Not So Secondary Anymore

A Case Study of How a Reinsurer Manages Increasing Natural Catastrophe Risks Beyond Established Risk Management Systems

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Abstract

This study examines how emerging risks that cannot be effectively managed within established risk management systems, but remain strategically relevant, are managed beyond such systems. To explore this phenomenon, a qualitative single-case study was conducted at a leading global reinsurer, focusing on how they respond to the increasing frequency and severity of natural catastrophe losses, particularly secondary perils such as hail and floods. The findings are analyzed using Callon's (1998) framing and overflowing theory, complemented by Çalışkan and Callon's (2009, 2010) concepts of economization and marketization. The study finds that risks which do not fit are excluded from the traditional risk management systems to protect their functioning and profitability, while simultaneously being economized through alternative systems. The study contributes to the risk management literature in two ways. First, it extends current understanding of how organizations manage risks within *and* beyond established risk management systems. Second, it contributes to research on risk as an object by highlighting the recursive process in which sociotechnical actors and market conditions shape how risk is managed within the industry.

Keywords:
Risk Management, Reinsurance, Climate Change, Natural Catastrophes, ANT

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Contents

1. Introduction

> "We don't have a crystal ball for upcoming losses. (...) But, I mean, you don't need to study math to see that there's coming more and more." - Interviewee #15

Natural catastrophes (NatCats) are becoming both more frequent and more severe across the globe, radically changing the risk landscape. In 2025, California wildfires destroyed over 16,000 buildings and burned more than 500,000 acres of land (California Department of Forestry and Fire Protection, 2026). In 2023, the Italy hailstorm produced hailstones up to 19 centimeters in diameter (Pucik, 2024). In 2021, a cloudburst in Gävle, Sweden, flooded thousands of homes (Länsstyrelsen Gävleborg, 2022). The list can be made long and new types of risks and geographies are constantly added. Together, they illustrate a broad trend of increasingly widespread and disruptive NatCats all over the world, rather than isolated once-in-a-lifetime events. These climate change effects, together with socioeconomic factors, such as increasing value at risk and urbanization, drives up the subsequent damages to extreme levels.

These damages must be covered by someone in order for society to function. The insurance industry, including primary insurers and reinsurers, are central actors in absorbing these large losses and equipping societies with NatCat resilience. Reinsurers are insurance companies for insurance companies and, within the NatCat area, reinsurers often absorb the majority of the losses since primary insurers cannot hold that much capital on their own balance sheet nor diversify enough to make the insurance logic work for such large losses. Since reinsurers operate globally and across all lines of business, they can often diversify the risk to reach an adequate and profitable premium charged to primary insurers for the reinsurance coverage.

This setup and the profitability are, however, challenged by the increasing NatCat risk as referred to above. In insurance, NatCat events can be divided into primary and secondary perils[1]. Primary perils are high-severity events that occur relatively infrequently, such as hurricanes and earthquakes. Secondary perils[2] have historically been defined as lower-severity events but with higher frequency, such as floods, convective storms, and wildfires. These events can be a secondary effect from a primary peril, or an independent event, and it is primarily these perils that are increasing in frequency and severity when talking about increasing NatCats. Historically, primary perils have dominated NatCat

[1] A peril in insurance context is the cause of loss, i.e. the specific event that triggers a loss.

[2] Secondary perils is a term coined by SwissRe, covering wildfires, severe convective storms, floods, winter storms (outside of Europe), droughts and all other non-primary natural catastrophe perils. I.e. secondary perils do not include primary perils such as earthquakes, tropical cyclones/hurricanes, and extratropical cyclones. (Swiss Re, 2025) Even though there are different terms for the same phenomena, such as secondary perils, side perils or non-peak perils, we have decided to use the term secondary perils to ensure coherence.

losses and secondary peril losses have been overshadowed in the (re)insurance industry, given their smaller individual size. However, with increased frequency and severity during the last decade, the accumulated secondary peril losses are now exceeding accumulated primary peril losses.

Large accumulated losses of course affect the profit negatively for those responsible for the losses, whether it is primary insurers or reinsurers. Furthermore, to be allowed to take on the risk from a regulatory point of view, and to be able to cover the losses once they occur, enough capital must be kept, posing balance sheet challenges. Additionally, high-frequency and high-severity perils introduce volatility into the (re)insurers' financial statements, as they cannot be diversified away as easily as lower-frequency events. Thus, in order to navigate in this changing risk landscape and mitigate its effects, (re)insurers have to adapt their risk management systems since these predominantly rely on stable categories and predictable loss patterns. Increasing secondary peril risks are challenging traditional, established, and calculative processes and practices by introducing a new type of risk that is difficult to standardize and predict.

Arguably, this phenomenon is interesting from an accounting perspective, particularly from a risk management perspective. Risk management systems are intended to structure, coordinate, and standardize how organizations identify and manage risk (Arena et al., 2010; Hall & Fernando, 2016; Miller et al., 2008; Power, 2007, 2009). However, existing literature increasingly shows that these systems are unable to cover all forms of risk and tend to struggle with accommodating complex and unique risks that do not fit calculative and standardized logics embedded in the established systems (e.g. Arena et al., 2017; Miller et al., 2008; Power, 2009; Tekathen & Dechow, 2013; Themsen & Skærbæk, 2018). At the same time, empirical studies demonstrate that organizational actors consistently try to integrate these excluded risks into the risk management systems (Arena et al., 2017; Jemaa, 2022; Themsen & Skærbæk, 2018), indicating a misfit between what the established systems recognize as relevant risk, and what organizational actors deem as relevant risk. To further understand why certain risks are deemed relevant by actors but not by the established systems, one may shift focus from the systems to the risk itself. According to a stream of literature on risk objects, risk is continuously constructed through social, relational, and discursive processes within sociotechnical networks (Boholm & Corvellec, 2016; Brivot et al., 2017; Maguire & Hardy, 2016; Samsonova-Taddei & Humphrey, 2015). What is considered a relevant risk emerges not only from established systems, but also from how actors interpret and value potential threats and opportunities (Mikes & Okamura, 2024; Power, 2009). The socially constructed nature of risk thus suggests that risks may become strategically and economically relevant even when they do not fit the established risk management systems.

While existing studies have primarily examined how established systems are adapted to incorporate these risks, less attention has been paid to how organizations continue to engage with and manage such risks outside the established system structures. This

question is particularly interesting in the (re)insurance context where risk is not only mitigated or avoided but actively sought as a source of economic value. In this context, risk is constructed within the sociotechnical network as a duality of benefit and harm (Bednarek et al., 2021), making certain risks desirable despite not fitting into established risk management systems. Despite this interesting dynamic, to the best of our knowledge, limited attention has been given to this industry within the accounting risk management scholarship.

To address this gap, our study examines how desirable but non-fitting risks are engaged with and managed, contributing to a broader understanding of risk management beyond established systems. Accordingly, our research question is the following:

How do reinsurers act on strategically relevant risks arising from a changing risk landscape when such risks do not fit into established risk management systems?

To answer this question, we perform a qualitative single-case study of an international reinsurance company, "ReCo". Through interviews with employees in various functions, information about the empirical phenomenon is gathered. The empirical findings are analyzed drawing on Callon's (1998) framework of framing and overflowing, grounded in actor-network theory (ANT). The framework is particularly suitable for this study, as it enables an examination of how certain risks do not fit previously established categories and practices, and how this tension can challenge, overflow, and reshape existing frames. Given the context of reinsurance, where risks are actively sought and must be rendered profitable, we complement the framing and overflowing theory with Çalışkan and Callon's (2009, 2010) notions of economization and marketization. This provides a perspective for analyzing how risks are continuously made economic through sociotechnical processes. In particular, we draw on the concept of pacifying goods (Çalışkan & Callon, 2010) to examine how overflows occur and how they are subsequently managed to capture economic value.

Our empirical findings are structured as a sequence of framing, overflowing and managing such overflows, based on Callon's (1998) framework. We find that the traditional frame of managing NatCat risk is heavily calculative and based on the characteristics of primary perils, namely low-frequency and relative predictability. Increasing secondary peril risks, due to changes in the outside world, constitute an overflow to this traditional frame given their contrasting characteristics of high frequency and low predictability. Interestingly, the overflow has effectively been excluded from the traditional frame mainly through increased attachment points, protecting the boundaries of the traditional frame and the profitability of traditional solutions. However, given the profit-driven mindset and pressures within the sociotechnical network, reinsurers both want and need to engage with these excluded risks. Our findings suggest that this is achieved through redistribution of the risk into alternative frames in which the risk can

be pacified into economic objects creating additional value (Çalışkan & Callon, 2009, 2010).

The study contributes to the accounting literature on risk management in two ways. Firstly, we contribute to existing research on risk management systems by showing how risks which do not fit established risk management systems but remain strategically relevant can be excluded from an established system to protect its functioning and instead managed through alternative systems. In doing so, the study extends current understanding of how organizations manage risks within *and* beyond the boundaries of established risk management systems. Secondly, we contribute to literature on risk as an object by emphasizing that the ability to exclude and redistribute risks is contingent on market dynamics, in which sociotechnical actors (e.g. market players, capital availability, and changing risk landscape) collectively shape the market conditions and are simultaneously also shaped by such conditions.

The remainder of this thesis is divided into five sections: Chapter 2 reviews existing literature in the risk management domain and presents the theoretical framework used to analyze the findings. In chapter 3, we describe the methodology of our study including research approach and design, data collection and analysis, and aspects of validity. Chapter 4 presents and analyzes the empirical findings using the theoretical framework. In chapter 5, our contributions are presented by discussing our empirical findings in relation to previous literature. Lastly, in chapter 6 we conclude the study by summarizing, providing practical implications, and reflecting upon limitations and potential future research.

2. Theoretical development

In the following section, we outline the theoretical foundations of our study. We begin this section with presenting and reviewing existing literature on organizational risk management. In section 2.2, we introduce framing and overflowing, as well as economization and marketization, in order to arrive at the theoretical framework used in this study.

2.1. Organizational risk management

In this section, we will review the existing risk management literature from both a system-centered perspective and risk-centered perspective. First, section 2.1.1 examines the extensive literature on risk management systems, which are intended to support organizations in identifying and managing risk, but have been criticized for excluding complex and uncertain risks that do not fit their established structures (e.g. Arena et al., 2010; Miller et al., 2008; Power, 2009). This creates a potential misalignment between the risks captured by established systems and the risks organizational actors deem relevant in practice.

To further understand this tension, section 2.1.2 shifts the analytical focus from the systems to the risk itself by reviewing literature on risk objects. From this perspective, risk is not a fixed or predetermined phenomenon but socially constructed within sociotechnical networks (e.g. Boholm & Corvellec, 2011, 2016; Brivot et al., 2017; Maguire & Hardy, 2013, 2016; Samsonova-Taddei & Humphrey, 2015). Finally, section 2.1.3 brings these perspectives together by reviewing literature on how organizations determine relevant risks (e.g. Mikes & Okamura, 2024; Power, 2009).

2.1.1. Risk in established risk management systems

Following a series of corporate scandals and financial crises from the 1990s and onwards, risk management has become a central topic both in corporate governance, organizational management, and research literature (Mikes, 2005; Miller et al., 2008; Power, 2007). These developments, alongside increasing regulatory and governance pressures, led organizations to adopt more formalized and structured approaches to identifying, assessing, and managing risk through integrated approaches such as enterprise risk management (hereinafter "ERM") (Arena et al., 2010; Miller et al., 2008; Power, 2009). Such risk management systems can support organizational engagement with risk by prompting risk assessments and mitigation practices within a structured process (Hall & Fernando, 2016). Furthermore, by translating uncertainty into risk categories, metrics, maps and reporting formats through calculative devices, these systems enable organizational coordination and informed decision-making on risk, as well as provide comfort of audit, accountability, and regulatory transparency (Power, 2007, 2009).

However, this emphasis on calculability and auditability also shapes what is recognized as risk in these systems, leading frameworks to prioritize standardized and measurable forms of information.

Evidence from studies on ERM show how this was designed to favor information which fits nicely into accounting and financing logics (Power, 2009). However, risk information is often radically different from accounting information, creating a gap between theory and practice (Tekathen & Dechow, 2013). Within accounting logics, information is "stable", "mobile" and "combinable" (Robson, 1992), and measurement involves "quantifying events or phenomenon which have already occurred, or are taking place" (Kaplan & Mikes, 2016, p.9). This suggest a documenting of certainty, while risk information produced by risk management systems is challengeable, changeable and complex (Tekathen & Dechow, 2013) with the aim to "address events in the future, those that have not occurred, and may never occur" (Kaplan & Mikes, 2016, p.9), thus being about documenting *absence* of certainty (Tekathen & Dechow, 2013). While established risk management systems with a box-checking attitude and rule-based compliance approach is attractive since extensive documentation offers a regulatory transparency and comfort of audit (Power, 2009), these systems can be deemed more controlling than supporting in risk management work, sidelining opportunities for risk discussions and proper decision-making support (Hall & Fernando, 2016). Furthermore, established risk management practices may limit organizations' ability to address all types of risks, as these practices often rely on boundary-spanning and hybrid forms of collaboration that extend beyond established systems (Miller et al., 2008). Risk management systems can thus be paradoxically problematic in their design, supporting certain risk management efforts and risk types, while limiting others as risks and required efforts do not fit the standardized systems (Hall & Fernando, 2016; Miller et al., 2008; Power, 2009). Moreover, this is not the only paradox of risk management, as despite attempting to *reduce* uncertainty, research suggests risk management systems and practices *generate* uncertainty as well, for example regarding roles and responsibilities, and the definition of risk management (Vinnari & Skærbæk, 2014).

Comprehensive risk management frameworks have been further criticized for being under-specified and difficult to implement in practice. Empirical studies of enterprise risk management illustrate these challenges (e.g. Mikes, 2005; Tekathen & Dechow, 2013). ERM gained a foothold globally as it was intended to be applied organization-wide in a strategic context, but Mikes (2005) found the framework to function more as an umbrella term for loosely defined risk management practices and techniques. Similarly, Tekathen and Dechow (2013) critiqued the vagueness of the framework and the difficulty to implement it in real-world settings. Furthermore, the framework was focused on "monitoring the execution of assignments" rather than explaining how to manage uncertainties (Tekathen & Dechow, 2013, p.102).

Despite the aim of being standardized and uniform, empirical evidence suggests that risk management systems do not manifest uniformly across organizations, but vary in construction, implementation and effectiveness depending on a range of organizational contingencies and specific contexts (Arena et al., 2010; Mikes, 2005, 2009, 2011; Mikes & Kaplan, 2015; Paape & Speklé, 2012; Woods, 2009). More specifically, Mikes (2005) demonstrates that organizations adopt different risk management mixes and argues that each organization forms their own risk management mix by adopting different risk management styles in a unique way corresponding to the specific characteristics of the firm. A few examples of such determining characteristics are the use of quantitative risk assessment techniques (Paape & Speklé, 2012), organizational size (Woods, 2009) and the nature of the risk (Mikes & Kaplan, 2015). Mikes and Kaplan (2012, 2015) suggest a taxonomy of risks, with the three categories preventable risk, strategic risk, and external risk. Each risk category "has a different source, a different degree of controllability, and a different approach for identification, mitigation, and management." (Mikes & Kaplan, 2015, p. 40). Mikes (2009, 2011) further shows how different "calculative cultures" influence how organizations engage with risk. She draws upon Power's (2005) notions of "calculative idealism" and "calculative pragmatism" and deepens this argument showing how different rationalities affect risk management practices by coining the terms "quantitative enthusiasts" and "quantitative sceptics", displaying different calculative cultures (Mikes, 2009, p.20-22). The first puts heavy focus on the models and managing risk by numbers and measurements, while the latter trusts numbers and models to a lesser degree and sees it only as input to be complemented with risk envisionment of alternate scenarios, managerial discretion, experience, and judgment (Mikes, 2009, 2011).

In addition to system design and structural variation, behavioral and communicative factors also shape how these risk management systems operate within specific organizations (Kaplan & Mikes, 2016; Tekathen & Dechow, 2020). Individuals have a tendency to overly rely on historical data and experiences when forecasting the future, resulting in heavy underestimations and difficulties in predicting and responding to major systemic risks (Kaplan & Mikes, 2016). This is argued to be one of the reasons why quantitative models fail during unpredictable and highly impactful events (Kaplan & Mikes, 2016). The compliance-based rationality encourages and justifies the use of historical numbers, undermining the importance of critical thinking, which is needed for effective risk management, and when things start to go wrong managers often stay on course longer than they should due to escalation of commitment to justify previous beliefs (Kaplan & Mikes, 2016). Similarly, organizations tend to, in their attempts to integrate risk management, keep repeating previous behaviors because patterns of communication are path-dependent (Tekathen & Dechow, 2020).

To address the limitations of quantitative overreliance and path dependency, risk management practices must be "forceful, intrusive and inquisitive" (Kaplan & Mikes, 2016, p. 11). If they are, they can collectively challenge underlying assumptions about

the world and the processes through which risk is assessed, while also enabling the communication of risk information and to attend to non-standardized risks that established systems tend to leave unaddressed (Kaplan & Mikes, 2016; Power, 2009). In line with this view, risk management has been conceptualized not as a mechanism for reducing uncertainty, but as an interactive process through which different hierarchical levels within the organization contribute to developing broader understandings of risk (Tekathen & Dechow, 2013). For example, Tekathen and Dechow (2013) highlight a risk management system that attempts to combine numerical data with managerial social discussions, thereby emphasizing critical thinking and the consideration of alternative perspectives in comparison to purely quantitative, box-checking technologies. Similarly, risk matrices have become a popular risk management tool due to their simplicity and the combination of both quantitative input and qualitative assessment of risk, which is particularly important for risks that cannot be not easily quantifiable (Jordan et al., 2018). However, even tools designed to combine quantitative and qualitative approaches may reproduce the limitations of established risk management systems. As Jordan et al. (2018) argue, risk matrices, while appearing to support more flexible and interactive forms of risk management, often oversimplify complex risks and create a false sense of control by rendering uncertainty more manageable than what it actually is.

This tension between the need for standardized, calculative approaches and more exploratory, qualitative forms of risk management indicate a form of "dual risk management" (Arena et al., 2017), where organizations combine established systems with more interactive and judgment-based practices (Kaplan & Mikes, 2016; Tekathen & Dechow, 2013; Power, 2009). However, as will be discussed in the following paragraph, integrating these approaches in practice remains challenging.

Empirical studies show how risk management systems are characterized by persistent tensions between the established structures and practical relevance and distinctiveness (Arena et al., 2017; Themsen & Skærbæk, 2018). Arena et al. (2017) investigate two organizations in which ERM takes distinct forms, illustrating contrasting configurations of risk management systems. These configurations reflect a tension between more flexible, practice-oriented approaches and more established, standardized systems, in line with the dual risk management as Kaplan and Mikes (2016), and Tekathen and Dechow (2013) suggest is needed. The first system Arena et al. (2017) investigate is characterized by flexibility, which allows actors to continuously apply further tools and practices as they see fit in order to fill the inconsistencies or gaps the established system has in terms of dealing with risks managers deem relevant. However, this approach leads to risk management as a practice in the organization becoming indistinguishable from other control practices, leading to confusion and dissatisfaction regarding risk management, and undermining the system itself (Arena et al., 2017).

In contrast, a robust system, where practices and boundaries of covered and non-covered risks are kept consistent, provides a beneficial structure and clear function unlike the

previous alternative (Arena et al., 2017). Nonetheless, such a robustness causes tension and dissatisfaction with local users of the system (Arena et al., 2017; Themsen & Skærbæk, 2018). This, because when local users encounter risks which are excluded from the established system for not fitting the standardized format, they need to find alternative and ad hoc risk management practices to deal with these risks (Arena et al., 2017). Consequently, just as the alternative approach, this robust system leads to an undermining of the risk management system (Arena et al., 2017). Arena et al. (2017) thus argue that the tensions and instability, which emerge in both arrangements of risk management systems, suggests that the two aspects in dual risk management, as Kaplan and Mikes (2016) and Tekathen and Dechow (2013) indicate, may not co-exist so easily. Similarly, Themsen and Skærbæk (2018), investigates a risk management system which caused dissatisfaction among local users as the system could not accommodate all the risks they deemed relevant. In response to this dissatisfaction, attempts were made to adjust the system to accommodate such risks, however, these attempts were unsuccessful, undermining the system and ultimately leading to its removal (Themsen & Skærbæk, 2018).

In short, the studies by Arena et al. (2017) and Themsen and Skærbæk (2018) demonstrate how systems which cannot account for non-standardized risks, are undermined as users attempt other ad hoc practices (Arena et al., 2017), or continuous unsuccessful changes to the system leads to its removal (Themsen & Skærbæk, 2018). Jemaa (2022) further develops this discussion and showcases that risk experts in organizations continuously and purposefully rework and realign risk management systems structures, routines and tools in order to align them with the organization's idea of what an effective risk management system should manage. Building on studies highlighting the instability and tensions of established risk management systems (Arena et al., 2017; Themsen & Skærbæk, 2018), Jemaa (2022) argues that inconsistencies between established structures and practical risk management do not simply undermine the system, but also trigger ongoing efforts by organizational actors to adjust and reconnect structures, routines, and tools with organizational practices and goals. In this sense, risk management systems are not understood as fixed structures, but as continuously reconstructed through the work of risk experts seeking to make them more coherent and operational.

In summary, this body of literature suggests that risk management systems, in various formats and structures, aim to make risk manageable and controllable through standardized practices and processes. These systems enable coordination, accountability, and decision-making, while also shaping what risks are covered by the organization by prioritizing calculable, standardized, and auditable forms of information. Empirical studies nevertheless show that organizational actors continuously try to adapt established systems or apply other ad hoc practices to manage the risks which do not fit the established system structures. This highlights a potential misalignment between risks prioritized within established risk management systems and risks that organizational

actors deem relevant in practice. However, by primarily focusing on how established systems are adapted in response to such tensions, less attention has been paid to the risks themselves. To complement this system-centered perspective, the following section shifts analytical attention toward literature that focuses on how risks themselves are constructed through social and interactive processes.

2.1.2. Risk as an object

This section draws on literature that conceptualizes risk not as a pre-existing entity, but as an object that is continuously constructed through social and interactive processes within the sociotechnical network. Several accounting scholars have used Hilgartner's (1992) concept of risk objects to study this phenomenon (Boholm & Corvellec, 2011, 2016; Brivot et al., 2017; Maguire & Hardy, 2013, 2016; Samsonova-Taddei & Humphrey, 2015).

Hilgartner (1992) argues that risk is not simply given but is socially constructed within complex networks. This implies that risks are not inherent properties of entities, but are constructed within sociotechnical networks, in which technical elements and social components are weaved together (Hilgartner, 1992). A risk object is constructed by linking an object (e.g. an activity, technology or actor) to a potential harm, through a causal relationship (Hilgartner, 1992). Building on this, Boholm and Corvellec (2011, 2016) develop a relational understanding of risk that further emphasizes how risk is constructed through a collective organizational practice of valuation. They suggest that risk identification and construction is explained as an "inside-out" process where actors begin with defining what they consider valuable and worthy of protection (e.g. economic performance, reputation) and then work outward to see what potential hazards should be identified as risks to their own values, rather than an "outside-in" perspective where risks originates from identifying external threats (Boholm & Corvellec, 2016). This implies that risk is actively produced through organizational practices and decisions that determine what matters and why, rather than objectively given external threats.

These processes can be further understood through a discursive perspective as forms of "riskwork", referring to the discursive practices through which actors actively construct, define, and respond to risk (Maguire & Hardy, 2016). In the case of "established" risks, hazards are widely recognized and causally linked to particular practices, thus the riskwork is primarily "normalizing" where risk understandings are stabilized and reproduced through routine practices and accepted knowledge (Maguire & Hardy, 2016, 2013). In contrast, "emerging" risks are more contested and uncertain, often involving conflict and ongoing negotiation over their meaning, measurement and importance (Maguire & Hardy, 2016). In such cases, actors engage in "problematizing" forms of riskwork which include more open-ended and reflexive processes where uncertainty is highlighted, existing knowledge is questioned, and the aim is to actively challenge and redefine what counts as risk (Maguire & Hardy, 2013, 2016).

The concept of riskwork practices within the sociotechnical network, and particularly problematizing riskwork (Maguire & Hardy, 2016), highlights the idea of Hilgartner (1992) that the construction of risk objects involves ongoing contestation between the actors in the sociotechnical network, with continuous struggles over how risk objects are defined and controlled as these networks evolve. He means that new objects are constructed and old ones are redefined, particularly, new data or knowledge can challenge prior linkages, and new control systems may succeed or fail in mitigating them. Samsonova-Taddei and Humphrey (2015) and Brivot et al. (2017) provide empirical support for this perspective at different levels of analysis. The former show how competing actors construct and contest different definitions of risk at the macro level of policy-making processes, while the latter focuses on the micro-level interactions through which risk is constructed, framed and negotiated in interactions between experts and clients to steer risk management practices.

More specifically, Samsonova-Taddei and Humphrey (2015) illustrate how actors construct competing conceptualizations of risk by emphasizing different sources of harm, causal linkages and responsibilities to advance their own position and influence political outcomes. These competing risk constructions generate ongoing struggles, preventing consensus among actors and resulting in ambiguous and constantly shifting understandings of risk at the macro level. Brivot et al. (2017) explore how risk is constructed at the micro level through interactions between experts and clients. They find that experts, through specific framing tasks, construct and promote risk objects and link them to de-risking solutions, trying to influence how clients should manage the specific risk object. However, the clients do not passively accept these framings and the solutions presented to them (Brivot et al., 2017). Through a process the authors call "diffraction", clients introduce additional risk objects when engaging with the experts' solutions (Brivot et al., 2017). This can lead to "overload", where the accumulation of interconnected risk objects becomes overwhelming and can cause resistance for de-risking solutions and ultimately inaction, rather than facilitating risk management action as suggested by the experts (Brivot et al., 2017). Taken together, these studies emphasize that risk is not predetermined but emerges through interactions across different levels, where multiple actors construct and contest competing interpretations. Consequently, risk is continuously redefined within the sociotechnical network, making it inherently dynamic and unstable.

To summarize, these perspectives suggest that risk is not a pre-existing entity to be managed, but rather something that is continuously defined through boundary-spanning processes of valuation, interaction and discursive work. Nuancing the previous discussion on risk management systems, this indicates that organizational engagement with risk may not be fully confined to the categories and structures embedded within established risk management systems, as risks can continue to acquire organizational relevance through broader, social practices and interactions even when they do not fit established systems.

This raises the question of how organizations determine which risks to engage with in practice.

2.1.3. Determining risk relevance

As suggested by the previous sections, risk management systems are not able to single-handedly determine which risks matter, as risks are continuously shaped both within *and* beyond the boundaries of the system itself. Despite this, ERM frameworks often suggests that determining what risks are relevant and thus clarifying what risks should be accepted and which should be left unattended is a process of determining an organization-wide risk appetite (Kaplan & Mikes, 2016). Such a process typically involves defining acceptable levels of risk exposure, which are then translated into specific tolerances (limits) for specific objectives, for which the organization sets risk responses and control activities to make sure they stay within these limits (Paape & Speklé, 2012). However, Paape and Speklé (2012) find no evidence that applying such a framework mechanistically contributes to perceived risk management effectiveness.

In line with the above, Power (2009) criticizes standardized risk management frameworks since they treat organizations as a unified and rational actor with a clear risk appetite that is often measured in numbers. In reality, organizations consist of many different people with various perceptions on risk, which means that risk appetite is not clear, fixed nor easily agreed upon (Mikes & Okamura, 2024; Power, 2009), and it is enacted in different ways across organizations (Mikes & Okamura, 2024). Rather than a fixed metric, Mikes and Okamura (2024) argue that determining risk appetite should be understood as an ongoing process through which multiple actors, both within and beyond organizational boundaries, negotiate and articulate values, priorities and trade-offs.

Thus, determining risk as relevant or not is not merely a technical exercise, but a social process (Mikes & Okamura, 2024; Power, 2009). Since the risk is socially constructed and the definition is interpreted differently within the organization and across the sociotechnical network, organizations must simplify this complexity in order to make concrete decisions regarding which risks to accept and which to act upon (Mikes & Okamura, 2024; Power, 2009). Thus, defining risk relevance is rather a process of selecting and stabilizing certain interpretations of risk, while excluding others. This implies that some risks are not only excluded due to limitations of established risk management systems, but also as a result of organizational choices about what is considered relevant and important.

This dynamic becomes particularly interesting in the context of (re)insurance, where risk itself is the product that generates income. Bednarek et al. (2021) demonstrates this by studying insurance portfolios. In contrast to Hilgartner (1992) who defines risk as harmful, risk objects in (re)insurance can be reconceptualized as a duality of harm and benefit in every-day operations (Bednarek et al., 2021). More specifically, insurance

portfolios are risk objects that can be both a source of harm (if claims are too high) and/or a source of benefit (if premiums outperform the claims). This introduces a complex duality that does not exist in industries where risk is simply a threat that needs to be mitigated or avoided, and insurance companies must actively seek risk and navigate this tension through risk management practices (Bednarek et al., 2021). As a result, determining which risks are relevant and should be acted on is not simply about limiting exposure, but about selecting and managing risks that may also represent future benefits.

2.1.4. Problematization

In summary, risk management systems have been developed to support organizations in structuring, coordinating, and standardizing the identification and management of risk (Arena et al., 2010; Hall & Fernando, 2016; Miller et al., 2008; Power, 2007). However, a growing body of literature highlights that such systems are not able to accommodate all types of risks in a uniform manner (Arena et al., 2017; Jemaa, 2022; Mikes, 2005; Mikes & Kaplan, 2015; Power, 2009; Tekathen & Dechow, 2020; Themsen & Skærbæk, 2018). In particular, complex and unique risks are often excluded because they do not fit the standardized formats, calculative models, and reporting structures embedded within these systems (Miller et al., 2008; Power, 2009; Tekathen & Dechow, 2020; Themsen & Skærbæk, 2018). Nevertheless, empirical research shows that this exclusion is not unproblematic, as organizational actors continue to recognize and attempt to incorporate such risks in practice, through other practices which undermine the purpose of a structured system, or through continuous adjustments to the system itself (Arena et al., 2017; Jemaa, 2022; Themsen & Skærbæk, 2018). This suggests a misalignment and tension between what organizational actors deem as relevant risks versus what the system is able to recognize as relevant and accommodate.

To further understand why certain risks may continue to attract organizational attention even when they do not fit the categories and structures embedded within established risk management systems, one may shift focus from the systems to the risk itself. Previous literature on risk objects shows how risk is not a pre-existing entity to be objectively identified and managed but is actively constructed through social and interactive processes within a sociotechnical network (Boholm & Corvellec, 2011, 2016; Brivot et al., 2017; Maguire & Hardy, 2013, 2016; Samsonova-Taddei & Humphrey, 2015). What constitutes a relevant risk is therefore not determined solely by established systems, but emerges from how actors interpret, value, and negotiate potential threats and opportunities (Mikes & Okamura, 2024; Power, 2009).

Building on these insights, this study shifts attention from prior research which has primarily focused on how established risk management systems are unable to deal with all types of risks and are adapted in response to non-fitting risks, to the trajectories and management of the risks themselves within *and* outside the boundaries of these established risk management systems. To the best of our knowledge, there is limited

understanding of how organizations continue to engage with and manage risks that remain organizationally relevant despite not fitting into established risk management structures.

This question becomes especially interesting in the context of reinsurance, where risk is not only something to be mitigated, but actively sought as a source of economic value. In this setting, the construction risk is shaped by its duality of both potential harm and benefit, making certain risks strategically and economically desirable even when they do not fit established systems. Despite the interesting dynamics of this industry, accounting research on (re)insurance within the field of risk management appears to remain limited.

Against this background, our study seeks to examine how reinsurers engage with and manage risks emerging from a changing risk landscape, which are deemed organizational relevant but do not fit into established risk management systems. By shifting the analytical focus from the systems to the risk itself, we aim to contribute to a deeper understanding of risk management beyond the boundaries of established systems.

2.2. Method theory

This study will apply the theoretical framework of framing and overflowing as presented and developed by Michael Callon (1998), complemented by Çalışkan and Callon's (2009, 2010) economization and marketization. Callon (1998) borrows Goffman's (1974) sociological concept of framing which posits frames as structures that organize how situations are constructed and understood in social interactions. Framing as developed by Goffman (1974) has been widely used in various research areas, and a large portion of the extant literature on framing has focused on communication and behavioral decision-making, i.e. how different framings of a message causes different interpretations of and attitudes towards the same phenomenon or decision (e.g., Chandran & Menon, 2004; Johnson et al., 1993; Olsen et al., 2014; Tversky & Kahneman, 1981). Callon (1998) departs from this cognitive/behavioral perspective by embedding Goffman's (1974) framing in an Actor-Network Theory (ANT) context. This context will be briefly introduced, followed by a presentation of Callon's (1998) conceptualization of framing and overflowing. Here, prior accounting research is drawn upon to illustrate how these concepts have been empirically applied and operationalized in accounting contexts. Finally, the section outlines how this analytical framework, complemented by Çalışkan and Callon (2009, 2010) will be applied in this study.

2.2.1. Actor-Network Theory

Actor-network theory is a theoretical perspective and research approach which originated in the 1970s and was largely developed in the 1980s by Bruno Latour, Michael Callon and John Law (Latour, 2005). ANT takes the position that "social" is the existence and trail of associations between heterogeneous elements/actors (Latour, 2005). This was developed in contrast to social scientists' perspective of the social being a homogeneous

stable context in which different phenomena exist (Latour, 2005). ANT awards agency to both human and non-human actors, such as machines, texts and institutional processes, and it is these actors who construct social reality through their associations with each other in different networks (Law, 1992). Agency is thus distributed across different elements, however, the agency given to non-human elements is not intended to fully equalize human and non-humans. The idea is not that non-human elements/objects are able to determine and take action, or perform actions *instead* of humans, but rather that they are active participants as they, for example, influence which actions of humans may be taken or not (Latour, 2005). These networks are commonly referred to as sociotechnical networks, emphasizing the intertwined nature of social (human) and technical (non-human) elements.

ANT has been used in management accounting largely to set focus on calculations and numbers in sociological research of accounting phenomena (Lukka & Vinnari, 2014). Additionally, there has been a large interest in applying ANT to investigations of innovations (Lukka & Vinnari, 2014), as with emergence of new groups of actors it is easy to track the associations between different elements (Latour, 2005). Callon develops ANT and subsequently framing by focusing more on economics and the operation of financial markets.

2.2.2. Framing, overflowing and economization

Callon (1998) borrows Goffman's (1974) sociological concept of framing and applies it to economic theory in order to lift the discussion of externalities and their importance in economics and the existence of markets. According to economic theory and through the idea of efficient resource allocation, both positive and negative externalities render a market inefficient. This means that according to economic theory, the optimal situation is void of externalities.

Based on Goffman (1974), Callon (1998) defines a frame as constituting the boundaries in which interactions can take place, which are independent from the surrounding context. A frame establishes for example which human and non-human actors are involved, as well as which behaviors and actions are expected, acceptable and possible. By establishing such boundaries and defining which elements are taken into account in the particular frame, calculation is made possible. Here, calculation does not merely refer to numerical computation but to the sociotechnical process which enables actors to identify, compare, articulate and act upon their interests. Thus, framing makes markets and their coordination effective, because "each individual can take into account the viewpoint of every other individual when reaching a decision" (Callon, 1998, p. 251).

Importantly, the frame is not an explicit agreement between the human actors involved, but rather implicitly shaped, structured and enacted by the human actors, devices, institutions, as well as the surrounding context. For example, Skærbæk and Tryggestad

(2010) find that accounting devices do not merely describe an organization's strategy which is decided upon by human actors but actively frames it by defining what can be included/excluded and what strategic options are available and actionable.

Given the perspective of ANT in which reality is continuously constructed and reconstructed through associations between actors, Callon explains that while there is a core idea of the frame creating an independence for its interactions within it, the frame itself is rooted in an outside context affecting its construction and preservation. Thus, only a relative independence is achieved, and this external connection opens the possibility for the frame to be affected once it has been established and used, i.e. the possibility for externalities to impact the frame and overflows to appear. Overflows refers to the boundaries of the frame becoming permeable, indicating a destabilization of the frame. Given the viewpoint of framing rendering markets effective, such a destabilization may threaten this effectiveness, entailing the overflow needs to be managed in some manner for the frame to stabilize and market to become effective again. For example, an established frame defining a construction site's operations may unexpectedly affect wildlife nearby, constituting an overflow as these effects now need to be taken into account, and entailing a reframe where operations may change to include the wildlife's interests as well.

Callon (1998) mentions two different viewpoints on the relationship between frames and overflows. The first perspective is that framing is the norm and while overflows happen, these can then be handled, and the frame can be easily stabilized until the next overflow may occur. The second perspective, more in line with the constructivist perspective of ANT and which Callon seems to argue for, is that overflowing is the norm and establishing and stabilizing a frame is rare and requires costly investments. This perspective has a few important implications. As mentioned, the elements constituting the frame are openings to the wider network/context creating the possibility for overflows to happen, and Callon argues it is because of this that the frame is productive in producing effects to the world. He exemplifies this with the idea of a research contract where a solid and completely independent frame would simply lead to a constant reiteration of existing knowledge, as it would entail no connection between the research and the outside world, and the frame would thus have no impact on the wider context. Accounting research has further investigated this in practice. For example, Skærbæk and Tryggestad (2010) finds support for the idea of successful framing producing overflows. They find how a frame for adaptive strategy successfully included certain elements while excluding others, causing tensions through disagreements between actors, new calculation methods to appear, and new actors entering the situation. Thus, overflows do not only occur because a frame is not successful, but the frame's success itself can be a driver for more or different overflows (Skærbæk & Tryggestad, 2010). In other words, because framing necessarily involves selecting and stabilizing certain elements while excluding others, its success intensifies the visibility and consequences of what is left out, thereby producing

new or transformed overflows. Furthermore, rather than analyzing overflows and frames by looking at the individual frame Vinnari and Skærbæk (2014) argue it should be done with the perspective of overflows emerging through tensions between multiple interacting frames. This idea is driven by the ANT perspective and how actors do not exist in a singular frame but simultaneously exist in multiple frames and are inseparable from the frames in which they exist.

Callon (1998) states that in the attempt of framing or reframing, overflows are ideally sought to be made measurable. This involves the following; effects are identified, who is responsible and who is affected is established, and effects are measurable in an objective way. Once these three factors of an overflow have been identified, it becomes possible to reframe the interactions. Cuckston (2018) further investigates the effects of overflows and finds that overflows are not only destabilizing of frames but generative as well, as they can lead to opportunities such as calculative innovation. Specifically, in his study on species conservation, Cuckston (2018) illustrates how relations between actors inside the frame and actors which were initially excluded from the frame, are reintroduced through overflows and lead to opportunities for new strategies of conservation to emerge.

Lastly, Callon discusses "hot" and "cold" situations. In hot situations, there is no stable knowledge base, a lot of actors are involved, and the method of measurement is uncertain. Framing is a chaotic process with heavy overflows, as actors and their interests are fluctuating, and they struggle with agreeing on the facts or what decisions need to be made (Callon, 1998; Christensen & Skærbæk, 2007). In cold situations however, such agreements regarding overflows are easily made, and knowledge and actors' interests are stable and accepted. Christner and Sjögren (2022) contrasts previous research focus that frame stabilization primarily occurs temporarily and in hot situations, concluding that frames can overflow in cold situations despite their high degree of establishment and stability, as their continued reinforcement may entrench specific configurations which can be challenged over time. Additionally, a study by Mouritsen et al. (2022) shows how different frames interact with each other, in line with Vinnari and Skærbæk (2014), and how they develop hot situations. More specifically Mouritsen et al. (2022) look at when tension arises between two stable frames which work well in their independent tasks but can no longer fulfil those tasks independently. Due to the frames becoming ineffective in the present situation, other elements/practices handle the hot situation, and the frames are reconfigured in order to work effectively again (Mouritsen et al., 2022). This supports the view that framing, overflowing, and reframing constitute a continuous and dynamic process where situations may shift between being more stable (cold) and contested (hot) states.

In this study, framing will be understood as the sociotechnical arrangement through which natural catastrophe risk is defined, delimited and made insurable in the reinsurer's business. Framing encompasses the calculative devices, categorizations and contractual structures that transform uncertain phenomena into bounded and manageable objects. As

reinsurance fundamentally relies on the ability to transform risk into a calculable object that can be priced and incorporated into contractual arrangements, framing is essential for rendering risks both insurable and economically viable.

However, as Callon (1998) emphasizes, framing is always imperfect. To frame implies making inclusions and exclusions, creating an outside that is not accounted for which gives rise to overflowing mechanisms where the excluded elements re-enter and disrupt the frame. In the context of reinsurance, overflows may not only threaten the stability of the frame of *how* the risk is managed, but also the very possibility of insuring certain risks. Emerging risks, unmodeled uncertainties and unexpected events can challenge calculative practices, threatening the ability to transform risk into economized and insurable objects. Thus, in this sense, overflows can be understood as moments where the stabilization of risk fails. These overflows reveal the frame's shortcomings by making the underlying material, legal or calculative devices visible and triggering debates and solutions to improve the frame (Çalışkan & Callon, 2010). Çalışkan and Callon (2010) note that these debates and solutions are analytical entry points, since the efforts to stabilize overflow become empirically observable.

Given our research question, we want to analyze such moments, i.e. where overflow occurs and where efforts are taken to manage this overflow. To do this, we complement Callon's (1998) framework with Çalışkan and Callon's (2009) notion of economization. Economization refers to the processes through which actors, institutions, practices, and material arrangements collectively constitute and qualify a phenomenon as an economic object. While Callon's (1998) concept enables us to identify the framing and overflowing, i.e. the limits of existing risk management practices, economization provides a lens for analyzing how the overflow, i.e. risks that do not fit the traditional frame, are actively engaged with and transformed into economic objects. This is particularly relevant in (re)insurance, where risks are not simply to be controlled or avoided, but must be actively sought and continuously made calculable and modeled in order to become tradable and profitable.

Within this broader theory, we draw on marketization (Çalışkan & Callon, 2010) as a specific modality of economization concerned with *how* things become tradable in markets in practice, through a set of interrelated processes. These processes include pacifying goods, marketizing agencies, market encounters, pricing, and market design and maintenance. While overflow can affect all of these dimensions, this study focuses on the notion of pacifying goods (Çalışkan & Callon, 2010, p.5-8). The idea of this notion is that goods must be made passive in order for them to be valued. Thus, pacifying refers to the process of turning complex, unstable and/or unpredictable things into stable, well-defined, passive objects that can be traded in a market.

We consider a focus on pacifying goods to be particularly appropriate in the (re)insurance context, as (re)insurance is essentially a continuous process of pacifying risk. This, since

risks, which are inherently uncertain and hard to define, must be made economic through stabilizing, calculative practices in order to be subsequently priced and exchanged. Important to note is that such processes are carried out through sociotechnical arrangements, i.e. combinations of human and non-human actors interacting, such as people, tools, devices and rules (Çalışkan & Callon, 2010). However, rather than analyzing these arrangements in their own right, this study treats them as part of the practices through which risks are stabilized and made calculable.

As Çalışkan and Callon (2010) argue, goods can never be fully pacified given that the frame allows for overflows. Overflows reveal the shortcomings of current pacifying processes and given that risks *must* be made economic in a (re)insurance context, this triggers efforts to repacify it. While other dimensions of marketization are undoubtedly present in the empirical setting and may also be affected by overflows, we argue that pacifying is the anchor dimension in our empirical setting since failures in the pacifying process can have cascading effects on other dimensions. Accordingly, this study focuses on the pacifying process as the most relevant and directly observable dimension of marketization failures in moments of overflow, capturing how such overflow is managed through efforts to repacify the overflow.

In conclusion, Callon's (1998) concept of framing and overflowing, complemented by the concept of economization and, more specifically, the notion of pacifying goods (Çalışkan & Callon, 2009, 2010), provide a coherent analytical framework for examining how boundaries around risk are constructed, how they are challenged by a changing risk landscape, and how such challenges are addressed through processes that transform unpredictable risks into calculable and tradable economic objects.

3. Methodology

In this section, we will describe the methodology applied to conduct our study. In section 3.1 we describe our research approach, followed by our research design in section 3.2. We then move on to explain our data collection process and data analysis processes in section 3.3 and 3.4 respectively. We end the methodology section with section 3.5, commenting on the validity of this study, given our research approach and design.

3.1. Research approach

The objective of this study is to analyze how reinsurers manage the risks emerging from a changing risk landscape. The study is guided by a constructionist ontology, which assumes that organizational realities and meanings are socially constructed through interaction and interpretation (Bell et al., 2019). This perspective is appropriate given the focus on how secondary risks are constructed as strategically and economically relevant, rather than treated as entirely predetermined and objective phenomena. The study is further guided by an interpretivist epistemology, emphasizing the understanding of how organizational actors interpret, assign meaning to, and subsequently act upon evolving secondary peril risk (Bell et al., 2019). In line with these perspectives, the study draws on the actor-network theory, as discussed in section 2.2, which emphasizes that the interpretation of risk and subsequent risk management practices emerge through interactions between human and non-human actors within dynamic networks (Latour, 2005). Consistent with this philosophical positioning, the study applies an abductive approach involving iterative movement between empirical observations and theoretical development (Dubois & Gadde, 2002).

3.2. Research design

The study originated from an interest in how climate change and increasing natural catastrophe losses are affecting society. The reinsurance industry was identified as the most suitable actor for our research. Given this, we conducted a qualitative single-case study of ReCo, one of the leading global reinsurers operating across all lines of property and casualty (P&C) reinsurance and life and health (L&H) reinsurance. Importantly, this study is delimited in scope to only focus on risk management practices regarding NatCat risk within P&C reinsurance.

A qualitative approach was considered suitable since the study seeks to examine how changing NatCat risks are interpreted and acted upon within risk management practices. Since these processes are embedded in organizational interactions and practices rather than directly observable or quantifiable phenomena, a qualitative design enables the depth and flexibility required to understand them (Bell et al., 2019).

Lastly, the choice of a single-case study is further supported by the market dynamics and characteristics of the reinsurance industry. Given the fundamental need for diversification of risk, the reinsurance market is highly concentrated with only a few large global players dominating the market ("Global Reinsurance Market", 2025). Furthermore, demand, prices and offerings are strongly connected to industry market cycles, meaning that these elements do not differ significantly between industry actors (Insurance Information Institute, n.d.). Studying one leading actor was therefore considered appropriate for generating in-depth insights with potential relevance to the broader industry within the scope of NatCat risk management practices.

3.3. Data collection

The data collection process started with gathering information about the case company, the industry and the effects of climate change. For this purpose, we accessed and reviewed several internal and external documents, such as reports and explanatory PowerPoints on different subjects. All documents are listed in Appendix A. Additionally, we conducted four context interviews with external parties including a client (primary insurer), an insurance broker, and two industry experts (see Appendix B). Alongside the context familiarization process, we discussed the findings with our main contact person at ReCo and started conducting, quite broad, case company interviews to make sure that we were on the right path. These insights and continuous internal discussion enabled us to develop an industry-relevant research question and formulate an initial interview guide. This preparation helped us familiarize with the industry terminology, market dynamics and core reinsurance concepts, which proved to be vital for our understanding of the interviews (Qu & Dumay, 2011).

Apart from the context interviews, we conducted 15 case company interviews, with a total of 17 interviewees (see Appendix C). Both authors were present at all interviews, supporting more reliable and accurate interpretations of the data (Bell et al., 2019). The interviews were held between the 3rd of February to the 15th of April, averaged 58 minutes, and the majority (14 out of 19) were held on site in Stockholm or at the main office in Europe, while the remainder were held via Microsoft Teams due to geographical distance or scheduling difficulties. Nearly all interviews were recorded and transcribed, with the consent of the interviewees, to enable and ensure a thorough and unbiased analysis of what had been said (Bryman, 2012). For the three interviews that were not recorded, notes were taken by one interviewer, and reviewed after the interview by both interviewers.

For the interviewee selection, we used a combination of generic purposive sampling and snowball sampling (Bryman, 2012). The initial interviewees were identified in collaboration with our contact person at ReCo. The primary selection criterion was that participants possessed relevant knowledge and experience related to NatCat risk

management practices and associated areas such as strategy, underwriting, sustainability and risk modeling. Through this process, a group of highly experienced and senior employees was assembled, including managers, specialists and executive board members. As the interview process progressed, additional participants were identified through recommendations from initial interviewees, as well as through our own ongoing assessment of areas where further insights were needed. This iterative approach enabled the study to capture diverse and industry-relevant perspectives while identifying organizational complexities that may have been difficult for us to uncover independently.

The interviews were semi-structured, allowing interviewees to discuss their perceptions and experiences relatively freely within broader thematic areas (Bell et al., 2019). This approach enabled both in-depth understanding and the emergence of unanticipated topics and insights, thereby enriching the empirical findings (Bell et al., 2019), which was particularly valuable given our limited prior industry knowledge. Furthermore, the semi-structured approach facilitated probing and ad hoc adjustments to the interview guide, enabling deeper and more relevant data collection (Qu & Dumay, 2011). Thus, during the processes, the interview guide was continuously refined where necessary to optimize our findings. Appendix D shows the overall areas we wanted to cover in the interviews, along with some sample questions for each area. Importantly, the interview guide functioned as a flexible tool with broad topics and open-ended questions, rather than a rigid script (Bryman, 2012). This was especially valuable given the diversity of our interviewees' knowledge and insights. Accordingly, each interview was adapted to the interviewee's area of expertise. While some interviews focused on specific technical topics, such as parametric solutions, others addressed broader industry dynamics at a more general level. Consequently, certain interviewees are more frequently cited than others given either their technical expertise in a certain area or their ability to explain complex topics in an understandable way.

To complement the interviews, as mentioned in the beginning of this section, we have accessed and analyzed several internal and external documents. These include; descriptions of the industry, the case company, product offerings, certain climate matters and more, a sustainability report of ReCo, and a renewal report from an insurance broker. This material enabled us to understand certain things in more detail and provided us with additional information for the analysis. Additionally, we had several site visits and informal meetings (see Appendix E). This included visits at the Stockholm office, as well as a three-day trip to the main office of ReCo in Europe where we attended a dinner with four employees, and two lunches with one and two employees respectively. During these informal meetings employees shared their knowledge and experience in the reinsurance industry. Thus, these conversations particularly contributed to our understanding of the industry and its terminology. Additionally, throughout the process, regular meetings with our contact person supported us in our understanding of the industry and the gathered material.

3.4. Data analysis

In line with the abductive approach applied in this study, theoretical development, data collection and data analysis were conducted iteratively and in parallel (Dubois & Gadde, 2002). Emerging empirical insights continuously informed refinements of the interview guide and sampling, as well as related to prior literature and theory to support the development of more theoretically grounded interpretations and contributions (Lukka & Modell, 2010).

In early phases, we had difficulties understanding the phenomenon at hand since interviewees were quite diverse in their explanations of increased NatCat risk and how it affected their risk management practices. After a few interviews and discussions with our contact person at ReCo we revisited the material gathered in early phases and realized we had to separate primary and secondary perils within the NatCat area to understand the phenomenon. This highlighted the importance of industry-specific language and terminology, which at times proved challenging despite extensive preparation. Therefore, we continuously adapted our own formulations and language by analyzing and questioning our findings. These adjustments enabled us to use comprehensible and relevant language to the interviewees (Bryman, 2012; Qu & Dumay, 2011), as well as mitigated risks for misinterpretation. Regular discussions with our contact person further supported this interpretive process.

The choice of analytical framework evolved progressively throughout the process as a result of unanticipated findings and further theoretical insights (Dubois & Gadde, 2002). Initial theoretical perspectives related to organizational processes, assetization and riskification were gradually reconsidered when empirical findings increasingly highlighted how risk management practices were influenced by market dynamics and sociotechnical interactions. This guided us in our choice of an ANT-inspired study.

Through this iterative engagement with both the empirical material and the domain literature, it became evident that secondary peril risks were perceived as challenging because they disrupted existing calculative models and established risk management systems developed for primary perils. This informed our choice of using Callon's (1998) concept of framing and overflowing as our theoretical lens. As the study developed further, the empirical data highlighted attempts to continuously engage with the secondary peril overflows. Together with the evolving domain literature regarding risk construction and relevance, we realized how the overflow was perceived as an economic opportunity. Consequently, Çalışkan and Callon's (2009, 2010) concepts of economization and marketization were incorporated to complement the analysis in understanding how overflows were managed and shaped through interactions between industry professionals, calculative devices and broader market dynamics.

Following each interview, we discussed key takeaways, reflections and emerging insights, enabling continuous refinement of interpretations and analytical focus. Interview recordings were transcribed shortly after each interview using AI-supported transcription software. Subsequently, the transcriptions were reviewed alongside the recordings by the authors to ensure accuracy. The material was then manually coded in NVivo 15 and organized into broad analytical themes. In line with our abductive approach, the codes and themes were continuously refined through iterative movement between empirics and theory.

Inspired by Langley's (1999) narrative strategy, we structured the codes and themes focusing on constructing a coherent understanding of how secondary peril risks were recognized, interpreted and managed within the reinsurance industry. We viewed the phenomenon as a process which has evolved, and is continuing to evolve, in the industry during the last decade. Consistent with the ANT perspective, rather than looking at the data as separate themes we tried to understand how the market dynamics and different sociotechnical actors influenced each other and how these relationships evolved and shaped risk management over time (Langley, 1999).

3.5. Validity

Given the interpretivist nature of this study, validity was approached as the credibility and plausibility of the interpretations rather than as the identification of an objective truth (Lukka & Modell, 2010). Following Lukka and Modell (2010), we actively sought to balance authenticity and plausibility by including diverse perspectives while developing coherent and analytically grounded interpretations.

To enhance authenticity, our interviewee sample includes interviewees with varying roles and expertise, ranging from underwriters and sustainability experts to executive board members. Furthermore, direct quotations were incorporated to preserve the emic qualities and strengthen transparency of interpretation. Plausibility was supported through the study's abductive approach, where empirical findings, theoretical frameworks and domain literature were continuously evaluated and refined in relation to each other. In particular, we iteratively evaluated possible theoretical explanations to find the most insightful ones, instead of sticking to a predefined process. Furthermore, when explaining our findings, we constantly aimed for a clear connection between quotes, themes and conclusions with inspiration from Langley's (1999) narrative strategy. In line with Lukka and Modell's (2010) concepts of contrast classes and counterfactuals, our analytical focus was progressively narrowed from increasing NatCat risk toward the specific challenges posed by increasing secondary peril risks. Counterfactual reasoning further helped us distinguish central explanatory factors from less relevant ones. For example, we continuously asked ourselves questions such as whether risk management practices would still change if secondary perils did not exhibit certain characteristics.

Furthermore, emerging interpretations were continuously discussed internally and with our main contact person at ReCo to ensure that industry-specific terminology, market dynamics and empirical interpretations were understood appropriately. Our contact person also reviewed an initial empirical analysis draft, to ensure both confidentiality and support the validity of our interpretations.

4. Empirical analysis

In the following section we present our findings and our theoretical analysis of these findings using Callon's (1998) idea of framing and overflowing, complemented by Çalışkan and Callon's (2009, 2010) concepts of economization and marketization, particularly through the concept of pacifying goods. We start by establishing the traditional frame through which natural catastrophe risks are managed in section 4.1. Then we move onto the changing nature of secondary perils and how these challenge the traditional frame in section 4.2. Next, how this misfit with the traditional frame is handled is presented in sections 4.3 and 4.4. The section ends with a look towards the future in section 4.5. Consistent with the delimitations outlined in the methodology section, the empirical findings focus only on *natural catastrophe* reinsurance.

4.1. Reinsuring large losses through a highly calculative frame

4.1.1. The reinsurance purpose of covering large losses

Across interviews, insurance is solidified as a cornerstone of society, without which, society and economies would not function. For example, individuals would not want to spend their capital on buying property if there is a risk all that capital is lost in case of some form of accident, such as a fire or break-in.

> "Without insurance, the whole society, the whole economy, they wouldn't work. No one would invest. No one has the capital to do anything, to try out anything." - Interviewee #4

Interviewees consistently highlight that insurance is fundamentally based on diversification of risk. This relies on the assumption that the probability of a risk event and subsequent loss, such as a car accident or single house fire, affecting one individual in an insurance company's client pool is high, but it is unknown which specific individual will be affected and it will not happen to all individuals at the same time. As a result, primary insurers are able to collect a premium (capital) from its client pool to support the individual(s) affected once a loss occurs.

While primary insurers are explained to typically be localized in a certain country or area, reinsurance is explained as being based on the same logic as insurance, but at a much larger scale. Reinsurers' clients are the primary insurers[3] instead of individuals or organizations. It is described as highly dependent on the ability to reach global diversification. This entails that when one local insurance company is affected by a large event, such as a large NatCat event, where its diversification falls through, i.e. a large

[3] Interviewees may use "primary insurers", "insurers", "insurance companies", "clients" and "cedents" interchangeably.

number of its clients are affected, the reinsurer has clients across the world for all different types of risks which are not being affected, thus achieving the diversification needed.

> "[If] you are a car insurer you probably have the risk that there is a hailstorm and [in the case of this event] the whole area of [a car company] where thousands of cars will be standing on a parking lot, and they will be completely destroyed. So, then this car company itself would probably no longer be there. The insurer would no longer be there. So, they are able to survive just because we [the reinsurer] are there in the background. (...) And it's this topic of diversification, that we can take a lot of risk because we are working worldwide. (...) Hopefully, it would not happen that there is a hurricane in Miami, there is this hailstorm in Germany, and there is this flooding in Australia all together, because that would definitely then affect us, and then probably we would be gone, and then other industries would probably be gone." - Interviewee #7

Interviewees explain that because reinsurers operate globally and across all lines of business, they can diversify away a lot of the risk, which enables them to support the functioning of primary insurers in several ways. Firstly, they offer balance sheet protection. Primary insurers are not large enough to be able to hold enough capital to cover the large losses with very low likelihood of occurring, such as a highly detrimental earthquake, and it would not be efficient if they did. They are faced with strict capital regulation stipulating they need to have coverage for these events, and instead of keeping this capital buffer on their own, they buy reinsurance.

> "So, if you take a simple insurance company in Sweden, for example, they must have enough capital to cover the largest loss or the biggest event that could happen. And of course, that becomes a very inefficient use of money if you are a local company in Sweden that insures a large industrial building or faces a natural disaster event that could cost four billion. Then they would need to have four billion sitting in the bank for something where the probability of it happening might be once every five hundred years. So instead, they buy that coverage from a reinsurance company, and the reinsurance company in turn insures [risks in] the whole world and can reuse this capital." - Interviewee #2

Secondly, primary insurers want stable results towards their investors and other stakeholders, and the more reinsurance they buy, the more stable earnings they get because they transfer the risk of a huge loss (impact) to the reinsurer. Thirdly, buying reinsurance is seen as a form of knowledge transfer. Since the reinsurance company operates globally and across all lines of business, they have a better opportunity to hold more knowledge regarding the largest risks and their probabilities, including larger databases and more tools. This can enable them to more accurately calculate the risk and thus assume risk at a more accurate price than what the insurer could do alone.

Reinsurers can thus support primary insurers in several specific ways. Taken together, these functions point to a broader purpose of NatCat reinsurance, namely making society more resilient to NatCat risk by supporting primary insurers when they cannot handle the risk of large losses by themselves. When asking interviewees about what counts as large losses and what does not, the concepts of severity and frequency were brought to

attention. It seems NatCat has historically been possible to roughly group into two types, low-severity high-frequency versus high-severity low-frequency. Interviewees expressed a more or less common view that low-severity, high-frequency risks are not optimal for reinsurers to cover in terms of profitability. Rather, high-severity and low-frequency are the main types of risks that NatCat reinsurance is supposed to cover.

> "We [reinsurers] don't want to be constantly subject to losses, because then it becomes inefficient. If we get lots of claims that we have to pay (…) there's a process between us and the customer that turns it into a kind of money exchange that becomes inefficient. On the traditional side, we usually want the retention to be high enough so that it's these rare losses that we help cover. Not the common things that can happen every year or several times a year." - Interviewee #2

One interviewee expressed a general preference for reinsurers to cover loss events that are predicted to happen every 10 years or less, however they also specified that there is no one such specific metric that draws a line between the insurer and reinsurer regarding all types of risks.

Historically, these high-severity low-frequency losses have been the result of what can be termed as primary perils, which mainly includes earthquakes and hurricanes. When looking at the traditional solutions for NatCat reinsurance, i.e. the predominant product offering of NatCat reinsurance toward primary insurers, it becomes clear that these methods and product structures have been developed by, and for, primary perils and their characteristics. This points to a frame (Callon, 1998) that defines how natural catastrophe risk is structured and managed within reinsurance practice. In the next section we will further explore this frame with particular attention to how it determines which risks fit into traditional reinsurance solutions, and by implication, which do not.

4.1.2. The highly calculative frame of traditional NatCat reinsurance

Interviewees explained how there are multiple versions of reinsurance product offerings which can be used for transferring risk from primary insurers to reinsurers. For NatCat coverage, it seems that the predominant solutions used traditionally (hereinafter referred to as traditional solutions) are "non-proportional", where for a certain event, the insurer will have to cover the loss themselves up until an attachment point, and past that point the reinsurer steps in to pay for losses. In other words, a high attachment point entails that the severity of the individual loss needs to be high in order for the reinsurance program to kick in, while a lower attachment point will cover less severe losses.

Generally, NatCat reinsurance programs do not explicitly specify which types of perils are included and excluded, such as hurricanes being covered while wildfires are not. Rather, the NatCat reinsurance program is based on the severity of losses when a risk event has occurred. While attachment points are described to be negotiable in contracts, their overall level for NatCats converge across the market, indicating which losses, i.e. higher- or lower severity, are typically covered by reinsurers. As previously established,

the reinsurer wants to focus on high-severity losses, and attachment points are therefore aimed to be set at levels that align with this focus. In this sense, attachment points act as a device contributing to shaping the boundary of the traditional frame (Callon, 1998), as they effectively determine which risks are more likely to be covered by the traditional solution and which are not. Consequently, since primary perils were defined to be the high-severity group of losses, these are included in the frame, while other NatCat perils with lower severity can be considered to be outside the scope of the traditional frame.

For the potential loss coverage, the primary insurer pays a risk premium which is negotiated based on the primary insurer's perception of what the risk transfer is worth, and the reinsurer's perception of what compensation is needed for the risk they take on. In simple terms, the higher the attachment point the lower the premium as the risk that is being transferred decreases with an increased attachment point.

In order to determine a price for these traditional solutions, the risk must be turned into a tradable economic object (Çalışkan & Callon, 2009, 2010). We argue that this is achieved through established risk models that enable measurement and calculation, thereby making the risk more stable and predictable. In this sense, risk is pacified through calculative practices (Çalışkan & Callon, 2010). Interviewees explained that to calculate the premium (price of the risk), you need frequency and severity of the peril.

> "Risk always needs the right price, the right modeled price. How you model is; you need the frequency and severity." - Interviewee #10

Interviewees argued that primary perils are quite predictable in their nature and there is a lot of data available on both frequency and severity, which makes it rather easy to predict through models, implying that the risk can be pacified relatively easily. Furthermore, interviewees and documents made it evident that these models are very developed and calibrated, meaning you can insert the data and get a quite accurate price of the risk. The models take the historical data and calculate the frequency of a particular risk event occurring. For example, the output could be that in a specific region, the probability of a hurricane of size X, is 1 in 50 years. In addition, for a traditional solution you need to calculate the potential loss that will occur in case of the event. To do this properly you want large amounts of data not only about the potential event, but also the property which is to be covered. Two houses next to each other may have the same probability of being in the danger zone of a hurricane, but because of differences in the values of the houses and the predicted damage the hurricane may bring to each house, the price of the risk will differ. Similarly, models must be continuously calibrated to new circumstances in order to stay relevant.

> "First of all, you use the historical losses to calibrate the model. But then it comes down to, for example, if you have the storm from the '90s, the houses were built differently. There were less houses maybe, there were more wooden construction, houses that were blown away completely, which would not happen nowadays. (...) and as if that storm would happen now, [damages] would be much less

> severe than it was then. But how do you measure that and how do you believe in that? So, that's always the question. - Interviewee #4

While the interviews indicated that the modeling part for primary perils is under control and that the models are the most important factor when assessing risk and determining prices for traditional solutions, it was clearly stated that NatCat models are inherently uncertain and no single model can accurately predict exactly when a NatCat will happen and what effects it will have. However, due to diversification and large scale, you do not need to know which exact year the disaster will happen to be able to set a price on the risk. Thus, the models can be used to quite accurately measure the risk and arrive at an adequate premium.

> "If I only look at that one program, I can personally be certain that the number is wrong. But with the law of large numbers, as we write a diversified book within [ReCo], in the overall portfolio, we hope it makes sense. So maybe the model for client A doesn't work properly and it underestimates the losses, then hopefully on client B it overestimates and we get more premium than we would actually need (...). Sometimes we're a bit overestimating and sometimes it's a bit underestimated. But as I said, I think with the global diversification and also the diversification in time, I mean, that's what reinsurance is about, it should work out." - Interviewee #4

To conclude, we identify traditional solutions as constituting a traditional frame (Callon, 1998) for managing NatCat risks. This frame is shaped by the characteristics of primary perils, namely their high-severity and low-frequency nature, their relative predictability, and the availability of historical data and established models. As such, the functioning of this frame depends on the ability to pacify risk into relatively stable and predictable objects through calculative models, thereby enabling the pricing of risk and the provision of traditional reinsurance solutions (Çalışkan & Callon, 2009, 2010).

4.2. Secondary perils threatening the traditional reinsurance frame

4.2.1. Secondary perils are not so secondary anymore

Secondary perils is a term for non-primary natural catastrophe perils, for example hail, floods, wildfires and severe convective storms. Historically, these have either occurred as a consequence of primary perils, or independently but less severe than primary perils. Interviewees explained that given their low severity, secondary perils individually have not historically entered the NatCat reinsurance programs since primary insurers have had the capital to cover these risks by themselves. Furthermore, these perils have had high frequency, placing these perils in the high-frequency and low-severity group of risks that interviewees indicated reinsurance is not meant to cover. In other words, secondary perils, given their lower severity, have consistently fallen below the general attachment points for NatCat reinsurance programs, and thus constituted NatCat risks that have resided outside of the traditional frame.

However, in the last decade, secondary perils have increased significantly in both frequency and severity, leading to significantly larger accumulated losses.

> "We don't have a crystal ball for upcoming losses. But, for me as an underwriter, I also look at loss history. So, I would see the losses that my cedents [clients] or potential clients had over the last 20-30 years, and you can see more frequency and more severity. (...) But, I mean, you don't need to study math to see that there's coming more and more." - Interviewee #15

According to an insurance broker report for 2025, accumulated secondary peril losses have been increasing for quite some time now, but in the last 5 years they have surpassed the accumulated losses caused by primary perils. This has led to them becoming relevant for reinsurers in a way not seen before. One interviewee noted that they recently saw a news report that said that a severe convective storm (secondary peril) was on the same level as a hurricane in category 4, one of the strongest categories there is. This type of wind speed can destroy a whole city, indicating it is not as low severity as secondary perils have historically been categorized as. Another interviewee gave an example of a recent hail event in Europe with record high size of the hail stones, causing severe damages. The interviewee continued:

> "That kind of shows you what's happening with the frequency and the severity of that event. Because a hailstorm wouldn't usually touch our NatCat programs, whereas in 2023/2024, these were one of the biggest [accumulated] events for [ReCo] in Europe. And that wouldn't normally sit within the reinsurance side. That would more probably sit within the primary insurance side. (...) So, I think the conversation and the way it's been moving is that we all agree that secondary perils are not so secondary." - Interviewee #5

These events exemplify that the physical characteristics of secondary perils are changing and the boundary the traditional frame has managed to establish between primary and secondary perils through the use of attachment points is beginning to blur. Since this boundary effectively determines which risks are covered by the NatCat reinsurance programs, secondary perils have been moving away from being "irrelevant" for ReCo. The increased severity and frequency of secondary perils caused their accumulated losses to exceed the attachment points and thereby making them appear in the reinsurance NatCat programs.

Interviewees indicated a few drivers of the increased secondary peril losses; mainly climate change increasing the probability of these events happening, and socioeconomic factors increasing the value at risk. One interviewee noted:

> "This [climate change] is one effect, but I think even more impactful is: the value at risk, things get more expensive to repair and to rebuild, and how condensed risks are because of urbanization. Usually it was spread somewhere, and you had a farm here and some here, and now since really high-value risks are all in one place, and if a NatCat event is happening there, well, then it gets super expensive. And this is what we [saw in] Dubai, for example, nobody expected a flash flood in Dubai. Dubai is

> pretty expensive. All the fancy cars were insured, and they were all damaged, and that was a major event not only for us, for the industry, and nobody really expected that. But this is the new reality, I guess. So, it's the three things: climate change (...), urbanization, and value at risk." - Interviewee #9

This highlights how changes in the physical world and material conditions, such as climate change and the concentration of value at risk, interact with and destabilize the assumptions underlying the traditional frame. Additionally, this reflects an interplay between sociotechnical actors, such as the physical weather events and calculative devices, and shows how the frame is not completely independent from its context and is subject to external connections. Furthermore, this can be seen as an indication of overflowing (Callon, 1998), where the changing characteristics of secondary perils begin to challenge the assumption that they are predominantly low-severity high-frequency risks, which has historically positioned them outside of the traditional frame. However, our findings indicate that secondary peril risk cannot simply be absorbed into the traditional frame and be managed in the same way as primary perils. Why secondary peril risks do not fit the traditional frame despite their increased loss impact, and how this is managed in practice, will be further explored in the following sections.

4.2.2. Misfit with the established frame due to contrasting characteristics

As established above, primary perils are high-severity and low-frequency in nature and they are relatively stable and predictable. Furthermore, there is a significant amount of data on these perils and models are significantly developed and calibrated. Taken together, these characteristics underpin the traditional frame, how it was developed and how it operates. In contrast, secondary perils were explained by interviewees as not sharing these same characteristics but rather being marked by high frequency and a larger inherent unpredictability.

This divergence in terms of higher frequency challenges the underlying logic of NatCat reinsurance which, as established, is based on risk diversification and a low probability of the events occurring, since it is difficult to diversify something that happens too often. Hypothetically then, to compensate for a higher probability, the risk premium that the primary insurer pays would simply increase. However, despite a general trend of increased probability for events to occur, there is also a high and increasing unpredictability when it comes to secondary peril risks. This leads to potential inaccuracies when attempting to calculate premium prices in the same way as calculating prices for primary perils, thus posing a threat to the calculative nature of the traditional frame. As one interviewee noted regarding this inherent unpredictability of secondary perils in comparison to primary perils:

> "Hurricanes, storms and earthquakes are under control. We have good models and a forward-looking view, no storm can surprise us. But what surprises us is the secondary perils – for example hail, floods" - Interviewee #12

Interviewees agreed on the fact that secondary perils are more surprising in their nature. The weather patterns are changing all the time, and you cannot really predict, for example, exactly where and how much it is going to rain, thus calculating potential damages of a specific event becomes highly difficult. Hail, for example, can happen in a very small, localized area, often 2x2km, and it is hard to predict exactly where this area will be and thus what value (property) is at risk. In comparison, interviewees described that it is easier to predict where an earthquake will occur, what magnitude it will have, and the damages it will cause. This is partly based on the nature of primary perils, as for example an earthquake occurs in a large area, and the margin of error is thus smaller. Additionally, it is due to there being large amounts of the type of data that is needed and developed models for primary perils, as they have been the ones relevant for the reinsurers and this type of modeling for decades.

> "It's like predicting the weather in the sense of 'where is it going to rain? How long is it going to rain?' Weather patterns are changing so much. (...) There was a Copenhagen cloudburst event in 2011, which is one of the biggest events that we've seen. That's not something you can really model. I think they're improving, of course, to see what kind of water load and how much water an area can take (...) but you can't predict how quickly or how much rain you can get in a place, as easily as you would be able to say that, 'Okay, these are the earthquakes', since these are the lines [fault lines] where they can draw kind of where the tremor is, how it'll affect, where it would drift through. Of course, you can't predict when it [an earthquake] will happen, but you know over time how long it might take for there to be those tectonic shifts. With flooding, it's very difficult to say where it's going to rain. I think that's the main thing." - Interviewee #5

Furthermore, it is stated that floods, wildfires and convective storms (secondary perils) can happen in new geographical areas where they are not expected based on historical data. Floods in Dubai and hail in Texas are mentioned as examples of events that were surprising, and more surprising events are expected. Likewise, Europe and the Nordics are now subject to quite a lot of NatCats, which has not been the case historically.

> "There have been floods in Gävle, we've had floods in Norway, in Denmark there have been many cloudburst-related damages, and hail damage has also occurred in a way that we haven't seen before." - Interviewee #2

This inherent unpredictability and higher frequency leads to a misfit with the existing modeling approaches, and consequently a misfit with the traditional frame, which are both mainly developed to manage relatively predictable low-frequency and high-severity events. As one interviewee from the modeling team noted:

> "The NatCat models are basically built for this [low-frequency] perils and nowadays we use it also for the frequency perils and the validation has to make sure that this is allowed because by definition the model is not intended to capture that much frequency." - Interviewee #16

The modeling challenge is further compounded by the limited availability of reliable and historical data for secondary perils, which is caused by their more recent development, uncertainty driven by climate change, and the inherent unpredictability as described above. Modelers are continuously working on developing new models and recalibrating existing models to better capture secondary peril risk, but several interviewees noted that this process is complex and marked by uncertainty, especially due to the nature of secondary perils.

> "Well, there is a lot of uncertainty in models. Models are based on historical data, so they're calibrated using many old events that have happened, and it's difficult then to use that to predict the future, especially when the underlying world we live in is changing. (…) In a way, you could just throw out all your old events because you can't really use them. You can use maybe the last five years to make guesses about the future, since in the past five years we've been somewhat affected [by secondary perils], but the models we've built and calibrated, all these modeling tools, they are based on losses going back 20, 30, 40, even 50 years." - Interviewee #2

In conclusion, calculating and predicting damages caused by secondary perils is currently not possible to do within the traditional frame with the same accuracy as for primary perils, and potentially developing models to reach the same accuracy is a complex and long process. According to interviewees the most prominent risk of not being able to model risks properly is mispricing. Too low prices will make secondary peril risks unprofitable since damages will exceed the premiums collected. Interviewees pointed out that if the model uncertainty is high, reinsurers can compensate for the uncertainty through a higher premium.

> "You can buffer this [uncertainty] with higher prices. But if the prices are too high, nobody will buy this, right? And that makes the things also not insurable." - Interviewee #11

However, as the interviewee indicated, due the inherent uncertainty with secondary perils and their models, this tactic might drive prices too high instead. Another interviewee explained this further:

> "[Traditional solutions] do not work [for secondary perils] only because the traditional way of pricing drives the prices to a point where it's not economic for the primary insurers to buy it. I mean, if you have enough information to price it, you can always come up with a price. But if the price is one that doesn't work for the primary insurers, then that becomes an issue." - Interviewee #6

Thus, using the price calculation logic in the traditional frame for secondary peril risks could potentially lead to primary insurers not being willing to buy NatCat reinsurance. Since NatCat reinsurance, as explained above, does not prematurely distinguish between types of risks, this would not only lead to primary insurers not buying coverage for secondary perils, but not buying coverage for primary perils as well. Thus, absorbing secondary peril risk into the traditional solutions would threaten profitability, which is not a viable solution.

In other words, secondary peril risks constitute an overflow (Callon, 1998) to the traditional frame, which is derived from, and contingent upon, calculable and predictable low-frequency events, because the traditional solutions are not built to cope with secondary peril characteristics. The characteristics of secondary perils lead to difficulties in pacifying the risk through the models used within the traditional frame, threatening the economization process (Çalışkan & Callon, 2009, 2010). Given that reinsurance cover is bought for NatCats in general, this could potentially lead to unprofitability not only for secondary peril risks, but also primary peril risks.

4.3. Protecting the traditional frame through exclusion

As argued in previous sections, secondary peril risks can be defined as an overflow to the traditional frame of managing NatCats. Interestingly though, the general consensus of the interviews was that, currently, this overflow is not particularly perceived as something negative nor uncontrollable. On the contrary, it was perceived as something manageable and even economically productive. Upon further investigation this positivistic perception appears to be attributed to certain market conditions and that the (re)insurance industry has, for the previous few years, been considered to be in what is called a "hard market" with increased attachment points. As indicated above, attachment points play a significant role in the traditional frame, acting as a device that more or less decides who, the reinsurer or insurer, will have to bear the losses caused by secondary perils. In the following sections we will firstly explore what is meant by a hard market, and subsequently why attachment points have increased and how these plays into dealing with the overflow of secondary peril risks.

4.3.1. Market cycles shaping the reinsurance industry

Interviewees explained how the (re)insurance industry is highly dynamic with what is known as "market cycles". The market is described as either "harder" or "softer", reflecting variations in pricing, available capital and distribution of risk between primary insurers and reinsurers. Price is explained as the primary factor which is directly correlated with market cycles. In Appendix F is a graph showing an approximation for how global prices of NatCat reinsurance programs have developed since the year 2000. A harder market entails increased prices for reinsurance coverage, thus being more favorable for reinsurers, while a softer market entails lower prices and being more favorable for primary insurers. As one interviewee explained:

> "In a harder market, there's probably more risk retained by the insurer, and the pricing for that risk is more costly. In a softer market the reinsurer assumes more of the risk at a relatively lower price per unit of risk. And then the pendulum swings depending on loss activity." - Interviewee #17

While interviewees pointed out that these cycles are often seen as key to understanding the market, interviewees also noted that they are not stable nor predictable. These cycle

shifts are contingent on a complex and dynamic interplay between the reinsurers, primary insurers, loss events, capital availability, competitive dynamics, capital market behavior, as well as broader economic and geopolitical conditions. This interplay indicates how reinsurers and their actions are embedded within the sociotechnical network, as discussed earlier. Given the complexity of the interplay, the timing of market shifts and each cycle's characteristics remain inherently unpredictable.

> "Those cycles can be affected by big events or just by shifting when participants start to drop out because for them it doesn't meet the margins anymore and that could just kind of shift then the supply side. But also on the demand side, you see those shifts." - Interviewee #6

Consequently, soft and hard markets are not fixed states, but temporary configurations of capital, pricing and risk-sharing. It is explained that a soft market occurs when there is excess capital in the market, typically due to limited large losses during a period. This increases competition among reinsurers, for example through new market players, leading to lower prices. If margins are low during a long period and large losses occur, the market becomes unfavorable for the reinsurers with less capital available, leading to reinsurers becoming more hesitant with offering reinsurance and prices increase. From a sociotechnical perspective, this suggests that the market is continuously shaped through an interplay between actors, such as capital availability, organizational entities and NatCats.

4.3.2. Increased attachment points reinforcing the traditional frame

As was mentioned above, the recent years' market was described as being hard with increased attachment points. As mentioned, attachment points were established as a general level being determined across the market. Importantly, interviewees highlighted that contractual elements such as attachment points are not mechanically determined by market cycles as price predominantly is but rather negotiated given the highlighted interplay within the sociotechnical network. However, in the most recent market cycle shift, these negotiations appear to have produced a significant increase in attachment points across the market.

At the start of the 2020s the market hardened due to a multitude of factors such as multiple large losses, decreasing available capital, increased severity of secondary perils, and inflation. While previously, a hard market as explained above has mostly entailed increased risk premium prices, this hardening also entailed reinsurers increasing their attachment points which effectively, despite their increased losses, excluded secondary perils from ReCo's NatCat programs.

> "During the [most recent] softening market, so before 2023, insurance companies were able to push more of their losses to reinsurers, and there was an abundance of capital. The market was in their [insurers] favor, it was a buyer's market, so they could get whatever they wanted. And they obviously don't want to pay a lot of losses. When there weren't also any large events to push up the attachment

> point to show that the attachment points were too low (...) the market allowed lower retentions, whereas with the hardening of the market since 2023, a lot has been changed structurally in the insurance and reinsurance space to say that the attachment point should be a bit higher because, yes, there's more frequency from a natural catastrophe perspective, but then also over the last couple of years with inflation and everything, your attachment points haven't moved to keep up with inflation for instance." - Interviewee #5

Another interviewee further explained:

> "There's also these market cycles in reinsurance. So, there was a hard market, with less capacity being on the market. (...) Maybe just as a figure example, [regarding severe hailstorms] there are cedants, so clients of ours, who had a retention of, let's say 5 million or 10 million euros, and then [between 2020 and 2024], their retention increased to 30 million. So, from five million to 30 million. And then you can imagine being hit by one event, a hit of five million versus a hit of 30 million. And it's driven by climate change because how hailstones develop and the size of hailstones are driven by climate change, but it's also the coincidence with the hardening market." - Interviewee #15

Thus, in the current market state, although losses from secondary perils are increasing, they remain, with few exceptions, lower per event than primary perils. Due to their higher frequency, however, accumulated losses may exceed those of primary perils but with regards to attachment points, it is the losses for each individual event that matters and secondary perils are individually falling below these levels. Consequently, the losses incurred by the secondary perils are often covered by the primary insurers, not reinsurers.

> "We pay a lot less of the losses, and they [primary insurers] keep paying a lot more of the losses, which has become a talking point as well, that reinsurance doesn't respond in the right way (...) Which, you know, reinsurance is supposed to, let's say as a general rule, take more of the larger losses and absorb the big impacts. And it's true that we [the market] haven't had a lot of large losses, therefore, we [reinsurers] shouldn't be paying a lot more of the losses." - Interviewee #5

In this sense, the overflow that secondary peril risks pose to the traditional frame was effectively handled by the market hardening and increase in attachment points, excluding the overflow from ReCo's traditional reinsurance programs. This can be considered driven by profitability reasons, as reframing the traditional frame to fit secondary peril risks (e.g. decreasing the emphasis on models) would not be a viable solution since this could threaten the profitable management of primary perils as well. Therefore, the traditional frame was instead reinforced with increased attachment points to protect traditional solutions and their profitability, while handling the overflow through exclusion. In relation to what Callon (1998) referred to as hot and cold situations, we argue the market conditions rendered this a cold situation, where the overflow could quickly be managed through sociotechnical actors "agreeing" on what needed to be done and interests were somewhat aligned. However, this seems to be changing. Interviewees indicated that they perceive primary insurers as becoming less satisfied with the

distribution of risk and losses, and there are pressures coming from the primary insurance side for reinsurers to do more.

> "We do need to be mindful that we need to stay relevant to insurers. If they feel that they're not getting what they're paying for, then that's something we should listen to. But effectively I would say that they pay more of the losses, and we pay a lot less of the losses as reinsurers, and that's something we still need to look at over time and make sure that we don't get too far removed from losses that therefore insurance or reinsurance isn't useful anymore." - Interviewee #5

This indicates that, while the exclusion protects the functioning and profitability of the traditional solutions through the increased attachment points, ReCo cannot just leave the issue of increased secondary peril losses to the primary insurers to manage on their own. This, since the primary insurer is still their client, and just as any company, one needs to listen to its customers in order to stay relevant and sustain a business. Additionally, as was described previously in the analysis, the general purpose of reinsurance is to support primary insurers in handling risks they cannot deal with all on their own. Excluding the overflow from the traditional frame does not mean that the change of the physical world and its impact on the social world has disappeared or is resolved. The issue of increased secondary perils still exists in the market and continuously shapes it. Thereby, the excluded secondary peril risks will still affect the reinsurers, just in different ways than before.

Simultaneously, the findings indicate that ReCo *wants* to engage with these secondary peril risks because risk is their core product and the consensus throughout the interviews was that secondary perils, despite their contrasting characteristics to primary perils, can be made profitable, perhaps just not solely through traditional solutions. This opportunistic mindset can be attributed to the profit-driven nature of reinsurers, a point emphasized by many interviewees. It was further indicated that this profit-driven mindset is what is driving new applications of already established solutions, as well as the development of new solutions.

> "Most of the time I spent at ReCo, we had a soft market, and the question at that time was always: 'okay, what does it need for the markets to get harder?' We were just, like, guessing what could turn it around. And what we learned at that time, and I think that fits in well with what we are doing, is okay, maybe we do something differently than just waiting for something to happen which we can't influence. So, we turned over every stone to find those points where we can offer value to our clients and I think that's the takeaway we take into the next cycle. We don't just think about how the cycles will move, but we're confident enough that we create the best solution for our clients" - Interviewee #14

Given this mindset of seeking opportunities to create value for their clients, while secondary perils' direct impact on the reinsurer is currently handled through exclusion, ReCo believe they can economize the overflow of secondary peril risks in other ways

than the traditional and do this in a profitable manner. These alternative solutions will be further explored below.

4.4. Alternative frames to economize the overflow

Interviewees described how there has been a significant development in the last two decades regarding the products and solutions ReCo can offer their clients. This was largely driven by ReCo's innovative and opportunistic mindset, as well as primary insurers expressing different needs. With the increased severity and frequency of secondary peril losses, which in a harder market falls mainly on primary insurers to cover, interviewees highlighted some aspects as to how this has changed the needs of primary insurers and consequently demand in the reinsurance market. They not only require more capital in order to cover the increased losses, but they also have an increased issue of higher volatility in their financial statements.

Alternative solutions, i.e. other solutions than the traditional reinsurance solutions, such as parametric solutions or structured solutions, have been around for a long time and used in multiple fields of reinsurance. However, the increased demand for solutions to manage secondary perils and the consequential issues they cause for primary insurers, have resulted in a wider area of application and increased use of these alternative solutions. This has expanded the toolbox ReCo has available to meet their clients' needs, as well as contributed to growth and profitability.

> "Being able to provide our clients with the structured and more individualized reinsurance solutions actually helps them deal with those issues. So, for us it's not just that we add earnings growth through [for example] structured solutions. We also help push our traditional business because we're able to deliver all of these solutions as a one-stop shop to the clients. So, I wouldn't say it has changed the business model in a way that we had to react to it, but it has changed the business model in a way that it has become a major component of the business model. - Interviewee #6

How alternative solutions, specifically parametric solutions and structured solutions, are able to help ReCo manage and economize the overflow and issues caused by secondary perils for the primary insurers will be explored in the following sections.

4.4.1. Parametric solutions – a frame less dependent on loss predictability

Interviewees suggested that one alternative to traditional reinsurance solutions is parametric solutions. This is similar to traditional solutions because the main idea is still pure risk transfer. However, there are a few key differences, making parametric solutions a good complement to traditional solutions in certain areas. As explained, for traditional solutions, you need specific data and a significant amount of data in order to model a price for the risk premium, and later in order to calculate the actual loss incurred. This means that the risk to be calculated have to be somewhat predictable, and there must be

a significant amount of data available, which holds for primary perils, but not secondary. Thus, as established, secondary peril risks are not possible to pacify into economic and tradable objects through traditional solutions.

With parametric solutions, the structure and thus the calculation methods required are explained to be more simplistic in comparison to traditional solutions, making this option suitable for areas or situations for which it is difficult to apply traditional reinsurance calculation methods. This simplified approach is described to be attributed to a few factors. Firstly, it is explained that compensation for a loss is paid solely based on a single predefined parametric. Such a parametric could be, for example, wind speed or earthquake magnitude, and once a set limit of that parametric is exceeded, compensation is paid regardless of actual loss incurred.

> "The way insurance works is: if you have a loss, you go to your insurance company, and your insurance company pays you your loss. If you damage your car, you go to a garage, the garage fixes it, and the insurance company pays the actual loss. This is called indemnity. You pay what has been damaged. You could approach it in a different way. For example, with an earthquake, you say you pay a loss if the earthquake in Tokyo has a magnitude of eight or higher. Very simple." - Interviewee #1

The same interviewee further exemplified:

> "In parametric, you don't have to count damages, you just pay because of a parameter. I'll give you an example why then it makes it a bit easier. Disney World Tokyo in 1996 or '7 (...) So I'm not sure if the trigger [Richter scale] was 8.0? When there is a large earthquake in Tokyo, the problem is not that the roller coasters are destroyed. It's not that expensive to rebuild the roller coaster. The problem is that people do not go to Disneyland, so they have a loss in income. A loss in income is very difficult to calculate, so they've taken the approach 'we do it very simple: If there's a large earthquake, I get two hundred million dollars.' There is, of course, a risk if now the earthquake is 7.9, you get nothing" - Interviewee #1

Moreover, this simplistic approach entails less types and amounts of data is required, and the data needed is less complex. Furthermore, for parametric solutions each party involved in the contract has access to the same underlying dataset regarding the parametric to be used, which is for example derived from remote sensing data from satellites or from weather stations. This results in data that is more objective and less prone to manipulation or separate interpretations by the parties involved as compared to traditional reinsurance.

> "So, the beauty in parametrics is that each party involved in a contract has, in principle, access to the same dataset. And many of these parametric structures out there are running on one selected variable, like the wind speed, or like the magnitude of earthquake, or like the amount of rainfall." - Interviewee #11

The interviewees further described that as these measures are solely weather based, these datasets often involve long and consistent time series which improves accuracy when assessing the risk. As established, for traditional reinsurance the data required is complex, with a multitude of factors, and highly related to calculations of specific probabilities. If you do not have enough data to make accurate calculations, adjustments may be made to prices to compensate for that uncertainty. However, on the parametric side, the data makes it possible to evaluate the price close to the actual risk you are pricing, i.e. the probability that the weather parametric will exceed the set limit.

Additionally, within traditional solutions the same event in the same place can cause different damages and thus payouts depend on other circumstances as well, such as preventative measures put in place, whereas the parametric approach would have the same payout no matter what.

> "When you're covering secondary perils on the traditional side, you're looking at real physical losses. And when you have a secondary peril event, for example, severe convective storms at a specific place you look at what is damaged. And here, besides the model, for example, the quality of the house which is standing in that area plays a role, but also other measures which maybe changed over the years. (...) Maybe they're doing adjustments, building new dams, reconstructing roads or so which make the thing which we want to insure much more resilient. [This] means: traditional side, same event, other loss. For us [parametric side] it would be: same event, same payout." - Interviewee #11

Taken together, these characteristics, such as relying on predefined triggers and more simplified data requirements, reduce the unpredictability and limited calculability that characterize the overflow that secondary peril risks cause to the traditional frame. Thus, we argue that managing NatCats through parametric solutions, is an alternative frame in which secondary peril risks do fit. As compared to the traditional frame with traditional solutions, this frame is not derived upon nor contingent on primary peril characteristics. This alternative frame thereby enables ReCo to reintroduce some secondary peril risks, which were excluded from the traditional frame, into their reinsurance offerings. More specifically, secondary peril risks can be reintroduced into the market since ReCo, with parametric solutions, is able to stabilize secondary peril risks through other types of models and data, and by packaging the risk in another way as compared to how primary peril risk is managed within the traditional solutions. Thus, despite failing pacifying processes within the traditional frame, secondary peril risks can be pacified through alternative frames. In other words, parametric solutions illustrate how the overflow of secondary peril risks can be partially recaptured but as a source of profit rather than a threatening overflow, not by absorbing it within the traditional frame, but by integrating it into another frame through alternative pacifying processes.

Importantly however, parametric solutions are not described as a perfect substitute to traditional solutions in general, and this is also highlighted regarding secondary peril risks. One main aspect is the "basis risk", explained as the risk that the predetermined

level of payout does not match the actual losses incurred. While some clients regarding certain risks or areas may be fine with this mismatch, others may not find this a valuable product offering. For example, parametric solutions are highlighted to have the added benefit of a faster payout, as no loss evaluation needs to be made. This may then be highly valuable for clients in certain areas, for example in areas with high financial instability where the basis risk is worth the quicker payout, while in other areas it is not.

Additionally, just as with traditional solutions, the high frequency of secondary perils can cause uncertainties within the parametric approach as well.

> "It always becomes more complex when you want to go into that higher frequency area. Because when you're looking on a more catastrophic cover – [with] low frequency, high severity – so if your triggers to define this event are very catastrophic, there's the risks that you over- or underestimate the event which occurs, is lower than if you'd want to try to apply a cover in the more frequent space. Because if you look on a more frequent cover, the probability that you over or underestimate one of these smaller things is much higher." - Interviewee #11

Thus, while the modeling uses less complex data, it is not a completely perfect fit. Nonetheless, these limitations do not negate the relevance of parametric solutions in helping to address secondary peril risks where traditional solutions cannot, and interviewees highlighted that this is a growing area for ReCo.

> "And when it comes to these secondary perils, it's an area of growth for parametric covers, because many of these secondary perils, like severe convective storms in the U.S., have formerly not really been covered. [Same with] overall storm capacity or NatCat capacity, the traditional one is limited in the U.S. market. And then many insurers see a chance to get coverage via parametric covers for these things like severe convective storms or also floods, et cetera." - Interviewee #11

This highlights how parametric solutions, despite their limitations, create new opportunities for being able to insure secondary perils that do not fit into the traditional frame. In this sense, they reflect an ongoing use of multiple frames through which NatCat risks are understood and managed in practice.

4.4.2. Structured solutions – a frame for managing financial consequences

Another such alternative frame which interviewees indicated can be used when the traditional frame cannot, is structured solutions. Interviewees agreed that structured solutions are helpful in multiple ways and areas, and as with parametric solutions, they help fill the gaps where traditional solutions cannot be optimally applied to achieve what the primary insurers need.

> "Structured solutions just expand the toolbox of what we can do to help a client. If their solvency is an issue, if that's the main thing that they want to solve, then structured solutions are probably a better play than a traditional [solution] that we would provide. (...) So yes, it definitely expands the toolbox and it provides [ReCo] with more avenues of income." - Interviewee #5

Compared to pure risk transfer in traditional solutions and parametric solutions, structured solutions are more of an accounting-based financial service helping primary insurers stabilize their balance sheet and income statement, as this may be important towards investors and other stakeholders. Thus, this does not require the same calculations and logic as the traditional solutions for which the secondary peril risks are not compatible with.

> "But with a structured solution, the risk transfer between us and the insurance company is not the same [as with traditional reinsurance]. Simplified, you could say that we try to smooth the insurer's results, but they pay for the losses over time in a different way. For example, you might lock them into a slightly longer contract, and then they experience a large loss in the first year. We step in and pay it, but then get repaid in years two and three, allowing the insurance company to smooth its results. So, in the year when the big loss occurs, the impact isn't as large, but in return they pay more for the reinsurance, as already agreed when the contract was written, during years two and three. In that way, the results are smoothed out. But over time, the insurance company effectively pays more of its losses itself, while we take on less risk in return and therefore need a smaller margin." - Interviewee #2

Importantly, as the interviewee stated, the insurance company is still the one who pays for the loss, they are just able to do it in a more stable manner over multiple years to smoothen their results thanks to the reinsurer supporting with temporary coverage within the contract time period.

> "In case of a loss, the cedent almost pays the loss by itself. But if nothing happens, they also get the money back, and we only keep a small margin to cover our costs." - Interviewee #4

In the case of secondary perils, structured solutions help primary insurers deal with the consequence of earnings volatility that primary insurers are subject to when secondary peril losses increase and they are the ones responsible for covering them.

> "So, with the increase of retention, they wanted more protection for frequency, which with secondary perils, you have a lot more frequency, which then affects their results. Then structured solutions is the perfect solution for that." - Interviewee #5

As one interviewee further explained:

> "[Primary insurers] also saw the frequency of these [secondary] events, so they bought more of these covers. Because for the very severe events they have their traditional reinsurance program. But for the frequency, they normally buy the structured covers because it's very difficult to price traditionally." - Interviewee #4

To conclude, structured solutions can be viewed as yet another alternative frame in which secondary peril risks can be managed, but in a different way than the parametric solutions frame. Here, instead of managing secondary peril risks directly through pure risk transferring, ReCo is able to pacify and economize the *consequences* that the excluded overflow causes for primary insurers, namely earnings volatility, through different

contractual arrangements. In doing so, they do not eliminate the overflow itself but instead position themselves as key actors in managing its consequences, allowing them to still capture value from risks that have formally been excluded from the traditional frame.

4.4.3. Complementary frames to manage a new reality

Evidently, even though the overflow of secondary peril risks was excluded from the traditional frame, ReCo still engages with these risks given their profit-driven mindset, as well as pressure from the market to still help in dealing with the increasing secondary perils and its consequences. ReCo is innovatively able to manage part of the overflow through an alternative parametric solutions frame and its consequences for primary insurers through an alternative structured solutions frame. In this way, risks that do not fit into the traditional frame are simply not excluded but gradually redistributed into alternative solutions. Given the rise of alternative frames in which the overflow of secondary peril risks has been economized through new pacifying processes (Çalışkan & Callon, 2009, 2010), we argue, in line with Callon (1998), that the overflow has been somewhat productive. We, however, emphasize that the ability to productively exclude and redistribute the overflow is contingent on broader market conditions and that ReCo, among other sociotechnical actors within the network, plays a part in shaping these conditions.

ReCo is able to serve its purpose of managing "large NatCat losses" and economizing the NatCat risk through, primarily, three complementary frames; the traditional frame where primary perils are economized through traditional solutions, and the two alternative frames where secondary peril risks and its consequences are economized through parametric solutions and structured solutions respectively. Importantly, all three frames are actively affecting and interacting with each other, as demand for the alternative frames can be deemed dependent on what the traditional frame covers and not.

> "I would say it depends on the market cycle, so how much capacity there is, and then [sometimes] traditional is fine, sometimes you just need all the other aspects a little bit more. And right now, since the market for reinsurance is rather hard, we focus on the other aspects more. And if it's getting softer, you can focus more on the traditional business." - Interviewee #9

However, as indicated by this interviewee, and throughout this whole analysis, this is not a stable solution. We previously argued that the efficient manner in which the broader market conditions aligned, suggests this is a cold situation, as Callon (1998) would describe it. Nonetheless, the reinsurance market is continuously changing, and NatCats and its effects, especially secondary perils, are continuously evolving in scope and nature due to climate change and socioeconomic factors. Therefore, coupled with the impending softening of the market, it might very well be the case that a hot situation could occur, causing more overflows and making it more difficult to manage them productively.

> "The world's becoming more and more complex, and more and more different types of risks are coming up. So yes, we have to keep up with helping clients and staying true to clients. That's one of our main values and missions. (...) So even if we have the toolbox, as I said, of like structured solutions, parametric, a cyber digital team, et cetera, at the core of it all, we want to do reinsurance. (...) But over time, you have to keep up with the market and provide more and more services." - Interviewee #5

4.5. An increasingly uncertain future

In line with our constructionist approach, we argue that the (re)insurance market is a complex interplay between actors within the sociotechnical network, thus, it is safe to say that the current NatCat situation and how this has been managed by reinsurers and the market overall, will continue to change. NatCats and their losses will continue to evolve given climate change and socioeconomic factors, but no one can predict in what way, especially given things like effects of tipping points or mitigation efforts.

> "The tricky thing is that we're in a world where you don't really know whether you're looking at an exponential curve or not. And that makes it difficult. That's the challenge here. You simply don't know where it's all going to end." - Interviewee #2

ReCo is currently able to exclude secondary perils from their NatCat programs through the high attachment points, while also finding growing opportunities to offer profitable alternative solutions. However, it was also frequently indicated that no matter how much you try to adapt solutions to stay relevant and profitable in the market, the (re)insurance market cycles and other sociotechnical actors (e.g. NatCat characteristics, and the behaviors of other market players) heavily influence profitability, relevance and capacity, and it is inherently difficult to predict how these interactions will shape the market. The only thing that can be known for sure is that the market will keep evolving and changing in ways never seen before, which opens up for a hot, as opposed to cold situation, to emerge, for new overflows to happen, and for traditional and alternative frames to be challenged. Throughout the interviews, there has been indications that some shifts are already happening, which might alter the current situation and how it is managed.

It has been mentioned how the market has, until just recently, been considered to be quite hard, with the last few years being favorable for ReCo and other reinsurers, with high premium prices as well as high attachment points. During the past few years, more capital has become available to the industry, and interviewees expressed that the market seems to be starting to soften. This can also be seen in the graph with an approximation of global NatCat reinsurance price in Appendix F, where in 2025 prices decreased slightly. Even though no further or more dramatic changes have been observed yet, interviewees anticipate that things are about to change in the near future.

However, as explained, each market cycle has its own characteristics, and it is difficult to predict what will happen. Following the analytical logic laid out in this analysis regarding overflow of secondary peril risks, there are a few analytical projections that could be made. Importantly though, these projections are purely hypothetical as the market cycles are highly dynamic, and are affected by many factors, some of which may not even be known.

Firstly, a softening market may put pressure on the reinsurers to lower the attachment points of their NatCat programs. In previous market cycles it has mainly been the price that has been affected, but in the recent change, where the market went hard around the 2020s, conditions such as attachment points changed as well. This indicates that further changes to this could be possible in future cycle changes as well. If the attachment points were to get low enough, this would likely result in a scenario where secondary perils are automatically included within the traditional frame and forced to be managed through traditional solutions.

> "For example, if you have a NatCat cover in a country, and you feel there are secondary perils, in a hard market, we mentioned in our contracts [secondary perils] would be entirely excluded or supplemented, but in other market phases, when everything gets softer, you are not sometimes able to exclude them [secondary perils]. (...) In the last renewal [beginning of 2026], there was negotiation on the price, but not on the conditions, so there was no new element coming in. But that might turn, in the next few years, to be the case." - Interviewee #14

In other words, in a softer market, reinsurers may no longer have the same possibility to exclude the overflow of secondary peril risks from their NatCat programs. Consequently, protecting the profitability of the traditional frame and successfully redistributing the overflow to alternative frames may be altered given changes in broader market conditions. This means that reinsurers might have to find even more/other alternative frames to manage secondary peril risks.

Interviewees agreed that it would not be favorable for ReCo to cover secondary perils through traditional solutions, considering the consequences of the misfit with the traditional solutions. However, they emphasize that it is ultimately a question of price. If the reinsurers are going to cover more of the inherently uncertain secondary perils, they will have to increase the premium charged to the primary insurers.

One interviewee emphasizes that, hypothetically, increasing prices to the point where certain perils become practically uninsurable is not a viable option. This is not only because of the societal consequences of a certain area or risk not being insurable, but it also threatens the logic of diversification for the (re)insurance industry.

> "As I see it, that's an economic risk for us. If we lose regions, we lose the money, we lose the diversification, and then your risks get more condensed on specific other areas." - Interviewee #9

The interviewee indicated that when diversification fails, profitability is threatened for all perils, not only the ones excluded. Thus, managing secondary peril risks within the traditional frame, with increased prices to compensate for high-frequency and uncertainty, could pose a threat to the fundamental reinsurance logic, prompting a need to find other solutions. Hypothetically, one such solution may be that the attachment points are then once again increased to exclude the secondary peril risks from the traditional frame. This repeated cycle connects to one interviewee who argued how, logically, the market cycles should get shorter and flatter due to increased severity and frequency of the losses, since the losses are something that turns the market. However, as previously mentioned interviewees also emphasize the unknown nature of market cycles.

> "It's hard to say if those cycles are changing in the dynamics in terms of are they getting longer or shorter because every cycle has their own characteristics" - Interviewee #6

Ultimately, this underscores the complex, interconnected, and everchanging nature of the (re)insurance industry, where shifting risk characteristics and increasing uncertainty challenge established frames and demands the need for organizations to pay close attention, and continuously find new approaches to understanding and managing risk.

> "And this [the world] is evolving anyway because of changing risks. But if you want to stay in the game, you need structured solutions, you need parametric solutions, (...) and you need traditional reinsurance. To take care of societies, to ensure we are still able to work and earn money and grow somehow. So, if insurance is done, the economy is done." - Interviewee #9

5. Discussion

The aim of this study was to explore how emerging and complex risks, which do not fit organizations' established risk management systems, are acted on given their strategic relevance. To address this, we conducted a single-case study of a global reinsurance company focusing on the changing risk landscape of secondary perils, a context in which continuous engagement with, and economization of, risks are central. Drawing on Callon's (1998) sociological framework of framing and overflowing complemented by Çalışkan and Callon (2009, 2010), the study analyzed how the development of secondary perils affected traditional risk management practices and how these effects were managed.

We argue that our thesis brings two primary contributions to the research area of risk management within accounting literature. Firstly, we contribute to literature on risk management systems by showing that the limitations of established risk management systems do not necessarily lead to system adaptation, undermined flexibility, or unmanaged risk. Rather, it may also result in excluding strategically relevant but non-fitting risks from established systems and redistributing them into alternative systems through which they can be profitably managed. Secondly, we extend prior literature on risk as an object by demonstrating that the ability to exclude and redistribute these risks is shaped through broader market dynamics, within which organizational actors recursively shape and are shaped by evolving market conditions.

5.1. Managing risks beyond established systems

There is extensive previous research on risk management systems, highlighting both their development and role in structuring and coordinating risk management, and their inherent limitations. In particular, this literature shows how such systems rely on and prioritize standardized and calculative representations of risk, while excluding more complex, emerging, and unique risks that do not fit these formats (e.g. Arena et al., 2017; Hall & Fernando, 2016; Jemaa, 2022; Miller et al., 2008; Power, 2009; Tekathen & Dechow, 2013; Themsen & Skærbæk, 2018). Existing studies primarily examine these tensions from a system-centered view, focusing on how organizations attempt to adapt established systems to incorporate these non-fitting risks (Arena et al., 2017; Jemaa, 2022; Themsen & Skærbæk, 2018).

We extend this literature by shifting analytical focus from the risk management system itself to the trajectory of the risk. In doing so, we show that organizations do not necessarily have to adapt established risk management systems to accommodate non-fitting but strategically relevant risks. Instead, organizations might be able to exclude such risks from the established systems to protect their functioning and redistribute the risks into alternative systems through which they can be profitably managed.

Our empirical findings demonstrate that secondary peril risks did not align with the calculative logic underpinning the traditional reinsurance frame and therefore could not be effectively accommodated within the traditional risk management system. More specifically, we find the traditional frame to be organized around calculative practices, relying on established models and relatively stable and predictable loss patterns. Risks characterized by greater volatility and uncertainty disrupted these underlying assumptions, thereby overflowing the existing frame and challenging its capacity to manage such risks through established practices and solutions. This supports existing literature showing that established risk management systems favor certain risks while struggling to accommodate others (Arena et al., 2017; Power, 2009; Tekathen & Dechow, 2013; Themsen & Skærbæk, 2018). Furthermore, this phenomenon can be understood through Maguire and Hardy's (2013, 2016) concepts of normalizing and problematizing riskwork. Primary perils can be seen to represent what Maguire and Hardy (2016) call established risks with a widely accepted understanding of how it should be understood and managed, whereas secondary peril risks seem to constitute emerging risks characterized by uncertainty regarding how they should be understood, calculated and managed. The traditional frame can be understood as a form of normalizing riskwork, with highly routinized and calculative practices, to accommodate the established risks. In contrast, incorporating secondary peril risks would require a shift toward more uncertain and problematizing forms of riskwork, where assumptions, classifications, and existing calculative practices are continuously questioned and renegotiated.

Consequently, to avoid this potential disruption to the established system, secondary peril risks could not be incorporated into the traditional risk management system. Importantly though, secondary perils were still deemed strategically relevant by ReCo and could not be left unattended, supporting that risk relevance is not solely determined by established risk management systems (Mikes & Okamura, 2024; Power, 2009). This highlights the misalignment found in prior literature between what risks the established risk management systems recognize and accommodate, and what risks organizational actors deem relevant (Arena et al., 2017; Jemaa, 2022; Themsen & Skærbæk, 2018). These studies further find that said misalignment often undermines the systems itself (Arena et al., 2017; Themsen & Skærbæk, 2018) or leads to attempts to modify the systems in order to accommodate the risks that do not fit (Jemaa, 2022). Our findings partially support this by indicating that adapting the established risk management system to accommodate secondary peril risks would threaten the functioning, efficiency and profitability of the existing system. However, we also contrast these findings by demonstrating that rather than adapting the established risk management system to incorporate non-fitting risks, organizations may protect the functioning, effectiveness and profitability of established systems by maintaining existing frame boundaries. In our findings, ReCo actively reinforced and protected its traditional system by excluding secondary peril risks from the traditional frame since its effectiveness and profitability was contingent on maintaining the calculative stability around established primary peril risks.

However, excluding secondary peril risks from the traditional frame did not imply that these risks were ignored or left unmanaged. Rather, the exclusion itself created a need to engage with these strategically relevant risks through alternative solutions outside the traditional system. In this sense, our findings shift analytical attention away from how organizations adapt established systems toward how non-fitting risks themselves continue to be managed once excluded from said system. This is particularly interesting in light of prior literature suggesting that the design of established risk management systems may undermine flexibility, limit meaningful risk discussions and collaboration, and generate new forms of uncertainty (Hall & Fernando, 2016; Miller et al., 2008; Power, 2009; Vinnari & Skærbæk, 2014). Furthermore, prior literature proposes such systems may also undermine flexibility by reinforcing reliance on historical practices and path-dependent behaviors, leading organizations to stay on course even when adaptation is needed (Kaplan & Mikes, 2016; Tekathen & Dechow, 2020). Our findings partly support these concerns, as secondary peril risks do challenge the assumptions underpinning the traditional frame and could potentially undermine its functioning and profitability if incorporated directly into the traditional system. However, rather than leading to reduced flexibility, the perceived misfit between secondary peril risks and the traditional frame instead prompted a flexible and innovative approach to managing these risks outside the traditional frame.

Our findings demonstrate how secondary peril risks were redistributed into complementary solutions operating alongside the traditional system. One such solution was designed to accommodate the characteristics of secondary perils by being less reliant on predictable loss data, while another reconstructed the risk and economized the consequences generated by increasing secondary peril exposure for primary insurers, rather than the secondary peril risk itself. Both these alternative solutions were deemed successful and profitable. These actions could be argued to be in line with the concept of dual risk management (Arena et al., 2017), where calculative and established systems are combined with more interactive and flexible practices (Kaplan & Mikes, 2016; Power, 2009; Tekathen & Dechow, 2013). However, in the case of ReCo, these more interactive and flexible practices are still highly calculative given the calculative enthusiastic mindset (Mikes, 2009, 2011; Power, 2005) of the reinsurance industry.

To conclude, our study contributes to the literature on risk management systems by showing that the limitations of established risk management systems do not necessarily result in either forced system adaptation, undermined flexibility and collaboration, or unmanaged risk. Instead, organizations may maintain the existing system to protect its effectiveness in managing other risks, by displacing non-fitting but strategically relevant risks into alternative systems through which such risks can be managed, economized and turned into opportunities for value creation. Importantly, though, the ability to exclude these risks and redistribute them into alternative systems is contingent on market conditions shaped by the sociotechnical market, which will be discussed below.

5.2. The ability to manage risk is influenced by market dynamics

Prior accounting literature on risk objects conceptualizes risk as socially constructed through processes such as interaction, framing, valuation and discursive work (Boholm & Corvellec, 2011, 2016; Brivot et al., 2017; Maguire & Hardy, 2013, 2016; Samsonova-Taddei & Humphrey, 2015). From this perspective, what constitutes a relevant risk and thus how to respond to it is not predetermined but emerges through sociotechnical processes in which human and non-human actors collectively shape how potential threats and opportunities are interpreted and understood.

We contribute to this prior literature by highlighting how the ability to act upon strategically relevant risks is contingent on broader sociotechnical market conditions. More specifically, we show that the ability to exclude risk from one risk management system and redistribute it to alternative ones depends on market conditions, which themselves are continuously shaped through interactions between actors such as market players, calculative devices, and changing risk landscapes.

This dynamic is illustrated in our empirical findings in how ReCo was able to exclude secondary peril risks from traditional reinsurance solutions because of the increasing attachment points, which effectively removed lower-severity secondary peril losses from traditional reinsurance programs. At the same time, reinsurers continued to act upon these risks by displacing secondary peril risks into alternative solutions, such as structured and parametric solutions, through which secondary peril risk and its consequences could be economized and managed. Importantly, both these actions were contingent on broader market conditions allowing them to occur. These market conditions include increasing secondary peril losses, inflation, reduced capital availability, market cycles, client pressure, bargaining power, and calculative devices. However, our findings suggest that these market conditions are not merely external enablers or constraints. Rather, in line with a sociotechnical network perspective, these market conditions are also continuously shaped through interactions between sociotechnical actors, such as market players, calculative devices and the changing risk landscape. Given the high concentration of the reinsurance market, studying one of the largest reinsurers makes these market-shaping abilities particularly visible. For example, we observed that although broader market developments enabled, and somewhat required, the increase in attachment points, reinsurers themselves also made the choice to increase them, which further shaped the market. Similarly, some of the very conditions that justified these increasing attachment points, such as capital availability, had also been partially shaped by reinsurers' own prior actions, such as maintaining low prices and relatively low attachment points over a long period of time despite increasing NatCat losses. These actions, however, are not independent from other market conditions. Evidently, there is a recursive market-shaping dynamic.

These findings can be further understood in relation to prior accounting studies examining how risk and risk management are constructed through interactions between organizational actors within the sociotechnical network (Brivot et al., 2017; Samsonova-Taddei & Humphrey, 2015). For example, Brivot et al. (2017) demonstrate how experts actively frame certain issues as risks and promote corresponding risk management solutions to clients. Similarly, our findings indicate that ReCo, through actions such as participating in negotiations leading to increased attachment points, contributed to shaping how secondary peril risks were managed in the market. This resulted in primary insurers being increasingly required to retain secondary peril risks themselves, increasing the demand for alternative solutions capable of managing the resulting financial consequences. Subsequently, ReCo, in interaction with other sociotechnical actors, positioned structured solutions as appropriate responses to these changing needs. Thus, in contrast to Brivot et al. (2017), who primarily emphasizes intentional framing by experts, our findings suggest that these processes are not solely deliberate acts of framing. Rather, interpretation of risk and appropriate risk management solutions are recursively emerging through broader industry dynamics in which organizational actors, together with other sociotechnical actors, simultaneously shape and are shaped by evolving market conditions. ReCo's actions for handling secondary peril risks were therefore neither solely strategic nor solely reactive. Instead, those actions emerged through the recursive interaction between strategic organizational actions and changing market conditions, which together created new opportunities to reconstruct, economize and manage secondary peril risks through alternative solutions.

Furthermore, while Samsonova-Taddei and Humphrey (2015) find how interactions between sociotechnical actors may be characterized by competing risk constructions that generate ongoing negotiations and contested understandings, our findings suggest that the recent market dynamic have instead facilitated a relatively broad consensus over how secondary peril risks should be managed. However, as indicated in the empirical analysis, changing market may destabilize this consensus and open up for struggles between actors within the sociotechnical network on how these risks should be understood and managed.

To conclude, while prior studies acknowledge the role of the sociotechnical market, they often foreground how actors construct and frame risks within organizational interactions (Boholm & Corvellec, 2011, 2016; Brivot et al., 2017; Maguire & Hardy, 2013, 2016; Samsonova-Taddei & Humphrey, 2015). We contribute to this existing literature by highlighting the importance of the recursive processes where sociotechnical actors collectively shape market conditions and are themselves shaped by such conditions. This dynamic is influencing organizational actors' risk management practices, more specifically their ability to exclude and redistribute risks that do not fit into established risk management systems.

6. Conclusion

To summarize, the purpose of this study was to examine how organizations engage with and manage risks emerging from a changing risk landscape, which are deemed organizational relevant but do not fit into established risk management systems. We have answered this research question by conducting a qualitative single-case study at a global reinsurance company, ReCo. The study has applied Callon's (1998) concept of framing and overflowing, complemented by Çalışkan and Callon's (2009, 2010) notions of economization and marketization, and particularly the process of pacifying goods. We have empirically explained how risks that do not fit into established risk management systems constitutes an overflow, and how this overflow can be excluded from the existing frame but still engaged with and managed through alternative frames in which the risk can be economized.

This study contributes to the existing literature on risk management in two ways. First, it contributes to literature on risk management systems by shifting analytical focus from the systems to the risk itself, showing that risks which do not fit established risk management systems, can be purposefully excluded from such systems to protect functionality and profitability, and efficiently managed through alternative systems. This deepens the current understanding of how risk management operates within *and* beyond established systems in practice. Second, the study highlights the importance of market dynamics in understanding risk as an object and how to manage these risks. We find a recursive process of sociotechnical actors collectively shaping market conditions, while also being shaped by such conditions.

6.1. Practical implications

The findings of our study have several practical implications for the (re)insurance industry. More broadly, the study suggests that managing strategically relevant risks is not only about incorporating all risks into one comprehensive risk management system. Organizations may also protect the effectiveness of existing systems by excluding risks that do not fit, while simultaneously developing alternative ways of managing such risks.

For reinsurers, this highlights the importance of combining stable traditional systems with product innovation and flexibility. When emerging risks, such as secondary perils, no longer fit traditional reinsurance solutions, reinsures may benefit from developing complementary solutions for managing such risks, rather than forcing them into the traditional solutions. These alternative solutions may enable continued engagement and potential profit from risks that would otherwise be uninsurable and/or unprofitable.

For the (re)insurance market as a whole, it becomes important to understand how the market dynamics influences risk management practices. For example, the attachment

points do not eliminate risk but redistribute it, requiring new ways to organize in the market to collectively manage the risk. Importantly, the findings also highlight that all actors in the market, for example reinsurers, primary insurers, models and the changing risk landscape, collectively shape and are shaped by the market conditions enabling these actions. These recursive processes should be acknowledged and understood in constructing risk management practices.

6.2. Limitations

This thesis is a qualitative single-case study of a reinsurance company, drawing on interview data with 17 employees and several documents, mainly provided from the case company. This approach was chosen to gain an in-depth understanding of an emerging and complex phenomenon, where existing research is limited. However, the chosen research design also entails certain limitations.

Firstly, the limited number of interviews and documents, as well as the interviewee sample consisting of mainly senior employees, might lead to certain biases. For example, there could be differing perspectives on the phenomena and risk management practices at different hierarchical levels in the organization. Furthermore, despite interviewing employees from the head office and two branch offices, it was evident that the employees predominantly had a European and/or U.S. perspective, which might bias our findings, leading to overrepresentation of certain areas where risk behaves in a certain way, and underrepresentation in others.

Secondly, while the studied phenomenon affects the broader (re)insurance industry, our analysis is based on the perspective of a single actor, which may limit the extent to which our findings capture the full range of industry dynamics and how other industry actors experience or respond to the given phenomenon. Moreover, our findings may be contingent on our particular context in which risk is the core product. Other, less risk-seeking contexts may prove different dynamics depending on how they wish to interact with risk, which might limit the generalizability of our results to other industries.

Thirdly, climate change is a complex and evolving phenomenon, and its broader consequences remain difficult to fully understand. As such, the observed dynamics may change over time and depend on specific market conditions. This also raises a broader critical point, namely that it is difficult to distinguish long-term structural changes from temporary market responses. Furthermore, since our study partly relied on retrospective accounts, the interview data may be subject to retrospective bias.

Lastly, following the interpretivist approach adopted in this thesis, it is implied that the findings are shaped through the interaction between researchers and interviewees. Despite efforts undertaken to mitigate reactivity and researcher bias, the way the research topic was framed and communicated to the interviewees may have influenced the results.

6.3. Future research

To mitigate the aforementioned limitations and to broaden the research within this topic, we suggest a few avenues for future research. Firstly, we recommend future research to focus on extending the empirical scope in order to assess the transferability and robustness of the findings across the (re)insurance industry. This could entail further case studies on reinsurers, primary insurers, brokers, end customers and/or regulators, as well as comparative studies across these actors. Given that the identified market dynamics involve redistribution of risk across the market actors, exploring multiple perspectives would provide a more comprehensive understanding of the phenomenon and the market dynamics surrounding it.

Secondly, future research could extend the analysis across different industries to test the generalizability of the observed processes of excluding risks from existing risk management systems and re-engaging with such risks through other risk management systems. This would be particularly interesting in industries where risk is not the core product and thus not a duality of harm and benefit as defined by Bednarek et al. (2021). Additionally, future studies could explore different types of risks, especially emerging and rapidly changing ones, to assess whether the identified dynamics are specific to NatCat and secondary peril risks or reflect a broader pattern in responses to complex and unique risks.

Lastly, as we concluded at the end of the analysis, the risk landscape is continuously evolving, and our empirical findings point to both the risk characteristics and thus the current risk management practices being subject to rapid and significant change. In particular, shifts in climate patterns and potential tipping points may significantly alter the current risk management practices and product offerings. It would also be valuable for future research to further disentangle the effects of climate change from other influencing factors. Future research could therefore adopt a longitudinal approach to extend the understanding of how these risks and processes develop over time and how market actors adapt their actions in response to the changing risk landscape.

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Appendices

Appendix A – List of documents

#	**Document**	**Year / Date**
1	Walkthrough of NatCat Modeling Process and Excel sheets	March 26, 2026
2	Case Company PowerPoint, Insurance-Linked Securities (exclusively made and presented to the authors)	2026
3	Reinsurance broker's Renewal Report (external document)	2025/2026
4	Case Company PowerPoint, Company description and product offerings	2025
5	Case Company PowerPoint, Reinsurance market cycles and the future	2025
6	Case Company PowerPoint, Parametric Solutions	2025
7	Case Company PowerPoint, Advanced Solutions	2025
8	Case Company Sustainability Report	2023
9	Employee-written article on Insurance-Linked Securities	2013

Appendix B - Context interviews with external parties

Relevance	**Date**	**Format**	**Duration**
Reinsurance & Climate Change Expert	Feb 17, 2026	In-person	107 min
Insurance Broker	March 2, 2026	In-person	52 min
Reinsurance Manager at Insurance Company (ReCo's Client)	March 3, 2026	In-person	72 min
Finance and Climate Data Expert	March 4, 2026	In-person	53 min

Appendix C - Case company interviews

#	**Position**	**Area of expertise/main interview focus**	**Date**	**Format**	**Duration**
1	Managing Director	Insurance-Linked Securities	Feb 3, 2026	Online	67 min
2	Senior Underwriter	Traditional Solutions	Feb 4, 2026	In-person	60 min
3	Senior Controller	Finance and Accounting	Feb 4, 2026	In-person	53 min
4	Senior Underwriter and Actuary	Advanced Solutions and Traditional Solutions	Feb 18, 2026	In-person	60 min
5	Underwriter	Traditional Solutions P&C	March 10, 2026	Online	50 min
6	General Manager	Strategy and Sustainability	March 18, 2026	In-person	79 min

7 & 8	(7) Team Manager and (8) Controller	Valuation, Analysis and Planning	March 18, 2026	In-person	60 min
9	Sustainability Specialist	Sustainability	March 19, 2026	In-person	58 min
10	Executive Board Member		March 19, 2026	In-person	30 min
11	General Manager	Parametric Solutions	March 19, 2026	In-person	52 min
12	Executive Board member		March 20, 2026	Online	30 min
13	General Manager	Property & Casualty	March 20, 2026	In-person	50 min
14 & 15	(14) General Manager and (15) Underwriter	Structured Solutions	March 20, 2026	In-person	46 min
16	Actuary	NatCat Modeling	March 26, 2026	Online	80 min
17	Managing Director	NatCat	April 15, 2026	Online	36 min

Appendix D - Interview guide with sample questions

Background

- Could you briefly describe your role and responsibilities within the organization?

Changing risk landscape

- How would you describe the development of natural catastrophe risk in the reinsurance market over the past decade? How has this affected primary insurers and reinsurers? Please provide examples.
- In what ways, if any, do secondary perils differ from primary perils?
- What is your view on uninsurability?

Challenges posed by changing risk landscape

- What challenges do increased secondary perils create for reinsurers (and in the industry in general)? E.g. in terms of risk management, modeling and underwriting perspective?
- How well/not well do traditional reinsurance structures apply to the growing secondary perils?

Response strategies

- When risks don't fit standard reinsurance solutions, what do you typically do in practice?
- How has the industry/reinsurers responded to the challenges of changing risk landscape/increased secondary perils? E.g. in terms of risk appetite, underwriting practices, attachment points, new solutions etc.?

- Is there disagreement within the industry about how secondary perils should be handled and who should handle them? If so, why and how is this disagreement handled?

Strategy, business model and rationale

- Do you see these new types of solutions and offerings as changing the role of reinsurance, or more as complementing and extending traditional solutions?

Future

- How do you expect the role of secondary perils to evolve in the coming years?
- How important are alternative solutions for the future of the reinsurance industry?

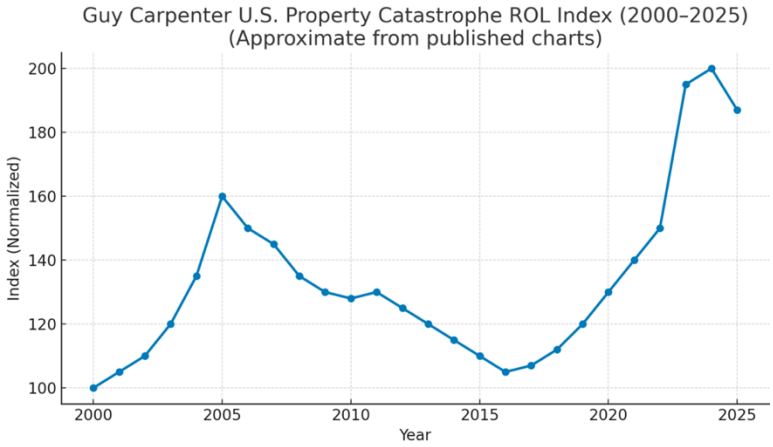
Structured solutions team/parametric solutions team

- Can you explain what structured/parametric solutions are and why they have increased in use?
- What problems do these solutions aim to solve for primary insurers? How have clients responded to these types of products?

Appendix E - List of site visits and informal meetings

#	Type	Date	Format
1	Regular meetings with our contact person (Branch Manager)	6 meetings and consistent written communication between January and May	Online
2	Stockholm Branch Office Visit	February 4 and February 18, 2026	In-person
3	Head Office Visit (Europe)	March 18 to March 20, 2026	In-person
4	Lunch together with an employee from the Strategy Team	March 18, 2026	In-person
5	Dinner together with 4 employees, including Strategy, Controlling and Sustainability Team members	March 18, 2026	In-person
6	Lunch with employees from the Structured Solutions team	March 20, 2026	In-person

Appendix F - Property Catastrophe Rate On Line (i.e. an approximate for global NatCat reinsurance price)



Appendix G - AI disclosure

In order to improve this thesis, we have utilized several AI tools. In the following disclosure, we will outline which tools and in what way they have been used.

In the beginning of the thesis process, we used SciSpace and ResearchRabbit in order to get a surface-level understanding of existing academic articles within our research area. A prominent risk with these types of tools is inaccurate summaries and insufficient suggestions. Given this, we only used these tools to get started. Once we got a better understanding of our research field, we used Scopus and accounting journals to manually find articles instead. We utilized ChatGPT for summarizing and understanding literature throughout our thesis process. However, due to the risk of AI misinterpretations or hallucinations, we have read all the articles thoroughly on our own, before or after discussing it with AI tools. Thus, the tools have only been used as an aid to understand particular details and to gain additional perspectives. For example, we have used prompts like "Please explain this section [section name] from this article [article name] in simpler terms". Importantly, all interpretations of articles and conclusions drawn are our own work.

For transcribing our recorded interviews, we used Klang which saved us a lot of time. Klang was chosen over e.g. Microsoft's transcribing tool because we deem it to be of higher quality, especially when dealing with interviews in both English and Swedish. Klang is a Swedish company which processes all data in accordance with regulation and is GDPR- and ISO 27001-certified, ensuring confidentiality of interviewees. Moreover, to mitigate the risk of inaccurate transcriptions, each transcript was read through by one of the authors while listening to the recording and both authors have reviewed each quote.

Throughout the whole thesis process, we have utilized ChatGPT to help us understand the subject and the reinsurance industry in more detail or to clarify concepts, since the industry is very specific and we had limited knowledge in the beginning of the process. To avoid blindly trusting AI, we fact-checked everything that was stated, for example through asking industry professionals or case company representatives. Furthermore, we have used ChatGPT as a sounding board to brainstorm ideas and to get another perspective, especially when we had discussed it internally for a while and felt that we were stuck. An example of a prompt we have used is "Can you help us brainstorm on this topic/discussion [inserted explanation]. Please critically evaluate our current discussion and help us move the discussion further". Lastly, we have utilized ChatGPT to improve the grammar in our thesis. For example, we have asked for synonyms, translations, and better formulations. We have also asked it to increase coherence for certain paragraphs. Importantly, we

have only submitted paragraphs that we had already written, and any suggestions or feedback generated from ChatGPT has been carefully reviewed and selectively incorporated manually into our text.

We have predominantly used the ChatGPT school subscription accounts offered by Stockholm School of Economics. To ensure GDPR compliance we only shared anonymous data and did not allow the model to use our data as training data. Any suggestions or feedback generated from ChatGPT has been carefully reviewed and selectively incorporated manually into our text.

By using these AI tools, we believe the quality of the thesis has been improved by allowing us to allocate the time where it was most valuable, i.e. discussing, researching and writing, rather than repetitive tasks such as transcribing interviews, and by helping us gain a deeper understanding of the reinsurance industry and existing literature.