



UNIVERSITÀ DEGLI STUDI DI MILANO

PhD Program: **Law, Ethics, and Economics for Sustainability, 36th cycle**  
Department: **Italian and Supranational Public Law**

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**GOVERNING FORESTS AS COMMONS, BEYOND  
EFFICIENCY: CAPABILITIES, CONFLICTS, AND  
COMPLIANCE WITH SOCIO-ENVIRONMENTAL  
JUSTICE AGREEMENTS**

SECS-P/02, SECS-P/01, SPS/01

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**A.Y. 2023/2024**

“What if we were to see economic activities not in terms of a separate sphere of human activity, but instead as thoroughly social and ecological? What if we were to see economic sociality as a necessary condition of life itself? What if we were to see the economy *as* ecology - as a web of human ecological behaviors no longer bounded but fully integrated into a complex flow of ethical and energetic interdependencies: births, contaminations, self-organizings, mergings, extinctions, and patterns of habitat maintenance and destruction?”  
(Gibson-Graham and Miller, 2015:2)

“Utopian critiques are critical perspectives we cannot do without – even if they will not be realized” (Tsing, 2005:268)



*A Ele, per essere stata forza motrice e salvagente,  
A Pietro, per aver condiviso gioie e frustrazioni,  
A chi mi ha insegnato a guardare sotto la superficie,  
E a chi ancora ci crede.  
Ma soprattutto, a chi ha smesso di farlo.*

*To Ele, for being a driving force and safety island,  
To Pietro, for sharing joys and frustrations,  
To the one who taught me to look beneath the surface,  
And to those who still believe in this.  
But above all, to those who have given up.*



## Abstract

What we are facing today is a situation of ecological and democratic crisis, necessitating deep and multilayered transformations, which should go into the direction of tackling both inefficiencies and inequalities. The aim should be to develop a new way of co-existing that does not eliminate differences but exploits their creative potential in a democratic way. The sustainability transformations we need must be radical, and that is why they raise concerns. They are neither win-win nor zero-sum processes: they can bring to mutual advantage, but distributional conflicts are inevitable and, as such, they must be acknowledged and made visible. Within this scenario and looking at its possible developments, the literature on the commons can offer a potential ground to analyse and direct sustainability efforts.

This paper-based dissertation zooms into the notion of **commons** to understand whether collaborative outcomes are feasible, which transform social, political, and economic relations while addressing the environmental and democratic crisis. Specifically, it focuses on **forest governance** and **forests-related conflicts** as emblematic of the current multiple and entwined crisis, as addressing forest deterioration and depletion is also an issue of recognizing people's **opportunities (capabilities)** to look for and pursue aspirations, social identities, and flourishing lives attached to forests (Ballet et al., 2018). The main overarching question is about whether governing forests as commons can counteract reductionism and enhance **democratic coexistence** also with a view to promote **socio-environmental justice**.

To answer this, the dissertation takes an interdisciplinary approach, mostly drawing from political economy and institutional economics, but also from political science, political philosophy, and political ecology. The first paper is the result of a systematic review of literature on carrying out balancing exercises in the governance of complex socio-ecological systems from the commons and capability approach scholarships. This work develops an integrative framework that connects the two and can serve as an informational and evaluative tool for institutions and policies aimed at governing co-existence in multiple-use forests. The second article instead digs into the ex-ante processes that can bring to well-designed polycentric governance, which translates values and claims' heterogeneity into institutional heterogeneity. In particular, the paper highlights the role of conflict in these processes and sheds light on how corollary theories can improve the understanding of these dynamics, which the polycentricity literature has mostly overlooked. Finally, the third paper deals with ex-post compliance with multi-stakeholder agreements for new

forest governance arrangements that promote environmental protection together with socio-environmental justice. Specifically, the article analyses the case in which a business company with strong economic power is involved, which can defect and abuse the most marginalized stakeholders, i.e., indigenous communities. Thus, this article also deals with the possible divide between environmental protection and social justice.

Overall, the dissertation defines the commons as institutional and social mediators between the ecological and the wellbeing dimensions and, as such, it proposes to analyze and evaluate their normative implications through the capability approach to justice. The reasoning adds to previous contributions on the issue of ecosystem services as socio-ecological services, i.e., services that do not automatically come from nature but are co-produced by human interactions. Importantly, this thesis finds that such co-production most often involves conflictual processes that can be read as two-level collective action problems where different collectivities bring different and competing claims over the same resource, and struggle for recognition of their stake on it. Thus, for democratic co-existence to emerge, conflicting parties must recognise their interdependence as a positive one, which sets the basis for integrative negotiation and deliberation. Then, choosing a new arrangement for forest governance is a matter of equilibrium selection, where different equilibria imply different distributional effects and a possible divorce between environmental and social objectives. This dissertation suggests that an impartial agreement can be of help in directing such equilibrium selection towards the fairest solution, by eliciting preferences and reciprocal expectations such that conformity with it can emerge endogenously. Thus, efficiency and equity can potentially be kept together.

Certainly, this dissertation opens avenues for further research, including investigating an operationalization of the integrative framework, exploring mixed-methodologies to map and measure heterogeneity of claims over complex socio-ecological systems, and carrying out empirical investigations on why certain beliefs and expectations on a socio-environmental equilibrium should emerge, with a focus on the role of culture in this.

## Sintesi

Quella che stiamo affrontando oggi è una situazione di crisi ecologica e democratica, che richiede trasformazioni profonde e multilivello indirizzate ad affrontare sia le inefficienze che le disuguaglianze. L'obiettivo dovrebbe essere quello di sviluppare un nuovo modo di convivere che non elimini le differenze ma ne sfrutti il potenziale creativo in modo democratico. Le trasformazioni della sostenibilità di cui abbiamo bisogno devono essere radicali, ed è per questo che destano preoccupazione. Sono processi in cui non tutte vinceranno, ma questo non vuol dire che sarà necessariamente un gioco a somma zero: le trasformazioni richieste possono infatti portare a vantaggi reciproci, ma è certo che i conflitti distributivi sono inevitabili e, in quanto tali, devono essere riconosciuti e resi visibili.

In questo scenario e guardando ai suoi possibili sviluppi, la letteratura sui beni comuni può offrire un potenziale terreno per analizzare e indirizzare gli sforzi di sostenibilità.

Questo elaborato si concentra sulla nozione di **beni comuni** per capire se siano possibili risultati collaborativi che trasformino le relazioni sociali, politiche, ed economiche, affrontando al contempo la crisi ambientale e democratica. In particolare, si concentra sulla **governance forestale** e sui **conflitti legati alle foreste** come emblematici delle attuali crisi, molteplici e intrecciate, poiché affrontare il deterioramento delle foreste e la deforestazione implica anche riconoscere le **opportunità (capacità)** di persone e comunità, di cercare e perseguire aspirazioni, identità sociali e vite fiorenti legate alle foreste (Ballet et al., 2018). Pertanto, la principale domanda di ricerca di questa tesi riguarda la possibilità di governare le foreste come beni comuni per contrastare il riduzionismo e migliorare la **coesistenza democratica**, anche al fine di promuovere la **giustizia socio-ambientale**.

A tal fine, la tesi adotta un approccio interdisciplinare, attingendo principalmente dall'economia politica e dall'economia istituzionale, ma anche dalla scienza politica, dalla filosofia politica e dall'ecologia politica. Il primo articolo è il risultato di una revisione sistematica della letteratura sull'implementazione di esercizi di bilanciamento nella *governance* di sistemi socio-ecologici complessi a partire dall'approccio dei beni comuni e delle capacità. Questo articolo sviluppa un *framework* integrativo che collega i due approcci e può servire come strumento informativo e valutativo per le istituzioni e le politiche di governo per la coesistenza nelle foreste a uso multiplo. Il secondo articolo invece approfondisce i processi *ex-ante* che possono portare a una *governance* policentrica ben progettata, che traduca l'eterogeneità di valori e rivendicazioni in

eterogeneità istituzionale. In particolare, l'articolo evidenzia il ruolo del conflitto e fa luce su come teorie corollarie possano migliorare la comprensione di questi processi, che la letteratura sul policentrismo ha per lo più trascurato. Infine, il terzo articolo si occupa della conformità *ex-post* a questi accordi, soprattutto nei casi in cui è coinvolto un attore con forte potere economico che può violare l'accordo e abusare degli stakeholder più emarginati, quali le comunità indigene.

Nel complesso, la tesi definisce i beni comuni come mediatori istituzionali e sociali tra la dimensione ecologica e quella del benessere e, in quanto tali, propone di analizzare e valutare le loro implicazioni normative attraverso l'approccio delle capacità. Il ragionamento si aggiunge anche ai precedenti contributi sulla questione dei servizi eco-sistemici come servizi socio-ecologici, cioè servizi che non provengono automaticamente dalla natura ma sono co-prodotti dalle interazioni umane. È importante notare che questa tesi rileva che tale coproduzione comporta molto spesso processi conflittuali che possono essere letti come problemi di azione collettiva a due livelli, in cui diverse collettività avanzano pretese diverse e in competizione sulla stessa risorsa, e lottano per il riconoscimento della loro partecipazione ad essa. Per far emergere una co-esistenza democratica, quindi, le parti in conflitto devono riconoscere la loro interdipendenza come positiva, il che pone le basi per una negoziazione e una deliberazione integrative. In seguito, la scelta di un nuovo assetto per la *governance* forestale è una questione di selezione tra molteplici equilibri, dove equilibri diversi implicano esiti distributivi diversi. Questa tesi suggerisce che un accordo imparziale può essere d'aiuto nel dirigere tale selezione verso la soluzione più equa, generando preferenze e aspettative reciproche tali da far emergere endogenamente la conformità con essa. Di conseguenza, efficienza e equità possono potenzialmente andare di pari passo.

Certamente questa tesi apre strade per ulteriori ricerche, tra cui lo studio di un'operazionalizzazione del framework integrativo, l'esplorazione di metodologie miste per mappare e misurare l'eterogeneità delle rivendicazioni su sistemi socio-ecologici complessi, e lo svolgimento di indagini empiriche sul perché emergano determinate credenze e aspettative su un equilibrio socio-ambientale, con particolare attenzione al ruolo della cultura in questo.

# List of Papers

This thesis is a collection of the following papers:

- I. Lorenzini, S. Finding a balance in the governance of complex socio-ecological systems: ethics beyond efficiency. (Part of this manuscript has been submitted to *Current Opinion in Environmental Sustainability*)
- II. Lorenzini, S. and von Jacobi, N. (2024). Whose forest? A two-level collective action perspective on struggles to reach polycentric governance. *Forest Policy and Economics*, 158, 103093. <https://doi.org/10.1016/j.forpol.2023.103093>.
- III. Lorenzini, S. and Sacconi, L. Multi-stakeholder coalitions, subjective games, and equitable equilibria in the Great Bear Rainforest agreement.

Paper II was published with Open Access, and it is reproduced here with the permission of the publishers.

# Introduction

For decades, we have been witnessing frightful environmental degradation, a more or less gradual and subtle curtailment of democratic participation, and a growing exacerbation of inequities. It is no coincidence that these phenomena go together: environmental problems are deeply entwined with social problems (Ballet et al., 2013; Bookchin, 1982) and environmental or natural resources' degradation is usually a symptom of how humans (mis)treat each other using nature (Wapner and Matthew, 2009).

Several heterogeneous interests are at stake in the ecological crisis we are living in, and we have been persuaded that this is a zero-sum game: someone loses, someone wins. What if the point is *not only* to win or lose something we already have, *but also* to co-create something new? Perhaps a new way to co-exist, which acknowledges differences but does not translate them into hierarchies, domination, and subordination. Instead, it exploits their creative potential.

Surely this does not mean naive optimism that the transition can be a win-win process: it can bring to mutual advantage, but conflict for fair distribution of costs and benefits is unavoidable, and it must be made visible. Only if conflicts emerge and are addressed in a democratic way will the transition result into a genuine system reconfiguration rather than a being a superficial reshuffling that benefits the same interests that created the crisis.

The research interest I pursue in this dissertation comes from these questions. It is born from encounters with conflicts and demands for socio-environmental justice and more democratic control against increasing concentration of corporate power and State-Market collusion. It goes towards understanding whether collaborative outcomes are feasible, which transform social, political, and economic relations while addressing the environmental and democratic crisis.

This thesis focuses on forest governance, as forests are emblematic of the ongoing ecological crisis. They are multiple-use(r)s resources that can perform a wide variety of ecosystem services (MEA, 2005), from provisioning to regulating, supporting, and cultural ones. Indeed, forests supply food, wood, fuel, and medicinal plants, they regulate water, climate, and soil, they support oxygen production and sustain biodiversity, and they serve as cultural and spiritual places. However, 178 million ha of forest have been lost in the world since 1990 (FAO and UNEP, 2020). Additionally, forests are increasingly losing their functions as carbon sinks and by now only 10 percent of them is devoted to biodiversity conservation, just a third of what is primarily used for producing wood and non-wood forest products (FAO and UNEP, 2020). Borrowing from Vandana Shiva (2004), we

are observing two paradigms of forestry: one stimulates life by keeping the renovation capacity of nature, the other destroys it by classifying all lands not producing economic benefits as "wasteland", and encouraging maximum profit from commercial exploitation. Especially since the introduction of commercial forestry, the latter paradigm has prevailed over the former, and life diversity has been reduced to dead product - mostly wood - or transformed into monocultures. As a result, forests multifunctionality is being destroyed or reduced to the economic interests of some small groups. In a different fashion, new environmental protection policies are converting large forests into protected areas that exclude nearly all human activity and often reproduce social inequalities. In both cases, a reductionist logic is at play: the forest is seen as a means to a single specific interest rather than a complex socio-ecological system that can support a plurality of use(r)s. Which use(r) prevails and which ones are excluded reflect the histories, political processes, and modes of social organization in which forests are placed and interested parties interact (Affolderbach, 2011; Ballet et al., 2013; Euler, 2018; Johnson, 2004; Ratner et al., 2013).

Against this background, the thesis zooms into the notion of governing forests as commons, that is as socio-ecological systems owned, managed, or used by a group of end-users who collectively negotiate and decide rules for mutual use (Agrawal et al., 2023). Commons are here explored as a form of governance that can guarantee coexistence - non-excludability - of multiple interdependent use(r)s. Indeed, forest territories are social and political landscapes (Tsing, 2005), as different collectivities usually attach different claims (cfr. institutional facts in Searle, 1995, 2005) to them, which are rooted in different sources of legitimacy and precise historical, political, and geographical contexts. Thus, forests' efficient management cannot do without their just governance; coexistence must be guaranteed with a view to both maintain the forest health, productivity, and sustainability, and to ensure non-exclusion of less subtractive use(r)s. In other words, it goes beyond efficiency and becomes an issue of justice, which implies acknowledging and dealing with distributive conflicts.

Therefore, the overarching question guiding this investigation is: Can the commons contribute to counteract reductionism and enhance democratic coexistence also with a view to promote socio-environmental justice? If so, how?

## **Analytical approach and overview of relevant literature**

Given these premises, this dissertation takes an interdisciplinary approach, focusing mostly on institutional economics, political economy, ecological economics, and economic policy (SECS-P/02), but also drawing from political philosophy, political science, and political ecology (SPS/01 and SPS/04). The literature on the commons serves as the primary building block.

Scholarship on the commons is a landmark in the study of governance of multiple use(r)s resources, as well as on institutional influence on economic performance and distributive issues. Starting with a very well-defined classification of goods based on their economic nature, scholars in this field have investigated patterns of collective decision-making and action through which communities self-organize and negotiate governance rules for complex rival and non-excludable resources such as pastures, forests, and fisheries, and how socio-institutional arrangements influence outcomes. More recently, research focus has expanded towards cities, internet, the workplace, waste management, and knowledge commons.

As its main merit, this body of research has questioned the assumption that individuals are necessarily self-interested and unable to organize themselves for the collective wellbeing, and only the market or the state are viable and efficient institutions to govern complex socio-ecological systems. Indeed, starting with Elinor Ostrom and the Bloomington school (Ostrom and Ostrom, 1977; Ostrom, 1990, 2005) scholars on the commons have contributed to illuminating the diversity of human institutions and the potential of human creativity in developing different solutions to governance problems, which are not reducible to the extreme of public *v.* private dichotomy.

When reviewing the rich corpus of scientific literature and knowledge available on this topic, I found numerous arguments in favor of the commons as specific institutional arrangement to manage complexity, use(r)s' heterogeneity, and possible congestion that often characterize the environment and natural resources. Indeed, several studies demonstrate how the commons can foster legitimacy and compliance with the rules, reduce monitoring and enforcement costs, and increase the possibility to maintain the social option value of a resource, that is the possibility to use the resource as input for many outputs (Frischmann, 2012; Frischmann et al., 2019; McKean, 1986; Oakerson, 1978). However, I have also found a gap in that, despite speaking about institutions, self-governance, and democracy, the literature on the commons lacks a normative commitment. Indeed, while several works have shown that the commons can replicate and enhance patterns of inequity, power imbalances, and socio-political exclusions (Agarwal, 2001;

Ayers et al., 2018; Clement et al., 2019; Kashwan et al., 2021), there is no shared framework to analyse the commons as an institutional model and as social institution from an ethical perspective.

Thus, I have started to investigate various approaches to socio-environmental justice, to understand whether the commons as an institutional arrangement to govern complexity and heterogeneity of socio-ecological systems could have a normative foundation. In conducting this research, I found a useful analytical framework in the Capability Approach to justice, which conceptualizes wellbeing as freedom-based, depending not only on material endowments but also on (i) how much an agent is successful in converting such resources into functionings, i.e., states of being and doing that the agent considers valuable for herself, and (ii) the procedures through which she can achieve these outcomes (Sen, 2009). In the last decades, various capability approach scholars have investigated the relation between the environment and its characteristics and the process of converting them into functionings through capabilities, getting to different conceptualizations (Ballet et al., 2013; Holland, 2008, 2014; Schlosberg, 2007; Peeters et al., 2015; Pelenc et al. 2013). Departing from this theoretical framework and its various developments, I have worked on developing an integrative framework that can connect commons and capabilities and serve as an analytical and evaluative tool for socio-institutional arrangements and policies that aim at governing complex ecological systems like forests as commons.

In a later step, I have investigated how the literature on the commons deals with *the processes* that can lead to co-existence. In conducting this research, I found another gap in that this scholarship has mostly endorsed a static perspective. Indeed, scholars have found that polycentric governance can do better than monocentricity in accommodating competing cross-scale claims, as institutional heterogeneity can help addressing values and interests heterogeneity (Aligica and Tarko, 2013; Andersson and Ostrom, 2008). However, there is a significant disregard for *ex-ante* processes that can lead to such well-designed polycentric governance, and for the fact that these processes are often conflictual. Indeed, conflicts certainly entail costs and risks, as they can intensify forests' deterioration and depletion and further exacerbate power and wellbeing asymmetries (Derkyi et al., 2014; Eckerberg and Sandström, 2013). However, if properly handled, they can also give rise to innovative collaborative governance arrangements and progressive policy reforms and contribute to the formation of new social and power relationships (Eckerberg and Sandström, 2013; Hellström, 2001; Nousiainen and Mola-Yudego, 2022). Thus, drawing on

different elements of classical institutional theory (Olson, 1965, 1982; Searle, 1995, 2005), I have investigated these dynamics, developing a framework to discuss them as two-level collective action problems. Since the root of these issues usually lays in decision-making problems over joint production of several concurring Ecosystem Services and democratization of such co-production, transforming disputes into multi-stakeholder agreements is more a matter of coordinating several cross-scale interests and objectives rather than optimizing a single objective function (Berkes, 2002).

Finally, I have asked myself how compliance with multi-stakeholder agreements for new governance arrangements that reflect heterogeneity of claims and socio-economic and political status can emerge. Indeed, even supposing conflicting parties come to an agreement, conformity to it should not be taken for granted, particularly in situations where there is no strong external enforcer but deep power asymmetries, such as when business companies with a strong economic position are part of the agreement. In investigating this issue, I have followed an understanding of the commons as socio-institutional arrangements resulting from struggles or processes of negotiation over resources that various stakeholders deem valuable (Euler, 2018; Gibson-Graham and Miller, 2015), which is also what emerges from the previous analysis.

Thus, I have used game theory models to frame changing interactions between various stakeholders and study such *ex-post* compliance problem (Gauthier, 1986). Generally, game-theory serves as a mathematical tool to study decision-making in situations of interdependencies and conflicts of interest (Beckenkamp, 2012; Duncan Luce and Raiffa, 2012). Applying it to forest-related conflicts and their transformation into innovative institutional arrangements is coherent with an approach to forest policies as the result of strategic interactions among organized decision-makers and interest groups (Dijkstra BR, 1999; Endres, 2004). Moreover, it brings to an understanding of the problem as one of multiple equilibria selection, where each equilibrium has different distributional implications.

**Intended Contribution and overview of papers.** To address the main research question of this project and the three gaps I identified, the research aims at answering three different but interrelated questions:

*Q1: Can the commons as a form of governance to manage complexity and heterogeneity in socio-ecological systems have a normative justification? If so, which one? (Paper I)*

*Q2: How and under which conditions can a polycentric system that truly reflects heterogeneity emerge? Does conflict play a role in this? (Paper II)*

*Q3: Under which conditions do prospects for innovative multi-stakeholder agreements and motivations for conformity with them develop? (Paper III)*

The three papers that compose this dissertation try to answer to each of these questions, building on different theoretical frameworks and dealing with issues of multiple-use(r)s forest governance.

**Paper I** investigates whether the commons as a governance model for managing heterogeneity and complexity in order to ensure coexistence, can also have an ethical justification (Q1). To do so, the paper first reviews the main arguments advanced by the literature on the commons and the capability approach when discussing governance of multiple-use(r)s resources. The aim is to explore how they inform balancing exercises in contexts of profound complexity and interdependence. The review shows that the two take very different approaches: in the commons literature balancing different claims is an efficiency exercise to avoid overcrowding effects and congestion. Moreover, it is based on self-organization and collective action. Conversely, the capability approach focuses on restraining someone's capabilities or functionings to guarantee that others' are not pushed below a level that is adequate for a flourishing life. The approach embraces methodological individualism and mostly excludes collective structures for co-living from its evaluative space.

In light of this review, the paper finds a gap but also a potential for connecting the two and presents a proposal for a framework based on a two-fold argument, which can integrate considerations for efficiency and justice. Several real-world examples are used as illustrative case studies to clarify the main analytical points, with a specific focus on the conflict between Sami reindeer herders and logging industry in northern Sweden.

The resulting framework shows an iterative cycle between the ecological dimension, the governance dimension - the commons - and the wellbeing dimension - capabilities and functionings. First, it highlights the role of the commons in negatively or positively affecting recognition and distribution of agents' capabilities set and achieved functionings, with respect to both the substantive and procedural aspects of capabilities. Considering substantive justice, non-

excludability assumes a normative meaning through the capability approach, as it sustains the entitlement component (Fia and Sacconi, 2019; Leach et al., 1999) of the capability (freedom) to benefit from the resource and its characteristics and transform them into valuable functionings. With respect to procedural justice, collective choice arrangements also assume a normative meaning in that they sustain the capability to function as equal citizens and co-design the rules for co-existence on equal terms with others. This point adds to the literature on commons by analyzing their normative implications and can serve as an informational and evaluative tool for policies and institutional arrangements that aim at managing forests as commons. Secondly, the framework highlights the importance of considering how protecting or restraining capabilities or functionings of certain users influence both the ecological and the governance dimensions of the loop, i.e., the commons as institutions for co-existence. Thus, findings add to the literature on environment, natural resources, and capabilities, by adding collective structures and ways of being together to the evaluative space of the capabilities approach (Deneulin, 2008; Stewart and Deneulin, 2002; Deneuline; Smith and Seward, 2009). Applying the framework to the case of Sami reindeer herding v. logging shows that what can appear as institutional arrangements for the commons at a first sight, isn't so in fact. Moreover, it shows how the current arrangement affects trade-offs between users' capabilities and functionings. Part of this paper has been submitted to the "Current Opinion on Environmental Sustainability" journal and it is now under review.

**Paper II** deals with the role of conflict in the *ex-ante* processes that can lead to a polycentric governance system that truly reflects heterogeneity of claims and ensures democratic co-existence (Q2). To do so, this paper builds on institutional economics (Olson, 1965, 1982; Searle 1995, 2005) with a view to investigate collective action dynamics that precede eventual polycentric governance and assess whether it is possible to identify commonalities across different cases. Indeed, a part of institutional economics scholarship assumes that institutions influence economic outcomes, and economic agents try to change those institutions if they consider them illegitimate or as obstructing their material and non-material ends (Ensminger, 1992). The interesting part is to understand how institutional change occurs, especially when diverse organized groups with different material, social, and political endowments as well as different ideological and material incentives are involved. Thus, we undertake a comparative analysis of four illustrative case studies from forests-conflicts hotspots (Mola-Yudego and Gritten, 2010), which seeks to identify some common dynamics and the role of conflict in these.

The framework we develop understands multiple use(r)s conflicts over forests as two-level collective action problems and it makes use of corollary theories - Social Movements, Bargaining, and Deliberative Theories - to better interpret and reconstruct actors' strategies within these processes. The analysis enables an understanding of how conflict dynamics can be functional to the emergence of polycentric governance. Indeed, conflict escalation may be instrumental for a more participatory governance, as marginalized parties often resort to it to reshuffle power imbalances. Social Movements Theories are of help here, in that they improve the understanding of enabling factors that lead collectivities' heterodox framing of a situation to reify as effective mobilisation and conflictual action. Moreover, the Social Movements and Bargaining theories shed light on conflict transformation as an issue of shifting bargaining endowments and costs, eventually through resources' pooling and coalition formations. Yet, conflict alone is not sufficient: while it can serve to reduce power asymmetries, to change some parties' framing of the issue, and create incentives to approach conflict in a democratically acceptable way, conflict escalation must be followed by integrative negotiations and deliberations. This can be possible if parties realize their positive interdependence and the need for mutual adjustment.

Overall, these results challenge models that take physical and technological attributes of the resource as the main factor leading to the creation of commons (Kashwan et al., 2021). Indeed, the dynamic analysis we present states the importance of socio-economic and political context as well as cultural and historical background. Moreover, it cautions against the quality and duration of any achieved solution, which will depend on continuous efforts and the institutional quality provided by the specific context.

Finally, **Paper III** investigates prospects for innovative multi-stakeholder agreements for more equal coexistence, and motivations for conformity with them. Specifically, this paper builds a game theory model of interactions between organized interest groups that serve to investigate the processes leading to the historical agreement over the Great Bear Rainforest after decades of "war in the woods" (Cashore et al., 2001), and partial ex-post compliance with it. In continuity with findings from Paper II, this work moves from the standard game theory approach by applying the *subjective games model* to study ex-ante transformation of conflict into dialogue for an agreement, and *psychological game theory* to study ex-post conformity with an agreement that promotes environmental protection together with socio-environmental justice.

As a first contribution, this work adds to the understanding of the formation of conditions that can shift parties' incentives to sit at a multi-stakeholder table. In particular, the subjective games model (Aoki, 2001 and Cecchini Manara and Sacconi, 2019a for a particular development of it) allows an interpretation of the crucial role of mobilization and boycotting in changing incentives for cooperation. Indeed, by applying this model, boycotting and mobilization can be seen as changing the most powerful actors' framing of the game, from a game where unilateral defection is possible and advantageous, to one where this strategy is less prominent, and cooperation becomes feasible. Secondly, this work contributes to the study of compliance with a multi-stakeholder agreement where at least one party is more powerful and could defect and abuse other parties, obtaining a better payoff for itself. Indeed, we demonstrate that by considering economic agents endowed with motivational complexity and conformity preferences, psychological game theory (Geanakoplos et al., 1989; Rabin, 1993; Battigalli and Dufwenberg, 2022; Cecchini Manara and Sacconi, 2019b, 2021; Grimalda and Sacconi, 2005; Sacconi and Grimalda, 2007) can explain collective action for (i) creating networks of solidarity to boycott companies that completely defect from an agreement and (ii) establishing and complying with an agreement that promotes environmental protection together with socio-environmental justice. This point gives an important contribution to the discussion on the possible divorce between environmental protection and socio-environmental justice; indeed, exclusionary conservation policies often run the risk of limiting forest dwelling communities' rights and ability to pursue traditional activities in their customary land, and to co-decide on such policies on equal footings with others (Bontempi et al. 2023; Fanari, 2022).

Results show the role that an impartial agreement can have in activating motivations to start a relationship whereby a surplus is co-produced and shared in a fairer way, which accounts for claims for social justice that go beyond pure environmental conservationism. Thus, they shed light on the role of the agreement in forging conditions for the endogenous emergence of an equilibrium of compliance.

The paper is meant to be divided into two different contributions in terms of scientific articles, with each one dealing with the *ex-ante* (Section 4) and the *ex-post* (Section 5) phases respectively.

## **Main findings and policy implications**

This dissertation sheds light on the issue of ecosystem services as social-ecological services, i.e., services that do not automatically come from nature but are co-produced by human interactions (Bruley et al., 2021; Fischer and Eastwood, 2016). Indeed, the results stress the need to consider the relation between the ecological and the wellbeing dimension as a cyclical one, where the commons work as an institutional mediating factor between the two and the capability approach to justice can shed light on such relation. Thus, this work suggests that changes in the ecological basis can affect motivations and contextual factors for people and communities to self-organize for collaboration and democratic coexistence, while institutions and modes of socio-political organization affect what a person or group is free to achieve in terms of wellbeing. This feed-backs again into the ecological basis and the governance dimension.

Such a result is fundamental to even justify an evaluation of the commons from an ethical perspective, whereby the normative implications of governing complex socio-ecological systems as commons are assessed both in terms of substantive and procedural justice. Considering that, this dissertation proposes an integrative conceptual framework where the commons and the capability approach can advise each other in informing social and institutional arrangements that aim at balancing exercises between competing use(r)s with a view to guarantee democratic coexistence beyond efficiency.

This way, the thesis broadens the understanding of trade-offs in environmental and natural resources governance. Indeed, the proper implementation of policies to govern coexistence between a multiplicity of use(r)s with different claims and deep power asymmetries, requires an understanding of capabilities and functionings priorities that different groups attach to the same ecological system. Governments and practitioners should assist the involved users in this mapping and policies should focus on managing trade-offs.

Then, if commons are institutions and social systems, they do not emerge as a direct consequence of resources' economic properties; rather, they are the outcome of struggles and negotiations. Indeed, this dissertation finds that the creation of a well-designed polycentric governance system that can translate heterogeneity of claims into institutional heterogeneity is often the outcome of conflictual processes. Such conflicts over multiple-use(r)s forests that precede polycentric governance can be read as two-level collective action problems where different collectivities bring different and competing claims over the same resource. Social

Movements, Bargaining, and Deliberative Theories can enrich Polycentric governance understanding of these *ex-ante* dynamics that precede eventual co-existence. In particular, findings demonstrate that collective mobilization and boycotting play a crucial role in shifting parties' perception of the situation as well as incentives and costs to sit at a multi-stakeholder negotiating table on more equal footings. However, conflict alone is not sufficient: policies should provide for impartial arenas where conflicting parties can negotiate. Importantly, the results show the importance of providing access to adequate information that serve as a basis for conflicting parties to advance publicly reasonable arguments. Indeed, transparent and accessible data can help producing common knowledge and highlighting interdependencies among use(r)s and respective capabilities and functionings, thus also assisting in the definition of critical thresholds.

However, asymmetries of power do not disappear after an agreement has been reached. Instead, they can persist and lead to ex-post compliance problems, as the most powerful parties can defect the agreement and abuse the most marginalized ones. When discussing forest governance, real-world case studies show that abuse and injustices can take different forms, and even come from environmental collusion between environmental NGOs, business actors, and governments. Thus, choosing a new arrangement for forest governance is a matter of equilibrium selection, where different equilibria entail different distribution of costs and benefits. This dissertation suggests that an impartial agreement can be of help by eliciting preferences and reciprocal expectations such that conformity with it can emerge endogenously. In other words, an impartial agreement can serve as a focal point and counteract incentives to act unjustly, thus inducing new and fairer compliance equilibria, potentially resolving the divide between environmental protection and social justice. On the one hand, introducing an impartial agreement encourages the creation of a system of mutual expectations that may converge in the direction of a certain solution – cognitive effect. On the other hand, it contributes to the development of new motivations to act, which are based on a sense of justice – motivational effect (Grimalda and Sacconi, 2005; Cecchini Manara and Sacconi, 2019b).

### **Limitations and future studies**

Surely, this dissertation comes with limits, and it can be considered as the basis on which I would like to build further research. With respect to the use of the capability approach, the framework here developed is mostly conceptual and there is no suggestion for further operationalization. I

believe that additional work should be carried out on this point, also with a view to discuss whether, in case of trade-offs between capabilities and functionings, a sufficientarian (Anderson, 1999) or limitarian (Robeyns, 2024) rule or a mix of both should be followed when developing policies and rules for the commons.

Moreover, paper II adopts a purely qualitative methodology; this helps developing the conceptual framework and better illustrating the analytical points. However, mixed methods such as the Q-methodology, also widely used in ecological economics, can help in mapping heterogeneity of claims over complex socio-ecological systems and give a measure to it. I believe further research should investigate this and other methodologies to characterize users' priorities and possibly track eventual changes in their claims and capacities to advance them.

Finally, empirical investigations could be conducted on why certain beliefs and expectations on a socio-environmental equilibrium should emerge. Further studies could also investigate whether culture plays a role in the formation of reasons to conform with a more equitable agreement.

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# PAPER I

# **Finding a balance in the governance of complex socio-ecological systems: ethics beyond efficiency.**

Sara Lorenzini

Keywords: commons, capabilities, balancing, socio-ecological systems, forests

## **Abstract**

Numerous scholars have argued in favor of the commons as an institutional arrangement alternative to the state-market dichotomy, which can result in increased efficiency for supplying and sustaining shareable resources by supporting users in managing complexity and potential congestion. However, a shared framework to include ethical concerns in the discussion is still lacking. Conversely, several capability approach scholars have stressed that the environment and its characteristics are key components of human wellbeing, either as goods to be converted into functionings or because they affect the conversion. However, this literature disregards the importance of collective action processes and structures in this relation. Moreover, it does not propose any specific institutional arrangements that can enable a balance between plural but competing capabilities and functionings that a socio-ecological system can support. This contribution reviews the main arguments advanced by the two strands of literature with respect to carrying out balancing exercises in the governance of complex socio-ecological systems, and it identifies a gap but also a potential to connect them. Specifically, it proposes an integrative framework for using the capability approach as a tool to give a normative foundation to socio-institutional arrangements for the commons and evaluate them with respect to justice outcomes, while expanding the evaluative space of capability approach to add collective structures. The analysis applies to multiple-use forests as a complex locus of interaction where different users with concurrent claims might coexist but social, economic, and political dynamics, power structures, and institutional arrangements impede that, causing socio-environmental injustices.

## **1. Introduction**

Starting with the Bloomington School, plenty of scholars have demonstrated that, under certain conditions, resource users are able to self-organize and cooperate to overcome social dilemmas, which means they can manage shareable but disputed resources as commons, also at multiple nested scales (Ostrom, 1990, 2005, 2009, 2010; Ostrom and Ostrom, 1977; Ostrom et al., 1961). Since then, this strand of literature has advanced many arguments in support of the commons as a governance model for collective ownership, management, or use of certain goods in accordance with rules agreed upon by a community (Agrawal et al., 2023; Frischmann et al., 2019). Following these arguments, governing a resource as a common is particularly advisable in case of use(r)s' heterogeneity and possible congestion, as it could increase possibilities to maintain the social option value of the resource, raise legitimacy and compliance, and reduce monitoring and

enforcement costs (Aligica and Tarko, 2013; Baldwin et al., 2018; Frischmann, 2012; McKean, 1996; Oakerson, 1978; Ostrom, 1990, 2005).

However, if all these considerations are remarkably relevant, they show an exclusive focus on greater efficiency, thus overlooking democracy, equity, and socio-environmental justice concerns (Ballet et al., 2007; Kashwan et al., 2021). Moreover, they downplay the social dimension of the commons and the strict relation between natural resources and human wellbeing (Dodds, 1997; Euler, 2018). Indeed, while a new strand of literature has begun to reason about issues of power reshuffling and democracy within the commons, a shared framework to include ethical concerns is still lacking (Ayers et al., 2018; Clement et al., 2018; De Angelis and Harvie, 2013; Fournier, 2013; Kashwan et al., 2021; Linebaugh, 2007; Sandström E. et al., 2017; Partelow and Manlosa, 2023; Turner, 2016).

Conversely, numerous scholars from the capability approach to justice (CA) have started reasoning on the environment and its characteristics as key components of human wellbeing. The capability approach is a normative theoretical framework that allows a conceptualization of a freedom-based account of wellbeing and an assessment of policies, programs, and socio-institutional arrangements aimed at enhancing it (Sen, 1980). For capabilities scholars, human wellbeing rests on (i) how much an agent is successful in converting goods into functionings, which are the states of being and doing that the agent considers valuable for herself, and (ii) the procedures through which people can achieve these outcomes (Sen, 1999, 2009). The conversion of goods into functionings depends on the person's capabilities - her actual opportunities (freedoms) of transformation - and personal, social, and environmental conversion factors have an impact on these, either positive or negative (Robeyns, 2005). Within this framework, scholars have conceptualized the environment and environmental characteristics as goods that can be transformed into valuable functionings, as (affecting) conversion factors themselves, or as meta-capabilities that can sustain other capabilities. Thus, in light of the plurality of values that different people and groups attach to the same resource, the argument follows, decisions for governance structures should focus on finding a balance between competing capabilities and functionings the resource could support (Holland 2008a,b; Peeters et al. 2015). However, there is no elaboration on a specific institutional arrangement that can enable such co-existence. Moreover, because it rests on methodological individualism, the CA tends to overlook the political economy issues and

collective action processes and structures that lie behind (un)sustainable governance of socio-ecological systems (Deneulin, 2008; Gore, 1997; Stewart and Deneulin, 2002).

This contribution aims at reviewing the main arguments advanced by the two strands of literature when discussing the governance of complex socio-ecological systems, to explore how they inform balancing in contexts of profound complexity and interdependence - Sections 2 and 3. Then, based on findings, it identifies a gap in but also an opportunity to connect the two and proposes an integrative framework that can serve as an analytical and evaluative tool in different case studies, especially related to multiple-use forests governance – Section 4. In a nutshell, the framework demonstrates that non-excludability and collective choice arrangements - the two main characteristics of the commons - can find a normative foundation in that they influence the substantive and procedural aspects of the CA. Namely, they impact the entitlement component of the capability to access a resource and the capability to choose freely and on equal standing with others which functionings to perform from that resource. Thus, the CA can serve to evaluate institutional arrangements for the commons from an ethical perspective. Then, in an iterative cycle, what a group does with a certain environmental good, i.e., the functionings it performs, feed backs into both the ecological basis and governance dimensions of the loop, furthering influencing governance for the commons and the resulting capabilities and functionings. Hence, this paper adds institutional arrangements to the CA's evaluative space. To illustrate the main analytical points, this analysis refers to Swedish multiple-use forest policy and specifically the reindeer herding v. forestry conflict as an exemplifying case study (Bryman, 2012).

## **2. The commons to manage complexity, heterogeneity, and congestion**

From the 1980s, the Bloomington school set the stage for a well-established scholarship on the commons that lasts to this day. Noteworthy, this scholarship has demonstrated that, given certain conditions, groups of people can efficiently self-define the rules to own, manage, or use a certain resource collectively, without this implying a tragedy (Agrawal et al., 2023; Frischmann et al., 2014; McKean, 1996; Ostrom et al., 1994; Ostrom, 2000; Ostrom and Ostrom, 1977; Vaccaro and Beltran, 2019). On the contrary, the commons can foster use(r)s' cooperation and co-existence, thus bringing about productive and administrative efficiency in dealing with the difficulties of supplying and sustaining shareable but congestible resources as infrastructures, i.e., as inputs for many outputs (Frischmann, 2012).

Oakerson (1978) and McKean (1996) observe that common-property regimes are mostly found where potential congestion of the resource's production systems requires property rights to be implemented but parceling is either impractical - as for high seas or air - or undesirable. For instance, if forests are valuable for the role they play in water, soil, and climate stabilisation and protection, they need to be managed in large units unless their value is compromised. In agricultural terrains, parceling might be discouraged because periodic fallowing of certain portions can increase overall productivity; thus, to avoid one randomly suffering the entire loss at a particular time, users can be better off in managing the area jointly. Finally, collective decision-making and mutual regulation of land use is convenient when users can inflict mutual negative externalities upon each other. This might be the case for a hilly landscape where deforesting the hillside implies negative impacts on downstream water supply.

More recently, building on the concept of "environmental infrastructures"<sup>1</sup>, Frischmann (2012) developed an argument in favor of the commons as a suitable institutional arrangement to face challenges like heterogeneity, partial rivalry, and congestion, while keeping the social option value of the resource. In his understanding, managing the resource as a common consists in a non-exclusive allocation of the resource, which allows different users to concurrently access and use the infrastructure for whatever purpose they wish, regardless of their identity or intended use. According to Frischmann (2012), this consists in a public strategy in that it can indirectly support public participation in the production, use, and distribution of public and social goods. Moreover, non-excludability contributes to maintaining the generic nature or social-option value of the resource, so that users can decide what to do with the opportunities provided by it. However, while non-discriminatory sharing can be technically feasible and socially desirable for certain non-rival resources, governing a resource as a common often implies carefully considering rivalry and potential congestion. In these circumstances, certain use(r)s might need to be regulated or restricted and others prioritized, as it happens with the creation of protected areas that limit certain extractive human activities to ensure biodiversity protection, or the limitation of logging concessions to secure communities' livelihoods. This choice might be functional to non-

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<sup>1</sup> Frischmann (2012:61) defines infrastructural resources as satisfying three main criteria: "(1) The resource may be consumed non-rivalrously for some appreciable range of demand; (2) Social demand for the resource is driven primarily by downstream productive activities that require the resource as an input; (3) The resource may be used as an input into a wide range of goods and services, which may include private goods, public goods, and social goods".

discriminatory use since it helps keeping the resource's overall capacity to sustain many different services and activities<sup>2</sup>.

Importantly, the literature on the commons has also shed light on the importance of pre-play communication in sustaining arrangements for the commons. Experimental studies show the crucial role of repeated cheap talk in the tendency of stakeholders to adopt pro-social behavior and in their capacity to discuss together personal level of investment, build mutual trust, and establish credible commitments that can generate more optimal agreements and institutions for self-organization (Ostrom, 1999, 2005, 2009; Ostrom et al., 1994; Ottone and Sacconi, 2015). Similarly, in their analysis of the Parks and People Program in the Nepalese Terai and the Kumaon forests councils, Agrawal and Ostrom found that for devolution to be successful and last in time, “users themselves need to be involved in the design of rules” (Agrawal and Ostrom, 2001:14). Thus, operational rights must be coupled with higher-level collective choice rights on which issues have to be prioritized in discussion, and when and how they will be discussed and addressed (Edwards and Steins, 1998; Pinkerton, 2003; Schlager and Ostrom 1992). Indeed, following Ostrom's studies, *collective-choice arrangements* are also one of the eight design principles shared by successful institutions (Ostrom, 1990, 2005, 2009)<sup>3</sup>.

Overall, these studies prove that when balancing among use(r)s is needed, the commons can actually lead to a comedy (Rose, 1986), i.e., productive and administrative efficiency. However, the way resources are managed and the resulting co-existence or conflict between multiple use(r)s is more than a technical or efficiency issue. Once competing demands and management priorities enter conflict, the decision on which use(r)s to restrict or prioritize, to what extent, and through which instruments, as well as who makes these decisions and how, influence who can benefit and from what, meaning patterns of power, equity, and justice (Ballet et al., 2007). *Viceversa*, the

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<sup>2</sup> To be precise, Frischmann [21:206] refers to this governance form as “semi-commons arrangements”. However, for the sake of exposition, I refer to commons interchangeably with semi-commons. Indeed, the literature on commons clearly understands that rules for restrictions and regulations must be in action for self-governance of a shared resource to work.

<sup>3</sup> The eight design principles were introduced by Ostrom in her famous book “Governing the Commons” (1990), as essential elements or conditions that help explaining the persistence of different institutions for the commons across various settings. These principles are: 1) Clearly defined boundaries; 2) Congruence between appropriation and provision rules and local conditions; 3) Collective choice arrangements; 4) Monitoring; 5) Graduated sanctions; 6) Conflict resolution mechanisms; 7) Minimal recognition of rights to organize; 8) Nested enterprises (for Common Pool Resources that are part of larger systems).

distribution of power and concerns for equity and justice influence procedures and outcomes of decision-making processes on how to manage a certain resource and the trade-offs it presents (Partelow and Manlosa, 2023).

Indeed, studies demonstrate that the commons can in fact replicate patterns of elite capture, macro- and micro-level inequalities, socio-political exclusions, and power-laden processes (Ayers et al., 2018; Agarwal, 2001; Ballet et al., 2007; Clement et al., 2018; Hajjar et al., 2021; Johnson, 2004; Kashwan et al., 2021; Partelow and Manlosa, 2021; Turner, 2016; Wade, 1988). For instance, intellectually based on scholarship on the commons, proponents of Community-Based Natural Resources Management (CBNRM) as win-win governance arrangements argue that these should simultaneously enhance environmental protection, social equity, and devolution of power (Gibbes and Keys, 2010; Robinson et al., 2021). However, studies demonstrate that this is not always the case. Studying the benefits and constraints of various CBNRM in southern Africa, Gibbes and Keys (2010) find that implementation of these arrangements often disregards pre-existing heterogeneity within the community and treats the latter more as a passive beneficiary than an active co-designer, thus continuing and enhancing inequities. Similarly, Adeyanju et al.'s (2021Hork) study on CBNRM in Ghana and Zambia finds non-inclusive and inequitable local participation that replicates patterns of inequity and top-down structures, where external donors, governments, or NGOs decide means and ends of the projects.

Considering these more critical views, it becomes evident that including ethical concerns in the commons is a much-needed step forward in research (Bromley and Paavola, 2008). Following this urgency, recent studies deal with the participatory aspect of commons and the issue of power, investigating *commoning* as an associational practice and collective process by which communities organize around shared issues, also with the aim of democratizing decision-making procedures and modifying socio-political relations and inequities (Clement et al., 2019; De Angelis and Harvie, 2013; Federici, 2018; Partelow and Manlosa, 2022; Sandström, E. et al., 2017). Importantly, these studies highlight how the commons do not emerge spontaneously when a certain good show specific economic properties, but rather as the outcome of histories and collective struggles, on which inequalities have an influence (Fournier, 2013; Kashwan et al., 2021). However, a shared framework to assess the commons as an institutional model to govern heterogeneity and interdependence of complex socio-ecological systems from an ethical standpoint is still lacking.

### 3. Environment, capabilities, and functionings

The idea that the environment and environmental goods and quality play a role in human wellbeing is not new to different approaches to justice. Scholarship is also aware that, in certain instances, environmental or natural resources' degradation is also a symptom of how humans (mis)treat each other, using nature (Wapner and Matthew, 2009).

Since its early development, the CA has acknowledged that environmental conditions influence people's conversion factors and people's constructive agency should play a role in environmental preservation (Sen, 2009:24). Nussbaum (2000:78-80) has also included "other species" – animal, plants, and the world of nature – in her list of central human capabilities that provide people with fundamental relationships to enjoy a good life. More recently, other scholars have given important contributions to the study of environmental and natural resources governance in light of the capability approach, better framing the precise relationship between the environment and capabilities and functionings (Ballet et al., 2011; Holland, 2008a,b, 2014; Pelenc and Dubois, 2011; Pelenc et al., 2013; Polischchuk and Rauschmayer, 2012; Schlosberg, 2007; Scholtes, 2010).

According to a first group of scholars, the environment and ecological systems and interactions provide a wide range of services that have an instrumental value for human capabilities to function (Holland, 2008a,b; Pelenc et al., 2013). These services are the goods and goods' characteristics that people can transform into valuable functionings, depending on what valuable means for them. Yet, actual conversion is feasible only provided people have the capabilities to do so, including the capability to choose among these functions. For instance, a local community that lives within or close to a forest but has no permission to use it for harvesting food and medicinal plants or bringing livestock to pasture, has no capability to transform the forest and its characteristics into achieved functionings. The cause might be the creation of a Protected Area or the concession of an exclusive permit to extract wood to a business organization, among others.

Other scholars instead consider environmental conditions and services as influencing conversion factors<sup>4</sup>, either negatively or positively. Indeed, different environmental conditions such as warmer or colder climates affect what a person can afford with a certain income, especially

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<sup>4</sup> The capability approach understands conversion factors as including all those factors that determine whether, and to what extent, a person can convert a resource into functionings. These factors can be personal, social, and environmental (Robeyns, 2005).

in terms of heating and clothing requirements (Sen, 1999:70). Similarly, exposure to environmental pollution might overtime affect other conversion factors like health and the capabilities the latter sustains, or it might alter crop yields, thus impacting on livelihoods and resulting capabilities (Polischchuk and Rauschmayer, 2012).

Adding a layer of complexity, Polischchuk and Rauschmayer (2012) also suggest further exploring the role of ecosystem services - especially regulating and cultural ones - as conversion factors themselves. To provide a concrete example, they refer to a plot of land that might not itself enable a specific range of capabilities but, through the ecosystem services it performs such as erosion and flood prevention, it helps assessing capabilities to farm and get high yields or it may be used as a cultural and spiritual place to sustain cultural identity.

Schlosberg (2008) goes even further in affirming that, in certain cases, protecting the environment is a prerequisite for people to have equal opportunities to deliberate and participate in political life. Holland (2008a,b, 2014) instead considers the protection of environmental conditions to be a matter of basic justice, as they are the basis for people's enjoyment of all other central human capabilities and they confer fundamental advantages to some and not to others. Thus, good environmental conditions constitute an independent meta-capability.

Then, if the environment and its characteristics play a role in people's capabilities to perform valuable functionings, governance choices should focus on which and whose capabilities and functionings the resource serves, rather than on purely aggregate resource measures (Anand, 2007; Ballet et al., 2018; De Groot, 2003; Holland, 2014; Peeters et al., 2015). Indeed, embracing value pluralism, the CA fully considers that different stakeholders might value the same resource as instrumental for reaching different types of functionings. Moreover, a person or group's degree and typology of use can affect the kind and quality left for others, limit their decisional autonomy in choosing between several conversion options, or constrain effective capabilities of conversion (Paavola, 2005; Scholtes, 2010). Given these interdependencies, interaction effects might be so negative that restraining certain capabilities or functionings involving excessive environmental and natural resources exploitation may be necessary to protect others' capabilities and functionings, at least to a threshold sufficient for a flourishing life (García-Portela, 2024; Holland, 2008, 2014; Nussbaum, 2000; Peeters et al., 2015).

However, following ethical individualism, the CA has traditionally neglected the collective nature of sustainability problems and the need for collective action to address these, also with a

view to modify the “structures of living together” that underlie these processes (Stewart and Deneulin, 2002; Deneulin, 2008). Indeed, while Sen acknowledges the mutual relationship between social arrangements and individual freedoms (Sen, 1999a:31), he neglects the importance of evaluating social arrangements *per se*, thus limiting the evaluative space to individual freedoms (Stewart and Deneulin, 2002; Deneulin 2008; Gore, 2007). Moreover, the approach does not say much about how and why a person come to have certain capabilities or not and what can be done to eventually change this (Reddy and Daoud, 2018).

#### **4. Commons, capabilities, and functionings for balancing: a view to ethics beyond efficiency**

The previous review shows that literatures on both the commons and the CA offer interesting insights on the balancing between numerous and potentially competing claims when discussing governance of multiple-use natural resources (Anand, 2007). However, they take a very different perspective: in the commons balancing is an efficiency exercise to ensure the avoidance of overcrowding effects and congestion. Moreover, it is based on self-organization and collective action. The CA instead evaluates balancing in terms of justice, i.e., for how it affects people’s capabilities to transform a resource into valuable functionings, and it adopts a more individualistic approach. Clearly, there is a gap in that the two literatures fail to talk to each other, but also a potential for connecting them. This has to do with the needs to (i) include ethical considerations into the discourse on the commons; and (ii) add to the CA by highlighting the institutional and collective dimension that mediate the relationship between ecological systems, capabilities, and functionings. Thus, the challenge but also the opportunity ahead is to develop an integrative framework that can contribute to this discussion – Figure 1.

Before doing so, I briefly introduce the case of Swedish multiple-use forest policy and specifically the conflict between reindeer herding *v.* forestry as an exemplifying case-study (Bryman, 2012) to illustrate the main analytical points. As they are the most marginalized group in the conflict, also due to colonial legacy, this paper analyses only the perspective of the Sami reindeer herders from the capability approach standpoint. More research is needed to add the forestry perspective and possibly better map the capability conflict between the two use(r)s (Nussbaum, 2000; Holland, 2008b, 2014). Importantly, the goal is not to develop a general theory of the “good forest” but an analytical tool specific to the case of multiple-use forests where different

use(r)s with concurrent and interdependent claims interact and could potentially co-exist. However, modes of social and political organization, power dynamics, and institutional arrangements (Ballet et al., 2013; Bookchin, 1985; Harvey, 1993) often impede such co-existence, causing social and environmental injustices detrimental to forest-reliant communities.

#### *4.1 Reindeer herding v. commercial forestry in Sweden*

Productive forestland covers about 53 percent of Sweden land area (Sandström et al., 2011). Since the introduction of the 1993 Forest Act, the Swedish forest policy aims at supporting multiple-use forestry, despite it is being contested to which degree it does so (Beland Lindhal et al., 2017; Hallberg-Sramek, 2023; Mårald et al., 2017). The principle of “freedom under responsibility” regulates forest management and harvesting, establishing that non-industrial forest owners and private companies can decide how to manage the forest freely but within certain limits and taking other forest values into account (Appelstrand, 2012; Roos et al., 2022; Sandström et al., 2016). The public has the right to access the forest for recreational purposes, such as picking berries and mushrooms, nature-based tourism, hunting, camping, or making fire, and the Indigenous Sami people who are part of a Reindeer Herding Community (RHC) have exclusive rights to “use the land and water for maintenance for themselves and their reindeer” (Swedish Reindeer Husbandry Act, 1886). Clearly, this is a case of multiple-use forests where policies try to support co-existence between different use(r)s. However, crowding effects and thus conflict do exist. This paper focuses particularly on the case of Sami reindeer herders v. forestry.

Potentially, one might say that the forest is managed as a common between the two users (Frischmann, 2012), as neither of them is excluded from using the forest for its own preferred use but some rules are in place to help manage complexity and heterogeneity. Indeed, Sami herders have the right to practice reindeer husbandry over roughly half of Swedish productive land area, but there is no land designated for herders' use only and they must share it with others, including landowners (Sandström, P., 2015; Eggers et al., 2023). The latter can use the forest for timber production, but they must refrain from altering the conditions of the land in such a way that it negatively affects herders' rights (Hahn, 2000). Moreover, collective choice arrangements seem to be in place. Indeed, facing a highly conflictual situation between herders and industries, in 1979 the Swedish parliament introduced consultation procedures between forest companies and the reindeer sector (Swedish Forestry Act, 1979:429; Swedish Reindeer Husbandry Act, 1971:437), as

a mean to find suitable institutional arrangements that could guarantee co-existence between the two sectors (Sandström, C. et al., 2011). Then, since 1998, the Forest Stewardship Council (FSC), the independent third-party forest certifier, has set specific consultation standards (FSC standard)<sup>5</sup>. The current one mandates forest owners to invite RHCs to participate in processes for planning activities that will have an impact on them (FSC, 2020). The process should follow the Free Prior and Informed Consent principle (Roos et al., 2022).

However, as illustrated in the next sections, applying the CA improves the normative analysis and evaluation of the current institutional arrangement from a justice standpoint. The CA seems to be particularly suited to analyze this case as Sami consider reindeer husbandry not just as a means of living, but as fundamental for their culture, historical legacy, and identity (Eggers et al., 2023).

Sami people practicing reindeer husbandry land use are mostly located in the Sapmi area, covering northern Sweden, Norway, Finland, and Northwestern Russia (Sandström, 2015). Reindeer herds are migratory and often change grazing areas according to food availability and variations in practices between ‘mountain’, ‘forests’, and ‘concessions’ RHCs (Horstkotte, 2013; Widmark, 2009). The practice dates back further, but since the 17th century reindeer husbandry has intensified and played a more important role in Sami livelihoods<sup>6</sup> for both personal consumption and sale. Indeed, Sami have strong traditional knowledge of pastures’ quality and accessibility, to the extent that herding “constitutes a socio-ecological system where the indigenous knowledge and culture of the herders influence where the animals will feed” (FAO, Alliance of Bioversity International and CIAT, 2021:118). Therefore, reindeer husbandry can be seen as a way of being and doing that Sami people deem valuable for themselves, that is a functioning. At the same time, their cultural identity as Indigenous reindeer herders affects the relation Sami have with the forest and their aspirations attached to it, through cultural ecosystems services (Ballet et al., 2018).

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<sup>5</sup> In Sweden, the Forest Stewardship Council (FSC) certify all major private forest companies and public forests and requires consultation to be held also on winter grazing ground (FSC, 2020; Eggers et al., 2023). For a more detailed description of what the 2020 National Forest Stewardship Standard requires, please see Roos et al., 2022.

<sup>6</sup> For more information on reindeer husbandry history and its role in Sami’s culture please refer to <https://www.samer.se/1134>.

#### 4.2 *The commons and substantive justice: non-excludability as entitlement for the capability to function*

To make a case for analysing the commons in light of the capability approach to justice, this work first builds on a specific conceptualization of capabilities as having an entitlement component. Since its first formulations, the capability approach has been concerned with both an opportunity and a process aspect of freedom, meaning that capabilities involve both the conversion processes themselves and the freedom to accomplish what the agent values the most (Fia and Sacconi, 2019). However, it does not say much about how and why a person comes to have certain capabilities or not and what can be done to eventually change this (Reddy and Daoud, 2018). By means of example, the capability approach might be useful in assessing whether a local community has enough land to practice subsistence farming that serves its flourishing or whether, in the case at hand, Sami have access to adequate *guohtun*<sup>7</sup> to continue practicing reindeer husbandry. Despite this, the capability approach does not explain how the community or the Sami herders have obtained such command over a certain resource or what to do to improve the situation. To fill this gap, some scholars have suggested an understanding of capabilities as also having an entitlement component, meaning a legal right to do something enforced by the legal system, social norms and/or social actors' negotiations (Fia and Sacconi, 2019; Fia et al., 2023; Gore, 1993; Leach et al., 1999; Reddy and Daoud, 2018). In the case of environment and natural resources, we can speak of entitlements as “the alternative sets of utilities derived from environmental goods and services over which social actors have legitimate effective command and which are instrumental in achieving wellbeing” (Leach et al., 1999:233).

An entitlement enhances the capabilities of a person or group by legitimizing control over certain resources (Sen, 1981, 1984), commodities bundles (Gasper, 1993) or their characteristics, which are necessary for human flourishing. In the case of multiple-use forests, if stakeholder A does not possess any valid title to access and use it or another stakeholder B's title or use impedes A's use, then A has no capability to turn the forest and its characteristics into functionings that are valuable for her, despite having the practical skills to do it<sup>8</sup>. Thus, each stakeholder must have an

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<sup>7</sup> Sami reindeer herders call *guohtun* the multi-dimensional concept of having access to food for reindeers, which depends on both the amount of ground lichens and the conditions of snow and ice (Roturier and Roué, 2009; Hortskotte, 2013)

<sup>8</sup> In dispute over Indigenous land rights, the existence – or not – of a legal title is a delicate issue. Xanthaki defines this as a “problem of proof”, since proving indigenous ownership is particularly difficult due to “differences in values between indigenous and non-indigenous peoples”, which “lead to a chasm between indigenous land systems and

entitlement over the forest and forests' characteristics that are instrumental for valuable functionings, as this is a necessary condition for her capability to convert it or some of its inputs into such functionings (Fia and Sacconi, 2018). Specifically, an entitlement simultaneously includes the freedom, positive, and negative claim-rights and defines the set of choices available to the agent (Fia and Sacconi, 2019:948; Hohfeld, 2017; Gasper, 1993). Borrowing from Hohfeld (1917), freedom is the equivalent of a privilege or permission to access and use a certain good and transform forests' characteristics into functionings. Thus, it also implies a claim not to be excluded without just cause from accessing the resource (Ribot and Peluso, 2003) and its characteristics, insofar as this is necessary for the capabilities to transform the forest into valuable functionings.

For multiple-use forests over which different actors claim a legitimate stake, this overall reasoning implies that none of them can have an absolute right to completely exclude the other(s) from accessing the same forest and its characteristics. Contrarily, each user has a duty to refrain from denying and violating others' freedom to access (Fia and Sacconi, 2019; Fia et al., 2022). Importantly, such non-excludability must be understood as more than purely physical; indeed, some of the collectivities who claim a stake do not need physical access to transform the forest and its characteristics into valuable functionings. Think about extensive forests such as the Amazon rainforest and the value that the global community attributes to it, mostly as a carbon sink, source of oxygen, or home for biodiversity. For the global community to be capable of choosing such utilization functions it suffices that the forest is managed in a way that it can still provide these services. Therefore, the global community does not need to *physically* access the resource, but it should not be excluded from the freedom to access and benefit from these valuable forest functions.

Following this reasoning, it is possible to conclude that when different stakeholders value the forest as an essential resource to perform valuable functionings, non-excludability must be guaranteed, which means the forest must be managed as a common. This is justifiable not only in terms of efficiency but also from an ethical standpoint: non-excludability indeed finds a normative foundation in that it is a necessary condition to have the entitlement component of the capability to access a certain good and convert it into valuable functionings. Thus, non-excludability affects who is entitled to the resource base of capabilities, i.e., who can demand a particular use of the

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current national policies" (Xanthaki, 2007:249). However, Courts are increasingly "adapting rules of evidence and requirements of proof to indigenous perceptions" (Xanthaki, 2007:251), considering their cultural identity.

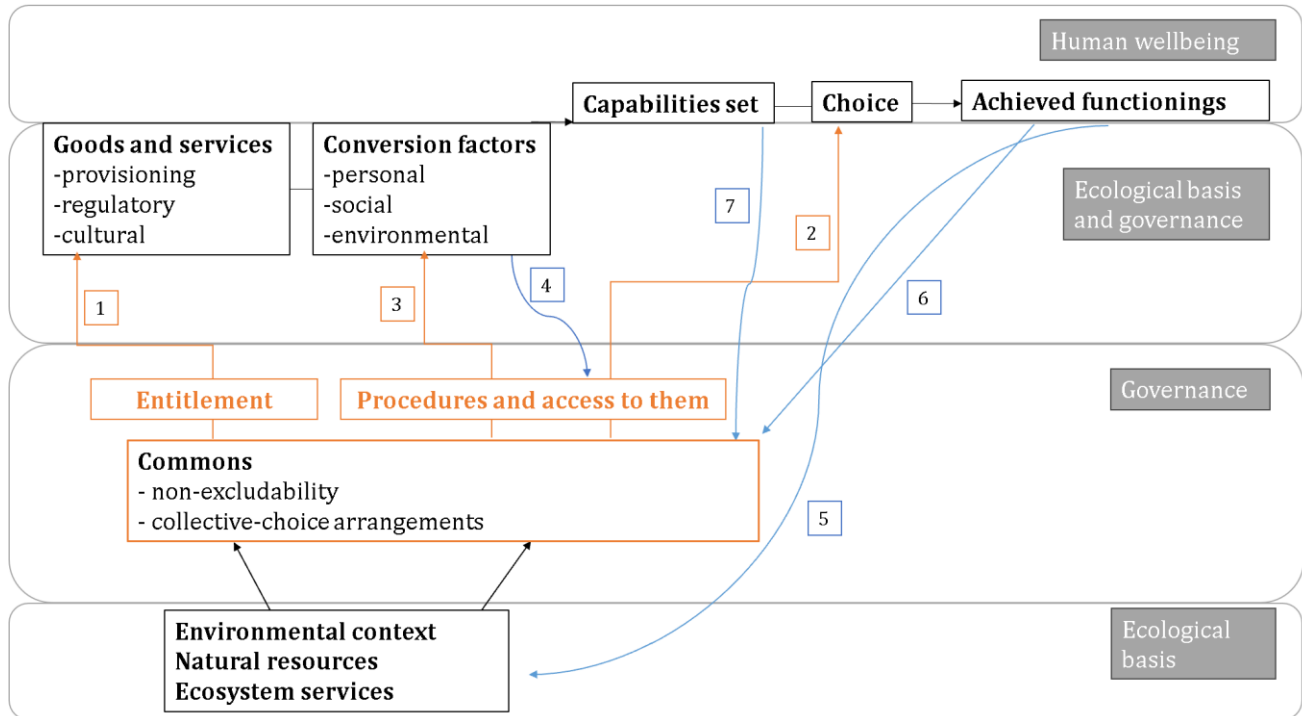
resource [Figure 1, Arrow 1], and the CA becomes a normative tool to give an ethical foundation to the commons as a form of governance for shared ownership, management, or use of a resource. However, the result is not a complete absence of any regulation and open access, but it recalls Frischmann (2012), McKean (2000), and Oakerson's (1978) arguments for semi-commons and mutual regulation to preserve co-existence and forest's multifunctionality. Indeed, unregulated or poorly regulated non-excludability can negatively affect the supply of the resource, as more subtractive functionings can prevail over less subtractive ones thus, *de facto*, excluding the latter and undermining the social option value of the resource [Figure 1, Arrows 5 and 6]. With respect to this, the capability approach also serves as an evaluative tool.

Let's consider the Reindeer husbandry *v.* forestry case: applying the previous overall reasoning implies asking whether Sami herders are (non-)excluded not merely from the forest itself but from *the capability to access – benefit from* – the forest and its characteristics and convert it into reindeer husbandry as a valuable functioning. Indeed, it can be said that non-excludability as entitlement sustains Sami herders' meta-capability (Holland, 2014) to access and benefit from the forest, which in turn is essential for other capabilities to function as reindeer herders – see Appendix A1 for a preliminary list of capabilities. Thus, policies and institutional arrangements should be evaluated also based on whether Sami have an actual *entitlement* to the forests' characteristics that are instrumental to their wellbeing. Precisely, this means evaluating whether they have: (i) the freedom (permission) to access the forest and the lichens and use them for reindeer herding, (ii) the positive claim-rights to require that forest management plans support their capability to benefit from the forest according to their preferred use, and (iii) the negative claim-rights to require that other forest use(r)s, in this case forestry, refrain from taking actions that impair such capability at least below a significant threshold (cfr. claim-rights of employees in Fia and Sacconi, 2019).

Since the mid-20th century, silvicultural intensification and the introduction of clear-cutting have been threatening the multi-functionality of the Swedish forest landscape, to the point that reindeer herding as a traditional way of life is more and more under pressure. Indeed, back in times selective harvesting of largest trees used to have a positive effect on reindeer grazing lands because it cleared the forests for animals' move (Berg et al., 2008). However, the introduction of clear-cutting, high intensity soil scarification, and extensive networks of roads are negatively affecting the forest landscapes by fragmenting the land and reducing food available for reindeers,

specifically ground and arboreal lichens (Eriksson and Raunistola, 1990; Esseen et al., 1997; Östlund et al., 1997; Roos et al., 2022; Eggers et al., 2023). According to data, there has been a 50 percent reduction of forests categorized as rich in terms of ground lichens in the last 50 years and, if maintained, current management practices would cause a further decline in lichens habitat (Eggers, 2023; Horstkotte, 2013; Korosuo et al., 2014; Miina et al., 2020; Sandström et al., 2006). The unpredictable cumulative effects of climate change even accentuate the overall impact (Horstkotte, 2013). Moreover, forestry influences snow cover, thickness, and trapping, indirectly affecting the *guohtun* (Roturier and Roué, 2009; Hortschette, 2013; Sandström, 2015); indeed, if there are fewer trees, more snow deposits on the ground and terrestrial lichens are scarce or difficult to reach. Arboreal lichens have also been declining significantly, due to a decrease in old-growth forests (Esseen, 2019; Eggers et al., 2023). While additional land uses such as mining, wind power installations, and tourism affect reindeer husbandry too (Sandström, 2015; Fohringer et al., 2021), forestry has a major impact also due to its direct effect on lichens. Clearly, reindeer herding can also affect forestry as animals can destroy tree seedlings and damage forested areas (Berg et al., 2008; Widmark, 2009). However, forestry is a more resource-intensive and more subtractive land use compared to reindeer husbandry, as it tends to reduce the available resources for reindeer herding more significantly than the reverse (Hahn, 2000; Roturier and Bergsten, 2006; Sandström and Widmark, 2007).

Thus, we can say that while Sami herders can physically enter the forest for reindeer husbandry, they see their positive and negative-claim rights to benefit from it and its characteristics neglected [Figure 1, Arrow 1]. Indeed, under the current institutional arrangement, intensive logging and increased economic and socio-political status of forest companies - that is achieved functionings of logging companies - reduce available lichens and the forest's capacity to sustain Sami herders' capability to perform reindeer herding [Figure 1, Arrow 5]. Importantly, because Sami herders value the forest landscape not just as a regulating and provisioning service but also as a cultural one, current forest management practices also represent an attack to their identity and traditional way of life (LaDuke, 2002). Moreover, they undermine governance of the forest as commons, as de facto, there is no co-existence, and the social option value of the resource as a common is under threat [Figure 1, Arrow 6].



**Figure 1.** A representation of the integrative framework connecting commons, capabilities, and functionings, adapted and integrated from Polishchuk and Rauschmayer (2012) and Bennet et al., (2015).

#### 4.3 The commons and procedural justice: collective choice arrangements on equal footing as precondition for the capability to be equal citizens

Capability as including an entitlement is just one aspect of freedom – the *opportunity* aspect – that refers to the ways of being and doing people succeed in achieving. The other aspect concerns the *procedures* through which people achieve certain outcomes – the *process* aspect of freedom (Sen, 2009). As regards forest governance, it is not the same if Indigenous or local communities obtain a halt of logging, mining, or extractive activities because of a negotiation process for new management rules, or just because the government and industries have unilaterally decided so. It also matters whether different plans were discussed and co-produced, or the communities were just informed of an already definitive plan.

As discussed in Section 2, the literature on the commons too has shed light on the importance of pre-play communication in promoting pro-social behavior, build mutual trust, and establish credible commitments (Agrawal and Ostrom, 2001; Ostrom, 1999, 2005, 2009; Ostrom et al., 1994; Sacconi, 2015). However, this overall discussion considers collective choice arrangements, i.e., the possibility for users to create and modify operational rules, solely in terms

of efficiency: they serve to better fit local needs as well as to increase the opportunities for adaptation and learning and tendency for conformity (Ostrom, 1990, 2005).

The capability approach to justice instead considers the intrinsic value of choice, which increases as the number of alternatives for choosing among significant functionings increases (Sen, 2009). Because a functioning has a higher value when chosen from a wide set of capabilities than in case of no-alternative, an agent must be capable to choose freely what constitutes a meaningful life, within the capability set under her control (Fia and Sacconi, 2018; Sen, 1992). Therefore, choice also has an instrumental value, as it expands the set of functionings from which an agent can choose. Importantly, an agent must have a *full* liberty that is comprehensive of both the opportunity to transform a good into valuable functionings and the opportunity not to do so, and she must be able to choose between them (Fia et al., 2023). Then, this liberty limits the counterpart negative claim to exclude. In the case at stake, this means that Sami herders' liberty to benefit from the forest - or not doing so - limits loggers' right to exclude them, under some qualifications. Thus, governance and collective choice arrangements become relevant because of the need to regulate liberties, possible conflictual relations between liberties and claims, and capabilities conflict.

Sen himself contends that there is a strong connection between democracy and justice, which must be found in the idea of democracy as “public reasoning” and “government by discussion” about matters of social concerns (Crocker, 2008; Sen, 2009). He affirms that “if the demands of justice can be assessed only with the help of public reasoning, and if public reasoning is constitutively related to the idea of democracy, then there is an intimate connection between justice and democracy, with shared discursive features” (Sen, 2009:326). Democracy receives an even more direct treatment in Anderson's democratic equality approach, which understands it as a process of “collective self-determination by means of open discussion among equals, in accordance with rules acceptable to all” (Anderson, 1999:313). According to this approach, two people are equal when each acknowledges that her actions must be justified by principles the other accepts, and they mutually consult, reciprocate, and recognise.

Thus, equality is a social relationship and justice should focus on protecting and guaranteeing each person's capabilities to participate and modify governance rules *on equal footing* with others, as this is a precondition to exercise equal citizenship, which is the aim of justice. This is in line with Fraser's call for participatory parity: if and only if institutions regulate social interactions in a way that actors are equally capable to participate in social life, then we are

in a context of status equality and mutual recognition (Fraser, 1996; Fraser and Honnet, 2003:44). It also resonates with Young's (1990) claim that mal-distribution is rooted in lack of recognition as well as political and cultural exclusions and oppression (Shrader-Frechette, 2002; Schlosberg, 2010).

Under this lens, collective choice arrangements assume a normative meaning, as they are necessary for people's capability to function as equal citizens and co-design the rules by which they live. Indeed, procedures and access to them influence agents' capability to choose freely how to convert the resource into what they consider valuable functionings [Figure 1, Arrow 2]. Thus, collective choice arrangements should be evaluated with respect to whether they guarantee everyone with equal capabilities to establish institutional terms that other functionings depend on and be equal protagonists in the governance of an essential resource for the community at stake. Overall, this means standing as equal citizens vis-à-vis the others. Indeed, unequal capabilities to choose on equal footings with other can affect the commons as a governance model where users collectively define rules for mutual use [Figure 1, Arrow 7].

Consider again the case of reindeer husbandry v. forestry. As seen above, one can say that the latter is incrementally and negatively interfering (Pettit, 2001) by removing the option for Sami herders to use the forest for their preferred use and in a way that allows them to perform valuable functionings attached to the resource. However, forestry is also indirectly removing options for choice, through unfair decision-making procedures that result in "participatory exclusions" (Agarwal, 2001). Indeed, despite consultation systems are in place, many reindeer herders have shown dissatisfaction with them, claiming they have few or no significance and they are more informative forums than real consultation processes (Eggers, 2023; Sandström et al., 2011; Sandström and Widmark, 2007; Widmark, 2009). They claim that consultation procedures are unbalanced, which in turn affects the possibilities for reindeer herders to influence the outcome. Indeed, Sami herders believe that participating in consultations is more expensive for them than for forestry employees, the information material supplied by the forestry industry is imprecise, and trainings are not easily available (Roos et al., 2022). Moreover, forestry is usually mostly focused on single trees and individual forest stands, while Sami reindeer herders have been demanding that consultations be held more from a landscape perspective. Indeed, depending on changing of seasons and animals' movements, they need access to more extensive pastures (Sandström, P. 2015; Harnesk, 2022; Horstkotte, 2013).

Overall, the current procedure is quite far from the *Samråd*<sup>9</sup> practice as intended by Sami, which is more rooted in negotiations and democratic culture (Roos et al., 2022; Widmark, 2009). Using the democratic approach to justice, one might say that what appears to be an institutional arrangement for collective decision-making where major stakeholder groups are involved in negotiations over rules to use a shared resource (Sandström and Widmark, 2007), it is not. Indeed, consultations and decision-making rules do not actually ensure the capabilities to participate in the establishment of governance rules on equal footings, therefore interfering with Sami herders' agency-freedom to achieve whatever they, as responsible agents, decide they should achieve. Such power imbalances are also rooted in colonial legacy and in the fact that while forestry contributes significantly to Swedish economy, reindeer herding does not and this gives the two users different bargaining endowments (Roos et al., 2022; Sandström and Widmark, 2007). Thus, analysing this case from the CA perspective can also be helpful to enhance our understanding of how the commons can either intensify or lessen the effect of conversion factors and vice versa [Figure 1, Arrows 3 and 4]. Moreover, it sheds light on the fact that the process is not able to modify socio-political relations, as Sami herders are neglected with essential capabilities to function as equal citizens in society and co-design the rules on equal terms. Indeed, logging companies' capabilities to decide how to use the forest for their more subtractive functionings also undermines the commons intended as a form of forest governance by which multiple users collectively decide and co-produce rules for mutual use that can ensure co-existence [Figure 1, Arrow 7].

## 5. Conclusion

In this paper, I have attempted to bridge a normative gap within the literature on commons via the capability approach to justice. The outcome is a conceptual framework that can connect these two strands of literature, with a view of applying it to the analysis of governance of complex socio-ecological systems such as multiple-use(r)s forests.

The paper presents a two-pronged argument in favor of using the capability approach as a normative and evaluative tool for institutional arrangements and policies that aim at implementing a balancing exercise between competing forests use(r)s from the commons perspective. First, considering substantive justice, I showed that under the capability approach, non-excludability

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<sup>9</sup> *Samråd* is the Swedish word to indicate the negotiations between Sami herders and forestry (Roos et al., 2022).

assumes a normative meaning, as it sustains the entitlement component of the capability to benefit from the resource and its characteristics, and transform them into valuable functionings. Second, with respect to procedural justice, I highlighted that collective choice arrangements - the second key characteristic of commons - also assume a normative meaning as they sustain the capability to function as equal citizens and co-design the rules by which one lives on equal terms with others.

Starting from this perspective, the paper shows how the capability approach can be useful to assess policies that aim at guaranteeing co-existence of use(r)s through commons, from the viewpoint of justice. The conflict between reindeer husbandry *v.* forestry in Sweden is used as an exemplifying case study to illustrate a potential application. The analysis shows that current policies fail to provide Sami both (i) the entitlement for the capability to benefit from the forest and (ii) the capability to co-design rules for mutual use on equal footings with the forestry sector, despite speaking of multiple-use forestry. Thus, they threaten Sami reindeer herders' survival as a distinct society with its own traditions and identity as a social and cultural group.

On the one hand, the framework is consistent with the view that commons are social institutions rather than material resources with specific attributes and, as such, they are the result of collective organizational processes, where inequalities and power relations play a role (Kashwan et al., 2021; Fournier, 2013). Thus, the integrative framework specifies how they work as mediators between the ecological and the wellbeing dimensions and it provides a tool for policy makers and practitioners to design and evaluate policies for the commons not only from an efficiency standpoint but also from a justice perspective. On the other hand, the framework highlights the importance of considering how protecting or restraining capabilities or functionings of certain users influence the ecological system at stake but also the commons as institutions for co-existence, and, in turn, others' capabilities and functionings, including the basis for identity and cultural practices among people and communities (Adger et al., 2011; Schlosberg, 2010). Thus, it adds collective structures and ways of being together to the evaluative space of the capabilities approach. Moreover, it highlights the interplays between commons and conversion factors.

Several scholars have already started working on issues of equity within the commons, mostly through the adoption of participatory approaches and power-related frameworks. However, using the capability approach has the advantage of keeping together the substantive and procedural aspects of justice, rather than focusing just on the latter. Moreover, the overall reasoning opens further avenues of research on the issue of ecosystem services as social-ecological

services, i.e., services that do not automatically come from nature but are co-produced by human interactions (Isaac et al., 2023), and it broadens the understanding of trade-offs in environmental and natural resources governance.

As the capability approach is mindful of the different values that various stakeholders might attach to the same resource, including cultural ones, the framework is also sensitive to the issue of considering the interactions between provisioning and cultural services, as the latter are less quantifiable and therefore more often excluded from pure efficiency calculations.

Finally, the framework might be helpful in addressing the three interrelated challenges of designing research for sustainability (Bennet et al., 2015), namely (i) accounting for how ecosystems are co-produced by socio-ecological systems, (ii) accounting for who benefits from the provision of ecosystem services and (iii) examine how specific institutions influence supply and distribution of ecosystem services.

Yet, the work presents some limitations. First, as it is a first attempt to connect the existing works on the commons and the capabilities approach, the framework is mostly conceptual and there are no indications for more concrete rules. For this reason, in line with the idea that the capability approach is context-specific, I stress the need for further research on more explicit operational rules, which are tailored to specific case-studies. For instance, there is room for discussion on whether, in case of capabilities conflict, a sufficientarian (Anderson, 1999, 2010) or limitarian rule (Robeyns, 2024) should be followed, or a mix of both. Moreover, further developments for the reindeer husbandry v. forestry case might concern the validation of a specific capability list or, better, different lists with respect to different forest management scenarios. At this stage, the aim was to use a real-world multiple-use forest management problem to illustrate the application of the capability approach to commons. However, it would be desirable to add the forestry perspective and possibly map the capability conflict between the two use(r)s, with a view to better elaborate on how the proposed approach can be applied to address the conflict. The same could be done for other conflicts, such as conservation v. development ones.

## **Acknowledgments**

A special thanks goes to Jerome Ballet, Enrica Chiappero-Martinetti, Eleonora Ciscato, Pietro Ghirlanda, Nadia von Jacobi, Lorenzo Sacconi, the research group of Camilla Widmark at the Forest Economics Department of the Swedish University of Agricultural Science, the research group of Camilla Sandström at the Department of Political Science of Umeå University, and the participants at the 2022 Commons, Commoning, and Social Change workshop for their valuable comments on previous versions of this work.

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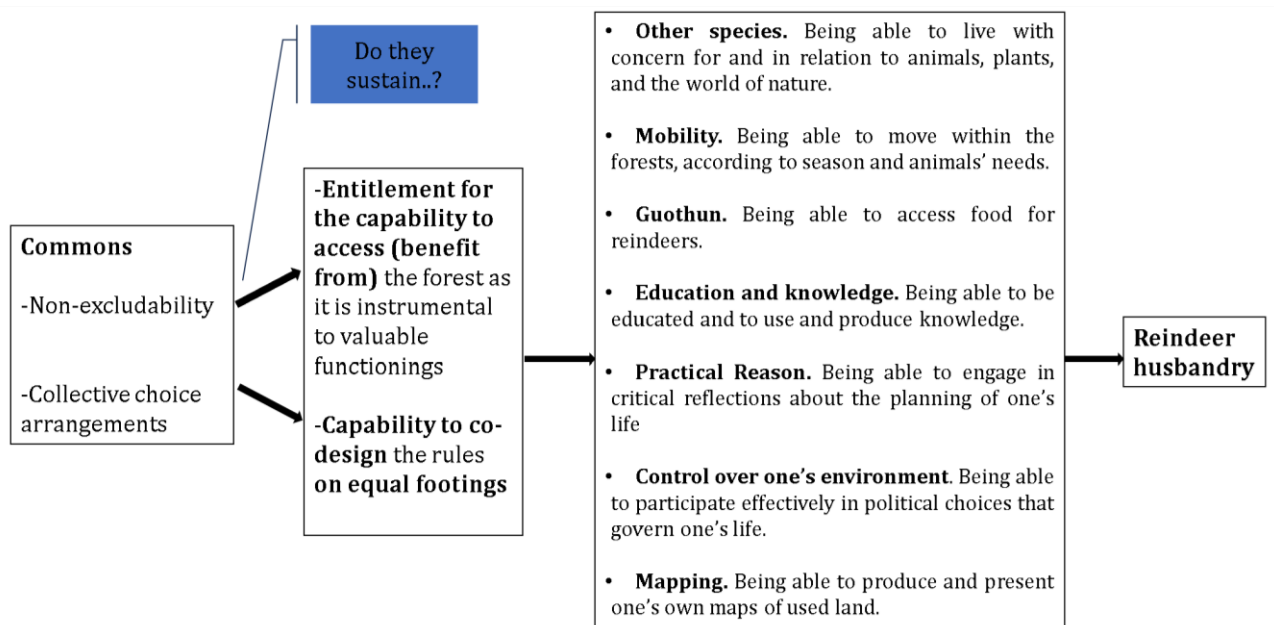
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**Appendix A1. Example of a preliminary list of Sami herders' capabilities necessary to perform reindeer husbandry.**

The list has been developed in the wake of the procedure followed by Robeyns (2003) for selecting capabilities relevant for the study of gender inequality in Western societies. First, an initial list was developed through unconstrained brainstorming, also drawing upon other lists (Burchardt and Vizard, 2011; Nussbaum, 2000; Wolf and de-Shalit, 2007). Then, the list was refined through engagement with the existing literature on the conflict. Finally, the list was discussed with different scholars and practitioners who have been working on the issue. However, the list is still defined as “preliminary” because further discussion should be made with Sami reindeer herders themselves, for validation through an iterative process (Wolf and de-Shalit, 2007).



## **PAPER II**

# Whose forest? A two-level collective action perspective on struggles to reach polycentric governance

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Keywords: Polycentric governance, Dynamics, Conflict, Collective goods, Forests, Distributional coalitions

## Abstract

Natural resources management often entails accommodating competing cross-scale interests. Polycentricity literature offers a potential solution: value heterogeneity can reflect in an institutional architecture that allows the coexistence of multiple management priorities, appeasing conflicts. However, this literature has largely endorsed a static perspective focusing less on the function conflicts can play *ex ante* for reaching such a more participated governance. This paper addresses this gap by focusing on the micro-processes of conflict that precede the potential instalment of polycentric governance. We present a two-level collective action framework that emphasizes key moments of such processes and use it to read forest-related conflicts. In a comparative analysis of four illustrative case studies from Finland, Canada, Brazil and Indonesia, we focus on common dynamics of conflict reification and its eventual transformation into an agreement on common procedural rules, which can sustain polycentric governance. We work iteratively to enrich our two-level collective action framework with insights from other corollary theories, notably the Social Movements, Bargaining, and Deliberative theories. We find that conflict serves the purpose of marginalized parties to reshuffle power imbalances and force stronger parties to the negotiation table, corroborating other literature. Yet, conflict must be followed by negotiations and integrative bargaining on procedural rules for institutional innovation, that can lead to the accommodation of value heterogeneity. Our study can help practitioners in contextualizing current conflict scenarios within a longer-term perspective and evaluating ongoing conflict episodes and the costs associated to certain strategies versus the prospect of longer-term consequences of these struggles

## 1. Introduction

Global cross-scale sustainability issues like deforestation, water and air pollution, soil erosion and land disputes are more and more tangible and urgent, especially as uncertainty associated with the climate crisis grows. Inability to address these issues poses a double threat: natural resources degradation and increasing conflict potential due to competing demands and priorities over such resources (Andersson and Ostrom, 2008; Ebbin, 2004; Heikkila, 2019). In turn, conflicts are likely to impede the identification of sustainable solutions, because different parties advance opposing views regarding resource access, use, and distribution (Colvin et al., 2015; Matiru, 2000; Xu, 2021;

Yasmi, 2003; White et al., 2019). Moreover, such disputes frequently result in the exclusion of certain groups from access to and use of the resource, further increasing conflict potential.

In this context, forests have been recognized as “increasingly contested economic, cultural and political spaces” (Oldekop et al., 2020:1406). Forest governance depends largely on the outcomes of bargaining between different interested actors who claim their stake over the forest (Schlüter and von Detten, 2011), as well as on large scale political and economic processes that interact with local dynamics (Oldekop et al., 2020), often driving conflicts (Eckerberg and Sandström, 2013). Therefore, forest science has been encouraged to look into social science in addition to natural science (Hicks et al., 2016), to understand more about the interaction between global and local processes (Oldekop et al., 2020). Social science research has indeed addressed similar complexities over the last 60 years, advancing proposals for more promising institutional designs, specifically participatory and multi-level institutional arrangements that can be both feasible and more suitable than top-down and single actor solutions (Aligica, 2014; Baldwin, 2020; Frischmann, 2012; Ostrom, 2009; Ostrom, 2010). The Ostroms and subsequent authors' findings have demonstrated that, under certain conditions, users can self-organize and solve collective action problems also across multiple and nested governing authorities, allowing for polycentric governance (Cole, 2015; Ostrom, 2005; Stephan et al., 2019).

As a result, much hope has been placed in polycentric governance to address pressing sustainability issues (Jordan et al., 2015; Milinski and Marotzke, 2022; Obura et al., 2021). While polycentricity itself may potentially also accommodate independent decision-making units, a polycentric ‘system’ implies interdependence between them (Ostrom et al., 1961). Polycentric governance can therefore be defined as an institutional arrangement with multiple, partially autonomous and partially overlapping decision-making centers, which interact and share governance responsibilities over a certain resource or policy under an overarching system of rules (Aligica and Tarko, 2013; Baldwin et al., 2018; Stephan et al., 2019).

Understood in this way, polycentric governance implies some sort of interdependence between its units. It is intended to alleviate conflicts that may arise from natural resources management, because multiple interests, claims and management priorities can co-exist and certain public goods can be co-produced. Within a well-designed polycentric system that translates value heterogeneity into institutional heterogeneity (Aligica and Tarko, 2013; Andersson and Ostrom, 2008), each unit can further use exit, voice, and self-organization as strategies to compete

with other interdependent units; and larger units can serve as conflict resolution mechanisms for smaller units (Thiel and Moser, 2019) or be useful in addressing issues such as elite capture and discrimination. Finally, because of greater interaction and coordination between decision-making centers, mutual adjustment is more likely to occur (Baldwin et al., 2018). Given these features, polycentric governance is likely to attenuate or partially prevent resource conflicts, although it may not ultimately resolve their root causes.

Because of such high expectations placed on polycentric governance, it is noteworthy that the literature has mainly focused on its ability to accommodate potentially conflicting units but it has not dig into trajectories to reach it. We see this gap as tied to the prevalent view seeing polycentric governance as an institutional arrangement that guarantees a certain *ex post* capacity to avoid or deal with conflict, which implies that less attention is paid to *ex ante* conflicts and dynamic processes.

In this paper, we focus exactly on these micro-processes preceding potential polycentric governance. While we do not assess the quality of the outcome reached, our focus on the preceding dynamics aims to contribute to a deeper understanding of how and under which conditions a polycentric system can emerge. Our goal is to develop a comparative framework for understanding collective action dynamics towards eventual polycentric governance, in which there is a role for conflict. We investigate whether it is possible to identify common dynamics across different cases.

We concentrate on forests-related conflicts and the resulting stress on livelihoods and sustainability (Derkyi et al., 2014; Eckerberg and Sandström, 2013). We treat forests as collective goods subject to concurrent and at least partially competing claims advanced by various collectivities. To frame the micro-processes through which conflicts involving cross-scale interests unfold in time, we propose a two-level collective action problem framework that combines various elements of classical institutional theory with each other (Section 2).

Then, we present illustrative case study material from four forest- conflicts hotspots (Mola-Yudego and Gritten, 2010), namely Finland, Canada, Brazil, and Indonesia (Section 3). We first use our framework as guidance in a comparative analysis that seeks to identify some common dynamics of conflict escalation and transformation. Second, we use corollary theories - the Social Movements, Bargaining and Deliberative Theories - to better interpret and reconstruct actor strategies within the dynamic process. We suggest that the resulting analytical grid (Tables 1–3) enriches the polycentricity literature in understanding key moments of *ex ante* conflict dynamics

(Section 4). In our conclusions, we highlight that our stylized description of dynamic micro-processes may have limitations but can be used to “read” other, multi- and cross-scale instances of forest governance. For practitioners, our analysis may serve as reference in evaluating ongoing conflict episodes and the costs associated to certain strategies versus the prospect of longer-term consequences of these struggles.

## **2. Conflicts over collective goods: a two-level collective action problem**

Forests are essential resources for a wide range of users and uses, from the local to the global scale (Geores, 2003; Gong, 2002). They provide numerous ecosystem services, from supporting biodiversity to providing food, water, medicinal plants and raw materials, regulating climate, air and water and serving as cultural, spiritual or recreative spaces (Oldekop et al., 2020) but due to their multifunctionality, forests are particularly subject to several potentially competing claims advanced by multiple cross-scale stakeholders (Berkes, 2002; Gong, 2002). Such claims are often rooted in value heterogeneity, as the collectivities' sources of behaviour and knowledge, regulatory and policy systems and connected socio-economic and political settings can vary widely (Adams et al., 2003; Nousiainen and Mola-Yudego, 2022; Paavola, 2005; Young, 2006). For instance, certain communities regard forests as places of spirituality and constitutive of personal and community-identity, history, and culture as well as sources of livelihoods (Abega, 1998; Pemunta, 2018; Simbaña, 2011; Tsing, 2004). Often, their demands for certain management priorities are rooted in claims of customary ownership or historical stewardship. Yet, to others, forests may simply be a source of a renewable commodity (Scott, 2020), a place of recreation and aesthetic pleasure, or a source of revenues.

We therefore envisage claims as reflecting institutional facts (Searle, 2005), which represent such value heterogeneity and are grounded in specific historical and political processes as well as geographical contexts (see Section 2.1). The framework we propose is meant to serve as tool to analyse the dynamics between “conflict episodes” (Pondy, 1967) of potentially longer-lasting - more or less latent - conflicts that result from economic, political, and institutional histories, as well as from ecological processes.

We synthesize quality and quantity of the advanced claims as use(r)s (Frischmann, 2012) and treat different stakeholders as collectivities. Notably, we consider a collectivity as a group of people who, despite likely internal heterogeneity (Agrawal and Gibson, 1999), distinguish

themselves from other stakeholders by perceiving the forest differently, having specific claims and preferring a linked management priority. Thus, in the problem-setup we propose, a forest is a collective good (Olson, 1965) for various collectivities, opening up a two-level collective action scenario. At a first level, each collectivity faces the dilemma of getting internally organized (Olson, 1965; Ostrom, 1990, 2005) to push for its own preferred use of the forest; at a second level, different collectivities struggle around how to manage the contested forest and distribute the benefits it may produce. In case of no agreement at such second level, there would be a failure to deliver the 'public good', which consists in preserving the overall forest's health, productivity, and sustainability.

At the second level, the collective action problem to find an agreement is often also a symbolic struggle for social and political reorganization and the recognition of new entitlement arrangements (Johnson, 2004; Johnson and Forsyth, 2002; Mosse, 1997). From this perspective, forest policy can be understood as a "social bargaining process" (Maryudi and Sahide, 2017:1) and forest governance as a "product of interaction between a number of interested participants" (Wagner, 2019:3).

### *2.1 Institutional facts. Getting organized around a claim*

Before a collectivity can even enter a dispute with others about which management priority should be given to the forest, it must self-organize and agree on the 'exact nature' of the collective good for which it wishes to make a claim (Olson, 1982:24). This is the first step in ensuring that each collectivity's claim is heard by the others (Aligica, 2018; Olson, 1965).

We propose such exact nature can be interpreted as the institutional facts (Searle, 1995, 2005) underpinning a claim. An institutional fact is "X counts as Y in C" and assigns a specific status and function (Y) to an object (X) that must be agreed upon by the relevant collectivity and reflects a specific cultural-historical context (C) (Searle, 2005:9). The "status function" transforming X into Y is observer dependent, meaning it is a social construction that depends on the attitudes of the people involved, which share the specific context C.

Institutional facts have a wide reach, in as much as they can constitute 'money', 'government' or 'property' (ibidem, p.3). In our study, institutional facts frame the perceived legitimacy of who uses a specific resource and for which purposes (cf. 'cognitive conflict' in Adams et al., 2003 and 'institutional ethos' in Voronov and Weber, 2017). For instance, while some

communities refer to traditional land and base their perception of the forest in experiential knowledge, informal rules, low social discount rates and historical disenfranchisement<sup>10</sup>, corporate actors or national governments often think in terms of commercial forestry, scientific evidence, high discount rates and formal, legally defined rules of ownership (Scott, 2020; Young, 2006).

In our analysis, we propose that X is a specific forest on which different collectivities concomitantly advance diverse claims, and Y is the ‘exact nature at issue’ (Olson, 1982:24) on which each collectivity internally agrees. The claim advanced is connected to a specific prioritized management arrangement that best resembles the preferred status and function attributed to the forest by the specific collectivity. We highlight that the legitimacy of each claim is to be traced back to “C”, which is a system of emotional, logical, and cultural elements unique to the collectivity and rooted in its specific historical, political, and geographical context. For example, the legal system may not be part of “C” of an indigenous community if it marginalizes their customary land ownership since centuries. X counts as Y in C - different for each participating collectivity - incorporates the value heterogeneity (Aligica and Tarko, 2013) that must be accommodated in a polycentric governance architecture, also taking into account historical legacies and symbolic meanings (Johnson, 2004; Mosse, 1997).

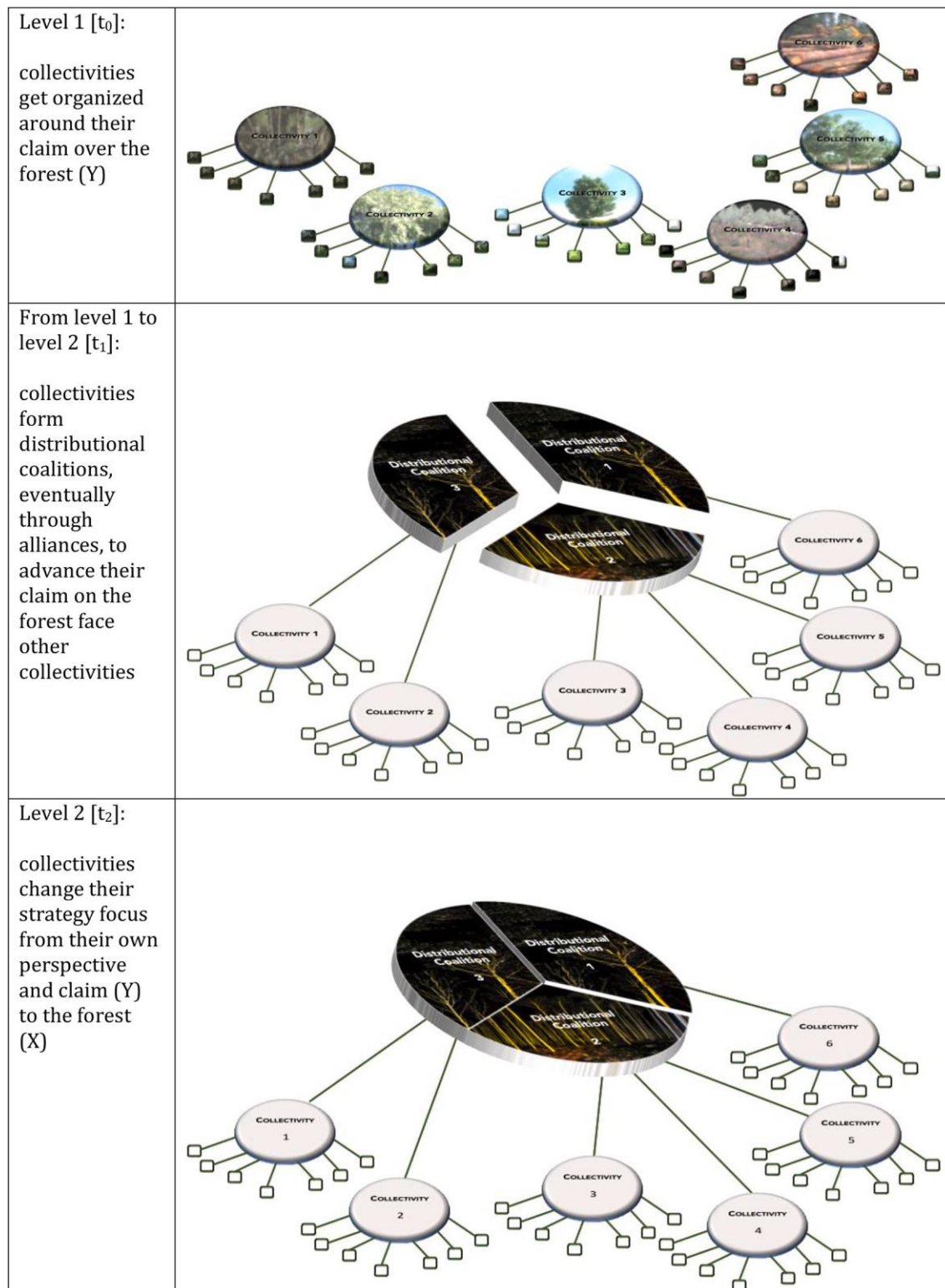
Our model enacts an intentionally stylized representation that does not weight claims based on the importance of the “C” they rely on – so indigenous culture is *ab initio* an equally valid source of legitimacy for a claim on the forest as is a logging concession granted by the government (cf. Scott, 2020). Power asymmetries of course come along with different institutional facts, but our study is interested in the dynamics of such asymmetries, not in assessing exact power levels from the start.

Because organizing around a collective voice and intentionality (Searle, 2005) does not come easily even within a single collectivity, a first-level collective action problem arises. Any individual sacrifice for the common goal implies the equal sharing of the obtained gains (Olson, 1982:18). Yet, obtaining, maintaining, or enlarging such gains is contingent, at least in part, on collective action taking place. Building a collective voice to advance a claim on the forest may thus be hampered by free-riding or hold-up, or by the absence of selective incentives that reward

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<sup>10</sup> We thank an anonymous reviewer for this point.

everyone who invests time and effort in the collective cause (Olson, 1965). When members of a collectivity agree upon a common perception of their purpose and succeed in getting internally organized, they can advance their claim at a second level, where different collectivities advance separate claims (Y)s on the same forest (X) – Fig. 1, upper panel.



**Fig. 1. A two-level collective action scenario.**

### 2.2 Distributional coalitions and the 'size of the pie'

The second level collective action problem envisages different collectivities, each with a separate

claim (Y), struggling to reach an agreement on how to manage the forest. As their mutual interdependence varies, each collectivity can have different preferences over certain outcomes, which might be ranked in order (Bruns and Kimmich, 2021). Different types of interdependence in strategic situations lead to different challenges to cooperation. In our scenario, we simplify such complexity and collapse multiple levels into a two-level scenario that serves as exemplification of much more complex and networked situations. While pay-off structures of the rival collectivities may be diversified (Bruns and Kimmich, 2021), failure to agree on a solution that preserves the forest's health, productivity, and sustainability can still broadly be envisaged as collective action problem. An unfavorable outcome results as long as each collectivity continues advancing its own claim over others', or until institutional change is just formal and not reflective of values heterogeneity and new forms of social and political organization (Mosse, 1997). Our “win-win” scenario is an agreement on forest governance that does not imply equal gains for all parties but is intended as outcome in  $t_2$  not making any party worse-off than in  $t_1$ , although it may make some party worse-off than in  $t_0$ . Such outcome is a partial outcome of a “conflict episode” (Pondy, 1967) subject to further changes within a longer process.

Following Olson (1982), we frame collectivities as “distributional coalitions” that advance their own claim and demand a redistribution of benefits in their own favour, even if this means sacrificing cumulative output and/or failing to provide the public good. A collectivity may engage in such action by itself or enter alliances with others (Villamayor-Tomas and García-López, 2018) to increase its relevance and stance. In Fig. 1, middle panel, collectivities act in favour of their own slice of the pie and no symmetrical solution across groups - which could increase the size of the pie - is found (Olson, 1982). We interpret the ‘size’ of the pie as the cumulative output the forest may produce for current and future generations.

Still, under certain conditions, distributional coalitions may be interested in joining collective action, which at this level implies engaging in bargaining with other coalitions to agree upon a common strategy for forest management. First, the coalition must have some bargaining endowment to bring at the table (Buchanan, 1975; Gauthier, 1987), which may simply be its claim (Y) provided other collectivities have recognized its legitimacy. Crucially, a collectivity's organizational capacity at the first level is essential for what bargaining endowment it will bring into the second level (Yasmi et al., 2011). Second, all coalitions must regard the condition in which no collective action takes place as suboptimal. Suboptimality, and thus the wish to improve the

current situation, may be determined by excessive predatory and defensive costs that one coalition inflicts upon the other(s) (Buchanan, 1975; Buchanan and Tullock, 1962; Gauthier, 1987). Further, if a coalition expects an agreement to be a more favorable outcome in  $t_2$  with respect to  $t_1$ , this represents additional perceived gains from entering the bargaining (Buchanan and Tullock, 1962; Deutsch, 2006).

Once bargaining starts, a possible path to polycentric governance implies a shift in the collectivities' bargaining strategy from increasing one's slice of the pie to one of (jointly) enlarging the pie - Fig. 1, lower panel. Understanding in which circumstances such a shift can happen is key to our comparative analysis.

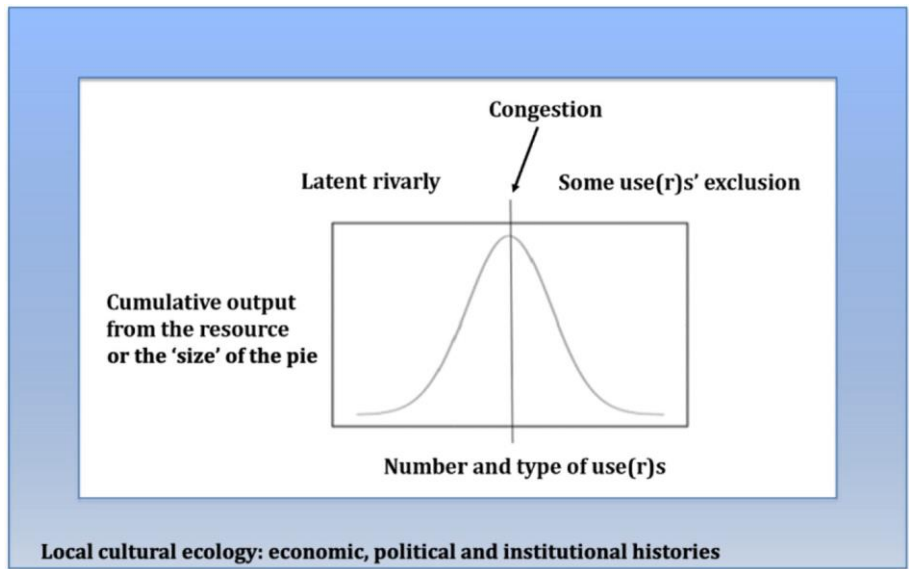
### *2.3 Reification of conflict*

The described two-level collective action scenario bears a clear potential for conflict. Tensions may first accrue during internal organizational processes within each collectivity. Then, conflict between different collectivities and coalitions is likely to manifest when the claims advanced by one are perceived as illegitimate or as an impairment to the claims of another (Glasl, 1999). Furthermore, each distributional coalition risks pursuing group-interests that may clash with the broader societal interest. Such frictions are exacerbated by power asymmetries rooted in historical legacies, heterogeneous organizational capacities including different abilities to afford predatory and defensive costs, and in the type of information, knowledge and legitimacy of their claims (Foucault, 1975; Morrison et al., 2019; Weede, 1985).

Despite conflict potential is always lurking, its escalation becomes more probable when some use(r)s are excluded, possibly because the resource gets congested (Ostrom, 2005; Frischmann, 2012). Exclusion might be either physical from the forest, i.e. eviction following outsiders' occupation, or exclusion from the possibility to practice traditional activities, i.e., due to impairment caused by other activities within the same forest.

In forests, rivalry is always latent but increases in as much as the diverse management priorities, their scale, and contingencies, cross a certain threshold beyond which the resource loses its capacity to support additional use(r)s – see Fig. 2. Then, the potential for conflict reification increases as the problem of each collectivity shifts from how one's own wants should be satisfied while reducing external costs to others, to whose wants should be satisfied at all (Weede, 1985). It is worth mentioning that there is no clear single mechanics according to which a certain number

of use(r)s will kick-off the threshold surpassing (Frischmann, 2012), much depending on both ecological dimensions and local cultural ecologies (Mosse, 1997), but external factors such as climate change can contribute to reaching the tipping point (Wohlleben, 2021).



**Fig. 2. The role of congestion and exclusion in increasing conflict potential.**

The figure depicts a sigmoidal function where  $n$  collectivities concomitantly make multiple use (x-axis) of the forest to derive a cumulative output (y-axis), the set of all outputs stemming from downstream uses – cfr. the Common-pool resource production function (Janssen et al., 2011). Initially, the obtained output increases at higher levels of forest use, first at an increasing and then at a decreasing rate. Yet, after the tipping point is reached, the forest gets congested and its overall capacity to sustain different use(r)s diminishes, at the detriment of some who will be excluded. Here is where the potential for conflict reification is most likely. The dynamics depends on ecological dynamics and on the local cultural ecology, which comprises economic, political, and institutional histories.

### 3. Case studies

We next analyse four conflicts from “forest-conflicts hotspots” (Mola- Yudego and Gritten, 2010), specifically in Finland, Canada, Brazil, and Indonesia. The last two cases concern plantations that replaced earlier forests (FAO, 2020; Wohlleben, 2021).

We selected cases on purpose, as they are of public prominence and have several common features that facilitate cross-case comparison in relation to our main research question (Bryman, 2012; Patton, 2002). In each case, four main collectivities are involved in cross-scale interactions (Adger et al., 2005) and have competing claims over the same forest: the government at various levels, a business organization, one or more local, national or international NGO and/or social movement, and one or more forest-reliant communities. Cases differ significantly in the previous level of organization of parties (Yasmi et al., 2011) and the surrounding

geographical, institutional and political context (Dubash et al., 2021), which also varies in the timespans we considered, i.e., more than 30 years.

Each of the local histories we described resembled a complex adaptive system we could not fully account for. Yet, our analytical endeavor consisted in comparing some dynamics of change within these four different, complex systems. This required a series of simplifications and stylizations: first, we only focused on four types of actors when many more players may be engaged. Second, we departed from our two-level collective action framework (Section 2) to reconstruct case dynamics, therefore reducing the potential multitude of levels to two.

We adopted a qualitative approach, combining two phases of research. First, we used available materials - secondary literature, official documents, reports, press releases and bulletins - to reconstruct conflict processes. Many sources are subject to previous interpretation of facts, but by triangulating different sources for the same case, we have excluded biased historical reconstructions as much as possible.

Second, to compare dynamic micro-processes, we elaborated a preliminary analytical grid based on the framework introduced in Section 2. However, our initial framework still lacked detail in breaking down the mechanics of change. Thus, we made use of corollary theories - Social Movements, Bargaining and Deliberative Theories - to better interpret actor strategies, which enrich our reconstruction of the micro-processes of change. Our resulting comparative analytical grid (Tables 1–3) has been iteratively enriched as we moved from the framework to the case studies and back.

### *3.1 Finland – reindeer herding v. the state timber company in Inari*

The Inari case takes place in Finland that, shortly after independence of 1917, adopted parliamentary, representative democracy in its first and second constitution - agreed upon in 2000. The case of interest dates to the 1950s, when commercial timber harvesting began to negatively affect both the environment and the livelihoods of Sami reindeer herders, due to the direct and indirect impacts that intensive logging has on the spatial distribution and quantity of lichens, which are essential for the winter grazing of reindeer (Greenpeace, 2005; Roturier and Roué, 2009; Sandström et al., 2010). On one side, reindeer herding is a traditional livelihood and a fundamental part of Sami culture and identity (Bostedt et al., 2003; Riseth, 2006), so much that the Reinder Herding Act (14.9.1990/848) established specific areas of

State-owned lands as areas dedicated to this practice that “shall not be used in a manner that causes considerable damage to the reindeer herding” (Section 2.2). On the other side, commercial forestry is a significant Finnish export industry and a major employer in the region, such that the forestry industry perceived the possibility of halting commercial logging activities from some pasture forests as a threat to the economic viability and employment in the area. One of the most contentious issues was disputed ownership, because commercial forestry occurred on State-owned land that partially overlapped with Sami's customary land.

Beginning in the 1970s, public outrage grew and the Sami, already organized in reindeer herding co-operatives (RHCs), started resisting logging operations. As a response, Metsähallitus - the State state-owned enterprise in charge of most of the area - organized meetings and stakeholder working groups with representatives from the Sami and the Municipality to discuss reconciliation of the two livelihoods (Raitio, 2008). In the late 1990s, the company also began to develop new planning tools for commercial forests, but many RHCs saw these initiatives insufficient and claimed for some areas to be excluded from commercial forestry (Raitio, 2008).

The conflict peaked from the 2000s onwards, when the RHCs scaled the issue up to the national political agenda and attracted international media attention in alliance with environmental NGOs (ENGOS). While Greenpeace and Nature League especially helped the RHCs in organizing field visits with media representatives, documenting and disseminating information about loggings in sensitive areas, some of the RHCs themselves drafted a joint appeal to the Ministries of Justice, Agriculture and Forestry and the Environment. They expressed their concerns and urged that logging of old-growth forests in winter pastures areas be halted immediately, forest management practices as well as the planned annual cut be reconsidered to take herders' needs into account and the consultations be improved (Greenpeace, 2005; Raitio, 2008). Furthermore, ENGOS launched an international campaign targeting Metsähallitus, the Finnish Government and the Central European customers of the Finnish paper industry. Metsähallitus claimed it had started revising the Natural Resource Plan for Northern Lapland in response to rapid conflict escalation (Metsähallitus press release, 2008). Nonetheless, it continued refusing to set aside logging from some areas marked on maps by the RHCs and ENGOS. Faced with a deadlock, some of the herders decided to file a civil lawsuit against Metsähallitus. Moreover, by the end of 2005, the Sami Council and the ENGOS had launched an independent but inter-linked campaign against Stora Enso, the largest buyer of Metsähallitus timber from

Inari and had brought their case to the UN (Nyyssönen, 2022). This strategy was so effective that Stora Enso asked Metsähallitus not to deliver wood from the disputed sites in Northern Lapland (Sarkki and Heikkinen, 2010).

Only in 2010, after a protracted conflict and negotiation process, a temporary de-escalation was reached, with nearly 80% of important reindeer pastures set aside from cutting areas, as previously marked by herders and Greenpeace. Two years later, Metsähallitus adopted a new Natural Resource Plan that guided its activities in the Sami homeland for the period 2012–2021. The plan was drafted by a plan cooperation group comprised of key stakeholders in the area and it also regulated felling operations, decided together with RHCs. In 2022, a new plan was approved that will regulate Metsähallitus' operations until 2027 (Metsähallitus press release, 2020).

### *3.2 Canada – logging in the Great Bear Rainforest*

The conflict over British Columbia's old-growth forests takes place in Canada, a constitutional monarchy, with a federal system rooted in parliamentary democracy. The conflict here described is also known as the “War in the Woods” (Cashore, 2001), and dates back to the 1980s when some of the First Nations (FNs) inhabiting the area together with some ENGOs started protesting against logging activities by timber industries (Affolderbach, 2011; Saakiroski et al., 2013; Sranko, 2011). At the time, ENGOs were mostly concerned with the global value of forest in terms of wildlife and biodiversity richness: they renamed it the “Great Bear Rainforest” (GBR) referring to the white-coated Kermode Bear endemic to the region and kept asking for the creation of class A Parks that exclude any human activity (Institute for Policy Analysis of Conflict. (IPAC), 2014; Saakiroski et al., 2013; Sranko, 2011). The FNs, instead, claimed the development of commercial forestry had occurred without their consent and was undermining their livelihoods. Moreover, they were concerned that conservationist arguments ignored their wellbeing and their right to hunt, harvest and take ceremonial logs from the forests. On the other hand, forestry companies were strongly hostile to any reduction of timber supply since this would further undermine the profitability of their operations and negatively affect employment and the regional economy (Armstrong, 2009; Cashore, 2001).

In the middle of this chaos, the Provincial Government (ProvGov) – the actual legal owner of the land - was first strongly adjutant with the forestry industries because of the jobs and

revenue they could generate, but it began to change its attitude in the 1990s due to the increasingly conflictual scenario. It attempted to introduce a collaborative planning system - the Land and Resource Management Planning (LRMP). Yet, neither part of the FNs nor the ENGOs accepted to participate in it, because they believed it would have jeopardized the possibility to have their land claims pleased and would be merely a cover-up for continuous logging (Howlett et al., 2009; IPCAs, 2018; Raitio and Saarikoski, 2012; Smith, 2010).

As a counterstrategy, the former chose to pursue a legal path by bringing cases to Courts, whereas the latter launched a big environmental campaign targeting the industries and their international customers (Raitio and Saarikoski, 2012). These strategies influenced the attitudes of ProvGov and logging business organizations respectively (Affolderbach, 2011; Sranko, 2011).

The critical turning point occurred in 1999, when a German delegation of papermakers and magazine publishers, guided by Greenpeace, visited active logging sites and met the FNs. Following the visit, they threatened cancellation of contracts with the timber companies unless an acceptable solution to the conflict was found (Armstrong, 2009; Saakiroski et al., 2013). Following this episode, the logging industries shifted from an “attack and defend” strategy to preserve the status quo (Raitio and Saarikoski, 2012), towards seeking mutually acceptable solutions. Some of them chose to engage in negotiations processes with ENGOs, which evolved into a longer-term alliance known as the Joint Solution Project (JSP). A significant achievement for ENGOs was a moratorium on logging activities in contested areas, agreed to by the industries in exchange for a halt to market campaigns (Saakiroski et al., 2013; Smith, 2010).

The JSP's development, however, engendered resentment in both the ProvGov and some FNs, who felt bypassed from agreements that concerned their territory (Union of British Columbia Municipalities (UBCM), 2000). As a response, the two parties began to sign protocols to strengthen their “Government to Government” (G2G) relation, pledging to work together on shared decision-making and agreement over land use planning and resource management. This was a strategic alliance for both actors to counterbalance the ENGOs-Industry power. Meanwhile, coastal FNs started to establish formal coalitions such as the Coastal First Nations Turning Point Initiative and, aware of need for international visibility, they strengthened their ties with the ENGOs (Raitio and Saarikoski, 2012). The passage of a logging moratorium on the one hand and the growth of G2G relations on the other, let FNs

and the ENGOs feeling that ground rules were more inclusive of their own interests. This power re-shuffling, in turn, changed their incentives towards participating in the formal LRMP.

In the end, the ProvGov regained control over the entire process; with an interest in formalizing the agreement, all collectivities sat down at the formal planning table (Raitio and Saarikoski, 2012). The process culminated into BC Premier Gordon Campbell's announcement, in February 2006, of a historic agreement on the GBR. Importantly, the agreement sanctioned the establishment of a network of protected areas and conservancies, i.e. protected areas over which First Nations have management rights, and the creation of a Coast fund to finance indigenous-led conservation and new sustainable business development (Armstrong, 2009; Smith, 2010). In 2009, the land use plan was finally completed, and a framework was put in place (Armstrong, 2009). The parties announced the GBR would be managed using an Ecosystem- Based Management (EBM) approach based on both science and traditional local knowledge (Smith, 2010). To put the commitment into action, in 2016 the government passed the Great Bear Rainforest Land Use Order and the Great Bear Rainforest (Forest Management) Act (British Columbia Government News, 2016a, 2016b). Legislative reviews are planned to continue and improve collaboration for EBM.

### *3.3 Brazil – Eucalyptus in Espirito Santo*

Brazil is a federal, presidential representative democracy. Independent since 1822, and a republic since 1889, its history is marked by extractive economy and institutions in the North, and more participated and inclusive institutions in the South (Amendolagine and von Jacobi, 2023). Despite a new democratic era (and the new Constitution of 1988) followed populist democracy and military dictatorship, external debt and economic vulnerability have long constrained the political autonomy of governments.

We start describing the conflict from 1967, during the military dictatorship, when Aracruz Celulose S.A (AC), a major producer of cellulose made from bleached eucalyptus pulp, entered the land of Tupinikim and Guarani Indigenous communities in Espirito Santo, built three factories and planted eucalyptus monoculture (World Rainforest Movement, 2021). The State of Espirito Santo gave land to support the local economy and further sold some to AC through the Companhia de Ferro e Aço de Vitória (Andrade et al., 2001). However, the Tupinikim and

Guarani perceived this as an illegal occupation of their traditional territories and saw the “green desert” (World Rainforest Movement, 2005) as a threat to their livelihoods, culture and identity.

Thus, in 1975 they started demanding the demarcation of their territories with the support of the National Foundation for the Indian (FUNAI), the body responsible for the protection of Indigenous peoples of Brazil. Since then, the FUNAI has negotiated with AC and instituted working groups to produce studies defining the area to be delimited as Indigenous territory. These studies were subject to revision and approval from the Ministry of Justice.

In 1980, AC donated 4.491 ha of land to the FUNAI for it to be used by the Tupinikim and Guarani communities; yet the latter deemed the territory insufficient. Additionally, the replacement of primary forest with eucalyptus monoculture and the industrial activities of AC had resulted in such level of pollution and soil consumption that the extensive farming and crop rotation methods traditionally used were no longer viable (Rocha, 2008). Thus, in 1994, the FUNAI working group published a new study (GT 783/94) demanding a demarcation of 18.070 ha and, in 1996, the Indigenous communities in alliance with the Conselho Indigenista Missionário (CIMI) launched an international campaign to request it (Andrade et al., 2001; Loureiro, 2006). However, the then Minister of Justice refused to accept it and, in 1998, he only extended the territory by 2.571 ha, for a total of 7.062 ha.

The Tupinikim and Guarani started protesting again. Under pressure from the potential damages to its image, AC agreed to enter a negotiation process with them, which culminated into an agreement ratified by the Federal Public Prosecutor's Office, who oversees collective interests, such as environmental protection or damage. Under the agreement, AC would have funded some economic sustainability and employability projects for communities and transferred 2571 ha of eucalyptus land to their management, but it would have continued its operations. These offers did not address the issue of land scarcity and posed a challenge to the communities' unity, as some leaders and other members were willing to accept the money while others considered territory more important (World Rainforest Movement, 2021).

In February 2005, about 1000 Tupinikim and Guarani families occupied the land, cut down eucalyptus trees and built two large communities' buildings in two of the villages they had previously inhabited. In May, they started self-demarcating 11,009 ha with the support of other movements, NGOs, networks, and the Small Farmers Movement (Movimento dos Pequenos Agricultores MPA). A network of resistance to the eucalyptus plantation was also born, the Alert

against the Green Desert Network (Rede Alerta contra o Deserto Verde), composed of citizens, social movements, pastorals and churches, who saw in these communities' struggle the opportunity to fight against a business organization that created problems for agriculture, biodiversity and water, prevented agrarian reform and shortened rural labour market, therefore forcing migration towards urban areas (Rocha, 2008; Rede Alerta Contra o Deserto Verde, 2005). In October 2005, the Indigenous communities with the support of the Landless Rural Workers Movement (Movimento dos Trabalhadores Rurais Sem Terra, MST) occupied the Aracruz facilities for three days (Kenfield, 2008). Meanwhile, AC started to bring causes to the Federal Tribunal to prove its possession of the disputed land; the Court agreed and ordered the removal of all occupants from the site. In January 2006 the federal police entered the village and evicted the people, destroying houses and properties (Conselho Indigenista Missionário, (CIM), 2006; Kenfield, 2008; World Rainforest Movement, 2006). Nonetheless, FUNAI published new conclusions confirming the need to readapt the 1998 decisions (GT 1299/05). AC again opposed to such conclusions.

Administrative delays in deciding over the demarcation contributed to the conflict's escalation. In December 2006, other occupations followed and the Federation of Industry of the State of São Paulo (Federação da Indústria do Estado de São Paulo) asked for the intervention of the federal police (Federação das Indústrias do Estado de São Paulo – FIESP, 2006). It took until February 2007 for the new Minister of Justice to order that the process be returned to the FUNAI, with instructions to conduct further studies and develop an adequate proposal to set the interests of the parties (Conselho Indigenista Missionário, (CIM), 2007). In July 2007, FUNAI confirmed its recommendation GT 783/94 to keep the 18.027 ha as land to be demarcated. Meanwhile, the MST organized a march through Brasilia to denounce President Lula's leadership and accuse the judiciary, executive and legislative branches of backing up agribusiness interests and impeding land redistribution (Kenfield, 2008).

The Ministry of Justice finally approved implementing the decrees for the demarcation of the territory in August 2007. This marked the beginning of new negotiations between AC and the Indigenous communities on a Conduct Adjustment Term (Termo de Ajustamento de Conduta) that had to resolve the compensation for Aracruz and the conditions of the territories returned to the communities. Following some stalemates, the parties reached an agreement in December 2007: the communities renounced on the eucalyptus already planted within their territories and granted

Aracruz the permission to remove them and agreed to withdraw some lawsuits, while Aracruz committed to finance studies and projects to identify the needs and priorities for the communities' self-sustainability and FUNAI committed to conduct these studies. However, due to administrative delays, the demarcation ended only in April 2008.

### *3.4 Indonesia – palm oil in Jambi*

Indonesia is a presidential, representative republic whose transition towards democracy has been assessed as incomplete, as free elections are not fully backed up by the protection of civil rights (Freedomhouse). Independent after the second world war, Indonesia experienced attempts for democratization and three decades of dictatorship until 1998.

We start reconstructing the conflict from 1987, when the Head of Agency for Inventory and Forest of Indonesia granted an oil palm plantation concession to PT Asiatic Persada (PT AP), one of Jambi's largest palm oil firms. The territory where the plantation expanded included 3.550 ha of Suku Anak Dalam Bathin Sembilan (SAD) communities' traditional land (Setyo Pratiwi, 2018; Institute for Policy Analysis of Conflict. (IPAC), 2014). Since the beginning, SAD communities considered this an illegal occupation of their customary territory (Steinebach, 2013), which prevented them from pursuing their traditional livelihoods (Compliance Advisor Ombudsman (CAO), 2013; Parker, 2013). However, it was only in 1998, with the fall of Suharto's dictatorship, that they started organizing to claim back their ancestral lands. Demonstrations, occupations, roads' blockades, and reports to the government office were combined with a formal legal path. As in the other cases, SAD communities got the support of several NGOs, especially in collecting proof of traditional land rights and developing maps.

The company's ownership changed several times over the years, and with it the responses to communities' demands communities. For instance, between 2004 and 2005, the company offered SAD communities 650 ha and 350 ha of smallholdings in the southern and northern parts of the concession respectively (Colchester et al., 2011). However, in 2008 Wilmar Group International bought the company and decided to pull back the offer, sparking reactions by the communities (Colchester et al., 2011). The conflict quickly escalated.

Only after several NGOs began to file complaints with the International Finance Corporation (IFC) - the World Bank's lending agency that provided funds to Wilmar - the latter agreed to submit the conflict to the mediation of the IFC's Compliance Advisory Ombudsman (CAO) (Compliance Advisor Ombudsman (CAO), 2013), which however did not run smoothly. Communities split

between those who wanted to accept Wilmar's offers and those who kept asking for return of customary land. Moreover, Wilmar started accusing them of stealing palm fruits and selling them outside the concession and, in July 2011, it engaged the mobile police brigade (BRIMOB) to guard the plantation (Institute for Policy Analysis of Conflict. (IPAC), 2014; Steinebach, 2013). BRIMOB and PT AP personnel kicked out people from their settlements, destroyed houses and properties with excavators and fired gunshots. BRIMOB also barred NGOs, media and local people from entering the area (Colchester et al., 2011). This “conflict episode” (Pondy, 1967) resulted in the destruction of 83 families' homes and the death of one person.

After three affected communities and a coalition of local, national, and international NGOs filed a new complaint with the CAO in November 2011, the mediation process restarted in March 2012. A Joint Mediation Team (JOMET) formed by the CAO and the Jambi Province government facilitated the dialogue and assisted the parties in achieving some interim agreements (Compliance Advisor Ombudsman (CAO), 2013; Nilakrisna et al., 2016). However, when it appeared as if the parties were close to an agreement, the mediation halted. In April 2013, Wilmar International sold PT AP to Prima Fortune International Ltd. and PT Agro Mandiri Semesta, without previously sharing information with and seeking consent of the affected parties. This move deeply concerned both the communities and the NGOs, who sent a cover note to the Roundtable on Sustainable Palm Oil (RSPO) and a complaint letter to Wilmar International Group expressing their concerns. Indeed, they feared that the new owners would have refused to continue with the JOMET-mediated dialogues and neglected the results reached so far. Even more so because the new owners were neither members of the RSPO nor funded by IFC as Wilmar was, meaning they were not bound by their standards (Complaint to Wilmar on PT Asiatic Persada sale agreement, 2013).

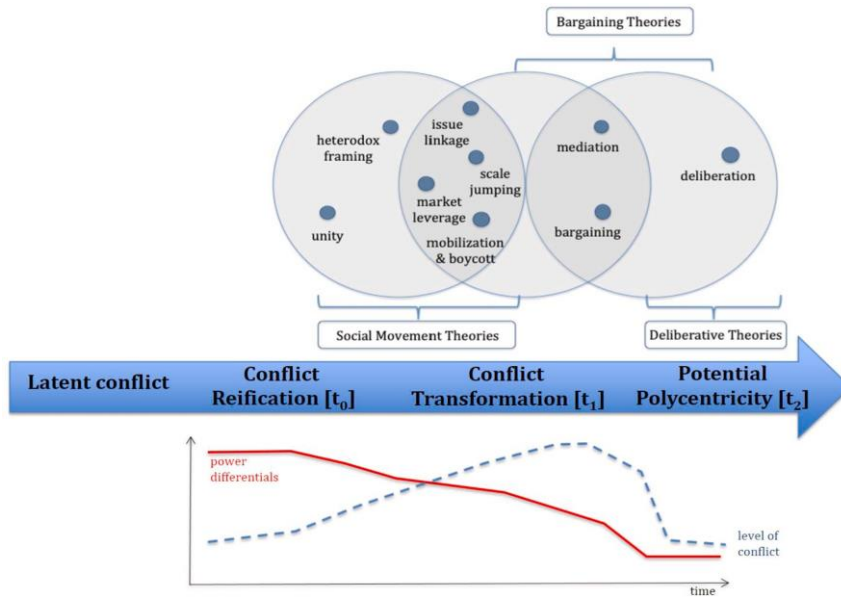
While Wilmar had ensured the new buyers were aware of the progress made and encouraged them to continue with the mediation process (Response from Wilmar, 2013), in late September 2013, without prior consultation of the communities, the new owners communicated their withdrawal from the JOMET-led dialogue and their decision to continue with a new Integrated Team of Batang Hari district (Nilakrisna et al., 2016), comprised of government representatives, the military and the police. Failing the consent of one of the parties, the JOMET-led process came to an end, causing big frustration among the affected communities, who organized several protests. In October 2013, with the occasion of a press conference, the communities accused the Jambi Province governor of ignoring their demands and asked him to

cancel the Business Use Permit of PT AP (Forest Peoples Programme Press Release, 2013). Moreover, they petitioned the RSPO to expel Wilmar International, suspend all its operations until the conflict was solved, and revise the standard to clarify companies' obligations when selling concessions during a pending conflict resolution process (Joint petition of the Indigenous Suku Anak Dalam Batin Sembilan, 2013).

#### **4. Discussion: understanding collective action for conflict transformation**

Despite different contexts and outcomes, the four case studies display the main characteristics of a two-level collective action problem and some similarities in their pathways from conflict reification to potential polycentric governance. For the sake of exposition, we divide the analysis into three main phases – conflict reification ( $t_0$ ), conflict transformation ( $t_1$ ) and potential agreement ( $t_2$ ). Such phases are largely compatible with the dynamic moments introduced in Fig. 1, although boundaries between them are not clear-cut.

Fig. 3 summarizes common actions and strategies that collectivities adopted within the cases analysed. These come from Social Movements (SMT), Bargaining (BT) and the Deliberative theories (DT) and help to better understand those ex-ante dynamics of cross-scale interactions that the polycentricity literature tends to leave unexplored. In the lower panel, we stylize the observed process from conflict reification to potential polycentric governance. We plot approximate level of conflict and power dynamics (vertical axis) against time (horizontal axis). Power is here intended as the (uneven) “capacity to influence the goals, process, and outcomes” of governance of a contested resource (adapted from Morrison et al., 2019). Our comparative analysis suggests that actors' strategies lead to some sort of reshuffling of power positions, which facilitates passing from ( $t_0$ ) to ( $t_1$ ) and ( $t_2$ ). The trajectory we stylize is one of possible others, being based on four long-term cases only.



**Fig. 3. Stylized conflict evolution and key actors' strategies highlighted by corollary theories.**

Fig. 3 is organized as timeline that stylizes common patterns observed across cases. Phases of conflict are compatible with the dynamics presented in Fig. 1 (see Section 2). The upper panel maps a conflict's pathway organized in three main phases (three big bubbles) whose boundaries are not sharp but overlapping. Dark points represent the collective action strategies that different collectivities adopted in the conflict. Corollary theories - SMT, BT and DT - contribute to the understanding of such strategies. The lower panel outlines how power differentials between collectivities and level of conflict approximately unfold in our cases. Initially, power differentials are too high for parties to engage in direct conflict: marginalized parties are too afraid of substantial loss while stronger parties benefit too much to have any interest in change. Eventually, the former start collective action to escalate the conflict, reshuffling power imbalances. If defensive/predatory costs become too high for both parties, they perceive the *status quo* as suboptimal, develop an interest in de-escalating the conflict, and enter bargaining. Notably, power differentials do not disappear but seem to shrink. The trends depicted are not a quantitative computation of observable indicators but represent the qualitative and stylized trajectory emerging from our comparative analysis.

#### 4.1 Phase 1: conflict reification

Our case reconstructions suggest a new conflict episode starts from a feeling of exclusion from policies, programs, negotiations or consultations, and a request for social change by marginalized parties (Almeida, 2019; Burawoy, 2017; Tarrow, 2011). In the GBR case, FNs claimed other parties made decisions over their territory without consulting them. In the Inari case, Sami felt the so-called negotiations were far from a real dialogue because they could not question fundamental issues (Raitio, 2008). In Jambi and Espirito Santo, the Indigenous communities asserted the business organizations had illegally occupied their territory, caused evictions, and destroyed their livelihoods. In the four cases, traditional communities alleged commercial forestry was undermining their livelihoods, culture, and identity. This suggests that feeling impairment was a critical cognitive element for conflict to spark (Glasl, 1999). However, marginalized collectivities

could not engage in conflict unless they first achieved internal cohesiveness and unity (Hiller, 1975; Toch, 1965; Wilson, 1973), that is they self-organized around a common claim (Y) at level 1. The SMT provides further insights.

The socialization of exclusion is a critical component for a social movement to reify: enough participants must share a sense of vulnerability in the face of similar circumstances and find the movement's goal appropriate and attainable (Hiller, 1975). A certain sense of exclusion may already be latently socialized, e.g. because of historical neglect of traditional ownership or stewardship, but sentiments may cumulatively become more relevant and experience deeper socialization in specific moments. To this end, activists must frame grievances and threats as culturally relevant and in a way that challenges target institutions (King, 2008; Kroger, 2011; Snow and Benford, 1988). Through heterodox framing, target institutions like a law, a specific actor or decision, are addressed as an enemy. Moreover, marginalized collectivities need to have some favorable surrounding social, political and economic environment and the possibility to access mobilization structures (Jenkins, 1983; McAdam and Scott, 2002) to transform a shared and heterodox understanding of the situation into action and influence. The influence of political opportunities for conflict (de)escalation and collective action assumes particular relevance in very oppressive systems. In the Jambi case, the fall of President Suharto in 1998 represented good news (McAdam et al., 2018; Meyer, 2002) for the proliferation of civil society organizations that were encouraging people to reaffirm their rights (Colchester et al., 2011; Setyo Pratiwi, 2018). Table 1 reports key elements of conflict reification in the four cases.

When similarly situated groups face good or bad news, the potential and scale of common interests expand if people are already organized (Yasmi et al., 2011), as this enhances trust and solidarity and facilitates communication. The case studies show significant differences in the forest-reliant communities' organizational capacity and unity at level 1: in Indonesia, the Indigenous communities started almost from scratch, whereas in Finland the Sami herders had already been organized in RHCs for years. NGOs, on the other hand, already had these organizational structures, making it easier for them to transform their framing into effective mobilization.

**Table 1: Comparative analysis of conflict reification**

		FINLAND				CANADA				BRAZIL (plantation)				INDONESIA (plantation)			
		GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM
Forest use(r)s 1F <sup>11</sup>		Municipality; Ministries of Justice/Agriculture/Forestry and the Environment	Metsähallitus: public enterprise	Greenpeace, Nature League and others	Sami reindeer herders	Provincial Government	Several BC timber companies	Environmental movements and NGOs (e.g Forest Ethics, Greenpeace, and Sierra Club BC)	First Nations	State of Espirito Santo, Federal Public Prosecutor's Office, National Foundation for Indigenous People (FUNAI)	Aracruz Celulose	Movimento dos Pequenos Agricultores, Movimento Sem Terra, Alliance against the Green Desert	Tupinikim and Guarani Indigenous communities	Head of Agency for Inventory and Forest, Jambi Province Government	PT Asiatic Persada	Various NGOs (e.g. Forest Peoples Programme, Sawit Watch, HuMa)	Suku Anak Dalam Bathin Sembilan (SAD) communities
institutional facts underpinning claims & management priorities	specific status and function (Y) for the forest (X)	diversified but mainly commercial forestry: export revenues and jobs	profitability of timber harvesting	global value for wildlife and biodiversity	traditional livelihood, mostly reindeer herding	diversified, but mainly employment and regional economy	profitability of timber harvesting	global value for wildlife and biodiversity	traditional livelihoods including hunting and selective logging	economic development	commercial eucalyptus monoculture plantations	land redistribution in favour of small producers	Tupinikim and Guarani traditional livelihoods	economic development	Profitability of commercial palm oil monoculture plantations	environmental claims, human rights claims	traditional livelihood and territory
	context (C)	state-owned land, national economy	public enterprise statute and mission	sustainability (mostly environmental)	usufructuary rights, customary land	legal ownership of the land	concession	sustainability (mostly environmental)	self-determination	state power	concession	equity: land redistribution (political narrative)	historical documents; customary land ownership	state power	concession	socio-environmental justice	customary ownership

<sup>11</sup> GOV - Government; BUSI - Business Organization; NGO - NGO or movement; COMM - forest-reliant community. NB: only key actors are reported here, the comprehensive list is much larger.

		FINLAND				CANADA				BRAZIL (plantation)				INDONESIA (plantation)			
		GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM
getting organized (at level 1)	use being excluded				participation in decision-making; traditional livelihoods				self-determination over their land; traditional livelihoods				crop rotation and extensive farming; traditional livelihoods				traditional livelihoods
	degree of organization/ unity	high	high	international	advanced: Reindeer herding co-operatives (RHC)	high	high	international	medium because divided, initially	high	high	national/political	unity initially threatened, organization advanced because of FUNAI	medium	high	medium because reduced international reach	early stage organization, unity threatened

#### *4.2 Phase 2: conflict transformation*

Once organized at level 1, each collectivity could present itself as unitary and credible actor and advance its claim (Y) in the face of its opponent(s). At this point, the collectivities became distributional coalitions and the conflict was most likely to escalate – see Fig. 3, lower panel. On the one hand, marginalized collectivities had strengthened their stance towards the others and they had gained momentum by organizing around a shared grievance, so that the cognitive element of conflict was particularly strong (Adams et al., 2003). Conflict escalation could now raise attention to their perceived exclusion (Affolderbach, 2011). On the other hand, the most powerful actors still benefited excessively from the status quo and did not perceive it as a suboptimal condition, so they had no interest in de-escalating conflict.

A more relaxed attitude to risk is an important source of bargaining power: until a party has less to lose than the other (Buchanan and Tullock, 1962; Gauthier, 1987), it will be reluctant to make concessions (Ratner et al., 2013; Zeuthen, 1930) or reach a fast agreement (Schelling, 1956). In other words, at level 2 there would be no collective action to transform conflict. Thus, marginalized parties had to find a way to change their opponent's reserve function by raising costs of non-deescalating the conflict (Weede, 1985). Informal and disruptive strategies may have been of crucial importance because they increased the defensive costs of the most powerful parties and made them perceive the status quo as suboptimal - see Tables 2a-b. The four cases also confirm SMT's explanation of heterodox framing, mobilizations, and boycotts as relevant instruments through which marginalized parties can level the playing field to get their demands considered (King, 2008; McAdam et al., 1996; Schurman, 2004).

In the four cases, the alliance between forest-reliant communities and NGOs having international reach played a key role in offsetting such conflict escalation. The formation of strategic alliances did not require the net fusion of interests but the construction of a shared (heterodox) frame: in Espirito Santo, the Tupinikim and Guarani people kept advancing claims for their customary land rights while other movements framed their allegations more as an issue of agribusiness advancement. Nonetheless, they believed the issues were linked (Zietsma and Winn, 2008) and addressed to a common enemy.

Similarly, in the Inari and GBR cases, native communities kept defending their livelihoods while ENGOs advocated primarily for biodiversity conservation, but they both opposed clear-cutting activities of logging companies. This issue-linkage enabled issues initially perceived as local to become of global concern, through scale-jumping (Haarstad and Floysand, 2007; Ukridi and Walter, 2011; Zietsma and Winn, 2008). By allying, the collectivities

could also effectively pool their resources (Hargrave and Van de Ven, 2006; Ratner et al., 2013), i. e., legal entitlements, information, technical skills or cross-scale networks, and increase their stance.

However, as SMT emphasize, parties must also gain the support of strategic others to make mobilization fully effective (Cronkleton et al., 2008; Fligstein, 1997; Troast et al., 2002). This is even more crucial for stakeholders lacking traditional sources of bargaining power (King, 2008; Zietsma and Winn, 2008). In the GBR and Inari cases, market campaigns addressed at international customers put pressure on the companies, reversing their status quo utility. In Brazil, where market leverage was insufficient, activists strongly targeted the government through demonstrations and threat of withdrawing electoral support.

**Table 2a: Comparative analysis of conflict transformation (part I)**

		FINLAND				CANADA				BRAZIL (plantation)				INDONESIA (plantation)			
		GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM
Distributional Coalition formed	alliance		with 4	with 4	with 1-2 and 3	with 4	with 3	with 2 and 4	with 1 and 3	with 1 and with 4 (through FUNAI)	with the Federation of Industry of the State of São Paulo	with 4	with 1 through FUNAI and with 3	through mobile police brigade repressing illegal occupations also	with 4	with 3	
	heterodox framing				legitimate users of the forest	legitimate government		Great Bear Rainforest (global value of ecosystem)	legitimate government			agribusiness harming social and environmental justice			monoculture development harming social and environmental justice		
	issue linkage			yes - against clear-cutting				yes - against clear-cutting				yes - against monoculture and agribusiness			Yes, against monoculture and agribusiness		
	scale jumping			yes - from local to global value of the forest				yes - from local to global value of the forest				yes - against national agribusiness model			yes - but with weaker international reach		
Key strategies enacted	market leverage			targeting international customers and investors			targeting international customers and investors										
	mobilization & boycott			yes	yes		yes	yes			yes	yes		yes	yes		
	strategy diversification				file a civil lawsuit			bring causes to Courts		bring causes to the Federal Tribunal		file a series of lawsuits		complaints with the International Finance Corporation	complaint letters, reports to the government office, formal legal path		

**Table 2b: Comparative analysis of conflict transformation (part II)**

		FINLAND				CANADA				BRAZIL (plantation)				INDONESIA (plantation)			
		GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM	GOV	BUSI	NGO	COMM
Bargaining endowment (initial)	legitimacy of claim	strong		geographically diffused	strong	strong	strong	Geographically diffused	partial	strong	partial	geographically diffused	strong	partial	partial	geographically diffused	low
	degree of organization	high	high	international	advanced: Reindeer herding co-operatives (RHC)	high	high	international	medium because divided, initially	high	high	national/political	unity initially threatened, organization advanced (FUNAI)	medium	high	medium because reduced international reach	early stage
Shift in bargaining positions	inflicting external costs to other parties (on whom)	logging - impact on spatial distribution of lichens (on 4)		reputational loss through market leverage, boycotts (on 2)	questioning credibility and lawsuits (on 1), boycotts (on 2)		logging in contested areas (on 3 and 4)	reputational loss through market campaigns, boycotts (on 2)	lawsuits (on 1 and 2) and mobilization and boycotts (on 2)	violent repression (on 4)	pollution, soil consumption, evictions (on 4)	reputational loss among the electorate (on 1), mobilization & boycotts (on 2)	lawsuits (on 1 & 2), mobilization, boycotts and self-demarcations (on 2)	violent repression (on 4)		reputational damage through campaigns, boycotts and lawsuits (on 1&2)	boycotts and occupations (on 2), reputational loss through complaint letters (on 1&2)
	paying predatory costs	no		yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	paying defensive costs	yes	yes	no	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes

#### *4.3 Phase 3: potential co-existence*

Once a new power balance emerges the various collectivities may develop an incentive for collective action to de-escalate the conflict - see Fig. 3, lower panel. A significant shift implies some sort of process agreement, which also manifests in the abandonment of informal and illegal actions and the - now more equal - participation in a formal setting. In the GBR case, the JSP approval enabled the business organizations and ENGOs to initiate taking responsibility for resolving their controversies.

As DT explain, collective action at this point is about “agreeing to disagree” (Fligstein, 1997; Sen, 1998). Recalling Searle, this means each distributional coalition still assigns its own claim (Y) to the forest (X) and there is no mutual identification, but all share a commitment to approach conflict in a democratically acceptable way (Young, 2000). Thus, their focus shifts from Y to X as the forest becomes a space of mutual effect and positive interdependence wherein realizing their respective goals requires mutual adjustment (Deutsch, 2006). At this point, a window of opportunity for an agreement over how to manage value heterogeneity opens.

Then, once deliberation starts, parties need to move from distributive to integrative bargaining, to create “valued states of affairs from as many normative perspectives as possible” (Aligica and Tarko, 2013:13), that is exactly the point of polycentric governance. This is the potential shift from a zero-sum game with a fixed pie to a positive-sum game with a pie that can be enlarged (Olson, 1982), even though each collectivity will simultaneously look for relative and public gains (Humphreys, 2001).

BT and DT highlight the factors most likely to contribute to this move. First, discussion should be problem- and not values-oriented (Fung and Wright, 2003). Secondly, parties should discuss interests rather than positions (Fisher et al., 2011) and frame one's argument as public and reasonable to the others (Young, 2000). Third, parties should have increased information about objective facts, which can support a reconsideration of values and interests (Fisher et al., 2011; Richardson, 2002; Sen, 2000).

According to our case analysis, scientific and mediating bodies can be crucial in facilitating this shift, by producing common knowledge and highlighting interdependencies (Dubash et al., 2021; Humphreys, 2001). In the GBR, the Coastal Information Team (CIT), a “science- minded” body made of representatives of the different stakeholder collectivities together with independent scientists, practitioners and experts, played an important role. By offering a separate arena for joint fact-finding and discussion of detailed ecological

questions using Ecosystem-Based Management (Slocombe, 1993), it helped the parties to focus on problem-solving and to explore interests and concerns more consciously.

In other cases, top-down solutions can also serve the purpose. The Finnish public enterprise resolved to include interactive planning through which Sami interests would be incorporated in the firm's operating model. In Brazil, judicial force settled the land demarcation debate. Our comparison shows that when no alliance between the government and the forest-reliant communities is built up at some point, results appear to be less satisfactory (Indonesia) - see Table 3.

## **5. Conclusion**

In this paper, we investigated and compared dynamic micro- processes for the transformation of forests-related conflicts into poly- centric governance. Such institutional design has been deemed prom- ising for managing sustainability issues involving actor heterogeneity and cross-scale interactions (Milinski and Marotzke, 2022; Obura et al., 2021).

As a key characterizing matrix, our theoretical framework proposed to study the path towards polycentric governance as an (eventual) outcome of a two-level collective action scenario in which different collectivities advance concurring and potentially competing claims over the same forest. Our comparative analysis of four illustrative case studies from Finland, Canada, Brazil and Indonesia, identified some common, long-term micro-process dynamics through which collectivities' agency in forest conflicts can be "read" (Oberlack et al., 2018).

As it does not focus on a particular stage such as conflict escalation (Yasmi et al., 2006) or bargaining (Affolderbach, 2011), our framework enables to analyse conflict dynamics more in depth than other works do, combining various micro-processes of conflict and collective action within the action arena (Ratner et al., 2013). It is nevertheless subject to some limitations. Our framework seeks to provide a ground for com- parison of different cases, so it simplifies the number of relevant actors and of interacting collective action levels. We further do not explain the deep roots of power asymmetries but limit ourselves to describing how change occurs between a series of conflict episodes and how bargaining positions change over the observed timeframe. The trajectory we describe is stylized and may be subject to the selective attention our framework enacts. However, when we run robustness checks in which we re-read the cases using alternative frameworks, we find fragmented but compatible evidence. Our study mainly serves to highlight possible micro-processes of long-term dynamics in which cross-scale conflict may transform into polycentric governance. Yet it is far

from being a quantitative computation of changing power positions. We suggest further research should investigate possible measures to track reductions in power asymmetries and in bargaining strategies (e.g. Morrison et al., 2019; Sandström et al., 2010). Such approaches could also integrate the backward-looking, historical reconstruction we enacted using mainly secondary resources.

For practitioners, our study can be helpful in contextualizing current conflict scenarios within a longer-term perspective. Present defensive or predatory costs may have to be counterbalanced against future expected bargaining positions. Our results indeed confirm that actors' strategies such as heterodox framing, issue linkage and scale-jumping, market leverage and the redistribution of bargaining endowments through conflict, can be key for introducing change into the forest governance status quo.

Conflict escalation may, indeed, be instrumental for a more participated governance, as marginalized parties often resort to it to reshuffle power imbalances (Affolderbach, 2011). We find that conflict escalation increases their bargaining endowments and inflicts costs to the status quo preferred by the stronger parties - which can lead to change. In this scenario, NGOs play a key role as allies in increasing the size and power of the marginalized parties' distributional coalition (Olson, 1982). Their legitimacy and mobilizing structures with international reach can be put "at service" of the marginalized parties' claims.

Yet conflict alone is not sufficient. While it can serve to reduce power asymmetries, its escalation must be followed by negotiations, for instance through top-down mediation or integrative bargaining on procedural rules, which can lead to the accommodation of value heterogeneity (Aligica and Tarko, 2013) within a new institutional architecture. We find that science can play a key role in negotiation and mediation, as it can provide information on the base of which publicly reasonable arguments can be advanced by the different parties. As the cases' reconstruction shows, different contexts will have different institutional resources on which to draw upon. i.e., civil society networks, the judicial system, or NGOs, so that strategies diversification seems to be key for achieving change through collective action.

Finally, our dynamic analysis cautions against the quality and duration of any achieved solution: this will depend on the institutional quality provided by the specific context and on continuous efforts, while it could itself become a lock-in that prevents further solutions from emerging (Dubash et al., 2021). The Indonesian case, for instance, shows that if a major player has the option of "exiting" from bargaining, for example due to global capital mobility, satisfying solutions for participated governance are less likely.

## **CRedit authorship contribution statement**

**Sara Lorenzini:** Conceptualization, Data curation, Formal analysis, Methodology, Investigation, Writing – original draft, Writing – review & editing.

**Nadia von Jacobi:** Conceptualization, Methodology, Supervision, Investigation, Visualization, Writing – original draft, Writing – review & editing.

## **Acknowledgments**

We thank Arun Agrawal, Alain Marciano, Ugo Pagano, Lorenzo Sacconi, Massimiliano Vatiero, Stefan Voigt, Roberta Raffaelli and the SUSTEEMS PhD program, the research group of the Rotterdam School of Management around Tine de Moor, and participants in the 2022 WINIR Conference, 2022 SIDE conference, 2022 AFED conference, and 2022 IASC conference for their valuable feedback on previous versions of this manuscript.

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## PAPER III<sup>12</sup>

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<sup>12</sup> Sections 4 and 5 can be read independently one from the other. Indeed,, this paper is meant to be divided into two different contributions in terms of scientific articles, with each one dealing with the *ex-ante* (Section 4) and the *ex-post* (Section 5) phases respectively.

# **Multi-stakeholder coalitions, subjective games, and equitable equilibria in the Great Bear Rainforest agreement.**

**Sara Lorenzini, Lorenzo Sacconi**

## **Abstract**

Forest governance is often at the root of multiple-level conflicts among actors with various forms of power, which involve a diverse array of costs and risks and negative impacts in terms of both efficiency and justice. However, if properly managed, conflicts can be a positive force for institutional change and innovation, allowing for the coordination of multiple cross-scale interests and objectives, as well as the formation of new social and power relationships.

This study uses game theory modelling to investigate the processes leading to the historical agreement over the Great Bear Rainforest after decades of “War in the woods” contestation among Provincial Government, First Nations, environmental NGOs, and timber companies, and partial compliance with it. We move from the standard game theory approach by applying the subjective games model to the ex-ante phase – the transformation of conflict into dialogue for an agreement. Then, we apply the psychological game theory to study the ex-post stage, that is implementation of a more socio-environmentally just agreement. The overall aim is to study the formation of conditions (i) that led to prospects for a multi-stakeholder agreement and (ii) under which compliance is feasible. The results sheds light on the possible divorce between environmental conservation and social justice.

## **1. Introduction**

Forests are multifunctional resources that provide a wide range of goods and services, from the local to the global scale (Geores, 2003; Gong, 2002; Oldekop et al., 2020). Because of this, forests governance and management are often at the root of multiple-stakeholders and multiple-level conflicts (Eckerberg and Sandström, 2013; Mola-Yudego and Gritten, 2010; Nousiainen and Mola-Yudego, 2022; Yasmi, et al., 2012). FAO defines natural resources conflicts as “disagreements and disputes over access to, and control and use of, natural resources” (Matiru, 2000:1). They arise when users have competing demands or different management priorities, including immaterial and immeasurable higher-level principles, core values, and technical and evidence-based arguments, and those of some groups are excluded from policies, programs, and projects (Adams et al., 2003; Matilainen et al., 2017; Matiru, 2000; Sranko, 2011). Often, involved parties also have different degrees of power to influence decision-making procedures and outcomes (Kashwan et al., 2021; Morrison et al., 2019).

On the one hand, conflicts imply an array of costs and risks, to the point that they can be described as “a lose-lose situation and a manifestation of governance failure” (Eckerberg and Sandström, 2013:1). Besides being at the roots of forest deterioration and depletion, they can lead to unequal exploitation of the good by one group at the expense of another, hence

aggravating power and wellbeing asymmetries and having a detrimental effect on both efficiency and justice. On the other hand, if properly handled, conflicts can give rise to innovative collaborative governance arrangements and progressive policy reforms, and they can contribute to the formation of new social and power relationships (Eckerberg and Sandström, 2013; Hellström, 2001; Nousiainen and Mola-Yudego, 2022). However, even supposing conflicting parties come to an agreement for new governance arrangements, such agreement is not necessarily just and conformity to it should not be taken for granted, particularly in situations where there is no strong external enforcer and at least one party could defect and abuse other stakeholders and be better off by doing so.

In this research, we develop a game-theory (GT) model to investigate these problems, that is to say the formation of conditions (i) that led to prospects for a multi-stakeholder agreement on the GBR – the *ex-ante* game, and (ii) for compliance with an agreement that promotes environmental protection together with social and environmental justice - the *ex-post* implementation game. Specifically, we study the historical agreement over the Great Bear Rainforest (GBR) in British Columbia as one of the most progressive agreements on forest governance, which also recognize First Nations' claims.

Applying GT to the analysis of multi-stakeholder decision-making processes over natural resources governance appears particularly illuminating. Indeed, forests-related conflicts and their transformation into innovative institutional arrangements and policies can be seen as forms of strategic interactions among organized decision-makers and interest groups, that is exactly GT's object of study (Dijkstra BR, 1999; Endres, 2004; Parrachino et al., 2006a, 2006b; Zara et al., 2006). Moreover, conflicts over forests usually stem from decision-making problems over joint production of several concurring Ecosystem Services and distribution of related benefits (MEA, 2005). Thus, transforming disputes into agreement is more about coordinating several cross-scale interests and aims (Berkes, 2002) rather than optimizing a single objective function. This is in line with what GT defines as mixed-interest games representing social situations (Harsanyi, 1977), where parties might want to avoid a mutually destructive non-agreement outcome, but they are in a conflict of interest in deciding which of the many coordination solutions to agree on. Indeed, while cooperative approaches may provide better results, they are not without challenges, including a lack equilibrium property and enforcement mechanism, social dilemmas, and coordination problems.

However, in this work we depart from the standard game theory approach. Indeed, we begin by applying the *subjective games* and *framed games models* (Aoki, 2001; Cecchini Manara

and Sacconi, 2019a) to the *ex-ante* phase, i.e., the transition from a conflictual scenario into prospects for an agreement. Then, we use *psychological game theory* (Geanakoplos et al., 1989; Rabin, 1993; Battigalli and Dufwenberg, 2022; Cecchini Manara and Sacconi, 2019b, 2021; Grimalda and Sacconi, 2005; Sacconi and Grimalda, 2007) to study *ex-post* stage compliance with the agreement. These two approaches allow us to consider environmental policies and institutions for forests governance as equilibria resulting from multi-stakeholders interactions and negotiations, where actors are endowed with motivational complexity rather than mere self-interest.

First, we anticipate that starting from an extremely conflictual scenario, participants' subjective models of the game can evolve because of environmental changes, collective actions, and institutional complementarity (Aoki, 2001), resulting in a new repertory of actions, consequence functions, and hence payoffs. While players witness new non-cooperative strategies aimed at assuring a certain level of security for each agent, unilateral defection becomes less prominent as the parties do not see the game as a mutual distrust game anymore. Cooperating by agreement is a possible outcome in the updated framed game (Cecchini Manara and Sacconi, 2019a) - a Stag Hunt game - because it is supported by an equilibrium. This alters the character of local stakeholders' interactions.

Moreover, through certain hypotheses having to do with conformity preferences based on agreement and mutual expectations, we explain the emergence of motivational levers for (i) creating networks of solidarity to boycott companies that *completely* defect from an agreement, (ii) establishing an agreement that promotes environmental protection together with socio-environmental justice, which can counteract incentives for green collusion amongst timber companies and those who support environmental protectionism against First Nations' claims. Indeed, results show that by anticipating mutual defection, psychological factors do not enter players' utility functions. This results in an equilibrium of mutual defection that in turn causes a high level of deforestation, or into an equilibrium of green collusion that excludes FN's claims for socio-environmental justice. However, when there are mutual beliefs of conformity, complying with an agreement that provides a fairer distribution becomes a psychological equilibrium. Moreover, an additional psychological motivating factor explains solidarity among the most powerful and most marginalized stakeholders as a consequence of adhering to a just ideal. Yet, the possibility of green collusion remains, which inspires discussion on the question of green conservation v. social equity, as agreements over forest governance and the creation of protected areas run the risk of perpetuating green neo-colonialism at the expenses of social

equity (Bontempi et al., 2023; Chen et al., 2022; Fanari, 2022; Franks et al., 2018; Mombeshora and Le Bel, 2009; Oldekop et al., 2015; Roe, 2008; Wilkie et al., 2006).

This paper is divided in five sections, organized as follows. Section 2 presents the theoretical framework, which serves as the building block for the following discussion. Section 3 illustrates the case study, describing the history behind the transformation of a “War in the Woods” (Cashore et al., 2011) into what is celebrated as one of the most advanced agreements on forests governance and biodiversity conservation (Armstrong, 2009; IPCAs, 2018). Section 4 introduces an analytical model of the story and a simplified representation of the factors that made the conflict transformation possible, therefore focusing on the *ex-ante* phase. Here, we refer to subjective games and institutional complementarity (Aoki, 2001 and a particular development by Cecchini Manara and Sacconi, 2019a). Section 5 focuses on the *ex-post* conformity and presents a model of a psychological game, taking and extending the one presented by Degli Antoni and Sacconi (2013) to study social responsibility, activism, and boycotting in the relationships between firms and stakeholders. In the conclusions we outline the main findings, underline some limits of our study, and give insights for future research.

## **2. Theoretical framework**

### *2.1 Subjective games model*

In his book *Toward Comparative Institutional Analysis*, Masahiko Aoki (2001) gives a conceptualization of *institutions as equilibria*, building on a game theory approach and other interdisciplinary contributions. In his account, an institution is “a self-sustaining system of shared beliefs about a salient way in which the game is repeatedly played” (Aoki, 2001:10). Each player has a “limited capacity of cognition, evaluation and calculation” (Aoki, 2001:205), by which she envisions a subjective and compressed model of the game, that is a summary depiction of it where only subsets of conceivable actions for large games are displayed. Then, in an iterative process, this initial frame constrains or empowers the player's strategies, determining the resulting equilibrium selection (Aoki, 2001; Cecchini Manara and Sacconi, 2019a). This conclusion reinforces the initial summary representation as long as it maintains an equilibrium.

However, if agents get new information or participate in collective action even from complementary choice arenas, this may activate a revision in the player's frame and possibly ignite a new set of activities. In case this reassessment results in mutual coherence between the

various frames of individual agents, what Aoki (2001:232) refers to as a new common system of beliefs, we have the foundation for a new organization.

A new endogenous equilibrium state emerges because of strategic choices made by agents who, by acting in accordance with these new shared beliefs, go through an equilibrium selection process, eventually achieving a state in which their actions combination replicates and maintains the equilibrium, i.e., a new institution. As a result, the institution is self-sustaining as long as agents believe in it as a substantial summary representation of behavior regularity, in line with a given inter-subjective mental model of the game played in the domain. When external shocks, internal domain crises, capacity growth, or a combination of these disrupt the shared system of belief, agents may seek new avenues of activity. Because the latter may exist in dimensions that were previously inactive, the agent's search for new repertoires of action may lead to the discovery of a new subjective frame. When this occurs for a large enough number of people, the survival of the old institution is jeopardized.

Cognitive representations and choices of agents playing in a certain domain can also be parametrically affected by prevailing institutions in other domains, without agents strategically coordinating their choices across them. Aoki (2001) refers to such interdependencies as *institutional complementarities*, claiming that they can drive agents to revise their perception of the game's structure and discover new ways of doing things, potentially leading to institutional innovation.

In this work, we use Aoki's theoretical framework to explain the *ex-ante* phase, that is the transformation of a multi-stakeholders' conflict where cooperation has no mutually beneficial outcomes, into multi-stakeholders' interactions with feasible prospects for agreement and cooperation, which the parties could exploit through some form of agreement or explicit coordination (Part I, Section 4). Borrowing from Cecchini Manara and Sacconi's (2019a) this shift can be seen as one in which a new mini game emerges as an alternative frame that allows the parties to see the possibility for solutions that could be object of an agreement and be sustained in equilibrium.

The process we describe explains how, in the interaction between certain players, a specific mental model emerges that allows to see the cooperation between business organizations and environmental NGOs (ENGOS) as an arena in which a mutual limitation agreement could credibly replace mutual distrust. In Section 4, we specifically enlighten how ENGOS' lobbying and market campaigning and resulting information coming from other arenas of interaction along all the supply chain – i.e., between the logging companies and their

intermediate customers - allow a shift in the framing of the game played amongst ENGOs and E, so that they start seeing the possibility of a feasible cooperation in equilibrium, even if the prospect of disagreeing remains viable. The same is true for the interaction amongst First Nations and the Provincial Government initially characterized by distrust. Then, these shifts together open the route to a wider agreement amongst the different parties here involved, with the Provincial Government acting as the rule maker and attempting to investigate the potential for a broader agreement that includes both environmental and social provisions.

We do not, however, examine the game associated with the bargaining table. It is sufficient to show that the prospect of credible agreements has evolved, and we consider that a bargaining agreement could correspond to a fair allocation of the surplus, reflecting the Nash Bargaining Solution. What we are interested in, instead, is the *ex-post* game that follows by taking the bargaining phase as given, with the inherent risk that it results in a cheap talk game without effectiveness on players' compliance.

This is what the literature defines as the compliance problem, which deals with the *ex-post* rationality for adherence to an agreement, as neither its binding nature nor the government's ability to enforce it should be taken for granted (Gauthier, 1986). Precisely, the question is how an agreement can generate motivational forces that are strong enough to induce implementation in situations where at least one party could abuse it and obtain a better material outcome and there is no external enforcement mechanism. Moreover, we anticipate that when the conditions for sitting at a multi-stakeholder negotiation table are met, only agreements limited to business organizations and ENGOs are implementable in equilibrium. As a result, FNs' claims, which include demands for more equitable outcomes where forest protection goes hand in hand with safeguarding their rights and way of life, would be left out. Thus, the second question is whether an impartial agreement can generate reasons to act more justly and counteract incentives for green collusion.

## *2.2 Psychological game theory*

In this work, we hypothesize that psychological game theory can explain ENGOs' sanctioning and boycotting of industries' unfair behaviors and *ex-post* conformity with the GBR agreement (Geanakoplos et al., 1989; Rabin, 1993; Battigalli and Dufwenberg, 2022; and in particular the conformity preference model according to Cecchini Manara and Sacconi, 2019b, 2021; Grimalda and Sacconi, 2005; Sacconi and Grimalda, 2007). Specifically, we take the psychological game developed by Degli Antoni and Sacconi (2013) in their work on corporate

social responsibility, boycotting, and stakeholder activism, and extend it so to include dynamics and develop further conclusions that are more relevant for the case at stake.

The conformity preference model – the version of psychological game we adopt – considers that economic agents are endowed with motivational complexity that goes beyond mere self-interest, so to also include a *sense of justice* (Rawls, 1971) that translates into psychological utility for conformity with a principle of justice called T. Specifically, psychological utility measures a player’s preference to generate a fair distribution of a surplus by complying with a fair agreement, given players’ reciprocal expectations of conformity.

Conformity preferences enter the picture when a fair and impartial agreement (i) is reached in a pre-play communication phase over a distributive justice principle T - the ideal social contract that sustains an institution or organization - and (ii) activates reciprocal conformity beliefs. Once these two conditions held, a disposition to comply with T emerges that enters the model as a positive parameter of psychological utility  $\lambda$  that adds to the players’ material payoffs. Then, once conformity preferences are incorporated, the game becomes a psychological game and novel Psychological Nash Equilibria (PNE) might emerge.

The first step for modelling a PG is to identify the T value, which is the ideal principle of fair cooperation free and rational persons would accept in a pre-play communication stage where they reason “as if” they were under a veil of ignorance (Rawls, 1971). In our case, T represents an impartial agreement over forest governance, timber extraction, and surplus’ distribution. Since it is intended to represent a fair agreement T is taken to be equal to the Nash symmetrical bargaining Solution (Aoki, 1984; Binmore, 2005; Nash, 1951; Sacconi, 2000, 2006):

$$T(\sigma) = \prod_{i=1}^n (U_i - d_i)$$

Then, because of their sense of justice (Rawls, 1971) and given mutual beliefs about reciprocal conformity, players can obtain psychological utility by mutually complying with T. This utility adds to the material one and modifies players’ final payoffs.

Thus, the second step is to include ideal utility and reciprocal beliefs in each agent’s overall utility function (Geanakoplos et al., 1989; Grimalda and Sacconi, 2005; Rabin, 1993; Sacconi and Grimalda, 2007):

$$V_i(\sigma) = U_i(\sigma) + \lambda_i F[T(\sigma)]$$

where  $U_i(\sigma)$  represents the material utility player  $i$  attaches to the state of affair  $\sigma$ , while  $\lambda_i F[T(\sigma)]$  represents  $i$ 's conformity motivation to act given her expectations of reciprocal conformity.  $\lambda_i$  is an exogenous motivational parameter that measures player  $i$ 's desire to conform with  $T$ , while  $F[T(\sigma)]$  captures the role of beliefs in affecting ideal utility.

Thus, given a certain state of affair  $\sigma$ ,  $F$  combines two indexes of deviation from maximal  $T$ :  $\tilde{f}_i$  represents the degree of deviation from  $T_{MAX}$  chosen by player  $i$  given his prediction of  $j$ 's choice (described by  $\sigma_j$ ), while  $\tilde{f}_j$  represents the degree of deviation chosen by player  $j$  given her expectation on  $i$ 's choice (described by  $\sigma_i$ ) seen through player  $i$ 's second order beliefs, i.e., what player  $i$  believes that player  $j$  believes about  $i$ 's choice. Thus  $F[T(\sigma)]$  measures an agent's conformity to the agreed principle  $T$ . As explained more into details in Appendix A4, this can also be more explicitly expressed as

$$V_i(\sigma, b_i^1, b_i^2) = U_i(\sigma_i, b_i^1) + \lambda_i (1 + f_i)(1 + \tilde{f}_j)$$

### *2.2.1 Psychological Trust Game and conformity preferences to study corporate social responsibility, activism and boycotting*

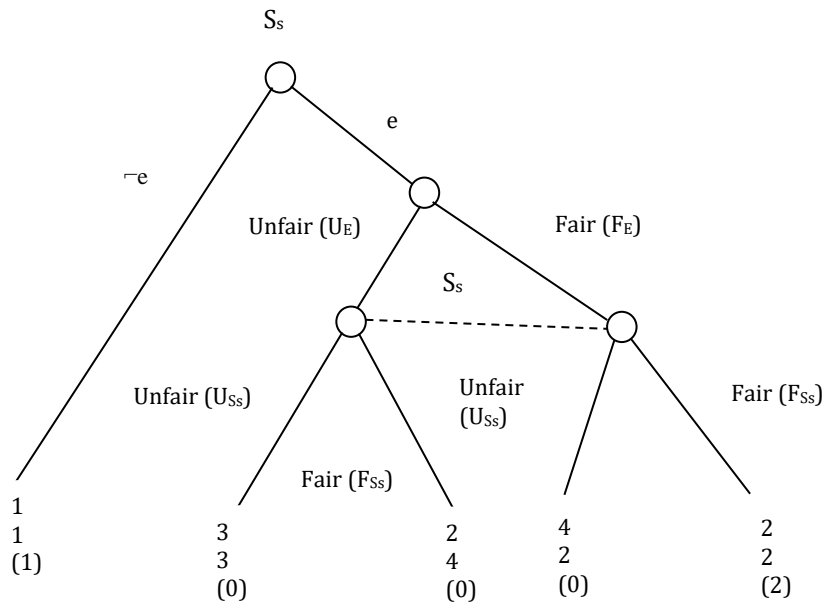
Degli Antoni and Sacconi start by discussing a formal model of a network (Lippert and Spagnolo, 2011) whereby an enterprise  $E$  is linked with a strong stakeholder ( $S_s$ ) and two weak stakeholders ( $S_{w1}$  and  $S_{w2}$ ) who are linked one another directly or through other agents. While  $E$  and  $S_s$  have a mutual relationship and prefer to cooperate indefinitely, the relation between  $E$  and its  $S_w$  is unilateral and deficient.  $S_{w1}$  and  $S_{w2}$  have an interest in repeated cooperation, but  $E$  has different material incentives and an interest in defecting from cooperation with them, even in the long run. Such a model is intended to represent the problem of fair cooperation amongst a main company and its small supply chain stakeholders, which is supervised by some strong stakeholder like an international NGO. Taking this as a starting point, the authors set up their own model to analyze the games played within the network. Specifically, they keep the relation between  $E$  and  $S_w$  as a PD, and devise a 3-players game  $G$  to model the relation between  $E$  and its  $S_s$  and  $S_w$ , where the latter is a dummy player (Figure 1, Degli Antoni and Sacconi, 2013:221).

$S_s$  - the NGO - has the faculty of deciding between entering ( $e$ ) or not ( $-e$ ) into a cooperative relation with  $E$ , depending on whether it thinks the latter will abuse ( $a$ ) or not ( $-a$ ). If  $S_s$  plays  $e$ , both  $E$  and  $S_s$  can act Fairly ( $F_E$  and  $F_{S_s}$ ) or Unfairly ( $U_E$  and  $U_{S_s}$ ) towards the

dummy player  $S_w$ , meaning they can decide whether to collude and appropriate the entire surplus or save a part for the  $S_w$ .

Interestingly, Degli Antoni and Sacconi (2013) demonstrate that, if agents are endowed with only material preferences, E and  $S_s$  will always collude, and E has no incentive to cooperate with its  $S_w$ . However, by introducing conformity preferences and reshaping the game as a psychological one, mutual cooperative and fair behavior become endogenously sustainable, as  $S_s$  might have a preference to boycott firms that do not cooperate with  $S_w$  and both  $S_s$  and E might have incentives to cooperate with  $S_w$  in the long term.

For conformity preferences to enter the picture an agreement must be reached in a pre-play communication phase over a distributive principle T of equal treatment for the supply chains of companies, whereby E and  $S_s$  decide to act fairly with  $S_w$ , leaving a portion of the surplus to it. Moreover, both  $S_s$  and E must assume by default that the counterpart will follow a strategy that fully realizes T or it is very close to doing so. Once these two conditions are held and parties develop psychological utility, if  $\lambda_i$  is high enough to constitute a sufficient incentive to counteract unfair collusion and play in accordance with the agreement, compliance strategies are a new equilibrium of the game.



**Figure 1.** The extensive form of the game  $G$  that represents the relationship between the firm and its  $S_s$  (the numbers at the edge of the three represent the payoffs obtained by  $S_s$ ,  $E$ , and  $S_w$  respectively) (Degli Antoni and Sacconi, 2013:221).

Because it captures the essential role of strong stakeholders’ activism and boycotting in preventing industries from adopting unfair behaviour against its  $S_w$ , this game constitutes a good starting point to represent compliance with the GBR agreement. However, in this paper we go beyond the initial model to show additional possible states of affairs, which are particularly relevant for our case and, more generally, when considering forest governance.

First, we capture different degrees of collusion, one between  $E$  and  $S_s$  and the other between them and ENGO. With respect to the first, psychological preferences reinforce ENGO’s decision to prevent such collusion, while the latter grasps the possibility of green collusion, which is of particular significance for the discourse on forests governance and sustainability. Indeed, false “green” solutions, such as the creation of Protected Areas (PAs) are more and more criticized as new forms of racism and colonialism in the name of “environmental protection” (Bontempi et al., 2023; Bockstael and Berkes, 2017; Fanari, 2022; Mombeshora and Le Bel, 2009; Wilkie et al., 2006).

In our model, we hypothesize that this latter equilibrium outcome can be sustained even by conformity preferences. Indeed, psychological preferences are a function of the spreading amongst the players of the benefit of reducing timber extraction: thus, some reduction may benefit any player a bit and the psychological game perspective may account also for motivations that support unequal consideration for the most marginalized parties. This makes

the case realistic but also shows how problematic it may be to achieve a proper level of socio-environmental justice. However, we also show that the introduction of psychological utility allows for the emergence of an additional PNE that is more socially fair and maximizes the Nash Bargaining Product, thus granting full and even more motivationally strong compliance with the agreement. Indeed, an initial agreement that is substantially fair to FNs can activate reciprocal beliefs that, in turn, brings to a psychological motivational component that induces agents to comply with principles of socio-environmental justice. Thus, the final picture will be one of a multiplicity of psychological equilibria.

### **3. The Great Bear Rainforest Case**

The beginning of the “War in the Woods” (Cashore et al., 2001) dates to the 1980s, when some of the FNs traditionally living in the area and environmental movements and grassroots organizations (ENGOS), started protesting logging activities carried out by BC timber industries in old-growth forests (Affolderbach, 2011; Saakiroski et al., 2013). FNs and ENGOS defended the rainforest as being of both local and global value and called for increased protection and new types of forest management (Armstrong, 2009; Raitio and Saakiroski, 2012). Yet, NGOs were mostly advocating for the environmental value of the forest, as a hotspot of wildlife and biodiversity richness, to the extent that they renamed it as the “Great Bear Rainforest” (GBR) after the white-coated Kermode Bear endemic to the region (Raitio and Saakiroski, 2012). The FNs instead claimed that commercial logging was undermining their livelihoods and socio-economic development, and it had been implemented without their consent (Raitio and Saakiroski, 2012). Moreover, they refused pure conservationist arguments in favor of strictly protected areas that would have denied their rights to hunt, harvest and take ceremonial logs in the forest (IPCAs, 2018). On their part, logging companies strongly opposed any request of reducing timber supply, as this would have threatened the profitability of their operations and negatively affected the regional economy (Armstrong, 2009; Cashore et al., 2011).

In the middle of such disagreement, the Provincial Government (ProvGov) found itself in a very uncomfortable position. While it had to represent the public environmental interest that ENGOS claimed they were defending, it also benefited economically from logging, which was the main economic driver of the region at the time. Moreover, the ProvGov had to ensure that FNs’ interests were represented in any ultimate deal. Thus, while being mostly acquiescent with the industries, the ProvGov also tried to introduce a collaborative planning system - the Land and Resource Management Planning (LRMP) table (Saakiroski et al., 2013). Yet, ENGOS thought this entire process would have served solely to cover continuing logging, and FNs

believed that participating in it would have jeopardized the possibility of having their land and governance claims met. Thus, they both decided to stay out of it: FNs pursued a legal path by bringing cases to Courts, while ENGOs started a huge market campaign targeting BC forest industries and their international customers and investors (Howlett et al., 2009; Raitio and Saakiroski, 2012; Wilson, 1998; Smith, 2010). These strategies contributed to changing the ProvGov and logging companies' attitude respectively (Affolderbach, 2011; Sranko, 2011; Zietsma and Winn, 2008).

Indeed, as the market campaigns of ENGOs spread internationally, the logging companies began to worry that their reputation would be harmed, with far-reaching economic consequences. A turning point occurred in 1999, when a German delegation of papermakers and magazine publishers, after having visited active logging sites and some of the FNs, threatened the cancellation of contracts unless an acceptable solution to the conflict was found (Armstrong, 2009; Saakiroski et al., 2013). Under this pressure, the logging industries decided to move from an "attack and defend" strategy towards a more conciliatory one (Affolderbach, 2011; Armstrong, 2009; Raitio and Saakiroski, 2012). Some of them reunited under the so-called Coast Forest Conservation Initiative (CFCI) decided to enter bilateral negotiations with ENGOs, which resulted into an agreement over basic principles for the development of joint solutions and the suspension of respective activities that were at the roots of the conflict (Armstrong, 2009). Through the so-called Joint Solutions Project (JSP), logging companies and ENGOs agreed upon a set of principles for joint solutions – precautionary principle, protection of habitat for fish and wildlife, harvesting techniques with low environmental impact and high timber value among others (Armstrong, 2009) – and on the creation of the Coast Information Team (CIT), an independent team of experts that would have provided knowledge and learning all along the process (Raitio et al., 2013; Smith, 2010). Moreover, ENGOs obtained moratorium on logging activities in contested areas, to which the industries agreed in return for a halt to market campaigns (Armstrong, 2009; Raitio et al., 2013).

On the other hand, both the FNs and the ProvGov felt that industries and ENGOs were coming to agreements on territories that were their own (UBCM, 2000). Thus, by 2001, the ProvGov began to sign protocols with the FNs so to enter a Government-to-Government (G2G) relation, by which they undertook a commitment for shared-decision making and negotiation of agreements over land use planning and resource management. This decision-making table served to counterbalance the ENGOs-industries alliance, or stakeholders table (Cullen et al., 2010; Raitio and Saakiroski, 2014).

In the meanwhile, the coastal FNs, who had until then worked mostly independently of each other to promote their rights and title, had started establishing formal coalitions such as the Coastal First Nations Turning Point Initiative (CFN). At the same time, the relation between ENGOs and FNs became stronger: the former recognized their need to take FNs' concerns seriously while the latter realized they could benefit from market that contributed to put the region on the global agenda and created the visibility and pressure needed to have more influence on the ProvGov and the industries. It is against this background that a critical meeting took place in 2001, where the FNs expressed their support for environmental pressure but asked the ENGOs to recognize their rights and title over those territories and consider FNs' well-being in their claims (Raitio and Saakiroski, 2012; Saakiroski et al., 2013). In other words, FNs wanted the issue of equity to be brought into the agreement: they claimed that colonization had already had a strong impact on their ability to self-manage land and ENGOs were now approaching the problem with a neo-colonialist mind, thinking mostly from a strategic and pure conservationist point of view rather than from an equity perspective.

In the end, the ProvGov retook control of the entire situation and brought key stakeholders to the formal LRMP Completion Table in December 2001. As Raitio and Saakiroski (2012) well explain, the ProvGov itself was strongly dependent on forest industries for income and employment and thus wished that parties could arrive at a permanent decision to be communicated to markets. On the other side, firms, ENGOs and FNs needed certainty and ProvGov's legitimacy, leadership, and expertise. Moreover, failure to reach a consensus would have induced the risk of a unilateral decision by the ProvGov itself.

The entire process culminated into BC Premier Gordon Campbell's announcement, in February 2006, that an historical agreement had been reached. A concrete outcome of FNs' increased influence was the establishment of Conservancies that, differently from strictly protected areas, allow for FNs' traditional social, cultural, and ceremonial uses (Howlett et al., 2009:389; IPCAs, 2018; Saakiroski et al., 2013; Raitio and Saakiroski, 2012). The agreement also established a network of protected areas that was off-limits to industrial logging, it improved logging activities over an additional part of the area, and it increased involvement of FNs' in decision-making and conservation financing for them (IPCAs, 2018). Three years later the parties agreed to a five-year plan to review the implementation of the Ecosystem-Based Management (EBM) principle with the aim of "concurrently moving to high levels of ecological integrity and high levels of human well-being and if that is not possible, to make meaningful increments to both" (BC Gov News Releases 29.1.2014). Then, in 2016, the government passed

new acts (BC Gov News Releases 1.3.2016 and 21.12.2016) with the objective of conserving 85 percent of the forest and 70 percent of old growth. Importantly, the agreement gave FNs a higher stake in forest management in the region and saw an increase in the allocation of forest carbon-offset credits to be sold and used for development projects of importance to them<sup>13</sup>. A Coast fund was also created to finance indigenous-led conservation and the development of new sustainable businesses (Armstrong, 2009; Smith, 2010).

Since its signature, at least partial compliance followed, even though many ENGOs have been complaining about industries' delays in the implementation of some key protection measures and failure to disclose relevant information on mapping (Rainforest Solutions Project, Press Release 12.02.2020). FNs instead, are more satisfied and recognize increased benefits, so that they continue to work in partnership with the ProvGov. Recently, new measures have been introduced to sustain the GBR under the Ecosystem-Based Management approach, also with a view to increase FNs' role and responsibility in co-management (BC Gov News Release 27.7.2023).

#### **4. From multi-stakeholders' conflict to opportunities for agreement and cooperation: changing subjective game models**

The GBR case is an example of a complex conflict involving multiple stakeholders, which was turned into an agreement for multi-stakeholder governance particularly thanks to FNs and ENGOs' ability to organize and mobilize at multiple scales.

This Section attempts to model the trajectory from a multi-stakeholder's conflict to interactions in which there are feasible prospects for agreement and cooperation that might be sustained in equilibrium. We give a reconstruction separated into stages, as we regard them as distinct games played in discrete time instants along an historical process, rather than components of a single game. This allows the solution of the game in each stage without considering the cumulative payoffs achieved in previous phases<sup>14</sup>. We adopt the subjective game and framed game models approach (Aoki, 2001; Cecchini Manara and Sacconi, 2019a) to illustrate how the game models representing the historical situation change at different stages due to players' cognitive disequilibrium. Changes in information from external factors and complementary games, make agents shift their own subjective representation of the game at

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<sup>13</sup><https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/great-bear-rainforest/gbr-agreement-highlights>.

<sup>14</sup> A more advanced technique may possibly simulate all these stages as part of a single game made up of multiple stages. However, at the time, this option appears to involve an unreasonable level of intricacy for the specified participants as well as the theoretician.

some point; from that moment on, they believe they can play a different game with new strategic opportunities and new equilibrium solutions.

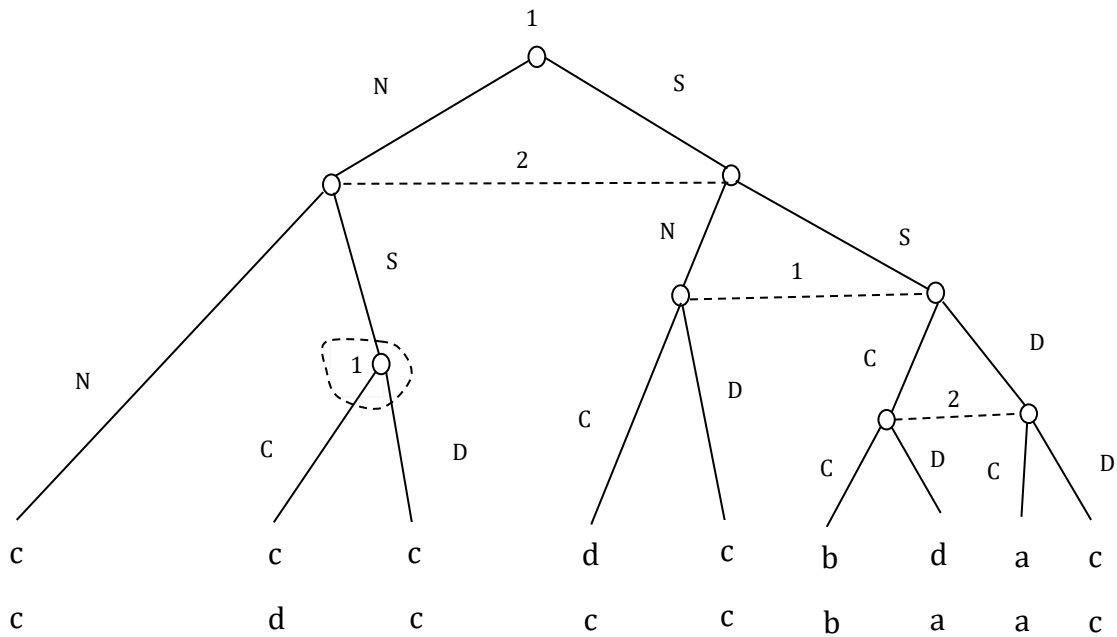
#### *4.1 A shift in players' subjective game models*

The very opening stage of the story (Phase 1), when the ProvGov tries to set up a LRMP table but both the ENGOs and FNs decide to stay out, is a phase of huge distrust, as ENGOs and FNs fear the agreement would not consider equity issues and would simply be a cover up for continuous logging. Thus, there is not a proper multi-actor bargaining table and the parties play separate games, with ENGOs and FNs negotiating with some of the logging industries and the ProvGov respectively (Raitio et al., 2013). By assumption, at this stage the various ENGOs, FNs and logging companies are considered as three single players<sup>15</sup>, hereinafter NGO, FN and E. All of them, as well as the ProvGov, are rational decision makers who maximize their own objective function.

Each of the two parallel interactions, one between NGO and E and the other between FN and the ProvGov, can be modelled as a 3x3 game that encompasses various subgames. This is a more complex representation than what players can see and perform since, due to limited awareness, they focus on specific subgames based on their mental models and their strategic interactions. The game is presented in Figure 1 in its extensive form and in Table 1 in its normal form.

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<sup>15</sup> In the real case, certain environmental organizations such as Greenpeace, ForestEthics, the Sierra Club, Rainforest Action Network and Natural Resources Defense Council carried forward a joint market campaign (Armstrong, 2009) and joined together the JSP. Similarly, various business organizations spoke as a unique voice both when they initially defended their practices and their contribution to the regional economic developed and when they later decided to shift their strategies to sit at the table with ENGOs (Armstrong, 2009). FNs too formed formal coalitions, such as the Coastal First Nations Turning Point Initiative (CFN), the Skeena First Nations Stewardship Council and the Nanwakolas Council (Raitio and Saakiroski, 2014).



**Figure 1.** The extensive form of the game depicting the relationship between NGO-E in Phase 1. The letters in the column represent the payoffs obtained by NGO and E, with  $a > b > c > d$ . A game with the same structure is played between FN and the ProvGov.

	<b>E</b>		
		<b>S, D</b>	<b>S, C</b>
<b>NGO</b>		<b>N</b>	
	<b>S, D</b>	(c,c)	(a,d)
	<b>S, C</b>	(d,a)	(b,b)
	<b>N</b>	(c,c)	(c,d)

**Table 1.** The normal form of the game depicting the relationship between NGO and E in Phase 1. The letters represent the payoffs obtained by NGO and E, with  $a > b > c > d$ . A game with the same structure is played between FN and the ProvGov.

Figure 1 shows that at first, each participant can decide whether to

- negotiate and subscribe an agreement (S); or
- do not negotiate and act without looking for cooperation (N).

If the player plays S, then it can decide to

- comply with the agreement (C); or
- do not comply with it and take advantage of the other's compliance if it occurs (D).

If instead the player initially plays N, it can continue doing it without looking for the other's cooperation. For example, considering the game between E and NGO:

- By playing S-C, E agrees on a rate of forest to be protected and be set aside from logging, as well as a new way of logging the rest of the area, and commits to abide by the agreement; correspondingly, NGO genuinely undertakes to stop any campaign against E.
- By playing S-D, the player agrees on the same points but defects and opportunistically exploits the other's cooperation if it occurs. For E, this means continuing logging even though NGO has renounced market campaigns, while for NGO it means continuing market campaigns against E, even against those who comply.
- By playing N, the player - either E or NGO - decides to stay out from any discussion table and from any agreement, thus maintaining the status quo.

For both players, the utility ordering of the game outcomes that makes fully sense of this interaction is  $a > b > c > d$ . Indeed, each player can obtain the maximum payoff by exploiting the counterpart's cooperation and taking advantage of it without shouldering any cost. Signing and carrying out an agreement when the counterparty does the same, instead, results in a lower but still good result, better than the outcomes of mutual defection. Finally, being exploited by the counterparty's defection brings the worst payoff. Anyway, even if there is an incentive to defect from the agreement, the result of mutual defection is quite poor, and it amounts to nothing more than the ongoing status quo where each party goes on with its own strategy without considering the possibility of an agreement that may stop their ongoing conflict.

By applying Aoki's (2001) subjective games model, we assume that agents have only subjective and restricted awareness of the game's objective structure. This means that at any given time, players engage just a tiny fraction of technologically feasible actions and their combinations as "repertoires" (Dosi and Marengo, 1994 in Aoki, 2001). Indeed, the major game does include nine mini games (Cecchini Manara and Sacconi, 2019a), but only two of them are immediately visible to the participants - see Tables 1.1 and 1.2. By assumption, we consider that parties have access to the same information so that, for symmetrical information, there is an analogous change of frame. Appendix A1 depicts all the different small-framed games that could become apparent through other simplified concepts.

NGO \ E	S, D	S, C	N
S, D	(c,c)	(a,d)	(c,c)
S, C	(d,a)	(b,b)	(d,c)
N	(c,c)	(c,d)	(c,c)

**Table 1.1** The normal form of the mini-game frame as a redux of the big game in Figure 1, as it is visible to the players, according to their initial frame.

The simplified view wherein the interaction is focused on the possibility to respect or not a given agreement drives agents to the idea that agreeing does not entail compliance, and hence toward a view of the game as a Prisoner Dilemma (PD). Indeed, the parties could potentially reach a mutually advantageous deal on some terms of compromise between their preferences, such as agreeing that NGO stops campaigning against logging industries and damaging their reputation, and E reduces the harvesting rate and agree to a sustainable way of managing the forest. However, at first, each player has a specific representation of the game in mind, according to which it would benefit from entering the agreement but then defecting and abusing the other's cooperation. E has been profiting from breaching claims of compliance with specific environmental and social norms, whilst NGO has been taking advantage from criticizing business organizations through mobilization and boycotting actions. As a result, they both believe it is more advantageous to defect unilaterally and benefit from the other's cooperation as in a PD, not least since they have no prior experience with fulfilled agreements and neither external restrictions nor endogenous motivations would compel them to conform. For instance, E perceives it could profit by continuing logging if NGO anyway suspend or stop market campaigns, as the customers will be unaware of it and there would be no fallout on their reputation. NGO, for its part, might benefit from continuing lobbying against E in the international market, even though E renounces to part of its logging activities, as this would increase the visibility of NGO's activities.

Thus, even if the other party defects, it is more convenient for each player to defect too rather than to cooperate, because cooperating would entail incurring the cost of fulfilling an agreement while receiving no gain from the counterparty's cooperation. Indeed, E would reduce logging while still suffering the consequences of NGO's market campaigns whereas NGO's would halt or discontinue campaigning without E changing their harvesting plans and

tactics. Thus, according to their mental representation, the parties perceive their interaction as a PD where defecting is the only rational behavior for both players regardless of what the other player does. As a result, (D;D) is the only equilibrium in dominant strategies even when a more mutually advantageous agreement is achievable by playing (C;C).

Later, something occurs that reduces interpretative clarity of the game as a PD. The prevalent belief emerges that it is inconvenient to consider exploiting the counterparty's cooperation. The lobbying and involvement of international customers and investors is the trigger mechanism compelling NGO and E to re-evaluate and update their own model of a subjective game in the GBR scenario (Affolderbach, 2011). NGOs' efforts in foreign markets are gaining increasing awareness and influence not only among the general public but also among the corporate community, compromising E's reputation and market ties with intermediary clients. E's customers that produce final goods for the final market, start considering that acquiring and transforming wood extracted in excess from forests under environmental conservation constraints, might result in significant losses of reputation and reduced profit. Thus, they ask the logging companies to find reasonable solutions to the conflict, otherwise threatening the cancellation of contracts.

As a result, E finds more and more difficult to implement the defection strategy, i.e., finding intermediate customers willing to buy the excess wood at the same price, as the latter would fear to be criticized too for being complicit in irresponsible conduct. Possibly, it might find alternative buyers and markets, but this might entail legal sanctions and bad reputational effects and, therefore, a reduced profit. Thus, successful unilateral defection becomes nearly impossible, up to the point that E sees no difference between entering into the agreement and then defecting, and simply staying out of it and going on alone without trying to deceive the interlocutors. Indeed, the latter appear to be capable of draining the benefits of deceit through the effects of boycotting campaigns across the entire supply chain.

On its part, NGO starts feeling that predatory costs for market campaigns are increasing but targeting all business companies operating in the area without differentiation based on their conduct could not bring the expected results. Indeed, intermediate customers could find themselves unable to discern the information they receive from the NGO and see it as not reliable, thus deciding to continue buying from E. Moreover, NGO starts seeing that E would probably accept to revise their harvesting plans only in exchange for a halt to market campaigns that damage their reputation, otherwise there will be no market effect.

In conclusion, the changing international framework bring the parties to see a different game, where each of them can either enter the agreement and try to obtain the associated benefits or, if it does not trust the counterparty, it can stay out from any negotiation table. Unilateral defection, instead, is no longer as viable and convenient a strategy as it used to be. According to their new mental models, players move their focus from a PD to a Stag-Hunt (SH) mini-game where the payoffs-dominant solution can prevail (Aoki, 2001; Cecchini Manara and Sacconi, 2019a) – Table 1.2. Indeed, if they do not trust each other and fear the counterpart’s defection, staying out could be a safer choice. Yet, it does not lead to an outcome as favorable as entering the negotiation and cooperating, as it implies predatory and defensive costs typical of remaining in a state of nature (Buchanan, 1975; Gauthier, 1987).

<b>NGO</b> \ <b>E</b>			
	<b>S, D</b>	<b>S, C</b>	<b>N</b>
<b>S, D</b>	(c,c)	(a,d)	(c,c)
<b>S, C</b>	(d,a)	(b,b)	(d,c)
<b>N</b>	(c,c)	(c,d)	(c,c)

**Table 1.2** The normal form of another mini-game frame as a redux of the big game in Figure 1, as it is visible to the players, after a shift in their initial frame.

In turn, this outcome generates a shift in the FN-ProvGov’s subjective frames of their interaction as well, as in an institutional complementarity scenario where the institutions prevailing in a certain domain can affect choices in another domain, even though the actors in the two domains do not strategically coordinate their choices (Aoki, 2001).

Considering the game in Figure 1 and Table 1 as played between FN and ProvGov:

- By playing S-C, the player agrees to enter a G2G relation with the counterpart, i.e., to set up a decision-making table that must scrutinize the proposal by other stakeholders. Specifically, the ProvGov agrees to recognize FN as another governmental actor endowed with decision-making powers and the FN agrees to work in partnership with the ProvGov.
- By playing S-D, the player agrees on the same points but defects and exploits opportunistically the other's cooperation, which for the ProvGov means undertaking decisions without involving FN while for FN means continuing

opposing and campaigning against the ProvGov, as well as threatening withdrawal of electoral support.

- By playing N, the player decides to stay out from any discussion table and from any agreement, thus continuing with the status quo.

As for E and NGO, at the beginning players see just a portion of the game, the one resulting in a PD. Indeed, both FN and ProvGov perceive they could enter into an agreement and then abuse the other's cooperative strategy. For ProvGov, this would be beneficial because it could avoid bigger compromise with industries than involving FN in decision-making would require. FN, for its part, still perceives the ProvGov as overly collusive with the logging industries, to the point where getting into an agreement and complying with seems as embracing this collusion. Instead, FN believes that unilateral defection will improve its bargaining power for an agreement that takes its demands more into account.

However, there comes a point when the rising international awareness of the issue as well as the shift in the game between E and NGO alter the perception that the ProvGov and FN have of their own game. The ProvGov starts seeing the possibility to collude with logging industries and abuse the unilateral cooperation of FN as increasingly problematic, as E itself is more careful of the effects the conflict is having on the entire supply chain worldwide, to the point that it is negotiating with NGO. On its part, FN is concerned that its unilateral defection would push the ProvGov to come to an agreement with the NGO and E, possibly with little or no regard for its claims. Thus, unilateral defection is no longer a viable strategy, since it would open the door for the other parties to reach an agreement from which FN is excluded and hence cannot benefit.

Still, both the ProvGov and FN could simply stay out of any negotiation table if they fear the counterpart's unilateral defection; however, this would be less convenient than negotiating and entering into a G2G relation, which could instead increase their stance *vis-à-vis* NGO and E. Indeed, both players start feeling threatened by the latter's alliance as this "stakeholders table" is taking choices on their own land (Barry, 2011; Howlett et al., 2009; Saakiroski et al., 2013).

Thus, FN and ProvGov too, activate a new mental frame of their interaction, which can also be modelled as a SH game, as they do not observe anymore the (S,D ; S,C) or (S,C ; S,D) pair with asymmetric payoffs but they instead see the case in which defection results in a poor outcome - which is the same as making no deal (N) - as there is no benefit associated with unilateral defection but almost harm. As a result, the summary description of the mini-game

the players have in mind is reduced to one that accounts for the possibilities of either entering into the agreement and cooperating (S,C) or not entering it (N) – see Table 1.2.

### **5. Studying ex-post compliance with the agreement through psychological game theory**

The games analyzed in Section 4 show the emergence of equilibria in the interaction between E-NGO and FN-ProvGov, where the parties see cooperation as a feasible outcome. In the real history, this served as the basis for the big negotiating table created by the ProvGov with the aim of coming to an agreement inclusive of FN's demands, NGOs' environmental concerns and E's concerns for their reputation in the market. This exact phase could be modelled as a bargaining or deliberation game. However, it is not the focus of this paper, which instead aims at modelling the *ex-post* implementation game, i.e., the factors that could make this agreement effective even in the absence of external enforcement mechanisms, especially when a stronger stakeholder could abuse the others (Gauthier, 1986).

In the model we present there is no complete overlapping between phase 1 - from protracted conflict to realistic prospect of feasible cooperation by agreement - and phase 2 - implementation. While in phase 1 agents play two parallel games, we model phase 2 as a four-players game between NGO, E, international customers of E (strong stakeholders  $S_s$ ) as active players, and FN as a dummy player.

In fact, the two phases represent two separate but linked problems. Market leverage by NGO targeting  $S_s$  was essential in modifying E's framing of the game and the perception of possible equilibria in the historical instance. As a result of their pressure on wood businesses to adjust their own strategy,  $S_s$  have indirectly played an important role in transforming a protracted conflict into viable prospects for a deal. Then, since the multi-stakeholder agreement was signed, there has been some degree of voluntary compliance although partial.

Thus, we hypothesize that ex-post conformity with the GBR agreement and NGOs' sanctioning and boycotting of unfair behaviors by industries can be explained through the contribution of psychological game theory (Geanakoplos et al., 1989; Rabin, 1993; Cecchini Manara and Sacconi, 2019b, 2021; Grimalda and Sacconi, 2005; Sacconi and Grimalda, 2007). Additionally, we show how weakest parties' organizational capacity and mobilization is decisive for a new equilibrium to emerge where environmental protection goes hand in hand with socio-environmental justice. In the *ex-ante* phase, this is evident from the role that NGO and FN play in changing the incentives of E and ProvGov respectively. In the *ex-post* phase, this

is illustrated by NGO's capacity to boycott in alliance with FN, i.e., to stay out and let the game end.

### *5.1 Modelling the game*

The game we use is a kind of Trust Game (TG) where a business organization - the forest industries operating in the GBR - interacts with a strong stakeholder - the NGO - while the weak stakeholder is a dummy player. However, we introduce an extension of the game to four participants, including another strong stakeholder, i.e., commercial partners of the forest industry that acquire timber to transform it and sell final products on commodity markets. Moreover, we assume that their strategy sets are composed of non-fair, environmentally fair, and socially fair strategies, rather than just by the alternative between fair and unfair. This serves to stress the distinction between purely conservationist policies - environmentally fair - and environmental policies that also address claims for socio-environmental justice - socially fair<sup>16</sup>. Moreover, it shows that the players representing timber industries and their customers may select the quantities of timber they want to sell or buy in ways that are completely incompliant, green-collusive partially compliant, or fully respectful of socio-environmentally fair principles.

By assumption, at this stage the various environmental ENGOs, logging companies, intermediate customers, and FNs are considered as three single players, hereinafter NGO, E, S<sub>s</sub> and FN. All the players are rational decision makers who maximize their own objective function and each of them has its own strategies:

- NGO can decide whether to let or not the game begin by entering (e) or not (¬e) the compliance game, where this means being the first mover in conforming to the agreement or staying out of the game and continuing lobbying in the market. Since it has the possibility to end the game from the beginning, NGO is a strong stakeholder of E; if it decides to stay out and continue with the status quo, it negatively influences the possibility for E and S<sub>s</sub> to take advantage from their own commercial partnership. This element catches Degli Antoni and Sacconi's (2013) idea of boycotting as not starting or interrupting a relation with collusive firms, thus punishing them and reporting their violations through a series of actions - i.e., market campaigns, naming and shaming, etc. - and making the agreement effectively unworkable.

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<sup>16</sup> To be clear, the authors are aware that purely conservationist strategies are not necessarily fair, as this is also one of the main arguments of this work. However, we refer to the "environmentally fair" and "socially fair" designations to highlight the development with respect to Degli Antoni and Sacconi's (2013) work.

- International customers  $S_s$  have two choices in the game. First, they can either buy ( $e_{S_s}$ ) or do not buy wood ( $r_{e_{S_s}}$ ) from E. If they decide not to the interaction ends, while if they purchase some, they later have a second choice on how much to buy among three purchasing levels corresponding to *no constraints* ( $nf_{S_s}$ ), *environmental constraints only* ( $gf_{S_s}$ ), and *socio-environmental constraints* ( $sf_{S_s}$ ), also depending on the quantity of wood extracted by E - see Table 2. Because they have a major interest in the running of the firm and they can significantly influence E's surplus production, we here consider these intermediate customers as strong stakeholders  $S_s$  too<sup>17</sup> (Freeman et al., 2010).
- Logging companies (E) can extract wood choosing among the same three quantities that respectively reflect *no constraints* ( $nf_E$ ), *environmental constraints only* ( $gf_E$ ), and *socio-environmental constraints* ( $sf_E$ ) - see Table 2.

Both  $S_s$  and E are subject to the effect of their accountability in the market, but they also have an economic interest in colluding to extract and exchange large quantities of wood. By assumption, we consider that if one of the two sells (buys) the maximum amount of wood corresponding to no constraints, while the other buys (sells) only what the agreement allows, the former can collude with third parties external to the agreement. This means it can sell (buy) the leftover wood in (from) another market, thus unilaterally circumventing the agreement. Importantly, this secondary market is economically disadvantageous and economically costly for both  $S_s$  and E, because of the risk of bad reputational effects and legal sanctions that impose a cost on both sales and acquisitions.

- FN appears in the game as a dummy player, meaning that it has no choice in it and the game's outcome is insensitive to its strategy. This means that we assume a representation of the game in which FN is a weak stakeholder, who can affect the game outcome only indirectly through the effect on other players of having endorsed an agreement in which FN was also a participant<sup>18</sup>. However, its payoff is represented in

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<sup>17</sup> For reasons of clarity, we henceforth use  $S_s$  to refer to intermediate customers only, while we continue referring to environmental NGOs as NGO.

<sup>18</sup> The authors are aware that FNs are not just passive actors, as they have played a fundamental role in the transformation of conflict into multi-stakeholder dialogue for an agreement. However, this article aims at investigating the worst-case situation, in which FNs are subject to noncompliance from logging corporations or green collusion, and to examine whether there are reasons that can impact the latter's conformance. Specifically, we want to analyze the effect of having a network in which a stronger stakeholder protects a more marginalized one through the agreement. We define which one is a strong and which one is a weak stakeholder based on their relationships with the business organization E. In the real case, E realized that ENGO's campaigns can have a significant effect on its market (Degli Antoni and Sacconi, 2013; Freeman et al., 2010). FN, instead, are  $S_w$  for E: they simply undergo the effects of the agreement and eventual (non-)compliance with it. As the reader will see, their mutual engagement in the big agreement in which FN plays a role pushes ENGO to also represent FN's interests.

the final vector of payments and reflects other players' level of compliance or not with socio-environmental constraints.

In conclusion, for each player  $i$ , the set  $\Sigma_i$  of strategies  $\sigma_i$  is:

- for NGO,  $\Sigma_{\text{NGO}} = \{e_{\text{NGO}}, r_{\text{NGO}}\}$
- for  $S_s$ ,  $\Sigma_{S_s} = \{e\text{-nf}_{S_s}, e\text{-gf}_{S_s}, e\text{-sf}_{S_s}, r_{\text{ES}_s}\}$
- for E,  $\Sigma_E = \{nf_E, gf_E, sf_E\}$
- FN is a dummy player and its strategy set is empty.

Table 2 summarises the behavioral content of the E and  $S_s$ ' strategies.

Player	Strategy		
	$\sigma_i = \text{nf}$	$\sigma_i = \text{gf}$	$\sigma_i = \text{sf}$
E	extract and sell $X_{\text{MAX}}$ , considering technological feasibilities and overall market request	extract $X_{\text{MED}}$ and do not extract in protected areas because of environmental policies	extract $X_{\text{MIN}}$ and do not extract in Conservancies because of social and environmental policies
$S_s$	buying as much wood as possible ( $X_{\text{MAX}}$ ) from E or any other seller that can offer the residual part to arrive at $X_{\text{MAX}}$	buying less ( $X_{\text{MED}}$ ) wood because of environmental policies	buying even less ( $X_{\text{MIN}}$ ) wood because of social and environmental policies

**Table 2.** Strategies available to E and  $S_s$  if NGO enters the game, where  $X_{\text{MAX}}$  = maximum amount of wood extraction, only constrained by technology and the market conditions,  $X_{\text{MED}}$  = medium amount of wood extraction, consistent with what required by environmental protection agreement;  $X_{\text{MIN}}$  = minimum amount of wood extraction, consistent with what required by socio-environmental protection agreement.

The game we model aims at representing the compliance problem with respect to the GBR agreement, in a way that allows us to show several possibilities of defection from it. First, we can have *Coordinated defection* when  $S_s$  and E adopt the *nf* strategy and exchange in the regulated market a quantity  $X^*$  that exceeds the agreed quantity. Thus, through an informal agreement they coordinately misapply the formal GBR agreement. Secondly, we have *Unilateral defection* when there is uncoordinated non-compliance. In this case, either E or  $S_s$  demands or supplies the “illegal” quantity  $X^*$  unilaterally, while the counterparty conforms its behavior to restraining rules on timber consumption ( $gf_i$  or  $sf_i$ ). Thus, the in-compliant player looks for a secondary market - typically illegal - where another producer (buyer) sells (buys) the difference. We assume that this opportunistic behavior is typically successful even if at a cost, as it implies risks of legal sanctions and bad reputation effects. Hence, profit is typically lower for the same number of exchanged units. Finally, we can have *Green collusion* when E and  $S_s$

coordinate amongst themselves and with NGO, and they adopt their “green fair” strategies while the latter allows this by entering the game. This option brings to an intermediate level of compliance as it permits a reduction of timber extraction that is compatible with environmental protection objectives, but it does not meet FN’s claims for socio-environmental justice.

## 5.2 Considering only material utility

### 5.2.1 Players’ objective outcomes

Before considering players’ utilities, let’s describe the outcome of each strategy combination in terms of physical quantities of extracted timber. When NGO enters the game, the subgame between E and S<sub>s</sub> takes the form of a simultaneous move game of supply and demand of certain quantities of extracted wood. At this point, if S<sub>s</sub> enters too, E and S<sub>s</sub>’ strategies consist in choosing a quantity of wood between X<sub>MAX</sub>, X<sub>MED</sub>, and X<sub>MIN</sub>, with X<sub>MAX</sub> equaling the quantity extracted by using full production capacity while the last two correspond to legal constraints on extraction imposed by the agreement. The transaction between E and S<sub>s</sub> takes place at the minimum value of X between supply and demand, and a limitation in X<sub>TOT</sub> (the total wood extracted) occurs only when the parties demand and supply the same agreed quantities X<sub>MED</sub> or X<sub>MIN</sub>.

Thus, the total quantity X<sub>TOT</sub> exchanged between them is equal to the quantity exchanged in the (regulated) primary market  $X^* = \{X_{MAX}, X_{MED}, X_{MIN}\}$ , if and only if both E and S<sub>s</sub> have chosen – supplied and demanded – the same quantity, i.e.  $X_E = X_{Ss} = X_{MAX}$ , or  $X_E = X_{Ss} = X_{MED}$  or  $X_E = X_{Ss} = X_{MIN}$ . Instead, if  $X_E > X_{Ss}$  or  $X_E < X_{Ss}$ , then  $X^* = X_E$  and  $X^* = X_{Ss}$  respectively, but there exist an *exceeding quantity* X<sub>D</sub> – supplied or demanded – which is exchanged in a *secondary* market. Consequently, E or S<sub>s</sub> respectively sell or buy the “difference” X<sub>DE</sub> or X<sub>DSs</sub> with respect to the supplied or demanded quantity in the primary market, where X<sub>D</sub> is defined as follows:

$$X_{DE} = \begin{cases} 0 & \text{if } X_{Ss} \geq X_E \\ X_E - X_{Ss} & \text{if } X_{Ss} < X_E \end{cases}$$

$$X_{DSs} = \begin{cases} 0 & \text{if } X_{Ss} \leq X_E \\ X_{Ss} - X_E & \text{if } X_{Ss} > X_E \end{cases}$$

with  $X_E$  being the quantity extracted by E, and  $X_{Ss}$  the quantity purchased by  $S_s$ .

Given this, the objective outcome of E and  $S_s$ 's' strategical choices is:

$$X_{TOT} = \begin{cases} X^* & \text{if } X_E = X_{Ss} \\ X^* + X_D, & \text{if } X_E - X_{Ss} \neq 0 \end{cases}$$

Furthermore, if the agreement brings to a reduction of  $X_{TOT}$  such that  $X_{TOT} < X_{MAX}$ , E,  $S_s$ , and NGO obtain positive environmental externalities U and, if the reduction is such that  $X_{TOT} = X_{MIN}$ , FN also receives socio-environmental objective benefits ( $B_{SE}$ ). We compute these two outcomes, derived from exchanged physical quantities, as follow:

- The positive environmental externalities U are a positive increasing function of avoided extraction calculated as

$$U = (X_{MAX} - X_{TOT}/X_{MAX}) (X_{MAX})$$

with  $0 \leq (X_{MAX} - X_{TOT}/X_{MAX}) \leq 1$  that increases with diminishing  $X_{TOT}$ , becomes maximal for  $X_{TOT} = 0$ , and null for  $X_{TOT} = X_{MAX}$ . The result is that the objective value of positive environmental externalities is simply the absolute quantity of avoided extraction ( $X_{MAX} - X_{TOT}$ ) = U.

- the socio-environmental benefit ( $B_{SE}$ ) is a positive increasing function of the decrement of  $X_{TOT}$  toward  $X_{MIN}$

$$B_{SE} = \left( 1 - \frac{X_{TOT} - X_{MIN}}{X_{MAX} - X_{MIN}} \right) (X_{MAX} - X_{MIN})$$

$B_{SE}$  results from the difference between  $X_{MAX}$  and  $X_{MIN}$  expressing the maximal magnitude of possible extraction reduction, weighted by an index of achieved reduction relative to the maximum possible reduction. The latter is calculated as the inverse of the (normalized) distance of  $X_{TOT}$  from  $X_{MIN}$ , which means that when the distance is 0, the index is 1 and the benefit is maximal, i.e.,  $(X_{MAX} - X_{MIN})$ .

### 5.2.2. Players' material payoffs

Depending on how E and S<sub>s</sub> play, each of the four players receives a certain final payoff, the size and distribution of which is conditional on the physical outcomes created through implementation of the agreement or active defection from it. Overall, E and S<sub>s</sub>' material utility functions are increasing positive and marginally decreasing functions of the following quantities:

- The individual profit from legal transaction  $P_i(X^*)$ , which is assumed to be a positive linear increasing transformation of the extracted and exchanged quantity  $X^*$  into a monetary surplus value by a positive constant  $q$ . E and S<sub>s</sub> equally share this profit so that each of them gets:

$$P_i = \frac{1}{2}qX^* \quad \text{with } 0 \leq q \leq 1$$

More specifically, E gains  $P_i(X^*)$  by extracting and selling a certain amount of wood  $X^*$  to S<sub>s</sub>, while the latter derives it from the industrial transformation of the quantity  $X^*$  of wood into goods that are then sold to final consumers. Depending on E and S<sub>s</sub>' strategies, there are three levels of  $X^*$ , namely  $X_{MAX} > X_{MED} > X_{MIN}$ , corresponding to  $P_{MAX} > P_{MED} > P_{MIN}$  respectively.

- The individual profit  $P\#(X_D)$  that *either* E or S<sub>s</sub> derive from selling or buying in a secondary market the quantity  $X_D$  they supply or demand that exceed the amount allowed by the agreement on limited extraction. More precisely, this profit is a linear positive transformation of the difference  $X_D$  by a positive constant  $z$ ,

$$P\# = zX_D, \quad \text{with } 0 \leq z \leq 1$$

where  $z < q$ , as the economic conditions are less favorable in the secondary market than in the main market.

- The utility deriving from environmental externalities  $U$ , which is an increasing but marginally decreasing function of the avoided extraction that becomes null for  $X_{TOT} = X_{MAX}$ . In a formula:

$$u_i(U) = (X_{MAX} - X_{TOT})^{\frac{1}{2}}$$

The elevation to  $\frac{1}{2}$  means that the increasing utility deriving from increments in the positive externalities is marginally decreasing. It ensures that increasing reduction of extractions - producing externalities - does not entail an overwhelming positive weight of externalities in the players' utilities, which would make the prediction of player's choice trivial. On the contrary,

we want to represent an actual trade-off in the players' utilities between profit and positive externalities.

NGO too obtains utility from positive environmental externalities  $U$ . However, the utility  $u_{\text{NGO}}(U)$  is a multiple, by a positive constant  $s > 1$ , of the increasing, marginally decreasing quantity  $(X_{\text{MAX}} - X_{\text{TOT}})^{\frac{1}{2}}$ . Indeed, the reduction of wood's extraction for environmental conservation coincides with NGO's organizational goal, so that this player also attaches a private payoff to  $U$ . Moreover, being the game under consideration related to the logic of the Trust Game, we assume that NGO incurs a cost  $c = -1$  in case it enters and either  $E$  or  $S_s$  or both play non-fairly and abuse its trust, and  $c = 0$  when their behavior is trustworthy.

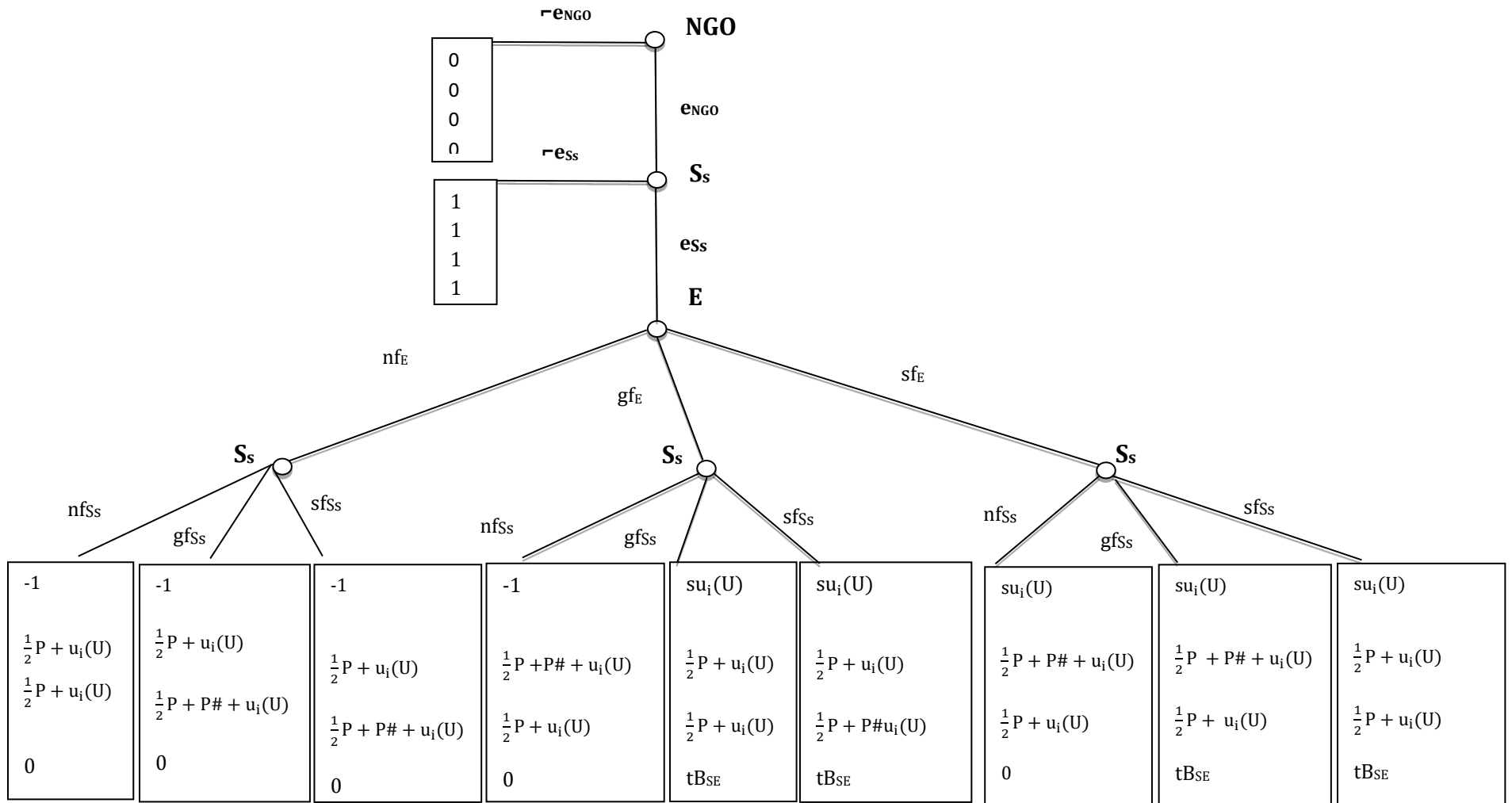
Finally, the utility that FN derives from socio-environmental benefits  $B_{\text{SE}}$  is a linear transformation of socio-environmental benefits by a factor  $t$ , with  $0 \leq t \leq 1$ . Importantly, the maximum potential value of this parameter enters FN's utility function only when the extracted timber is reduced to  $X_{\text{MIN}}$ , according to the socio-environmental agreement. This is justified by the fact that FN obtains  $B_{\text{SE}}$  only when there is substantial reduction of extraction and parts of the forests are converted into Conservancies, on which FN has rights of use.

Thus, the typical utility functions of the four players are:

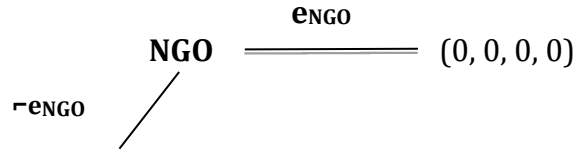
$$\begin{aligned}
 u_{E/S_s} &= \frac{1}{2}qX^* + (X_{\text{MAX}} - X_{\text{TOT}})^{\frac{1}{2}} \quad \text{if } X_D \leq 0, \text{ or} \\
 u_{E/S_s} &= \frac{1}{2}qX^* + zX_D + (X_{\text{MAX}} - X_{\text{TOT}})^{\frac{1}{2}} \quad \text{if } X_D > 0, \\
 u_{\text{NGO}}(U) &= s(X_{\text{MAX}} - X_{\text{TOT}})^{\frac{1}{2}} + c, \\
 u_{\text{FN}} &= t[1 - (X_{\text{TOT}} - X_{\text{MIN}})/(X_{\text{MAX}} - X_{\text{MIN}})](X_{\text{MAX}} - X_{\text{MIN}})
 \end{aligned}$$

Figure 2.1 and Matrix 2.2 present the game in its extensive and normal form respectively. Since NGO is a key member of the agreement, the no implementation point is given by NGO staying out: in this scenario, NGO imposes the failure of the implementation game, so that no one takes benefits and the status quo is equal to 0. Instead, if NGO enters and gives trust to  $E$  and  $S_s$ , the implementation phase starts. Then, if  $S_s$  stays out, which means it does not participate to transactions and prevents possible abuse by  $E$ , there is a minimal trade volume, as  $S_s$  expresses distrust on the implementation. Moreover, as the volume of trade is reduced, it impacts less on the environment and FN's socio-environmental benefits, while giving minimal payoffs to firms; thus, we conventionally place this scenario equal to the vector (1,1,1,1). Indeed, NGO does not have the cost of disruption, a minimal amount of trading occurs and, given the reduced volume, FN receives few negative effects.

For the sake of exposition and given that if NGO stays out of the game it nullifies the possibility for other players to play any of their strategies, in Matrix 2.2 we display the game in its normal form with a unique no implementation outcome for  $\Gamma_{\text{ENGO}}$ .



**Figure 2.** The extensive form of the ex-post compliance game representing the relationship between NGO,  $S_s$ , and E. The payoffs are for NGO,  $S_s$ , E, and FN respectively. For reasons of space, we only represent reduced literal payoffs; Matrix 2.2 displays the extended version.



$E$ $S_s$	$nf_E = X_{MAX}$	$gf_E = X_{MED}$	$sf_E = X_{MIN}$
$e-nf_{S_s} = X_{MAX}$	$c$ $\frac{1}{2}qX_{MAX} + (X_{MAX} - X_{MAX})^{\frac{1}{2}}$ $\frac{1}{2}qX_{MAX} + (X_{MAX} - X_{MAX})^{\frac{1}{2}}$ $0$	$c$ $\frac{1}{2}qX_{MED} + z(X_{MAX} - X_{MED}) + (X_{MAX} - X_{MAX})^{\frac{1}{2}}$ $\frac{1}{2}qX_{MED} + (X_{MAX} - X_{MAX})^{\frac{1}{2}}$ $0$	$c$ $\frac{1}{2}qX_{MIN} + z(X_{MAX} - X_{MIN}) + (X_{MAX} - X_{MAX})^{\frac{1}{2}}$ $\frac{1}{2}qX_{MIN} + (X_{MAX} - X_{MAX})^{\frac{1}{2}}$ $0$
$e-gf_{S_s} = X_{MED}$	$c$ $\frac{1}{2}qX_{MED} + (X_{MAX} - X_{MED})^{\frac{1}{2}}$ $\frac{1}{2}qX_{MED} + z(X_{MAX}X_{MED}) + (X_{MAX} - X_{MAX})^{\frac{1}{2}}$ $0$	$s(X_{MAX} - X_{MED})^{\frac{1}{2}}$ $\frac{1}{2}qX_{MED} + (X_{MAX} - X_{MED})^{\frac{1}{2}}$ $\frac{1}{2}qX_{MED} + (X_{MAX} - X_{MED})^{\frac{1}{2}}$ $t[1 - (X_{MED} - X_{MIN})/(X_{MAX} - X_{MIN})](X_{MAX} - X_{MIN})$	$s(X_{MAX} - X_{MED})^{\frac{1}{2}}$ $\frac{1}{2}qX_{MIN} + z(X_{MED} - X_{MIN}) + (X_{MAX} - X_{MED})^{\frac{1}{2}}$ $\frac{1}{2}qX_{MED} + (X_{MAX} - X_{MED})^{\frac{1}{2}}$ $t[1 - (X_{MED} - X_{MIN})/(X_{MAX} - X_{MIN})](X_{MAX} - X_{MIN})$
$e-sf_{S_s} = X_{MIN}$	$c$ $\frac{1}{2}qX_{MIN} + (X_{MAX} - X_{MAX})^{\frac{1}{2}}$ $\frac{1}{2}qX_{MIN} + z(X_{MAX}X_{MIN}) + (X_{MAX} - X_{MAX})^{\frac{1}{2}}$ $0$	$s(X_{MAX} - X_{MED})^{1/2}$ $\frac{1}{2}qX_{MIN} + (X_{MAX} - X_{MED})^{\frac{1}{2}}$ $\frac{1}{2}qX_{MIN} + z(X_{MED} - X_{MIN}) + (X_{MAX} - X_{MED})^{\frac{1}{2}}$ $t[1 - (X_{MED} - X_{MIN})/(X_{MAX} - X_{MIN})](X_{MAX} - X_{MIN})$	$s(X_{MAX} - X_{MIN})^{1/2}$ $\frac{1}{2}qX_{MIN} + (X_{MAX} - X_{MIN})^{\frac{1}{2}}$ $\frac{1}{2}qX_{MIN} + (X_{MAX} - X_{MIN})^{\frac{1}{2}}$ $t[1 - (X_{MIN} - X_{MIN})/(X_{MAX} - X_{MIN})](X_{MAX} - X_{MIN})$
$e-s_{S_s}$	1,1,1,1	1,1,1,1	1,1,1,1

**Matrix 2.2** A general example of normal form of the *ex-post* game between ENGOs,  $S_s$ , and  $E$ , considering only material utility. Final payoffs are written for ENGO,  $S_s$ ,  $E$ , and FN respectively.

According to the previous hypotheses on the payoffs' variables and components, we assume that the individual payoffs in the cells of the subgame between E and S<sub>s</sub>, are ordered as follows. Considering E,

$$\begin{aligned}
u_E(e_{\text{NGO}}; e - nf_{S_s}; \mathbf{nf}_E) &> u_E(e_{\text{NGO}}; e - gf_{S_s}; \mathbf{gf}_E) > u_E(e_{\text{NGO}}; e - gf_{S_s}; \mathbf{nf}_E) \\
&> u_E(e_{\text{NGO}}; e - nf_{S_s}; \mathbf{gf}_E) \geq u_E(e_{\text{NGO}}; e - sf_{S_s}; \mathbf{gf}_E) > u_E(e_{\text{NGO}}; e - sf_{S_s}; \mathbf{sf}_E) \\
&> u_E(e_{\text{NGO}}; e - sf_{S_s}; \mathbf{nf}_E) > u_E(e_{\text{NGO}}; e - gf_{S_s}; \mathbf{sf}_E) > u_E(e_{\text{NGO}}; e - nf_{S_s}; \mathbf{sf}_E) \\
&> 1
\end{aligned}$$

A symmetrical order holds for S<sub>s</sub>.

The order relations between the payoffs reported above are reasonable given the basic variables that compose them. For instance, comparing the case (X<sub>MAX</sub>, X<sub>MAX</sub>) corresponding to (e; e-nf<sub>S<sub>s</sub></sub>; nf<sub>E</sub>) with (X<sub>MED</sub>, X<sub>MED</sub>) corresponding to (e; e-gf<sub>S<sub>s</sub></sub>; gf<sub>E</sub>), it is reasonable to hypothesize that

$$\frac{1}{2}qX_{\text{MAX}} - \frac{1}{2}qX_{\text{MED}} > (X_{\text{MAX}} - X_{\text{MED}})^{\frac{1}{2}}$$

so that

$$\frac{1}{2}qX_{\text{MAX}} > \frac{1}{2}qX_{\text{MED}} + (X_{\text{MAX}} - X_{\text{MED}})^{\frac{1}{2}}$$

This means that bilateral defection from any limitation is more remunerating for producers E and S<sub>s</sub> than respecting an agreement of soft mutual extraction reduction. Indeed, utility deriving from positive environmental externalities obtained through bilateral restriction on extraction does not repay the loss of profit. This makes the game assumptions as pessimistic or "realistic" as possible.

However, it is also true that, if one player complies with a soft constraint for limiting extraction corresponding to X<sub>MED</sub>, the other might expect a payoff from externalities (X<sub>MAX</sub> - X<sub>MED</sub>)<sup>1/2</sup>. Thus, it is reasonable to assume this value is high enough to counterbalance the possibility of a (poor) additional profit z(X<sub>MAX</sub> - X<sub>MED</sub>) gained from selling/buying on secondary market the excess beyond X<sub>MED</sub>, which is

$$z(X_{\text{MAX}} - X_{\text{MED}}) < (X_{\text{MAX}} - X_{\text{MED}})^{\frac{1}{2}}$$

so that

$$\frac{1}{2}qX_{\text{MED}} + z(X_{\text{MAX}} - X_{\text{MED}}) < \frac{1}{2}qX_{\text{MED}} + (X_{\text{MAX}} - X_{\text{MED}})^{\frac{1}{2}}$$

Thus,  $(X_{\text{MED}}, X_{\text{MED}})$  corresponding to  $(e; e-gf_{S_s}; gf_E)$  gives E and  $S_s$  an higher utility than  $(X_{\text{MED}}, X_{\text{MAX}})$  corresponding to  $(e; e-gf_{S_s}; nf_E)$ . Indeed, at least for this initial extraction avoidance level, the increasing but marginally decreasing utility of U for players E and  $S_s$  is large enough to compensate the renounce to search an extra profit in the secondary market. Therefore, as we will see, the former is an equilibrium outcome of the game.

Analogous inequalities can explain the payoffs' ordinal properties in each matrix cell. For instance, taking E's payoff for  $(X_{\text{MIN}}, X_{\text{MED}}) = (e; e-sf_{S_s}; gf_E)$  and for  $(X_{\text{MIN}}, X_{\text{MIN}}) = (e; e-sf_{S_s}; sf_E)$ , we may have that, since the extra-profit gained by selling wood in the secondary market outweighs the marginally decreasing utility deriving from increasing externality, the following condition holds:

$$z(X_{\text{MED}} - X_{\text{MIN}}) > (X_{\text{MAX}} - X_{\text{MIN}})^{\frac{1}{2}} - (X_{\text{MAX}} - X_{\text{MED}})^{\frac{1}{2}}$$

Therefore

$$\frac{1}{2}qX_{\text{MIN}} + z(X_{\text{MED}} - X_{\text{MIN}}) + (X_{\text{MAX}} - X_{\text{MED}})^{\frac{1}{2}} > \frac{1}{2}qX_{\text{MIN}} + (X_{\text{MAX}} - X_{\text{MIN}})^{\frac{1}{2}}$$

meaning that E's payoff for  $(X_{\text{MIN}}, X_{\text{MED}})$  where E exceeds  $S_s$ ' demand and sells in the secondary market, is higher than its payoff for  $(X_{\text{MIN}}, X_{\text{MIN}})$  corresponding to  $(e; e-sf_{S_s}; sf_E)$ . Indeed, this socio-environmental outcome is not an equilibrium of the game - see below.

Now considering the payoff ordering for NGO and assuming  $c = -1$ , we have that

$$u_{\text{NGO}}(e_{\text{NGO}} | \sigma_{S_s}; \sigma_E) = -1, \forall \sigma_i \in \Sigma_{S_s} \text{ and } \forall \sigma_i \in \Sigma_E \text{ such that } U = 0.$$

Therefore,  $\forall \sigma_i$

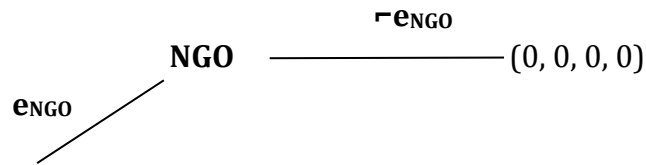
$$\begin{aligned} u_{\text{NGO}}(e_{\text{NGO}}; e - nf_{S_s}; nf_E) &= u_{\text{NGO}}(e_{\text{NGO}}; e - nf_{S_s}; gf_E) = u_{\text{NGO}}(e_{\text{NGO}}; e - nf_{S_s}; sf_E) \\ &= u_{\text{NGO}}(e_{\text{NGO}}; e - gf_{S_s}; nf_E) = u_{\text{NGO}}(e_{\text{NGO}}; e - sf_{S_s}; nf_E) = -1 \end{aligned}$$

Moreover,  $\forall \sigma_i \in \Sigma_{S_s}$  and  $\forall \sigma_i \in \Sigma_E$  such that  $u_{\text{NGO}}(e_{\text{NGO}} | \sigma_{S_s}; \sigma_E) = s(X_{\text{MAX}} - X_{\text{MED}})^{\frac{1}{2}}$  and  $0 < u_{\text{NGO}}(e_{\text{NGO}} | \sigma_{S_s}; \sigma_E) < s(X_{\text{MAX}} - X_{\text{MED}})^{\frac{1}{2}}$ , we have that

$$\begin{aligned} u_{\text{NGO}}(e_{\text{NGO}}; e - gf_{S_s}; gf_E) &= u_{\text{NGO}}(e_{\text{NGO}}; e - gf_{S_s}; sf_E) = u_{\text{NGO}}(e_{\text{NGO}}; e - sf_{S_s}; gf_E) \\ &< u_{\text{NGO}}(e_{\text{NGO}}; e - sf_{S_s}; sf_E) \end{aligned}$$

The same order holds for FNs.

This makes the game in Matrix 2.2 fully specified, but for simplicity we consider it under a particular numerical interpretation. Thus, let's assume  $X_{MAX} = 100$ ,  $X_{MED} = 60$  and  $X_{MIN} = 30$  and  $q = 0,6$ ;  $z = 0,1$ ;  $s = 2$ ; and  $t = 0,3$ . Matrix 2.2A shows the numerical payoff of sub-game between E and  $S_s$  - see Appendix A2 for complete calculations.



<b>E</b>			
<b>S<sub>s</sub></b>	<b>n<sub>fE</sub> = X<sub>MAX</sub> = 100</b>	<b>g<sub>fE</sub> = X<sub>MED</sub> = 60</b>	<b>s<sub>fE</sub> = X<sub>MIN</sub> = 30</b>
<b>e-n<sub>fS<sub>s</sub></sub> = X<sub>MAX</sub> = 100</b>	(-1, 30, 30, 0)	(-1, 22, 18, 0)	(-1, 16, 9, 0)
<b>e-g<sub>fS<sub>s</sub></sub> = X<sub>MED</sub> = 60</b>	(-1, 18, 22, 0)	(13, 24, 24, 12)	(13, 18, 15, 12)
<b>e-s<sub>fS<sub>s</sub></sub> = X<sub>MIN</sub> = 30</b>	(-1, 9, 16, 0)	(13, 15, 18, 12)	(17, 17, 17, 21)
<b>r<sup>e</sup>S<sub>s</sub></b>	1,1,1,1	1,1,1,1	1,1,1,1

**Matrix 2.2A** A numerical example of normal form of the *ex-post* game between NGOs, S<sub>s</sub> and E, considering only material utility. Final payoffs are written for NGOs, S<sub>s</sub>, E and FNs respectively.

*5.3 Nash equilibria of the material game.*

Analyzing the players' payoffs for the various strategy combinations of E and S<sub>s</sub> when NGO enters the game, we observe that:

- If both E and S<sub>s</sub> play n<sub>f<sub>i</sub></sub> they engender the maximum monetary surplus P<sub>MAX</sub> from extraction and they share it among themselves, appropriating it all. No positive externality U is generated and NGO incurs trust costs.

- If both E and  $S_s$  play  $gf_i$  they renounce to a part of the market so that they obtain a reduced total surplus and they equally distribute it among them. A positive environmental externality  $U$  is generated and the utility deriving from it enters E,  $S_s$ , and NGO's payoffs, while FN obtains an intermediate value of utility deriving from  $B_{SA}$ .
- If both E and  $S_s$  play  $sf_i$ , they renounce to an even larger share of the market and the payoff they obtain decreases even though externalities increase, while FN obtains the maximum  $B_{SA}$ .

However, it is not necessarily the case that E and  $S_s$  play the same strategy and, thus, equally share the profit.

- If E plays  $nf_E$  while  $S_s$  plays  $e-gf_{S_s}$ , they exchange  $X_{MED}$  but E obtains an extra profit  $P\#$  from selling the excess  $X_D$  to an alternative market, and its payoff will be higher than  $S_s$ ' one. Because the game is symmetric, the opposite is true when E plays  $gf_E$  while  $S_s$  plays  $e-nf_{S_s}$ , as  $S_s$  obtains an additional profit  $P\#$  through buying from alternative logging companies. In both cases, there are neither  $U$  nor  $B_{SA}$  and NGO incurs trust costs.
- If E plays  $nf_E$  while  $S_s$  plays  $e-sf_{S_s}$ , for the same logic E obtains a higher payoff than  $S_s$ , but a lower one than in the previous case, as the share of extracted timber sold in alternative market gives a lower profit than the timber sold to  $S_s$ . The opposite is true if E plays  $sf_E$  while  $S_s$  plays  $e-nf_{S_s}$ . In both cases, there are neither  $U$  nor  $B_{SA}$  and NGO incurs trust costs.
- If E plays  $gf_E$  while  $S_s$  plays  $e-sf_{S_s}$ , for the same reasons, the former makes a higher profit than the latter. *Vice-versa*, if  $S_s$  plays  $e-gf_{S_s}$  while E plays  $sf_E$ , the former gets a higher payoff. However, in these cases, NGO and FN obtain some  $U$  and  $B_{SA}$  as  $X_{TOT} < X_{MAX}$ .

Analyzing the overall game, we find two possible Nash equilibria.

- The first is in  $(\neg_{NGO}; e-nf_{S_s}; nf_E) = (0,0,0,0)$ . Indeed, in the subgame between  $S_s$  and E, the equilibrium would be in  $(e-nf_{S_s}; nf_E)$ , which would bring a payoff of 30 for  $S_s$  and E but -1 for NGO and 0 for FN. However, foreseeing this outcome, NGO would stay out of the game, so that the first equilibrium is the status quo. This reminds us of the kinship between this game and the Trust Game, where the option "stay out" is always an equilibrium strategy to preempt abuse from the other player.
- The second is in  $(e_{NGO}; e-gf_{S_s}; gf_E) = (13, 24, 24, 12)$ . Indeed, if E plays  $gf$ ,  $S_s$ ' best reply is to play  $gf$  and *vice-versa*. Foreseeing this,  $S_s$  would enter the game in its first move and NGO too.

As mentioned above, the latter equilibrium requires that  $S_s$  gets a lower payoff for playing its strategy component in  $(e_{NGO}; e-nf_{S_s}; gf_E)$  than for  $(e_{NGO}; e-gf_{S_s}; gf_E)$ , which may happen for the

“early” extraction reductions, because we assume that extraction reduction brings a marginally decreasing positive incidence; thus, later reduction may have a low incidence on players’ utility - See Appendix A3 for further explanation.

At this point, it is important to observe that  $(e_{NGO}; e-sf_{S_s}; sf_E)$  is the outcome with the highest Nash Bargaining product but it is not a Nash equilibrium of this non cooperative subgame. Indeed, for both  $S_s$  and  $E$  the  $gf_i$  strategy is the best reply to the other player’s playing  $sf_i$ . On the other hand, environmental collusion between  $E$ ,  $S_s$ , and  $NGO$  is a feasible equilibrium when the increase in utility from  $zX_D$  is higher than utility from  $(X_{MAX} - X_{TOT})^{\frac{1}{2}}$ . This outcome would avoid complete defection by  $E$  and  $S_s$ , but it nevertheless represents substantial divorce from an agreement that also represents  $FN$ ’s socio-environmental justice claims, for which instead there is no endogenous support at this point. Hence, we see the divorce between social justice and environmental protection, which represents a real problem.

However, we will show that the solution may change by considering the overall *ex ante* agreement as an instantiation of the social contract, which can induce the Rawlsian “sense of justice” (Rawls, 1971) and hence introduce conformity preferences. Under this transformation of the game payoffs, new PNE emerge.

#### *5.4 Compliance with an environmentally and socially fair agreement: Introducing psychological utility*

The above game is only the material basis for a psychological game (PG) where players have conformity preferences and related first and second-order beliefs (Degli Antoni and Sacconi, 2013; Grimalda and Sacconi, 2005; Sacconi and Faillo, 2010; Sacconi and Grimalda, 2007). Given the theory presented in Section 2, we apply it to the case at point assuming that  $NGO$ ,  $E$ , and  $S_s$  are endowed with conformity preferences after having agreed on a fair agreement. To do so, let’s remind that they have subscribed to an agreement that identifies maximization of the Nash Bargaining Product - call it  $T_{MAX}$  - as the principle to be achieved in the distribution of payoffs. Indeed,  $T_{MAX}$  represents the fair solution of a symmetrical bargaining game amongst all the players that, through pre-play communication, decide how to share the value at stake, independently of their role in the non-cooperative game just examined. Then, *ex post*, active players first compute the  $T$  values for each state of affairs belonging to the subgame wherein only  $S_s$  and  $E$  participate, assuming  $NGO$  has first chosen to enter. This serves to identify which players’ strategies conform to the agreement, i.e., achieve the principle. Indeed, such  $T$  values

define the ordering of outcomes based on their consistency with the principle of justice  $T_{MAX}$  that parties have agreed to (Grimalda and Sacconi, 2005; Sacconi and Grimalda, 2007).

$\Omega$	T
(e-nf <sub>Ss</sub> ; nf <sub>E</sub> )	0
(e-gf <sub>Ss</sub> ; gf <sub>E</sub> )	89856
(e-sf <sub>Ss</sub> ; sf <sub>E</sub> )	103173
(e-nf <sub>Ss</sub> ; gf <sub>E</sub> )	0
(e-gf <sub>Ss</sub> ; nf <sub>E</sub> )	0
(e-nf <sub>Ss</sub> ; sf <sub>E</sub> )	0
(e-sf <sub>Ss</sub> ; nf <sub>E</sub> )	0
(e-sf <sub>Ss</sub> ; gf <sub>E</sub> )	42120
(e-gf <sub>Ss</sub> ; sf <sub>E</sub> )	42120
(-ess; nf <sub>E</sub> )	1
(-ess; gf <sub>E</sub> )	1
(-ess; sf <sub>E</sub> )	1

**Table 2.4.** T values for each state of affairs of the subgame between S<sub>s</sub> and E.

As Table 2.4 shows, considering all the combinations of strategies of players S<sub>s</sub> and E in the subgame, T assumes maximum value for (e-sf<sub>Ss</sub>; sf<sub>E</sub>) = 103173, second best value for (e-gf<sub>Ss</sub>; gf<sub>E</sub>) = 89856, intermediate values for (e-gf<sub>Ss</sub>; sf<sub>E</sub>) or (e-sf<sub>Ss</sub>; gf<sub>E</sub>) = 42120 and low value (-ess) = 1 when S<sub>s</sub> decides to stay out, and minimum value T = 0 for all the other outcomes in which due to the active players' opportunism FN gets nothing. Thus, under an hypothetical ex-ante agreement, parties would choose (e-sf<sub>Ss</sub>; sf<sub>E</sub>), which is the ideal state of affairs.

Then, we compute S<sub>s</sub> and E's overall conformity indexes to the principle T, given their expectations on the other player's actions. For instance, S<sub>s</sub>' conditional conformity index is computed as the composition between its conditional deviation index given its prediction on E's choice, and E's expected deviation index given S<sub>s</sub>' second order belief on E:

$$\begin{aligned} f_{S_s}(\sigma_{S_s}, b_{S_s}^1) &= f_{S_s}(e-nf_{S_s}|nf_E) = T(e-nf_{S_s}; nf_E) - T_{MAX}(nf_E) / T_{MAX}(nf_E) - T_{MIN}(nf_E) \\ &= 0 - 1/1 - 0 = -1 \end{aligned}$$

while E' expected deviation from full conformity for strategy nf<sub>E</sub> is computed as

$$\begin{aligned} f_E(b_i^1, b_i^2) &= f_E(nf_E|e-nf_{S_s}) \\ &= T(nf_E; e-nf_{S_s}) - T_{MAX}(e-nf_{S_s}) / T_{MAX}(e-nf_{S_s}) - T_{MIN}(e-nf_{S_s}) \\ &= 0 - 0/0 - 0 = 0 \end{aligned}$$

which entails  $S_s$ ' overall conformity index equal to

$$F(T) = (1 + f_{S_s})(1 + f_E) = (1 - 1)(1 + 0) = 0$$

Given these indexes - see Appendix A4 for complete calculations and results - for each player we can see which of its strategy gives the highest conformity, given reciprocal expectations. For instance, assuming that  $S_s$  believes that  $E$  plays  $sf_E$  and that  $S_s$  believes that  $E$  expects that it will play so,  $S_s$  can maximize  $T$  by playing  $(e-sf_{S_s})$ . The same applies reciprocally. Alternatively, if  $S_s$  foresees that  $E$  plays  $gf_E$  and  $S_s$  believes that  $E$  expects that it will play so,  $(e-gf_{S_s})$  is  $S_s$ ' strategy that maximizes  $T$  and the same applies reciprocally in this case too. The calculus of conformity degree defines whether the weight  $\lambda_i$  of the disposition to comply or - said differently - the weight  $\lambda_i$  of the psychological preference for compliance will enter the utility function or not.

Depending on the absolute value of  $\lambda_i$ , the calculus of players  $S_s$  and  $E$ 's best responses may change with respect to the game where only material payoffs were considered. In the subgame between  $E$  and  $S_s$ , the two players base their choice on mutual conformity expectations, whereas they have no expectations on NGO, since its choice is assumed as given. Hence, at this point, we take NGO entry strategy as given when computing  $S_s$  and  $E$ 's conformity indexes. Contrarily, when considering NGO's choice in the entire game, NGO has expectations on  $S_s$  and  $E$ 's further moves and on their level of conformity to the agreement. Thus, it is important to analyze NGO's conformity indices for its two options  $(e_{SS})$  and  $(-e_{SS})$  in relation to every possible strategy of  $S_s$  and  $E$ .

To make these computations, when  $S_s$  enters the game, we consider  $S_s$ & $E$  strategies as conjoint events as the symbol of conjunction "&" indicates. By means of an example, NGO's deviation from full conformity for strategy  $(e_{NGO}; e-nf_{S_s}\&nf_E)$  is computed as

$$\begin{aligned} & f_{NGO} (e_{NGO}|e-nf_{S_s}\&nf_E) \\ &= T(e_{NGO}; e-nf_{S_s}\&nf_E) - T_{MAX}(e-nf_{S_s}\&nf_E)/T_{MAX}(e-nf_{S_s}\&nf_E) - T_{MIN}(e-nf_{S_s}\&nf_E) \\ &= 0 - 0/0 - 0 = 0 \end{aligned}$$

while  $S_s$ & $E$ 's expected deviation from full conformity is

$$\begin{aligned} f_{S_s\&E} (e-nf_{S_s}\&nf_E|e_{NGO}) &= T(e-nf_{S_s}\&nf_E; e_{NGO}) - T_{MAX}(e_{NGO})/T_{MAX}(e_{NGO}) - T_{MIN}(e_{NGO}) \\ &= 0 - 103173/103173 - 0 = -1 \end{aligned}$$

which entails NGO's overall conformity index equal to:

$$F(T) = (1 + f_{S_s}) (1 + f_E) = (1+0) (1-1) = 0$$

Instead, NGO's deviation from full conformity for strategy  $(r_{\text{NGO}}; e\text{-}nf_{S_s}\&nf_E)$  is computed as

$$\begin{aligned} f_{\text{NGO}}(r_{\text{NGO}}|e\text{-}nf_{S_s}\&nf_E) \\ &= T(r_{\text{NGO}}; e\text{-}nf_{S_s}\&nf_E) - T_{\text{MAX}}(e\text{-}nf_{S_s}\&nf_E)/T_{\text{MAX}}(e\text{-}nf_{S_s}\&nf_E) - T_{\text{MIN}}(e\text{-}nf_{S_s}\&nf_E) \\ &= 0 - 0/0 - 0 = 0 \end{aligned}$$

while  $S_s$ & $E$ 's expected deviation from full conformity is

$$\begin{aligned} f_{S_s\&E}(e\text{-}nf_{S_s}\&nf_E|r_{\text{NGO}}) \\ &= T(e\text{-}nf_{S_s}\&nf_E; r_{\text{NGO}}) - T_{\text{MAX}}(r_{\text{NGO}})/T_{\text{MAX}}(r_{\text{NGO}}) - T_{\text{MIN}}(r_{\text{NGO}}) \\ &= 0 - 0/0 - 0 = 0 \end{aligned}$$

which entails NGO's overall conformity index equal to:

$$F(T) = (1 + f_{S_s}) (1 + f_E) = (1+0) (1+0) = 1$$

Thus, if NGO foresees that both  $S_s$  and  $E$  play non-fairly, then it realizes that it does not improve  $T$  by staying out compared to what it would do by entering the game, as  $T$  would be equal to 0 in both cases. However, by staying out, NGO can prevent the others from appropriating the surplus and imposing a trust cost  $c$ .

Appendix A4 shows complete calculations of combined conformity indexes, while Matrix 2.5 displays the new overall – material plus psychological - payoffs of all players.

Assuming that  $S_s$  and  $E$  believe that NGO enters the game:

- $S_s$  obtains full value of  $\lambda_{S_s}$  by playing  $(e\text{-}gf_{S_s})$  if it expects that  $E$  plays  $gf_E$  and that  $E$  believes that  $S_s$  plays  $(e\text{-}gf_{S_s})$ , and by playing  $(e\text{-}sf_{S_s})$  if it expects that  $E$  plays  $sf_E$  and that  $E$  believes that  $S_s$  plays  $(e\text{-}sf_{S_s})$ . Indeed, given such respective beliefs and the alternatives, these are the choices that maximize  $T$ . Symmetrical results hold for  $E$  and  $\lambda_E$ .

Notice that  $\lambda_i$  enters a player's payoff if the strategy used amongst those available is the one maximizing  $T$  contingently with a given choice of the other player, which is predicted and reciprocally expected. For two diverse predictions, such as  $E$  playing  $gf_E$  or  $sf_E$ , the choice that maximizes  $T$  for  $S_s$  shifts from  $(e\text{-}gf_{S_s})$  to  $(e\text{-}sf_{S_s})$ . Then, given its first order belief that  $E$  and  $S_s$  play  $(e\text{-}gf_{S_s}; gf_E)$  or  $(e\text{-}sf_{S_s}; sf_E)$  and its second order belief that  $E$  and  $S_s$  think that NGO enters, NGO's choice to enter brings it a full value of  $\lambda_{\text{NGO}}$ . Indeed, NGO maximizes  $T$  by entering contingently with its other option to stay out, which would obtain  $T = 0$ .

- $S_s$  and  $E$  obtain full value of  $\lambda_{S_s}$  and  $\lambda_E$  if  $S_s$  plays  $r_{\text{ES}_s}$  given a first order belief that  $E$  plays  $nf_E$  and a second order belief that  $E$  believes that  $S_s$  plays  $r_{\text{ES}_s}$ . Indeed, by staying out,  $S_s$  impedes complete deviation from  $T = 1$  that would materialize when it entered given  $E$

predicted choice, which gives  $T = 0$ . Therefore, given its first order belief that  $S_s$  plays  $\neg e_{S_s}$  and E plays  $n_{fE}$  and its second order belief that E and  $S_s$  think that NGO plays  $\neg e_{S_s}$ , NGO obtains full  $\lambda_{NGO}$  by entering. Indeed, NGO maximizes T by entering since by staying out the result would have been  $T = 0$ , even in the hypothesis that  $S_s$  would have stayed out and impeded the abuse by E playing  $n_{fE}$ .

- $S_s$  obtains only a partial value of  $\lambda_{S_s}$  by playing  $(e-g_{fS_s})$  if it expects that E plays  $s_{fE}$  and that E believes that  $S_s$  plays  $(e-g_{fS_s})$ , and by playing  $(e-s_{fS_s})$  if it expects that E plays  $g_{fE}$  and that E believes that  $S_s$  plays  $(e-s_{fS_s})$ . Indeed, given these reciprocal beliefs and the alternatives,  $S_s$ ' choices in these cases neither maximize nor minimize T contingently on the predicted choice of E, but they bring to an intermediate value of it. Symmetrical results hold for E and  $\lambda_E$ . Then, by entering and given its first order belief that E and  $S_s$  play either  $(e-s_{fS_s}; g_{fE})$  or  $(e-g_{fS_s}; s_{fE})$  and its second order belief that E and  $S_s$  think that NGO enters, NGO also obtains an intermediate value of  $\lambda_{NGO}$ . Indeed, by staying out NGO would determine  $T=0$  while, by entering, it allows E and  $S_s$  to reach  $T_{MED}$ , which maximizes T contingently with NGO's possibilities of choice.
- In all other cases, neither  $S_s$  nor E obtain any psychological utility as, given reciprocal beliefs, their choices minimize T to  $T=0$ . In these cases, by entering NGO confirms  $T=0$  and gets no ideal utility.

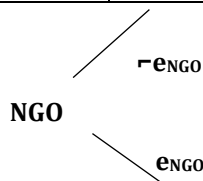
If, instead, we assume that NGO stays out of the game, the outcome is always  $(0,0,0,0)$  and the other players do not really have a possibility of choosing a specific strategy. Thus, to explain psychological outcomes we consider possible states of affairs through a counter-factual reasoning, i.e., we consider what  $\neg e_{NGO}$  entails with respect to conformity to T, given what it believes the other players would have played if NGO had entered, and the significance of these actions for T.

Hence let's assume that, given their reciprocal expectations, either both  $S_s$  and E or at least one of them plays non-fairly. All these strategies combinations minimize T with respect to the alternatives available to E and  $S_s$ , and NGO does not reduce T by staying out and making impossible this result. Indeed, regardless of which strategy NGO chooses, the payoff is  $T = 0$ , which means NGO cannot reduce T by staying out and the deviation index is 0. At the same time, if NGO plays  $\neg e_{NGO}$  and  $S_s$  cannot deviate from the maximal  $T = 0$  by playing as predicted above, E and  $S_s$  do not deviate at all, i.e., the deviation index is equal to 0. Thus, if  $S_s$  and E hypothetically decide to play non-fairly knowing that NGO does not enter, they get  $\lambda_{S_s}$  and  $\lambda_E$  as they have no alternative choice that can improve T. If, instead, we assume that  $S_s$  plays  $\neg e_{S_s}$  to

prevent  $nf_E$ , and given these reciprocal expectations between the two players, they obtain  $\lambda_{S_s}$  and  $\lambda_E$ . Indeed, if E plays  $nf_E$ ,  $S_s$  entails  $T = 0$  by playing  $e_{S_s}$ , which means it minimizes T with respect to  $T = 1$  obtained by  $\neg e_{S_s}$ . However, in this case NGO would be better by entering, as staying out would determine  $T = 0$  instead of  $T = 1$  that would emerge from NGO entering but  $S_s$  staying out.

In all other cases, none of the three active players gets any psychological utility, as  $S_s$  and E would have at least partially complied with the agreement but  $\neg e_{NGO}$  determines  $T=0$ , which means it minimizes T contingently with its other possibility to enter the game.

<b>S<sub>s</sub></b> \ <b>E</b>	<b>nf<sub>E</sub> = X<sub>MAX</sub> = 100</b>	<b>gf<sub>E</sub> = X<sub>MED</sub> = 60</b>	<b>sf<sub>E</sub> = X<sub>MIN</sub> = 30</b>
<b>e-nf<sub>Ss</sub> = X<sub>MAX</sub> = 100</b>	$\lambda_{\text{ENGO}}, \lambda_{\text{Ss}}, \lambda_{\text{E}}, (0)$	$\lambda_{\text{ENGO}}, \lambda_{\text{Ss}}, \lambda_{\text{E}}, (0)$	$\lambda_{\text{ENGO}}, \lambda_{\text{Ss}}, \lambda_{\text{E}}, (0)$
<b>e-gf<sub>Ss</sub> = X<sub>MED</sub> = 60</b>	$\lambda_{\text{ENGO}}, \lambda_{\text{Ss}}, \lambda_{\text{E}}, (0)$	0, 0, 0, (0)	0, 0, 0, (0)
<b>e-sf<sub>Ss</sub> = X<sub>MIN</sub> = 30</b>	$\lambda_{\text{ENGO}}, \lambda_{\text{Ss}}, \lambda_{\text{E}}, (0)$	0, 0, 0, (0)	0, 0, 0, (0)
<b>¬e<sub>Ss</sub></b>	0, $\lambda_{\text{Ss}}, \lambda_{\text{E}}, (0)$	0, $\lambda_{\text{Ss}}, \lambda_{\text{E}}, (0)$	0, $\lambda_{\text{Ss}}, \lambda_{\text{E}}, (0)$



<b>S<sub>s</sub></b> \ <b>E</b>	<b>nf<sub>E</sub> = X<sub>MAX</sub> = 100</b>	<b>gf<sub>E</sub> = X<sub>MED</sub> = 60</b>	<b>sf<sub>E</sub> = X<sub>MIN</sub> = 30</b>
<b>e-nf<sub>Ss</sub> = X<sub>MAX</sub> = 100</b>	-1, 30, 30, (0)	-1, 18, 22, (0)	-1, 9, 16, (0)
<b>e-gf<sub>Ss</sub> = X<sub>MED</sub> = 60</b>	-1, 22, 18, (0)	13+0,87 $\lambda_{\text{ENGO}}$ , 24+ $\lambda_{\text{Ss}}$ , 24+ $\lambda_{\text{E}}$ , (12)	13+0,4 $\lambda_{\text{ENGO}}$ , 18+0,2 $\lambda_{\text{Ss}}$ , 15+0,2 $\lambda_{\text{E}}$ , (12)
<b>e-sf<sub>Ss</sub> = X<sub>MIN</sub> = 30</b>	-1, 16, 9, (0)	13+0,4 $\lambda_{\text{ENGO}}$ , 15+0,2 $\lambda_{\text{Ss}}$ , 18+0,2 $\lambda_{\text{E}}$ , (12)	17+ $\lambda_{\text{ENGO}}$ , 17+ $\lambda_{\text{Ss}}$ , 17+ $\lambda_{\text{E}}$ , (21)
<b>¬e<sub>Ss</sub></b>	1+ $\lambda_{\text{ENGO}}$ , 1+ $\lambda_{\text{Ss}}$ , 1+ $\lambda_{\text{E}}$ , (1)	1, 1, 1, (1)	1, 1, 1, (1)

**Matrix 2.5.** The normal form of the game PG'' representing the relationship between ENGOs, S<sub>s</sub> and E, considering also psychological utilities.

### 5.3.1 Psychological Equilibria

The new payoffs in Matrix 2.5 show a situation where there are three outcomes that can be a Psychological Nash Equilibrium.

- The first outcome is (¬e<sub>NGO</sub>; e-nf<sub>Ss</sub>; nf<sub>E</sub>) = ( $\lambda_{\text{ENGO}}, \lambda_{\text{Ss}}, \lambda_{\text{E}}, (0)$ ). Indeed, playing nf<sub>Ss</sub> is S<sub>s</sub>' best response to E playing nf<sub>E</sub> and *vice-versa* and, if it foresees that both S<sub>s</sub> and E play non-

fairly, staying out is NGO's best response as  $\lambda_{\text{NGO}} > -1$ , which means  $V_{\text{NGO}}(-e_{\text{NGO}}; e - nf; nf_E) > V_{\text{NGO}}(e_{\text{NGO}}; e - nf; nf_E)$ . Clearly, this would be a suboptimal equilibrium, but it is nevertheless interesting because it psychologically rewards boycotting and sanctioning over non-fair collusion. Indeed, NGO obtains higher psychological utility from staying out if it predicts that if it enters,  $S_s$  and  $E$  would then decide for a strategies' combination that determines low  $T$  values.

- The second outcome is  $(e_{\text{NGO}}; e - gf_{S_s}; gf_E) = (13 + 0.87\lambda_{\text{NGO}}, 24 + \lambda_{S_s}, 24 + \lambda_E, (12))$ . This can be an equilibrium outcome of the game because  $18 < 24 + \lambda_{S_s/E}$ , which means  $V_{S_s}(e - gf_{S_s}; nf_E) < V_{S_s}(e - gf_{S_s}; gf_E)$  and  $V_E(e - nf_{S_s}; gf_E) < V_E(e - gf_{S_s}; gf_E)$ . Foreseeing this, NGO's best response would be to enter, as  $13 + 0.87\lambda_{\text{NGO}}$ . Importantly, this would be a non-Pareto dominant equilibrium, but it shows that the introduction of psychological utility confirms the possibility of green collusion.
- The third outcome is  $(e_{\text{NGO}}; e - sf_{S_s}; sf_E) = (17 + \lambda_{\text{NGO}}, 17 + \lambda_{S_s}, 17 + \lambda_E, (21))$  and it is also non-Pareto dominant. For this to be an equilibrium, we need to have

$$V_{S_s}(e - gf_{S_s}; sf_E) < V_{S_s}(e - sf_{S_s}; sf_E)$$

and

$$V_E(e - sf_{S_s}; gf_E) < V_E(e - sf_{S_s}; sf_E).$$

However, since we know that

$$u_{S_s}(e - gf_{S_s}; sf_E) > u_{S_s}(e - sf_{S_s}; sf_E)$$

and

$$u_E(e - sf_{S_s}; gf_E) > u_E(e - sf_{S_s}; sf_E)$$

the necessary and sufficient condition for  $e - sf_{S_s}$  to be an optimal response to  $sf_E$ , and vice-versa, is that

$$\lambda_{S_s} - x\lambda_{S_s} > u_{S_s}(e - gf; sf_E) - u_{S_s}(e - sf; sf_E)$$

and

$$\lambda_E - x\lambda_E > u_E(e - gf; sf_E) - u_E(e - sf; sf_E)$$

Foreseeing this, NGO enters the game if

$$V_{\text{NGO}}(e_{\text{NGO}}; e - sf; sf_E) > V_{\text{NGO}}(-e_{\text{NGO}}; e - sf; sf_E).$$

Indeed, given a certain ordering of  $T$ , if for a certain outcome we have that  $T = T_{\text{MAX}}$  and there are reciprocal expectations that this outcome is reached, then a full value of  $\lambda_i$  enters players' utility functions. Similarly, if there are reciprocal expectations that another outcome is

reached such that  $T = T_{MED}$ ,  $\lambda_i$  enters players' utility function with a weight  $x$  such that  $0 < x < 1$ , which reflects the normalized distance between  $T = T_{MED}$  and  $T_{MAX}$ . At this point, if the difference between the two values  $(\lambda_i - x\lambda_i)$ , which represents the motivational force to conform, is higher than the difference between the two material utilities that the agent obtain from the considered outcomes, the first outcome with  $T = T_{MAX}$  can be a psychological equilibrium. Indeed, despite being higher, the material payoff is not a sufficient incentive to induce a deviation from the outcome where  $T$  is fully realized.

If these conditions hold and given appropriate players' first and second order beliefs in mutual conformity with the ideal principle  $T_{MAX}$ , then playing  $e-sf_{S_s}$  ( $sf_E$ ) is the best strategy to the other playing  $sf_E$  ( $e-sf_{S_s}$ ) as it generates  $T_{MAX}$ , and the socially-fair outcome is an equilibrium of the psychological game. Indeed, despite responding ( $e-gf_{S_s}$ ) to  $sf_E$  gives higher material payoffs ( $u_{S_s}$ ), it gives less psychological utility, and the same holds symmetrically.

In the numerical example,

$$\lambda_{S_s} - 0,2\lambda_{S_s} > 18 - 17$$

is true if and only if

$$\lambda_{S_s} > 1,25$$

and

$$\lambda_E - 0,2\lambda_E > 18 - 17$$

is true if and only if

$$\lambda_E > 1,25$$

and

$$17 + \lambda_{ENGO} > 0$$

$$\lambda_{ENGO} > -17$$

Thus, when  $\lambda_{S_s/E} > 1,25$  and  $\lambda_{ENGO} > -17$ , NGO believe that  $S_s$  and  $E$  play ( $e-sf_{S_s}$ ;  $sf_E$ ),  $S_s$  believes that  $E$  plays  $sf_E$  and  $E$  believes that  $S_s$  plays ( $e-sf$ ), and each of them has a second and higher order belief that the other has exactly these beliefs, then ( $enGO$ ;  $e-sf_{S_s}$ ;  $sf_E$ ) becomes a PNE and the agreement is sustained in equilibrium.

While the first two equilibria were also possible equilibria of the material game, the third one is a new equilibrium, which is more equitable in terms of payoffs symmetry and improves NGO and FN's positions. This result reflects the idea of boycotting and strategic activism, by

which stakeholders create influence chains and networks of solidarity through a variety of tactics, so to enter and influence an organizational field, i.e., the logging companies and their international markets in this case (Zietsma and Winn, 2008). Thus, boycotting campaigns can be read here as a result of collective action fueled by NGO, which has both direct access to the place and connections with the international scenario. NGO, indeed, can be seen as working on structural conditions that favour the chain's activation, namely providing access to "sensitizing information" on what lies beyond the wood, and creating "reasonable choice architecture", that is the opportunity for customers to evaluate their buying options and eventually change them (Stolle and Micheletti, 2013).

Indeed, the analysis shows that, assuming NGO is driven by conformity preferences, it will reward enterprises who accept the demand to revise their harvesting activities, while it will punish firms that do not (Baron and Diermeir, 2007; Degli Antoni and Sacconi, 2013). In the case at issue, rewarding means complying with the agreement by halting market campaigns against at least partially compliant industries. Punishing instead means carrying on campaigns against unfairly playing industries and increasing their production costs by raising defensive costs<sup>19</sup>. In the model,  $\tau_{\text{NGO}}$  when the other players play non-fairly implies obtaining the same  $T$  as it would be obtained by  $e_{\text{NGO}}$ , but it avoids trust costs to NGO and it reduces material payoffs for  $S_s$  and  $E$ , which thus lose the possibility to appropriate the surplus. Moreover, boycotting gives a higher psychological payoff, thus reinforcing NGO's choice to prevent  $S_s$  and  $E$  from *complete* defection.

However, the model shows that boycotting does not eliminate the possibility of green collusion, but the introduction of psychological utility can generate a possibility for a more equitable agreement, giving rise to a genuine multiplicity problem and activating reasons to start a relationship whereby a surplus is created and shared in a fairer way. Thus,  $(e_{\text{NGO}}; e\text{-}sf_{S_s}; sf_E)$  is an *ex-post* equilibrium if players' motivational weight  $\alpha_i$  is high enough to counterbalance their temptation to adopt a non-fair or just environmentally fair strategy.

To summarise, the following propositions hold:

*Proposition 1:* In the material game, as in the traditional trust game, the stay out option is in equilibrium, which means that NGO stays out and it does not let the implementation game start if it predicts abuse by the other players. Psychological preferences reinforce this outcome.

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<sup>19</sup> This reasoning might recall Buchanan and Tullock's argument (1962) that players have an incentive to change the status quo only when their predatory and defensive costs are high enough. In a way, repeated boycotting can be seen as what might increase these costs.

*Proposition 2:* In the material game there is also a possibility of green collusion, by which NGO allows the other active players to play their green-fair strategies without regards for FN's socio-environmental justice claims. Psychological preferences reinforce this outcome.

*Proposition 3:* If a multi-stakeholder agreement is reached that has certain provisions for socio-environmental constraints, and this agreement is supported by mutual expectations of conformity that activate attitudes, a certain degree of compliance with a more equitable outcome can be predicted even by the most marginalized stakeholders.

*Proposition 4:* In the psychological game there is a multiplicity of equilibria. Boycotting prevents complete abuse but it does not eliminate the possibility of green collusion. However, the introduction of psychological utility can generate a possibility for a more equitable agreement, giving rise to a genuine multiplicity problem and activating reasons to start a relationship whereby a surplus is created and shared in a fairer way.

## **6. Conclusion**

This paper has focused on the Great Bear Rainforest case as an example of a long-lasting conflict that was turned into collaboration for a multi-stakeholder agreement. Overall, the agreement is considered to have brought a notable situation improvement (Walker and Daniels, 1996). Indeed, it contributed to protecting the forest through a more ecological perspective and increased FNs' rights and decision-making powers over land and land revenues. Moreover, since the multi-stakeholder agreement was signed, there has been some substantial degree of compliance although incomplete.

Specifically, we referred to subjective and framed game models (Aoki, 2001; Cecchini Manara and Sacconi, 2019a) to study the ex-ante phase of conflict transformation into prospects for a multi-stakeholder agreement (Part I). Then, through an extension of Degli Antoni and Sacconi's (2013) model we used psychological game theory to study compliance with the GBR agreement, the possible divorce between forest conservation policies and socio-environmental justice, and the conditions for compliance with a more equitable agreement (PART II).

Part I of this work shows that the evolution from a highly conflictual state of play to one in which there are prospects to sit at a multi-stakeholder negotiation table can be explained as

resulting from significant shifts in the players' subjective view or mental model of the game. Importantly, NGO's international market campaigns and boycotting have played a crucial role in such a shift, as they increased the costs of unilateral defection that thus became a less prominent strategy while cooperating by agreement assumed more prominence. Moreover, there is an effect of institutional complementarity at place (Aoki, 2001), whereby the relation between FN and ProvGov also changed due to what happened in the international scenario and in the NGO-E interactions. Thus, the institutional change at place emerges as the result of a new equilibrium selection triggered by new shared mental models.

The analysis in Part II instead shows that, by considering economic agents endowed with motivational complexity and conformity preferences, psychological game theory can explain collective action for (i) creating networks of solidarity to boycott companies that completely defect from an agreement and (ii) establishing an agreement that promotes environmental protection together with social and environmental justice. On the first result, the model we developed shows the essential role played by NGO's sanctioning behavior associated with staying out from the compliance game. As seen, conformity preferences reinforce NGO's decision to stay out, if they expect  $S_s$  and E to collude on a non-fair strategies' combination. These results show that NGO has the faculty to boycott and impede a complete violation of the equity principle. Yet, the analysis shows that boycotting does not eliminate the possibility of green collusion where NGO also takes part. However, the introduction of psychological utility can generate a possibility for a more equitable agreement, whereby NGO forms a solidarity network with FN, to prevent logging companies and their customers from abusing. The result is a genuine multiplicity problem. Concerning the second point, we can say that the agreement has the capacity to elicit preferences and reciprocal expectations such that conformity can emerge endogenously. Indeed, it can serve as a focal point for reciprocal expectations of compliance with it, and thus help develop psychological utility for conformity. In this vein, ecological collective action can be explained as emerging from a motivational force to counteract incentives to act unjustly, which in turn stems from the sense of justice derived from principles rationally agreed under a veil of ignorance (Rawls, 1971).

Thus, and particularly relevant for the discourse on natural resources management, sustainability and justice, the extended version of the model sheds light on the importance of distinguishing between institutional agreements that are purely environmental and those that, instead, display consideration for social justice as well. Indeed, it is not true that we need to give up more compelling claims of social and environmental justice, to accommodate more

modest goals of environmental protection. Indeed, an agreement incorporating substantial fairness claims as represented in a symmetrical Nash bargaining solution can also be supported in equilibrium by psychological preferences.

Certainly, this work has limitations and leaves a lot of space open for further research. First, a both theoretical and empirical investigation could be conducted on why certain beliefs and expectations on a socio-environmental equilibrium should emerge. Indeed, the results show a significant multiplicity of equilibrium, which opens a problem of equilibrium selection. However, experiments show that if unbiased agreements are made, and these generate compliance expectations through aligned beliefs, then ex-post compliance with a more socially fair agreement is ensured for rather small values of  $\lambda$ , even if both alternative solutions of collusion among active players and solutions of moral sanction are possible. Moreover, considering the crucial role culture plays in this topic, it would be interesting to investigate whether different  $\lambda$  could have a – at least partial – cultural explanation. A comparative empirical analysis of conformity might present interesting results.

### **Acknowledgments**

A special thanks goes to Virginia Cecchini Manara and the participants to the 19<sup>th</sup> Annual Conference of the Italian Society of Law and Economics (SIDE) for their valuable comments on previous versions of this manuscript.

### **CRedit authorship contribution statement**

**Sara Lorenzini:** Conceptualization, Data curation, Case study, Methodology, Visualization, Writing.

**Lorenzo Sacconi:** Conceptualization, Data curation, Methodology, Supervision, Visualization, Writing.

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**Appendix A1. Mini small-framed games of the overall game.**

The normal form of the game depicting the relationship between NGO and E in Phase 1 is represented in Table 1. The letters represent the payoffs obtained by ENGO and E, with  $a > b > c > d$ . A game with the same structure is played between FN and the ProvGov.

	<b>E</b>		
<b>NGO</b>		<b>S, D</b>	<b>S, C</b>
<b>S, D</b>		(c,c)	(a,d)
<b>S, C</b>		(d,a)	(b,b)
<b>N</b>		(c,c)	(d,a)

**Table 1.**

By applying Aoki's (2001) subjective games model and Cecchini Manara and Sacconi's (2019a) work on mini-games, we assume that agents have only subjective and restricted awareness of the game's objective structure, due to bounded rationality. This means that at any given time, players engage just a tiny fraction of technologically feasible actions and their combination as "repertoires" (Dosi and Marengo, 1994 in Aoki, 2001). Therefore, within this original 3x3 matrix, there are 9 possible 2x2 small-framed games, as shown below.

	<b>E</b>	
<b>NGO</b>		
<b>S, D</b>		(c,c)
<b>S, C</b>		(a,d)

(a)

	<b>E</b>	
<b>NGO</b>		
<b>S, C</b>		(b, b)
<b>N</b>		(d,c)

(b)

	<b>E</b>	
<b>NGO</b>		
<b>S, D</b>		(c,c)
<b>N</b>		(c,c)

(c)

	<b>E</b>	
<b>NGO</b>		
<b>S, D</b>		(c,c)
<b>S, C</b>		(d,a)

(d)

<b>NGO</b> \ <b>E</b>	<b>S, D</b>	<b>S, C</b>
<b>S, D</b>	(c,c)	(a,d)
<b>N</b>	(c,c)	(d,a)

(e)

<b>NGO</b> \ <b>E</b>	<b>S, D</b>	<b>S, C</b>
<b>S, C</b>	(d,a)	(b,b)
<b>N</b>	(c,c)	(d,a)

(f)

<b>NGO</b> \ <b>E</b>	<b>S, C</b>	<b>N</b>
<b>S, D</b>	(a,d)	(c,c)
<b>S, C</b>	(b,b)	(a,d)

(g)

<b>NGO</b> \ <b>E</b>	<b>S, D</b>	<b>N</b>
<b>S, C</b>	(d,a)	(a,d)
<b>N</b>	(c,c)	(c,c)

(h)

<b>NGO</b> \ <b>E</b>	<b>S, C</b>	<b>N</b>
<b>S, D</b>	(a,d)	(c,c)
<b>N</b>	(d,a)	(c,c)

(i)

Each of these mini small-framed games can become apparent to the players through a certain simplified concept of interaction (Aoki, 2001) such as "respect or take the opportunity of not respecting agreement" or "play alone or collaborate with others", which results in minigame (a) and (b) respectively. Other simplified concepts such as "compete only" can give rise to other mini games, such as game (c).

In these three cases, frames are symmetrical, meaning that players see the same available strategies. However, other frames might be asymmetrical and result in mini-games such as (d), (e), (f), (g), (h), (i).

In our work, we assume that parties have access to the same information, so that, for symmetrical information, they see the same strategies and there is an analogous change of frame.

**Appendix A2. Computation of the material payoffs of the four players, with reference to the game in its normal form in Matrix 2.2A.**

To compute the material payoffs of the four players, we must first consider their utility functions. Thus, we recall the utility functions of E and S<sub>s</sub> as

$$u_i = \frac{1}{2}qX^* + (X_{\text{MAX}} - X_{\text{TOT}})^{\frac{1}{2}} \quad \text{if } X_D \leq 0, \text{ or}$$

$$u_i = \frac{1}{2}qX^* + zX_D + (X_{\text{MAX}} - X_{\text{TOT}})^{\frac{1}{2}} \text{ if } X_D > 0$$

with  $q > z$

and the utility functions of NGO and FN as, respectively

$$u_{\text{NGO}} = s(X_{\text{MAX}} - X_{\text{TOT}})^{\frac{1}{2}} + c$$

$$u_{\text{FN}} = t[1 - (X_{\text{TOT}} - X_{\text{MIN}})/(X_{\text{MAX}} - X_{\text{MIN}})] (X_{\text{MAX}} - X_{\text{MIN}})]$$

Then, we assume

$$X_{\text{MAX}} = 100, X_{\text{MED}} = 60 \text{ and } X_{\text{MIN}} = 30$$

$$c = -1 \text{ if at least one among E and } S_s \text{ play nf and } c = 0 \text{ if no one plays nf}$$

$$q = 0,6; z = 0,1; s = 2 \text{ and } t = 0,3$$

and compute the players' payoffs for each cell of the game, as follows.

**(e; e-nfs; nf<sub>E</sub>)**

$$U_{S_s} = \frac{1}{2}qX_{\text{MAX}} + (X_{\text{MAX}} - X_{\text{MAX}})^{\frac{1}{2}} = 0,3 \times 100 = 30$$

$$U_{S_s} = \frac{1}{2}qX_{\text{MAX}} + (X_{\text{MAX}} - X_{\text{MAX}})^{\frac{1}{2}} = 0,3 \times 100 = 30$$

$$U_{\text{NGO}} = s(X_{\text{MAX}} - X_{\text{MAX}})^{\frac{1}{2}} + c = 0 - 1 = -1$$

$$U_{\text{FN}} = 0$$

**(e; e-gfs; gf<sub>E</sub>)**

$$U_{S_s} = \frac{1}{2}qX_{\text{MED}} + (X_{\text{MAX}} - X_{\text{MED}})^{\frac{1}{2}} = (0,3 \times 60) + (100 - 60)^{\frac{1}{2}} = 18 + 6.3 = 24.3 = 24$$

$$U_E = \frac{1}{2}qX_{MED} + (X_{MAX} - X_{MED})^{\frac{1}{2}} = (0,3 \times 60) + (100 - 60)^{\frac{1}{2}} = 18 + 6.3 = 24.3 = 24$$

$$U_{NGO} = s(X_{MAX} - X_{MED})^{\frac{1}{2}} = 2 \times (100 - 60)^{\frac{1}{2}} = 2 \times 6.3 = 13$$

$$U_{FN} = t\{[1 - (X_{MED} - X_{MIN})/(X_{MAX} - X_{MIN})](X_{MAX} - X_{MIN})\} \\ = 0,3x\{[1 - (60 - 30/100 - 30)]x(100 - 30)\} = 12$$

**(e; e-sfs; sfe)**

$$U_{Ss} = \frac{1}{2}qX_{MIN} + (X_{MAX} - X_{MIN})^{\frac{1}{2}} = (0,3 \times 30) + (100 - 30)^{\frac{1}{2}} = 9 + 8.4 = 17.4 = 17$$

$$U_E = \frac{1}{2}qX_{MIN} + (X_{MAX} - X_{MIN})^{\frac{1}{2}} = (0,3 \times 30) + (100 - 30)^{\frac{1}{2}} = 9 + 8.4 = 17.4 = 17$$

$$U_{NGO} = s(X_{MAX} - X_{MIN})^{\frac{1}{2}} = 2 \times (100 - 30)^{\frac{1}{2}} = 2 \times 8.4 = 16.8 = 17$$

$$U_{FN} = t\{[1 - (X_{MIN} - X_{MIN})/(X_{MAX} - X_{MIN})](X_{MAX} - X_{MIN})\} \\ = 0,3x\{[1 - (30 - 30/100 - 30)]x(100 - 30)\} = 21$$

**(e; e-gfs; nfe)**

$$U_{Ss} = \frac{1}{2}qX_{MED} + (X_{MAX} - X_{MAX})^{\frac{1}{2}} = (0,3 \times 60) = 18$$

$$U_E = \frac{1}{2}qX_{MED} + z(X_{MAX} - X_{MED}) + (X_{MAX} - X_{MAX})^{\frac{1}{2}} = (0,3 \times 60) + (0.1 \times 40) = 18 + 4 \\ = 22$$

$$U_{NGO} = s(X_{MAX} - X_{MAX})^{\frac{1}{2}} + c = 0 - 1 = -1$$

$$U_{FN} = 0$$

**(e; e-nfs; gfe)** brings a symmetrical result (-1, 22, 18, 0)

**(e; e-nfs; sfe)**

$$U_{Ss} = \frac{1}{2}qX_{MIN} + z(X_{MAX} - X_{MIN}) + (X_{MAX} - X_{MAX})^{\frac{1}{2}} = (0,3 \times 30) + (0.1 \times 70) = 9 + 7 = 16$$

$$U_E = \frac{1}{2}qX_{MIN} + (X_{MAX} - X_{MAX})^{\frac{1}{2}} = (0,3 \times 30) = 9$$

$$U_{NGO} = s(X_{MAX} - X_{MAX})^{\frac{1}{2}} + c = 0 - 1 = -1$$

$$U_{FN} = 0$$

**(e; e-sf<sub>ss</sub>; nf<sub>E</sub>)** brings a symmetrical result (-1, 9, 16, 0)

**(e; e-sf<sub>ss</sub>; gf<sub>E</sub>)**

$$U_{Ss} = \frac{1}{2}qX_{MIN} + (X_{MAX} - X_{MED})^{\frac{1}{2}} = (0,3 \times 30) + (100 - 60)^{\frac{1}{2}} = 9 + 6 = 15$$

$$U_{Ss} = \frac{1}{2}qX_{MIN} + z(X_{MED} - X_{MIN}) + (X_{MAX} - X_{MED})^{\frac{1}{2}}$$
$$= (0,3 \times 30) + (0,1 \times 30) + (100 - 60)^{\frac{1}{2}} = 9 + 3 + 6 = 18$$

$$U_{ENGO} = s(X_{MAX} - X_{MED})^{\frac{1}{2}} = 2 \times (100 - 60)^{\frac{1}{2}} = 2 \times 6,3 = 12,6 = 13$$

$$U_{FN} = t\{[1 - (X_{MED} - X_{MIN}) / (X_{MAX} - X_{MIN})](X_{MAX} - X_{MIN})\}$$
$$= 0,3 \times \{[1 - (100 - 60 / 100 - 30)] \times (100 - 30)\} = 12$$

**(e; e-gf<sub>ss</sub>; sf<sub>E</sub>)** brings a symmetrical result (13, 18, 15, 12)

### Appendix A3. General explanation of the equilibrium property of the environmental collusion outcome

The fact that  $(e_{NGO}; e-gf_{ss}; gf_E)$  is a Nash equilibrium of the game can be demonstrated in more general terms. Indeed, E obtains a lower payoff for  $(e-nf_{ss}; gf_E)$  than for  $(e-gf_{ss}; gf_E)$ , because

$$\frac{1}{2}qX_{MED} + z(X_{MAX} - X_{MED}) < \frac{1}{2}qX_{MED} + (X_{MAX} - X_{MED})^{\frac{1}{2}}$$

Contrarily, again for the marginally decreasing utility from externalities, E obtains a higher payoff for  $(e-sf_{ss}; gf_E)$  than for  $(e-sf_{ss}; sf_E)$ , as

$$\frac{1}{2}qX_{MIN} + z(X_{MED} - X_{MIN}) + (X_{MAX} - X_{MED})^{\frac{1}{2}} > \frac{1}{2}qX_{MIN} + (X_{MAX} - X_{MIN})^{\frac{1}{2}}$$

The same results hold for  $S_s$ . Thus,  $(e_{NGO}; e-gf_{ss}; gf_E)$  is an equilibrium outcome of the game while  $(e_{NGO}; e-sf_{ss}; sf_E)$  is not. This can be explained by the following reasoning.

Let's consider

$$X_{MAX} = (X^* + X_D + X_U)$$

where

$$X_U = (X_{MAX} - X_{TOT})$$

$$X^* = \min(X_E, X_S)$$

$$X_{TOT} = (X^* + X_D)$$

$$X_D = (|X_E - X_S|)$$

Then, we assume that, taking  $X$  as a variable indicating the quantity of extracted or saved wood,

- for all values  $X$  so that  $X_{MIN} \leq X \leq X_{MAX}$ ,  $\frac{1}{2}qX > X^{\frac{1}{2}}$
- for all values  $X > X_{MIN}$ ,  $\frac{1}{2}qX > zX$
- for all values  $X < X_{MAX}$ ,  $z(X) < X^{\frac{1}{2}}$
- for  $X = X_{MAX}$ ,  $z(X_{MAX}) = (X_{MAX})^{\frac{1}{2}}$

These assumptions correspond to what is required for  $(X)^{\frac{1}{2}}$  to be marginally decreasing, and  $\frac{1}{2}qX$  and  $z(x)$  linearly increasing. Thus, to know whether given a certain  $X^* < X_{MAX}$ , the choice of  $X_D = (|X_E - X_S|) > 0$  is optimal, the following condition must be verified:

$$\Delta = \left[ (X_{\text{MAX}} - X^*)^{\frac{1}{2}} - (X_{\text{MAX}} - X^* - X_D)^{\frac{1}{2}} \right] < z(X_D)$$

$\Delta$  represents the decrease in the utility the player gets from positive environmental externalities, when the amount of extracted timber increases from  $X^*$  to  $(X^* + X_D)$ , and the externality therefore decreases. The aim is to verify whether this loss is greater or smaller than the additional utility the player gets from  $X_D$ : in the former case, resorting to an alternative market for additional wood is not convenient, but it is so in the second case.

In general terms, this coincides with the condition that  $\Delta$  is greater for lower values of  $X_U = (X_{\text{MAX}} - X^*)$ . i.e., when  $X^*$  is relatively high, and the function  $X^{\frac{1}{2}}$  is in the steepest region. On the contrary, where the derivative flattens down,  $\Delta$  is smaller, with  $X^{\frac{1}{2}} < z(X)$ . Graph 2.2 shows the case where

$$\begin{aligned} X_{\text{TOT}} &= X^* \\ \text{and } X'_U &= X_{\text{MAX}} - X^* \end{aligned}$$

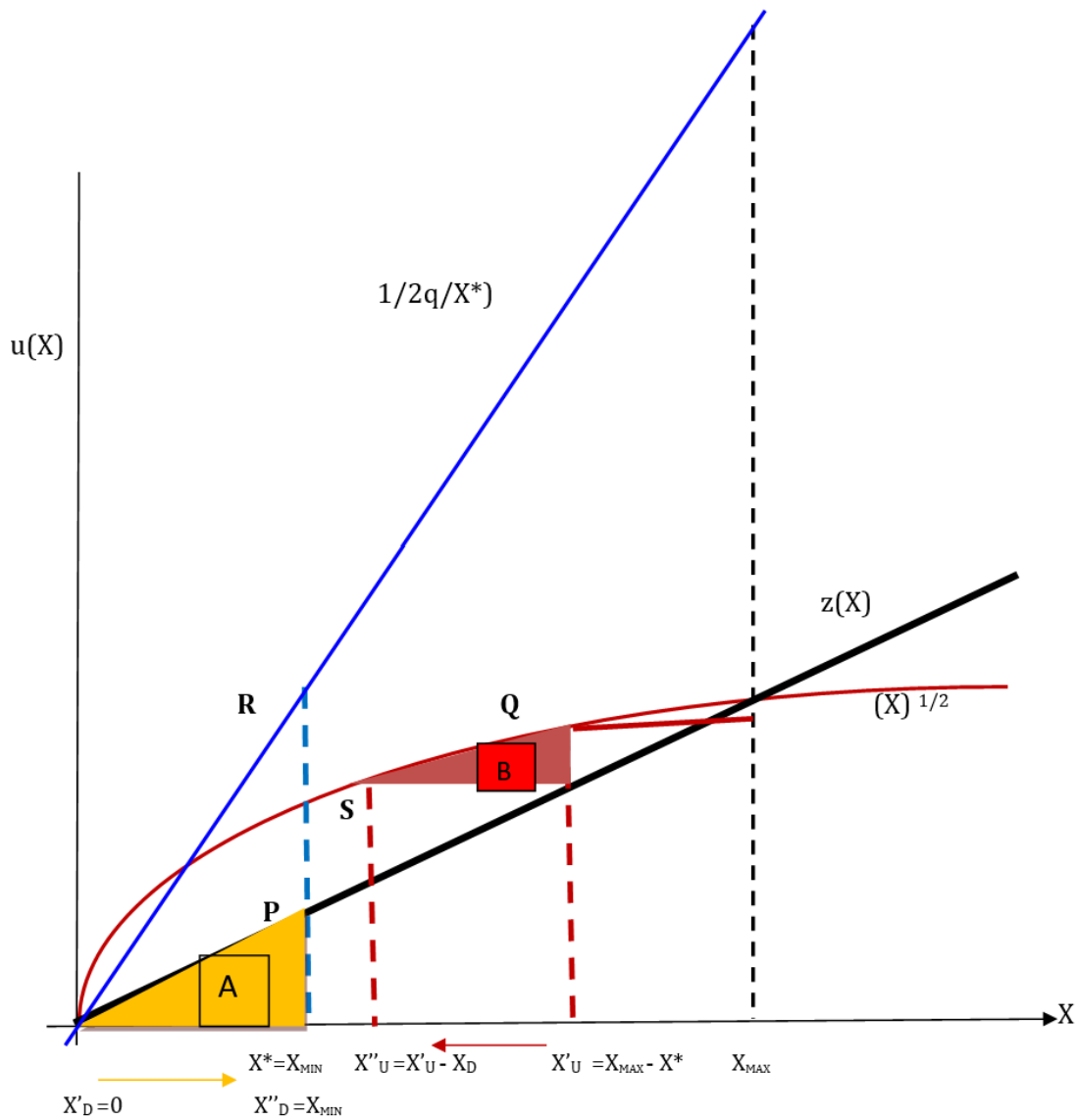
compared to the case where

$$\begin{aligned} X_{\text{TOT}} &= X^* + X_D \\ \text{with } X_D &= X_{\text{MIN}} \\ \text{and } X''_U &= X_{\text{MAX}} - X^* - X_D \end{aligned}$$

In the first case, when  $X^* = X_{\text{MIN}}$ ,  $X_D = 0$ , and the quantity saved from extraction is equal to  $X'_U = X_{\text{MAX}} - X^*$ , the utility deriving from profit from the primary market at the R level adds up to the utility at the Q level from positive environmental externalities.

In the second case, instead, when we add  $X_D = X_{\text{MIN}}$ , the externality is reduced from  $X_U'$  to  $X_U''$ , meaning from Q to S. However, the area of the cyclical triangle B included under the chord from Q to S that represents  $\Delta = \left[ (X_{\text{MAX}} - X^*)^{\frac{1}{2}} - (X_{\text{MAX}} - X^* - X_D)^{\frac{1}{2}} \right]$ , is lower than the area of the triangle A, corresponding to the utility gain in passing from  $X_D = 0$  to  $X''_D = X_{\text{MIN}}$ . This means that the decrease in utility obtained by moving from  $X'_U = X_{\text{MAX}} - X^*$  to  $X''_U = X_{\text{MAX}} - X^* - X_D$  is smaller than the increase in utility obtained with  $zX_D = X_{\text{MIN}}$ . Thus, given  $X^*$ , the other player's optimal response is not to limit itself to stay in the main market, i.e.,  $X_D = 0$ , but to go into the secondary one. This means it is better to defect.

Foreseeing that both E and  $S_s$  play their green-fair strategy, NGO would enter the game, as it would obtain  $s(X_{\text{MAX}} - X_{\text{MED}})^{\frac{1}{2}} > 0$ .



**Figure A3.1** The figure shows a graphical representation of the fact that  $(e_{NGO}; e\text{-}gf_{SS}; gf_E)$  is an equilibrium outcome of the game while  $(e_{NGO}; e\text{-}sf_{SS}; sf_E)$  is not, because the reduction of utility from positive environmental externalities represented by the area of B, obtained by going from  $X'_U$  to  $X''_U$ , is outweighed by the increase of utility represented by the triangle A derived increasing the secondary market profit from  $X_D = 0$  to  $X''_D = X_{MIN}$ . The figure also illustrates a numerical example, taking  $X_{MAX} = 100$ ,  $X^* = 30$ ,  $X'_D = 0$ , and  $X'_U = X_{MAX} - X^* = 70$  and comparing it to the case where  $X''_D = 30$  and  $X''_U = X_{MAX} - X^* - X_D = 40$ . By looking at the graph we can see that the area B corresponding to  $\Delta = \left[ (X_{MAX} - X^*)^{\frac{1}{2}} - (X_{MAX} - X^* - X_D)^{\frac{1}{2}} \right]$  is smaller than the area A corresponding to the increase in utility by  $z(X_D)$ , which means that the decrease in utility when we move from  $X'_U$  to  $X''_U$  is smaller than the increase obtained from resorting to a secondary market. Thus, given  $X^*$ , the other player's optimal response is not to limit itself to stay in the main market, i.e.,  $X_D = 0$ , but to go into the secondary one.

#### Appendix A4. Computation of psychological payoffs

The first step to compute psychological payoffs is to identify the T value, i.e., the ideal principle of fair cooperation that free and rational self-interested persons would accept under a veil of ignorance (Rawls, 1971). By assumption (Aoki, 2001; Binmore, 2005; Sacconi, 2000, 2006a, 2010a), T is equal to the Nash Bargaining Solution (Nash, 1950, 1953).

$$T(\sigma) = \prod (U_i(\sigma) - d_i)$$

According to the formula, for each state of affairs  $\sigma$ , T is equal to the product of differences between the utility  $U_i(\sigma)$  that each player  $i$  could get from  $\sigma$  and its reservation utility  $d_i$ , which is the utility she obtains if the agreement fails and the game ends in the status quo. Thus, T can be computed as the Nash Products – see Table A4.1 – and  $T_{MAX}$  is obtained when material utilities' distribution is in accordance with T.

$\sigma$	T
(e, nf <sub>ss</sub> ; nf <sub>E</sub> )	0
(e, gf <sub>ss</sub> ; gf <sub>E</sub> )	89856
(e, sf <sub>ss</sub> ; sf <sub>E</sub> )	103173
(e, nf <sub>ss</sub> ; gf <sub>E</sub> )	0
(e, gf <sub>ss</sub> ; nf <sub>E</sub> )	0
(e, nf <sub>ss</sub> ; sf <sub>E</sub> )	0
(e, sf <sub>ss</sub> ; nf <sub>E</sub> )	0
(e, sf <sub>ss</sub> ; gf <sub>E</sub> )	42120
(e, gf <sub>ss</sub> ; sf <sub>E</sub> )	42120
(¬e <sub>ss</sub> ; nf <sub>E</sub> )	1
(¬e <sub>ss</sub> ; gf <sub>E</sub> )	1
(¬e <sub>ss</sub> ; sf <sub>E</sub> )	1

**Table A4.1** T values for each state of affairs of the subgame between S<sub>s</sub> and E.

Ideal utility is introduced here as distinct from material utility: it refers to the fact that players may get psychological utility from mutual compliance and adherence to the principle T. This is so only insofar as they expect reciprocal conformity by other players.

Thus, the second step is to include reciprocal beliefs in the agents' utility function following the psychological game concept (Grimalda and Sacconi, 2005; Geanakoplos et al., 1989; Rabin, 1993; Sacconi and Grimalda, 2007). By doing so, the overall utility function of each player  $i$  results from the sum of her material utility  $U_i$  and her ideal utility  $\beta_i F[T(\sigma)]$ . In a formula:

$$V_i(\sigma) = U_i(\sigma) + \lambda_i F[T(\sigma)]$$

$\lambda_i F[T(\sigma)]$  represents  $i$ 's psychological conformity preference given her expectations of reciprocal conformity. Specifically,  $\lambda_i$  is an exogenous motivational parameter that measures player  $i$ 's desire to conform with  $T$  while the function  $F[T(\sigma)]$  captures the role of beliefs in affecting ideal utility. Given a certain state of affair  $\sigma$ , a system of beliefs  $b$  which includes player  $i$ 's conditional conformity index  $\lambda_i$  and a reciprocal expected conformity index  $\lambda_j$ ,  $F[T(\sigma)]$  measures an agent's conformity to the agreed principle  $T$ , given what she expects the other player will play and what she expects the other expects from her. In a formula:

$$F(T) = [1 + f_i(b_i^1, b_i^2)] + [1 + f_j(\sigma_i, b_i^1)].$$

$f_i$  measures the extent to which, given what  $i$  expects  $j$  will do,  $i$  will comply with principle  $T$  while  $f_j$  is an esteem of player  $j$ 's compliance with  $T$ , given what  $j$  is expected to expect from  $i$ 's behavior. Both indexes can take values that range from 0 (no conformity) to 1 (full conformity).

Given the state of affair  $\sigma$  and a first order belief  $b_i^1$  that  $i$  has in  $j$ 's behavior,  $\lambda_i$  is computed as

$$f_i(\sigma_i, b_i^1) = T(\sigma_i, b_i^1) - T_{MAX}(b_i^1)/T_{MAX}(b_i^1) - T_{MIN}(b_i^1)$$

where  $T(\sigma_i, b_i^1)$  is the value  $T$  assumes when player  $i$  adopts strategy  $\lambda_i$  and player  $j$  plays what player  $i$  believes ( $b_i^1$ ), while  $T_{MAX}(b_i^1)$  and  $T_{MIN}(b_i^1)$  are the maximum and minimum values that  $T$  can assume depending on  $i$ 's strategy given its prediction on  $j$ 's strategy.

Similarly, given a first order belief  $b_i^1$  and a second order belief  $b_i^2$  about what player  $j$  believes about  $i$ 's strategy,  $\lambda_j$  is computed as

$$f_i(b_i, b_i^1) = T(b_i^1, b_i^2) - T_{MAX}(b_i^2)/T_{MAX}(b_i^2) - T_{MIN}(b_i^2)$$

where  $T_{MAX}(b_i^2)$  and  $T_{MIN}(b_i^2)$  are the maximum and minimum values that  $T$  can assume depending on  $i$ 's first and second order beliefs, which define  $j$ 's expected deviation as predicted by  $i$ .

Considering these elements, the overall utility function  $V_i$  is computed as a sum of player  $i$ 's material and psychological utility:

$$V_i(\sigma, b_i^1, b_i^2) = U_i(\sigma_i, b_i^1) + \lambda_i [1 + f_j(b_i^1, b_i^2)] + [1 + f_j(\sigma_i, b_i^1)]$$

Given the T values for each state of affairs computed as Nash Products – see Table 2 - it is now possible to calculate the two indexes and the overall index of conformity F(T) as well as the overall utility functions. For instance, S<sub>s</sub>' deviation from full conformity for strategy (e-nf<sub>Ss</sub>; nf<sub>E</sub>) is computed as:

$$\begin{aligned} f_{Ss}(\sigma_{Ss}, b_{Ss}^1) &= f_{Ss}(e-nf_{Ss}|nf_E) = T(e-nf_{Ss}; nf_E) - T_{MAX}(nf_E) / T_{MAX}(nf_E) - T_{MIN}(nf_E) \\ &= 0 - 1/1 - 0 = -1 \end{aligned}$$

while E' expected deviation from full conformity for strategy nf<sub>E</sub> is computed as

$$\begin{aligned} f_E(b_i^1, b_i^2) &= f_E(nf_E|e - nf_{Ss}) \\ &= T(nf_E; e - nf_{Ss}) - T_{MAX}(e - nf_{Ss}) / T_{MAX}(e - nf_{Ss}) - T_{MIN}(e - nf_{Ss}) \\ &= 0 - 0/0 - 0 = 0 \end{aligned}$$

Thus, S<sub>s</sub>' index of conditional conformity is equal to

$$1 + f_{Ss}(e-nf_{Ss}|nf_E) = 0$$

And the index of expected reciprocal conformity is

$$1 + f_E(nf_E|e-nf_{Ss}) = 1$$

which entails S<sub>s</sub>' overall conformity index equal to

$$F(T) = (1 + f_{Ss})(1 + f_E) = (1 - 1)(1 + 0) = 0$$

and an overall utility function equal to

$$V_{Ss} = U_{Ss} + \lambda_i F[T] = 30 + 0 = 30$$

Table A4.2 shows the results for each state of affair  $\square$ .

$\sigma$	$(1 + f_{S_s}) (1 + f_E)$	F(T)
(e-nf <sub>S<sub>s</sub></sub> ; nf <sub>E</sub> )	(1 - 1) (1 + 0)	0
(e-gf <sub>S<sub>s</sub></sub> ; gf <sub>E</sub> )	(1 + 0) (1 + 0)	1
(e-sf <sub>S<sub>s</sub></sub> ; sf <sub>E</sub> )	(1 + 0) (1 + 0)	1
(e-nf <sub>S<sub>s</sub></sub> ; gf <sub>E</sub> )	(1 - 1) (1 + 0)	0
(e-gf <sub>S<sub>s</sub></sub> ; nf <sub>E</sub> )	(1 - 1) (1 - 1)	0
(e-nf <sub>S<sub>s</sub></sub> ; sf <sub>E</sub> )	(1 - 1) (1 + 0)	0
(e-sf <sub>S<sub>s</sub></sub> ; nf <sub>E</sub> )	(1 - 1) (1 - 1)	0
(e-sf <sub>S<sub>s</sub></sub> ; gf <sub>E</sub> )	(1 - 0.5) (1 - 0.6)	0,2
(e-gf <sub>S<sub>s</sub></sub> ; sf <sub>E</sub> )	(1 - 0.6) (1 - 0.5)	0.2
(¬e <sub>S<sub>s</sub></sub> ; nf <sub>E</sub> )	(1 + 0) (1 + 0)	1
(¬e <sub>S<sub>s</sub></sub> ; gf <sub>E</sub> )	(1 - 1) (1 + 0)	0
(¬e <sub>S<sub>s</sub></sub> ; sf <sub>E</sub> )	(1 - 1) (1 + 0)	0

**Table A4.2** S<sub>s</sub> and E's overall conditional conformity indexes with the principle of justice T.

In the subgame between E and S<sub>s</sub>, their choices are based on mutual conformity expectations, whereas they have no expectations on NGO, since its choice is assumed as given. Hence, there is no need to compute the same indices with respect to the alternative of not entering. Contrarily, when considering NGO's choice in the entire game, NGO has expectations on S<sub>s</sub> and E's further moves and on their level of conformity to the agreement that maximizes T. Thus, it is important to analyze NGO's indices for its two options (e<sub>NGO</sub>) and (¬e<sub>NGO</sub>) in relation to every possible combination of S<sub>s</sub> and E's strategies.

Accordingly, we now consider all the possible states of affairs  $\sigma$  of the overall game. When S<sub>s</sub> enters the game, we consider S<sub>s</sub>&E strategies as conjoint events, as the symbol of conjunction “&” indicates. By means of an example, NGO's deviation from full conformity for strategy (e; e-nf<sub>S<sub>s</sub></sub> &nf<sub>E</sub>) is computed as

$$f_{\text{NGO}}(e_{\text{NGO}} | e\text{-nf}_{S_s} \& \text{nf}_E) = \frac{T(e_{\text{NGO}}; e\text{-nf}_{S_s} \& \text{nf}_E) - T_{\text{MAX}}(e\text{-nf}_{S_s} \& \text{nf}_E)}{T_{\text{MAX}}(e\text{-nf}_{S_s} \& \text{nf}_E) - T_{\text{MIN}}(e\text{-nf}_{S_s} \& \text{nf}_E)} = \frac{0 - 0}{0 - 0} = 0$$

while  $S_s$  &  $E$ 's expected deviation from full conformity is

$$f_{S_s \& E}(e - nf_{S_s} \& nf_E | e_{NGO}) = \frac{T(e - nf_{S_s} \& nf_E; e_{NGO}) - T_{MAX}(e_{NGO})}{T_{MAX}(e_{NGO}) - T_{MIN}(e_{NGO})} = \frac{0 - 103173/103173 - 0}{103173 - 0} = -1$$

Thus,  $ENG$ O's index of conditional conformity is equal to

$$1 + f_{ENG}O(e | e - nf_{S_s} \& nf_E) = 1 + 0 = 1$$

while the index of expected reciprocal conformity is

$$1 + f_{S_s \& E}(e - nf_{S_s} \& nf_E | e) = 1 - 1 = 0$$

which entails  $ENG$ O's overall conformity index equal to:

$$F(T) = (1 + f_{S_s})(1 + f_E) = (1+0)(1-1) = 0$$

and an overall utility function equal to:

$$V_{ENG}O = U_{ENG}O + \lambda_1 F[T] = -1 + 0 = -1$$

On the other hand, taking the cases in which  $S_s$  stays out, we consider  $S_s$  and  $E$  strategies as disjoint events. Thus, if, by means of an example we take  $\sigma = (e; -e_{S_s}; nf_E)$ , we first compute  $NG$ O's deviation from full conformity as

$$f_{ENG}O(e_{NGO} | -e_{S_s}; nf_E) = \frac{T(e_{NGO}; -e_{S_s}; nf_E) - T_{MAX}(-e_{S_s}; nf_E)}{T_{MAX}(-e_{S_s}; nf_E) - T_{MIN}(-e_{S_s}; nf_E)} = \frac{1 - 1/1 - 0}{1 - 0} = 0$$

Then, given that  $NG$ O enters, we consider whether  $S_s$  choice not to enter maximizes  $T$ , considering what  $S_s$  expects  $E$  to play. Thus, we compute  $S_s$ ' expected deviation from conformity as

$$f_{S_s}(-e_{S_s} | e_{NGO}; nf_E) = \frac{T(-e_{S_s}; e_{NGO}; nf_E) - T_{MAX}(e_{NGO}; nf_E)}{T_{MAX}(e_{NGO}; nf_E) - T_{MIN}(e_{NGO}; nf_E)} = \frac{1 - 1/1 - 0}{1 - 0} = 0$$

Thus,  $ENG$ O's overall utility function for this state of affairs equal to:

$$V_{ENG}O = U_{ENG}O + \lambda_1 F[T] = (1 + f_{ENG}O)(1 + f_{S_s}) = (1 + 0)(1 + 0) = 1$$

Given complete calculations, Tables A4.3 and A4.4 show the overall results of composite conformity indexes  $F(T)$ , respectively conditional on the hypothesis that  $S_s$  enters and  $S_s$  &  $E$  can be considered as conjoint events (Table A4.3), and on the hypothesis that  $S_s$  does not enter and  $S_s$  and  $E$  are considered as disjoint events (Table A4.4).

NGO S <sub>s</sub> & E	NGO		eNGO			¬eNGO		
	eNGO	¬eNGO	$(1+f_{\text{eNGO}})$	$(1+P_{S_s \& E})$	F(T)	$(1+f_{\text{eNGO}})$	$(1+P_{S_s \& E})$	F(T)
(e-nf <sub>S<sub>s</sub></sub> &nf <sub>E</sub> )	T=0	T=0	(1+0)	(1-1)	0	(1+0)	(1+0)	1
(e-gf <sub>S<sub>s</sub></sub> &gf <sub>E</sub> )	T=89856	T=0	(1+0)	(1-0.12)	0,87	(1+0)	(1-1)	0
(e-sf <sub>S<sub>s</sub></sub> &sf <sub>E</sub> )	T=103173	T=0	(1+0)	(1+0)	1	(1+0)	(1-1)	0
(e-nf <sub>S<sub>s</sub></sub> &gf <sub>E</sub> )	T=0	T=0	(1+0)	(1-1)	0	(1+0)	(1+0)	1
(e-gf <sub>S<sub>s</sub></sub> &nf <sub>E</sub> )	T=0	T=0	(1+0)	(1-1)	0	(1+0)	(1+0)	1
(e-nf <sub>S<sub>s</sub></sub> &sf <sub>E</sub> )	T=0	T=0	(1+0)	(1-1)	0	(1+0)	(1+0)	1
(e-sf <sub>S<sub>s</sub></sub> &nf <sub>E</sub> )	T=0	T=0	(1+0)	(1-1)	0	(1+0)	(1+0)	1
(e-gf <sub>S<sub>s</sub></sub> &sf <sub>E</sub> )	T=42120	T=0	(1+0)	(1-0,6)	0.4	(1-1)	(1+0)	0
(e-sf <sub>S<sub>s</sub></sub> &gf <sub>E</sub> )	T=42120	T=0	(1+0)	(1-0,6)	0.4	(1-1)	(1+0)	0

**Table A4.3** Overall conformity indexes of NGO, for each of the two strategies at its disposal, conditional on the hypothesis that  $S_s$  &  $E$  use each of their strategies' combinations considered as conjoint events.

NGO S <sub>s</sub> and E	NGO		eNGO			¬eNGO		
	eNGO	¬eNGO	$(1+f_{\text{eNGO}})$	$(1+f_{S_s})$	F(T)	$(1+f_{\text{eNGO}})$	$(1+f_{S_s})$	F(T)
(¬e <sub>S<sub>s</sub></sub> ; nf <sub>E</sub> )	T=1	T=0	(1+0)	(1+0)	1	(1-1)	(1+0)	0
(¬e <sub>S<sub>s</sub></sub> ; gf <sub>E</sub> )	T=1	T=0	(1+0)	(1-1)	0	(1-1)	(1+0)	0
(¬e <sub>S<sub>s</sub></sub> ; sf <sub>E</sub> )	T=1	T=0	(1+0)	(1-1)	0	(1-1)	(1+0)	0

**Table A4.3** Overall conformity indexes of NGO, for each of the two strategies at its disposal, conditional on the hypothesis that  $S_s$  &  $E$  use each of their strategies' combinations considered as conjoint events.

By considering the new overall conformity indexes of all the three active players, we obtain the new psychological game as presented in the manuscript – see Matrix 2.5.