations****,* 71(4): 741–767.

Kim, J. Y. 2013. The Politics of Code Enforcement and Implementation in Vietnam's Apparel and Footwear Factories. ***World Development***, 45: 286–295.

King, A., Lenox, M., Terlaak A. 2005. The strategic use of decentralized institutions: Exploring certification with the ISO 14001 management standard. ***Academy of Management Journal,*** 48(6): 1091-1106.

Kostova, T. 1999. Transnational transfer of strategic organizational practices: A contextual perspective. ***Academy of Management Review***, 24(2): 308-324.

Kumar, A., Thapa, G., Roy, D., & Joshi, P. K. 2017. Adoption of food safety measures on milk production in Nepal: Impact on smallholders' farm-gate prices and profitability. ***Food Policy,*** 70: 13–26.

Langley, A., Smallman, C., Tsoukas, H. 2013. Process studies of change in organization and management: Unveiling temporality, activity, and flow. ***Academy of Management Journal***, 56(1): 1–13.

Lawrence, T. B., Winn, M. I., & Jennings, P. D. 2001. The temporal dynamics of institutionalization. ***Academy of Management Review***, 26(4): 624-644.

Lazaric, N., & Denis, B. 2005. Routinization and memorization of tasks in a workshop: The case of the introduction of ISO norms. ***Industrial and Corporate Change***, 14(5): 873–896.

Leisinger, K. M. 2007. Corporate philanthropy: The "top of the pyramid". ***Business and Society Review,*** 112(3), 315-342.

Levy, D., Reinecke, J., & Manning, S. 2016. The Political Dynamics of Sustainable Coffee: Contested Value Regimes and the Transformation of Sustainability. ***Journal of Management Studies***, 53(3): 364–401.

Lim, A., & Tsutsui, K. 2012. Globalization and commitment in corporate social responsibility: Cross-national analyses of institutional and political-economy effects. ***American Sociological Review***, 77(1): 69-98.

Locke, R., Amengual, M., & Mangla, A. 2009. Virtue out of necessity? Compliance, commitment, and the improvement of labor conditions in global supply chains. ***Politics & Society***, 37(3): 319-351.

Locke, R. M. 2013. ***The promise and limits of private power: Promoting labor standards in a global economy.*** Cambridge University Press.

Mena, S., & Palazzo, G. 2012. Input and output legitimacy of multi-stakeholder initiatives. ***Business Ethics Quarterly***, 527-556.

Montiel, I., Christmann, P., & Zink, T. 2019. The effect of sustainability standard uncertainty on certification decisions of firms in emerging economies. ***Journal of Business Ethics***, 154(3): 667-681.

Montobbio, F., & Solito, I. 2018. Does the Eco-Management and Audit Scheme foster innovation in European firms? ***Business Strategy and the Environment***, 27(1):82–99.

Onkvisit, S., & Shaw, J. 1987. Self-concept and image congruence: Some research and managerial implications. ***Journal of Consumer Marketing***, 4(1), 13-23.

Overdevest, C., & Zeitlin, J. 2014. Assembling an experimentalist regime: Transnational governance interactions in the forest sector. ***Regulation & Governance***, 8(1): 22–48.

Perez-Aleman, P. 2011. Collective learning in global diffusion: Spreading quality standards in a developing country cluster. ***Organization Science***, 22(1): 173–189.

Perez-Aleman, P. 2013. Regulation in the process of building capabilities: Strengthening competitiveness while improving food safety and environmental sustainability in Nicaragua. ***Politics & Society***, 41(4), 589.

Pérezts, M., & Picard, S. 2015. Compliance or comfort zone? The work of embedded ethics in performing regulation. ***Journal of Business Ethics***, 131(4):833–52.

Pipkin, S., & Fuentes, A. 2017. Spurred to upgrade: A review of triggers and consequences of industrial upgrading in the Global Value Chain literature. ***World Development***, 98, 536–554.

Ponte, S., & Ewert, J. 2009. Which way is 'up' in upgrading? Trajectories of change in the value chain for South African wine. ***World Development***, 37(10):1637–50.

Potoski, M., & Prakash, A. 2009. A club theory approach to voluntary programs. ***Voluntary Programs: A Club Theory Perspective***, Eds. Matthew Potoski and Aseem Prakash, 17-39.

Rasche, A. 2010. The limits of corporate responsibility standards. ***Business Ethics: A European Review,*** 19(3): 280-291.

Rasche, A. 2012. Global policies and local practice: Loose and tight couplings in multi-stakeholder initiatives. ***Business Ethics Quarterly***, 679-708.

Rasche, A., & Kell, G. 2010. Introduction: The United Nations Global Compact: retrospect and prospect. In ***The United Nations Global Compact: Achievements, trends and challenges*** (pp. 1-19). Cambridge University Press.

Rasche, A., & Waddock, S. 2014. Global sustainability governance and the UN Global Compact: A rejoinder to critics. ***Journal of Business Ethics***, 122(2): 209-216.

Reinecke, J., Manning, S., & Von Hagen, O. 2012. The emergence of a standards market: Multiplicity of sustainability standards in the global coffee industry. ***Organization Studies***, 33(5-6): 791-814.

Riisgaard, L., & Hammer, N. 2011. Prospects for labour in global value chains: Labour standards in the cut flower and banana industries. ***British Journal of Industrial Relations***, 49(1): 168-190.

Sandholtz, K. W. 2012. Making standards stick: A theory of coupled vs. decoupled compliance. ***Organization Studies***, 33(5-6): 655-679.

Schuler, D. A., & Christmann, P. 2011. The effectiveness of market-based social governance schemes: The case of fair-trade coffee. ***Business Ethics Quarterly***, 21(1): 133-156.

Sethi, S. P., & Schepers, D. H. 2014. United Nations global compact: The promise–performance gap. ***Journal of Business Ethics***, 122(2): 193-208.

Shanahan, S., & Khagram, S. 2006. Dynamics of corporate responsibility. ***Globalization and Organization: World Society and Organizational Change***, 196-224.

Southey, F. 2020, July 1. Rainforest Alliance unveils new certification standard: We need new approaches that move beyond a simple pass-fail system. ***ConfectioneryNews.com.***

Staats, B. R., Dai, H., Hofmann, D., & Milkman, K. L. 2017. Motivating process compliance through individual electronic monitoring: An empirical examination of hand hygiene in healthcare. ***Management Science***, 63(5): 1563-1585.

Sutter, C. J., Kistruck, G. M., & Morris, S. 2014. Adaptations to knowledge templates in base-of-the-pyramid markets: The role of social interaction. ***Strategic Entrepreneurship Journal,*** 8(4): 303–320.

Szulanski, G. 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm. ***Strategic Management Journal***, 17: 27–43.

Szulanski, G. 2000. The process of knowledge transfer: A diachronic analysis of stickiness. ***Organizational Behavior and Human Decision Processes***, 82(1): 9–27.

Szulanski, G., & Jensen, R. J. 2006. Presumptive adaptation and the effectiveness of knowledge transfer. ***Strategic Management Journal***, 27(10): 937-957.

Szulanski, G., Winter, S. G., Cappetta, R., & Van den Bulte, C. 2002. Opening the black box of knowledge transfer: The role of replication accuracy. ***Philadelphia: Wharton School of Business, University of Pennsylvania.***

Tampe, M. 2021. Turning rules into practices: An inside-out approach to understanding the implementation of sustainability standards. ***Ecological Economics***, 184: 106947.

Thévenot, L. 2009. Postscript to the special issue: Governing life by standards: A view from engagements. ***Social Studies of Science***, 39(5): 793-813.

Thorlakson, T. 2018. A move beyond sustainability certification: The evolution of the chocolate industry's sustainable sourcing practices. ***Business Strategy and the Environment***, 27(8): 1653-1665.

Thorlakson, T., Hainmueller, J., & Lambin, E. F. 2018. Improving environmental practices in agricultural supply chains: The role of company-led standards. ***Global environmental change***, *48*: 32-42.

Tolentino-Zondervan, F., Berentsen, P., Bush, S., Idemne, J., Babaran, R., Lansink, A. 2016. Comparison of private incentive mechanisms for improving sustainability of Filipino tuna fisheries. ***World Development***, 83: 264–279.

Van der Byl, C. A., & Slawinski, N. 2015. Embracing tensions in corporate sustainability: A review of research from win–win and trade-offs to paradoxes and beyond. ***Organization & Environment***, 28: 54–79.

Van Rijsbergen, B., Elbers, W., Ruben, R., & Njuguna, S. N. 2016. The ambivalent impact of coffee certification on farmers' welfare: A matched panel approach for cooperatives in Central Kenya. ***World Development***, 77: 277–292.

Waldman, K. B., & Kerr, J. M. 2014. Limitations of certification and supply chain standards for environmental protection in commodity crop production. ***Annual Review of Resource Economics,*** 6(1): 429-449.

Wijen, F. 2014. Means versus ends in opaque institutional fields: Trading off compliance and achievement in sustainability standard adoption. ***Academy of Management Review***, 39(3): 302–323.

Winter, S. G., & Szulanski, G. 2001. Replication as strategy. ***Organization Science***, 12(6): 730-743.

Winter, S. G., Szulanski, G., Ringov, D., & Jensen, R. J. 2012. Reproducing knowledge: Inaccurate replication and failure in franchise organizations. ***Organization Science***, 23(3), 672-685.

Yeung, G., & Mok, V. 2005. What are the impacts of implementing ISOs on the competitiveness of manufacturing industry in China? ***Journal of World Business***, 40(2): 139–157.

6.
Conclusion

This chapter contains an integrated discussion of the theoretical contributions, managerial implications, limitations, and future research opportunities of this work.

6.1 Theoretical contributions

This Ph.D. thesis adopt an emergent approach in the sustainability and management literature that views organizations as embedded in the natural system. Through this perspective, in line with the first overarching objective, this thesis first investigate how organizational members perceive and interpret changes and stimuli in the natural environment in which they are embedded and how this interpretation influences their response to increasingly pronounced and powerful stimuli, such as the effects of climate change or natural disasters. Specifically, Chapter 3 of this thesis discuss how the interpretative framing of decision makers influences the type of adaptation implemented in response to climate change, from longer-term oriented adaptations with positive effects on the natural system to the maladaptive ones that create vicious circles in the relationship between organizations and nature. The type of adaptive response, therefore, depends on two mechanisms, risk appraisal, an assessment of the future risk, and coping appraisal, an assessment of one's ability to deal with it, and on the cognitive barriers to these mechanisms. Yet, the increase in the risk and coping appraisal that foster the implementation of an adaptive response is not the only way through which experiencing natural disruptions affect the organizational practices through the perceptions and interpretation of the organizational members. Chapter 4 shows that, under certain conditions, such as an organizational culture that favors mindfulness and value the sharing of emotions, the experience of a natural disruption can lead the organization to develop more altruistic values and beliefs and become more sensitive to the social and natural needs, ultimately increasing the organizational responsiveness to its environment and long-term revenues. This explains how and why certain organizations are able to achieve post-traumatic growth. Therefore, our first set of contributions detailed in paragraph 6.1.1 adds to ongoing conversations in the field of organizational responses to natural disruptions (Berkhout 2012; Christianson, Farkas, Sutcliffe, & Weick, 2009; Linnenluecke, Griffiths, & Winn, 2013; Pinkse & Gasbarro, 2019; Slawinski & Bansal, 2015).

The second overarching objective of this thesis is to understand how to align and balance the necessarily local manifestation of organizational responses to natural phenomena with the need to coordinate and adhere to universal rules, as natural phenomena are local in their manifestation but global in scale. While the interrelationship between the

organizations and nature occurs in a specific place (Marsden, 2012), the whole business system is nested in the natural one, requiring a global perspective in order to assess the effects of the business activity on the natural system. Sustainability standards have been developed with the purpose to diffuse and standardize sustainable business practices in order to facilitate the monitoring and global coordination needed to solve global challenges and to overcome the limited geographic power of national governments (Aravind & Christmann, 2011; Gilbert, Rasche, & Waddock, 2011). For this reason, Chapter 5 explores the tension between adapting to local specificities and adhering to universal rules in the context of voluntary sustainability standards (VSS), private governance tools developed to overcome regulatory fragmentation and coordinate organizational actions to solve grand challenges (Behnam & MacLean, 2011; Gilbert et al., 2011). Specifically, by adopting a knowledge transfer lens (Szulanski, 2000, 1996), this chapter distinguishes two phases in the implementation of VSS, the adoption and the integration phases. The tension between adherence to universal rules and adaptation to local specificities manifests especially in the transition between different phases, as the two phases call for a different focus on either adherence and adaptation and require the implementation of different, and conflicting, mechanisms to ensure the VSS successful implementation. The chapter concludes with an application of the framework to different types of VSS, based on their enforcement, stringency, and scope. Therefore, the second set of contributions detailed in paragraph 6.1.2 adds to ongoing conversations in the field of voluntary sustainability standards implementation and effectiveness (Aravind & Christmann, 2011; Behnam & MacLean, 2011; Brunsson, 2012; King, Lenox, & Terlaak, 2005; Giuliani, Ciravegna, Vezzulli, & Kilian, 2017).

The next sections present in more detail the contributions to the fields of organizational responses to natural disruptions and voluntary sustainability standards implementation, before moving to the transversal theoretical contributions of this Ph.D. thesis.

6.1.1 Theoretical contributions to the field of organizational responses to natural disruptions

Chapter 3 and 4 contribute to the literature on organizational responses to natural disruptions in three main ways. First, we shed light on the role of the individual level and perceptions of organizational members in explaining the response to natural disruptions.

Second, we show, within this perspective, the decisive role not only of the cognitive sphere but also of emotions, such as fear or despair, still little considered in the management literature. Finally, by broadening the spectrum of responses to natural disruptions considered, as this thesis examines different types of response to natural phenomena, including the less immediate ones mostly ignored by extant literature such as a long-term change in the organizational values and beliefs.

The first contribution is the focus on the micro-level perspective to explain the organizational response to natural phenomena. While the literature has extensively discussed the antecedents that explain organizational responses to natural disruptions at the institutional level, such as governance and policymakers' support (Arnell & Delaney, 2006; Pinkse & Kolk, 2012; Sullivan & Gouldson, 2016), or organizational level, such as organizational structure and incentives (Bazerman, 2006; Busch, 2011; Lee & Klassen, 2016; Smit, Burton, Klein, & Wandel, 2000), individual factors have, surprisingly, been less considered. Yet, the adoption of an embedded view, in which the organization is perceived as embedded in the natural environment, reveals that organizational members' perception and interpretation are essential to determine the organizational response to natural stimuli (DeBoer, Panwar, & Rivera, 2017; Whiteman & Cooper, 2000).

By integrating the embedded perspective into the study of organizational response to natural phenomena, it is therefore possible to shed light on the importance of organizational members' perceptions and interpretations. As Chapters 3 and 4 of this work show, organizational response to natural phenomena is necessarily mediated by the organizational members' effort to notice and interpret the cues from the uncertain natural environment in which they are embedded. Organizational members find in plausible interpretations a guide for deciding between different courses of action (Chapter 3) and for making long-term changes in the organizational values and performance (Chapter 4). The quality and outcome of the interpretive process determine whether organizational members adapt and innovate to adjust to the changes in the natural environment or to force surprising events into existing frames, thus worsening the ecological conditions of the natural system in which they are embedded. This thesis provides evidence that the relationship between humans and nature, for long at the center of the intellectual debate but almost entirely ignored in the current world in which most individuals in industrialized nations live largely alienated from nature (Schultz, 2002), is still essential to determine human and business activities, whether we acknowledge it or not. How

individuals interact with the elements of nature in which their business or social activities are embedded plays a much more important role in determining organizational practices (Chapter 3) and outcomes (Chapter 4) than discussed by the extant management literature.

The second contribution of this work to the literature on responses to natural disruptions, linked to the first one, is to stress the importance of emotions to determine respectively organizational practices (Chapter 3) and outcomes (Chapter 4). While the literature has started recognizing and discussing how environmental stimuli are interpreted and rationalized during a crisis through a substantial cognitive effort (Pratt, Rockmann, & Kaufmann, 2006; Weick, 1988, 1993, 1995; Wicks, 2002), we know very little about how stimuli are noticed and interpreted through the whirlwind of sensations and emotions that upset organizational members during a crisis (Maitlis & Christianson, 2014; Maitlis & Soneinshein, 2010). By adopting an embedded perspective that stresses the connection between business and the natural environment in which the activities are embedded, our work confirms the emerging view that the interpretations of cues in the natural environment shape emotional responses, which in turns affect how cues are interpreted (Rafaeli, Ravid, & Cheshin, 2009). Chapter 3 shows how fear affects the type of responses implemented to adapt to the effects of climate change: Fear, a component of risk appraisal, fosters the implementation of adaptive responses but mostly the shorter-term oriented ones. Chapter 4 provides insights on how the collective discussion of the negative emotions spurring after the experience of a natural disaster increases the likelihood of achieving organizational post-traumatic growth by favoring a change in the values and beliefs of the organization.

These insights are partially conflicting with the extant literature that describes how negative emotions lead to inaction while positive emotions are catalysts for organizational members' interpretation and response to disruptions in their environment. In the literature on responses to disruptions, positive emotions have been consistently found to increase teams' ability to develop and spread new framings to interpret new situations and enhance collective sensemaking and constructive change (Liu & Maitlis, 2014; Rafaeli et al., 2009). On the contrary, negative emotions, such as fear or desperation, have in general been recognized as barriers for interpretation and action (Maitlis & Sonenshein, 2010). For instance, Cornelissen and colleagues (2014) found that negative emotions spread through contagion and contributed to the reinforcement of the initial - and wrong - framing within the law enforcement agencies, ultimately leading to the dramatic outcome

of the killing of an innocent civilian mistaken for a terrorist. Similarly, Liu and Maitlis (2014) found that senior management team negative emotions are associated with superficial sensemaking and inability to act collectively. This work partially deviates from these past studies by showing how the negative emotions following disastrous natural events lead to the implementation of responses to limit the damages for the organization (Chapter 3), especially when combined with the perception of one's capacity to deal with the disruption, and even improve the organizational outcomes (Chapter 4) when shared and expressed among members.

Finally, the third contribution to the field of organizational responses to natural disruptions is to have broadened the spectrum of responses examined compared with the extant literature. While much more emphasis has been placed on mitigating natural disruptions, namely discussing and minimizing the effects of human activities on the natural system in which they are embedded (Gasbarro, Rizzi, & Frey, 2016; Okereke, Wittneben, & Bowen, 2012), the other side of the relationship, how organizations respond to natural phenomena, has been less considered. Even where responses to natural phenomena have been studied, each study has generally examined either a generic or single response, thus considering response as a binary variable to be contrasted with inaction (Berkhout 2012; Grammatikopoulou, Pouta, Myyrä, 2016; Pinkse & Gasbarro, 2019; Tam & McDaniel, 2013; Tucker, Eakin, & Castellanos, 2010), or a narrow type of response closely related to the immediate consequences of the natural phenomenon (Carley & Harrald, 1997; Madsen, 2009; Oetzel & Oh, 2013; Scholten, Scott & Fynes, 2019).

By adopting an embedded perspective and its more accurate representation of the interrelation between the business and natural systems, this thesis expands the type of organizational responses to natural phenomena considered. Chapter 3 shows how the different interpretations of natural phenomena by organizational decision makers drive the implementation of different responses, with different effects on the natural system in which the organization is embedded. Specifically, this chapter distinguishes between responses that are (1) ecosystem-based, i.e., having a positive effect on the natural environment in which the organization is embedded, (2) technology-based, with mixed effects on nature, and (3) maladaptive, i.e., those responses that, given their negative effects on the natural environment, feed vicious circles that can further undermine the stability of the natural system and, inevitably, of the social and business system within it

(Marcus, Kurucz, & Colbert, 2010). Chapter 4 further expands the typology of response to natural phenomena by illustrating, for the first time in quantitative terms, the potential positive consequences of experiencing a natural disaster over the long term. Through this chapter, it is possible to understand how the experience of disastrous natural phenomena can have positive consequences for organizations whose members are able to transpose at the organizational level the change in values experienced at the individual level as a consequence of the disaster. This study thus reveals how the response to a natural phenomenon can constitute a radical change in organizational values and beliefs, which can make the organization more capable of facing future challenges not related to the disaster. Overall, these studies show that organizational practices are affected by the natural elements in multiple and nuanced ways and that the interpretation and relationship with the natural elements determine not only the type of responses implemented (Chapter 3) but also the potential to turn negative experiences of natural phenomena into a catalyst for positive organizational change (Chapter 4).

6.1.2 Theoretical contributions to the field of sustainability standards

Chapter 5, on the other hand, aims to contribute to the literature on voluntary sustainability standards. By taking an embedded view of organizations in nature, it is possible to underline a tension emerging between two opposite needs. On the one hand, the embeddedness of organizations in the natural environment is necessarily local in its manifestation, as each human activity is embedded in a specific natural context and, as Chapters 3 and 4 show, the local characteristics of the natural environment in which the organizational activities are carried on largely affect organizational practices (Chapter 3) and outcomes (Chapter 4). The local natural context matters, yet it is not the whole story. On the other hand, the embedded view of organizations portrays whole systems as nested one into the other (Marcus et al., 2010). In such a view, the whole system of business activities, i.e. the constellation of individual activities and organizations, affects and is affected, as a single entity, by the social and natural systems in which it is embedded, where both these systems are also perceived as the sum of the elements that constitute local specificities. Therefore, global coordination is required to monitor the effects of the whole business system and guarantee that natural and social boundaries are not exceeded at the system level. The double level of embeddedness that this perspective entails, the embeddedness in the local context but also in the entire natural system, creates tensions that emerge between the need to adapt to local specificities and the need to adhere to

universal imperatives in order to coordinate business activities globally and to preserve the natural system as a whole (Wijen, 2014).

In Chapter 5, this tension has been explored in the context of voluntary sustainability standards (VSS), private governance tools proposed to overcome the limits of national governments to fulfill the above-mentioned coordination and monitoring need. Therefore, this thesis contributes to the literature on VSS by uncovering how the tension between the two levels of embeddedness in nature, the local and the global, plays out and evolves during the implementation of VSS. Specifically, the framework developed in Chapter 5 contributes to a better understanding of how the tension between adherence to global imperatives and adaptation to local context specificities unfolds in the two different phases of implementation of VSS delineated through the integration of the literature on knowledge transfer. Building on the parallelism between the implementation of the sustainability requirements of VSS and a transfer of knowledge between organizations, this chapter distinguishes different phases in the implementation of VSS. In doing so, this work moves beyond previous literature in which the implementation of VSS requirements was considered as a single act, instead of a process (Brunsson et al., 2012). Therefore, it uncovers the existence of a tension between adherence to requirements and adaptation to local specificities within and between consecutive phases. By describing how the tension evolves during the implementation of VSS, Chapter 5 answers a call for a deeper look at the contextual and system level factors affecting the implementation of VSS, taking a dynamic perspective (Brunsson et al., 2012; de Bakker, 2019).

Concomitantly, by identifying these tensions, the framework developed in this chapter helps to delineate why successful implementation is hardly achieved in practice, as emerging from extant literature (Giuliani et al., 2017; Locke et al., 2009; Tolentino-Zondervan et al., 2016; Waldman & Kerr, 2014). In doing so, this work contributes to the literature on decoupling in VSS (Aravind & Christmann, 2011; Behnam & MacLean, 2011; Brunsson et al., 2012; King et al., 2005; Giuliani et al., 2017) by showing how the decoupling of certification and outcomes is not necessarily the result of lack of adherence to the VSS requirements nor of lack of fit with the local context of implementation, but it can result from difficulties in responding to these conflicting demands of adherence and adaptation, each requiring the presence of mechanisms that conflict with each other. The chapter also moves to apply the framework to different types of VSS, accounting for the effects of stringency, enforcement, and scope in the evolution of the tension between

adherence and adaptation during the implementation process. Therefore, this Ph.D. thesis proposes, for the first time to the best of the author's knowledge, a dynamic approach to recoupling that takes into account the temporal dimension and the differential needs of the different phases of implementation.

In sum, the adoption of an embedded perspective helps to identify why voluntary sustainability standards play an important role in the achievement of both levels of embeddedness of organizational activities in nature, the local and the global level, and the challenges and potential solutions to balance the respective demands.

6.1.3 Transversal theoretical contributions

Taken together, the four central chapters of this Ph.D. thesis contribute to the embedded view of organizations in nature. First, it responds to the call of Marcus and colleagues (2010) who urge the use of a view of organizations as embedded in the social and natural system to represent a more faithful view of reality and to develop more accurate theories and models. Moreover, although this approach has started gaining ground at the theoretical level, there are still few empirical studies that explicitly adopt this perspective (cfr. DeBoer, Panwar, & Rivera, 2017; Whiteman & Cooper, 2000, 2011). Thus, the first contribution of this work is to adopt and expand this approach through the empirical study of the relationship between organizational practices and the natural environment in which the organization is embedded. In doing so, this thesis examines two different contexts, with relevant differences but equally subject to strong natural phenomena that can compromise the human activity, the context of cocoa producers in Brazil, struggling with the effects of climate change (Chapter 3), and the context of Japanese companies, one of the countries most affected by natural disasters (Chapter 4). In both cases, this work lends support to the theoretically developed idea that the natural environment and its changes determine business practices far more prominently than has been argued by the mainstream literature in management (Guthey, Whiteman, & Elmes, 2014; Shrivastava & Kennelly, 2013). Thus, this Ph.D. thesis provides empirical support for the embedded view.

The second contribution of this work is to show how this view can be adopted to provide a more realistic description of the relationship between organizations and adverse

natural phenomena, such as the effects of climate change or natural disasters. While most of the scholars who have adopted this perspective focus on the effects of organizational practices on the social and natural environment on a local (Giuliani et al., 2017; Sullivan & Gouldson, 2016) or global (Howard-Grenville, Buckle, Hoskins, & George, 2014; Pinkse & Kolk, 2012) level, this Ph.D. thesis applies this perspective to describe the other side of the relationship between organizations and nature, namely how natural events and phenomena affect organizational practices. Not only is this aspect of organizational embeddedness in nature still scarcely considered (Linnenluecke et al., 2013), but it also proves to be strictly relevant in a context where organizations are increasingly affected by natural phenomena (Alexander, 2006; Guion, Scammon, & Borders, 2007; Sahebjamnia, Torabi, & Mansouri, 2015). By going deeper into the local-level relationship between human activities and the natural phenomena in which they are embedded, this thesis reveals the determining role of interpretations of natural phenomena in determining organizational practices, opening up new avenues for research that adopts an embedded approach.

Yet, this work also reveals a challenge in adopting the embedded perspective that has remained on the fringes of discussion even among proponents of this theory: The tension between embeddedness at the local and system level. Proponents of an embedded view are distinguished between micro, i.e., interested in the relationship between the organization and the natural environment in which it is embedded at the local level (Guthey et al., 2014; Whiteman & Cooper, 2000, 2011), and macro, i.e., interested in the relationships and effects of the embeddedness of the entire natural system, thus paying attention to the limits and drivers of the natural system to economic activity at the global level (Marcus et al., 2010; Steffen et al., 2015). Both levels are critical: The local level is needed to fully understand the effects of organizational practices on nature but also, as illustrated in this work, to understand the effects of natural phenomena on organizational practices; the global level allows assessing the total effects of these local interactions, ensuring that human activity is carried out with due respect and within the limits set by the systems in which it is embedded (Marcus et al., 2010). While the proponents of this theory have mostly considered one or the other level, without discussing how to balance the two levels, this thesis emphasizes how coordinating local realities with the system level is anything but simple. Some tools, such as voluntary sustainability standards, have been developed with this goal in mind (Aravind & Christmann, 2011; Montiel,

Christmann, & Zink, 2019), yet the tensions between different local specificities and the need for local coordination are particularly evident, as Chapter 5 reveals. This chapter, however, not only proposes a challenge to the embedded vision, but also proposes concrete solutions, with important policy implications discussed next.

6.2 Managerial and policy implications

The findings of chapters 3, 4, and 5 of this Ph.D. thesis entail relevant managerial and policy implications. In broad terms, the findings suggest that organizational members' interpretation of the phenomena of the natural environment in which they are embedded crucially shapes the organizational response (Chapter 3) and long-term outcome (Chapter 4). This finding entails relevant managerial implications outlined below. At the international level, these local interactions between organizations and nature require coordination to assess the potential harm of the organizational activity on the natural system as a whole, creating a set of challenges (Chapter 5) for policy-makers and international organizations.

Starting with the implications for managers, this work first presents a set of implications for the decision makers facing the consequences of natural phenomena in the context in which the organization is embedded. As these phenomena are more and more frequent (Alexander, 2006) and have often devastating consequences on the organization (Guion, et al., 2007; Sahebjamnia et al., 2015), it is vital for the organizational members to increase their preparedness and the effectiveness of their response to such events. An important implication spurring from this work is that implementing an effective response to these phenomena requires the ability to activate and manage the interpretative process following the event. The interpretative framework, based on cognitive but also emotional components, becomes a tool through which decision makers order their mental processes and establish and share a collective sensemaking of the events that can guide future actions, especially in the development and exploration of new initiatives (Chapters 3 and 4). This process strengthens the preparedness to face and respond to natural phenomena, as it leads to the evaluation of current measures and the implementation of better ways to prevent or limit the damages in case of a reoccurrence of similar events in the future (Chapter 3). As the decision maker is often faced with multiple potential alternative responses, with different effects on the ecosystem but also different degrees of protection,

this process guides the organization towards the choice of what response to implement, based on the level of risk and coping appraisals and their barriers. Moreover, activating cognitive and emotional processes leads to the development of a new set of values and a renewed organizational identity, pushing the organization to seize new opportunities lying in the environment, ultimately improving the financial performances in the long-term (Chapter 4).

The next lines are dedicated to describing how managers can enhance this interpretative process and maximize the chances that long-term oriented and effective responses to natural phenomena are implemented. Our work underlines two important factors determining whether and how the organization is able to respond effectively to natural phenomena: A greater awareness of how future scenarios can look like, by perceiving the risk of natural phenomena to undermine organizational activities, and a greater appraisal of the organizational capacity to deal with such risk and to implement effective responses. Especially the second factor is fundamental to drive the implementation of long-term oriented responses with positive effects on the natural system as well. The essence of implementing an effective response, therefore, lies in a reflection and critical evaluation of the potential alternative responses, and their effectiveness in the long-term, by the members of the organization. As discussed, however, psychological barriers undermine these processes. The capacity to foresee future risk and the potential ways to deal with it is therefore important in order to identify new actions capable of preparing the organizational structure for different future scenarios, including the long permanence of the consequences of the natural phenomenon or the reappearance of similar phenomena in the future.

A valuable ally for favoring this process and removing the psychological barriers to the risk and coping appraisals is scenario planning (Wright, 2005). As proposed by Wright (2005), adopting such a strategy allows organizational decision makers to make sense of future events inductively, boosting the organizational ability to learn and change practices to the optimal course of action. When using such tools, managers become more open to unexpected future events and are better able to extract meaning from the uncertain. This device can support the interpretative effort following a disaster, helping the organization to prepare for the different possible future scenarios ahead. For instance, in the case of the COVID-19 pandemic, a natural phenomenon where uncertainties are particularly

persistent, organizations are encouraged to prepare for scenarios based on different pandemic and lockdown persistence, including the possibility of multiple waves, and outline a detailed action plan for each of these eventualities, including the changes in production, procurement, and organizational structure that would be required in each scenario. By engaging systematically in scenario planning, it is possible to reduce many of the psychological barriers to the risk and coping appraisals identified in Chapter 3, helping the most vulnerable organizations to boost the effectiveness of their responses.

Moreover, beyond an evaluation of the measures implemented to respond to the disaster and the discussion of more effective ways to prepare for the future, the members of the organization should activate an even deeper cognitive and emotional evaluation of the natural phenomena, in order to benefit from a change in the organizational values and beliefs that can boost the organizational performances in the long-run. As illustrated in Chapter 4, in order to achieve organizational post-traumatic growth, the discussion should move to re-evaluate other aspects of the organization and to construct an improved, more ambitious vision of what the organization should be and its mission in the social and natural environment in which it is embedded. This process requires the establishment of mechanisms and of an organizational culture that welcomes constructive criticism, employee engagement, emotion sharing, and an open and collaborative discussion about what went wrong. The natural phenomena, although having negative consequences on the organization, should become an opportunity to question the existing practices of the organization and to discuss the potential for improvement. This interpretative process should involve organizational members at various levels, in order to collectively face the negative emotions spurring outside and within the organization in the aftermath of disastrous natural events. In this way, it is possible to develop and share a renewed collective vision of the organization's potential and how to achieve it.

Organizational members are therefore encouraged to embrace “sensemaking in chaos”, i.e. the capability to make sense in situations of high uncertainty and instability in order to explore new better ways through which the organization can manifest its identity and relate to its environment and stakeholders (Das & Kumar, 2010). For instance, in the case of the COVID-19 outbreak, organizations should engage in open conversations with their stakeholders and with other institutions, allowing for a sharing of criticism and negative emotions, before moving to delineate a new mission for the organization able to better take into account the newly emerged social and natural needs and the changes that will

affect the society slowly recovering from the pandemic. This engagement is likely to enlighten the organization about new ways through which it can answer to the emerging needs of the society, enhancing collective experimentation with the relevant stakeholders to define new ways to address social needs, making the most of the organizational resource potential.

On top of managerial implications, this work presents implications for policy-makers. The first policy implication concerns how to incentivize the response of organizations, especially those most vulnerable to climate change and natural disasters, i.e., small and medium-sized organizations engaged in agricultural activities in tropical countries (Adger, Huq, Brown, Conway, & Hulme, 2003), which are more directly dependent on natural phenomena (Shrivastava & Kennelly, 2013). Following the literature on the subject (Bleda & Shackley, 2008; Pinkse & Gasbarro, 2016; Weinhofer & Baush, 2013), many governments, but also international and non-governmental organizations, adopt a strategy aimed at sharpening the perception of climate risk by these organizations, in an attempt to encourage an adaptive response. Although Chapter 3 of this Ph.D. thesis confirms that risk perception fuels adaptive response, a closer examination of the type of responses implemented shows that responses adopted under this pressure are poorly effective in the long run. Based on this evidence, it is therefore recommended that policy-makers and organizations interested in reducing vulnerability to climate phenomena should instead foster the perception of climate risk resilience and the effectiveness of adaptive responses. When the perception of one's own ability to cope with adverse natural phenomena and of the effectiveness and feasibility of available responses increases, the implementation of long-term responses is stimulated. The positive consequence of this result is that stimulating coping appears feasible, as most barriers to coping appraisals are not difficult to remove through forward-looking policies. For example, a barrier to coping appraisal delineated in Chapter 3 is the perceived inequality between those who contribute to the exacerbation of natural phenomena (i.e., large producers) and those who suffer the most (i.e., small producers). Policies aimed at reducing this inequality, at least at the level of perception, can therefore be effective in reducing this barrier and foster longer-term oriented adaptation.

Another policy implication spurs from Chapter 5. This chapter provides an additional explanation for the low effectiveness of voluntary sustainability standards emerging

empirically (Giuliani et al., 2017; Locke et al., 2009; Tolentino-Zondervan et al., 2016; Waldman & Kerr, 2014), compared to what has been shown in the existing literature. The literature focuses on the lack of motivation or incentives to implement the requirements of the standard (Behnam & MacLean, 2011; Brunsson et al., 2012; Christmann & Taylor, 2006), or the lack of effectiveness of the standard in the specific context of implementation (Christensen et al., 2017; Rasche, 2010; Sandholtz, 2012; Wijen, 2014). This chapter highlights a third potential explanation for the poor achievement of sustainability outcomes by organizations adopting voluntary standards, namely the need to enable conflicting mechanisms at different stages of implementation to balance both the need to adapt to local context specificities and the need to adhere to universal imperatives. It follows that standard setters but also policy-makers and international organizations need to adopt a dynamic approach that allows different mechanisms to be present only at the stages where they are needed and to take a marginal role where they are not, to prevent the emergence of tensions that can potentially compromise the standards implementation effectiveness.

6.3 Limitations and future research

Notwithstanding its theoretical contributions and managerial and policy implications, this Ph.D. thesis has also several limitations that future research is invited to address and overcome. The first limitation is related to the oversimplification of complex constructs. On the one hand, the simplification of elaborate abstract concepts is necessary and functional to the modeling of real phenomena. Any theoretical or empirical framework, in fact, requires a flattening of the infinite nuances of reality in order to extract a series of relationships and patterns useful for understanding and analyzing real phenomena (Sutton & Staw, 1995). On the other hand, this simplification reduces the predictive reach of the proposed models. For example, Chapter 3 delineates the two constructs proposed by Protection Motivation Theory (Rogers, 1975, 1983) i.e., risk and coping appraisals, as the key factors explaining the interpretation of natural phenomena by organizational members. Those constructs are measured quantitatively in a simplistic manner based on the response to a single open-ended question. Although this methodology has been adopted by previous studies (cfr. Eakin, Tucker, & Castellanos, 2010), triangulation with qualitative data brings out more nuances and values for these variables, on top of

underlining a variety of psychological barriers that may reduce these appraisals. Similarly, Chapter 4 constructs a new measure, given the absence of a scale in the literature, to measure the change in organizational values and beliefs that emerge following a disaster. Although this is a first step toward a measure of the profound and radical changes an organization may undergo when afflicted by certain circumstances, it is clear that a few items asked to a single person within the organization, although a key informant possessing better knowledge about the organizational strategy and vision, only partially capture the complex interpretive process that occurs within and outside the organization following a disastrous natural phenomenon.

It is apparent that the interpretation of the surrounding natural environment and its changes by organizational members is a particularly complex cognitive and emotional process, collectively experienced, even when not explicit or conscious. These characteristics and the many factors involved in the process make quantitative measurement particularly complex. However, while qualitative analysis is essential to uncovering such complexity in interpretations (Sandberg, 2005; Van Maanen, 2011), it is also important to develop quantitative measures that, however fallacious, can test and generalize the insights emerging from qualitative analysis. The quantitative measurement of psychological factors relevant to the interpretation of natural phenomena in which organization is embedded is still in its infancy, and so the current oversimplification is warranted. However, the hope is that future studies will continue to develop more accurate measures that will be increasingly able to capture the complexity of the phenomenon. Help in this area may come from neuroscience, which is increasingly appearing in applications in the social sciences and management (Fitzgerald & Callard, 2015; Ibanez, Sedeno, Garcia, 2017; Rilling & Sanfey, 2011). For example, it is possible to detect changes in the neural areas involved in decision making by decision makers before and after a natural phenomenon, to understand the scope and effects of the change more thoroughly. Through this new frontier of science, it is also possible to understand what the role of emotions is in interpreting the natural surroundings and determining organizational practices.

A second limitation of this work is the limited generalizability of the inferences proposed in the central chapters. In each of the central chapters of this thesis, Chapters 3 and 4,

an extreme context was analyzed in an attempt to delve into the phenomenon under investigation, given the paucity of research on the subject. Chapter 3 discussed a context of particular vulnerability to climate change. The study context, southern Bahia, like many tropical areas, is particularly affected by the effects of climate change (Bedran-Martins, Lemos, & Philippi, 2018; Gateau-Rey, Tanner, Rapidel, Marelli, Royaert, 2018), worsened by the continued action of deforestation (Chiapetti, Barbosa da Rocha, Santos da Conceição, Baiardi, Szerman, & VanWey, 2020). Moreover, the type of organizations studied in this context, i.e., small and medium-sized cocoa producers, are particularly vulnerable to the consequences of climate change as they have few means at their disposal to combat and mitigate it (Adger et al., 2003). The close relationship with the land makes relocation of production activities more complicated, while the small and medium size makes climate change mitigation more difficult. It is, therefore, a context in which both the preponderance of the effects of climate change and the scarcity of tools to deal with it combine dramatically.

The choice of context was determined by the desire to study a highly vulnerable context, where the adoption of adaptive responses determines the survival of the organization itself. These contexts, still little explored by the literature (Linnenluecke et al., 2013), are more informative than industrialized countries, where adaptive responses are less present also due to the countries' lower vulnerability (Galbreath, 2014; Weinhofer & Baush, 2013). However, further studies are needed to determine whether the inferences made are also valid outside the context of tropical agriculture. Furthermore, given the interest in studying organizational decision makers, the context of family business where all decisions are generally made by the producer allows for the isolation of the individual decision maker's role and thus a better understanding of its interpretation of natural phenomena. Yet, it is clear that, in more complex organizational settings where decisions are made by a group of people, individual interpretations become mixed and other factors, such as politics or corporate culture, become equally important. The role played by the interpretation of natural phenomena may therefore be less predominant in complex contexts. Nevertheless, as Chapter 3 points out, the interpretation of natural phenomena still plays an important role, more than what is acknowledged by the extant literature, in determining the organizational practices and outcomes even in more complex structures. Thus, a study in the simplified context of small producers better allows to isolate these relevant interpretive dynamics. Future research is needed, however, to adapt the proposed model to more complex organizations.

Chapter 4 also investigates an extreme context, the one of the Great East Japan Earthquake, one of the costliest disasters in history. The study of a major disaster has provided a deeper understanding of the profound and radical changes that affect some organizations following traumatic events. Given the scarcity of studies on the possibility of organizational post-traumatic growth, it was necessary to select an extreme context to isolate and understand the causes and mechanisms of the phenomenon. Yet, future studies will need to understand how these mechanisms change and alter the possibility of post-traumatic growth for different traumas with a different intensity, for example in the study of the consequences of the COVID-19 pandemic. Indeed, the opportunity for post-traumatic growth at the organizational level is highly relevant in the context of a pandemic that puts the financial viability of entire countries at risk, as a way to speed the recovery of the entire economy. Therefore, future research can explore the antecedents of post-traumatic growth in this context. Moreover, although anecdotal evidence reports instances of post-traumatic growth following corporate crises (Weick, 1998) or industrial plant damages (Christianson et al., 2009; Nishiguchi, & Beaudet, 1998), future studies are encouraged to investigate whether and how post-traumatic growth occurs for minor crises that undermine the survival and soundness of organizations but not of its members.

To conclude, this Ph.D. thesis adopted a view of organizations as embedded in nature (Chapter 2) to understand how organizational members interpret and respond to the natural context in which they are embedded, shedding light on how organizational practices are affected by nature (Chapters 3 and 4). Moreover, it reveals and discusses a potential challenge emerging from the adoption of an embedded view of organizations: The risk to get lost in the myriad of local interpretations and responses while losing the big picture necessary for international coordination. Chapter 5 discusses this challenge and potential solutions in the context of voluntary sustainability standards. Despite the limitations, justified by the early stage of research on this topic and paving the way for future research, this work presents relevant contributions to the streams of organizational responses to natural disruptions and voluntary sustainability standards, on top of providing empirical support to the emerging embedded view of organizations, still scarcely considered in the management and sustainability literature (Marcus et al., 2010). Moreover, given the increased frequency and strength of natural phenomena affecting the business and the social systems, this work provides timely policy and managerial implications to foster an effective response and to increase the harmony between the business, social, and natural domains.

6.4 References

Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulme, M. 2003. Adaptation to climate change in the developing world. ***Progress in Development Studies***, 3: 179–195.

Alexander, D. E. 2006. Globalization of disaster: Trends, problems and dilemmas. ***Journal of International Affairs***, 59(1): 1–22.

Aravind, D., & Christmann, P. 2011. Decoupling of standard implementation from certification: does quality of iso 14001 implementation affect facilities' environmental performance? ***Business Ethics Quarterly***, 21: 73–102.

Arnell, N. W., & Delaney, E. K. 2006. Adapting to climate change: public water supply in England and Wales. ***Climatic Change***, 78(2-4): 227-255.

Bazerman, M. H. 2006. Climate change as a predictable surprise. ***Climatic Change***, 77(1-2): 179-193.

Bedran-Martins, A. M., Lemos, M. C., & Philippi, A. 2018. Relationship between subjective well-being and material quality of life in face of climate vulnerability in NE Brazil. ***Climatic Change***, 147(1–2): 283–297.

Behnam, M., & MacLean, T. L. 2011. Where is the accountability in international accountability standards?: A decoupling perspective. ***Business Ethics Quarterly***, 21(1): 45-72.

Berkhout, F. 2012. Adaptation to climate change by organizations. ***Wiley Interdisciplinary Reviews: Climate Change***, 3(1), 91-106.

Bleda, M., & Shackley, S. 2008. The dynamics of belief in climate change and its risks in business organisations. ***Ecological Economics***, 66(2-3): 517-532.

Brunsson, N., Rasche, A., & Seidl, D. 2012. The dynamics of standardization: Three perspectives on standards in organization studies. ***Organization Studies***, 33(5-6): 613-632.

Busch, T. 2011. Organizational adaptation to disruptions in the natural environment: The case of climate change. ***Scandinavian Journal of Management***, 27(4): 389-404.

Carley, K. M., & Harrald, J. R. 1997. Organizational learning under fire: Theory and practice. ***American Behavioral Scientist***, 40(3): 310-332.

Chiapetti, J., Barbosa da Rocha, R., Santos da Conceição, A., Baiardi, A., Szerman, D., & VanWey, L. 2020. Panorama da cacauicultura no Território Litoral Sul da Bahia 2015-2019. In: ***Revelando desafios e oportunidades sociais, econômicas, e ecológicas para restauração de florestas em propriedades rurais na Mata Atlântica do Sul da Bahia***. Instituto Floresta Viva: Ilhéus, BA, 2020.

Christensen, L. T., Morsing, M., & Thyssen, O. 2017. License to critique: A communication perspective on sustainability standards. ***Business Ethics Quarterly***, 27(2): 239-262.

Christianson, M. K., Farkas, M. T., Sutcliffe, K. M., & Weick, K. E. 2009. Learning through rare events: Significant interruptions at the Baltimore & Ohio Railroad Museum. ***Organization Science***, 20(5): 846-860.

Christmann, P., & Taylor, G. 2006. Firm self-regulation through international certifiable standards: Determinants of symbolic versus substantive implementation. ***Journal of International Business Studies***, 37(6): 863–878.

Cornelissen, J. P., Mantere, S., & Vaara, E. (2014). The contraction of meaning: The combined effect of communication, emotions, and materiality on sensemaking in the Stockwell shooting. ***Journal of Management Studies***, 51(5): 699-736.

Das, T. K., & Kumar, R. 2010. Interpartner sensemaking in strategic alliances. ***Management Decision***, 48(1): 17-36

de Bakker, F. G., Rasche, A., & Ponte, S. 2019. Multi-stakeholder initiatives on sustainability: A cross-disciplinary review and research agenda for business ethics. ***Business Ethics Quarterly***, 29(3): 343-383.

DeBoer, J., Panwar, R., & Rivera, J. 2017. Toward a place-based understanding of business sustainability: The role of green competitors and green locales in firms' voluntary environmental engagement. ***Business Strategy and the Environment***, 26(7): 940–955.

Eakin, H., Tucker, C. M., & Castellanos, E. J. 2010. Perceptions of risk and adaptation: Coffee producers, market shocks, and extreme weather in Central America and Mexico. ***Global Environmental Change***, 20(1): 23–32.

Fitzgerald, D., & Callard, F. 2015. Social science and neuroscience beyond interdisciplinarity: Experimental entanglements. ***Theory, Culture & Society***, 32(1): 3-32.

Galbreath, J. 2014. Climate Change Response: Evidence from the Margaret River Wine Region of Australia. ***Business Strategy and the Environment***, 23 (2): 89-104.

Gasbarro, F., Rizzi, F., & Frey, M. 2016. Adaptation measures of energy and utility companies to cope with water scarcity induced by climate change. ***Business Strategy and the Environment***, 25(1): 54-72.

Gateau-Rey, L., E. V. J. Tanner, B. Rapidel, J-P. Marelli, and S. Royaert, 2018. Climate Change Could Threaten Cocoa Production: Effects of 2015-16 El Niño-Related Drought on Cocoa Agroforests in Bahia, Brazil. ***PLOS ONE*** 13(7):e0200454.

Gilbert, D. U., Rasche, A., & Waddock, S. 2011. Accountability in a global economy: The emergence of international accountability standards. ***Business Ethics Quarterly***, 21(1): 23-44.

Giuliani, E., Ciravegna, L., Vezzulli, A., & Kilian, B. 2017. Decoupling standards from practice: The impact of in-house certifications on coffee farms' environmental and social conduct. ***World Development***, 96(1): 294–314.

Grammatikopoulou, I., Pouta, E., & Myyrä, S. 2016. Exploring the determinants for adopting water conservation measures. What is the tendency of landowners when the resource is already at risk? ***Journal of Environmental Planning and Management***, 59(6): 993-1014.

Guion, D. T., Scammon, D. L. & Borders A. L. 2007. Weathering the storm: A social marketing perspective on disaster preparedness and response with lessons from Hurricane Katrina. ***Journal of Public Policy & Marketing***, 26 (1): 20–32.

Guthey, G. T., Whiteman, G., & Elmes, M. 2014. Place and Sense of Place. ***Journal of Management Inquiry***, 23(3): 254–265.

Howard-Grenville, J., Buckle, S. J., Hoskins, B. J., & George, G. 2014. Climate change and management: From the Editors. ***Academy of Management Journal***, 57, (3), 615-623.

Ibáñez, A., Sedeño, L., & García, A. M. (Eds.). 2017. ***Neuroscience and social science: the missing link***. Springer.

King, A., Lenox, M., Terlaak A. 2005. The strategic use of decentralized institutions: Exploring certification with the ISO 14001 management standard. ***Academy of Management Journal***, 48(6): 1091-1106.

Lee, S. Y., & Klassen, R. D. 2016. Firms' response to climate change: The interplay of business uncertainty and organizational capabilities. ***Business Strategy and the Environment***, 25(8): 577-592.

Linnenluecke, M. K., Griffiths, A., & Winn, M. I. 2013. Firm and industry adaptation to climate change: a review of climate adaptation studies in the business and management field. ***Wiley Interdisciplinary Reviews: Climate Change***, 4(5), 397-416.

Liu, F., & Maitlis, S. 2014. Emotional dynamics and strategizing processes: A study of strategic conversations in top team meetings. ***Journal of Management Studies***, 51(2): 202-234.

Locke, R., Amengual, M., & Mangla, A. 2009. Virtue out of necessity? Compliance, commitment, and the improvement of labor conditions in global supply chains. ***Politics & Society***, 37(3): 319-351.

Madsen, P. M. 2009. These lives will not be lost in vain: Organizational learning from disaster in US coal mining. ***Organization Science***, 20: 861-875.

Maitlis, S., & Christianson, M. 2014. Sensemaking in organizations: Taking stock and moving forward. ***Academy of Management Annals***, 8(1): 57-125.

Maitlis, S., & Sonenshein, S. 2010. Sensemaking in crisis and change: Inspiration and insights from Weick (1988). ***Journal of Management Studies***, 47(3): 551-580.

Marcus, J., Kurucz, E. C., & Colbert, B. A. 2010. Conceptions of the business-society-nature interface: Implications for management scholarship. ***Business & Society***, 49(3), 402-438.

Marsden, T. 2013. Sustainable place-making for sustainability science: the contested case of agri-food and urban–rural relations. ***Sustainability Science***, 8(2): 213-226.

Montiel, I., Christmann, P., & Zink, T. 2019. The effect of sustainability standard uncertainty on certification decisions of firms in emerging economies. ***Journal of Business Ethics,*** 154(3): 667-681.

Nishiguchi, T., & Beaudet, A. 1998. The Toyota group and the Aisin fire. ***Sloan Management Review***, 40(1): 49.

Oetzel, J. M., & Oh, C. H. 2013. Learning to carry the cat by the tail: Firm experience, disasters, and multinational subsidiary entry and expansion. ***Organization Science***, 25: 732-756.

Okereke, C., Wittneben, B., & Bowen, F. 2012. Climate change: Challenging business, transforming politics. ***Business & Society***, 51(1): 7-30.

Pinkse. J. & Gasbarro, F. 2019. Managing Physical Impacts of Climate Change: An Attentional Perspective on Corporate Adaptation. ***Business & Society***, 58 (2): 1-36.

Pinkse, J., & Kolk, A. 2012. MNES and climate change: exploring institutional failures and embeddedness. ***Journal of International Business Studies***, 43: 332-341.

Pratt, M. G., Rockmann, K. W., & Kaufmann, J. B. 2006. Constructing professional identity: The role of work and identity learning cycles in the customization of identity among medical residents. ***Academy of Management Journal***, 49(2): 235-262.

Rafaeli, A., Ravid, S., & Cheshin, A. 2009. Sensemaking in virtual teams: The impact of emotions and support tools on team mental models and team performance. ***International Review of Industrial and Organizational Psychology***, 24: 151-182.

Rasche, A. 2010. The limits of corporate responsibility standards. ***Business Ethics: A European Review***, 19(3): 280-291.

Rilling, J. K., & Sanfey, A. G. 2011. The neuroscience of social decision-making. ***Annual Review of Psychology***, 62, 23-48.

Rogers, R. W. 1975. A protection motivation theory of fear appeals and attitude change. ***The Journal of Psychology***, 91: 93- 114.

Rogers, R.W. 1983. Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In B. L. Cacioppo & L. L Petty (Eds.), ***Social psychophysiologv: A sourcebook*** (pp. 153-176). London, UK: Guilford.

Sahebjamnia, N., Torabi, S. A., & Mansouri, S. A. 2015. Integrated business continuity and disaster recovery planning: Towards organizational resilience. ***European Journal of Operational Research***, 242(1): 261-273.

Sandberg, J. 2005. How do we justify knowledge produced within interpretive approaches? ***Organizational Research Methods***, 8(1): 41-68.

Sandholtz, K. W. 2012. Making standards stick: A theory of coupled vs. decoupled compliance. ***Organization Studies***, 33(5-6): 655-679.

Scholten, K., Sharkey Scott, P., & Fynes, B. 2019. Building routines for non-routine events: Supply chain resilience learning mechanisms and their antecedents. ***Supply Chain Management: An International Journal***, 24(3): 430-442.

Schultz, P. W. 2002. Inclusion with Nature: The psychology of human-nature relations. In ***Psychology of Sustainable Development*** (pp. 61–78). Boston, MA: Springer US.

Shrivastava, P., & Kennelly, J. J. 2013. Sustainability and Place-Based Enterprise. ***Organization & Environment***, 26(1): 83–101.

Slawinski, N., & Bansal, P. 2015. Short on Time: Intertemporal Tensions in Business Sustainability. ***Organization Science***, 26(2): 531–549.

Smit, B., Burton, I., Klein, R. J., & Wandel, J. (2000). An anatomy of adaptation to climate change and variability. In ***Societal adaptation to climate variability and change*** (pp. 223-251). Springer, Dordrecht.

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., … Sörlin, S. 2015. Planetary boundaries: Guiding human development on a changing planet. ***Science***, 347(6223).

Sullivan, R., & Gouldson, A. 2016. Comparing the climate change actions, targets and performance of UK and US retailers. ***Corporate Social Responsibility and Environmental Management***, 23(3): 129-139.

Sutton, R. I., & Staw, B. M. 1995. What theory is not. ***Administrative Science Quarterly***, 371-384.

Szulanski, G. 1996. Exploring internal stickiness: Impediments to the transfer of best practice within the firm. ***Strategic Management Journal***, 17: 27–43.

Szulanski, G. 2000. The process of knowledge transfer: A diachronic analysis of stickiness. ***Organizational Behavior and Human Decision Processes***, 82(1): 9–27.

Tam, J., & McDaniels, T. L. 2013. Understanding individual risk perceptions and preferences for climate change adaptations in biological conservation. ***Environmental Science & Policy***, 27: 114-123.

Tolentino-Zondervan, F., Berentsen, P., Bush, S., Idemne, J., Babaran, R., Lansink, A. 2016. Comparison of private incentive mechanisms for improving sustainability of Filipino tuna fisheries. ***World Development***, 83: 264–279.

Tucker, C. M., Eakin, H., & Castellanos, E. J. 2010. Perceptions of risk and adaptation: coffee producers, market shocks, and extreme weather in Central America and Mexico. ***Global Environmental Change***, 20(1): 23-32.

Van Maanen, J. (2011). ***Tales of the field: On writing ethnography***. University of Chicago Press.

Waldman, K. B., & Kerr, J. M. 2014. Limitations of certification and supply chain standards for environmental protection in commodity crop production. ***Annual Review of Resource Economics***, 6(1): 429-449.

Weick, K. E. 1988. Enacted sensemaking in crisis situations. ***Journal of Management Studies***, 25(4): 305-317.

Weick, K. E. 1993. The collapse of sensemaking in organizations: The Mann Gulch disaster. ***Administrative Science Quarterly***, 628-652.

Weick, K. E. 1995. ***Sensemaking in organizations*** (Vol. 3). Sage.

Weinhofer, G., & Busch, T. 2013. Corporate strategies for managing climate risks. ***Business Strategy and the Environment***, 22(2), 121-144.

Whiteman, G., & Cooper, W. H. 2000. Ecological Embeddedness. ***Academy of Management Journal***, 43(6): 1265–1282.

Whiteman, G., & Cooper, W. H. 2011. Ecological sensemaking. ***Academy of Management Journal***, 54(5): 889-911.

Wicks, D. 2002. Institutional bases of identity construction and reproduction: The case of underground coal mining. ***Gender, Work & Organization***, 9(3): 308-335.

Wijen, F. 2014. Means versus ends in opaque institutional fields: Trading off compliance and achievement in sustainability standard adoption. ***Academy of Management Review***, 39(3): 302–323.

Wright, A. 2005. The role of scenarios as prospective sensemaking devices. ***Management Decision***, 43(1): 86-101.