Climate Politics at the Intersection between International Dynamics and National Decision-making: A Policy Network Approach

Cumulative Thesis

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on the recommendation of the doctoral committee:

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Dedication

Dear Miami

Behind these walls
You can be so self-absorbed
Behind those eyes, no disguise
Disguise, no you can't disguise
Behind this fortress of an address
Stuck in the passion void
With a little style full and for a while
But you can't turn back time
Dear Miami, you're the first to go
Disappearing under melting snow
Each and everyone turn your critical eye
On the burning sun and try not to cry
Strictly rolling V.I.P.
Strictly rolling V.I.P.
We got it all
If the empire ever falls
We got all control, untold power to
Do what we wanna do
We got the moves
But there's nothing left to prove
There's only stardust memories
We can make 'em true
Dear Miami, you're the first to go
Disappearing under melting snow
Each and everyone, turn your critical eye
On the burning sun and try not to cry
Dear Miami, you're the first to go
Disappearing under melting snow
Each and everyone, turn your critical eye
From the burning sun and try not to cry
Merry-go-round again
A carousel
Passionate raid
An escapade, adventures eve
Strictly rolling V.I.P.

Roisin Murphy, 2007

Acknowledgements

"Finalising a Ph.D.-Thesis is almost like giving birth to a child", with this words Karin Ingold, one of my co-supervisors, has described the final weeks of writing a dissertation. While the metaphor is rather obvious to her, as she delivered baby a few weeks ago, I think she is right. Being in labour is breath taking, but at the same time compelling and not without struggle. There is more to writing a dissertation than meets the eye. It is a long-term adventure with many enthusiastic highs and moments of absolute fatigue. It is a process of continuous learning and self-reflection that is often not comprehensible to outsiders. Not only the mystery of the Ph.D. topic, but also the particularities of the academic world are hard to understand for all these people outside the university. My family and close friends never got tired of asking the same questions about my dissertation project, the topic, the kind of work I do, and my future as a political scientist (will I run for being the next chancellor??). Some of them were even sceptical of me ever doing real work at all. But, drum roll, please! There it is; my dissertation. Ready to be read by those who are interested. And despite the scepticism about the value of my work, I know my family and my closest friends (I refrain from listing you all, as I am too scared to forget somebody) are quite fond of me and my profession. And, this is because, they know that I really do love what I do and that I really am convinced about its importance for society. Hence, even if they can't fully empathise with my feelings about doing research, going to conferences, and teaching, they have always supported me. I am very grateful for that, as I know that this cannot be taken for granted.

On the hike to my thesis, I have crossed many people, without whom I would never have been able to write this text. Luckily, the "Acknowledgements" give space for naming and thanking them all. First and foremost, I would like to thank Christian Hirschi and Thomas Widmer. Christian Hirschi has developed the research project that funded my Ph.D. and is also one of my co-authors. This whole thesis is based on his ideas and his very own preceding research. As very supportive, patient, and caring supervisor, he laid the foundation for the progress of this dissertation, in the first year of my PhD. Thomas Widmer kindly agreed to take over the main supervision of this thesis and I think he has done a very good job at that. He was always supportive and accountable to my personal needs, but he never over-supervised and gave me the freedom I needed to advance this project. Next, I thank Karin Ingold and Marco Steenbergen for being on my committee. Both of them have made an invaluable contribution to the success of this thesis. Karin, who is an expert in policy networks and Swiss climate policy and above all a very kind, reliable, and considerate person, was an excellent choice. Marco

Steenbergen, who is always gracious and helpful, gave me the most valuable methodological support and advice.

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Finally, my very special thanks and love go to Markus Schwarzbauer and above all to my husband Jörg Gerstl. Markus Schwarzbauer has proofread and edited this whole text. Right now, he is the person (besides myself of course) that knows this thesis top to bottom, inside

and out. Because he was at my side in these exhausting final weeks, I never felt alone. Somehow, we were in this together. This was a very motivating and consoling feeling and put some pressure on me to hold deadlines, too. Jörg Gerstl, my beloved partner and best friend, escorted me through this thesis in the past four years. When I first told him that I planned to do a Ph.D., he was lost for words. However, over the following months, he got as enthusiastic about it, as I was myself. With him, we discussed literally everything concerning my Ph.D. He celebrated my successes and kept his fingers crossed, when I had to present at conferences. He supported me in every thinkable way and he was my bastion of calm. If I could, I would share my title with him; he would deserve it.

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Synopsis

1. Topic and Overview of the Thesis

Mitigating anthropogenic climate change and its disastrous consequences for present and future generations belongs to the most important challenges in current world politics. Its complexity is unprecedented, as it requires a commitment to radical changes in modern life style that still worryingly depends on fossil fuels. In the past decades, globalisation led to a massive increase in wealth of the middle class of industrialised countries, the major emerging economies, and many developing countries. Paired with a growing population, the demand for consumer goods and services increases. In consequence, trade flows, air, ship, and road traffic, as well as electricity and land use have massively amplified. All these issues contribute to an accumulation of carbon emissions in the global atmosphere, which are harmful because they intensify the natural greenhouse effect heating up the planet.

Albeit a growing awareness for the perils of climate change triggering the use of renewable energies, such as solar, wind, or hydropower, carbon emissions are still rising. In addition, other greenhouse gases (GHG), such as methane or nitrous oxide aggravate the problem due to profound meat consumption and intensive agriculture. Unequal distribution of the causes and consequences of global climate change worsen the problem. Today and in the future, the ones suffering the most from the negative impacts of climate change are those who are also the least responsible, namely the least developed countries and small island states of the global South. In these areas, the vulnerability towards climate hazards is high. They are not only exposed to droughts, floods, landslides or elevation, extreme weather events, or sea level rise, but at the same time, they are less capable of coping with these risks. The consequences are more conflicts over scarce resources like water, malnutrition due to droughts, and a loss of livelihood in flood-prone areas to name only some of the numerous consequences. Eventually, humankind will have to face augmented migration flows from the South to the North, raising important questions about social equity (Roberts and Parks 2009).

While to a certain extent climate change is 'unequivocal' (IPCC 2007, 72) and the adaptation to its impacts is inevitably a crucial task, the international community must increase efforts to mitigate climate change in order to reduce adaptation pressures to a minimum. However, finding an effective modus operandi is certainly no less intricate than the problem itself. Climate change mitigation policy must find effective mechanisms to incentivise consumption and production behaviours less harmful to climate, hence to emit less GHGs.

The issue is multifaceted due to the wide spectrum of target groups that range from individual to multinational corporations or local, sub-national, and even national

governments. It is also cross sectoral in nature, as the mitigation of harmful GHGs requires action in policy domains as diverse as industry, business, traffic, agriculture, or spatial planning. In many instances, the interests of these sectors clash when measures to protect the climate contrast with traditional sectoral necessities.

Not surprisingly, the history of the evolution of the United Nations (UN) climate regime is delicate. Although the international community has been negotiating for already more than two decades over an effective agreement to collectively mitigate climate change in the scope the United Nations Framework Convention on Climate Change (UNFCCC), the willingness of many countries, in particular the major emitters, to commit themselves to effective emission reduction targets is poor. The discrepancies arising from different national circumstances and deviant opinions about the distribution of responsibilities are enormous. On top of this, missing sanction mechanisms incentivise free-riding behaviour, as the implementation of mitigation policies is costly when others do not comply. The lack of an international authority equipped with enough power to implement and enforce emission reductions makes national governments to the protagonists in combating climate change. Therefore, research must contribute to an improved understanding of the conditions under which countries are willing and able to coordinate their mitigation actions and to adopt national policies. In this context, this thesis asks two main research questions:

1. Under which conditions do national governments engage in cooperative, international interactions to coordinate their climate change mitigation policies?

2. What international and domestic factors contribute or hinder the adoption of climate change mitigation policies by national governments?

The focus on these two questions shall not downplay the myriad of other actors involved in this process, such as intergovernmental organizations (IGO), non-governmental organisations (NGO), transnational networks, like the C40 Cities Climate Leadership Group, transnational corporations, science, or sub-national and local governments. These are all highly relevant as current developments in the Unites States illustrate, again. State governments and companies have publicly announced to take climate change mitigation action despite the plans of the administration under President Trump to withdraw from the Paris Agreement.

A whole body of research is devoted to this multiplicity of actors that emerged along with the concept of multi-level governance (MLG, e.g. Bache and Flinders 2004). The common denominator here is the argument that environmental (or climate) governance - once

'dominated by interactions among nation-states' (Andonova and Mitchell 2010, 256) - has been replaced by a fragmented governance system (Biermann et al. 2009) or regime complex (Keohane and Victor 2011), where private and sub-national actors play a major role. In this vein, manifold studies investigate various aspects of this development. For example, scholars study the role of transnational networks (Lidskog and Elander 2010), environmental NGOs, business, scientific or epistemic communities, or mass media (Gough and Shackley 2001; Schroeder and Lovell 2012). Others, focus on the interplay between actors from different levels of governance, like sub-national or local administrations (Betsill and Bulkeley 2006; Granberg and Elander 2007; Schreurs and Tiberghien 2007).

These developments are undoubtedly important, but will not be stressed in this very thesis. It rather emphasises on countries and their national governments. With the Paris Agreement of 2015, which is based on the principle of self-determination of national contributions, this perspective has again grown in importance, as the success of the agreement depends on the enthusiasm of the countries involved and their readiness to implement domestic mitigation measures.

The thesis assumes that climate policy is constrained by both the dynamics of the international relations and the policy positions, interests, and characteristics of the involved actors at national scale. At the international level, on behalf of their very governments, country negotiators drive a hard bargain for national interests at the international climate conferences to satisfy domestic pressures. They make emission reduction pledges and coordinate actions or strategies with other countries. At national scale, governments and sub-governments are responsible for the implementation of these pledges or policies. The difficulty arises, as climate policy is also a cross-sectional matter that affects actors from many policy domains. National governments must, therefore, negotiate with domestic stakeholders that pursue competing interests. Hence, national governments are involved in what political scientists typically refer to as a 'two level game' (Putnam 1988). The connection between the international and national arenas of decision-making refers to the concept of the so-called 'win-set'. The 'win-set' of a country at international scale largely depends on what is politically feasible at national scale and how likely an international treaty may be ratified. Having their hands tied to the domestic will, negotiators enter international negotiations in a restraint fashion.

So far, empirical studies focusing on climate policy-making at the intersection of the international relations and national policy are either cross-sectional (e.g. Broadbent 2010; Dolšak 2009; Schreurs 2004; Stein 2008), or if dynamic, entail predominantly analyses of single

cases (e.g. Ingold and Pflieger 2016; Schreurs and Tiberghien 2007). In general, quantitative studies of the politics of climate change in a dynamic perspective remain scarce and focus on single case studies (Ingold and Fischer 2013) or have a limited focus on the climate negotiation process (Castro, Hörnlein, and Michaelowa 2014; Santos and Pacheco 2013). In addition, dynamic studies often face a lack of available time series data or provide only very limited systematic analyses on the relevant policy processes. This dissertation takes up these challenges by combining a dynamic large-N analysis with the in-depth investigation of an individual case study.

The thesis is conceptualised as a cumulative dissertation, which consists of four papers. As Figure 1 shows, Paper 1 and 2 concentrate on international relations and the following on national politics. Paper 1 responds to the first research question and identifies factors that explain the motives for national governments to engage in cooperative interactions to coordinate their climate change mitigation actions. The theoretical approach laid out in this paper builds on important axioms of theories of the international relations, like reciprocity (Goldstein et al. 2001; Keohane 1986) or structural equivalence (Maoz et al. 2006), and combines this with an emphasis on country-specific interests (Sprinz and Vaahtoranta 1994), like they arise due to individual political, socio-economic, or geographical circumstances. The remaining three papers approach the second research question. Paper 2 attempts the question from a macro-level perspective. It conducts a large-N analysis to explain general patterns that trigger or hinder the adoption of national climate change mitigation policies and their diffusion across countries over the past 20 years. In close connection to previous empirical and theoretical advances in the policy diffusion literature (e.g. Dolšak 2009; Gilardi 2012; Mohrenberg 2017), it elaborates on an improved operationalisation of the international interdependencies that are an important factor to explain the propagation of policies.

Paper 3 and Paper 4 are devoted to an in-depth analysis of a single case to assess paradigmatically factors that influence the formulation and implementation of national climate change mitigation policies in an ever-changing international environment. I selected Switzerland as case study, because Switzerland is highly dependent on international markets, policies, and other critical political developments. At the same time, this country is highly vulnerable to climate change, due to its Alpine geography. Therefore, its climate policy is formulated closely considering international developments. The Federal Act on the reduction of CO_2-emissions (CO_2-Act) is the centrepiece of Swiss climate change mitigation policy, providing its main regulatory framework. In 1999, a first version of the CO_2-Act entered into force, which was supposed to implement the Kyoto Protocol requirements and targets. In

2008, the revision process of the CO_2-Act started to set up a new legal basis for the Post-Kyoto phase. The aim of the revised act was to formulate new reduction targets for this period and to decide on adequate policy instruments. The main purpose of the current revision of the CO_2-Act that started in 2016 is to translate the international commitments made in the Paris Agreement into national law.

Figure 1: Conceptual Overview of the Thesis
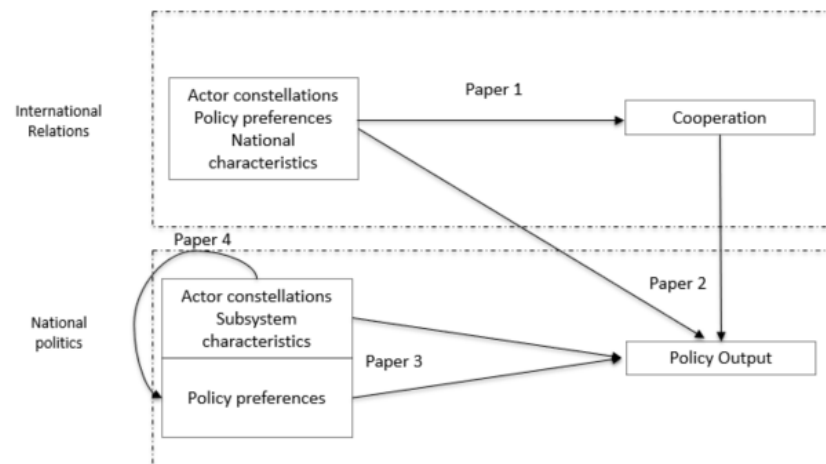
Previous research on Swiss climate policy focuses on different issues, such as the use and non-use of particular policy instruments like the climate cent (Bahn 2001; Ingold 2010) or voluntary instruments (Baranzini and Thalmann 2004; Niederberger 2005). These studies have made a vital contribution to the apprehension of the decision-making processes and the effectiveness of specific policy instruments. Moreover, the work of Ingold and colleagues gave valuable insights into the important role of actor constellations and policy networks to understand policy choices. They assessed the configuration of advocacy coalitions (Ingold 2007; 2010; 2011), the patterns of collaboration between and among them (Ingold and Fischer 2013; Ingold and Leifeld 2014), and the role of individual political actors in their functions as policy brokers, veto players (Ingold and Varone 2011), and policy entrepreneurs (Ingold and Christopoulos 2015).

Both Paper 3 and Paper 4 join this literature and extend it in two fundamental aspects. Paper 3 investigates the policy-process to implement and revise the CO_2-Act in a very detailed fashion. By identifying major protagonists and the prevailing actor constellations, it contributes to an increased comprehension of how the interplay between different actors affects policy decisions. It uses structural explanations such as the endemic decision-making

style or characteristics of a subsystem to explore the conditions under which policy innovations are possible. Specifically, it provides a comprehensive portrayal of the developments in Switzerland´s climate change mitigation policy-making that also critically assesses the recent developments with respect to their political feasibility. Paper 4 elaborates on one of the crucial findings of Paper 3, namely the decisive position that interest groups occupy in the decision-making process. Specifically, it analyses the patterns according to which interest groups formulate their policy positions. In doing so, the analysis tackles a question that is usually overlooked. Most policy studies treat policy preference or policy beliefs as given and use them to explain collaboration (Ingold and Fischer 2013; Ingold and Leifeld 2014), policy change (Henry 2011; Henry et al. 2014), or coalition structures (Ingold 2011; Kukkonen, Ylä-Anttila, and Broadbent 2017). In contrast, this research creates a discourse network about the revision process of the CO_2-Act to explain how interest groups form their preferences as a function of fundamental value orientations, sector-specific needs, and the interest of others.

2. Analytical Framework

A general assumption of this thesis is that the decision to interact, to adopt a policy, or to support or to restrain a specific policy option is relational. Hence, political actors are in general assumed to be interdependent. Coordination, cooperation, or conflict – all involves interaction. National or sub-national policies are adopted in consideration of the behaviour of other authorities. Policy-decisions are not made unilaterally, but in a process, that involves the participation of multiple actors at various levels of governance. Also, policy preferences are formed and adjusted considering overall societal norms, in accordance to the interest of allies, or because of mutual adjustments to find a compromise solution. This relational perspective is more and more taken into account in the political sciences literature. In a public policy context, usually in the form of policy networks or policy discourse networks and in the international relations literature as political networks.

Numerous scholars have tried 'organizing the Babylon' (Börzel 1998) of the policy network literature, as yet. In an encompassing meta-analysis of policy network studies, Schneider and colleagues (Schneider et al. 2009) identified more than 20 overview articles already in 2007. Since then, a number of articles elucidated the research area. Older overview articles typically assessed the analytical and theoretical value of the policy network concept beyond mere metaphorical or descriptive applications (Börzel 1998; Dowding 1995; Héritier 1993; Pappi 1993; Thatcher 1998). In contrast, newer summaries explicated its wide scope of applications without questioning its explanatory power to the same extend (Adam and Kriesi 2007; Kenis

and Raab 2007; Knoke 2011; Schneider et al. 2009). The following section is no re-edition of these meta-analyses. More importantly, it serves to locate this dissertation within this inscrutable research area. In doing so, it briefly overviews the major strands of the vast literature on policy networks and justifies the application of the concept for each of the four papers.

Policy networks: A Janus-faced concept

The literature on the policy network concepts suggests three main streams. First, comparably dated literature uses policy networks to describe government and governance styles and actor constellations among the political elites. Whereas some authors develop typologies to describe coordination among different actor groups (Coleman and Perl 1999; Heclo 1978; Marsh and Rhodes, R. 1992), other researchers, in the tradition of the governance literature, use policy networks as metaphor for coordination mechanisms and actor relations in modern governments (Dowding 1995; Klijn and Koppenjan 2000; Mayntz 1993; Pappi 1993; Scharpf 1997; Scharpf 2006).

Second, more recent literature studies and highlights the methodological value-added of social network analysis for the comprehension of social and political phenomena. These advances encompass technical descriptions of methods (Lubell et al. 2012; Robins, Lewis, and Wang 2012) and possible applications in political sciences (Victor et al. 2016).

Finally, the by far largest body of research uses the policy network concept as an analytical framework that can be enriched with hypotheses from different theories by applying tools from social network analysis. For example, Lubell et al. (2011) combine belief systems and social capital theory to explain the participation in the case of regional planning in California. In a similar vein, a community of researchers use hypotheses from the advocacy coalition framework to explain the roles of various actors in policy processes by using the network analysis tool-box (Fischer et al. 2016; Henry et al. 2014; Ingold and Christopoulos 2015; Ingold and Fischer 2013; Ingold, Fischer, and Cairney 2016; Ingold and Leifeld 2014; Kukkonen, Ylä-Anttila, and Broadbent 2017; Varone et al. 2017). Related literature that is in the tradition of the Lauman and Knokes 'Organisational State' (1987) studies the role of political interest groups through the lens of policy networks (for an overview compare Heaney and Strickland 2016). These studies address questions of interest group formation (Hadden 2015; Heaney 2006; Padgett and Powell 2012), development and identity formation (e.g. Browne 1990; Engel 2007; Halpin and Daugbjerg 2014; Heaney 2004), patterns and prerequisites of collaboration (Carpenter 2010; Laumann and Knoke 1987; Leifeld and Schneider 2012), and

their general influence in the democratic process (Baumgartner, 2009; Varone et al., 2017). To conclude this list of applications of the policy network concept, the emerging literature on discourse networks must be mentioned. Akin to the 'argumentative turn' (Fischer and Forester 1993) in the policy analysis literature, discourse network analysis (Leifeld 2009; 2016; Singer 1993) has evolved and long with it a number of interesting contributions (Anttila and Kukkonen 2014; Fisher, Leifeld, and Iwaki 2013; Fisher, Waggle, and Leifeld 2012; Kukkonen, Ylä-Anttila, and Broadbent 2017; Leifeld 2013). With respect to climate change politics, the international research project COMPON (Comparing Climate Change Policy Networks, http://compon.org/) needs to be named that conducts both media discourse and policy network analyses in 19 countries.

The use of political networks in international relations literature gained momentum in the early 2000s. Current applications utilise social network analysis to test core hypotheses related to interstate conflict and cooperation (Corbetta 2013; Corbetta and Grant 2012; Dorussen and Ward 2010). Other advances exploit concepts of the network theory to explain typical phenomena in the international relations, such as homophily and preferential attachment (Maoz 2012), centrality (Maoz et al. 2004), or structural equivalence (Maoz et al. 2006). In addition, the network approach is applied to the exploration of effectiveness of environmental regimes (Grundig and Ward 2013; Ward 2006), to compare cooperation patterns in international regimes (Grundig 2006), or focus on the role of international organisations in the evolution of international conflict (Hafner-Burton and Montgomery 2006). Finally, a small number studies focuses on international climate politics. For example, Compston (2009) uses policy networks as analytical framework to develop a theory of resource exchange in climate policy. In contrast, von Stein (2008) uses network centrality statistics to explain the ratification of the UNFCCC and Kyoto Protocol.

The Network Approach in this Thesis

This thesis uses the network approach both as analytical framework and as method. This approach is affiliated to modern theoretical perceptions that understand policy-making as a processes of interdependent interactions, in contrast to treating its components as autonomous entities (Lubell et al. 2012). Network analysis is advantageous in particular for empirical studies on relational observations, since it allows for dependencies between the observations. In contrast, in traditional linear regression models the observations need to be independent. This core assumption of regression analysis raises a question for empirical analyses in political sciences, public policy, or international relations as many political events

are in fact relational, but treated as if they were independent. Often interdependencies are included by controlling for relations between the observations (e.g. spatial proximity, common membership in an institution, number of meetings per year etc.). Nevertheless, if appropriate network data is available, it is usually advisable to rely on network models that can deal with dependencies between the observations. In addition, by introducing so-called network statistics one is able to infer behavioural patterns from the network structure, for example, the propensity of actors to form clusters, to connect to popular individuals, to tie to actors with similar characteristics, or to adapt the own behaviour in accordance to actors with similar characteristics.

Figure 2 shows that policy networks structures are located between the macro-level of institutional arrangements, such as rules, norms, procedures, or the code of conduct in a policy domain and micro-level of the individual political actor. In this context, two crucial distinctions have to be made: is the focus on social selection or social influence (or both), and is the network treated as a dependent or independent variable. First, in social selection models the tie or tie formation (relation) is the main dependent variable, which is explained by the characteristics of the actors and by the structure of the relations in a network.

Figure 2: Policy networks as Meso-level Concept
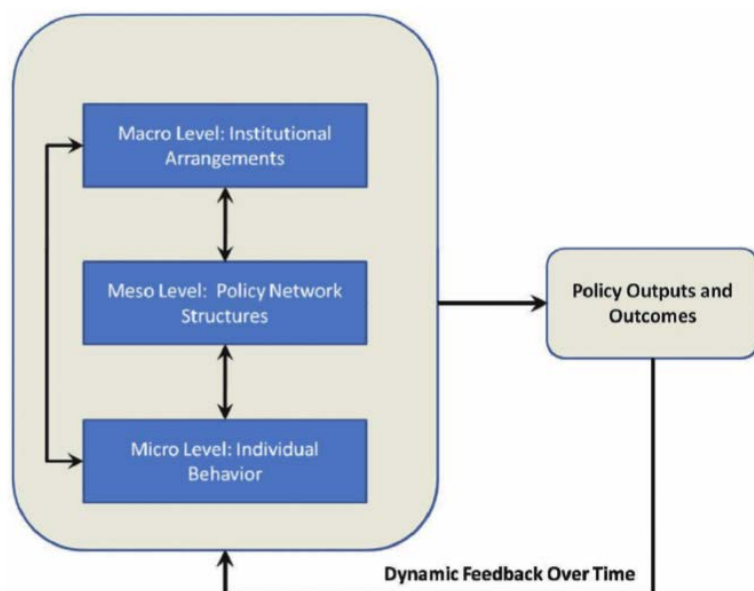
Source: Lubell et al. 2012, p. 354

Paper 1 and 4 are in line with this approach. Paper 1 draws on policy preferences and country-specific characteristics (micro-level), such as the GDP, natural rents, institutional factors, and vulnerability to explain the motivation to engage in international, cooperative

interactions. In addition, present events are assessed based on the structure of the past events to derive behavioural patterns, such as inertia, reciprocity, structural balance, or structural equivalence. Paper 4 studies why interest groups support specific policy preferences. In doing so, it regards the connection between an interest group and policy statements made in the context of a policy debate as a tie in a discourse network. Applying an inferential network model allows to investigate this question by using the structure of the policy debate and characteristics of the interest groups as explanations for how policy preferences are formed. Secondly, in social influence models the main dependent variable is a specific characteristic or behaviour of a social actor that is explained by the characteristics of the actor or other actors, and the existing ties in the network. Paper 2 studies the climate policy adoption behaviour of national governments. The adoption behaviour of other countries are used as an explanatory variable next to national characteristics. Hence, both social selection and social influence models combine actor-specific and structural characteristics of the observed relations in a single model. Finally, the network structure can also be used as an independent variable to explain policy output. In Paper 3, the climate policy subsystem in Switzerland is operationalised as a network to inform about changing actor configurations, for example whether power is in the hands many or few and on the innovation potential in the policy subsystem.

3. Contribution

The contribution of this thesis is threefold: it presents three data sets for relational data on political processes and analyses them with innovative methods, puts forward a valuable theoretical advancement by pointing to future research areas, and provides a number of interesting practical implications.

Data & Methods

Political science is often about relations – a network perspective on international relations, domestic politics, or public policy-making is therefore often the best way to approach research questions. But, how to collect appropriate data? The majority of research that uses social networks relies on the survey method (e.g. Berardo and Scholz 2010; Ingold and Fischer 2013; Kukkonen, Ylä-Anttila, and Broadbent 2017). Participants of a social network are a priori pre-determined and then asked with whom they share a specific relation, such as collaboration or conflict, resource or information exchange, asking for advice, and others. This approach has a number of drawbacks depending on how well the network survey was constructed (Henry, Lubell, and McCoy 2012). The initial problem arises with the pre-selection of actors, which

depends on the awareness and attitude of the researcher. As a result, important actors might be missing in the network data set. Furthermore, self-reported perceptions about the ties can be inaccurate or incomplete. For example, the comprehension of the nature or strength of the relation may vary among the survey participants. While one actor considers a relationship collaborative, the other actor might perceive it as a mere exchange of information. Whom shall we count on? On top, many network surveys are incomplete due to a lack of severity among the participants. All these issues lead to a biased representation of the network relations.

Similarly, it is complicated or sometimes even impossible to reconstruct historical processes in a survey situation, as this requires conducting a continuation of surveys to follow up. This is not always possible. In some cases, the researcher might not be interested in the topic anymore; in other cases, the respondents are not willing to participate in a similar survey again. In the latter case, a sequent survey may differ with respect to the coverage of the respondents, what makes a comparison difficult. Conducting a survey can be time consuming and costly in particular in large-scale settings. For example, constructing a survey about the relations between intergovernmental organizations may require the researcher to travel to headquarters and arrange interviews to ensure an acceptable response rate.

Finally, surveys are difficult to replicate, as survey responses also depend on the individuals filling in the questionnaires. These individuals may also change their opinions over time. In consequence, studies based on network surveys are usually limited in scope and mostly focus on small-scale policy processes at the national, sub-national, or local level mostly at a single point in time.

This thesis counts on an alternative approach to collect network data, based on document analysis, like official documents or press releases. Relying on documents allows reconstructing historical data that do not depend on response rates. It improves the replicability, ensures that answers are independent from the individual respondent and it is comparably cheap and time efficient. Nevertheless, one should be aware of some problems, too. The network data may be biased by the coding scheme applied. Based on their knowledge or theoretical orientation researches may come up with different coding frameworks leading to different data sets on the same relations. Even if the coding is done based on the same coding framework, issues of intra or inter coder reliability may arise. Also, the choice of the data sources can lead to biases in the network data, in particular if their selection is unilateral. However, the main advantage of this data collection approach is the possibility to collect large-

scale data sets and to reconstruct historical developments. These advantages are the main reason for this thesis to use network data based on document analysis.

I created three different data sets. The first data set was developed in close collaboration with Christian Hirschi. He collected the first version of the POLCLIMATE event data set (Hirschi 2008), which was then elaborated on in the scope of this thesis. To code the network data, we relied on press releases issued by the Agence France Press (AFP) media wire service. The coding was done automatically using the software TABARI (Textual Analysis by Augmented Replacement Instructions Schrodt 2011). After several rounds in which the software had to be trained to recognise important actors or common verbal expressions used in a policy domain, the coding of an extensive amount of text is done in only a few minutes. The coding framework is based on the CAMEO (Conflict and Mediation Event Observation, Schrodt 2012) cooperation and conflict scheme, which was created to analyse violent, international conflicts. In consequence, the challenge was to adapt the coding scheme to the purpose of international climate policy. The data set captures conflictive and cooperative events related to the international climate change mitigation policy between 1995 and 2015 and includes a wide range of actors, such as national governments, sub-national governments, IGOs, NGOS, media actors etc. It also covers a wide array of different types of cooperative or conflict events. Cooperation, as well as conflict often start in a declarative way, for example, by praising or criticizing the behaviour of countries, like the release of a new policy, a political reform, or the general climate performance. Moreover, cooperation comes about when two countries meet to discuss each other's plans on national climate policy, but it also deals with appealing, offering, or providing material cooperation, such as economic and judicial support, exchanging information, involving in diplomatic interactions, providing financial or human resources, and sharing knowledge. Finally, cooperation involves easing sanctions, solving disputes, mediating, and apologising. In contrast, conflictive interactions involve critical comments related to other country's climate policy, denying responsibility, rejecting cooperation or negotiations, threatening with or getting involved in substantial conflict. For a more detailed description of the data set, the coding framework, the data collection process, and validity issues compare Paper 1 and Hirschi (2008). The main asset of the POLCLIMATE data set is its large-scale nature both in terms of the time span and the scope of actors considered. In addition, as the data set was coded in an automated setup, the coding framework only needs some adjustments to extend the time period under investigation. Finally, the coding scheme has the potential to be applied to other topics related to international environmental policy. This offers appealing opportunities for future research.

The extended POLCLIMATE data set was used for Paper 1 and Paper 2. Paper 1 applies a Relational Events Model (REM, Lerner et al. 2013). This cutting-edge inferential social network model is ideally suited to disentangle explanatory factors of dyadic events, over time. This model allows to investigate the dynamic formation of interactions over a period of time. The main assumption is that every event depends on the stream of previous evens. These dependencies are represented by parameters that reflect patterns in the structure of the event sequence (e.g. reciprocity, structural balance, or structural equivalence). Both network statistics and actor characteristics are used as independent variables to explain the emergence of the next dyadic event. For this analysis, the event data set was restricted to interactions between national governments. To this day, and to the best of my knowledge, there is no comparable publication that studies this kind of international political interactions related to climate policy, covering a period of twenty years.

Paper 2 studies factors that trigger the adoption of climate policies and their international diffusion. Specifically, a temporal network autocorrelation model (Leenders 2002; Leifeld and Cranmer 2016) is used to test hypotheses on distinct factors that might lead to the adoption of climate change mitigation policies. The event data set on political interactions between 1995 and 2015 is the foundation for this analysis. Here, the stream of dyadic events was divided into four subsequent time phases and restricted to cooperative events, only. Transformed in an actor-actor matrix and displayed as social network, the time phases contain aggregated information about all cooperative ties between countries in the respective phases. In contrast to Paper 1, where the event data set itself, i.e. cooperative interaction was the subject of study, in Paper 2 cooperative interaction is used to explain adoption behaviour in a network perspective. While the network approach gained importance in the policy diffusion literature (e.g. Cao 2010; Mohrenberg 2017), Paper 2 is the first endeavour to study the international diffusion of climate change mitigation policies using advanced methods of social network analysis. In contrast, previous studies in climate policy diffusion applied event history analysis and included country interdependencies by controlling for spatial proximity (Dolšak 2009; 2013; Dolšak and Sampson 2011).

The second data set developed in this thesis is related to the decision-making process about the implementation and revision of the Swiss CO2-Act between 2004 and 2013. The decision-making processes were systematised using the Actor-Process-Event-Scheme (APES, Serdült et al. 2012; Widmer et al. 2008). The APES tool is an interface that links relevant political actors to important events in the political processes. Based on a thick description of the decision-making process as reported in official documents actors are linked to political

events in which they commonly participate by manual coding. Examples of such political events are expert committees, parliamentary debates, consultations, decisions, statements, and so on. Therefore, single actors receive a different status within the policy process depending on how often and in which events they have participated. This allows investigating single stages of the climate policy formulation process and the role of specific actors therein. The APES tool helps to systematize this large amount of qualitative data and enables a quantitative analysis by clearly identifying the actor participating in a political event. This information is now displayed in a two-mode matrix, which can be transformed into policy network data (Widmer et al. 2008). The policy networks can be investigated with the help of tools and methods of social network analysis. The interpretation of the results is then enriched with detailed qualitative data. For more information, consult Paper 3. The advantages of this data collection method are the possibility to display policy processes over time and to combine quantitative methods with an in-depth qualitative investigation of the relevant processes and actors.

The final data set displays policy preferences of interest groups about the main issues discussed in the context of the revision of the CO_2-Act in a discourse network. By coding the 2009 public consultation about the revision of the CO_2-Act, a discourse network analysis is created to study policy positions of interest groups. So, what is the use of being concerned with discourse networks among interest groups? A policy discourse is defined as what political actors express to one another, or the public, in the process of formulating, implementing, and legitimating public policies. They encompass 'both a set of policy ideas and values and an interactive process of policy construction and communication' (Fisher, Leifeld, and Iwaki 2013). Accordingly, analysing policy discourses provides a deepened understanding of why specific policy decisions are made. In addition, policy debates or discourses are often decisive for political outcomes, as they predispose topics on the political agenda and the perception and evaluation of options by the public and political elites. (Leifeld 2016). The data set was coded using the Discourse Network Analyzer (DNA) tool developed by Philip Leifeld (Leifeld 2012). This software tool systematises hand-coded information about actors supporting or opposing policy statements and provides export facilities to create network data. Compare Paper 4 for more detail on the coding process.

Discourse network analysis (Leifeld 2009) obtains the rich analytical tool box from social network analysis. It examines political actors and their statements in a relational perspective. This does justice to the necessarily relational nature of policy discourses or debates. Instead of treating the reasons for why an actor takes on a certain position towards a policy as isolated

from other´s opinions and the discourse dynamics itself, discourse network analysis allows to include all possible explanatory factors in one approach ranging from actor characteristics to explanations grounded in the structure of the discourse. The latter are essentially issues of policy framing (clustering of policy issues) or policy coalitions (clustering of policy actors).

To test the outlined hypotheses on the drivers of interest group alignment in the climate policy discourse, an exponential random graph model (ERGM) for two-mode networks was set up (Lusher, Koskinen, and Robins 2013). ERGMs render the process of network tie formation (here the link between an interest group and a policy statement). In general, ERGMs 'have the explicit aim to relax the assumption of independence between network tie-variables and to incorporate possible dependencies among tie variables' (Lusher, Koskinen, and Robins 2013, 53). While the discourse network approach has been applied in a number of studies using descriptive methods, this approach for identifying the factors that influence the adoption of policy preferences and how they are interlinked is unique, so far.

Main Results and Theoretical Advances

The results for the first research question define the conditions under which national governments interact to coordinate their activities to mitigate global climate change. The research conducted in Paper 1 emphasises on bi- or multilateral political interactions that emerge on a daily basis beyond or in preparation of the yearly "Conferences of the Parties" (COP) under the umbrella of the UNFCCC. A key assumption is that the coordination of national climate protection measures or bargaining positions does not primarily occur in the closed setting of the climate conferences. It is a long-term diplomatic process that involves a gradual harmonisation of national policies culminating in the annual summits. Studying and understanding these processes is important, because the success of the climate conferences predominantly depends on the willingness of countries to negotiate. The more substantial "work" (e.g. settling disputes) is done beyond the COPs; their outputs are expected to be more effective. Often, the responsible presidency of a specific COP initiates this preparatory work. For example, France, among others did an impressive job prior to the Paris summit in 2015, by uniting the United States and China. This essentially contributed to the successful adoption of the Paris Agreement in 2015 (Brun 2016).

The results confirm and extend major axioms in the international relations literature. The analysis of the dyadic interactions of the past two decades has shown that cooperation ensues more often when countries disagree over important principles, policy objectives, or implementation procedures. Hence, cooperation arises from discord, not harmony (Keohane

1984). When countries are in harmony with respect to their policy preferences no adjustment of policies is necessary. Vice versa, when countries disagree over important aspects, they must coordinate their policies, thus they must cooperate.

Nevertheless, the need to cooperate in order to overcome disagreements does not suffice to ensure cooperation in an environment of insecurity about other country's behaviour. Climate change is a typical problem of shared resources, where free riding is omnipresent. Also, missing sanction systems in the UNFCCC framework increase the dilemma. In consequence, countries need trust in other countries to comply. Trustful relationships among countries prosper over time in the light of positive experiences and mutuality. Conversely, tit-for-tat strategies often escalate in international conflicts. Therefore, reciprocity is one the core concepts discussed in many international relations theories (Axelrod 1984; Keohane 1986; Larson 1988). The findings of this thesis invigorate the importance of reciprocity in international climate politics. National governments show an increased likelihood to engage in cooperative events, when they share a history of mutuality.

In addition, the results highlight on structural equivalence, another important concept deliberated by the international relations literature (Burt 1982; Hafner-Burton and Montgomery 2006; Maoz et al. 2006). Two social actors are said to be structural equivalent if they exhibit similar or equal patterns of relations to other actors. The structural equivalence theory of international conflicts predicts that two countries with shared allies and opponents share, ceteris paribus, similar conflicts. Indeed, in the climate context, national governments seem to erect their cooperative relations primarily to countries that are structurally similar, i.e. to countries that cooperate or fight in a comparable manner. This points to the tendency of countries to organise themselves in homophile structural blocks with an increased propensity to coordinate policies and positions within them and a decreased likelihood to coordinate with actors outside their own block.

However, the analysis reveals major changes in the behavioural patterns, over time. The Copenhagen climate summit of 2009 was a turning point in the international climate negotiations and abruptly ended a phase of intense international interest in the climate change problem. The conference was the final stage of two years of negotiations towards a follow-up agreement to the Kyoto Protocol of 1997, which defined legally-binding GHG emission reduction targets for industrialised countries (Annex I countries) to be reached by 2012, but did not contain comparable obligations for developing countries (non-Annex I countries). Instead of producing a convincing strategy and new binding targets for the next commitment period starting in 2013, 'insurmountable discrepancies of interests between

negotiation partners' (Blühdorn 2012, 12) were revealed. Controversies arose over the responsibility of emerging economies to reduce their swelling carbon emissions and the rigid divide of the world in Annex I and non-Annex I countries that did not account for the changed socio-economic realities. In fact, many industrialised states criticised that emerging economies, like Brazil, China, or India, were still classified as non-Annex I parties and refused to pledge to any further commitments until these countries would also take up their responsibility. In contrast, the majority of the developing world insisted on the industrialised world to carry the main burden in terms of cutting down GHG emissions, providing financial and technical support to developing countries to adapt to climate impacts, and compensating for ensuing losses and damages. Ultimately, the irreconcilable positions climaxed in the meagre output of the Copenhagen summit that was at best a modest declaration with the intention to take further actions in the future. Nevertheless, 2009 also remarked the begin of a new era in the climate negotiations that paved the way for a novel agreement (Brun 2016). In the years to come, the international community step-by-step abolished the strict divide as introduced by the principle of 'Common But Differentiated Responsibilities' (CBDR, United Nations 1992) and developed new mechanisms related to climate finance, adaptation, monitoring, and transparency. The most important innovation is the introduction of the principle of self-determination of national contributions. Instead of imposing pre-determined reduction targets on a specific group of countries, the Paris Agreement obliges all countries to formulate their own contributions.

These developments are also reflected in the results of this thesis. Prior to Copenhagen, national governments more actively interacting with countries that disagreed over the CBDR principle. With the iterative disentanglement from the rigid Annex I/ non-Annex I division in the aftermath of the Copenhagen summit, implementation issues gained importance. Among them measures to ensure the commitment to the international agreement, the design and use of flexibility mechanisms, approaches to reduce asymmetries across countries such as adaptation aid, finance or loss and damage, or the application of technological solutions to mitigate climate change. Now, countries got increasingly involved in cooperative interactions after disagreeing over these issues. In addition, the Copenhagen shock was apparently large enough to dismantle the tendency to interact with structural equivalent partners. In fact, the results indicate that national governments started to progressively cooperate across the homophile building blocks that have dominated international climates politics before 2009. These findings also speak to a small number of studies that demonstrate the empirical applicability of the punctuated equilibrium framework to the empirical enquiry of

international regimes (Colgan, Keohane, and Van de Graaf, Thijs 2012). It shows that institutional innovations, like the shift from the top-down approach of the Kyoto Protocol that imposed emission cuts to a selection of countries, to the bottom-up approach of the Paris Agreement that allows countries to formulate their own pledges, have the power to gradually change gridlocked behavioural patterns. This is good news. However, future research must keep track with old and new controversies that have the potential to stagnate the international process, such as the recent debate on Loss and Damage, as well as new arrangements that might lead to the consolidation or institutionalization of conflicts hampering the urgently needed progress to combat climate change. This phenomenon is discussed in literature in the context to effectiveness regimes (Castro, Hörnlein, and Michaelowa 2014). Artificially introduced divisions over core conflicts may lead to a gradual deepening of the divide seriously endangering the success of an environmental regime.

In the context of the second research question, this thesis investigates the conditions, under which national governments adopt climate change mitigation policies from three different angles. The first perspective explores the role of international interdependencies and is therefore closely connected to the above outlined findings. Countries cooperate if they disagree over important contestations in order to bring their positions in the international climate negotiations in line and to coordinate national climate protection measures. As a result, countries that increasingly cooperate are more likely expected to adopt similar policies at national level. If governments regularly exchange information about their programs, negotiate activities, or settle disputes, they develop trustful relationships in which they exert influence on each other through a process of communication and comparison. Even in the absence of these close relationships, national governments must consider the policy positions and activities of other countries. In a policy domain that is prone of free-riding, ambitious solo runs can be costly due to relative losses and competitive disadvantages. Conversely, ambitious initiatives from other actors, especially if they are in similar structural positions, may increase the social pressure to emulate to social norms, thereby setting an incentive to implement policies.

In this context, Paper 2 promotes a dynamic network analysis of political interaction, using a subset of 99 countries (including the European Union) to reveal general patterns connected to the adoption and diffusion of national climate change mitigation policies in the past two decades. The theoretical argument elaborates on the 'unified model of government innovation' (Berry and Berry 2014) that includes internal and external determinants to explain the adoption of national policies. Internal determinants include the intrinsic motivation of a

country to adopt mitigation policies, the available resources or the capability of a country to adopt respective measures, or the existence of other related policies. External determinants determine the relationships to other countries. In many diffusion studies, these factors are operationalised through variables like spatial proximity, the membership in an international organisation, trade relations, and so forth. Only recently, a small number of studies started to explain diffusion processes by using the social network perspective. The analysis conducted in Paper 2, however, is the first approach that uses political interactions as a proxy for interdependencies in the climate policy realm and therefore provides an improved and more accurate operationalisation of interdependencies, compared to previous studies. The biggest advantage of this approach is that it accounts for changing political circumstance, as interactions between countries evolve over time. The interdependencies can be operationalised in different ways, for example as direct relations, indirect relations, time-lagged variables that capture past relations, or structural equivalence. The results underline this consideration. Internal determinants and time-invariant external factors explain the adoption of climate policies on a purely general level. In the dynamic perspective, they lose their explanatory power. Due to specific national circumstances, some countries are more or less incentivised to implement climate protection measures. Examples for national characteristics that affect the likelihood of a country to adopt climate policies are prevailing the energy mix of a country, its vulnerability towards climate change, or the strength of environmental organisations. However, these internal factors, as long as they do not change over time, cannot explain the changes in the policy adoption behaviour of a country, over time. In addition, the diffusion of policies is a relational process, for an accurate understanding of which both the time and network perspective is needed. The propensity for a country to adopt climate change mitigation policies rises, if it repeatedly engages in cooperative interactions with, or is structural equivalent to, a country that has implemented comparable policies.

The second perspective focuses on the conditions under which national governments adopt climate change mitigation polices at national scale. For this purpose, Paper 3 conducts an in-depth case study of Switzerland's climate change mitigation policy by reconstructing and analysing the decision-making process related to the implementation and revision of the CO_2-Act between 2004 and 2013 with focus on the carbon levy on combustibles and motor fuels. In doing so, this paper contributes to the important, puzzling, and so far, open question of why it was possible to introduce a carbon tax on combustibles, already a decade ago, whereas the carbon levy on motor fuels continues to be unsuccessful. On a more theoretical level, it

discusses under which circumstances policies are feasible and investigates the likelihood for policy innovations in dependence of the prevailing actor constellations.

A two-step approach, that combines a qualitative case study analysis with a quantitative policy network analysis, showed what political actors have been influential in the different stages of the decision-making process and how this has changed over time. The main theoretical argument is that both the decision-making style and policy subsystem structures significantly determine the policy instruments selected (Adam and Kriesi 2007; Fischer 2014; Howlett 2002; 2007). The analysis is based on a 'thick description' (Serdült et al. 2012) of two important phases in the evolution of the CO_2-Act. The implementation phase between 2004 and 2008 and the revision phase between 2008 and 2013. In both phases, a carbon tax on motor fuels was almost introduced. Both times, it was prevented due to lobbying by the business and energy.

The first step of the analysis dealt with the decision-making process in a longitudinal perspective. It explored which actors were involved in what stages and for what purpose. The results show that the involvement of many actors in the decision-making process prompts compromise solutions, as manifold interests must be balanced out. This is typical for policy environments that are characterised by low complexity, yet high constraints (Howlett 2007). The analysis illustrates that this was the case for Swiss climate policy during the time under investigation. The complexity was low, as the problem was already defined and well known. The key parameters of Swiss climate policy were already set by the international developments in the context of the UNFCCC, but also by the CO_2-Act that determined policy objectives and policy instruments. The revised act of the CO_2-Act between 2008 and 2013 was influenced by international developments to a much lesser extent. During this time, the pressure softened, as there was no treaty that had to be implemented in national policies. It was very interesting that despite the clear-cut boundaries during the implementation of the first act, a much more innovative policy output could be observed. In fact, with the climate cent, the oil association very creatively circumvented the introduction of a carbon levy on motor fuels before it even went into the parliamentary process. Conversely, during the revision, the carbon levy almost made it to the final version of the new act if economiesuisse had not threatened with a referendum that endangered the new act, altogether.

The second step of the analysis is devoted to this puzzle. It explains the different innovation potential prevalent in the two phases by changes in the structure of the climate policy subsystem over time. During the implementation phase between 2004 and 2008, many actors from different levels were active in the climate policy subsystem. The network indicators, such

as the density of the network (i.e. the numbers of ties in relation to the number of possible ties), centralisation (i.e. the overall trend of a network to be star-shaped or fully connected), centrality statistics (i.e. the importance of single actors) indicated that the power structure was rather fragmented across various types of political actors (Borgatti, Everett, and Johnson 2013). This increases the innovation potential in the policy subsystem, as more ideas from a greater number of actors have a realistic chance to get on the political agenda. For the revision phase between 2008 and 2013, the selected network indicators point to a more centralised power structure with a small number of actors, mainly from the administration and the business sector. Accordingly, the innovation potential should be lower. The empirical findings support this. In fact, while a real policy innovation prevailed with the climate cent, the revised version of the act did not comprise any real novelties. It was just about a continuation of the first version of the act, with intensified reduction targets. It sustained the carbon levy on combustibles and replaced the levy on fuels with a compensation mechanism on oil imports, a policy instrument that was already envisaged ahead.

Paper 3 develops an innovative analytical framework for investigating the link between structural components, i.e. power structures in a policy subsystem, decision-making styles, and the policy output. The framework combines a qualitative description and examination of two important policy processes related to the formulation and implementation of Swiss climate policy over a decade. This provided insight into details of the decision-making process, which would not have been possible through just a quantitative analysis. Combining it with a quantitative analysis of actor and policy preference structure prevented it from getting lost in myriads of details and lose track of the essentials. Hence, the utilised mixed methods approach benefits from the advantages of both qualitative and quantitative tools. Finally, Paper 3 belongs to a small group of policy analyses that use the network structure as independent variable to explain policy change (Bresser and O'Toole 2005; Fischer 2014; Sandström and Carlsson 2008; van Beuren, Klijn, and Koppenjan 2003).

Finally, the limelight is on a crucial important actors group. Interest groups are not only important actors in Swiss politics (Kriesi and Trechsel 2008), but especially in climate policy (Ingold 2011; Ingold and Christopoulos 2015). In contrast to weaker parties in Switzerland, interest groups are more coherently structured and well appointed with financial resources and personnel. As Paper 3 shows, they played a key role in the legislative process, particularly in the pre-parliamentary phase, and during policy implementation. They decisively influenced the policy output by advocating for their specific interests. Therefore, it does matter, how they position themselves in the context of policy-making.

The results display that if we examine a general level of the policy debate (i.e. general positions related to the ambitiousness of climate policy and the preferred policy instruments); interest groups align with the traditional left versus right cleavage. This is backed by other studies, which find that interest groups tend to align with party politics and the respective political cleavages (Bruycker and Beyers 2015; Klüver 2012; Lowery et al. 2015). Whereas business interests align with conservative, Christian-Democratic, and liberal parties, non-governmental organizations (NGO) align with left, social-democratic, and green parties. However, the results indicate that the rightist side of the cleavage is comprehensively split over the climate policy issue. In particular, more progressive business groups and energy organisations with focus on renewable energies tend to support a more ambitious climate policy. These actors tend to adopt more middle ground positions and are therefore possible policy brokers. In addition, this paper highlights the importance of a further cleavage between the winners and losers of globalisation that seems to be important for the alignment of interest groups in relation to climate policy (Kriesi et al. 2006). However, the analysis also shows that a perspective that merely focuses on political cleavages has limitations. In contrast, on the more detailed and technical level of the policy debate, interest groups position themselves more towards the needs of their policy niches and follow opinion leaders. While it is reasonable to formulate general policy positions along fundamental value orientations, more information is required on the detailed and technical level of a policy. Acquiring this information is costly and requires resources. As interest groups are unevenly appointed with resources they can afford advocating for their policy positions, many less inclined groups will adopt the policy positions of others that are more involved in the policy-making process.

Policy Implications

The empirical and theoretical findings of Paper 1 and 2 underline the importance of the international climate regime of the United Nations. Despite the many-voiced critique on the UNFCCC and its related institutions, agreements, and the negotiations process, it sets an institutional framework where countries regularly meet and are forced to interact. We have seen in Paper 1, that iteration and reciprocity strengthen cooperation over time and that cooperation is necessary to coordinate climate policies. In addition, Paper 2 demonstrates that countries implement more national climate policies if they cooperate with other countries that too adopt climate protection measures. This argument is very similar to the reciprocity finding from Paper 1. If a country learns that other countries comply with the international climate protection regime, they are more likely to comply themselves. Repeated and reciprocated interaction between countries reduces free-riding behaviour, due to the

increased social control in the absence of powerful sanction mechanisms. Also, the international process creates awareness of the climate problem among governments and the general public. It is, therefore, increasingly difficult to diminish. In this process of continuous interaction, countries also compare with each other to understand what they do in terms of climate policy, especially when they share similar backgrounds. Moreover, direct interactions create a channel for communication and policy learning. The international climate regime facilitates all these processes by creating a common forum for regular meetings and negotiations, dealing with disputes, exchanging information, and so on. Therefore, even if climate negotiations fail to deliver effective agreements, they create a forum that fosters cooperation among countries and increases the likelihood for the adoption of climate policies. In this context, the presidency of the COP has a special responsibility to unite conflictive parties and solve conflicts prior to the summits.

Paper 3 shows that introducing a carbon levy on fuels was and is politically not feasible in Switzerland, due to the powerful interest groups in the climate policy subsystem. Business, energy, and traffic organizations that represent a large share of the electorate, are among the most active and prominent actors in both policy processes at hand. In contrast, the industry that is the most affected target group of the carbon levy on combustibles, is less active in the policy process. The industry lobby is less appointed with human resources, which is the main factor for successful lobbying. In addition, they are not backed up by the electorate in a direct way, but are often considered evil by the general public. The lack of resources probably explains the late reaction by industry representatives in the implementation phase. Whereas the climate cent for petrol and diesel was already discussed in 2005, the federal government considered a carbon levy, the climate cent was only discussed when the governmental proposal was already in parliament. The lack of support by the electorate rendered the politicians to be less scrupulous towards punishing the industry by introducing a carbon levy on fuels. This also calmed down the green and left side of the political spectrum.

Paper 4 supports this by highlighting the important role of opinion leaders in the decision-making process related to the revision of the CO_2-Act. It argues that on a general level interest groups adopt policy positions that best reflect their fundamental value orientations along important political cleavages. On the level of technicalities however, they choose positions that best represent their policy niches, and that are in line with the preferences of related interest groups and opinion leaders. In consequence, Swiss climate policy is essentially the result of a political controversy between leading interest groups. Formulating policies that

ignore these realities will unequivocally lead to the same results: an ambitious policy proposal will be downgraded until it does justice to all individual interests.

The results of Part 2 have significant implications for future climate policy in Switzerland. Assessing two past policy processes confirmed the limited political feasibility of a carbon tax on motor fuels and the vital role of several interest groups. As the political landscape has not significantly changed, I expect that future policy processes in the realm of climate policy will face similar constraints. Anecdotal evidence from several representatives from important target groups point to strong lobbying to prevent a more ambitious climate policy in the future. Two very recent developments underline this assumption.

First, in the context of introducing a new strategy on Swiss energy policy, it was discussed to meticulously integrate climate and energy policy concerns (FFA and UVEK 2015). The core concept of the energy strategy was the so-called climate and energy steering system to replace existing subsidy and funding programs by a levy on electricity, emissions from combustibles and motor fuels. However, similar to the preceding policy processes an overwhelming majority of stakeholders supported the levy on electricity and emissions from combustibles, but rejected the levy on motor fuels. Interestingly, even the left and green parties rejected the steering system, arguing that the existing mechanisms are already suitably sufficient. Secondly, a further revision of the CO_2- Act is necessary to implement the requirements of the Paris Agreement. Accordingly, in 2016 a public consultation was held on three topics: the ratification of the Paris Agreement, the integration in the EU emissions trading scheme, and the revision of the CO_2-Act. Related to the latter, the introduction of a CO2 levy on motor fuels was discussed, again. Although the summary report of the consultation is not yet released, it is very likely that it will comprise many critical views concerning the levy on motor fuels echoing the past 30 years of decision-making on this issue.

The analysis of Swiss climate politics illustrates in a convincing way that eco-taxes are not always the most efficient and effective solution to environmental problems, if they are not backed by the lion part of the society. As stated in Paper 3, policy instruments are not like an 'arrow in a quiver (…) awaiting selection and application at appropriate strategic moments by public officials' (Bresser and O'Toole 2005, 132). Rather, their effectiveness depends on the social, political, economic, and institutional context of their application and so should their selection. A careful recognition of the political context can increase the chance of a successful implementation of the policy mix. Put differently, good policy design needs careful analysis of the political aspects of public decision-making. Paying attention to the problem of political feasibility includes the identification of important actors, their beliefs and interests, resources

and venues of interaction (Meltsner 1972). Therefore, the success and failure of a policy depends on the decision-making process, like variances in the decision-making style, and factors related to the structure of the policy subsystem, i.e. actor constellations and their policy preferences (Klijn and Koppenjan 2000; Sabatier and Jenkins-Smith 1993).

Theoretically, eco-taxes might be the most pragmatic way to reduce emissions in a cost-efficient way. However, it is politically impossible to introduce them, as it is the case for the carbon levy on motor fuels in Switzerland. Continuous attempts of implementation are time-consuming and frustrating. Investing the time that is lost on the fruitless task of introducing a carbon levy on motor fuels is better spent on searching for new options to regulate the traffic sector. In consequence, it would be commendable for the Swiss government to start changing their strategy by considering other measures to reduce the CO_2-emissions, such as programs to increase rail traffic and transport, levies and taxes on passenger vehicles, increased road tolls, traffic-free zones in cities, and so forth.

4. Limitations

The most important limitation of this thesis are validity issues related to the event data set. The POLCLIMATE date set is based on media sources. Media is created by humans. Humans are subject to their cultural background, their opinions, their education, and their emotions. How specific topics are assessed, described, and selected depends on this very individual background. Also, news wire services are embedded in different socio-political environments that vary across space and time. What is reported is never fully objective and never reflects the whole truth. Surely, this analysis would have profited from an inclusion of different wire services across the globe. Besides the bias introduced due to this skewed perspective on the political process, the data set must also deal with coding errors. The data set was coded using an automatic, computer-based coding system (compare Paper 1). Before the coding system can be applied to a massive amount of text, it needs a training period of manual coding. This allows for two possible sources of error – the human coder and the software. While we tried our best to avoid any coding problems caused by the coder (e.g. fatigue or inadvertence) or the software (e.g. misspecification or missing specification of important verbs, actors, or terms), some issues can simply not be avoided. For example, some sentence structures are too complicated to decode for the content analysis software, in particular if it does not follow the standard "subject-verb-object" structure. In consequence, the software will ignore a number of interactions. We used lead sentences of new wire reports as data source. While

this is in general a good proxy for the political process[1], some events might be missed out on, as they are only reported in the body text. In sum, event data always only covers a small fraction of the events that occur and is therefore never able to deliver a complete social network, capturing all relations among all involved actors. So, event data is neither a full, nor a random sample (Schrodt, 1994). Nevertheless, event data provides a rich data source for the analysis of political behaviour, which goes beyond formal institutional links. Thus, it offers data on political processes on which systematic quantitative data is usually not available.

In addition, the APES data set of Paper 3 faces similar problems as discussed for POLCLIMATE data. Even though I considered a wide range of official documents and media reports to code the decision-making process, some important events might be missing. Especially, processes that took place behind closed doors are almost impossible to access, although they would be very crucial. To validate my data, I interviewed several vital insiders of the policy process. This helped me to understand if I had covered the most important aspects of the policy process. APES data is based on the assumption that being part of the same political events is equal to interaction. This of course is an oversimplification of the political process, yet a very useful device to encode complex processes.

In a similar vein, the discourse network data set does not reflect all aspects of the policy debate. First, it is only a snapshot, as it is based on the public consultation that captures the opinion of stakeholders at one specific time in the process – in this case in 2008. It does not mirror the development of the discussion over time. The analysis would have benefited from investigating the debate just as several time points. However, this would have been at the expense of the level of details and comparability as typically public consultations are one-time events in individual decision-making processes. Ultimately, all approaches to study political phenomena are based on models that depend on specific assumptions about reality. Pondering between the completeness and parsimony is not only accountable to political science, but a necessary measure in science in general.

Another number of important points of critique are related to single aspects in the research design of the individual papers. Of course, there is no 'perfect paper' and the problems in the presented research are possibly numerous and due to limitations of the data, the methods, or myself. Nevertheless, I would like to highlight some to me important points that might be addressed in the future. To begin with, the analyses in Paper 1 and 2 would have profited by

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[1]Compare Hirschi (2008) for a validity check of the POLCLIMATE date set based on lead sentences and full text.

disentangling conflict from cooperation in the scope of the regression analysis. For Paper 1, the current version of the R-package that implements the relational event model applied for the analysis, however, does not allow this. Similarly, the R package used for the temporal autocorrelation model, in Paper 2, is not yet designed to assess weighted and valued network data.

Furthermore, the emphasis on mitigation policies in Paper 2 is not without problems. This decision was mainly driven by conceptual reasons, as this thesis focuses on climate change mitigation. It must be acknowledged here, that adaption is an increasingly important topic with climate change, becoming more predominant. In fact, countries with a higher vulnerability naturally tend to adopt more adaptation than mitigation policies. This analysis possibly underestimates the diffusion processes in climate policy. In addition, we did not distinguish between the quality and scope of mitigation policies. This means that all policies are treated equally, regardless of them being comprehensive flagship legislation or minor regulations that focus on single issues. As a result, the effect of the diffusion processes might possibly be biased. It is overrated if countries tend to adopt many small regulations or underrated if countries tend to adopt flagship laws.

Finally, the part of this thesis focusing on Swiss climate policy faces two main restrictions: Foremost, it studies only one single case. Therefore, they cannot offer thorough tests in the theory, presented. However, an extension to a cross-country comparison of analytical frameworks presented, offers presents opportunities for future research in this area. Similarly, the research presented in Paper 4 is restricted to one point in time. As discourses evolve over time, this analysis only provides a snapshot of what has been discussed and is not suited to derive causal mechanisms, but relations between observations. Nevertheless, this research might be a valuable start for future research in this area if different policy fields are compared or the analysis was extended to a dynamic investigation of policy discourses.

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PART 1

I.   Old wine in a new bottle? A time-dynamic analysis of country motives to mitigate global climate change, by *M. Kammerer & C. Hirschi*

Abstract

This paper studies the motives of national governments to cooperate to mitigate global climate change. The new Paris Agreement obliges all countries to cut their carbon emissions, but allows them to self-determine their contributions. The effectiveness of the new treaty ultimately depends on the readiness of the parties to make reasonable pledges, despite a strong incentive to free ride. This analysis grounds on a novel data set on political, international events that occurred beyond and in preparation to the yearly climate summits between 1995 and 2015. A relational events model is utilized to disentangle the factors that have shaped these political processes, over time. Our results show that, in general, cooperation best evolves in an environment of trustful long-term relations and serves to coordinate activities and positions with respect to critical issues. The shock induced by the failure of the Copenhagen climate summit in 2009 perforated the institutionalised split between developed and developing countries and paved the way for the new treaty. Nevertheless, old conflict lines are still visible in the contestations about implementation-related topics.

1. Introduction

This paper studies factors that explain the motives for national governments to coordinate their actions in the context of international climate politics. This question is important, as the new Paris Agreement, decided in 2015, depends more strongly on the disposition of national governments to comply. In contrast to the Kyoto Protocol of 1997, the new treaty addresses all countries, but allows them to self-determine their own contributions. While the majority of countries have already made their pledges (to date 162 out of 190), the intended national contributions are yet not high enough to reach the common target of limiting the average temperature increase to two degrees Celsius. Therefore, countries must increase their ambitions, while at the same time they are facing a high motivation to free ride. Countries on their own accord have only little incentive to adopt ambitious targets and rigid policies. This can be explained by using the metaphor of the 'tragedy of the commons' (Hardin, 1968). The investment in mitigating measures contributes to a common pool resource from which nobody can be excluded. In contrast, the costs of these measures are shouldered individually. Countries are therefore well aware of possible relative losses and competitive disadvantages and try to avoid the implementation of too costly climate change mitigation policies (Hovi, Sprinz, & Underdal, 2009).

In this context, a longstanding conflict arises from the contestation about the distribution of responsibility between developing and developed countries. According to the UNFCCC, climate change is a matter of 'common but common but differentiated responsibilities' (CBDR, UNFCCC 1992). The principle says that industrialised countries must carry the main burden for the mitigation of climate change, as they are financially and institutionally more capable in doing so and have a history with creating most of the CO_2 emissions in the atmosphere. Developing countries shall do their part, but considering their 'respective capabilities' (ibid.). Until recently, the principle was interpreted more in lines with the 'differentiated responsibilities' between the industrialised and developing part of the world. The Kyoto Protocol institutionalised this divide with the definition of legally binding emission reduction obligations for industrialised countries in the Annex I to the protocol (Annex I parties), and no comparable commitments for all other countries (non-Annex I parties).

It took eight years from the adoption of the protocol in 1997 until it eventually came into effect in 2005. This reflects the widespread opposition in some Annex I countries. For example, the United States, which account for almost a quarter of world's total emissions, even departed from the protocol before it entered into force and Canada withdrew as soon as it was obvious that it could not meet its obligations. Over time, the positions became so

entrenched, that an appropriate subsequent agreement could not be negotiated[2]. The 'constructed peer group' hypothesis (Castro, Hörnlein, & Michaelowa, 2014, p. 110) suggests that the artificial divide of the world between Annex I and non-Annex I countries unintentionally intensified the conflict and is therefore responsible for the failure of the climate negotiations. When the Copenhagen conference ended in a 'disaster' in 2009 (Blühdorn, 2012), the international community started to reconsider the Annex I/ non-Annex I split and began to negotiate a new agreement. The Paris Agreement, despite its limitations (Brun 2016, Obergassel et al. 2015), is the result of this turn in the development of the international climate regime. In the light of these new developments, it is interesting and important to understand more about the factors that caused this turn in climate history and to identify early-on possible stumbling stones that could negatively affect the success of the agreement in the future. While the insights of this research are primarily relevant to the climate case, important lessons can be drawn for other international regimes.

This paper lines into the wide field of study on cooperation over global climate change, but investigates it from a rather distinct and new perspective. Earlier studies on the matter usually focus either on the negotiation process (e.g. Blühdorn, 2012; Gupta, 2010; Michaelowa & Michaelowa, 2012), the climate policy performance of the parties to the agreement (e.g Bättig & Bernauer, 2009; Bernauer & Böhmelt, 2013; Dolšak, 2009; Sprinz & Vaahtoranta, 1994), or elaborate on theoretical arguments about the quarrels of cooperation in the climate regime (Dietz, Ostrom, & Stern, 2003; Grundig, 2009; Hovi & Sprinz, 2006). In addition, a large number of studies focus on issues related to social justice and international equity in the climate negotiations (Morgan & Waskow, 2013; Roberts & Parks, 2009; Stadelmann & Castro, 2014) also regarding the divisions between the North and the South and the formation and position of different country groupings (Betzold, Castro, & Weiler, 2012; Blaxekjær & Nielsen, 2014; Hallding, Jürisoo, & Atterdige, 2013). Finally, a literature more in tradition of the multi-level governance concept (Bache & Flinders, 2004) studies the role of transnational networks to arrange interests and mediate positions of countries and organization (Bulkeley et al., 2014; Michaelowa & Michaelowa, 2016; Roger, Hale, & Andonova, 2016).

In contrast, our key argument assumes that the coordination of national climate policies or bargaining positions occurs based on a long-term diplomatic process that involves a gradual harmonisation of national policies that only culminates in the climate summits. Put differently, cooperation evolves in the continuous adjustment of a political actor's behaviour to the

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[2] In fact, Kyoto II, which was adopted in 2013 as a follow-up agreement only encompassed about 37 country that together are responsible for 15% of the emissions.

tangible behaviour and the anticipated preferences of others through a process of policy coordination (Keohane, 1984; Milner, 1992). The political processes side-lining the international negotiations are far less institutionalised, less visible to the public, und also less understood. In addition, in these usually more informal settings negotiators and other country representatives enjoy a larger scope of action and more flexibility, what increases the likelihood for concessions to be made. Therefore, investigating these processes could contribute to an increased understanding of regime effectiveness, but at least add an important aspect that has been overlooked so far.

In the next section, the paper advances with a discussion of the main theoretical argument. Countries cooperate more likely, if they believe others to cooperate, too (Axelrod, 1984; Keohane, 1986; Milner, 1992); thus, cooperation follows a logic of reciprocation. In addition, cooperation arises predominantly in situations when countries disagree about important aspects of an issue; thus, cooperation follows from discord, not harmony (Keohane, 1984). However, the failure of the Copenhagen conference in 2009 was a shock to the international community. This made the departure from the strict divide between Annex I and non-Annex I countries only possible. Akin to these developments, we expect to see a turn in cooperation patterns. We assume that after Copenhagen, the reason to cooperate is not anymore primarily the Annex I/ non-Annex I division, but more inclined to technical issues related to specific policy objectives and policy instruments to reach a most comprehensive nationally-determined commitment to the treaty.

To test our theoretical propositions, we systematised information on political events that occurred in the context of international climate change between 1997 and 2015. Our new data set reflects a stream of relational political events between pairs of countries, which can be understood as a network of dyadic events. Methodologically, we apply a relational events model (REM) (Butts, 2008; Lerner, et al. 2013). This provides an innovative way to investigate the formation of cooperative relationships over time by including parameters reflecting how previous realizations of collaboration structures and actor attributes determine current cooperation patterns. The paper concludes with a comprehensive discussion of the results.

2. Explaining International Cooperation on Climate Change

The need for policy coordination and cooperation results from countries having diverging policy preferences about global climate change. Diverse domestic needs call for mutual adjustment of the own behaviour to the tangible behaviour and the anticipated preferences of others through a process of policy coordination. This process is commonly understood as

political cooperation (Milner, 1992). Hence, cooperation goes beyond 'reflecting a situation in which common interests outweigh conflicting ones' (Keohane, 1984, p. 12). Surely, countries, in the context of the climate negotiations, form coalitions based on common policy preferences and cooperate to enforce their positions. However, in climate negotiations countries of opposing camps also meet to coordinate their positions and therefore, they cooperate. Otherwise, solutions or compromises would never be found.

For harmonious countries (i.e. those sharing policy preferences or interests), this kind of cooperation is not necessary. 'Cooperation, as compared to harmony, requires active attempts to adjust policies [or positions] to meet the demands of others. That is, not only does it depend on shared interests, but emerges from a pattern of discord or potential discord. Without discord, there would be no cooperation, only harmony' (Keohane, 1984, p. 12). Harmony is when countries' policies match, so that they facilitate the goals of others without having regarded the policy preferences of others in the first place. Cooperation, on the other hand, is necessary, when countries' policies hinder common goals or the goals of others. When countries attempt to adjust each other's goals then it is cooperation. If countries' policy ultimately becomes more compatible, it is successful cooperation. Also, we must distinguish between cooperation and common preferences. Cooperation is then the consequence of diverging preferences, not from harmony. 'To summarize more formally, intergovernmental cooperation takes place when the policies actually followed by one government are regarded by its partners as facilitating realization of their own objectives, as the result of a process of policy coordination' (Keohane, 1984, p. 51). The existence of cooperation does not imply the absence of conflict. Cooperation is, on the contrary, the result of any endeavour to overcome conflict. It arises in situations in which actors have contrasting beliefs or interests in an issue.

We argue that countries cooperate more likely with each other when they have diverging interests about important critical issues. In the context of the international climate protection regime, many conflicts arose due to the stern divide between Annex I and non-Annex I countries and the thereof resulting differential treatment (Castro et al., 2014). In the Kyoto Protocol, only industrialised countries had legally binding emission reduction obligations, which were noted in the Annex I to the protocol, while developing countries did not have any obligations. Over time, the economic situation for some countries like China, India, Brazil, and South Africa etc. ameliorated what called this artificial and outdated divide between developing and developed countries increasingly into question. The dispute about who is responsible for the emissions causing climate change, and who is responsible for mitigating the emissions hindered for many years to come an agreement on a subsequent treaty to the

Kyoto Protocol. After, the so-called 'Copenhagen disaster' in 2009 (Blühdorn, 2012), the international community started to rethink the principle of 'common but differentiated responsibilities' (CDBD) and the approach of legally-binding commitments only for industrialized countries. Gradually, a new treaty was negotiated. Eventually, it took until 2015 to find new compromises on old contestations. Now, instead of forcing developed countries top-down to cut their emissions, the new treaty set on bottom-up, self-determined, but still legally-binding emission reductions commitments. So, at different points of time, different issues were critical. Countries are more likely to cooperate with other countries, when they disagree about major issues (e.g. ordering principles, contested policy instruments), as here cooperation is necessary to mutually adjust policies and positions to find compromising solutions. This pattern changes over time as far as policy issues change, i.e. gain or lose their importance. Hence, we hypothesize:

Hypothesis 1a: Over time, two countries are more likely to cooperate, when they disagree about a major point in the design of the international climate regime.

Hypothesis 1b: Cooperation patterns shift with the change of issues discussed.

However, cooperation is not only driven by these actor-specific preferences, but also by the anticipated cooperative (or conflictive) behaviour of others. As policy coordination is costly, and even more so, if it is done unilaterally, the incentive to defer is high. The prisoners` dilemma illustrates this problem; and it is often used to explain collective action problems in societal phenomena. Two actors decide not to cooperate, although the revenue is highest if both cooperate. But, if one of the actors does not cooperate, the other will face high costs. To avoid these high costs, it is rational not to cooperate. Hence, the preferred strategy is not to cooperate.

In the case of global warming, international welfare would benefit most from all states reducing their emissions. The proportional burden share would reduce for all countries and the future costs of climate change related hazards were smaller (IPCC, 2013). Yet, states face competitive advantages, if they reduce their emissions unilaterally. Without any binding emission reduction obligations that count for all countries and that are sanctioned, the most rational thing to do is not to reduce own emissions. In other words, to free ride on other's mitigation action and not to cooperate. Axelrod´s (1984) core explanation of why states still cooperate is that interstate cooperation is always based on trust. Trust arises from repeated and reciprocated interaction. It is rational to cooperate voluntarily if states interact over a

longer period, which is infinite, when the end of the interaction is not known. The idea is that the past casts a shadow on the future. Past decisions will ultimately affect future decisions.

Here, the concept of reciprocity is crucial. In a wide range of literature, reciprocity is discussed as one the most important patterns and norms of social interactions and is seen as vital for the stability of social systems (Gouldner, 1960). The willingness of political actors to cooperate depends on whether they believe that cooperation will be repeated or reciprocated and whether this continues indefinitely. Repeated and reciprocated cooperation reduces the perils of anarchy and the defection trap of the Prisoner's dilemma by maximizing absolute gains due to increased mutual predictability of behaviour, enhanced information flows, or effective sanction mechanisms to punish defection (Axelrod, 1984; Keohane, 1986; Young, 1989). We therefore argue that countries tend to reciprocate cooperation:

Hypothesis 2: Over time, countries initiate cooperative interactions more likely towards countries that have in turn initiated cooperation with them in the past.

3. Research Design

To uncover the pattern of cooperative interactions in international climate change politics, we rely on political event data. In general, event data can be used to collect and systematize data on political processes in a long-term perspective. It captures 'who did what to whom' and when (Schrodt & Yonamine, 2012) by breaking down these complex processes into a series of single events. Relational event models (Butts, 2008; Lerner, Bussmann, Snijders, & Brandes, 2013) are ideally suited to analyse this kind of data, as they are designed to model causes and effects by sequences of related events. They treat past and future events as interrelated as well as past and future decisions of individual actors. They add a social network component to the analysis, which is advantageous to traditional regression models that would treat events and actors as independent of each other and bias the results. In addition, they are also advantageous to other temporal network models, such as stochastic actor-oriented models (SAOM) or temporal exponential random graphs models (TERGM), as they allow more accurate examination of tie formation processes, because they use the whole sequence of events instead of several subsequent snapshots of a network (Malang, Brandenberger, & Leifeld, forthcoming). This is important, as different interaction sequences can cause the same network snapshot. Thus, using the snapshot for inferences about tie formation over time may lead to biased results. In the following subsections, we outline the basic intuition behind REMs and provide an overview of the data needed and the respective data collection procedures.

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The Relational Events Model

Relations events models (REM) are designed to uncover 'rules that govern behaviour' in dynamic social networks (Lerner et al., 2013, p. 11). They seek 'to answer questions like what makes actor A interact more or less with actor B or what makes actor A engage in a specific type of interaction towards B' (Lerner et al., 2013, p. 4). These interactions form an event sequence that involves a sender node, a target node, and a time stamp. Patterns that are specific for the event sequence at hand are, like in other dynamic network models, explained by endogenous dynamic network statistics capturing basic rules of behaviour of political actors such as social inertia, reciprocity, triangulation, or social balance as well as by exogenous covariates capturing actor characteristics.

A basic assumption of REMs is that the probability of an observed *events sequence* $E = (e_i, \dots, e_n)$ depends on events that have happened earlier. The main explanatory variable is the network of past interactions; i.e. a weighted graph defined as a function of the past event sequence. REMs model the probability density of e (a single event in the event sequence), given the network of past events G_e using a piecewise constant hazard model, where the hazard of an event occurring is held constant within a time interval (Malang et al., forthcoming).

The likelihood that a specific number of events $n_{ij}(t)$ occurs between a pair of actors (i, j) in the time interval (t) is given by the hazard rate $\lambda_{ij}(t)$ and multiplied by the survival function $exp\left(-\lambda_{ij}(t)\right)$. The survival function captures all events that could have occurred at time (t) but did not (Butts, 2008; Lerner et al., 2013, 2013; Malang et al., forthcoming). The question is: Why did a specific event occur and not another one? The probability function of a specific event is written as follows:

$$Pr\left(n_{ij}(t)\right) = \frac{\lambda_{ij}(t)^{n_{ij}(t)} exp\left(-\lambda_{ij}(t)\right)}{n_{ij}(t)!}$$

The probability density function is then represented by a multiplication over all dyads and all time intervals in the observed *events sequence* $E = (e_i, \dots, e_n)$:

$$f_\lambda(E; \theta^\lambda) = \prod_{t=t_1}^{t_N} \left(\prod_{ij \in D_{act(t)}} \frac{\lambda_{ij}(t)^{n_{ij}(t)} exp\left(-\lambda_{ij}(t)\right)}{n_{ij}(t)!} \right) exp\left(-\sum_{ij \in D} \lambda_{ij}(t) \right),$$

where $D_{act(t)}$ represents all dyads in which an event occurred and D represents all events that could have potentially happened. The estimated model parameters reflect which factors cause an increase or decrease in the frequency of interaction (rate parameters, θ^λ). Like other

inferential network models, it is possible to include both network statistics and actor or dyadic covariates as explanatory factors. Endogenous network statistics are calculated for each event in the event sequence.

To estimate the rate parameter, a stratified conditional logit model estimates the hazard time of an event until the next event occurs. Thence, coefficients are estimated for the variables of interest conditional on the risk sets. Positive significant parameter estimates are associated with an increased risk that cooperative interaction occurs. Negative significant parameter estimates are associated with a decreased risk that cooperative interaction occurs. Parameter estimates can be interpreted in terms of log odds.

The Data Set

REMs require input data in form of an **_event sequence_** that consists of dyadic and typed events. In the literature, there is a broad discussion about what an event exactly is (compare Schrodt, 1994). We define an event as a 'discrete incident that can be located at a single [point in] time (usually precise to a day) and a set of actors, usually a dyad of a source and target' (Schrodt, 2012b, p. 548). In more formal terms, each event is defined as a tuple $e = (a_e, b_e, w_e, t_e)$ where a_e is the initiating political actor (the *source*), b_e is the addressed actor (the *target*), w_e is the quality of an event (the *event type*), and t_e the *time* when e happens.

We coded our new POLICLIMATE event dataset on country interactions related to international climate change politics using the software TABARI (Text Analysis by Augmented Replacement Instructions, Schrodt, 2011) based on news reports from Agence France Presse (AFP) between 1995 and 2015. [3] AFP provides a rich data source for monitoring and analysing the international politics of climate change, as it has frequently reported on international political events on the climate change issue. After several rounds of manual coding, the software can identify the date of an event, its initiators and targets, and the quality of each event on an automated basis. To determine the event type, the software relies on the 'Conflict and Mediation Event Observations (CAMEO)' (Schrodt, 2012a) scheme as the coding framework. The CAMEO coding scheme is a codebook for verbs and verb constructions. Nominal event codes reflect 10 different categories (with many subcategories) of cooperation ranging from positive verbal comments to an exchange of material resources and 10 different categories of conflict ranging from verbal comments to different kinds of military violence. To identify the type of a political event, category and subcategory codes are assigned to verbs

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[3]Strengths and weaknesses of event data for empirical analysis have been comprehensively discussed in the literature. Compare for example Gerner, Schrodt, and Yilmaz (2002), Huxtable and Pevehouse (1986), King and Lowe (2003), Schrodt (1994), Schrodt and Gerner (1994), Hirschi (2009).

and verb constructions. As the original codebook was created to analyse violent conflict, we had to adjust the coding framework for international climate policy by adding the relevant political actors and a fine-tuning of verbs and verb constructions. We also aggregated the CAMEO sub-categories into twelve main event categories, ranging from positive statements to substantial cooperation on the cooperative side, and ranging from negative statements to substantial conflict on the conflict side (compare Appendix A). This reduces the number of distinct event type categories to a manageable number. In addition, the effect of coding errors is reduced by avoiding misclassification within ambiguous categories (Schrodt & Gerner, 2004).[4] Now each event code can be clearly assigned to one of the CAMEO event categories.

The raw event sequence is the basis for several different variables to be used for the analysis.[5] Firstly, it provides the ***main dependent variable***, which is the stream of cooperative interactions happening between two countries over time among all other events that could have been occurred. For this purpose, we first calculated the event sequence for both cooperative and conflictive events in the event sequence. Next, we created a subset of the event sequence that only contains cooperative events. This subset of cooperative events is now the foundation to calculate the REM data set. The REM data set contains, among others, an *event dummy* variable that is coded as 1 for cooperative events that have happened in the event sequence and 0 for all null events (all events that could have happened). Secondly, the REM data set contains an *event weight* variable that reflects the intensity of cooperation for each event ranging from 1 (verbal cooperation) to 6 (material cooperation) according to the above specified CAMEO sub-categories. In the analysis, we used this variable to control for the intensity of cooperation. Thirdly, the REM data set contains an *event time* variable that reflects for each event on what day in the event sequence the event has occurred. The event time variable is used as strata in the conditional logit model.

In our model, we use two different types of ***independent variables***. The first set of independent variables are *preference homophily variables* that capture whether two countries in a dyad hold the same policy preferences on different, crucial aspects of international climate policy. We coded the policy preferences for all countries present in the event sequence. We identified the most important issues discussed in international climate change

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[4]Coding the POLICLIMATE event data set based on the original CAMEO coding scheme led to many problematic misclassifications. Expressions such "combat climate change", for example, resulted in events that were classified as military conflict. We inspected the data set for these kinds of problems and adjusted the verb dictionary accordingly. We continued this process until no such misclassifications occurred.
[5]All calculations were done in R with the "rem" package Brandenberger (2017a). A detailed description of the REM date set and its components can be found in the related manual Brandenberger (2017b).

politics by consulting the relevant literature in the field (Bernauer, 2013; Betzold et al., 2012; Blaxekjær & Nielsen, 2014; Hallding et al., 2013). We condensed the main contestations to three variables that cover the most important aspects: (1) the fundamental position towards the distribution of responsibilities and capabilities (*CBDR-principle*); (2) the fundamental position on how the importance of climate change and climate policy is assessed in contrast to other important policy areas (*impacts*); (3) and the position on the most important policy objectives and instruments (*instruments*).

To test our Hypotheses 1a and 1b, we used three variables that cover these main contestations. We operationalized the first variable accordingly on how a country thinks about the CBDR-principle. We differentiated four realizations: equal (all countries must contribute to climate change mitigation and must be treated the same way), equal flex (all countries must contribute, but are differentiated according to their background), major emitters (only major emitters must contribute), developed countries (only OECD countries must contribute). Variable 2 reflects how important a country assesses the impacts of climate change on society as opposed to other important issues, such as the socio-economic development. We observed three different levels: medium, high, and very high. Countries that were coded as 'medium' regard climate change is an important problem, but there are other more pressing issues on their agenda. For countries that were coded as 'high' climate change is an important problem and assessed at least as equally important to other issues. Finally, for some countries the impacts of climate change belong to the most pressing problems. They were coded as 'very high'. Variable 3 captures the different ways to approach climate change mitigation. The final variable captures the main policy objective and related instruments. We coded for each country on which policy objective it lays its focus: the 'commitment' to international agreements enforced by legally-binding targets and sanction mechanisms, the defeat of 'asymmetries' between developed and developing countries by financial and technology transfer, the reduction of 'uncertainties' by the increased use of flexibility mechanisms, and the promotion of 'technology'-based solutions. For our hypothesis to be supported, we expect a negative, and significant relationship linked to these variables and the prospect of cooperation. Henceforth, we expect countries holding the same policy preferences are less likely to cooperate.

We developed coding guidelines (compare Appendix B for coding examples) based on previous work dealing with the issue (e.g. Sewell, 2005). In a pilot coding phase, we coded several countries representing all important country groups – to be specific: developed countries, emerging economies, developing countries, least developed countries and small

island developing states (SIDS) to formulate coding rules. For example, we coded the CBDR principle 'equal' when a country referred to 'the necessity to overcome the CBDR principle or the divide between the developed and developing world', or 'the need to stop blaming each other, but to collaborate', or 'the urgency that all countries alike must fulfil their commitments', and the need to 'change or evolve responsibilities and capabilities of countries'. Compare Appendix B for a complete overview on all coding guidelines and example statements from this pilot coding phase.

After the pilot coding phase, we fine-tuned the coding guidelines and coded the policy beliefs for all the countries. As data source, we used statements made by high-level country representatives (High-level segment statements by Heads and Governments) at selected UN Climate Change Conferences of the Parties (COPs). Specifically, we used written and audio-visual statements made at the COP meetings between 1997 and 2014[6]. We coded beliefs for two phases from 1997 to 2009 and from 2009 to 2015, arguing that international climate politics has significantly changed after the Copenhagen disaster (Blühdorn, 2012). For each country, all actors were crosschecked for at least three years per period (beginning of the period, middle of the period, end of the period). This allows us to believe that policy preferences are rather stable within the two periods. All written and audio-visual statements are available on the individual COP meeting websites hosted by the website of the UNFCCC[7].

Secondly, *reciprocity* describes the degree to which an actor has mutual connections to other actors. This effect measures the tendency of senders to reciprocate earlier events if other senders targeted them in return. Therefore, it captures whether actor A adapts its behaviour towards actor B in accordance to how B treated A in the past. It is an endogenous network statistic and calculated based on the event sequence given by the following formula:

$$G_t = G_t(t) = (A, B, w_t),$$

where G_t is the network of past events including all events *E* that consist of a sender A and target B and a weight function w_t. Here, a positive parameter implies that political actors tend to reward cooperative behaviour. A negative parameter on the other hand, would imply that reciprocation does not increase the likeliness for the occurrence of cooperative events.

In terms of our **control variables**, we used both exogenous covariates and endogenous network statistics. As for our exogenous controls, we included several factors that cover important characteristics of nation states affecting country behaviour in international climate

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change politics. According to Sprinz and colleagues (1994, 2001), two factors are important: the level of climate-related vulnerabilit*y* and the magnitude of abatement costs. We included several covariates that cover different aspects of these two factors i.e. a country's vulnerability and its abatement costs. As *vulnerability* indicator, we used the GDP adjusted ND Gain vulnerability country index that measures a country's exposure, sensitivity, and ability to adapt to the adverse impacts of climate change[8]. We expect that the level of a country's vulnerability towards climate-related risks influence a country's cooperative behaviour. A country facing high climate-related vulnerability is likely to act as a 'pusher' (Sprinz and Vaahtoranta, 1994, p. 69) in favour of combatting climate change and is subsequently expected to cooperate more likely.

Here, abatement costs are the costs of reducing climate mitigation related negatives such as the price of reducing greenhouse gas (GHG) emissions. They are difficult to capture, as there is no comparable index to the ND Gain vulnerability index described above. Instead, we controlled for a set of variables that affect the level of abatement costs: GDP per capita, democracy (polity 2), absolute CO_2 emissions, and natural rents.[9] The basic intuition is that countries with high abatement costs of climate change mitigation action behave as 'draggers' (Sprinz and Vaahtoranta, 1994, p. 69) and are expected to cooperate less likely but are maybe targeted more often by cooperative initiatives. Starting with the *GDP per capita*, we expect that richer countries can afford climate change mitigation action more so than poorer countries. On that account, even if these countries face high abatement costs due to high levels of CO_2 emissions, for instance, they may cope with emission reduction better, because they have more financial resources to do so. A similar argument applies to the *level of democracy*. Democratic countries are usually institutionally better equipped than autocracies and are, therefore, more capable to deal with the climate change issue. Hence, we expect rich countries and democracies to cooperate more likely and also to be more often the target of cooperative initiatives. Moreover, high levels of *absolute CO_2 emissions* adversely affect a country's abatement costs. Taking climate change mitigation action increases abatement costs and, thereupon, decreases the likelihood to show cooperative behaviour. However, there is also a different way to approaching the effect of high CO_2 emissions. In traditional realist thinking, imbalances in the power structure also create imbalances in influence (Milner, 1992). Influential countries, thus, often adopt the position of organizing powers that can

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[8]Compare: Notre Dame's Environmental Change Initiative (ND-ECI) (2015). Notre Dame Global Adaptation Index (ND-GAIN) Available online: URL: https://gain.nd.edu/our-work/country-index/.
[9]For all other variables, we used the 2016 World Development Indicators as data source.

punish defective behaviour, for example, by exerting military or economic power. In the context of climate change, power might be understood as the ability to affect the global atmosphere (Rowlands, 2001). Along these lines, countries are powerful if cooperation is essential for a successful climate policy and their veto has the strength to block international action. One could argue that countries with high absolute CO_2 emissions tend to have a higher leverage for promoting or blocking international climate change politics than countries with low absolute CO_2 emissions. Without the cooperation of high emission countries, any endeavour to protect the global climate is rendered pointless. In consequence, it is also likely that countries with high absolute CO_2 emissions will more likely be involved in cooperative interaction. Like so, we expect our model to show no clear effect for the level of CO_2 emissions. Finally, we controlled for the *natural rents* of a country. Countries with high *natural rents* face rather high abatements costs as their economy depends on fossil fuel resources. We expect these countries to behave less cooperatively. On the other hand, in a similar vein to the level of CO_2 emissions, these countries are important for the success of international climate politics. We therefore expect these countries to more likely be the target of cooperative interactions.

In terms of ***endogenous network effects[10]*,** we controlled for a number of network statistics (Lerner et al., 2013). The simplest network dependency is captured by the *social inertia* network statistic. The statistic measures the tendency of actors to keep behaving just as they did in the past. In the model, a significant, positive inertia parameter indicates that past cooperative events between A and B increase the likelihood of cooperative events between A and B in the future.

Countries behave differently in political processes; so, they take on different roles and hold different positions. The term 'position' here, refers to a set of social actors, which are similarly embedded in a network of relations, whereas the term 'role' refers to the patterns of relations between social actors. Actors who are similar in their social activity towards other actors hold a similar position and are consequently structurally equivalent (Wasserman & Faust, 1994). This effect describes the tendency to maintain and create ties to other countries that make similar choices (Burt, 1982). Structural equivalence has always been an important element in international relations theory and particularly studied in the context of conflict and war as a stabilizing factor for homophile blocs of opponents (Griffiths, 2007; e.g. Maoz, Kuperman, Terris, & Talmud, 2006). In the case of global climate change, this behaviour is not desirable,

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[10]Compare Brandenberger (2017b) for a description on how to calculate these statistics.

as the divide into opposing blocs runs contra to the achievement of a universal climate regime. To control and test for these differences, we use a set of two statistics, i.e. *sender similarity* and *target popularity*. The target popularity statistic measures the popularity of targets, hence how often the current targets was targeted by senders in the past. In the model, a significant, positive parameter estimate means that being a popular target increases the likelihood of being involved in cooperative events by other senders in the future. *Sender similarity* measures how many targets the current sender has in common with other senders that targeted the current target in the past. In other words, how likely is it that two senders show the same pattern of behaviour towards the same set of targets? A significant, positive parameter estimate points to an increased probability of senders to initiate cooperation towards the same set of targets. In other words, there is a tendency of senders to cluster together or inhibit the same behaviour towards the same set of targets. Compare Appendix C for an overview on variables and data sources.

4. Results

We estimated our models using the 'rem' package implemented in R (Brandenberger, 2017a). The subset of the REM data set with only cooperative events has 521196 observations from which 1582 are true events. We tested several model set-ups with different variable combinations and conducted several robustness checks.

Table 1: Parameter estimates models 1-6

	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6
ULNERABILITY SENDER	0.00 *	0.00 *	0.00 *	0.00 *	0.00 *	0.00 *
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
VULNERABILITY TARGET	0.00 ***	0.00 ***	0.00 ***	0.00 ***	0.00 ***	0.00 ***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ABSOLUTE CO_2 EMISSIONS SENDER (LOGGED)	0.02	0.02	0.00	-0.01	-0.01	-0.01
	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)
ABSOLUTE CO_2 EMISSIONS TARGET (LOGGED)	0.06 ***	0.05 **	0.04 *	0.04	0.04	0.04
	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)	(-0.02)
NATURAL RENTS SENDER	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
NATURAL RENTS TARGET	0.01	0.01	0.01	0.01	0.01	0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GDP PC LOGGED SENDER	0.19 ***	0.18 ***	0.16 ***	0.13 **	0.15 ***	0.13 **
	(-0.04)	(-0.04)	(-0.04)	(-0.04)	(-0.04)	(-0.04)
GDP PC LOGGED TARGET	0.18 ***	0.17 ***	0.15 ***	0.19 ***	0.17 ***	0.18 ***
	(-0.04)	(-0.04)	(-0.04)	(-0.04)	(-0.04)	(-0.04)
POLITY 2 DEMOCRACY	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)	(-0.01)
SAME INSTRUMENT PREFERENCES		-0.04	-0.03	-0.02	-0.02	-0.02
		(-0.07)	(-0.07)	(-0.07)	(-0.07)	(-0.07)
SAME IMPACT PREFERENCES		0.21 ***	0.19 **	0.18 **	0.19 **	0.18 **
		(-0.06)	(-0.06)	(-0.06)	(-0.06)	(-0.06)
SAME CBDR PREFERENCES		-0.20 **	-0.21 **	-0.22 **	-0.22 ***	-0.22 ***
		(-0.07)	(-0.07)	(-0.07)	(-0.07)	(-0.07)
RECIPROCITY			7.98 *	-8.30	8.37 *	
			(-3.1)	(-8.36)	(-3.64)	
TARGET POPULARITY				-0.86	-0.6	-0.96
				(-0.89)	(-0.88)	(-0.89)
SENDER SIMILARITY				24.61 *	26.41 **	24.86 *
				(-10.12)	(-10.05)	(-10.11)
INERTIA				18.29 *		11.05 **
				(-8.04)		(-3.56)
EVENT ATTRIBUTE						
INSTRUMENTS*EVENT ATTRIBUTE						
IMPACTS*EVENT ATTRIBUTE						
CDBRS*EVENT ATTRIBUTE						
AIC	17808.69	17791.9	17787.52	17781.11	17784.2	17780.11
NUM. EVENTS	1582	1582	1582	1582	1582	1582
NUM. OBS.	521196	521196	521196	521196	521196	521196
MISSINGS	1160	1160	1160	1160	1160	1160
NOTES	($p < 0.001$ ***, $p < 0.01$ **, $p < 0.05$ *) STANDARD ERROR IN PARENTHESES					

Table 2: Parameter estimates model 7-10

	MODEL 7 (HLP 30)	MODEL 8 (WG, HLP 30)	MODEL 9 (SUBSET 1)	MODEL 10 (SUBSET 2)
VULNERABILITY SENDER	0.00 * (0.00)	0.00 * (0.00)	0.00 * (0.00)	0.01* (0.00)
VULNERABILITY TARGET	0.00 *** (0.00)	0.00 *** (0.00)	0.00 * (0.00)	0.01 *** (0.00)
ABSOLUTE CO_2 EMISSIONS SENDER (LOGGED)	-0.03 (-0.02)	-0.03 (-0.02)	-0.07 *** (-0.02)	0.08 * (-0.03)
ABSOLUTE CO_2 EMISSIONS TARGET (LOGGED)	0.01 (-0.02)	0.01 (-0.02)	0.01 (-0.02)	0.07 * (-0.02)
NATURAL RENTS SENDER	0.01 (0.00)	0.01 (0.00)	0.00 (-0.01)	0.01 (-0.01)
NATURAL RENTS TARGET	0.01 * (0.00)	0.01 * (0.00)	0.01 (0.00)	0.02 (-0.01)
GDP PC LOGGED SENDER	0.14 *** (-0.04)	0.14 ** (-0.04)	0.17 *** (-0.05)	0.09 (-0.08)
GDP PC LOGGED TARGET	0.12 ** (-0.04)	0.12 ** (-0.04)	0.17 *** (-0.04)	0.06 (-0.08)
POLITY 2 DEMOCRACY	-0.03 * (-0.01)	-0.02 * (-0.01)	-0.02 (-0.01)	0.03 (-0.01)
SAME INSTRUMENT PREFERENCES	0.01 (-0.07)	-0.08 (-0.15)	0.01 (-0.08)	-0.42 ** (-0.15)
SAME IMPACT PREFERENCES	0.12 * (-0.06)	0.21 (-0.13)	0.1 (-0.07)	0.61 *** (-0.16)
SAME CBDR PREFERENCES	-0.20 ** (-0.07)	-0.15 (-0.15)	-0.27 *** (-0.07)	0.52 ** (-0.17)
RECIPROCITY	8.24 *** (-0.9)	2.74 *** (-0.33)	8.50 *** (-0.93)	21.05 *** (-5.31)
TARGET POPULARITY	0.00 (-0.09)	0.01 (-0.09)	-0.01 (-0.10)	-0.41 (-0.77)
SENDER SIMILARITY	6.75 *** (-1.4)	6.77 *** (-1.39)	8.78 *** (-1.36)	-22.65 ** (-8.62)
INERTIA				
EVENT ATTRIBUTE		-0.01 (0.03)		
INSTRUMENTS*EVENT ATTRIBUTE		-0.02 (-0.04)		
IMPACTS*EVENT ATTRIBUTE		-0.02 (-0.04)		
CDBRS*EVENT ATTRIBUTE		-0.02 (-0.04)		
AIC	17672.35	17690.08	15235.32	2370.75
NUM. EVENTS	1582	1582	1292	290
NUM. OBS.	521196	521196	497612	23584
MISSINGS	1160	1160	1160	0
NOTES	(P < 0.001 ***, P < 0.01 **, P < 0.05 *) STANDARD ERROR IN PARENTHESES			

Table 1 and 2 show the estimated model parameters with standard errors in parentheses. As variables are not scaled, parameter estimates are not interpreted in terms of their size but only in terms of significance and direction. We started with a model only containing the actor covariates (Model 1) for the whole event sequence. We then added the policy preference homophily variables (Model 2) and eventually included the endogenous networks statistics (Model 3 to 7). As the reciprocity and social inertia variables are correlated (Model 4), we controlled for inertia (Model 6) and reciprocity (Model 5) in separate models. Comparing parameter estimates shows that the results are robust across different model set-ups with respect to the models based on the whole event sequence. In addition to different variable combinations, we also tested different variations of the same model (Model 8 to 10). We used the set-up of Model 6 as starting point, which we ran on the whole event sequence, which does not control for the intensity of cooperation, and which has a half-life parameter of 366. The half-life parameter entails information about how important past events are for future events, hence how long the shadow of the past casts on the future. A half-life parameter of 366 (about one year) implies that events that happened 366 days ago are half as important as events that happened earlier. Testing different half-life parameters revealed the best model fit for a half-life parameter of 30 days (Model 7) in the terms of AIC[11] values. Model 8 shows the results for controlling for the intensity of cooperation. For this purpose, we calculated a new set of endogenous networks statistics that is weighted by the event weight variable. This means that in the calculation of network statistics, events with more intense cooperation count more. The respective statistics get higher values for highly cooperative events, and lower values for less cooperative events. Compare Appendix A for the coding of the event weight variable.

We also included interaction effects with the preference homophily variables and the event weight that indicate whether intense cooperation is more likely with actors that share the same policy preferences. We see that including the event weight does not affect parameter estimates for the endogenous network statistics and the interaction terms are not significant. Yet, the preference homophily variables lose their significance. This implies that the effect of the preference homophily variables are independent of the intensity of cooperation.

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[11]The Akaike information criterion (AIC) is a parsimony-adjusted measure of fit. A larger value of the AIC indicates a worse model fit.

In the following, we discuss Model 8, 9 and 10 as our final models. Model 8 is non-weighted with a half-life parameter of 30 days and the best value concerning the AIC value. Running separate models for the two subsets (1997 – 2009 and 2010 – 2015), revealed different results for some variables for the two phases. This signifies that in line with our expectations cooperation patterns changed in some regards after the Copenhagen disaster in 2009.

Despite the democracy indicator, the included ***controls*** did not surprise and behaved in line with our expectations. The models show that countries, which are vulnerable to climate change, cooperate more often and are more often targeted by cooperative interaction. The effect is small, but significant, and robust across all model variations, including both subsets (before and after Copenhagen). Also, richer countries cooperate more often, both in their roles as senders as well as targets. This effect is also highly significant and robust across all models that are based on the whole event sequence. However, the effect clearly changes after 2009. For the subset covering the period between 2010 and 2015, there is no significant effect; hence, wealth is now not any more decisive for cooperative behaviour. This finding is congruent with the assumption that the strict divide between Annex I and non-Annex I countries lost its importance, since the split between the two country groups reflects the divide between the rich and the poor.

Moreover, we see that countries with high absolute CO_2 emissions do not act more often as senders of cooperative events, but they are more often targeted by cooperative initiatives. But, the significance of these effects vanishes by including the target popularity and sender similarity statistics in Model 4. This points to a possible link between the level of CO_2 emissions and the position that a country holds in the network of related events. Position here refers to a country's patterns of interaction – with whom does it interact and when? It is reasonable to assume that countries with a similar level of CO_2 emissions behave similarly in terms of their cooperation patterns as they might hold similar interests and preferences[12]. Like for the GDP variable, the effect is different after 2009. Now the parameter estimate related to the levels of absolute CO_2 emissions of the senders is positive and significant, indicating that big polluters start to engage more in the climate change issue. In addition, in line with our expectations, we find now clear effect for the natural rents variable, across all models. Countries with high natural rents neither are more likely targeted with cooperative interactions nor initiate cooperation more often than countries with low rents. Although, Model 8 shows a small,

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[12]Running pairwise correlation reveals a moderate correlation (r=0.33) between absolute CO_2 emissions and the sender similarity variables. Variance inflation coefficients are well below 2.

positive, and significant effect related to the natural rents, there is no such effect showing up in the models for both subsets.

Finally, we controlled for the effect of democracy. We tested both, whether democracies in general more likely tend to cooperate (results not shown in Table 1 and 2) and whether they tend to cooperate more with other democracies. The results show no effects of the polity 2 variable neither for the general effect nor for the homophily variable in both subsets. In contrast, Model 8 shows a small, negative, and significant effect. These findings are in contrast to our expectations and the results of Bernauer and colleagues (Bättig & Bernauer, 2009; Bernauer & Böhmelt, 2013) that find a link between the climate policy performance and the level of democracy. However, when it comes to the efforts of policy coordination, cooperation happens more between the developed and developing world. This last finding is interesting and nicely underlines the difference between two perspectives. Whereas Bernauer and colleagues operationalize cooperation as policy output (higher performance, higher level of cooperation), cooperation is here understood as the process to mutually adjust policies.

For the *preference homophily variables*, we find that, prior to the Copenhagen summit in 2009, countries cooperated less likely, when they shared the beliefs on the CBDR-principle. This is in line with our hypothesis 1a: Cooperation arises rather from discord than from harmony. As discussed, the CBDR principle was the most important ordering principle of the climate regime until 2009, but also the biggest contestation dividing the political landscape into two opposing blocs. Cooperation across these camps was important to coordinate climate protection endeavours. Moreover, there is no effect related to the instrument preference and impact homophily variables until 2009. Therefore, these issues were apparently not decisive enough to affect cooperation patterns. However, everything changes after 2010. We see that our results are identical for the whole event sequence and the first phase, but that they change in the second phase. This stresses our assumption that the political landscape has changed with the Copenhagen climate conference and cooperation patterns change during altered contestations. This provides evidence for our hypothesis 1b.

More specifically, in the second subset, we see that the parameter estimates related to CBDR principle and impact homophily variables are now significant and positive, while the parameter estimate related to the instrument preference homophily variable is now significant and negative. Accordingly, after 2009, countries are more likely to cooperate with countries that share their view on the CBDR principle and the impacts of climate change, as well as the ones disagreeing on policy objectives and instruments. On that account, these findings support our assumptions that cooperation patterns have changed after the

Copenhagen disaster. Loosening the 'dysfunctional' (Depledge & Yamin, 2009) divide between North and South changed incentives and priorities of cooperation. This finding is also well in line with the fact that after 2009 the landscape of country coalitions has changed dramatically. While before 2009 country groups were neatly separated along the Annex I and non-Annex I divide, after 2009 new country groups emerged that are located across this artificial line (Blaxekjær & Nielsen, 2014). Subsequently, new incentives and necessities for cooperation arose. We now see that countries cooperate more, when they disagree over rather technical issues, like policy objectives and instruments, in order to increase commitment to the treaty.

With respect to our second independent variable, *reciprocity*, the result shows that cooperation over climate change is largely about expectations of the future. On the one hand, political actors' willingness to cooperate is clearly influenced by the belief that an interaction will continue in the future. Consequently, they are inclined to collaborate with previous cooperation partners. In game theoretic terms, this kind of behaviour is referred to as an iterated Prisoner's Dilemma; and it is explained by using the value of continued cooperation that outweighs the benefits of defection at any point of time (Milner, 1992). On the other hand, cooperation over climate change follows a tit-for-tat strategy. However, the explanation is a lot like repeated cooperation. Again, it is all about the anticipated behaviour of others. Climate change politics and negotiations may be regarded as a game of repetition. Agreeing on an international treaty will not singlehandedly solve the problem but it is only the first step in a rather long drawn process. In this setting, cooperation is a rational behaviour, knowing that others pursue a tit-for-tat strategy, too. As a result, cooperation is rewarded with cooperation and defection is punished by defection. The parameter estimate related to the reciprocity variable is positive and significant across all models and periods. Hence, we are confident to confirm our Hypothesis 2.

In terms of the *endogenous network controls* we find that, just as expected, countries tend to repeat cooperation as indicated by the positive and significant model parameter related to the inertia effect in Model 6. With respect to structural equivalence network variable, our analysis reveals interesting results. For all models including the first subset, there is no effect related to the target popularity variable, but a significant and positive effect related to the sender similarity variable. The latter points towards a tendency of actors to make similar choices as structurally equivalent others. Hence, they preferably cooperate with countries that are structural equivalent. For the time until 2009, this indicates the existence of homophile blocs that oppose each other. This, however, significantly changes with 2009. From there on, the effect is negative and significant. This discovery is highly interesting, as it point to a

dismantling of rigid political structures that determined the politics of international climate change for more than two decades.

5. Conclusions

This research emphasises on bi- or multilateral political interactions that transpire beyond or in preparation to the yearly climate summits. Studying these processes is important, since the success of the climate conferences to a large part depends on the willingness of countries to negotiate an agreement. The more substantial "work" (e.g. settling disputes) is done beyond the COPs, the more effective their outputs are expected to be. Often, the responsible presidency of a specific COP initiates this preparatory work. For example, France did an impressive job in advance to the Paris summit in 2015, among others by bringing together the United States and China. This essentially contributed to the successful adoption of the Paris Agreement in 2015 (Brun, 2016).

The results confirm and extend major axioms of the international relations literature. The analysis has shown that cooperation ensues more often when countries disagree over important principles, policy objectives, or implementation procedures. Hence, cooperation arises from discord, not harmony (Keohane, 1984). When countries are harmonious with respect to their policy preferences no adjustment of policies is necessary. Vice versa, when countries disagree over important aspects, they must coordinate their policies, thus they must cooperate. Nevertheless, the need to cooperate to overcome disagreements does not suffice to ensure cooperation in an environment of insecurity about other country's behaviour. Trustful relationships among countries prosper over time only in the light of positive experiences and mutuality. Conversely, tit-for-tat strategies not seldom mount in an escalation of international conflicts. Our results underpin the importance of reciprocity, which is one the core concepts discussed in many international relations theories (Axelrod, 1984; Keohane, 1986; Larson, 1988).

The key findings of this the analysis reveal major and very interesting changes in the behavioural patterns, over time. The Copenhagen climate summit of 2009 was a turning point in the international climate negotiations and abruptly ended a phase of increased, international interest in the climate change problem. The conference was the final stage of two years of negotiations towards a follow-up agreement to the Kyoto Protocol. But, instead of producing a convincing strategy and new binding targets for the next commitment period starting in 2013, 'insurmountable discrepancies of interests between negotiation partners' (Blühdorn, 2012, p. 12) were revealed. Controversies arose above all about the responsibility

of emerging economies to reduce their swelling carbon emissions and the rigid divide of the world in Annex I and non-Annex I countries that did not account for the changed socio-economic realities. In fact, many industrialised states criticised that emerging economies, like Brazil, China, or India, were still classified as non-Annex I parties and refused to pledge to any further commitments until these countries would take up their responsibility, too. In contrast, the majority of the developing world insisted on the industrialised world to carry the main burden in terms of cutting down GHG emissions, providing financial and technical support to developing countries to adapt to climate impacts, and to compensate for ensuing losses and damages. Ultimately, the irreconcilable positions mounted in the meagre output of the Copenhagen summit that was nothing more than a lukewarm declaration about the intention to take further actions in the future. Nevertheless, 2009 also remarked the begin of a new era in the climate negotiations that paved the way for a novel agreement (Brun, 2016). In the years to come, the international community step-by-step abolished the strict divide as introduced by the principle of 'Common But Differentiated Responsibilities' (CBDR, United Nations Framework Convention on Climate Change, 1992) and developed new mechanisms related to climate finance, adaptation, monitoring, and transparency.

These developments are reflected in our results. Prior to Copenhagen, national governments more actively involved in interactions with countries that disagreed about the CBDR principle. With the iterative disentanglement from the rigid Annex I/ non-Annex I division in the aftermath of the Copenhagen summit, implementation issues gained in importance. Among them measures to ensure the commitment to the international agreement, the design and use of flexibility mechanisms, approaches to reduce asymmetries across countries such as adaptation aid, finance or loss and damage, or the application of technological solutions to mitigate climate change. In addition, the Copenhagen shock was apparently large enough to dismantle the tendency to interact with structural equivalent partners. In fact, the results indicate that national governments started to cooperate progressively across the homophile building blocks that have dominated international climates politics before 2009.

While this perspective add an important aspect the literature on environmental regimes., these findings also speak to a small number of studies that demonstrate the empirical applicability of the punctual equilibrium framework to the empirical enquiry of international regimes (Colgan, Keohane, & Van de Graaf, Thijs, 2012). It shows that institutional innovations, like the shift from the top-down approach of the Kyoto Protocol to the bottom-up approach of the Paris Agreement inhibit the potential to break gridlocked behavioural patterns. This are

good news, however, future research on the issue must keep track with old and new controversies that are likely to stagnate the process, such as the recent debate on Loss and Damage. These phenomenon are also discussed in a literature in the context to effectiveness regimes (Castro et al., 2014; Grundig & Ward, 2013) offering a starting point for future research.

The event data set used in the study is bound to few restrictions that must here be named. Event data always only covers a small fraction of the events that occur on any given day and is therefore never able to deliver a complete network, capturing all relations among all involved actors. This is because media sources are not able to draw a comprehensive picture of reality. Also, event data collection must deal with the bias introduced by the selection of media sources and coding errors. So, event data are neither a full nor a random sample (Schrodt, 1994). Hence, important relationships might be missing, political actors ignored, or interactions or single actors emphasized, which are less decisive. Nevertheless, event data provides a rich data source for the analysis of political behaviour as the press reports it, which goes beyond formal institutional links. Thus, it offers data on political processes on which systematic quantitative data is usually not available.

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Appendix

Appendix A: Adjusted CAMEO Scheme

EVENT TYPES NOMINAL	EVENT TYPES	DESCRIPTION	EVENT DUMMY
POSITIVE STATEMENT	1	Optimistic or emphatic comments, symbolic acts, express accord, consider policy option, acknowledge responsibility	Cooperation
CONCRETE ACTION	2	Consult, make or host a visit, meet, mediate, negotiate, discuss	Cooperation
APPEAL POSITIVE ACTION	3	Appeal for material cooperation (economic, judicial, information), diplomatic cooperation, aid, political reform, to yield (e.g. easing sanctions, dissent), to negotiate, to settle dispute, to mediate	Cooperation
INTEND POSITIVE ACTION	4	Express intends to engage in material cooperation (economic, judicial, information), diplomatic cooperation, aid, political reform, to yield (e.g. easing sanctions, dissent), to negotiate, to settle dispute, to mediate	Cooperation
YIELD COOPERATION	5	Ease sanctions, political dissent, agree on political reform	Cooperation
SUBSTANTIVE COOPERATION	6	Provide aid or engage in material cooperation (economic, judicial, information, intelligence), engage in diplomatic cooperation (praise or endorse, rally support on behalf of, grant diplomatic recognition, apologise, forgive, sing agreement)	Cooperation
NEGATIVE STATEMENT	-1	Decline or make pessimistic comment, deny responsibility	Conflict
DEMAND COOPERATION	-2	Demand for material cooperation (economic, judicial, information), diplomatic cooperation, aid, political reform, to yield (e.g. easing sanctions, dissent), to negotiate, to settle dispute, to mediate	Conflict
CRITICIZE, ACCUSE, DISAPPROVE	-3	Disapprove, criticise, accuse, rally opposition against, complain officially, lawsuit, find guilty or liable	Conflict
REJECT COOPERATION, VETO	-4	Reject material cooperation (economic, judicial, information), diplomatic cooperation, aid, political reform, plant, proposal, to yield (e.g. easing sanctions,	Conflict

		dissent), to negotiate, to settle a dispute, to mediate. Defy norms, laws, and to veto.	
THREATEN	-5	Threaten to reduce or stop aid, with sanctions, boycott, embargo, with political dissent or repression, to halt negotiations or mediation. Give ultimatum.	Conflict
SUBSTANTIAL CONFLICT	-6	Protest, strike, or boycott, engage in political dissent. Reduce relations, stop material aid, halt negotiations or mediations, impose an embargo, boycott, or strike, coerce, and assault.	Conflict

Appendix B: Coding Guideline Policy Preferences on Climate Change

CBDR: THIS CATEGORY ADDRESSES THE QUESTION OF WHO IS RESPONSIBLE AND CAPABLE TO TACKLE GLOBAL CLIMATE CHANGE.

CATEGORY	Definition	Example	Coding Rules
EQUAL	Despite historic divergent responsibilities, all countries are equally responsible to tackle climate change. Nevertheless, different country groups may have different capabilities. Each country must commit to legally binding and multilaterally coordinated contributions.	'Looking to the future, Australia will work to secure an agreement in Paris that is strong, effective and ensures countries live up to their commitments. To deliver on its promise, the agreement must establish a common playing field, **moving past the developed-developing country divide** that puts a brake on real action' (Australia, High-level segment statement, COP 20). 'Let us stop a blame game. Let us stop standing. Let each of us – **the developed countries, the large emerging economies, and the most vulnerable countries alike** – come out of our respective cocoons. We must compromise to save our future. All of us live in one village.' (Kenya, High-level segment statement, COP 16). '**We need commitments from all countries** - common but differentiated commitments, reflecting individual capabilities as they evolve over time. We need a response to the climate challenge which is ambitious and equitable at the same time' (Austria, High-level segment statement, COP 20). 'I am sure that nobody will back-down from a solution that foresees balanced and shared commitments for all, and **I say ALL, the countries**. Our future agreement must also incorporate the low carbon development option for developing countries: a solution strongly supported and promoted by the industrialized world' (Italy, High-level segment statement, COP 16).	Reference to … -the necessity to overcome the CBDR/RC principle or the developed – developing divide, OR -the need to stop blaming each other, but to collaborate, OR -the urgency that all countries alike must fulfil their commitments, AND -changing or evolving responsibilities and capabilities of countries.
EQUAL_FLEX	Despite historic divergent responsibilities, all countries are equally responsible to tackle climate change. However, only	'Of course, we understand that nation circumstances must be taken into account (…). That is why Canada supports CBDR. **Any long-term agreement should be flexible [and] allow for all countries to choose the policies that suit their political realitie**s '(Canada, High-level segment statement, COP 13)	Reference to … -national differences and circumstances

	voluntary commitments should be made with differentiated targets and full flexibility for all countries according to national circumstances.		AND -flexibility for ALL countries.
MAJOR_EMITTERS	Shared responsibility among all countries. However, major emitters – those who emitted most in the past and those who are responsible for future emissions – must take the lead and are responsible to tackle climate change. Therefore, industrialized countries and large emerging economies must commit to legally binding and multilaterally coordinated contributions. Full-flexibility and differentiated targets shall be granted to least developed countries.	'While we recognize the need to respect the principles of the Convention concerning differentiation, we need to apply these **principles according to today's economic and geopolitical realities**' (EU, High-level segment statement, COP 20). 'And this reduction in emissions can only be achieved **if all countries, namely all main emitters, act**. Climate change does not stop at national borders. Cross-border problems therefore require global solutions. National efforts are good, but internationally coordinated and binding measures are better' (Switzerland, High-level segment statement, COP 19). '(…) the countries with obligations under the Kyoto protocol cause 30% of global emissions. Even drastic reductions in these countries will not be enough. Therefore, **the new agreement must include all major-emitters**. (…) '(Norway, High-level segment statement, COP 13)	Reference to… -the CBDR/RC principle but changed socio-economic realities, OR -emerging economies as new major source of emissions, OR -the need to act by developed countries AND emerging economies AND -the need for socio-economic development, poverty reduction in least developed countries, OR -the flexibility for least developed countries.
DEVELOPED	Shared responsibility among all countries to mitigate climate change. However, industrialized countries, who have predominately caused global warming in the past, are the ones to take the lead in mitigating climate change and support developed countries in taking action. Therefore, industrialized	The new agreement '(…) should be able to address the **genuine requirements of the developing countries** by providing them with equitable carbon space to achieve sustainable development and eradicate poverty. (…) The beautiful balance of collective action – the **principles of equity and common but differentiated responsibilities** - should form the basis of continued action. Our ambition in the post-2020 period is directly linked with **ambitious actions in the pre-2020 period by the developed countries;** otherwise the poor people in developing countries will not get the **carbon space** to achieve sustainable development'. (…) We firmly believe that the INDCs are to be 'nationally determined'. We do not see any role for any ex-ante review in this process' (India, High-level segment statement, COP 20).	Reference to… -the principle of equity and common but differentiated responsibility, -importance of the divide between the developed and developing world AND

countries must commit to legally binding and multilaterally coordinated contributions. Full-flexibility and differentiated targets shall be granted to all developing countries, as they still must catch up in terms of socio-economic development.

'**Differentiation between developed and developing countries is essential** to ensure the global level of ambition required to keep temperature increase below an agreed threshold. (…) While enhanced ambition is expected from all Parties, we must ensure that previous commitments are safeguarded and that developed countries are taking the lead in the global effort against climate change, while allowing developing countries to gradually assume further obligations, in accordance with their development circumstances' (Brazil, High-level segment statement, COP 20).

'For us, that Agreement must be legally binding, with **flexibility for LDC's and SIDS**. (…) in the global fight against climate change, historical polluters must take the lead with economy wide emission reduction commitments, and that historical responsibility should provide the basis of their contributions' (Guyana, High-level segment statement, COP 20)

OR

OR

OR

-the need for socio-economic development of developing countries,

-poverty reduction of developed countries,

-'carbon space', the polluter pays principle, or the (historic responsibility of developed countries

-the flexibility for developing countries.

IMPACTS: HOW ARE THE RISKS AND IMPACTS OF CLIMATE CHANGE AND CLIMATE POLICY ASSESSED AND VALUED WHEN COMPARED TO OTHER CRITICAL AREAS SUCH AS ECONOMIC DEVELOPMENT AND POVERTY REDUCTION?

CATEGORY	Definition	Example Statement	Coding Rules
UNCLEAR	Risks of climate change are unclear – positive impacts are possible	No example found	NA
LOW	Climate change bears risks and negative impacts, but other issues (economic development, competitiveness, etc. …) are more important	No example found	NA
MEDIUM	Climate change bears substantial risks and negative impacts. However, the costs of responding are also high and other issues (economic development, competitiveness, etc. …) are at least equally important and should not be compromised by climate change mitigation or adaption action.	'Climate change is a challenge for us all, with serious environmental, social and economic consequences. Individually and collectively we must deliberate carefully and determine the best course of action to reduce emissions. **This action must deliver real cuts in emissions and not put countries at a competitive disadvantage. And it must work alongside countries' plans for strong economic growth, jobs, and development**' (Australia, High-level segment statement, COP 20). 'Bangladesh, though an LDC, has expressed its willingness to participate in mitigation if supported with finance and technology. Bangladesh needs huge amounts of energy to fuel its development process and at present we have large shortfalls in commercial energy. (…) **We shall not compromise our efforts towards development**, but we are committed to put our efforts for mitigation activities' (Bangladesh, High-level segment statement, COP 16)	Reference to both -the seriousness of climate change impacts AND -the necessity to consider other factors such as socio-economic development, competitiveness, as well.
HIGH	Climate change bears high risks and negative impacts, and the costs of impacts clearly outweigh the costs of responds. However, other issues (economic	'**In addition to all these challenges Afghanistan is one of the ten countries in the world identified as most vulnerable to climate change**. We are experiencing that the impacts of climate change in this land-locked, mountainous, and least developed country. The new government and the President himself have recently identified the impacts of climate	Reference to … -climate change as an additional and major burden for socio-economic development,

	development, competitiveness, etc. …) are also important.	change as a major additional hurdle in achieving our socio-economic objectives' (Afghanistan, High-level segment statement, COP 20). 'Climate change is a global challenge with serious consequences for nations across the globe. **The cost of inaction far outweighs those of taking concrete measures**' (Iran, High-level segment statement, COP 20). 'Vietnam belongs **to the group of countries that are most affected by climate change**, also affecting its socio-economic development'. (Vietnam, High-level segment statement, COP 13)	OR -the serious consequences of climate change, OR -the high vulnerability of a country to climate change, OR -cost of inaction is higher than of taking concrete measures.
VERY_HIGH	Climate change has most significant risks and the costs of its impacts are well exceeding the costs responds. Climate change impacts are among the most important threats to socio-economic development and safety.	'For Africa, Climate change is indeed a challenge. (…) most African economies rely on climate-sensitive sectors **highly exposed to climate variability**, drought, flooding, which are disrupting agricultural production, endangering livelihoods, and health, (…)' (African Union, High-level segment statement, COP 20, Lima) 'The projected future impacts present **catastrophic scenarios** for Kenya, Africa and other vulnerable developing countries (Kenya, High-level segment statement, COP 20) '**Climate change is the single greatest challenge facing my country**' (Tuvalu, High-level segment statement, COP 20)	Climate change impacts clearly range among the most important threats indicated for example by superlative formulations, adjectives such as catastrophic, or an enumeration of negative impacts.

INSTRUMENTS: WHAT ARE THE MOST IMPORTANT POLICY OBJECTIVES AND WITH WHAT KIND OF INSTRUMENTS SHOULD BE ADDRESSED? RESPECTIVE CATEGORY HAST TO CLEARLY DOMINATE OVER OTHER CATEGORIES TO BE CODED.

CATEGORY	Definition	Example Statements	Coding Rules
COMMITMENT	Preference is given to the matter of reducing political uncertainty as caused by non-compliance to national commitments and free riding. The possible policy instruments to address this matter are monitoring and reporting arrangements that control, legally binding commitments, and enforcement mechanisms (such as sanctions).	'(..) we need clarity on the information required to ensure that Parties proposed contributions **are transparent and understandable**; we should also agree on a process on a process to consider and analyse those proposed commitments before Paris' (EU, High-level segment statement, COP 16). A global legally binding agreement '(…) **will provide reasonable assurance that there will be reciprocity of actions among Parties and instil confidence** in countries to implement their own' (Singapore, High-level segment statement, COP 16). An agreement must 'deliver action over time. One effective way to do that is **to allow countries to cooperate in full-filling their obligations**' (Norway, High-level segment statement, COP 20) The Paris protocol 'has to satisfy the following criteria. It has to be legally binding. Countries will only be willing to make commitments, if they can be sure that all other countries will stand by (…). **We need a credible review mechanism for commitments and a robust transparency system**' (Germany, High-level segment statement, COP 20)	Priority must be given to at least one of the following issues: -transparency mechanisms or monitoring and reporting arrangements, -the legally-binding character of commitments that ensures the reciprocity of action among Parties, OR -flexibility mechanisms in the sense that the implementation of commitments is ensured.
ASYMMETRIES	Preference is given to the matter of reducing asymmetries of interests and capabilities between developing and developed countries. Possible policy instruments to address this issue are technology or financial transfer mechanisms, capacity building and Loss & Damage arrangements.	'It is equally evident that developing countries could do more **if finance, technology support and capacity building is ensured**' (India, High-level segment statement, COP 20). 'We need a neutral mechanism **to determine the reasonable fair share** of the huge global effort of each party, both to minimize the risk of dangerous climate change and enable adaptation to the global warming which has already been caused primarily by the Annex 1 countries.' (Afghanistan, High-level segment statement, COP 20). '**Climate financing is one of the key elements**. Climate financing is not only about funding. It is also about balancing economic interests and responsibilities. And of creating trust	Priority must be given to at least one of the following issues: -developed countries that support developing countries through financial or technology transfer, or capacity building, -compensation payments for climate change mitigation action and

		between countries at all levels of development' (Norway, High-level segment statement, COP 16).	impacts through Loss and Damage or REDD, AND -equity in terms of a fair share of efforts and benefits of mitigation or adaptation action. -
UNCERTAINTY	Preference is given to reduce technical uncertainty such as the height of economic costs imposed by specific commitments. Possible policy instruments to address this issue are all kinds of flexibility mechanisms to ensure that climate change mitigation action is in accordance with economic development goals.	'As for addressing another sensitive and essential issue, namely the surplus and carry-over of Kyoto units, the solution should take into consideration all aspects: acknowledge the compliance efforts of the parties in respecting the KP provisions, assure **fairness for all Parties, and correctly assess the economic, financial and social consequences of reducing emissions and the respective Parties**. For achieving mitigation objective in a cost-efficient manner, we believe that carbon market is an essential tool' (Romania, High-level segment statement, COP 16). 'Latvia was very concerned about its possible commitments and their impact upon economic growth' (Latvia, High-level segment statement, COP 20).	Priority must be given to -the concern about economic costs of climate change mitigation commitments and fairness in terms of the social-economic costs of reducing GHG emission AND/OR -to the use of flexibility mechanisms
TECHNOLOGY	Priority is given to technological or economic solutions to mitigate climate change. This may include mechanisms of technology transfer, carbon capture and storage, the increased use of renewables and increased energy efficiency of technologies, among others.	'This process is a technology intensive one. We, therefore, **need extensive global cooperation including practical measures and mechanisms for developing, transfer and dissemination of technology on concessional and preferential terms**. (…) Therefore, international cooperation for developing and transferring relevant technologies and associated know-how, to help achieving cleaner energy from fossil fuels is of paramount importance. Furthermore, transfer of technology and associated know-how is critical for sustainable agriculture to promote food security and to combat hunger and poverty across the globe' (Iran, High-level segment statement, COP 20). 'Reduction targets have to be set in all countries so that new, **climate –friendly technologies** are put to use. We in Switzerland have the technological know-how in water protection, in buildings, energy use and air quality management. Wealthy countries have to support poorer countries' (Switzerland, High-level segment statement, COP 16).	Priority must be given to one of the following issues: -technology transfer as a tool to ensure that developing countries can reduce their GHG emissions, -renewables, green technology, and increased environmental efficiency as the preferred tool to reduce GHG emissions, -economic instruments such as taxes, -the balance between climate change mitigation

and economic development is an opportunity,
-the important role that the transfer to a green economy play for mitigating climate change.

Appendix C: Research Design

RESEARCH DESIGN	VARIABLE	EXPLANATION	DATA SOURCE	REM VARIABLE	HYPOTHESIS
DEPENDENT VARIABLE	Cooperation dummy (cooperation = 1; conflict =0	This variable reflects all true cooperative events in the event sequence. It is coded as dummy variable with true cooperation = 1 and potential cooperation = 0.	Event data set	Based on event sequence	all
INDEPENDENT VARIABLE	3 preference homophily variables (CDBR-principle, impact, instruments)	These variables capture whether two countries share preferences on the CDBR-principle, climate change related impacts, or policy objectives and instruments.	Statements made by high-level country representatives made at selected UNFCCC Climate Change Conferences at two periods $(1997 - 2009$ and 2010-2015)	Dyadic variable	H1a, H1b
INDEPENDENT VARIABLE	Reciprocity	Tendency of actors to reciprocate cooperative behaviour.	Event data set	Network statistic	H2
CONTROL VARIABLE	Inertia	Tendency of past contacts to become future contacts or social inertia.	Event data set	Network statistic	
CONTROL VARIABLE	Sender similarity	Tendency of senders to target the same cooperation partners.	Event data set	Network statistic	
CONTROL VARIABLE	Target popularity	Tendency for targets to be targeted by others with cooperative initiatives.	Event data set	Network statistic	
CONTROL VARIABLE	Absolute GHG emissions	The variable captures the level of absolute GHG emissions for each year between 1997 and 2015. Absolute emissions are measured in CO_2 Ktons per year.	World development indicators	Actor covariate	
CONTROL VARIABLE	Vulnerability	The variable reflects the GDP adjusted vulnerability of a country to climate	ND Gain Vulnerability Index	Actor covariate	

		change. The index is composed of a countries exposure to climate-related hazards, its sensitivity, and adaptive capacity.		
CONTROL VARIABLE	Per capita GDP	The variable reflects the logged GDP for each year between 1997 and 2015.	World development indicators	Actor covariate
CONTROL VARIABLE	Polity 2	The variable reflects the level of democracy of a country for each year between 1997 and 2015.	World development indicators	Actor covariate
CONTROL VARIABLE	Natural rents	The variable reflects the average rents from coal, oil, and natural gas production (% GDP) in period for each year between 1997 and 2015.	World development indicators	Actor covariate

II. What drives the Adoption of Climate Change Mitigation Policy? A Dynamic Network Approach to Policy Diffusion, by M. Kammerer & C. Bagchi

Abstract

The Paris Agreement envisages bottom-up action from all countries to protect the global climate. Therefore, studying the factors influencing policy adoption is more important now than ever. This article lines into the policy diffusion literature to shed light on the conditions, which incentivises countries to adopt climate change related mitigation policies. The theoretical argument elaborates on the unified model of government innovation that includes both internal and external factors as explanations for the adoption of policies. Previous applications of this model usually operationalise the latter by spatial proximity or international, institutional ties to account for the interdependencies among countries and use them to explain policy diffusion. In contrast, this research highlights the benefit of studying the relations between countries as they arise in the context of international interactions, over time. The findings indicate that internal determinants and time-invariant international factors give important insights about why some countries more likely adopt (more) climate policies than others, but they cannot explain how these policies have diffused across countries in the past two decades. In contrast, the inclusion of dynamically, evolving relations between countries shows that policy adoption is a matter of social influence. In the context of political interactions related to international climate policy, countries communicate, compare with each other, and coordinate their behaviour, leading to a diffusion of political practices.

1. Introduction

The Paris Agreement of 2015 is the first ever international treaty in the history of climate change politics where all the countries in the world agreed to act together to fight climate change. Unlike its predecessors, the treaty is based on the principle of self-determination requiring ambitious national climate protection policies. While the Paris Agreement is a momentous development in climate change policy, it requires bottom-up action from all the countries. Therefore, countries, on their own accord, must adopt domestic policies to reduce greenhouse gas (GHG) emissions or mitigate climate change.

However, countries on their own have little incentive to adopt climate change mitigation policies since global climate change is considered to be a classic 'tragedy of the commons' (Hardin, 1968). Investing resources to adopt climate change mitigation policies provides a common pool resource by contributing to a cleaner atmosphere around the globe. Climate change mitigation is hence, a global public good with non-excludable benefits. This aspect of mitigation often encourages free-riding behaviour, i.e. enjoying the benefits of other countries' climate protection efforts, while avoiding costly policies yourself. Understanding the free-riding incentives of others increase the non-likelihood of adopting climate change policies due to potential economic losses and expected competitive disadvantages in the short run. Nevertheless, despite having the ability to free ride on mitigation action by others, we do observe countries adopting a substantial number of national legislations on climate change mitigation. The GLOBE Climate Legislation Study (2016; 2014) finds that between 2009 and 2014, the number of climate change policies adopted almost doubled in the 99 countries they studied. In this article, we aim to investigate the factors that influence the domestic adoption of climate change mitigation policies.

Some authors claim that countries adopt climate change mitigation due to the associated co-benefits (Dolšak, 2009). Co-benefits are defined as the benefits accruing locally due to the adoption of a climate change mitigation policy (IPCC, 2007). For instance, if a country adopts renewable energy programs, the global benefit will be the overall GHG reduction. Additionally, it will also generate economic benefits and reduce local air pollution. Irrespective of the generation of such co-benefits, the motivation behind the adoption of climate change related mitigation legislation is targeted towards a more general reduction of GHGs, principally at a global scale. In fact, many countries pass a 'flagship law' (Townshend et al., 2013) that specifies an emission target or unifies different policies under an inclusive legislation. Moreover, the extent of co-benefits from a mitigation policy is often not enough to incentivise high levels of GHG emission reductions. For instance, because of the global nature of mitigation countries,

like the US and China, often find themselves in a deadlock, where both of them wait for the other to take action (Thurston, 2013). Hence, we expect that co-benefits alone cannot drive countries to adopt climate change mitigation policies. It is rather the nature of international relations and the anticipation of the behaviour of other countries that foster or hinder the adoption of climate change mitigation policies.

Based on this argument, the article lines into the policy diffusion and adoption literature by questioning how international interdependencies can lead to a diffusion of climate change mitigation policies and thereby influence domestic decision-making. The next section of the paper discusses developments in the policy diffusion literature. It explores the factors that influence the adoption of a domestic policy, keeping in view the connection between international relations and domestic politics. We also discuss the current research on climate policy diffusion. Furthermore, we explain why the current literature has not satisfactorily covered the issue of country interdependencies and highlight the advantages of a dynamic network perspective to explore policy diffusion. In the succeeding section, we introduce the 'unified model of government innovation' (Berry & Berry, 1990, 2014) to derive and explain the analytical approach. Methodologically, we apply a temporal network autocorrelation model (Leenders, 2002; Leifeld & Cranmer, 2016). We chose this model since it allows us to disentangle the different factors that might lead to the adoption of climate change mitigation policies, such as the internal motives, resources, or constraints of a country and its international relations, and to assess them over time. By studying cooperative political interactions that happened in the context of the global climate change issue between 1995 and 2015, we demonstrate that the adoption of climate policies is a matter of social influence. Our results show, that countries are more likely to adopt policies if they interact with other countries that already have adopted a few climate policies. In addition, countries tend to behave akin to those countries that are in a similar structural position.

2. Theoretical Approaches to Policy Diffusion

The interconnectedness between international relations and domestic policy innovation is often analysed in the context of transnational diffusion processes or clustered decision-making, which can be understood as a 'dispersion or dissemination' (Elkins & Simmons, 2005, p. 36) of political practice. These processes are studied in the context of a wide range of phenomena, such as the diffusion of specific policy instruments, institutions, or policy frameworks. To name a few, we can consider the studies on neoliberal models, democracy standards and certifications, or labour rights (Gilardi, 2012). Rogers (1983, p. 6) defines policy

diffusion as a 'process by which [policy] innovation is communicated through certain channels over time among members of a social system'. The patterns of policy innovation by diffusion are often expressed through two levels: the unit of analysis (e.g. countries) and the social structure (e.g. a policy domain) (True & Mintrom, 2001). The mechanisms that induce policy innovation are either due to the internal characteristics of the unit of analysis (e.g. socio-economic conditions) or due to the 'unit's interaction with others in the broader social system' (True & Mintrom, 2001, p. 34). Diffusion is usually understood as a mechanism of social influence that manifests either through the vertical mechanism of coercion or the horizontal mechanisms of competition, social learning, or emulation (Berry & Berry, 2007; Gilardi, 2012). Coercion is carried out through conditionality and can either be from federal governments to the state or local governments (Shipan & Volden, 2006) or imposed on nation-states by hegemons, supranational or intergovernmental organisations (Biersteker, 1990; Schimmelfennig & Sedelmeier, 2004). Competition is defined as 'the process whereby policymakers anticipate or react to the behaviour of other countries to attract or retain economic resources' (Gilardi, 2012, p. 15). Learning happens when policymakers go through a process of Bayesian updating to deal with the uncertain consequences arising from the introduction or modification of a policy (Gilardi, 2010). Lastly, emulation or imitation occurs when policymakers learn from one another's 'good policy practices' or adapt to commonly accepted norms (Jordan & Lenschow, 2000). Regardless of quality or motive, the common idea behind these causal mechanisms of policy diffusion is that the adoption of a certain kind of behaviour depends on the behaviour of other actors.

Based on the mechanisms of policy diffusion, Berry and Berry (2007) claim that internal and/or external determinants might drive the adoption of a policy. For example, a combination of internal factors (social or political) may influence a country to impose a tax on its citizens. On the other hand, external factors such as joining an international agreement may encourage it to impose a regulation to phase out on certain industrial pollutants. Following this approach, most of the early diffusion studies often implicitly assumed that policy diffusion arises from interdependencies and interactions between related actors. Expressed differently, these studies understood diffusion as a process where countries observe the policy behaviour in related countries and then implement similar policies back home (Berry & Berry, 1990; Mintrom, 1997).

A network perspective in studying the diffusion of policies allows us to integrate explicitly interdependencies resulting from social interactions of actors in a policy domain. Increasingly, scholars across different policy areas started to assimilate a more refined analytical approach

to understand interdependencies where the behaviour of one actor can be dependent on the actions of other actors (Cao, 2010; Dorussen, Gartzke, & Westerwinter, 2016) and not necessarily only due to geographical proximity or organizational similarity. To name only a few of the most recent advancements: Chyzh (2016) studied human rights diffusion via trade networks; Haim (2016) investigated how a network of international political alliances influence trade flows and Mohrenberg (2017) used a social network analysis approach to study the diffusion of foreign trade policies through bilateral trade flows.

Typically, studies in climate policy continue to explain the adoption of new climate policies either by policy diffusion between geographically neighbouring countries (Matisoff, 2008), the influence of international organisations (Oberthür & Tänzer, 2002) and/or by internal determinants (Regens, 1980). Climate policy studies, more recently are tending to incorporate international factors along with domestic ones, to study the process of policy diffusion. Some noteworthy studies investigate the adoption of climate policies by using Berry and Berry's (2014) 'unified model of government innovation' that combines external factors and internal determinants. For instance, Dolšak (2009, 2013) examines how internal factors (such as, domestic air pollution, the level of income, democracy levels) in conjunction with external factors (for example, a country's embeddedness in different networks of intergovernmental organisations (IGOs) affects policy diffusion. She concludes that countries have an incentive to implement international climate protection agreements when emission reduction policies create domestic co-benefits such as reduced domestic pollution. In a similar vein, Biesenbender and Tosun (2014) point out that while external factors such as learning from other international organisations influence the adoption of climate policies, internal factors, such as political preferences, too, are pivotal for diffusion to occur. Stadelmann and Castro (2014) also develop an integrated model to study energy policy adoption in developing countries to come to a similar conclusion - both external and internal factors influences policy adoption. Frankhauser, Gennaioli, and Collins (2015) contrast policy diffusion, which is more of a bottom-up process, with the more top-down nature of international treaties, such as the Kyoto Protocol. They conclude that whether a country passes any climate change legislation or not depends substantially on whether other countries do the same. Another extension to traditional climate policy diffusion studies is that of Matisoff and Edwards (2014). They study how clean energy policies diffused across different states in the United States to finally conclude that policy learning and diffusion happens when states are imitating 'cultural cohorts, rather than geographical cohorts' (Matisoff & Edwards, 2014, p. 798).

A network perspective in the literature on policy diffusion in climate policy is rare and climate policy studies that have used network analysis do not focus on policy diffusion (Ingold & Fischer, 2013; Kukkonen, Ylä-Anttila, & Broadbent, 2017; Stein, 2008). On the other hand, as already discussed above, studies in climate policy that attempt to analyse policy diffusion, do not adopt a network perspective but rather focus on internal/external determinants. It is imperative to take this into account, because as an issue area, climate policy itself is an interdependent process where actions taken by one country may very well have effects on other countries. This gap created in the climate policy diffusion literature by the absence of the consideration interdependencies arising out of interactions between actors is precisely what we aim to fill in this study. The main aim of our research is to assess the extent to which policy adoption is a function of interactions between countries. To this end, we extend the traditional approaches by including country interactions in the realm of international climate policy, thereby integrating a network perspective on policy diffusion. Our expectation is that meetings in common forums such as the UNFCCC to agree on common goals in climate policy can facilitate an exchange of ideas and promote policy learning among different actors. We explain how we expand on Berry and Berry's model of 'unified government innovation' (1990, 2014) to incorporate network ties as an additional external determinant of policy diffusion in the succeeding section.

3. The Extended Model of Government Innovation

We base our analytical framework on the 'unified model of government innovation' as proposed by Berry and Berry (1990, 2014, p. 325). The model combines internal and external determinants to explain the adoption of new policies as a function of the motivation (M) of country officials to adopt a certain policy, the available resources, or obstacles (R), the existence of other policies (POL), and external factors (EXT). While M, R, and POL all refer to domestic characteristics, EXT captures variables such as the spatial proximity of two countries or their institutional similarity. In its original version, the model is expressed as follows:

ADOPT = f ((DOM = M + R + POL) + EXT)   Equation 1

Applications of the 'unified model of government innovation' usually operationalise the external effects that trigger diffusion processes by neighbouring or peer group effects that capture physical or cultural closeness (Dolšak, 2009, 2013; Fankhauser, Gennaioli, & Collins, 2014). Similarly, trade relations, common membership in international organisations, etc. create direct and indirect links between countries and result in social influence. Many of these applications use an event history analysis (EHA) model. In an EHA, the main dependent

variable is the risk of adopting a new policy. The unit of analysis is usually state-years, country-years, city-years, and so on. The problem of this approach is that although EHA models include neighbouring effects, they are unable to capture appropriately interdependencies between countries. This is because the observations in these studies are, by assumption, independent from each other. All kinds of traditional regression models are based on the same assumption. Therefore, arguing that policy adoption is a matter of interdependencies between the countries stands in direct contrast to the assumption of independent observations.

Gilardi and Füglister (2008) react to this problem by proposing a dyadic approach, in which the dependent variable is coded as 1 when country A makes its policy more similar to country B. According to them, 'the dependent variable does not record policy change or the influence of one state over another, but simply indicates an increased similarity in the policies of two states' (Gilardi & Füglister, 2008, p. 419). While we acknowledge that this approach is appealing, it is not without certain drawbacks. Firstly, the dependent variable cannot be observed directly but needs to be constructed indirectly. This makes the process of data collection cumbersome and particularly so, with geographically large data sets. Secondly, this approach still neglects dependence structures of higher order as imposed by the network context.

Our approach takes into consideration the drawbacks of the existing literature and proposes extending the 'unified model of government innovation' by including network dependencies over time as an additional external determinant of policy diffusion. A crucial assumption of the network approach is that the existence and emergence of ties between the units of analysis depend on the existence of other ties (network dependence assumption) and exogenously given actor attributes (social selection assumption). Put differently, many social phenomena are 'embedded within networks of interdependencies, the so-called 'context' of these phenomena' (Leenders, 2002, 21). This means that social actors are responsive to the context by contemplating on the behaviour of others.

The occurrence of specific attributes or behaviour often depends on direct and indirect network ties as well as on the distribution of actor-specific characteristics and behaviour across the network. Leenders (2002, p. 26) argues that social influence occurs '(…) when an actor adapts his behaviour, attitude, or belief, to the behaviours, attitudes, or beliefs of other actors in the social system'. Whether the influence is intentional or not does not matter here. The priority is the availability of information about the behaviour and attitude of other actors to be able to mutually compare and learn. In our research context, this implies that countries have a higher probability of adopting a climate policy when they are directly or indirectly linked

to other countries that have already adopted climate policies. This argument is in line with findings from Bernstein and Cashore (2012) and Kern, Jörgens, and Jänicke (2001) and has been widely accepted within the policy diffusion literature (Gilardi, 2010).

Leenders (2002) breaks down the horizontal mechanisms behind social influence into two main processes – communication and comparison. Communication 'refers to social influence through direct contact between ego and alter' (Leenders, 2002, p. 27). Consequently, countries use other countries as their frame of reference, with which they have direct ties. For the diffusion of climate policies this entails that countries are more likely to innovate their climate policy, when they have direct links to other countries (i.e. diplomatic interactions, meetings of country officials, exchange of material and human resources and so on) that have already adopted climate policies. This leads to our first hypothesis:

Hypothesis 1: Countries with direct ties to other countries that have already adopted climate policies, should adopt climate more policies.

On the other hand, the adoption of new policies might be triggered by a comparison with structurally similar countries. In the process of searching for a 'social identity,' a country ascribes to itself the same characteristics as structurally similar countries and adopts a similar behaviour. Studies on international conflict support this claim by showing that countries tend to follow a similar behaviour to structurally equivalent alters (Maoz, Kuperman, Terris, & Talmud, 2006). In other words, structural equivalence can be described as the tendency to have and create ties with other actors that make similar choices. Thus, countries that are similar in their relations with other countries hold a similar structural position and are structurally equivalent. For the diffusion of climate policies, we expect countries to imitate other countries that are akin to themselves. In other words, these countries are structurally equivalent if they interact in similar ways, i.e. they have similar diplomatic relations, meet, and exchange information with the same countries. We expect these countries to also behave likewise with respect to their climate mitigation policy. We therefore hypothesise:

Hypothesis 2: A country will more likely adopt a climate policy if structurally equivalent countries also adopt climate policies.

This approach also has its limitations, as it is not possible to solve the 'chicken and egg' problem and disentangle comparison from communication. In principle, however, countries with direct ties could compare themselves with each other and countries with indirect ties could have overlooked the channels of communication. In addition, one cannot truly know whether the similarity of two structurally equivalent countries arises from comparison and/or

communication. The results of this study are not meant to offer an empirical solution to separate these two distinct, but interconnected theoretical concepts. However, it points to the importance of interdependent decision-making in a more general sense.

Based on these hypotheses, we propose to redefine the 'unified model of government innovation' (Berry & Berry, 1990, 2007) in the following way:

$$ADOPT_{it} = f(INT_{it} = (M_{it} + R_{it} + POL_{it}) + EXT_{it} = (PROX_{it} + NET_{it})) \qquad \text{Equation 2}$$

Hence, the adoption of (climate) policies is now a function of:

- Internal determinants (INT) that encompass the country-specific motivation and problem severity (M), the available resources and capacity of a country to implement climate change mitigation policies (R), existing policies (POL)
- External factors (EXT) that reflect the adoption behaviour of others that are in spatial proximity (PROX) or the political relation of countries expressed as direct and indirect network ties (NET).

4. Research Design and Data

This section outlines our data set based on the reformulated version of the 'unified model of government innovation' (Berry & Berry, 1990, 2007).

Climate policy data

The dependent variable in the analysis is the adoption of mitigation policies. It is based on data from the Grantham Research institute's Global Climate Legislation Study of 2015 (Grantham Research Institute, London School of Economics, 2016). The study captures climate change laws and policies for mitigation as well as adaptation. This information is available for 98 countries and the European Union (EU). Together, these countries are responsible for almost 93 percent of world emissions including the 46 of the world's top emitters and are home to 90 percent of world's forests. The dataset includes 33 developed and 66 developed countries including the EU. It contains a list of about 800 climate-related policies and detailed country chapters with background information on key indicators. From this data set, we use a subset of 91 countries including the EU (compare Online Appendix A).

We only focus on the adoption of mitigation policies based on the expectation that international factors influence its adoption since mitigation of climate change is a collective action issue. Mitigation policies refer to those policies aimed the reduction in emission of GHGs, energy supply and demand, renewable energy, transportation and so on. These policies

were coded as 1. In total, we consider 667 climate policies that have been adopted between 1995 and 2015.

Network data

To collect information on country interactions, we have used the POLCLIMATE (Politics on Climate Change) event data set (cp. for more details Author(s), 2016, Hirschi, 2008). The dataset contains information on dyadic political, cooperative, and conflictive events related to climate change issues that occurred between 1995 and 2015. The current version of the event data set codes political event data based on lead sentences of news reports from Agence France Presse (AFP) for the period from 1 January 1995 to 31 December 2015.

The dataset describes interaction patterns between countries over time by encoding their participation in a conflictive or cooperative political event. Conflict or cooperation between countries can range from something small to something significantly important. For example, it can be something small, like a country making a comment on another country's reformed policies, to something substantial, like offering financial support and agreeing to exchange confidential information. The dataset breaks down the complex political processes that occur beyond and in preparation to the yearly climate negotiations into a series of single events and therefore, captures 'who did what to whom, when' (Hirschi, 2009, p. 90; Schrodt, 1994). Each of these dyadic events can be understood as a political interaction operationalised as a tie in a political network. For this study, we used a subset of the same 98 countries including the EU that are available in the Global Legislation Study (2015). These countries cover more than 90% of the political interactions contained in the POLCLIMATE data set.

Moreover, we focused on cooperative ties to disentangle possible contrary effects from conflict on policy diffusion. We decided to study policy diffusion based on cooperative interactions for several reasons: countries often meet and exchange views and opinions in international negotiation forums. More often than not, they have opposing views but for mutual profitability reasons, they try to cooperate and find a common ground. This can be a precursor to political coordination between countries (Keohane, 1984). We argue that these cooperative interactions are a good proxy for international interdependencies in climate politics since one country's decisions might be influenced by these cooperative events. This reflects a completely different aspect of interdependencies in comparison to spatial proximity or institutional similarity. For exact definitions of types of cooperative and conflictive events that we consider in our analysis, compare Online Appendix B.

Based on the cooperative interactions (we made no distinction between the different types of cooperation), we transformed the event sequence, as created by event data analysis, into four weighted network matrices that only reflect cooperative ties in four subsequent time phases. These networks contain aggregated information about all cooperative interactions between countries occurring in the respective time phase. We constructed these time phases as per major events that have transpired in the history of climate policy. Compare Table 3 and Appendix C for a detailed description and justification of the periods.

Table 3: Description of phases used in the analysis

PHASE	NAME	PERIOD
T_1	Negotiating the Kyoto Protocol	1995-2004
T_2	Implementing the Kyoto Protocol	2005-07
T_3	Post Bali Enthusiasm	2008-09
T_4	Towards a New Agreement	2010-15

Explanatory variables

The *policy adoption behaviour of other countries* is one of our two explanatory variables. It enters the model as a net-lagged variable for weighted graphs. The 'weightlag' (Leifeld & Cranmer, 2016) model term captures spatial autocorrelation in the four cooperation networks. The intuition behind the construction of this variable is that the policy adoption behaviour of a linked country affects a country's policy adoption behaviour. If the value of the autocorrelation variable is significant, the country shows a similar adoption behaviour compared to the countries with which it cooperates most. The variable is constructed by a multiplication of the weighted matrices, one matrix for each phase, with the policy adoption variable of the respective phase. The resulting vectors reflect the level of spatial autocorrelation for each country in each phase. For example, between 1995-2004, Japan and Germany have cooperated intensively and hence have a direct, weighted tie with a high value. In line with our expectations, these countries also show similar policy adoption behaviour in terms of the climate policies they have adopted during this time phase. Consequently, the variable interprets the policy adoption behaviour of other countries in a network perspective. We expect the model parameter to be significant and positive to support hypotheses 1.

To test hypothesis 2, we use a model term that encompasses the *structural similarity* of actors in terms of their cooperative interactions. We consider actors that are similar in their

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social activity towards other actors to be structurally equivalent (Wasserman & Faust, 1994, p. 348). The 'structursim' (Leifeld & Cranmer, 2016) model term is constructed as a similarity matrix based on Euclidian distance, which reflects the structural equivalence of two actors in terms of their cooperative ties. It is then multiplied by the policy adoption variable. This is computed for each of the four networks. Analogous to the weightlag variable, the resulting vector reflects how far a country shows similarity in their adoption behaviour compared to other structural equivalent countries. As an example, consider the countries Bangladesh and Bolivia. The two countries are highly structurally equivalent in time phase 4 i.e. between the year 2010-15 and both adopt a significant number of policies. For our hypothesis 2 to be supported, we expect the model parameter to be significant and positive.

Control variables

The first set of control variables reflects the motivation of a country to adopt climate policies. Therefore, we account for vulnerability, the level of absolute CO_2 emissions, and natural resource rents. Countries that are more vulnerable to climate change are possibly those, which have contributed less to the problem and have lower levels of GHG emissions. It is expected that they will probably focus more on adapting to climate change rather than mitigate it. We utilise the vulnerability component of the ND-GAIN Index, since it is comprehensive, covers many countries, and adjusts for GDP, reducing our chances of encountering multicollinearity.[13] We anticipate that high levels of vulnerability are negatively correlated with the adoption of mitigation policies. We also control for the absolute level of CO_2 emissions since we expect that countries with higher levels of CO_2 emissions are more likely to introduce climate change mitigation policies. Nachmany et al. (2014) claim that almost all countries with significantly higher emissions have taken up mitigation policies to reduce GHG emissions. Lastly, we control for natural resource rents that often form a sizeable part of the GDP and can influence the policy behaviour of a country. Since climate protection requires that countries reduce their carbon emission, it should result in a reduced use of fossil fuels. Therefore, countries with higher natural resource rents should adopt more climate change mitigation policies. We use the World Bank's natural resource rent indicator

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[13]Compare: Notre Dame's Environmental Change Initiative (ND-ECI) (2015). Notre Dame Global Adaptation Index (ND-GAIN) Available online: URL: https://gain.nd.edu/our-work/country-index/.
The vulnerability component, measures the extent to which a country is susceptible to the adverse effects of climate change. Specifically, it captures a country's exposure to climate hazards, its sensitivity to climate impacts, and its adaptive capacity.

to control for the effect of natural resource rent on climate change policy adoption and expect a positive correlation between the two variables.

The next set of variables reflects the resources available to a country and capacity of a country to adopt climate policies. Firstly, we control for GDP per capita. While countries often adopt climate change mitigation policies to access the co-benefits associated with them, the motivation to do so is less for countries that have fewer resources to procure and often the costs of introducing these expensive mitigation policies offset the benefits accruing from it. Therefore, we expect that countries with more financial resources will introduce more climate change mitigation policies. This anticipation is also because higher growth in GDP levels is usually associated with higher levels of GHG emissions. Secondly, we control for the level of democracy of a country. Some studies such as Dolšak (2013) stated that democracy is an important determinant of climate change mitigation policy adoption since democratic governments are accountable to their people and more likely to adopt policies amenable to public opinion in their country. We use the Polity2 index and expect that the more democratic a country is, the higher will be its rate of policy adoption.

Furthermore, existing mitigation policies might be positively correlated with whether a country adopts more mitigation policies. For instance, the existence of flagship laws may encourage countries to adopt more climate change mitigation. An additional motivation provided by existing policies may be because countries realise the co-benefits accruing from adopting climate change mitigation policies in the past that make them more likely to adopt climate change mitigation policies in the present. Lastly, we also control for the regional proximity of countries to capture neighbouring effects. For this purpose, we coded a variable that assigns countries to world regions as defined by the World Bank. In our model we included the region as a homophily term *same region.* A significant positive parameter estimate related to this variable would indicate that countries from the same region show a similar policy adoption behaviour.

5. Model Specification

Understanding the structure and effect of networks on the behaviour of social actors is important, because social processes, such as diffusion, may be potentiated by network ties (Daraganova & Robins, 2013). Social influence models serve to assess how the individual behaviour is constrained by the position of a social actor in a network and by the behaviour of other actors (and their position). The so-called autologistic actor attribute models or network autocorrelations models take the network tie as an exogenous explanatory factor, as well as

independent covariates, to model a specific behaviour (here: the adoption of climate change mitigation policies).

Table 4: Overview of Variables and Data Sources

VARIABLE TYPE	VARIABLE	EXPLANATION	DATA SOURCE	RESEARCH DESIGN	DEPENDENCY
DEPENDENT VARIABLE	Policy adoption	Number of adopted climate change mitigation policies in period t	Global Climate Legislation Study		
DYAD-INDEPENDENT COVARIATES	Own past policy adoption behaviour	Number of adopted climate change mitigation policies in period t	Global Climate Legislation Study	Control variable	Covariate-Dependent Assumption Time-lagged
	Vulnerability	Average vulnerability of country towards climate change risk in period t	ND-GAIN Index of vulnerability	Control variable	Covariate-Dependent Assumption
	CO_2 emissions (log)	Average absolute emissions ($ktCO_2e$, logged) in period t	World Development Indicators	Control variable	Covariate-Dependent Assumption
	Natural Rents	Average rents from coal, oil, and natural gas production (% GDP) in period t	World Development Indicators	Control variable	Covariate-Dependent Assumption
	Polity2	Average level of democracy in period t	World Development Indicators	Control variable	Covariate-Dependent Assumption
	Income	Average GDP per capita PPP in period t	World Development Indicators	Control variable	Covariate-Dependent Assumption
DYAD-DEPENDENT COVARIATES	Weightlag	Adoption behaviour of directly linked countries	Global Climate Legislation Study & POLCLIMATE data set	H1	Network-Attribute-Dependent Assumption
	Structursim	Adoption behaviour of structurally equivalent actors	Global Climate Legislation Study & POLCLIMATE data set	H2	Network-Attribute-Dependent Assumption
	Same region	Regional proximity captured as homophily variable	Own coding according to World Bank regions	Control variable	Network-Attribute-Dependent Assumption

Autocorrelation models are based on four possible dependence assumptions (Daraganova & Robins, 2013). The simplest is the assumption of attribute independence, i.e. the network has no effect on the distribution of a specific attribute or behaviour across the social actors

resulting in no social influence effects. The covariate-dependence assumption is that the attribute or behaviour is conditionally dependent on other covariates (here: vulnerability, CO_2-emissions, democracy status, income, natural rents) relating to the same actor. On its own, this assumption produces models equivalent to standard logistic regression where several covariates predict policy behaviour. The network-dependent assumption is that an attribute or behaviour depends on the structural position of an individual in a social network, e.g. reflected by the level of activity or the involvement in transitive relationships. Finally, the network-attribute-dependent assumption arises when an attribute or behaviour of an individual is conditionally dependent on the tie to another individual with the same attribute or behaviour (here: the policy adoption behaviour of a country's cooperation partner). Besides direct ties, the dependence structure can be extended to more complex network structures, such as indirect links (k-order dependencies) or network positions or roles (e.g. structural equivalence). We use an extension of a cross-sectional autocorrelation model that allows assessing policy diffusion patterns over time. The temporal network autocorrelation model as proposed by Leenders (2002) has a general form as follows:

$$y_{it} = X\beta_{it} + \rho_1 W y_{it} + \rho_2 W_{it} + \varepsilon_{it} \qquad \text{Equation 3}$$

In this model, y_{it} is our dependent variable – the adoption of mitigation policies for every country in the dataset at time t ($ADOPT_{it}$).[14] It is a count variable defined as the number of climate-related policies a country has adopted in the four consecutive periods (compare Appendix C). The first model term captures the set of covariates that reflect the relationship between the internal determinants of a country and its policy adoption behaviour ($INT_{it} = (M_{it} + R_{it} + POL_{it})$). The second model term hinges on the specification of the weight matrix W at time t (i.e. the network of cooperative interactions at time t) interacting with the dependent variable y_{it}. This interaction term represents the external factors, i.e. the policy adoption behaviour of other actors in the network at time t, $EXT_{it} = (PROX_{it} + NET_{it})$. In our model, the specification includes the effect of direct ties, structural equivalence, and the homophily or *same region variable*. The third model term contains network statistics related to the activity level or structural position and roles (These model terms are not used for this analysis.). Compare Table 4 for an overview of all variables, the research design.

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[14] Equation 2: $ADOPT_{it} = f (INT_{it} = (M_{it} + R_{it} + POL_{it}) + EXT_{it} = (PROX_{it} + TIES_{it}))$

6. Results

We estimated the model in R using the 'tnam' package (Leifeld and Cranmer 2016) and the 'pglm' package (Croissant, 2017). As our dependent variable is a count variable, we ran the temporal network autocorrelation model using a negative binomial distribution function for panel data with time fixed effects based on a maximum-likelihood estimation. We started analysing our results by running several pooled models that average the effects over time and countries. We do this to account for the time invariant variables that cannot be estimated in a fixed effects setup. The effect of geographical regions, for instance, cannot be estimated in a fixed effects model.

Table 5: Results temporal autocorrelation model

	POOLED MODEL 1	POOLED MODEL 2	POOLED MODEL 3	POOLED MODEL 4	FIXED EFFECTS
INTERCEPT	-5.18 *	-2.68	-1.67	-3.01	-1.85
	(2.11)	(1.82)	(1.09)	(-1.84)	(2.99)
PAST POLICY ADOPTION	0.03	0.08**	0.08*	0.07*	-0.15***
	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
DEMOCRACY STATUS	0.03	0.05	0.05	0.05 *	- 0.02
	(0.02)	(0.03)	(0.03)	(0.02)	(0.04)
GDP PER CAPITA (LOG)	-0.13	-0.60	-0.57	-0.77	0.25
	(0.85)	(0.77)	(0.77)	(0.77)	(1.40)
CO2 EMISSIONS (KT) (LOG)	2.34***	1.44**	1.69***	1.61 ***	1.07
	(0.46)	(0.45)	(0.46)	(0.46)	(0.68)
NATURAL RENTS	-0.01	-0.00	-0.00	-0.00	0.00
	(0.01)	(0.00)	(0.00)	(0.00)	(0.10)
VULNERABILITY	0.00	-0.00	-0.00	-0.00	
	(0.00)	(0.00)	(0.00)	(0.00)	
SIGMA	1.39***	0.71***	0.70***	0.65***	
	(0.25)	(0.17)	(0.17)	(0.17)	
SAME REGION		0.01***			
		(0.00)			
STRUCTURISM			0.05***	0.05***	0.05 ***
			(0.00)	(0.00)	(0.00)
WEIGHTLAG				0.04**	0.06 **
				(0.01)	(0.02)
LOG LIKELIHOOD	-500.613	-463.59	-461.20	-458.38	-213.86
AIC	1017.23	945.19	940.40	936.77	443.72
NUM. OBS.	273	273	273	273	273
NOTES	(P < 0.001 ***, P < 0.01 **, P < 0.05 *) STANDARD ERROR IN PARENTHESES				

We expect this could be an impediment to precise estimation of the factors leading to policy diffusion. The advantage of using political interactions to study diffusion is that they vary over time, what offers a much more precise estimation. It is also consistent with fixed

effects. Ultimately, accounting for political interactions allows us to understand the effect of international interdependencies on the diffusion of climate change mitigation policies across countries.

Table 5 presents the parameter estimates of our models with standard errors in parentheses. Comparing the models reveals four main findings. First, whereas the Pooled Model 1 displays no effect for the past adoption behaviour, Pooled Models 2-4 show a positive and significant effect on the parameter estimate related to the past adoption behaviour. Similarly, the democracy status parameter becomes significant only in model 4. This shows that there is an omitted variable bias, which is resolved by controlling for spatial proximity (model 2) or the policy adoption behaviour of structurally equivalent and directly linked countries (model 4). This finding is further confirmed by the improved model fit as reflected by the decreased Akaike information criterion (AIC) values when comparing Pooled Model 1 with the other models.

Second, in the averaged perspective of the pooled models, countries adopt more policies if they can build on existing ones. The fixed effects model that controls for the time periods has a significant but negative parameter estimate related to the past policy adoption behaviour of a country. This change in parameter sign can be well explained. It demonstrates that if countries have adopted many climate change mitigation policies in the previous period, it is very likely that they will not adopt many policies in the next period again. From an averaged perspective, however, countries that are already actively engaged in adopting climate policies in the past tend to be more active in the future, too, thereby increasing the overall number of policies adopted more than for more passive countries.

Third, parameter estimates for all other covariates related to the internal determinants of a country turn insignificant in the fixed effects model. Hence, internal determinants give valuable insights about why countries adopt more policies than others, but reveal nothing about the change of the policy adoption behaviour over time. The pooled models indicate that contrary to our expectations, countries with a higher *GDP per capita* do not adopt more mitigation policies. GDP per capita is negative in sign and not significant. One possible explanation is the greater capacity of richer countries to formulate and administer more 'overarching framework laws and policies' (Fankhauser et al., 2014; Nachmany et al., 2014), while poorer countries tend to formulate a greater number of sector-specific policies. In addition, in many richer countries, climate-related laws are already in place rendering the need for further legislation unnecessary. Results of the Global Climate Legislation (Grantham

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Research Institute, London School of Economics, 2016) study supports this consideration and show that the most recent growth of climate policies has predominantly taken place in the developing world. For the *democracy status* model term, we find a positive effect for the parameter estimate (model 4). This finding is highly consistent with earlier literature about the effect of democracy on climate policy (Bättig & Bernauer, 2009; Bernauer, 2013). Overall, however, these studies show that 'democracies are, *ceteris paribus*, [more] likely to adopt more ambitious climate policy commitments relative to other countries' (Bernauer, 2013, p. 435). Taken together, the GDP and democracy status model terms account as indicators for a country's resources and capabilities to adopt climate change mitigation. The findings indicate that countries, like Saudi Arabia, that are rich and not democratic adopt, in total, the smallest number of climate policies. On the other hand, democracies implement more climate change mitigation policies. However, as argued above, the quantity of climate change mitigation policies does not necessarily imply high standard policies. Thus, emerging democracies, such as India, tend to adopt a larger number of sector-specific policies; richer democracies tend to adopt more encompassing flagship policies or frameworks.

We also tested for a country's motivation to mitigate climate change and how this affects its climate policy adoption behaviour. For this purpose, we included three indicators: natural rents, vulnerability, and absolute CO_2 emissions. We get a non-significant effect for the *natural rents* model term. This finding makes sense as the effect of the variable can be interpreted ambiguously. Some countries with higher natural rents, such as China, might be more inclined to adopt more mitigation policies to compensate for their polluting behaviour. They do so either to show goodwill at the international scale, or due to high local pollution levels that make them aware of the co-benefits that arise from climate change mitigation policies. At the same time, some countries with higher natural rents, like the oil-exporting countries of the Middle East are more concerned with economic growth-related issues rather than with environmental quality and are, therefore, less inclined to adopt climate change mitigation policies. In addition*,* we find no effect related to the *vulnerability* to climate change as expected. A country like Tuvalu, which is highly vulnerable to climate change, has implemented five policies targeting disaster or risk management and climate change adaption issues since 2008 but has adopted only one policy addressing climate change mitigation in the same period. Finally, we controlled for the level of *absolute CO_2 emissions*, since we expected that countries with higher levels of CO_2 emissions are more likely to introduce climate change mitigation policies. Our results show, that countries with higher CO_2 emissions are indeed more likely to adopt climate legislation. We explain this finding among others with local co-

benefits such as the reduction of local air pollution, energy efficiency, and so on. For example, China faces several environmental problems related to air pollution and experiences the adverse effects of climate change. Hence, it is ever more aware of the necessity to combat climate change and its own role therein. Moreover, big polluters are under immense international pressure to act and adopt effective climate legislation.

Fourth, even in the averaged perspective of the pooled models including network dependencies, i.e. our two main explanatory variables – structural equivalence (structursim) and direct cooperative ties (weightlag), to control for interdependencies between countries is superior to the spatial proximity indicator, alone. The superiority of the network dependency model is reflected in the improved model fit of models 3 (and 4), as indicated by the decreased AIC. Also, as discussed, including the weightlag variable reduces the omitted variable bias of the internal determinants model (model 1). A high variance inflation factor (VIF) related to the structursim variable and the same region variable, indicates multicollinearity between them. As a result, we cannot include both terms in the same model without confounding the results[15]. This makes a separate discussion of the models necessary. Pooled Model 2 includes the geographical proximity of the countries. The same region variable enters the model as 'homophily' (McPherson, Smith-Lovin, & Cook, 2001) term, that captures whether countries of the same region tend to show a similar policy adoption behaviour. We find a positive and significant effect. This result confirms the finding of many earlier diffusion studies that policy diffusion transpires across spatially close countries. Both the structursim and weightlag variable have positive and significant parameter estimates that are robust across all model variations including the fixed effects model. This implies that structurally equivalent countries,

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[15] This also makes sense intuitively, as countries of the same region often tend to behave in a similar way. For instance, Nordic countries tend to have rather progressive policies for climate change mitigation. The countries have similar domestic background conditions, as they are all wealthy democracies, with plentiful resources of renewable energies such as hydropower, wind power, and geothermal energies, and they are affected by climate change in a similar way. Moreover, these countries are represented in the Nordic Council of Ministers (NCM), which is a forum for governmental co-operation on climate change-related issues. In line with our expectations, these countries also show high levels of structural equivalence in our interaction networks. On the other hand, structural equivalence does not need regional proximity. For example, according to our analysis, Vietnam and Cuba are both communist countries, and have very similar cooperation partners in our interaction networks. This might be triggered by the specifics of their political system, but may also be due to common patterns of cooperation related to climate change. Both countries are, for instance, members of the group of Like-minded Developing Countries (LMDC) in the climate change negotiations under the UNFCCC and negotiate with other countries in a unified voice. Hence, regional proximity is also captured by the structural equivalence term to a certain extent.

i.e. countries with similar patterns in their international relations, and countries that are engaged in cooperative interactions affect a country´s policy adoption behaviour. Hence, network dependencies are an important explanatory factor for the diffusion of climate change mitigation policies. What stands out here is that whereas the attribute network dependence terms remain significant and positive, most of the covariates are not significant in the fixed effects model. This finding highlights the importance of considering these network dependencies to explain the policy adoption over time. The results show that network dependencies do not only account for similar policy adoption behaviour in general, but they are also relevant when considering important periods in the development of the international climate regime.

In sum, these findings are in line with our expectations that including a network perspective improves the explanatory power of diffusion studies, in general, and the 'unified model of government innovation', in particular. As suggested in our first hypothesis, direct ties such as an exchange of resources, personal interactions, and knowledge transfer trigger mutual social learning that might lead to similar climate change mitigation behaviour. Moreover, repeated cooperation fosters trust, which reduces the likelihood of a free-riding behaviour, and increases the propensity for coordinated action in the context of climate change mitigation. In addition, hypothesis 2 states that being in cooperative relationships with the same cooperation partners significantly increases the likelihood of same policy adoption behaviour, as well. This is because countries are facing similar framework conditions in terms of how they are embedded in the international context. This causes comparable incentives for adopting climate policies, thereby leading to similar policy adoption behaviour. On the one hand, these countries possibly compare with each other triggering policy learning. On the other hand, other countries set benchmarks for the own behaviour in a positive as well as a negative sense. In a setting, where countries fear competitive disadvantages from adopting national policies, as it is in the case for climate policy, they face an imperative not to surpass others in their engagement for the mitigation of climate change. Conversely, if others are particularly active with regards to climate change mitigation, social pressure might increase the need to adopt own policies. Overall, these results provide evidence for both of our hypotheses.

7. Concluding Comments

In this article, we demonstrate how international relations can influence national policy adoption. Along with other contributions (e.g. Mohrenberg, 2017), our research highlights the value added of informing the policy diffusion literature with a dynamic social network

perspective., Our inquiry demonstrates that analytical frameworks, such as the 'unified model of government innovation' (Berry & Berry, 2014), increase in their explanatory power when they include temporal network dependencies. Direct and indirect ties between countries, as they arise from bi- or multilateral political events, reflect international relations in a different and more overarching way than traditional approaches of the diffusion literature. Specifically, assessing the evolution of countries' interactions over time reflects political developments in a specific policy domain much better than static measures, like the spatial closeness of two countries or their common membership in an institution.

To analyse our argument, we have used the case of climate change mitigation policy adoption and reviewed the interdependencies in the form of cooperative, political interactions that occurred in the realm of global climate change issues between 1995 and 2015. We have chosen this case, as combatting climate change is a topic of high relevance that depends on the engagement of all countries. As no country alone can save the global climate, it necessarily depends on policy decisions of other countries. Hence, countries need to interact regularly to coordinate their climate mitigation policies. They do so in the context of the international climate negotiation process, but also based on bi-or multilateral initiatives. Earlier studies on climate policy diffusion have not yet considered these political developments satisfactorily. We have found two related mechanisms of social influence mechanisms at work. Firstly, countries adopt more policies when they are directly tied to countries that have adopted climate change mitigation policies. The theoretical underpinning of this finding is social influence by communication. Countries interact, learn from each other, and in consequence are more likely adopt similar policies. Secondly, countries in similar structural positions, although not necessarily linked by a direct tie, often compare themselves with one another and react by adopting similar policies. While our main contribution is to overcome the existing limitations of the current analytical and methodological approaches to study policy diffusion in climate change, our work also has important ramifications for studying policy diffusion processes in other international or national policy domains that are characterised by high levels of interdependencies of between involved actors.

However, we do acknowledge that our study has some drawbacks related to the data used. To begin with, the data on climate change related mitigation legislation from the Global Climate Legislation Study does not include sub-national laws or amendments to the current laws and this could have led to a valuable loss of observations. In addition, the analysis might have profited from a qualitative differentiation between different climate mitigation policies to understand more about what kind of policies diffuse more likely. In relation to this,

weighting policies with respect to their outreach (sector-specific vs. flagship laws) would possibly improve the estimation of diffusion processes, by avoiding an underestimation of comprehensive legislation. All these issues raise potential for future research in this area.

Additionally, the use of event data is not without complications. The most common threats to validity (Hirschi, 2009; Schrodt & Gerner, 1994) in event data coding are biases introduced by the media sources that provide the raw material and biases due to the coding scheme or coding process. Source related validity issues mostly arise in course of the editorial selection process, for example, when conflictive events dominate the reporting (conflict orientation), when media attention towards a specific issue decreases (media fatigue), or due to duplicate stories that emerge when multiple reports on the same event are published by different media sources or repeated in different reports. We tried to reduce these validity issues by using the electronic wire services Agence France Press, as they are usually less affected by editorial choices than other journalistic sources like newspapers (Schrodt, 2012). An integration of other wire services also from other continents might improve the validity of the dataset by increasing the number observations. Finally, the present study is restricted to cooperative interactions, only, and does not distinguish between different intensities of cooperation. Therefore, a possible follow up project could work towards refining the policy networks and testing for different kinds of interaction that may also include conflictive events.

8. Literature

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Appendix

Appendix A: Country List and Coding

COUNTRY NAME	UN COUNTRY CODE	STATUS IN UNFCCC	GAIN VULNERABILITY RANK	POLICY ADOPTION			
				t1	t2	t3	t4
UNITED ARAB EMIRATES	ARE	non-Annex I	34	0	0	1	1
ARGENTINA	ARG	non-Annex I	44	1	5	0	3
AUSTRALIA	AUS	Annex I	1	1	1	1	8
AUSTRIA	AUT	Annex I	17	1	2	0	5
BELGIUM	BEL	Annex I	59	4	2	0	3
BANGLADESH	BGD	non-Annex I	143	1	0	2	4
BULGARIA	BGR	non-Annex I	39	3	1	2	3
BELARUS	BLR	Annex I	53	1	4	2	3
BOLIVIA	BOL	non-Annex I	79	1	0	1	4
BRAZIL	BRA	non-Annex I	23	2	4	3	3
CANADA	CAN	Annex I	2	1	0	1	4
SWITZERLAND	CHE	Annex I	12	2	0	1	3
CHILE	CHL	non-Annex I	23	3	0	3	6
CHINA	CHN	non-Annex I	28	1	1	0	5
DEMOCRATIC REPUBLIC OF CONGO	COD	non-Annex I	161	0	0	0	4
COLOMBIA	COL	non-Annex I	42	2	1	0	5
COSTA RICA	CRI	non-Annex I	65	1	0	3	4
CUBA	CUB	non-Annex I	82	1	1	1	0
CZECH REP	CZE	Annex I	18	2	0	0	2
GERMANY	DEU	Annex I	13	3	3	2	5
DENMARK	DNK	Annex I	14	0	1	4	2
DOMINICAN REPUBLIC	DOM	non-Annex I	109	2	1	1	2
ALGERIA	DZA	non-Annex I	69	3	3	0	6
ECUADOR	ECU	non-Annex I	74	0	0	1	4
EGYPT	EGY	non-Annex I	75	2	3	0	15
SPAIN	ESP	Annex I	15	1	0	0	3
ETHIOPIA	ETH	non-Annex I	146	0	0	1	8
EUROPEAN UNION	EU	Annex I	0	6	0	10	8
FINLAND	FIN	Annex I	10	2	1	0	4
FRANCE	FRA	Annex I	9	1	2	1	5
GABON	GAB	non-Annex I	86	0	0	0	4
UNITED KINGDOM	GBR	Annex I	3	6	4	2	10
GHANA	GHA	non-Annex I	126	1	1	0	5
GREECE	GRC	Annex I	32	2	2	0	7
GRENADA	GRD	non-Annex I	91	0	1	0	4
GUATEMALA	GTM	non-Annex I	119	1	0	1	2
GUYANA	GUY	non-Annex I	135	0	0	1	0
HUNGARY	HUN	Annex I	42	0	0	3	4
INDONESIA	IDN	non-Annex I	87	0	3	8	9
INDIA	IND	non-Annex I	115	3	4	1	2

IRELAND	IRL	Annex I	19	3	2	1	6
IRAN (ISLAMIC REPUBLIC OF)	IRN	non-Annex I	53	1	1	2	4
ISRAEL	ISR	non-Annex I	56	2	0	0	6
ITALY	ITA	Annex I	23	8	5	3	7
JAMAICA	JAM	non-Annex I	94	1	0	1	2
JORDAN	JOR	non-Annex I	101	1	0	0	2
JAPAN	JPN	Annex I	27	3	1	0	2
KAZAKHSTAN	KAZ	non-Annex I	30	1	2	1	1
KENYA	KEN	non-Annex I	148	0	1	1	2
REPUBLIC OF KOREA	KOR	non-Annex I	32	0	1	1	3
KUWAIT	KWT	non-Annex I	103	1	0	0	0
MOROCCO	MAR	non-Annex I	91	0	0	2	6
MADAGASCAR	MDG	non-Annex I	160	0	0	0	2
MALDIVES	MDV	non-Annex I	0	0	0	0	0
MEXICO	MEX	non-Annex I	47	1	2	0	4
MYANMAR	MMR	non-Annex I	134	0	0	0	1
MONGOLIA	MNG	non-Annex I	76	1	2	0	5
MOZAMBIQUE	MOZ	non-Annex I	145	0	0	4	4
MALAYSIA	MYS	non-Annex I	31	0	1	0	4
NIGERIA	NGA	non-Annex I	130	0	1	0	3
NETHERLANDS	NLD	Annex I	49	3	2	0	2
NORWAY	NOR	Annex I	4	1	0	1	3
NEPAL	NPL	non-Annex I	131	1	0	0	1
NEW ZEALAND	NZL	Annex I	5	5	0	0	0
PAKISTAN	PAK	non-Annex I	111	0	0	0	8
PERU	PER	non-Annex I	71	3	1	2	7
PHILIPPINES	PHL	non-Annex I	95	1	2	3	6
POLAND	POL	Annex I	22	1	1	2	3
PORTUGAL	POR	Annex I	45	1	3	0	4
ROMANIA	ROU	Annex I	84	2	1	0	7
RUSSIA	RUS	Annex I	6	2	0	4	2
RWANDA	RWA	non-Annex I	168	1	0	0	4
SAUDI ARABIA	SAU	non-Annex I	63	0	0	1	1
SINGAPORE	SGP	non-Annex I	40	4	0	0	3
EL SALVADOR	SLV	non-Annex I	118	0	2	0	2
SLOVAKIA	SVK	Annex I	37	1	3	2	8
SWEDEN	SWE	Annex I	11	1	0	2	5
THAILAND	THA	non-Annex I	70	0	2	1	7
TAJIKISTAN	TJK	non-Annex I	102	0	1	1	1
TRINIDAD AND TOBAGO	TTO	non-Annex I	66	0	2	0	3
TURKEY	TUR	Annex I	41	0	4	0	3
TUVALU	TUV	non-Annex I	0	0	1	0	1
TANZANIA	TZA	non-Annex I	140	0	0	0	3
UGANDA	UGA	non-Annex I	166	1	1	0	1
UKRAINE	UKR	Annex I	50	3	1	0	1
UNITED STATES OF AMERICA	USA	Annex I	7	0	3	4	5
UZBEKISTAN	UZB	non-Annex I	62	0	0	1	1

VENEZUELA	VEN	non-Annex I	38	0	1	1	1
VIET NAM	VNM	non-Annex I	117	0	3	0	7
VANAUTU	VUT	non-Annex I	156	1	0	0	0
SOUTH-AFRICA	ZAF	Annex I	51	0	0	2	2

Appendix B: Coding of Event Types

EVENT TYPES NOMINAL	EVENT TYPES	DESCRIPTION	EVENT DUMMY
POSITIVE STATEMENT	1	Optimistic or emphatic comments, symbolic acts, express accord, consider policy option, acknowledge responsibility	Cooperation
CONCRETE ACTION	2	Consult, make or host a visit, meet, mediate, negotiate, discuss	Cooperation
APPEAL POSITIVE ACTION	3	Appeal for material cooperation (economic, judicial, information), diplomatic cooperation, aid, political reform, to yield (e.g. easing sanctions, dissent), to negotiate, to settle dispute, to mediate	Cooperation
INTEND POSITIVE ACTION	4	Express intends to engage in material cooperation (economic, judicial, information), diplomatic cooperation, aid, political reform, to yield (e.g. easing sanctions, dissent), to negotiate, to settle dispute, to mediate	Cooperation
YIELD COOPERATION	5	Ease sanctions, political dissent, agree on political reform	Cooperation
SUBSTANTIVE COOPERATION	6	Provide aid or engage in material cooperation (economic, judicial, information, intelligence), engage in diplomatic cooperation (praise or endorse, rally support on behalf of, grant diplomatic recognition, apologise, forgive, sing agreement)	Cooperation
NEGATIVE STATEMENT	-1	Decline or make pessimistic comment, deny responsibility	Conflict
DEMAND COOPERATION	-2	Demand for material cooperation (economic, judicial, information), diplomatic cooperation, aid, political reform, to yield (e.g. easing sanctions, dissent), to negotiate, to settle dispute, to mediate	Conflict
CRITICIZE, ACCUSE, DISAPPROVE	-3	Disapprove, criticise, accuse, rally opposition against, complain officially, lawsuit, find guilty or liable	Conflict
REJECT COOPERATION, VETO	-4	Reject material cooperation (economic, judicial, information), diplomatic cooperation, aid, political reform, plant, proposal, to yield (e.g. easing sanctions, dissent), to negotiate, to settle a dispute, to mediate. Defy norms, laws, and to veto.	Conflict
THREATEN	-5	Threaten to reduce or stop aid, with sanctions, boycott, and embargo, with political dissent or repression, to halt negotiations or mediation. Give ultimatum.	Conflict
SUBSTANTIAL CONFLICT	-6	Protest, strike, or boycott, engage in political dissent. Reduce relations, stop material aid, halt negotiations or mediations, impose an embargo, boycott, or strike, coerce, and assault.	Conflict

Appendix C: Time Periods

T1: Negotiating the Kyoto Protocol (1995-2004)

The first network (t1) stage is characterised by events leading to the ratification of the Kyoto Protocol. The release of the first Intergovernmental Panel on Climate Change's (IPCC) report in 1990 was integral to the drafting of the UNFCCC in 1992. The UNFCCC consequently came into force two years later during the year 1994. The predominant key principles enshrined in the Climate Convention are the North-South divide and the principle of 'Common but Differentiated Responsibilities and Respective Capabilities (CBDR/RC)', which distinguishes between Annex I countries (with greater historical responsibility and capability to combat climate change) and non-Annex I countries with relatively less (or no) such responsibility or capability to combat climate change (Blaxekjær & Nielsen, 2014). However, the UNFCCC did not contain binding or specific targets leading to a disappointment of several environmentalists and brought to the fore the need for a more stringent agreement. Consequently, the first Conference of Parties (COP-1) was expected to take strong action leading to the adoption of the Berlin Mandate whose focus was to promote legally binding reduction commitments intended to be adopted at COP-3 in 1997 at Kyoto (Gupta, 2010). The adoption of the Berlin Mandate ultimately led to countries becoming a party to the UNFCCC and adopting what came to be known as the Kyoto Protocol. The Kyoto Protocol was the first internationally binding treaty that contained provisions for developed country parties to take up legally binding emissions targets for period 2008-12. Unfortunately, enforcing the ratification was much more difficult than expected with the United States, which was a key player in the negotiations, pulling out in 2001. However, parties tried to salvage the effects of United States S pulling out of the Kyoto Protocol during the negotiations in Bonn in 2001 leading to the adoption of the Marrakech accords[16]. The Marrakech Accords set the rules for implementing the Kyoto Protocol and detailed the flexibility mechanisms such as the Joint Implementation (JI), Emissions Trading and Clean Development Mechanisms (Betzold et al., 2012). This hallmark phase in the climate policy architecture ends with the entering into force of the Kyoto Protocol on 16 February 2005.

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[16]Marrakech Accords. Available at: http://unfccc.int/ cop7/.

T2: Implementing the Kyoto Protocol (2005-07)

During the second stage (t2), the most important issues were to implement the Kyoto Protocol and to negotiate its successor. With respect to the institutional framework conditions, the important milestones must be mentioned: (1) The adoption of the *Bali Road Map* in 2007, which paved the way for a post- 2012 agreement; (2) The release of the IPCC's Fourth Assessment Report in 2007, which brought the climate change issue on top of the international agenda. It instilled great enthusiasm among the Parties ahead of COP 15 in Copenhagen with respect to agreeing on a new international legally binding agreement and a second commitment period of the Kyoto Protocol. This period is also significant due to the fact that the CDM witnessed a growth and increasing focus on adaptation related issues (Gupta, 2010).

T3: Post-Bali Enthusiasm (2008-09)

The high expectations during stage three (t3) from the Copenhagen summit remained unfulfilled due to the parties failing to agree on much and erosion of trust over rumours about several different initiatives leading parties. With the Copenhagen Accord, the parties only submitted non-binding emission reduction pledges or mitigation action pledges at a later point in time. In general, this phase started with high political and public attention towards the climate change issue because of the release of the fourth IPCC report and former US Vice-President and environmentalist Al Gore winning the Nobel Peace Prize in 2007. It, unfortunately, ended with disappointment over the 'Copenhagen disaster' (Blühdorn, 2012). Similar to the previous phase, the static North-South divide between countries positions remained, with developing countries and emerging economies seeing themselves as having little (or no) responsibility as well as the capability to combat climate change.

T4: Towards a New Agreement (2010-15)

Stage 4 (t_4) spans from 2010 to 2015 and is the most important phase in the history of climate change. It started with the adoption of the Cancun Agreements in 2010, which advanced important mechanisms such as the Green Climate Fund, the Technology Mechanism, and the Cancun Adaptation Framework. Despite the failure of the Copenhagen conference in 2009, countries continued negotiating with the goal to achieve a legally binding international treaty that is applicable to all Parties and comes into effect from 2020. Negotiations on the design of the agreement mainly took place under the Ad hoc Working Group on the Durban Platform for Enhanced Action (ADP). Its main goals were to achieve progress towards implementing

clear mitigation contributions by all parties and assisting parties to adapt to a changing climate (Blaxekjær & Nielsen, 2014). The time after COP 15 brought a proliferation of institutions and arrangements under the umbrella of the UNFCCC. Moreover, it also called for a reinterpretation and questioning of the UNFCCC key principles, as well as a rearrangement of country groups (Blaxekjær & Nielsen, 2014; Brenton, 2013). The divide now remained between three main antagonistic camps. The emerging powers stuck to the key principle of CBDR/RC and the North-South divide. They demanded that industrialised countries must carry the heavier burden, as they are historically responsible and are comparatively more capable in combatting climate change. Alongside a broad range of vulnerable (least) developing countries, the EU pressed for sharp emission reduction and called for joint action of all involved countries. In this perspective, all parties, but industrialised and emerging economies, in particular, must take action. The United States and other developed nations such as Russia and Canada were more reluctant to accept legally binding emission reductions. However, all the negotiations finally led to the Paris agreement being adopted in 2015, with the latter imposing not only the condition of limiting global temperatures well below 2 degrees centigrade but also taking into account the needs of the climate vulnerable nations. The Paris agreement is deemed a success and a first of its kind since it could ensure that it is not rigid enough to demotivate any country to not join but in parallel maintained that certain characteristics remained legally binding.

Appendix D: Overview on Variables and Data Sources

VARIABLE TYPE	VARIABLE	EXPLANATION	DATA SOURCE	HYPOTHESIS
DEPENDENT VARIABLE	Policy adoption	Number of adopted climate change mitigation policies in period t	Global Climate Legislation Study	
DYAD-INDEPENDENT COVARIATES	Past policy adoption	Number of adopted climate change mitigation policies in period t	Global Climate Legislation Study	Control variable
	Vulnerability	Average vulnerability of country towards climate change risk in period t	ND-GAIN Index of vulnerability	Control variable
	CO_2 emissions (log)	Average absolute emissions ($ktCO_2$ e, logged) in period t	World Development Indicators	Control variable
	Natural Rents	Average rents from coal, oil, and natural gas production (% GDP) in period t	World Development Indicators	Control variable
	Polity2	Average level of democracy in period t	World Development Indicators	Control variable
	Income	Average GDP per capita PPP in period t	World Development Indicators	Control variable
DYAD-DEPENDENT COVARIATES	Weightlag	Adoption behaviour of directly linked countries	POLCLIMATE data set	H1
	Structursim	Adoption behaviour of structurally equivalent actors	Global Climate Legislation Study & POLCLIMATE data set	H2
	Same region	Regional proximity captured as homophily variable	Own coding according to World Bank regions	Control variable

Part 2

III. Towards a Feasible Climate Policy: The Difficile Stance of a Carbon Tax in Switzerland, by M. Kammerer

Abstract

This paper reconstructs two decision-making processes related to the planned introduction of a carbon levy on combustibles and fuels in Switzerland between 2004 and 2013. Particularly, it focuses on the reasons of why there is still no carbon levy on fuels, albeit the levy on combustibles was already introduced a decade ago. In a two-step analytical framework, this study examines how influential actors modified the selection of policy instruments. The key assumption is that the decision-making style and the structure of the policy subsystem are decisive factors determining the feasibility of policy instruments. A mixed methods approach helps to disentangle the complex policy processes. Specifically, the paper advocates a combination of a process-based, qualitative case study and quantitative, descriptive policy network analysis. The results show, that due to the political opportunity structure of conflicting coalitions in the policy process and a strong business, energy, and traffic sector, the introduction of a carbon tax on fuels was never viable and its introduction will remain unlikely in the future.

1. Introduction

One important aspect of any climate policy design is its political feasibility. According to Majone (1975, 261) a policy is feasible, 'insofar as it satisfies all the constraints of the problem which it tries to solve, where "constraint" means any feature of the environment that (a) can affect policy results, and (b) is not under the control of the policy maker'. Often, however, there tends to be a gap between the theoretically desirable and the politically feasible (Meltsner 1972; Skodvin, Gullberg, and Aakre 2010). Research often explains this observation with the unequal distribution of costs and benefits among the affected target groups and contrasting opinions on how a problem should be solved (Bresser and O'Toole 1998; Carter 2007; Stavins 1997; Underdal 1998).

Swiss climate policy provides an illustrative case study. Although in Switzerland, a CO_2 levy[17] is widely respected as an effective policy instrument to reduce domestic CO_2 emissions; its implementation has been limited. Although a levy on combustibles has been implemented over a decade ago, the introduction of a carbon levy on motor fuels has been successfully prevented by the skilful manoeuvring of business groups in fear of increased costs and diminished international competitiveness.

Preceding studies scrutinised the implementation and functionality of climate policy instruments (Bahn 2001; Baranzini, Thalmann, and Gonseth 2004; Ingold 2007; Niederberger 2005) in Switzerland. These studies made their contribution to the apprehension of the decision-making processes and the effectiveness of specific policy instruments. The work of Ingold and colleagues gave valuable insight into the significant role of actor constellations and policy networks to comprehend policy choices (e.g. Ingold 2011, Ingold & Fischer 2013). This paper continues this projection by analysing the link between structural characteristics of decision-making style and the policy subsystem and policy output (Howlett 2014). Simultaneously, it accompanies the literature that links subsystem characteristics (e.g. Fischer 2014; Howlett 2014) with prospects of policy change and the nature of the policy output. The benefit of this research is an innovative framework for the analysis of the decision-making context.

This study conducts a two-step approach to study the Swiss climate policy process between 2004 and 2013. Specifically, it advocates a combination of a process-based, qualitative case study and quantitative, descriptive policy network analysis. Offering a process-centred

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17In the following, the term levy is used, since in Switzerland the revenues from the CO2 levy are redistributed to the population and industry sector. Therefore, it is not a tax in a strict sense.

perspective, it inspects the development over time to fathom the continuous processes of selecting and implementing specific policy instruments. Providing a network perspective, this analysis (van Beuren, Klijn, and Koppenjan 2003)reflects on how changing political configurations effect the policy outcome. To execute decisions, actors from the public and private scope, must coordinate their policy preferences and cooperate (Klijn and Koppenjan 2000). The decision making style (Howlett 2007) and the structure of a subsystem (Adam and Kriesi 2007) define the means of coordination and cooperation and eventually the feasibility of a policy output. This approach is inspired by earlier research that uses the Actor Process Event Scheme (APES, Serdült et al. 2012). APES is an analytical approach and software tool that helps to visualise political processes and to convert this information into policy network data.

Section two proceeds with a brief outline of Switzerland's climate policy history and sets historical developments into a theoretical context by formulating expectations about the absence of the CO_2 levy on motor fuels in section three. Section four presents the methodological approach, whereas section five conducts a detailed and systematic analysis and the resulting policy output. It explores the involvement of various actors throughout the decision-making process, particularly focusing on the interplay between corporate actors (Coleman 1974). The results show, that the involvement of many actors in the decision-making processes prompts compromise solutions, as balancing is an imperative in multi-actor settings. However, the power structure in the climate policy subsystem has changed over time, what influenced the policy output. During the implementation of the CO_2-Act, many actors from both the public and private sector exerted influence on the policy-making process. This led to an innovative compromise solution that replaced the carbon levy with the climate cent. The revision of the CO_2-Act, nonetheless, was mostly executed by the administration and the legislative branch. The involvement of private actors only came sparingly. Apparently, this rather homogenous decision-making environment dominated by a smaller number of actors is no ideal breeding ground for innovations. In consequence, the revised CO_2-Act revamped the first version with minor changes.

2. The Difficile Stance of a Carbon Levy on Fuels

The roots of the CO_2-Act date back to the 1980s. To achieve better air quality, an issue linked to the forest dieback debate, CO_2 emissions and other pollutants should be reduced by introducing a carbon levy on combustibles and motor fuels. Most stakeholders regarded the levy as an efficient policy instrument, but it was harshly criticised and continuously opposed

by the economy. After several unsuccessful attempts to introduce the levy, the Federal Council (FC) had to change its strategy. It developed an overall program to reduce GHG (greenhouse gas) emissions that targeted a broader range of sectors such as traffic, building, industry, and a wider scope of policy instruments. This can be regarded as the birth of the CO_2-Act and the first version entered into force in 2000. Its main target was to implement Kyoto Protocol requirements. Switzerland agreed to reduce its total GHG emissions by 8% as compared to emission levels in 1990 and its CO_2 emissions from combustibles and motor fuels by 10% (FOEN 2010). The act focused on voluntary instruments, but also included a subsidiary carbon levy, which was only to take effect, when the targeted CO_2 emission reduction could not be reached. Already in 2002, CO_2 inventories pointed in this direction. In consequence, the federal government intended to introduce the carbon levy on both motor fuels and combustibles. However, cunning lobbying by the energy and transport sector under the auspices of the oil association prevented the introduction of a carbon levy on motor fuels (Niederberger 2005). Instead, the oil association promoted the introduction of the climate cent – a voluntary levy of 1.5 Swiss cent per litre petrol and diesel. Revenues from this charge were supposed to be used to support emission reduction projects and to sponsor a state-level building modernization subsidy program (Stiftung Klimarappen 2013). Backed by the parliament, with the CO_2-Regulation of 2007, the federal government introduced a compromise solution: the climate and carbon levy on combustibles, but not on motor fuels. The implementation of the climate cent can be regarded as a policy innovation, since the instrument was not included in the CO_2-Act but introduced afterwards to replace crucial parts of an already set up legislation.

The next revision process of the CO_2-Act started in 2008. The main intention of the act was to create a new legal basis for the Post-Kyoto phase (Kyoto II) from 2012 to 2020. Switzerland had to formulate new reduction targets for this period. An amendment of policy instruments was planned. Once again, the federal government suggested the introduction of a carbon levy on motor fuels. The federal proposal went into parliament, but eventually, the levy was banned. Specifically, economiesuisse, Switzerland's leading business sector organisation, threatened with a referendum that would have endangered the whole CO_2-Act, which came into force in 2013. It is rather ambitious in terms of reduction targets, but unprogressively with respect to its policy mix. While the first CO_2-Act allowed for a mixture of domestic and foreign measures to reach emission reduction targets, the revised act raised reduction targets to 20% by 2020 (baseline 1990) relying on domestic measures, only (FOEN 2014). With respect to policy instruments, the revised CO_2-Act maintains the status quo: only tried and trusted

instruments like the emission trading scheme and the carbon levy on combustibles are continued, yet new regulative instruments such as emission standards and emission compensation mechanisms were introduced. Like previously, a carbon levy on motor fuels did not gain acceptance. To substitute the carbon levy, importers of petrol and diesel are now obliged to compensate CO_2 emissions, domestically. This approach, however, does not affect consumption patterns in the traffic sector, enough. Since traffic is accountable for the highest CO_2-emission in Switzerland, by far, this is a real caveat.

As empirical basis of this analysis, I use a 'thick description' (Serdült and Hirschi 2004) of two linked but distinct policy processes. The first phase covers the implementation of the CO_2 levy and the climate cent between 2004 and 2008. The second phase reflects the revision process of the CO_2-Act.

3. Theoretical Background

What policy instruments are selected? Who selects? Why and how are they selected? Public policy scholars have argued that the selection of instruments depends on the prevailing power relations between important actors in a policy subsystem (Bresser and O'Toole 2005; Majone 1975; Sabatier and Jenkins-Smith 1993). Powerful, yet losing target groups often prevent the implementation of specific instruments. This is possible, because the balance of power in a subsystem is usually not entirely static, and by 'the tactical manipulation of power differences in different policy processes or at different times (…) a shift in the balance may be obtained' (Bresser and O'Toole 2005, 133). Bresser and O'Toole (2005) explain this phenomenon with what they call 'contextual-interaction' theory. The policy analyst must consider all activities and interactions between the responsible authorities and affected societal actors in a long-term, process-based perspective. This also includes factors that hinder a successful implementation. Often, authorities and target groups mutually exert influence on each other to determine how and if a policy is implemented. In addition, a new policy usually is tightly bound to its context. It does not replace ongoing processes, but adds new elements. It is important to analyse policy implementation in a networked and contextual manner to understand the factors determining present and future processes. Considering this at an early stage in the formulation process may lead to more effective and efficient policy-making (Howlett 2014).

Similarly, Howlett and Ramesh (1995) argue that instrument selection and implementation is a systematic activity composed of a series of interlinked choices involving multiple actors with specific institutional backgrounds, perceptions, and preferences regarding the policy

outcomes that may be obtained (Scharpf 1997). While governmental actors are often the protagonists in decision-making and show a stable level of activity, non-governmental actors, like interest and civil sector groups, rather tune into the process when their interests are affected by providing expertise or lobbying for specific collective interests (Howlett et al., 2009). How policy decisions originate depends on the context and the actors involved. Howlett and Ramesh (1995) identify four different decision-making types characterised by the severity of political constraints and the complexity of the policy issue (compare Table 6) that (2007)influence the kind typically expected policy outcomes.

Table 6: Decision-making styles represented after Howlett & Ramesh 1995

		Constraints on Decision-Makers	
		Low *[Limited Actor, Single Level, Single Round]*	*High* *[Multi-Actor, Multi-Level, Multi-Round]*
Complexity of Policy Context	*Low* *[Clear Problem Definition, Available Information, Available Time]*	**Type I** Rational decision-making	**Type III** Multiple round, decision-accretion decision- making
	High *[Poor Problem Definition, Limited Information, Limited Time]*	**Type II** Incremental decision-making	**Type IV** Garbage can decision-making

Source: (Howlett & Ramesh, 1995)

Type I, the rational decision-making style, usually occurs when the policy context is straightforward and the constraints of the authorities are low, leading to a maximization of resources and efficient solutions. Type II, the incremental decision-making style typically occurs when the context is simple, but constraints are high. Only few actors are involved, but they face high constraints, such as inferior problem definition, missing information, or time restraints (Aden 2012; Jänicke, Kunig, and Stitzel 2003). Type III, multiple round, decision-accretion decision-making, typically emerges in settings when the problem complexity is low. The new policy area is well-known and suitable policy instruments well-understood, but powerful target groups prevent their implementation. The resulting output is usually a compromise solution developed from deliberations of many actors in a complex decision-making process. Finally, Type IV, 'garbage can' decision-making ensues when both the constraints and complexity of a policy issue are high. Often this style can be found in new policy fields, calling for new solutions. This means that the problem is ill defined and policy objectives are unclear. Trial and error then select policy instruments. In consequence, the result is, 'at best, satisfying' (Howlett 2007, 664).

The decision-making process in Swiss climate policy is best reflected by Type III. Over time, many actors have interfered in a complex policy setting, involving multiple actors from different levels in numerous rounds of decision-making. Climate protection was already well-established in Switzerland, when the implementation of the CO_2-Act commenced. Also, the

policy field is bound to the international context that sets firm framework conditions for national climate policy to be formulated. Hence, climate policy decision-making took place within clear-cut boundaries with little room for manoeuvring. In this set policy environment, preferences of powerful interest groups must be balanced out, ultimately leading to compromise solutions. With respect to why the carbon levy on motor fuels was never introduced, I argue *that the observed output is a typical compromise solution caused by long and complex decisions, involving a respective number of actors* in a clear-cut policy context *(Hypothesis 1).*

Besides the style of the decision-making process, the structure of the subsystem also helps to understand what kind of output may be expected. Earlier studies investigated links between the policy subsystem and prerequisites for policy change (Adam and Kriesi 2007; Fischer 2014; Howlett 2002) or policy learning (Weible, Pattison, and Sabatier 2010). Specific structural characteristics, such as the coalition structure, the degree of centralisation, or the number and nature of policy venues, explain the likelihood for policy change or learning.

Based on previous frameworks, I developed a typology of how different subsystem structures are linked to policy innovation. As illustrated in Table 7, I combine two dimensions to characterise the policy subsystem as endorsed by previous research: the distribution of power among actors (Adam & Kriesi 2007) and the type of interaction (Howlett 2002). The distribution is concentrated if power is in the hands of a small number of actors or one group. On the contrary, power structures are fragmented when there are many actors or groups competing for influence. The type of interaction reflects the level of propensity for conflict or cooperation of the subsystem.

A high level of conflict is given when actors in influential positions have different views on the policy issue and/or belong to different advocacy coalitions (Sabatier 1988). Conversely, a high level of cooperativeness is prevalent when actors in power positions predominantly belong to the same coalition or share beliefs. In terms of the resulting policy outputs, four scenarios are thinkable. In a cooperative and centralised policy environment, effective solutions are possible, but the innovation potential is low as policy-making is in the hands of few and new ideas are improbable. In a cooperative environment with fragmented structures, the innovation potential is higher, due to the diversity of actors involved. Conflictive interactions are related to compromise solutions, as different policy options need to be negotiated. In a conflictive and centralised policy environment, compromise solutions with low innovation potential are presumable. Lastly, in a conflictive setting with fragmented power structures compromise solutions develop with a higher potential for innovation.

Table 7: Influence of policy network structure on policy output

		Types of Interactions	
		Cooperative *[No opposing coalitions, powerful actors mostly agree on policy issues]*	*Conflictive* *[Opposing coalitions, powerful actors do not agree on policy issues]*
Distribution of Power	*Concentration* *[Clear domination of the policy network by one or more influential actors]*	**Rational I** Efficient solutions with low potential for innovation	**Compromise I** Compromise solutions with low potential for innovation
	Fragmentation *[No clear domination of the policy network by one or more influential actors]*	**Rational II** Efficient solutions with high potential for innovation	**Compromise II** Compromise solutions with high potential for innovation

Source: Adjusted from Adam and Kriesi (2007) and Howlett (2002)

For Swiss climate policy, I argue, that during the two decision-making processes related to the implementation (from 2004 to 2008) and the revision (from 2008 to 2013) of the CO_2-Act, the policy subsystem is conflictive, as important actors are members of different advocacy coalitions with different beliefs on climate policy (Ingold, 2010, 2011). However, with respect to the distribution of power, the two decision-making processes diverge, explaining the different levels of innovativeness:

Hypotheses 2a: The significant innovation potential of the climate policy subsystem during the implementation of the CO_2-Act between 2004 and 2008, which was caused by the fragmentation of power structures, accounted for the climate penny to prevail.

Hypotheses 2b: Relations in the revision process were more centralised, limiting the innovation potential of the climate policy subsystem, and thereby explaining the lack of comparable novelties in the revised CO_2-Act.

4. Data & Methods

This analysis is based on APES (APES, Widmer et al. 2008), which is a non-technical method for systematizing qualitative information as provided by case studies into quantitative data. The biggest asset related to APES is the possibility of using qualitative case study material for a systematic, comparative, and quantitative analysis of network data, thereby enjoying the benefits of mixed-method analysis (Fischer 2011). An important assumption of APES is that

policy processes, like the implementation and revision of the Swiss CO_2-Act between 2004 and 2013, can be regarded as a sequence of political events (committee sessions, political statements, consultations and hearings, parliamentary debates, decisions, etc.) (Serdült et al. 2012). By a collection of information on these linked events regarding their order, involved participants, and nature, the role of involved actors can be analysed and policy processes compared.

The source material of APES on Swiss climate policy is a detailed narration of events related to crucial events of the policy process. For the two policy processes at hand[18], data was collected systematically on events in the pre-parliamentary phase, as well as the parliamentary-phase i.e. public initiatives, stakeholder meetings, consultations, political statements, governmental messages, decisions, and so forth. The empirical evidence for the events and actor participation is based on the written documentation of the Curia Vista – Database of Parliamentary Proceedings that contains detailed information of parliamentary proceedings, such as Federal Council dispatches, procedural requests, elections, petitions, stakeholder statements, summaries, and others. A media analysis was done to compliment the Curia Vista data. For this purpose, I searched the SDA news wire service for articles on the CO_2-Act, available in the Lexis-Nexis database. I also conducted 10 semi-structured interviews with selected representatives of the most important actors in the policy subsystem to validate the information from the document analysis and to enrich the analysis with anecdotal evidence.

Events and actor participation was systematised with the help of the APES tool (Serdült et al. 2012). The software generates a diagram of the policy process. On the vertical axis, it displays all actors involved, grouped by actor type (i.e. executive branch, legislative branch, political parties, and private sector). On the horizontal axis, the diagram presents a timeline of subsequent events that are grouped by the phases of the decision-making process. For each event, little dots and triangles[19] indicate which actors have participated in the event.[20] An analysis of the policy process based on the APES helps to investigate Hypothesis 1. For this

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[18] Phase 1: 05.057 CO2-Gesetz. Umsetzung (https://www.parlament.ch/de/ratsbetrieb/suche-curia-vista/geschaeft?AffairId=20050057). Phase 2: 09.067 Für ein gesundes Klima. Volksinitiative. CO2-Gesetz. Revision. URL: https://www.parlament.ch/de/ratsbetrieb/suche-curia-vista/geschaeft?AffairId=20090067.

purpose, I assessed the identity and incitement of private and public political actors involved in the respective policy processes, such as environmental organisations, interest groups, political parties, as well as administrative and legislative bodies.

Based on the procedural event data, the APES tool allows transferring this information into network data. This is possible, as the policy process is understood as a sequence of linked events from which a structure can be derived (Widmer et al. 2008). In the SNA literature, this idea is often referred to as affiliation networks, bipartite networks, or two-mode networks (Borgatti, Everett, and Johnson 2013). Here, the actor-event network reflects the participation of actors in political events. Standard transformation routines, as for example implemented in R or UCINET (Borgatti, Everett, and Freeman 2002), are then utilised to convert the actor-event matrix into a one-mode actor-actor matrix, which links actors when they have participated in the same event. Although the underlying assumption that there is some kind of interaction between all actors participating in an event is not explicit (Widmer et al. 2008), the resulting matrix serves as valuable approximation of the network of political interactions that have taken place throughout the two decision-making processes. It is now possible to illustrate graphically constellations (compare Figure 3 and 4) and to analyse the influence of different actors with the help of network indicators.

The policy network reflects the actor constellations prevalent in the climate policy subsystem. Analysing them is the approach to examine Hypotheses 2a and 2b.

The use of centrality statistics (Borgatti, Everett, and Johnson 2013, Chapter 10) gives valuable insights in power and influence relations on the micro-level of individual actors or groups. In general, it can be stated that the larger the number of actors in central network positions, the more fragmented the power structure. To assess this, I consider three statistics that express different facets of the centrality concept.

Degree centrality informs about what actors and actor types hold the most central positions, as it simply counts the number of ties an actor has. It is used as a proxy for the importance of an actor in a network. In this context, a high degree centrality might indicate an influential position in the policy network, which gives the actor power over the decision-making process.

Closeness centrality, measures the distance of an actor to all other actors. For example, an actor mostly tied to well-connected actors is closer to the centre of the network than one with many connections to actors situated at the periphery of the network. Conceptually, the statistic helps to identify what actors are closest to each other and represent the inner circle

of the subsystem. As such, it is closely related to the degree centrality statistic, but with a stronger focus on the clique aspect. If a considerable number of actors is well connected, the inner circle of the subsystem is larger and the power structure more fragmented.

Betweenness centrality is often used as a proxy for actors' power and influence over information or resource flows and its bridging function. The number of shortest paths between two nodes including a third actor calculates it. The more often this actor is the shortest connection between pairs of nodes, which are not directly linked, the more central they are in the network. Therefore, an actor with a high betweenness centrality is often in a good position to control information or resource flows and able to connect different parts of a network. If only few actors have a high value in their betweenness centrality, opposed to a large number of actors with low values, information and resources flows are in the hands of a small elite indicating a centralised power structure.

For this analysis, centrality statistics contribute to the assessment of power structures by identifying who is influential. Moreover, in a combined assessment with the preference structure of the actors, the statistics also allow evaluating the level of conflict. For the latter, I conducted a systematic analysis by running OLS regression models for both phases. I used the centralisation statistics (degree, betweenness, closeness centrality) as independent and the policy preferences as dependent variables. Significant, positive parameter estimates related to specific policy preferences indicate that influential actors tend to support the same policy options. The level of conflict is lower, the more policy preferences core actors share. In turn, negative, significant estimates imply disagreement and therefore a higher level of conflict.

I coded data on policy preferences of the actors for both policy networks. For this purpose, I used the consultation summary report related to both processes to identify actor positions on policy instruments (FOEN 2009). For the first policy processes, I coded the positions for four instruments, i.e. voluntary measures, the CO_2 levy, tradeable permits, and the climate cent. For the second policy processes, I coded three variables, i.e. the position on emission reduction targets, the scope of these targets, and the position towards a carbon levy on motor fuels. Furthermore, the actor type was included as a control. Compare the supplementary material in Appendix B for a more detailed description of the coding scheme.

The second set of network statistics refers to the macro level of the policy network. Specifically, I use two different indicators to assess the power structure of the two networks. First, network cohesion measures how knitted the network is. For comparison, it is advisable to use the average degree of the network, which can easily be computed by calculating the

degree for each node and then average these values by the number of actors (Borgatti, Everett, and Johnson 2013). A higher average degree reflects stronger network cohesion as more actors are tied to each other. This indicates a more fragmented power structure as more actors are active. On the contrary, a lower average degree reflects weaker network cohesion, because less actors are tied. This points to a more centralised power structure, as only a small number of actors share numerous ties.

Secondly, centralisation 'refers to the extent a network is dominated by a single node' (Borgatti, Everett, and Johnson 2013, 159). Full centralisation implies that one actor is connected to all other actors, there are no connections otherwise, and hence resemble a star. The contrast is a network in which all nodes are connected to each other. The link to the power structures is now straightforward: A highly centralised policy network also shows highly centralised power structures, whereas a policy network that is only little centralised is connected to fragmented power structures.

5. Analysis

Process-based analysis

As shown in Figure 3, all actor types were involved in all stages of the decision-making process during the implementation of the first CO_2-Act between 2004 and 2008, but to varying degrees. In the pre-parliamentary phase, the protagonist and responsible administration was the Federal Council (FC) in collaboration with the Department of the Environment, Transport, Energy and Communications, the Federal Office of the Environment (DETEC), and the Federal Office for Energy (SFOE). Business groups, science, political parties, and citizen groups were also active during this first period. Most importantly, the Foundation Climate Cent (FCC) under the auspices of the oil industry developed the climate cent to abolish the CO_2 levy on motor fuels. In 2004, the FC launched a public consultation to review four different alternatives to implement the CO_2-Act, among them the climate cent. In consequence of the consultation, the FC sent an adjusted policy proposal into parliament that included the carbon levy on combustibles combined with the climate cent to replace a levy on motor fuels.

In 2005, the parliamentary debates started when the message of the FC was sent to the Committee for Environment, Spatial Planning, and Energy of the National Council (CESPE-NC). The commission debate ended with the advice to return the draft to the FC for revision, regarding a potential extension of the climate cent on combustibles (climate cent II) lobbied for by industry interest groups. The NC rejected this option after controversial debates and assigned the commission to continue with discussions that are more detailed. This led to two

events: the commission suggested an iterative introduction of the levy and the FCC presented its business plan in the NC. Eventually, both NC and SC accepted the described iterative introduction of a CO_2 levy on combustibles and the introduction of a climate cent, replacing the levy on motor fuels. The new CO_2-Regulation, that detailed the implementation of the CO_2 levy on combustibles, entered into force in 2005.

In terms of the actors involved, Figure 3 shows an active involvement of all types of actors, whereby the protagonists were the two councils (NC and SC) and their environmental commissions (CESPE-NC and CESPE-SC). However, private actors were also active, in particular the FCC, the leading actor in terms of the climate cent. Business groups too tried to influence the parliamentary decision-making process.

Several environmental citizen groups organised themselves under the roof of the Alliance for a Responsible Climate Policy (AFRCP), as the limited CO_2 levy did not satisfy them. In consequence, they planned the launch a public initiative with the perspective of adding ambitious climate protection in the Swiss constitution.

The revision of the CO_2-Act between 2008 and 2013 was already set off in the implementation phase with the foundation of the AFRCP. The alliance launched the public initiative 'For a healthy climate' demanding to include a reduction target of 30% until 2020 (1990 baseline) in the Swiss constitution. The FC, however, opposed this and subsequently came up with a federal counterproposal. The FC suggested two different options (cp. Federal Council 2009) to be discussed in a public consultation. One suggested a levy on motor fuels, again. The consultation was launched in 2008, overwhelmingly supporting the option that contained a levy on motor fuels and a 20% emission reduction target, only to be achieved by domestic reductions (FOEN 2009). The proposal was rather progressive and chances of the levy on motor fuels were high. In pre-parliamentary phase that lasted until late 2009, the administration, and the IC-CI (committee of climate initiative) were the key actors. Interestingly, neither private actors from the business nor the environmental side lobbied for their interests.

The subsequent parliamentary debates were tough, lasting until 2011. The ESPEC-N invited important stakeholders for a consultation. It was soon clear, that the NC would forward the governmental draft and reject the climate initiative. In the following, difficult negotiations in both parliamentary councils commenced. The debates pointed at an introduction of a CO_2 levy on fuels. This impression also lasted throughout discrepancies stage. The legislative branch

dominated both parliamentary stages. Private actors, only tuned into the processes in the scope of the regular lobbying process and occasional statements.

The tide only turned in the very end of the parliamentary process, when the economiesuisse threatened to launch a referendum against the CO_2-Act, if the CO_2 levy on motor fuels was introduced. In consequence, even the green and left members of parliament agreed to cancel the levy on motor fuels to save the CO_2-Act. In return, economiesuisse withdrew the referendum threat. After the final vote in early 2012, the final version of the new act was decided on and entered into force in 2013.
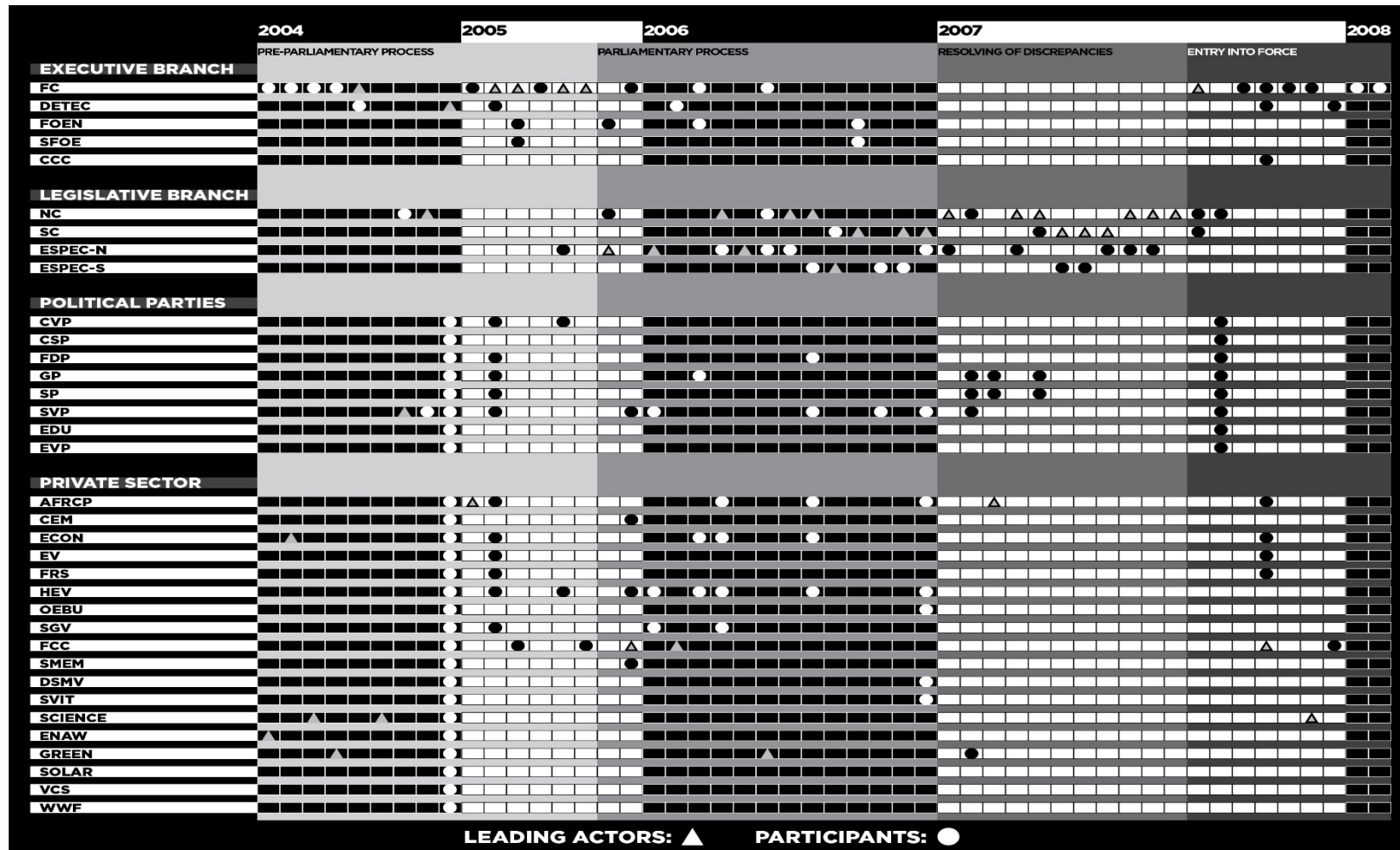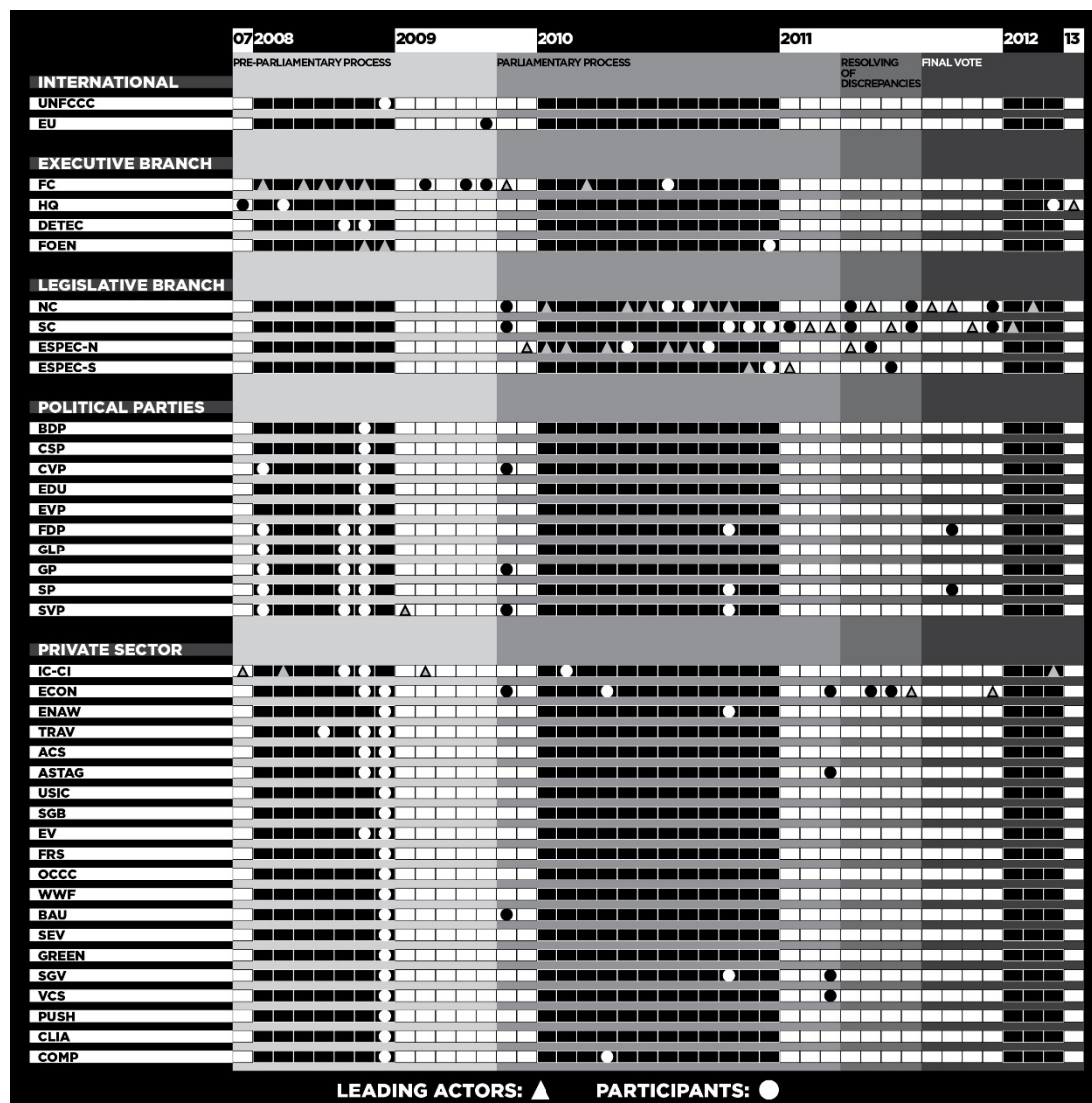
Figure 3: Actor-Process-Event Scheme 2004-08

Figure 4: Actor-Process-Event Scheme 2008-13

The analysis of APES for the two phases shows several elements. First, both processes resemble each other in their overall patterns. Multiple-actors from different levels were involved in multiple rounds of decision-making. Therefore, the decision-making context was constraint. The implementation process was clearly determined by the objectives formulated in the CO_2-Act. It can be stated that the policy context was rather simple, as the problem was already defined and well known.

Secondly, the involvement of actors in the two phases was considerably diverse. In the first phase, more private actors, above all the FCC, were generally active, but particularly in the pre-parliamentary phase. In consequence, the administration had to balance carefully the interests of the business and energy sector. It was clever lobbying by the oil association, early in the decision-making process, that enabled the climate cent and thereby avoided the introduction of a carbon levy on motor fuels. The representatives of the industry and the

housing sector, being the main target group, were not very active during the process. This explains, why the levy on motor fuels was avoided, while the levy on combustibles was introduced. In the second phase, environmental organisations contributed significantly to the policy formulation process, especially in the context of the public initiative. The most relevant private actor, however, was economiesuisse, which in the end intervened with respect to the carbon levy on motor fuels.

In sum, Hypothesis 1 is hereby confirmed. The involvement of multiple actor from different levels, in several subsequent rounds of decision-making led to a compromise solution that aimed to balance out the interest from different target groups

Policy Network Analysis

During the implementation of the first CO_2-Act between 2004 and 2008 a high level of conflict developed. As illustrated in Figure 5 and 6, actors that were most central in the network had contrasting views on the climate cent and the CO_2 levy on motor fuels. During this period, they were the FC, the DETEC, AFRCP, and several business and traffic organisations, such as the economiesuisse, the House Owner's Association, and the Oil Association (cp. Online Appendix C). (Ingold 2010; Lehmann and Rieder 2002)(Lehmann and Rieder 2002)

Table 8 summarises the regression results for the climate cent and the carbon levy. To support the hypotheses, the parameter estimates related to the policy instrument preferences should not be significant, as significances would indicate that more central or influential actors tend to support the same preferences. Moreover, the regression models allow assessing if specific actor types are more central in the network. The results, across all models show no significant parameter estimates related to the instrument preference variables. Similarly, there are no actor groups that are central to the policy process. However, the results show that citizen groups tend to be comparatively less influential as they are negatively related to the betweenness centrality statistic. In all, this finding shows that high centralisation is neither connected to specific positions nor to actor types. The conclusion is that single actor groups or coalitions did not dominate the policy process, which supports the process-based analysis in section 5.1. Nevertheless, this points to a more conflictive policy subsystem with fragmented power structures. Table 9 also underlines this result: The different actor types have similar levels for all centrality statistics, except science. Thus, many actors from different levels and types were active and influential during the implementation process. As discussed in the theory section, this raises potential for policy innovations.

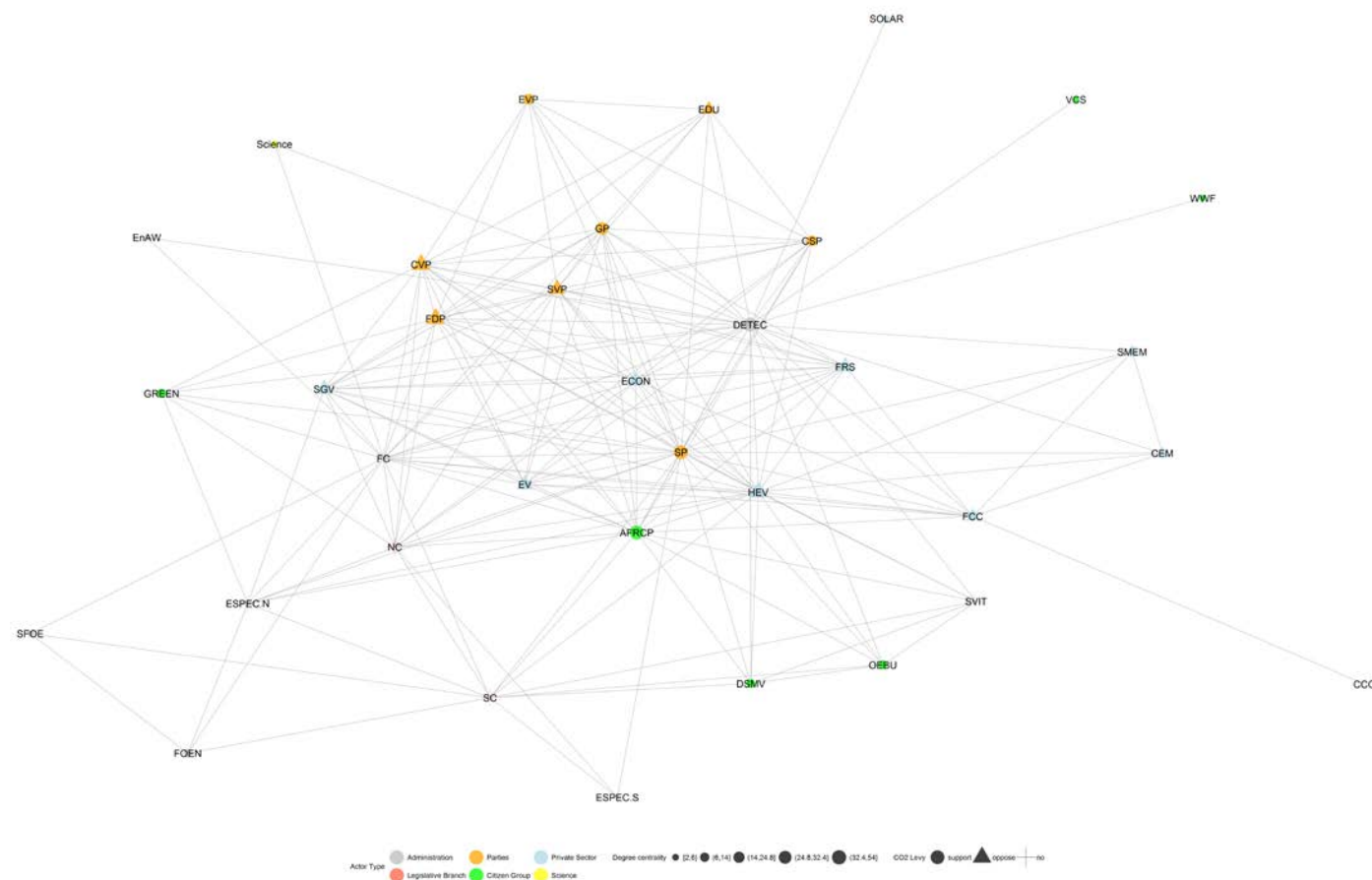Table 8: Regression results implementation

	DEGREE 1	BETWEENESS 1	CLOSENESS 1	DEGREE 2	BETWEENESS 2	CLOSENESS 2
INTERCEPT	0.33* (-0.13)	0.07 (-0.03)	0.56 *** (-0.07)	0.32 * (0.14)	0.07 (0.03)	0.56 *** (0.03)
CLIMATE CENT (OPPOSE)	0.01 (-0.15)	0.02 (-0.04)	0.02 (-0.08)			
CLIMATE CENT (SUPPORT)	0.12 (-0.17)	0.02 (-0.04)	0.06 (-0.08)			
CO_2 LEVY (OPPOSE)				0.09 (0.17)	0.01 (0.04)	0.05 (0.08)
CO_2 LEVY (SUPPORT)				0.01 (0.16)	0.03 (0.04)	0.02 (0.08)
CITIZEN GROUPS	-0.12 (-0.14)	-0.09 (-0.04)	-0.03 (-0.07)	-0.12 (0.15)	-0.09 * (0.04)	-0.04 (0.07)
LEGISLATIVE BRANCH	-0.05 (-0.17)	-0.06 (-0.04)	-0.02 (-0.08)	-0.04 (0.17)	-0.05 (0.04)	-0.01 (0.09)
PARTIES	0.06 (-0.14)	-0.07 (-0.04)	0.04 (-0.07)	0.06 (0.14)	-0.07 (0.04)	0.04 (0.07)
PRIVATE SECTOR	-0.13 (-0.14)	-0.08 (-0.04)	-0.03 (-0.07)	-0.11 (0.15)	-0.07 (0.04)	-0.02 (0.07)
SCIENCE	-0.27 (-0.24)	-0.09 (-0.06)	-0.08 (-0.12)	-0.28 (0.25)	-0.10 (0.06)	-0.08 (0.12)
R^2	0.2	0.22	0.14	0.18	0.22	0.13
ADJ. R^2	-0.01	0.02	-0.09	-0.03	0.02	-0.10
NUM. OBS.	35	35	35	35	35	35
RMSE	0.22	0.06	0.11	0.22	0.06	0.11
NOTES	($p < 0.001$ ***, $p < 0.01$ **, $p < 0.05$ *) Standard error in parentheses					

Macro-level statistics point in the same direction. The policy network shows an average degree of 24.6 and a density of 0.73. The values indicate that actors tend to be tied to about two third of actors, a comparably high value for social networks. Related to the power structure, this implies that many actors are tied to many actors. Therefore, the power structure is more fragmented. Accordingly, the policy network has a degree centralisation value of 0.23, which is relatively low. For our analysis, it shows that the power is not in the hands of few actors, but suggests a rather fragmented power structure.

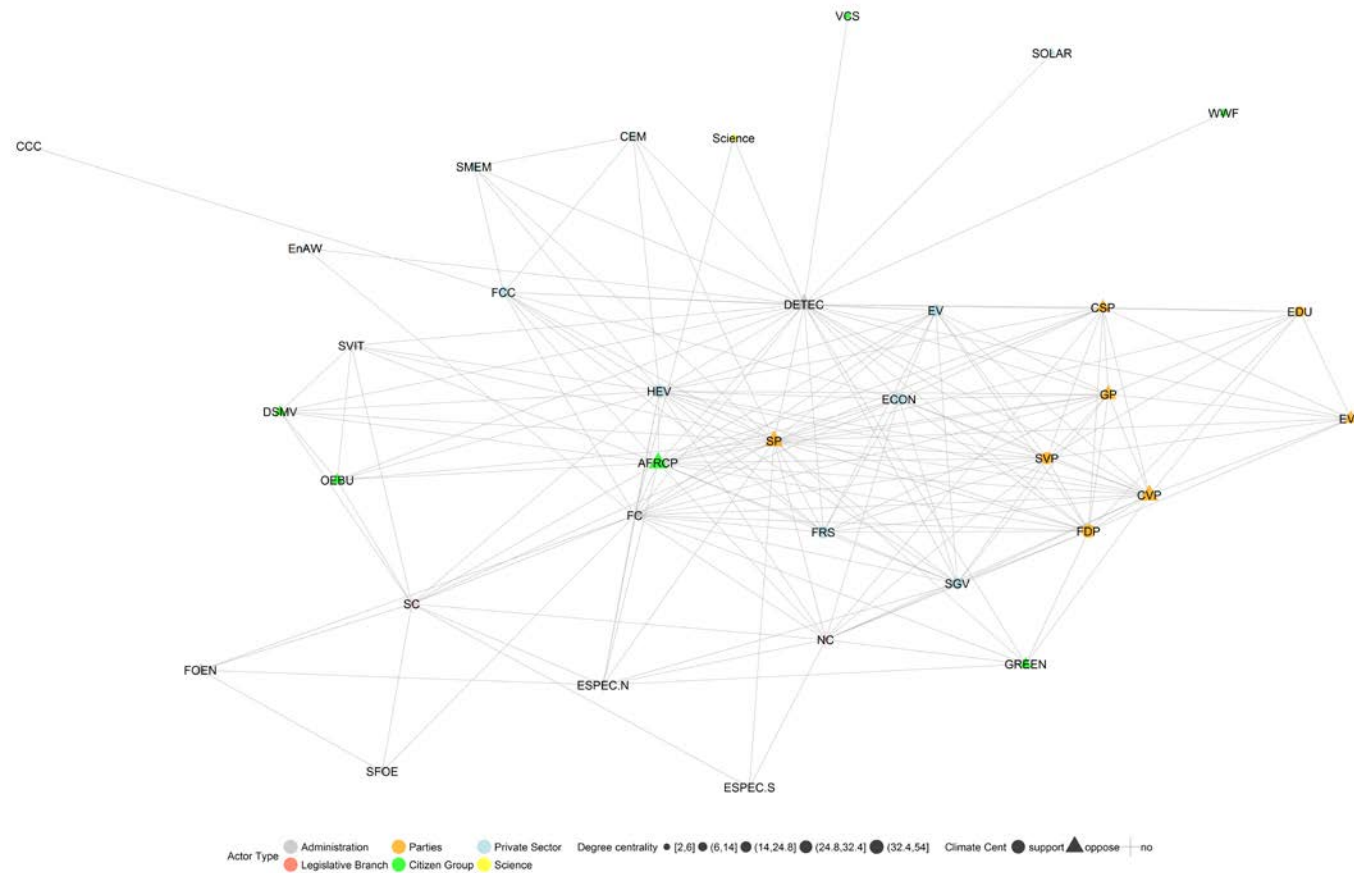Table 9: Centrality scores implementation by actor group

ACTOR TYPE	CENTRALITY SCORES		
	Degree	Betweenness	Closeness
ADMINISTRATION	0.33	0.08	0.57
CITIZEN GROUP	0.21	0.01	0.54
LEGISLATIVE BRANCH	0.28	0.01	0.54
PARTIES	0.44	0.02	0.63
PRIVATE SECTOR	0.29	0.01	0.58
SCIENCE	0.10	0.00	0.50

Figure 5: Policy network implementation 2005-08, CO_2 levy

Note: The network graph is based on a dichotomized version of the network. The dichotomization was done at cut-off value 6.

Note: The network graph is based on a dichotomized version of the network. The dichotomization was done at cut-off value 6.

During the revision process of the CO_2-Act between 2008 and 2013, the level of conflict was significant. Figure 7 shows that actors, which were most central in the network had contrasting views on the CO_2 levy on motor fuels. They were the FC, Federal Office for the Environment (FOEN), and economiesusisse (cp. Appendix C), which belong to different advocacy coalitions. Interestingly, the World Wildlife Foundation (WWF), one of the most influential actors in Swiss climate policy among the energy, industry, and business sector, is only at the periphery. The environmental organisation, however, played a leading role in the committee of the public initiative 'For a Healthy Climate' and was nominated as an important actor by the organisations interviewed. I assume that the importance of the WWF is overstated by the representatives interviewed. This phenomenon, known as 'devil shift', is to paint enemies more dangerous and powerful as they actually are (Fischer et al. 2016).

Table 10: Regression results revision

	DEGREE	BETWEENESS	CLOSENESS
INTERCEPT	0.21* (0.08)	0.10* (0.04)	0.14*** (0.02)
CO_2 LEVY (OPPOSE)	0.18* (0.08)	0.06 (0.04)	0.01 (0.03)
CO_2 LEVY (SUPPORT)	0.09 (0.08)	0.05 (0.04)	0.01 (0.02)
CITIZEN GROUPS	-0.25** (0.08)	-0.14 ** (-0.04)	-0.00 (-0.02)
INTERNATIONAL	-0.20 (0.12)	-0.10 (0.06)	-0.05 (0.04)
LEGISLATIVE BRANCH	-0.06 (0.09)	-0.08 (-0.04)	-0.02 (-0.08)
PARTIES	-0.25** (0.07)	-0.15*** (-0.04)	-0.05* (0.02)
PRIVATE SECTOR	-0.23**(0.07)	-0.13*** (-0.04)	-0.00 (0.02)
SCIENCE	-0.28* (0.13)	-0.15* (-0.06)	-0.01 (-0.04)
R^2	0.2	0.22	0.14
ADJ. R^2	-0.01	0.02	-0.09
NUM. OBS.	35	35	35
RMSE	0.22	0.06	0.11
NOTES	($p < 0.001$ ***, $p < 0.01$ **, $p < 0.05$ *) STANDARD ERROR IN PARENTHESES		

The regression analysis shows (cp. Table 10) that actors in more central positions (degree centrality) tend to oppose the introduction of the levy on motor fuels. This implies that actors opposing the CO_2 levy on motor fuels were more active in terms of lobbying, but they are not necessarily in more powerful positions or better connected to powerful actors (closeness and betweenness centrality). For the other issues, no such relation was found (cp. Appendix D). In terms of the actor types, the results show that citizen groups, parties and business actors tend to be in less central positions. With respect to the CO_2 levy, central actors were against its introduction, which explains, why the levy was not introduced. The policy process was

dominated by a small number of actors from the legislative branch, the administration, and the economiesuisse.

Table 11 supports this conclusion. We see, that the most active and influential actors are from the administration, followed by the legislation and the private sector. The other groups played a subordinated role, both in terms of their presence in the process (degree centrality) and being in powerful positions (betweenness centrality). With respect to closeness centrality, what measures the extent of actors connected to other important actors, the inverted statistic has equally low levels for all actor types. There is a general tendency of actors to be at the periphery of the network. All this points to a less fragmented but more centralised power structure.

The analysis of the macro-level statistics supports this. During the revision of the act, the policy network shows an average degree of 15.85 and a density of 0.40. In comparison to the implementation phase, these values are much lower. The power structure prevalent in the policy subsystem was much more centralised than during the implementation. This is also highlighted by the lower centralisation score of 0.41.

Table 11: Centrality scores per actor type revision

ACTOR TYPE	CENTRALITY SCORES		
	Degree	Betweenness	Closeness
ADMINISTRATION	0,28	0,14	0,14
CITIZEN GROUP	0,07	0,01	0,14
INTERNATIONAL	0,01	0,00	0,08
LEGISLATIVE BRANCH	0,18	0,03	0,14
PARTIES	0,09	0,00	0,09
PRIVATE SECTOR	0,12	0,02	0,14
SCIENCE	0,03	0,00	0,14

Figure 7: Policy network revision process 2008-13
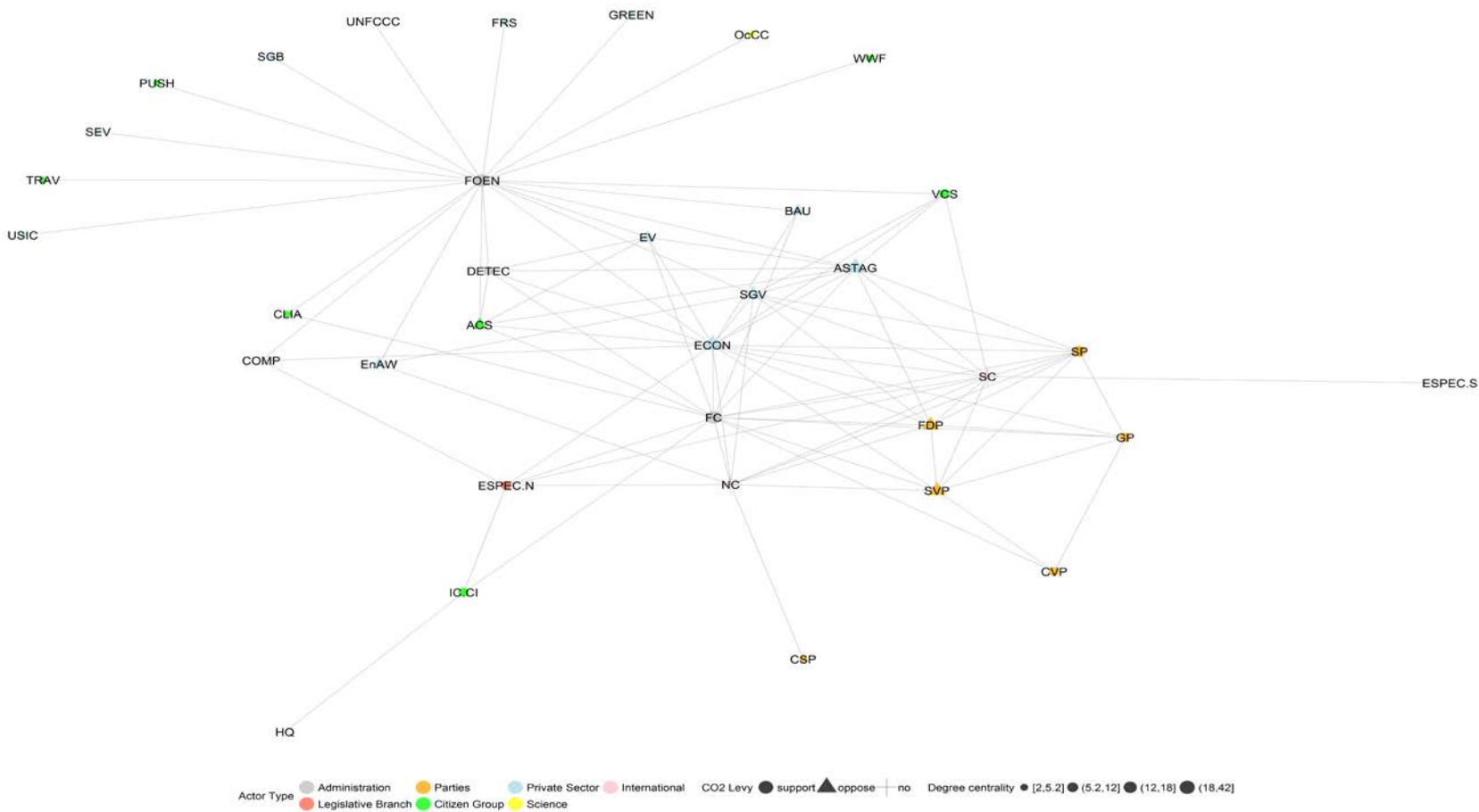
In a comparative perspective, we see that the subsystem structure has changed over time. The analysis showed that during implementation more actors from different types and levels were active during all stages of the process. Conversely, in the revision process less private actors from both the business sector and citizen organisations played a central role. In this second phase, only two actors from the private sector can be highlighted: the AFRCP and the economiesuisse. This indicates that lobbying was less intensive in the revision period between 2008 and 2013, a finding that is also stressed by a representative of the economy during the interviews. An interviewee explained that the revision process was not taken too serious, as it was not directly connected to any international developments. As a result, lobbying organisations opposing the introduction of the CO_2 levy sleepwalked through this decision-making process until they finally realised the need to intervene at a stage, when it was too late.

In sum, the analysis demonstrates that both decision-making processes were characterised by a conflictual environment with core actors disagreeing over crucial topics. The two phases differed in terms of the power structure. This supports the formulated hypotheses. In phase one, the fragmented power structure led to a compromise solution with an innovative moment, namely the introduction of the climate cent as alternative to the carbon levy on fuels. In phase two, the more centralised power structure limited the innovative potential. Last minute lobbying allowed no room for the development of ground breaking policy alternatives to the levy. As a result, the revised act contained no CO_2 levy on fuels and no convincing replacements. The compensation of oil imports does target consumption patterns in the traffic sector equally, as a CO_2 levy on motor fuels would have done.

6. Conclusion

In this paper, the point of departure is that policy instruments are not like an "arrow in a quiver (…) awaiting selection and application at appropriate strategic moments by public officials" (Bresser and O'Toole 2005, 132). Rather, their effectiveness depends on the social, political, economic, and institutional context of their application and so should their selection. A careful recognition of the political context can increase the chance of a successful implementation. Good policy design has to analyse carefully the aspects of public decision-making. Paying attention to the problem of political feasibility includes the identification of important actors, their beliefs and interests, recourses and venues of interaction (Meltsner 1972). Therefore, the success and failure of a policy depends on the decision-making process, like variances in the decision-making style, and factors related to the structure of the

subsystem, i.e. actor constellations and their preferences (Klijn and Koppenjan 2000; Sabatier and Jenkins-Smith 1993).

This analysis shows that the introduction of a carbon levy on motor fuels was politically not feasible due to the strong opposition by powerful interest groups. Business, energy, and traffic organisations, that represent a large share of the electorate, were among the most determined and prominent actors in both policy processes. In contrast, the industry, most affected by the carbon levy on combustibles, was meagrely active. Possible explanations for the passivity of the industry to avoid the levy stem from the interviews. The industry lobby is barely as well appointed with human resources, yet it is the main factor for successful lobbying. This probably caused the late reaction in the implementation phase. Whereas the climate cent for petrol and diesel was already discussed before 2005 the federal government considered to introduce a carbon tax, the climate cent was only discussed when the governmental proposal was already in parliament.

The results of this paper have significant implications for future climate policy in Switzerland. Assessing two very recent policy processes confirmed the limited political feasibility of a carbon tax on fuels. By introducing a new strategy of Swiss energy policy, it was discussed to meticulously integrate climate and energy policy concerns (FFA and UVEK 2015). The concept of the energy strategy was the so-called climate and energy steering system to replace existing subsidy and funding programs by a levy on electricity, emissions from combustibles and fuels. However, like the preceding policy processes an overwhelming majority of stakeholders supported the levy on electricity and emissions from combustibles, but rejected the levy on fuels. Interestingly, even the left and green parties rejected the steering system arguing that the existing mechanisms are already suitably sufficient.

A further revision of the CO_2- Act is now necessary to implement the requirements of the Paris Agreement. In 2016, a public consultation was held on three topics: the ratification of the Paris Agreement, the integration in the EU emissions trading scheme, and the revision of the CO_2-Act. The introduction of a CO_2 levy was discussed, again. Although the summary report of the consultation is not yet released, it is very likely that it will comprise many critical views concerning the levy on motor fuels echoing the past 30 years of decision-making on this issue. Although it might be the most efficient instrument to reduce emissions in the traffic sector, it is also the most implausible to be realised in the future. In consequence, it would be commendable to change the strategy by considering other measures, such as programs to increase rail traffic and transport, levies and taxes on passenger vehicles, increased road tolls, traffic-free zones in cities, and others.

This paper conducts an in-depth case study of Swiss climate policy. It also presents an innovative framework for analysing structural aspects of the decision-making process (style and actor constellations). While this paper makes a valuable contribution to the comprehension of Swiss climate politics and answers some previously unacknowledged, yet crucial questions, it is also limited. To see whether the developed analytical framework may be adapted to any other policy context, it must be applied to other areas and across countries. Further research might lead into this direction.

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Appendix

Appendix A: APES Event List

Phase 1: Implementation of CO_2-Act 2004-08

Pre-parliamentary process	Parliamentary debates	Resolving of discrepancies	Entry into force
1) Signing of target agreements with EnAW 2) ECON demands more flexibility in climate cent 3) GREEN criticises climate cent and certificates 4) BRAT authorizes UVEK to start consultation 5) Science conference on climate change 6) SVP introduced facultative referendum CO_2 levy 7) Referendum denied 8) UVEK starts consultation 9) Climate Alliance publishes declaration for the introduction of a CO_2 levy 10) BRAT decides on CO_2 levy and climate cent 11) Negotiations on climate cent 12) Adoption CO_2-Regulation 13) Message on CO_2 levy 14) Target Agreement climate cent	15) ESPEC-N starts to deliberate on CO_2 levy 16) FCC presents climate cent II 17) ESPEC-N debate on federal message 18) FCC presents business plan on climate cent 19) Disagreement on CO_2 levy among stakeholders expressed towards administration 20) Parliamentary debate on CO_2 levy in NC 21) ESPEC--N presents iterative introduction of CO_2 levy 22) GREEN protests for ambitious climate policy 23) Parliamentary debates in NC 24) Decision NC 25) ESPEC-S starts debate 26) ESPEC-postpones decision 27) ESPEC-S starts debate 28) SC deliberates on proposal 29) SC decision	30) Resolving of discrepancies ESPEC-N NC decides 31) Parties demand extra session on climate policy after UNFCCC report 32) Secret meeting on public initiative 33) NC parliamentary debate 34) Decision on CO_2 levy & gas-fired power plants 35) Debate on discrepancies SC/ESPEC 36) Second round on C gas-fired power plants in SC 37) Final vote on CO_2 levy SC 38) ESPEC debates on discrepancies 39) Final vote in NC	40) Federal decree 41) Special session on climate policy in NC 42) Decision on climate cent in NC 43) Agreement federal decree 44) Final business plan 45) CO_2 Regulation enters into force 46) Science demands more ambitious climate policy 47) Extension contract with CCF 48) CO2-Regulation enters into force

Phase 2: Revision 2008-13

Pre-parliamentary process	Parliamentary debates	Resolving of discrepancies	Final vote
1) FC presents Climate Initiative 2) FC postpones the decision on new climate policy 3) IC-CI submits Climate Initiative 4) FC presents ideas on new climate policy 5) FC rejects Climate Initiative 6) FC publishes proposal on revised CO2 Act 7) Public consultation starts 8) FC publishes report on Swiss climate policy 9) SVP demands suspension of CO_2 Act 10) IC-CI criticises governmental proposal 11) BAFU issues carbon statistics for Switzerland 12) Climate alliance protests for an ambitious climate policy 13) EU climate summit	14) FC submits message to parliament 15) Decision for consultation of stakeholders 16) ESPEC-N deliberates climate initiative 17) ESPEC-N rejects climate initiative 18) FC introduces legal framework for building programme 19) Consultation of stakeholders in ESPEC-N 20) Parliamentary debates national council 21) NC rejects Climate Initiative 22) ESPEC-N deliberates policy proposal 23) ESPEC--N adopts policy proposal 24) Parliamentary debate NC 25) NC votes for proposal and passes it to SC 26) ESPEC--S deliberates on policy proposal 27) FOEN reports internationally committed targets to commissions 28) ESPEC-S adopts proposal with changes 29) SC deliberates on proposal	31) Resolving of discrepancies NC 32) NC decides 33) Resolving of discrepancies in SC 34) ECON considers referendum	35) Final deliberations in NC 36) Final vote on proposal NC 37) Final vote on proposal SC 38) ECON withdraws referendum 39) Final vote on climate initiative 40) IC-CI withdraws climate initiative 41) Revised act enters into fore

	30) Votes for proposal		

Appendix B: Covariates

Phase 1: Implementation of CO_2-Act 2004-08

Full name	Abbrev	Actor Type	Voluntary	CO2Levy	Permits	Climate Cent
Federal Council	FC	Administration	no	no	no	no
Federal Department of the Environment, Transport, Energy and Communications	DETEC	Administration	support	support	oppose	oppose
Federal Office for the Environment	FOEN	Administration	oppose	support	support	oppose
Swiss Federal Office of Energy	SFOE	Administration	oppose	support	support	oppose
Climate Cent Control Committee	CCC	Administration	no	no	no	no
National Council	NC	Legislative Branch	no	no	no	no
State Council	SC	Legislative Branch	no	no	no	no
Environment, Spatial Planning and Energy Committees - National Council	ESPEC-N	Legislative Branch	no	no	no	no
Environment, Spatial Planning and Energy Committees - State Council	ESPEC-S	Legislative Branch	no	no	no	no
Civic Democratic Party	CVP	Parties	support	oppose	support	oppose
Cristian Social Party	CSP	Parties	oppose	support	support	oppose
Liberal Democratic Party	FDP	Parties	oppose	oppose	support	support
Green Party	GP	Parties	support	support	oppose	oppose
Social democratic Party	SP	Parties	oppose	support	support	oppose
Swiss People´s Party	SVP	Parties	support	oppose	support	support
Federal Democratic Union	EDU	Parties	support	oppose	support	support
Evangelical People´s Party	EVP	Parties	oppose	support	support	oppose
Alliance for a Responsible Climate Policy	AFRCP	Citizen Group	oppose	support	oppose	oppose
cemsuisse	CEM	Private Sector	support	oppose	support	support
economiesuisse	ECON	Private Sector	oppose	oppose	support	support
Oil association	EV	Private Sector	oppose	oppose	support	support
Road Traffic Organization	FRS	Private Sector	oppose	oppose	support	support
Swiss House owner Association	HEV	Private Sector	support	oppose	oppose	support
Association for ecological integration for business management	OEBU	Citizen Group	oppose	support	oppose	oppose
Swiss Chamber of Commerce	SGV	Private Sector	support	oppose	support	support

Climate Cent Foundation	FCC	Private Sector	oppose	oppose	support	support
swissmem	SMEM	Private Sector	support	oppose	support	support
German speaking Swiss Tenant Association	DSMV	Citizen Group	oppose	support	oppose	oppose
Swiss Real Estate Industry Association	SVIT	Private Sector	no	no	no	no
Science	Science	Science	support	support	oppose	oppose
Energy Agency of the Economy	EnAW	Private Sector	support	oppose	support	oppose
Greenpeace Switzerland	GREEN	Citizen Group	oppose	support	oppose	oppose
swisssolar	SOLAR	Private Sector	oppose	support	oppose	oppose
Velo Club Schweiz	VCS	Citizen Group	oppose	support	oppose	oppose
World Wildlife Foundation Switzerland	WWF	Citizen Group	oppose	support	oppose	oppose

Phase 2: Revision of the CO2-Act 2008-13

Full name	Abbreviation	Targets	Scope	CO₂-Levy	Actor Type
United Framework Convention on Climate Change	UNFCCC	no	no	no	International
European Union	EU	no	no	no	International
Federal Council	FC	medium	domestic	support	Administration
Federal Chancellery (Head Quarter)	HQ	no	no	no	Administration
Federal Department of the Environment, Transport, Energy and Communications	DETEC	medium	domestic	support	Administration
Federal Office for the Environment	FOEN	medium	domestic	support	Administration
National Council	NC	no	no	no	Legislative Branch
State Council	SC	no	no	no	Legislative Branch
Environment, Spatial Planning and Energy Committees - National Council	ESPEC-N	high	domestic	support	Legislative Branch
Environment, Spatial Planning and Energy Committees - State Council	ESPEC-S	no	no	no	Legislative Branch
Civic Democratic Party	BDP	soft	flex	oppose	Parties
Cristian Social Party	CSP	high	domestic	support	Parties
Cristian Peoples' Party	CVP	high	flex	support	Parties
Federal Democratic Union	EDU	soft	flex	support	Parties
Evangelical People´s Party	EVP	high	flex	oppose	Parties
Liberal Democratic Party	FDP	medium	domestic	oppose	Parties
Green Liberal Party	GLP	high	domestic	support	Parties
Green Party	GP	high	domestic	support	Parties
Social democratic Party	SP	high	domestic	support	Parties
Swiss People´s Party	SVP	soft	flex	oppose	Parties
Initiative Committee of the Climate Initiative	IC-CI	high	domestic	support	Citizen Group
economiesuisse	ECON	soft	flex	oppose	Private Sector
Energy Agency of the Economy	EnAW	medium	domestic	oppose	Private Sector
Travail Suisse	TRAV	high	domestic	support	Citizen Group

Automobile Club Switzerland	ACS	medium	flex	oppose	Citizen Group
Swiss Road Transport Association	ASTAG	medium	flex	oppose	Private Sector
Swiss Association of Consulting Engineers	USIC	high	domestic	support	Private Sector
Schweizerischer Gewerkschaftsbund	SGB	high	domestic	support	Private Sector
Oil association	EV	soft	flex	oppose	Private Sector
Road Traffic Organization	FRS	medium	flex	oppose	Private Sector
Consultative organization on Climate Change	OcCC	high	domestic	support	Science
World Wildlife Foundation Switzerland	WWF	high	domestic	support	Citizen Group
Bauenschweiz	BAU	medium	flex	oppose	Private Sector
Association of Traffic Personell	SEV	high	domestic	support	Private Sector
Greenpeace Switzerland	GREEN	high	domestic	support	Private Sector
Swiss Chamber of Commerce	SGV	medium	flex	oppose	Private Sector
Velo Club Schweiz	VCS	high	domestic	support	Citizen Group
Push - Praktischer Umweltschutz	PUSH	medium	domestic	support	Citizen Group
Climate Alliance	CLIA	high	domestic	support	Citizen Group
Companies	COMP	no	no	no	Private Sector

Appendix C: Centrality statistics for all actors

Phase 1: Centrality Statistics (sorted by the degree statistic)

	Degree	Betweenness	Closeness	Eigenvector
DETEC	0,794	0,289	0,829	0,929
SP	0,765	0,13	0,81	1
HEV	0,647	0,058	0,739	0,917
FC	0,618	0,134	0,723	0,84
AFRCP	0,588	0,035	0,708	0,887
CVP	0,5	0,011	0,654	0,822
FDP	0,5	0,011	0,654	0,822
SVP	0,471	0,008	0,642	0,799
GP	0,441	0,006	0,63	0,759
ECON	0,441	0,006	0,642	0,778
NC	0,412	0,016	0,586	0,635
SGV	0,412	0,005	0,618	0,734
EV	0,382	0,002	0,618	0,7
FRS	0,382	0,002	0,618	0,7
SC	0,353	0,034	0,567	0,399
CSP	0,353	0,003	0,576	0,613
FCC	0,324	0,064	0,596	0,485
ESPEC.N	0,265	0,007	0,54	0,394
EDU	0,235	0	0,54	0,411
EVP	0,235	0	0,54	0,411
OEBU	0,206	0,001	0,548	0,319
DSMV	0,206	0,001	0,548	0,319
SVIT	0,206	0,001	0,548	0,319
GREEN	0,206	0,002	0,548	0,364
CEM	0,147	0	0,523	0,239
SMEM	0,147	0	0,523	0,239
FOEN	0,118	0,001	0,466	0,115
SFOE	0,088	0	0,459	0,09
ESPEC.S	0,088	0	0,479	0,136
Science	0,059	0	0,5	0,118
EnAW	0,059	0	0,5	0,118
CCC	0,029	0	0,378	0,032
SOLAR	0,029	0	0,459	0,062
VCS	0,029	0	0,459	0,062
WWF	0,029	0	0,459	0,062

Phase 2: Centrality Statistics (sorted by the degree statistic)

	Degree	Betweenness	Closeness	Eigenvector
FOEN	0,538	0,413	0,154	0,613
ECON	0,436	0,133	0,155	1
FC	0,41	0,136	0,149	0,868
SC	0,282	0,053	0,146	0,725
ASTAG	0,282	0,035	0,151	0,754
NC	0,256	0,059	0,145	0,631
FDP	0,231	0,004	0,144	0,683
SP	0,231	0,004	0,144	0,683
SGV	0,231	0,034	0,148	0,619
SVP	0,205	0,009	0,144	0,568
DETEC	0,154	0,007	0,147	0,449
ESPEC.N	0,154	0,023	0,143	0,389
GP	0,154	0,004	0,141	0,435
ACS	0,154	0,007	0,147	0,449
EV	0,154	0,007	0,147	0,449
VCS	0,128	0,007	0,146	0,403
CVP	0,077	0	0,133	0,203
IC.CI	0,077	0,045	0,134	0,138
EnAW	0,077	0,01	0,144	0,202
BAU	0,077	0,007	0,146	0,27
COMP	0,077	0,011	0,145	0,217
CLIA	0,051	0,007	0,145	0,161
UNFCCC	0,026	0	0,136	0,067
HQ	0,026	0	0,12	0,015
ESPEC.S	0,026	0	0,13	0,079
CSP	0,026	0	0,129	0,069
TRAV	0,026	0	0,136	0,067
USIC	0,026	0	0,136	0,067
SGB	0,026	0	0,136	0,067
FRS	0,026	0	0,136	0,067
OcCC	0,026	0	0,136	0,067
WWF	0,026	0	0,136	0,067
SEV	0,026	0	0,136	0,067
GREEN	0,026	0	0,136	0,067
PUSH	0,026	0	0,136	0,067
EU	0	0	0,025	0
BDP	0	0	0,025	0
EDU	0	0	0,025	0
EVP	0	0	0,025	0
GLP	0	0	0,025	0

IV. What Triggers Interest Groups Interests? A Case Study of Swiss Climate Change Politics, by M. Kammerer

Abstract

This paper adds to an emerging literature on the question of how and why political interest groups position themselves in ongoing policy processes. It argues that (1) main contestations are linked to traditional values, which are complicated to overcome or even not negotiable, and (2) how interest groups position themselves with respect to their secondary aspects is rather connected to sector-specific interests and prevailing advocacy coalitions. Empirically, the paper builds on evidence from the Swiss climate policy debate. Previous research has shown that interest groups were influential actors in the formulation, implementation, and revision of the CO2-Act, which is the centrepiece of Switzerland's climate policy. By analysing responses from the 2009 public consultation about the revision of the CO2-Act in the context of a discourse network analysis, the paper demonstrates that on a more general level, interest groups define their positions along their policy core. But when it comes to the secondary aspects of a policy issue, they are more inclined with their policy niches and coordinate their preferences with other interest groups. A bipartite exponential random graph model (ERGM) is used to systematically test for potential structural and actor-related mechanisms that shape the patterns of interest groups' policy positions.

1. Introduction

How and why do interest groups adopt their policy positions in relation to a specific policy issue? This question is important, as interest groups are vital, formative factors in many policy-making processes (Beyers, Bruycker, and Baller 2015). The essential mission of interest groups, which are themselves non-governmental organisations, is to advocate their perception of the public interest to various governmental bodies' (Heaney and Strickland 2016). The main aim of their lobbying activities is to change existing public policies in favour of their specific interests, to yield issues on the political agenda, or to influence on-going legislative processes. Hence, an increased understanding of how they position themselves in the context of policy-making and under what conditions they form their policy positions, helps to assess the feasibility of policies and to anticipate policy outcomes.

A dynamically growing scholarship on political interest groups (Beyers, Eising, and Maloney 2009; Hojnacki et al. 2012) issues a vast range of eminent research areas, such as interest groups and their role in various stages of the decision-making process and their influence on policy outcomes (Baumgartner 2009; Ritchey and Nicholson-Crotty 2015), their lobbying strategies (Buffardi, Pekkanen, and Smith 2015; Hanegraaff, Beyers, and Bruycker 2016; Hanegraaff, Poletti, and Beyers 2016), mobilisation of interest groups and group dynamics (Klüver, Braun, and Beyers 2015), and so forth. Moreover, several authors study interest group politics through the lens of policy networks (for an overview compare Heaney and Strickland 2016). These studies address questions of interest group formation (Hadden 2015; Heaney 2006; Padgett and Powell 2012), development and identity development (e.g. Browne 1990; Engel 2007; Halpin and Daugbjerg 2014; Heaney 2004), patterns and prerequisites of collaboration (Carpenter 2010; Laumann and Knoke 1987; Leifeld and Schneider 2012), and their general influence in the democratic process (Baumgartner 2009; Varone et al. 2017).

However, only a limited amount of research has been done on the principles, according to which interest groups adopt their policy positions. Roughly, contemporary literature can be divided into two contrasting arguments. The first perspective argues that interest groups act in the context of policy niches (e.g. consumer interests, nature conservation, industry sectors, etc.) and mainly concentrate on the protection and promotion of their respective niche interests (Gray and Lowery 1996; Maloney, Jordan, and McLaughlin 1994). The second argument builds on one-dimensional conflict spaces of interest group representation. For example, Beyers, Bruycker, and Baller (2015) argue that in European Union (EU) legislative politics interest groups are organised along the traditional left-right party cleavages. Other studies that focus on biased interest group representation in policy making in the EU and the

United States draw the conflict line between business and public interests (Bruycker and Beyers 2015; Klüver 2012; Lowery et al. 2015). Regardless of the nature of the conflict line, the main argument is that interest group communities align with party politics: While business interests line up with conservative, Christian Democratic, and liberal parties, non-governmental organisations (NGO) align with left, social-democratic, and green parties.

This paper unifies these contrasting perspectives. In line with a more 'middle ground' (Beyers, Bruycker, and Baller 2015, 537) perspective on interest group mobilisation, it argues that, on a general level of alignment in a policy area, interest groups adopt positions according to their core beliefs, reflected by their fundamental value orientations towards important political cleavages. At the level of secondary aspects (i.e. technicalities and implementation details), they choose positions that best represent the interests of their policy niches. In this context, interest groups that are less inclined with a specific topic and less capable to develop positions formulate their preferences akin to important opinion leaders. Hence, this research uses Sabatier´s beliefs system concept (Sabatier and Jenkins-Smith 1993). Instead of using actors' beliefs to explain coalition building (e.g. Fidelman et al. 2014; Ingold 2010) or collaboration patterns (e.g. Ingold and Fischer 2013; Kukkonen, Ylä-Anttila, and Broadbent 2017), the beliefs themselves are of interest. This analysis highlights in how far belief systems are formative factors for policy debates and how the individual levels of the belief system belong together.

I test my theoretical claims by analysing for interest group alignment in the Swiss climate policy debate. Akin to Leifeld (2016), I define a policy debate or political discourse as 'verbal interactions between actors about a given policy', where they publicly state their opinion on policy objectives and instruments. The actors in this debate are dependent on each other, learn from each other, and try to influence each other. Hence, policy debates are necessarily relational and their study requires a networked perspective (Fisher, Leifeld, and Iwaki 2013; Leifeld 2009; 2016). Discourse networks display, which political actor makes what policy statement in a debate. By analysing the structures of the political discourse with tools from social network analysis, it is possible to investigate factors that affect the alignment of interest group policy positions in a policy domain and conclude how these positions are linked.

But, why bother with policy debates among interest groups? In the policy analysis literature, dynamic elements, i.e. policy learning and policy change, are usually associated with open 'policy windows' (Kingdon 2011) or 'focusing events' (Birkland 1998) that change the political agenda. Moreover, 'external and internal shocks (Sabatier and Weible 2007) or 'punctuations' to the political equilibrium (Baumgartner 2006) jeopardise previous policies by

strengthening the position of new actors and coalitions. In this regard, policy debates are often 'highly consequential for political outcomes' (Leifeld 2016), as they determine what gets onto the political agenda, influence the public opinion, or alter policy perceptions (Endfield and Morris 2012; Tellmann 2012).

Due to this important role of policy debates, the discursive dimension gained attention in the policy network literature (Anttila and Kukkonen 2014; Leifeld 2013; 2016). For example, on-going research on discourse networks is conducted in the context of the Comparing Climate Change Policy Networks (COMPON) project (Broadbent and et al. 2016). The international project compares the climate policy discourse of 19 countries to find general principles that explain cross-national variation in climate policy performance. Moreover, a recent paper by Fisher et al (2013) investigates how climate policy is framed in the United States climate politics by mapping ideological relationships among speakers in congressional hearings.

Empirically, the paper builds on evidence from Swiss climate policy. Previous research has shown that interest groups were influential actors in the formulation, implementation, and revision of the CO_2-Act, which is the centrepiece of Switzerland's climate policy (Ingold 2010; 2011). By analysing responses from the 2009 public consultation about the revision of the CO_2-Act in the context of a discourse network analysis, the paper disentangles different explanations for interest group alignment in an important policy field. For this purpose, it combines a descriptive analysis of the policy discourse and the prevailing actor constellations therein with an Exponential Random Graph Model (ERGM, Wang, Pattison, and Robins 2013) to test the theoretical claims systematically and under consideration of their interdependence.

Swiss climate policy makes for a good case study for two main reasons. In Swiss politics, interest groups are generally powerful actors (Kriesi and Trechsel 2008; Linder 2005), but especially in climate policy. (Ingold 2010; 2011; Ingold and Christopoulos 2015). In contrast to Switzerland's weaker political parties, interest groups are more coherently structured and well appointed with financial resources and personnel. They play a key role in the legislative process, particularly in the pre-parliamentary phase, and during policy implementation (David et al. 2010; Kriesi and Trechsel 2008, 100f). They are leading actors in formulating and implementing economic policy, but their influence also stretches to other policy fields. In addition, an increasing approachability of political institutions (Kriesi and Trechsel 2008) and the rise of post-materialist values since the 1980s (Inglehart 1990) established influential interest groups in further policy fields. For example, environmental non-governmental

organisations (ENGOs), such as the World Wildlife Foundation (WWF) Switzerland have advanced to important actors in transport, energy, research, or land use planning previously domains of business interests.

Secondly, climate policy is a cross-sectional matter that affects almost all societal sectors. Swiss environmental policy has traditionally been shaped by political divisions between the political left as proponent for stronger environmental protection and the political right taking an adverse stance over environmental regulations (Carter 2007; Geser 2003). Accordingly, recent research on Swiss climate politics has shown that policy-making is dominated by two opposing advocacy coalitions (Ingold 2008): the 'pro-economy coalition' that comprises of influential business and trade organisations, as well as right-wing parties and the 'pro-ecology' coalition that unites important ENGOs and left-wing parties. However, climate policy in particular has entered the national political arena, mainly as an international environmental policy issue and has remained firmly akin to international policy processes (Klöti et al. 2005; Sprinz and Weiss 2001). I assume that the cleavage between internationally open and nationally oriented, conservative political actors is also relevant in Swiss climate politics.

The paper proceeds as follows: The theoretical section starts by outlining the main theoretical arguments about why interest groups adopt certain policy positions. I rely on Sabatier's belief system concept to disentangle several levels of policy preferences and operationalise them by combining cleavage theory (Kriesi et al. 2006; Lipset and Rokkan 1967) and policy niche approaches (Browne 1990) with a networked perspective. In the data section, I construe my case and data collection. Methodologically, I start with a descriptive analysis. Later, I employ a bipartite exponential random graph model (ERGM) to test for potential structural and actor-related mechanisms shaping the patterns of interest groups' policy positions on climate policy in Switzerland.

2. Cleavages, Policy Niches, and the Interests of Others

As already noted by Schattschneider (1975), political cleavages are important organising principles in interest group politics. Cleavages are important lines of conflict along fundamental value orientations prevalent in societies. While studying cleavages in the context of party systems is widespread, their application to the landscape of interest groups is rare and usually connected to how they are situated to political parties (e.g. Beyers, Bruycker, and Baller 2015; Klüver 2012). However, studying the political landscape of interest groups provides a finer model of competing interests and societal values prevalent in a society, because they accurately represent the configuration and prioritisation of important policy

domains, i.e. business, transport, energy, agriculture, industry, environment, and so forth. Often, political parties are also dependent on the expertise of interest groups. They deal with a wide range of topics provide great manpower to satisfyingly deal with issues. Interest groups situate themselves close to parties that best represent their fundamental value orientations and use them as vehicle to lobby for their sector-specific interests in the policy process.

In the belief system of an interest group, the positioning towards political cleavages constitutes the highest level of beliefs, which are often referred to as core beliefs (Sabatier and Jenkins-Smith 1993). Core beliefs are free from specifics of individual policy domains, but do mirror the general convictions of how a society should be organised, like for example the level of state intervention, the handling of the challenges as imposed by globalisation, or matters of social equity.

The cleavage literature discusses two main cleavages visible in modern societies: (1) the traditional socio-economic division between the political left- and right-wing (Lipset and Rokkan 1967), and (2) the cultural division between internationally open and culturally liberal segments of society, and the part of society that emphasises political independence, traditional cultural values, and national identity (Kriesi 1998; Kriesi et al. 2006).

The first cleavage reflects the traditional division between capital and labour. The capital side of the continuum is usually associated with traditional rightist values and business interests. It advocates free enterprises, privatisation, liberal markets, decreased state intervention, and a limitation of social services. Associated interest groups are typically business or employer associations and trade unions. The labour side is associated with leftist values and public interests. It advocates an increasing public ownership of the industry, increased state, and a strong focus on reducing income inequality. Associated interest groups are usually labour organisations and NGOs.

The second cleavage reflects the more recent developments in a globalising world. Instead of merely dividing societal conflicts into national business interest and public welfare, the conflict is now progressing between the losers and winners of globalisation (Kriesi 1998; Kriesi et al. 2006). The winners are 'entrepreneurs and qualified employees in sectors open to international competition, as well as all kinds of cosmopolitan citizens (…)' (Kriesi et al. 2006, 922). The 'expected losers, by contrast, include entrepreneurs and qualified employees in traditionally protected sectors, all unqualified employees and citizens who strongly identify themselves with their national community'(ibid.). Cultural and material threats are not treated

as distinct phenomena, but mutually reinforcing factors of social integration. The open and culturally liberal segment of winners among society favours open markets and is generally internationally oriented. The traditional side of the cleavage, uniting the losers, favours protected national economies, political independence and national identity, and promotes conservative cultural values. Here, the allocation of interest groups on one or the other side of the cleavage works across the typical divide of interest groups into a private or public sphere and is therefore less obvious. A humanitarian organisation, for example, might advocate leftist but traditional values if it focuses on the welfare of citizens and natives and deplores migrants. A business organisation usually supports rightist values, but if it represents a sector that is vulnerable to globalisation, it will advocate rather traditional values.

Considering these core beliefs, as reflected by important societal cleavages is important, as they determine, on a most general level, the political space in which a policy domain can evolve, i.e. its main directions and boundaries. The assumption is that convictions about general policy objectives and approaches, i.e. policy core beliefs, in a policy domain are nested in these general value orientations. For example, with respect to the climate policy domain, rightist values are usually associated with a policy approach that prioritises economic interests to ensure international competitiveness. Also, a low level of state intervention is favoured in this perspective. A climate policy approach that is in line with this value orientation supports voluntary measures with a high degree of flexibility and opposes taxes or emission standards.

Being very hard, if not impossible to change, compromise solutions over contested issues in a policy domain will typically arise along and not across these lines of conflict. I assume that cleavages are reflected on how interest groups position themselves in relation to specific policy domains on a general level. Hence, interest groups that share common fundamental value orientations, because they are similarly situated in the two-dimensional space of political cleavage, are expected to express the same policy preferences more often than interest groups from opposing sides do. This leads to a first hypothesis:

Cleavage hypothesis: If the policy core beliefs of interest groups in a policy domain depends on fundamental value orientations (core beliefs), interest groups that are situated on the same side of a cleavage should more often than not support the same policy positions.

I argue that these main cleavage structures are also important for Swiss climate policy in general and for the 2008-2013 revision of the Swiss CO_2-Act in particular. In Switzerland, environmental policy has been shaped by political divisions between left-wing parties as

proponents for stronger environmental protection and right-wing parties taking an adverse stance over environmental regulations (Carter 2007; Geser 2003). Climate policy has entered the national political arena mainly as an international environmental policy issue and has remained strongly connected to international policy processes (Klöti et al. 2005; Sprinz and Weiss 2001). It is therefore assumed that the cleavage between internationally open and nationally oriented, conservative political actors is also relevant.

However, explaining the policy positions of interest groups based on political cleavages alone has limitations, as this approach disregards the configuration of sector-specific interests prevalent in a policy domain. This is important, as many policy domains affect a variety of different sectors. Climate policy, for example, is usually a conflictive policy domain (Ingold and Varone 2011), as it touches a wide range of sectors that often compete in interest, such as business, environment, energy, agriculture, forest, spatial planning, industry, consumption, among others. In addition, these sectors can be split further, like the energy sector that is divided in conventional energy and renewable. The interest group literature discusses these sector-specific beliefs in what they call a policy niche (Gray and Lowery 1996; Maloney, Jordan, and McLaughlin 1994).

These sector-specific interests are both reflected in the policy core of an interest group and in their secondary aspects. Both are policy domain specific and focus on important principles of a domain, i.e. the position towards an instrument type, the relevant target groups, appropriate policy objectives (policy core), and more detailed implementation details (secondary aspects). In contrast to the core beliefs, both the policy core and secondary aspects have a higher propensity for change. In particular, the issues related to the secondary aspects of a policy offer room for compromise between actors from different societal sectors. The key assumption is that interest group politics mainly follow the imperative of needs among the own policy niche. Hence, when formulating their policy position in relation to a specific policy proposal in a policy domain, interest groups consider what is best for their own policy niche. This leads to a second hypothesis:

Policy Niche Hypothesis: If the policy position of interest groups in a policy domain depends on policy niches (policy core beliefs and secondary aspects), interest groups of the same policy niche should more often than not support the same policy positions.

3. Research Design: Evidence from Switzerland

To test my theoretical claims, I draw on two different levels of analysis: To begin with, an actor-based explanation focuses on the relationship between interest group characteristics, i.e. cleavage affiliation and sectoral-specifics and an interest group's alignment towards a policy domain. Furthermore, a structure-based explanation that highlights the choice to support a policy position in relation to the position of others. The simultaneous use of actor-based and structure-based explanations renders tools from social network analysis as particularly useful, as they allow analysing both factors in one approach.

A Network of Policy Positions

I created a discourse network that displays interest groups and their policy positions towards climate policy. For this purpose, I used the data gathered in the context of a public consultation. In Switzerland, an institutionalized consultation procedure (Vernehmlassung) includes various non-governmental actors in the decision-making process at an early stage and on a regular basis (Linder 2010). The public consultation was executed in the context of the revision of the Swiss CO_2-Act, which is the centrepiece of Switzerland's climate policy and its main legal framework (FOEN 2010). The first version of the act, entering into force in 1999, aimed at implementing Kyoto Protocol[21] requirements and serves as key statutory basis of Swiss climate policy until 2012. Subsequently, a revision of the act was necessary to set up a new legal basis for Swiss climate policy between 2012 and 2020 that is the second commitment period of the Kyoto Protocol. The revision was also triggered by a public initiative launched by an alliance of environmentalist organisations. The public initiative pursued the goal of introducing a constitution article, setting emission reduction targets to 30% against the 1990 baseline. Eventually, the government reacted to the initiative with a governmental counterproposal.

The final version of the counterproposal was based on the results of the public consultation, which was held in 2009. In the consultation, stakeholders reviewed two disparate alternatives for a new draft of the federal CO_2-Act: Option 1 (Binding Climate Targets) provided for a 20% reduction target (1990 baseline) with a focus on domestic CO_2 emission reductions and a carbon levy on both combustibles and fuels. Option 2 (Binding Steps towards Climate Neutrality) comprised for a 50% reduction target (1990 baseline), yet flexible

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[21]The Kyoto Protocol is a legally binding international agreement under the United Framework Convention on Climate Change. The agreement defined CO_2 emission reduction targets for the commitment period of 2008 to 2012 for so-call Annex I countries (mostly OECD countries).

approach towards emission reductions that allowed the compensation of emissions by climate projects abroad. In addition, several technicalities of policy instruments were discussed, among them the continuation of the Swiss emissions trading system (ETS) and its link to the EU ETS, emission standards in the housing and traffic sector, as well as matters of climate change adaptation, climate innovations, and financing issues.

The consultation is an excellent data source, as it captures all major points discussed in the context of the revision of the CO_2-Act and it covers all relevant interest groups. The DETEC received around 198 responses by a variety of addressees, such as all cantons, the political parties, interest groups, and companies, which all evaluated on the governmental draft. The consultation procedure was designed as a structured survey, but also allowed for open comments. All responses were collected and summarised in a report issued by the Federal Office for the Environment (FOEN 2009).

Both the consultation survey and the summary report are not scientific but political documents that contain a pre-selection of topics to be discussed in detail. This raises the potential for a biased data set in favour of what or whom the responsible authorities consider to be important. For example, in the summary report some core economic interest groups or political parties were mostly named individually, whereas smaller NGOs, or companies were often summarised (e.g. environmental organisations). The structured survey, in contrast, only contains information on the support or opposition with respect to predefined questions. In addition, some but not all participants of the consultation submitted additional statements extending the topics discussed in the survey. The summary report certainly considers these statements, as well. To overcome the limitation of either data source, I coded both the structured survey data and the summary report. When necessary, I also consulted the open statements, for example, when an actor was not mentioned in the summary report, but submitted a survey statement. Also, I skimmed the open comments to find out, whether there were topics not covered by the summary report. If so, I also coded the open comments. The resulting data set covers all issues asked by the authorities and includes additional topics that arose among the consultation participants.

The data was used to create an affiliation network that links policy statements to interest groups. I used the 'Discourse Network Analyzer' (DNA)[22] – 'a quantitative content analysis tool with network export facilities' (Leifeld, 2013) to code the data. Specifically, I assigned 102

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[22] Software accessible via: http://www.philipleifeld.de/software/discourse-network-analyzer/discourse-network-analyzer-dna.html.

interest groups to 85 different statements, expressed in the consultation responses. Next, I merged similar statements to 30 broader policy positions (see Appendix 1). I used a routine implemented in the DNA tool to export the coded data into an Excel file that summarises interest groups (rows) and the supported policy positions (columns)[23]. If an interest group supports a policy position, the respective cell in the spreadsheet contains the digit 1 (or else 0). This binary two-mode matrix was then transformed into a bipartite network graph, using the UCINET software (Borgatti, Everett, and Freeman 2002). Bipartite networks consist of two sets of nodes, where ties can only be among the nodes of different sets. Here, one node set reflects the interest groups that participated in the consultation procedures (compare Appendix 2 for a list of interest groups). The other node set mirrors the policy positions (compare Appendix 1 for a list of policy positions). The network relation (tie) shows the support of a policy position by an interest group. This network can be understood as a network of policy positions or discourse network. Hence, the main dependent variable is the tie between an interest group and a policy position in the discourse network.

I also identified the three main contestations in the public consultation. The positioning of interest groups towards these issues basically reflect their climate policy core beliefs: (1) the height of emissions reduction targets, (2) the position towards the carbon levy on fuels, and (3) the issue whether CO_2-emission reductions should be reached by focusing on domestic measures, as opposed to a flexible approach that allows to account for emission reductions abroad. Based on the consultation documents, I coded three respective categorical variables: the *targets variable* was coded as 'high' (> 20% emission reduction), 'medium' (~20% emission reduction), or 'low' (< 20% emission reduction). The *carbon levy* variable was coded as 'yes' (carbon levy on fuels supported) or 'no' (carbon levy on fuels not supported). Finally, the *scope variable* was coded as 'flexible' (flexible approach supported) or 'domestic' (focus on domestic emission reductions).

Explanatory variables

Cleavage affiliation. I coded the affiliation of each interest group for two cleavages, i.e. the capital versus labour cleavage (CapLab) and the liberal versus traditional cleavage (LibTrad), to account for policy core beliefs. I assume that most interest groups can be assigned to either one side of the cleavage. For example, the WWF Switzerland was coded as 'labour' and 'liberal'. It is coded as 'labour', because it promotes values, such as social equity, sustainability, or favours state interventions. In addition, it is situated on the liberal side of the cleavage being

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23I also exported a version of the data set linking interest groups and all political statements.

an internationally oriented organisation that advocates open cultural values. In contrast, the strasseschweiz (the main car driver's organisations) was coded as 'capital', because it supports liberal markets and opposes state interventions, and is 'traditional', due to its focus on securing the need of Swiss car drivers and political independence.

To assign interest groups to the two cleavages, I developed a simple coding scheme based on seminal work in the cleavage literature (Kriesi et al. 2006; Lipset and Rokkan 1967). For an overview compare Table 12. The coding was based on these outlined core values. For an interest group to be assigned to one side of a cleavage, these core values should be consistently reflected in the policy goals, positions, or mission statements. To derive this kind of documents, I consulted the official websites for all interest groups and assessed respectively. Moreover, relevant literature on the Swiss political system in general and historical cleavages in Swiss politics in particular served as an alternative data source to cross-validate the coding (Kriesi and Trechsel 2008; Linder 2005). If an unambiguous assignment was not possible, the respective interest group was coded as 'ambiguous' situated in the middle of the continuum.

Table 12: Cleavage coding scheme

	CAPITAL	LABOR
Capital vs. Labour cleavage	- Limitation of social services - Liberal markets - Free enterprises and privatization	- More redistribution of income - More state intervention - More public ownership of industry
	LIBERAL	TRADITIONAL
Liberal vs. Traditional cleavage	- winners of globalization - Open markets - International political orientation - Open cultural values	- losers of globalization - Protected national economy - Political independence - Traditional cultural values

Policy niche. I coded a categorical variable that reflects the seven most important sectors i.e. agriculture & forest, building, economy, energy, environment and renewable energies, human aid, traffic, and cross-sectional. The cross-sectional category was used sparingly and reserved for interest groups, situated in more than one policy niche. For example, the Catholic Women's Association focuses on a wide range of themes from environmental issues to matters of education or the economy. Compare Appendix 2 for the coding of the policy niche variable.

All these variables are entering the analysis as homophily effect. Homophily (McPherson, Smith-Lovin, and Cook 2001) is a very prominent concept in social network analysis that reflects a tendency of making ties with similar others. Thus, social actors that share common attributes are inclined to show a similar behaviour. Here, this implies that interest groups that are advocates of the same side of a political cleavage or political niche tend to share a greater number of common positions on climate policy.

To check the reliability of the coding frame and the validity of the data set, a colleague of mine re-coded the complete data set on the cleavages, the policy niches, and some of the controls based on the same coding rules. Moreover, another colleague reviewed the coded data without coding rules. A small number of differences arose, which we discussed until a consensus was found.

All these actor-focused variables are entering the analysis as homophily effect. Homophily (McPherson, Smith-Lovin, and Cook 2001) is a very prominent concept in social network that reflects a tendency of making ties with similar others. Thus, social actors sharing common attributes are inclined to show a similar behaviour too. Here, this implies that interest groups being advocates of the same side of political cleavage or the same political niche tend to share common positions on climate policy.

Controls

In addition to the explanatory variables, I included two further actor covariates and four structural network terms. The first actor covariate reflects the affiliation of an interest group towards the two important advocacy coalitions in the climate policy subsystem, the pro-economy, and the pro-ecology coalition. I expected to see that interest groups formulate their positions in line with other members of their coalition. For the coding, I used the existing literature on advocacy coalitions in Swiss climate policy (Ingold 2008). The second actor covariate mirrors the breadth of an interest group and basically operationalises the dual structure of the Swiss interest group system in sector-specific peak organisations. This variable is included to control for the impact of influential interest groups on the policy discourse.

Finally, this analysis also controls for network dependency statistic that model the structure of the policy discourse. These, model terms capture the patterns of a network that are reflected more or less often than one would expect in a random graph with the same metrics (number of nodes and ties). Here, a set of two statistics refers to the popularity of policy positions in the discourse network. The first term is a 2-star Markov term that captures the overall popularity of policy positions. The second term is an alternating star parameter term that is linked to the spread of popularity across policy positions. A positive Markov term in combination with a negative alternating star parameter indicates a relatively equal distribution of popularity of policy positions across the networks with a small number of high degree policy positions. This reflects a tendency to support policy positions that are supported by many others. In the network literature, this effect is usually referred to as preferential attachment or degree assortativity (Wasserman and Faust 1994).

Furthermore, two network degree terms reflect the number of positions that interest groups tend to support. Positive degree terms indicate an increased propensity of an interest group to support a higher number of policy positions. This can be interpreted as the complexity or readiness to compromise. Interest groups that support a limited spectrum of positions are either hard-liners or not really interested in the process. Conversely, interest

groups that are more on the middle ground of the debate are expected to have a broader spectrum of positions. To control for these processes and to assess the overall level of conflict, I included a 2-star model term based on Markov dependence (two ties are conditionally independent unless they share a tie) and an alternating star parameter. While the Markov terms capture the overall propensity of an interest group to support a policy preference better, the alternating star parameter is superior in modelling the spread of the spread of this propensity. A positive Markov term combined with a negative alternating star parameter implies a relatively equal distribution of activity among interest groups across the networks with a small number of highly active interest groups.

Finally, the research design includes two terms to control for the existence of clusters in the network. The interest group alternating 2-path term is the bipartite version of network closure (Wang 2013), based on the degree of interest groups. Network closure reflects, whether interest groups tend to share the same policy positions. A significant and positive parameter estimate points to a tendency of two interest groups to have more than one policy position in common. The policy position alternating 2-path: This dependence term is the bipartite version of network closure based on the popularity of policy positions. Network closure reflects, whether policy positions tend to be supported by the same actors. A significant and positive parameter estimate points to a tendency of two policy positions having more than one interest group in common.

4. Methodology

My analysis proceeded in two steps. I analysed the structure of policy positions and interest group alignment based on a descriptive analysis of actor and preference constellations and ran several simple Chi-square tests to assess the relationship between cleavage affiliation and the positioning of interest groups towards the more general policy positions on climate policy. I then applied a bipartite exponential random graph model (ERGM) to test systematically the above outlined hypotheses on the more nuanced level of policy discourse.

ERGMs represent a class of models for specifying the probability distribution for a set of random networks (Lusher, Koskinen, and Robins 2013). The general form of an ERGM can be written as:

$$P(Y = y) = \frac{exp\big(\theta' g(y)\big)}{k(\theta)}$$

where Y is the random variable for the state of the network (with realisation y), g(y) is a vector of model statistics for the network y, θ is the vector of coefficients for these statistics,

and $k(\theta)$ represents the quantity of the numerator summed over all possible networks with the same node set y. The model terms g(y) are functions of network statistics, assumed to appear more common than in a simple random network, in which all ties are equally probable. Network ties can be either dyad-dependent or dyad-independent. Dyad-dependent terms, such as degree or triad terms, reflect the dependency between nodes in a network. This means that a link between an interest group and the policy position it supports depends on other existing ties or tie configurations. Dyad-independent terms like nodal covariates or homophily terms (i.e. interest groups with the same attributes have the same policy preference) (McPherson, Smith-Lovin, and Cook 2001) imply no dependence between the dyads. The presence or absence of a tie is caused by the attribute of an interest group, but not by the state of other ties. The main purpose of an ERGM is to model the process of network tie formation, whereas the presence of a tie between two nodes is explained by a combination of actor attribute variables and by patterns of ties. In contrast to classical regression models, ERGMs relax the assumption of independence between observations. Therefore, they incorporate possible dependencies among tie variables. For the network at hand, I use a version of an ERGM for bipartite networks (Wang 2013). Compare Appendix 3 for an illustration of all network dependencies assessed in this analysis and an overview of all variables, their description, role in the research design, and data sources.

5. Results

Figure 8 shows the distribution of popularity among all 30 policy preferences discussed in the 2009 public consultation. The distribution is calculated based on a normalised version of the degree centrality statistic that captures how often a preference was supported in relation to all other supported preferences present in the network. The most commonly supported preferences are the link of the Swiss emission trading system the one of the European Union, a federal funding of climate mitigation policies, the introduction for sector-specific emission reduction targets, and emission standards for passenger cars. The majority of preferences are less frequently supported. With respect to the height of the emission reduction standards and their scope (domestic or abroad), the graph shows a dispersion of different supported alternatives, such as high targets with great flexibility, low targets with great flexibility, high targets with low flexibility, and so on. Also, an extension of the carbon levy on fuels receives little support. These findings underpin the identified main contestations in the policy discourse (targets, scope, and carbon levy on fuels).

Figure 8: Distribution of Popularity of Preferences

Distribution Preference Popularity
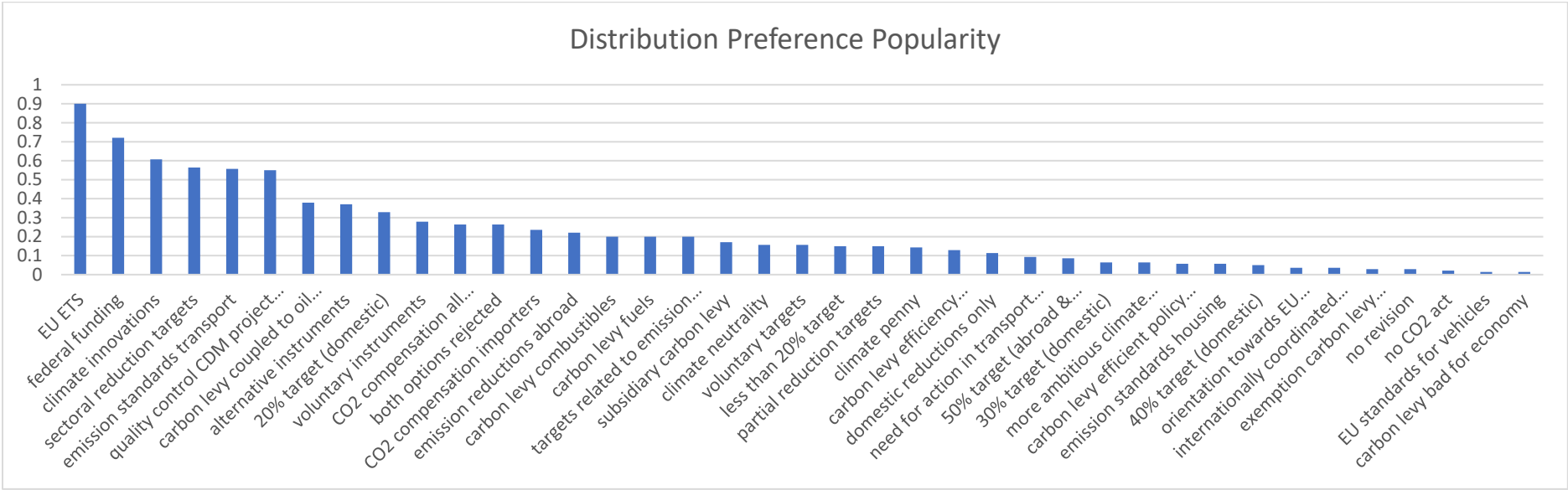
Notes: Calculations based on normalised degree centrality.

Out of the 102 interest groups seized in this analysis 66 are affiliated to the capitalist side of the *CapLab* cleavage, 26 belong to the labour side, and 12 are ambivalent. The *LibTrad* cleavage encompasses 64 interest groups that represent liberal values, 41 with traditional values, and eight again ambivalent ones. Figure 9 shows the distribution of actors according to the cleavages and their ecological orientation. We see that most of the rightist and traditional actors are members of the pro-economy coalition and most of the leftist members are part of the pro-ecology collation, but the liberal interest groups seem to be rather split-up between the two coalitions

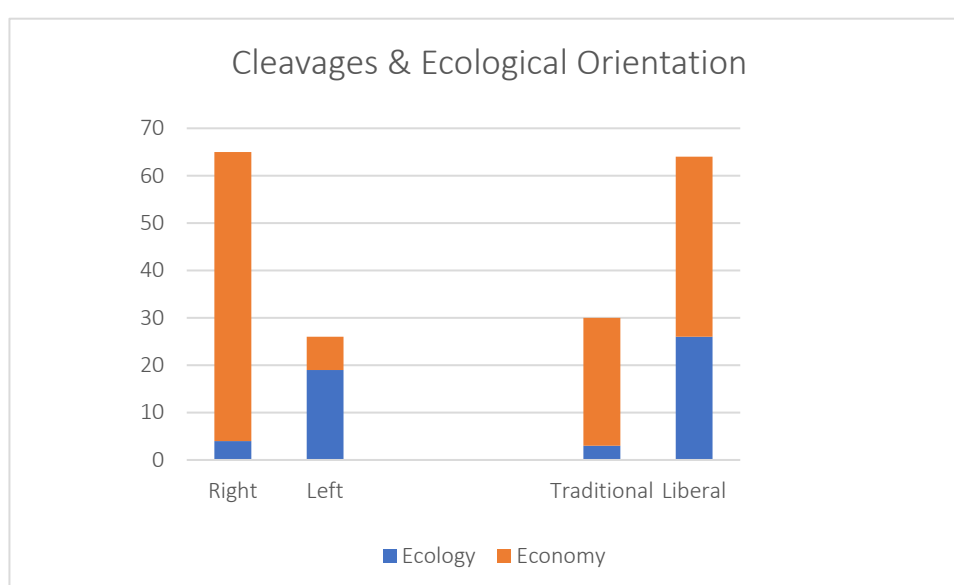***Figure 9: Distribution of actors across cleavages and coalitions***

Figure 10 displays the interest groups according to their cleavages and towards the main critical points discussed in the consultation. Not surprisingly, the capital side of the *CapLab* cleavage predominantly demands a greater flexibility, offsets emission reduction targets (at home or abroad) and opposes the introduction of a carbon tax on fuels.
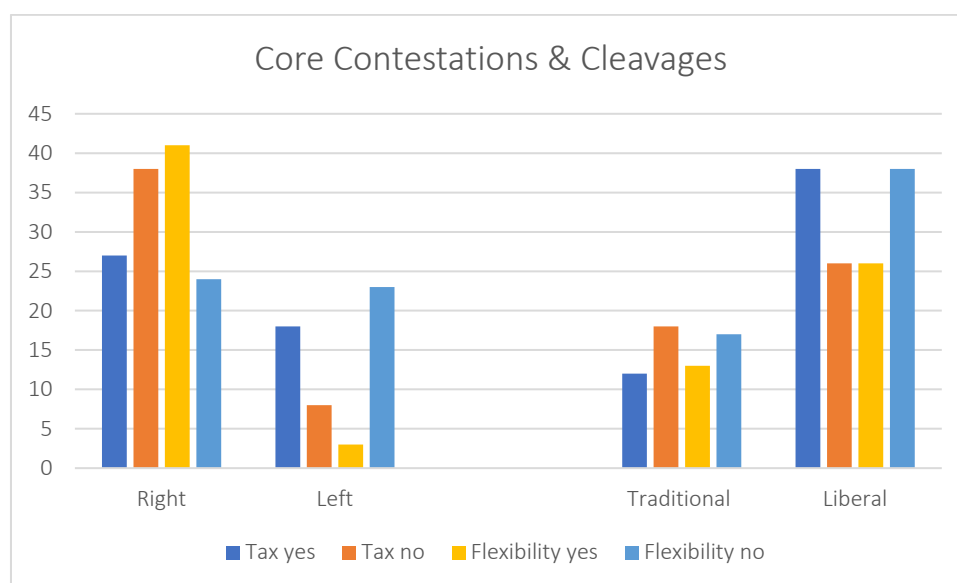
Conversely, the labour side opposes the greater flexibility but supporting a levy on fuels. Both the liberal and the traditional side of the *LibTrad* cleavage seem to be rather heterogeneous in their preferences. These findings are highlighted and confirmed by the results of a Chi-square test (compare Table 13).

Table 13: Results Chi-square tests

	CAPITAL VS. LABOR	LIBERAL VS. TRADITIONAL
Targets	Significant. X-squared = 48.1508 df = 2 p-value = 3.501e-11	Not significant. X-squared = 0.9665 df = 2 p-value = 0.6168
Scope	Significant. X-squared = 11.0944 df = 1 p-value = 0.0008659	Not significant. X-squared = 2.3892 df = 1 p-value = 0.1222
Tax	Significant. X-squared = 10.1172 df = 1 p-value = 0.001469	Not significant. X-squared = 3.1274 df = 1 p-value = 0.07698
Note	All chi-square tests were conducted in r based on the data displayed in appendix 2.	

Note: All Chi-square tests were conducted in R based on the data displayed in Appendix 2.

The Chi-square tests assess the relationship between the cleavage affiliation of interest groups and the most important issues discussed in the consultation. The results indicate a significant relationship between how interest groups aligns with the capital versus labour cleavage and its major positions towards climate policy, but not for the liberal versus traditional cleavage. In sum, all these results point to the importance of the core beliefs, as

shaped by the divide into left and right values for the general outline of climate policy in Switzerland. In contrast, the split into liberal and traditional values seems to be less important.

Bipartite Exponential Random Graph Model

I used MPNet (Wang et al. 2014) – a software designed to simulate multilevel and bipartite ERGMs – to estimate the model based on an MCMC algorithm and maximum likelihood estimation[24]. I followed the recommendations proposed by Wang, Pattison and Robins (2013) and Wang (2013) for the specification of the model. Table 14 presents the results of the bipartite ERGM estimations. The numbers represent the estimated parameter values with standard errors in the parentheses. An asterisk indicates significant parameter estimates. The parameters provide information about the likelihood of dyad-dependent and dyad-independent terms in the observed networks. Positive, significant parameter estimates indicate that more configurations of that type are observed in the network than expected in a random network graph given the same node sets. Negative, significant parameter estimates imply that less configurations of that type are observed in the network than expected in a random network graph given the same node sets. All models presented in Table 14 converged[25] with t-values below 0.1.

The Bernoulli model only contains one model term that captures the density of the network, as a function of a homogeneous edge probability. Cleavage Model 1 includes the two homophily terms related to the cleavages. Cleavage Model 2, in addition, controls for the advocacy coalitions. These first models reveal several highly interesting findings. While the parameter estimates of the first model that are related to the cleavage variables are both significant and positive, the effect for the *CapLab* cleavage in the second model is now significant, but negative. The one related to the *OpTrad* cleavage remains robust. Several conclusions can be drawn from this. To begin with, the advocacy coalition variable is correlated to the *CapLab* variable, but the effect of the policy preferences is much better covered by the coalitions. The implications are not surprising: Climate policy preferences on the level of secondary aspects are formulated considering the policy core beliefs of the

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[24]To date, the MPNet software is the only software tool that allows a reliable estimation of ERGMs for bipartite networks. Although the statnet package implement in R offers network terms for bipartite networks, they are not yet steady enough to produce consistent results for large networks, in particular.
[25]Convergence means that the 'difference between simulated statistics and observed statistics for the 'fitted effects', as measured by the convergence statistic, is smaller than 0.1 in absolute value' Robins and Lusher (2013, 181).

respective advocacy coalition. On a more detailed level, the results contrast with the Chi-square test, which only evaluated the relationship for the most critical issues and the policy core. For these critical issues, core values are decisive. These findings also explain why the core conflicts in climate policy are so hard to solve. They are strongly influenced by the core beliefs, and therefore, not negotiable. In addition, analysis on a detailed level also demonstrates the importance of the new cleavage between winners and loser of globalisation. In sum, while these results support the cleavage hypothesis, the affaire is more intricate. The traditional divide between the political right and left wing is responsible for ingrained controversies in Swiss climate policy and explains why over some issues, such as the introduction of a carbon tax on fuels, no satisfying compromise solution can be found.

Introducing the policy niche variable does not affect the parameters of other variables. The parameter estimate shows a positive and significant effect, what points at the importance of policy niches on the level of secondary aspects. Figure 11 shows how the sectors are positioned in relation to the three most critical issues, and demonstrates that there are now clear tendencies with respect to these positions. In contrast, the results of the ERGM highlight that interest groups tend to formulate their policy preferences considering sector-specific interests on the level of secondary aspects. This finding supports hypothesis 2. Finally, I controlled for the effect of umbrella organisations, and whether these organisations support a wider-range of preferences, as they also cover a broader spectrum of policy preferences, yet the variable shows now effect.

Figure 11: Sectors displayed per key contestations
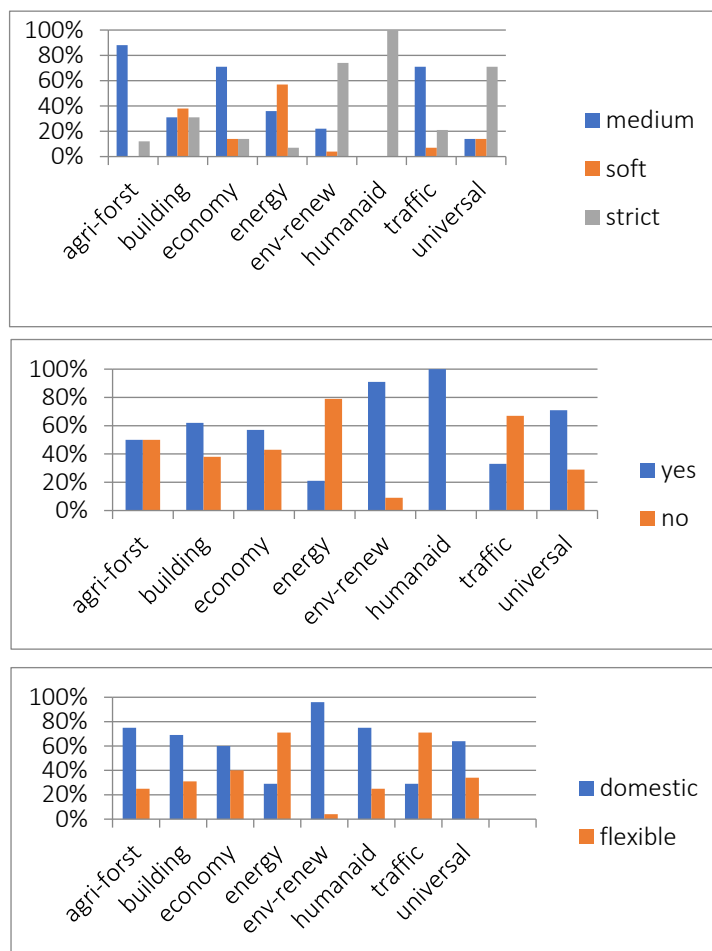
The final model includes the dyad-dependent terms, introduced above. The model has a sound goodness of fit (GOF), as illustrated in Appendix 4, and shows robust results, as compared to the other models. In the structural model, the popularity terms behave as expected. The combination of the 2-star Markov and the alternating star parameters for both, policy preferences and interest groups, reflect the structure of the discourse well. On the one hand, it mirrors the right-skewed distribution of the supported policy preferences. While a small number of preferences receive large support, the majority of positions is contested. On the other hand, the negative and significant 2-star Markov parameter undermines this, as it reflects the tendency of interest groups to support only a small number of policy preferences. In all, these results point to a rather high level of conflict, present in the discussion on the revision of the CO_2-Act, connected to the three contestations, discussed. Finally, the model now shows significant effects, related to the clustering statistics.

Table 14: Estimated parameters bipartite ERGM

	BERNOULLI MODEL	CLEAVAGE MODEL 1	CLEAVAGE MODEL 2	POLICY NICHE MODEL 2	POLICY NICHE MODEL 2	DEPENDENCE-HOMOPHILY (85)
EDGES	-1.0668* (0.040)	-2.3730* (0.037)	-2.4121* (0.046)	-2.4943* (0.031)	-2.4915* (0.047)	-5.3885* (3.368)
2-STAR INTEREST GROUP						-0.1684* (0.038)
2 STAR PREFERENCE						0.0145* (0.004)
ALTERNATING STAR INTEREST GROUP						0.7097 (0.598)
ALTERNATING STAR PREFERENCE						-3.6097* (1.738)
CLUSTERING INTEREST GROUP						-0.5443* (0.062)
CLUSTERING PREFERENCE						-0.0431* (0.009)
CAPITAL VS. LABOUR		0.0390* (0.003)	-0.0220* (0.009)	-0.3500* (0.009)	-0.0352* (0.009)	-0.0343* (0.010)
LIBERAL VS. TRADITIONAL		0.0484* (0.003)	0.0457* (0.003)	0.0372* (0.003)	0.0371* (0.003)	0.0210* (0.005)
ECOLOGY VS. ECONOMY			0.0631* (0.008)	0.0582* (0.008)	0.0581* (0.008)	0.0437* (0.009)
POLICY NICHE				0.0844* (0.008)	0.0844* (0.008)	0.0679* (0.008)
PEAK ORGANIZATION					0.0141 (0.029)	0.0044 (0.026)

NOTE: ESTIMATION FOR FINAL MODEL BASED ON 500 ITERATIONS

6. Outlook

This paper tackles the question of how and why political interest groups position themselves in ongoing policy processes and has two main contributions: First, it unites previous literature by linking cleavage-based and policy-niche based arguments about why and how interest groups adopt policy preferences in relation to a specific policy issue and operationalises these concepts with Sabatier's belief system. Specifically, this paper finds that core contestations in climate policy are determined by the traditional divide between the political left and right, what also explains why it is difficult to solve these conflicts. When it comes to the secondary aspects of a policy issue, interest groups are more importantly inclined to the needs of their respective policy niches and tend to support popular preferences. While the causal effect of the latter cannot exactly be determined, a possible explanation is that many less disposed interest groups simply follow the opinion leaders in their advocacy coalitions.

Secondly, it adds to the scholarship of interest groups and policy preferences in two main ways. On the one hand, it highlights the split between winners and looser of globalisation, as a further important political cleavage, structuring the realm of interest groups. Here, this cleavage is only visible in the more detailed discussion about how Switzerland's climate policy should be formulated. Hence, the fundamental questions related to a policy issue are very much reflected by the traditional divide between leftist and rightist values. Detailed questions that have implications on the de facto implementation are discussed more in the context of the challenges of a globalised world.

In addition, this paper offers a relational perspective by considering that the policy positions of interest groups are not per se exogenous and independent of each other. Instead, they depend on policy positions of separate interest groups, and how different policy positions are linked to each other, until they form a narrative on how a policy domain should ideally be regulated. These narratives stretch beyond the complete belief system of an interest group and usually encompass the policy core beliefs and secondary aspects (Sabatier and Jenkins-Smith 1993). For example, an economic interest group might support an ambitious climate policy with high emission reduction targets, but favours non-interventionist policy instruments, such as voluntary agreements among the administration and companies to reach their targets. An environmental organisation, on the other hand, might also support high emission reduction targets, but favours more interventionist policy instruments, such as emission standards or taxes. I argue that these narratives develop through collaborative

interaction of interest groups that usually do not act individually, but are organised in peak organisations or form advocacy coalitions.

Moreover, not all interest groups are equally interested in the same policy issues and they do not have the time and resources to focus on all of them with similar scrutiny. Only few interest groups, highly involved in a policy issue take up the role of opinion leaders in an advocacy coalition. For example, the Swiss climate policy subsystem is divided into the pro-ecology coalition, primarily led by the WWF Switzerland, and the pro-economy coalition, led by the economiesuisse and the oil association (Ingold 2011). In contrast, a large number of interest groups that are less inclined and resourced will follow and adopt policy position from opinion leaders. Although not tested directly, the results of this analysis reveal considerations of the policy discourse on the revision of the CO_2-Act by the tendency of many interest groups supporting the positions promoted by their coalitions. The implication of this is straightforward: In the rather detailed discussion about the design of a policy, the majority of less inclined interest groups align with the minority of opinion leaders.

Finally, the findings of this study provide a first attempt of understanding how interest groups or other actors formulate their preferences in the context of a specific policy issue. The results have shown that (1) main contestations are linked to traditional values, which are complicated to overcome or even not negotiable, and (2) how interest groups position themselves with respect to their secondary aspects, which are considerably connected to sector-specific interest and prevailing advocacy coalitions. This research might spark off future investigation, if different policy fields are compared or the analysis extended to a dynamic investigation of policy discourses.

7. Literature

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Appendix

Appendix 1: List of Aggregated Policy Positions

20% domestic	20% reduction of CO_2 emissions with a focus on Swiss-wide efforts
30% abroad	30% reduction of CO_2 emissions allowing the flexibility to include investment in mitigation efforts abroad
50% abroad	50% reduction of CO_2 emissions allowing the flexibility to include investment in mitigation efforts abroad
EU ETS instead carbon tax	Link to the EU ETS instead of carbon tax
Carbon tax combustibles	Carbon tax on combustibles is supported
Carbon tax fuels	Extension of carbon tax on fuels is supported
Climate friendly innovations	Focus on climate friendly innovations
Climate neutrality	Switzerland should focus on climate neutrality
Climate penny	Climate cent must be reintroduced
Domestic reductions	Focus on Swiss-wide CO_2 emissions reduction efforts
Emission standards housing	Introduction of emissions standards in the housing sector
Federal funding adaptation	Federal funding of adaptation
Federal funding mitigation	Federal funding of mitigation
< 20% target	Less than 20% CO_2 emissions reduction target
No CO2 act	No CO_2 Act at all
No revision	No revision of the CO_2 act
Partial reduction targets	Partial reduction targets for different GHG
Sectoral reduction targets	Sectoral reduction targets
Subsidiary carbon tax	Carbon tax shall be a subsidiary instrument only
Voluntary instruments	Focus on voluntary instruments
Voluntary targets	Voluntary targets for the industry
Ambitious climate policy	More ambitious climate policy
Internationally coordinated target	Swiss target must be internationally coordinated
Compensation	Compensation of CO_2 emissions instead of tax
Emission standards transport	Emissions standards in the transport sector
Carbon tax contested	Carbon tax is contested
Reduction flexibility	More flexibility with respect to CO_2 emission reduction measures
Exemption carbon tax	More exemptions from carbon tax
High standard CDM	CDMs should have a higher standard
Tax incentives	Tax incentives to reduce CO_2 emissions

Appendix 2: List of Interest Groups and Coding

ACTOR	FULL NAME	FOCUS	CAPLAB	LIBTRAD	AMBI
ACS	Automobil Club der Schweiz	traffic	mat	cap	trad
ADER	Association pour le Développement des Energies Renouvelables	env-renew	postmat	ambi	open
AEE	Agentur für erneuerbare Energien und Energieeffizienz	env-renew	postmat	cap	open
AEFU	Ärztinnen und Ärzte für Umweltschutz	env-renew	postmat	lab	open
AGVS	Auto Gewerbe Verband Schweiz	traffic	mat	cap	open
AIHK	Aargauische Industrie- und Handelskammer	economy	mat	cap	ambi
ALLS	Alliance Sud	civil	postmat	lab	open
ALP	Alpen-Initiative	env-renew	postmat	ambi	trad
ALU	Aluminium-Verband Schweiz	economy	mat	cap	open
AQUA	AQUA NOSTRA Schweiz	env-renew	postmat	ambi	trad
ASTAG	Schweizerischer Nutzfahrzeugeverband	traffic	mat	cap	open
ATE	Arbeitskreis Tourismus & Entwicklung	civil	postmat	lab	open
AUTO	auto-schweiz, Vereinigung Schweizer Automobil-Importeure	traffic	mat	cap	open
AVES	Aktion für vernünftige Energiepolitik Schweiz	energy	mat	cap	trad
BAU	bauenschweiz Dachorganisation der Schweizer Bauwirtschaft	building	mat	cap	trad
BFA	Brot für alle	env-renew	postmat	cap	open
BMEI	Schweizerischer Baumeisterverband	building	mat	lab	trad
CARGO	Cargo Forum Schweiz	traffic	mat	cap	open
CEM	cemsuisse - Verband der schweizerischen Cementindustrie	building	mat	cap	trad
ECON	economiesuisse	economy	mat	cap	open
ECOS	Eco Swiss Umweltorganisation der Wirtschaft	energy	mat	cap	trad
EMOD	Energiemodell Zürich	env-renew	postmat	cap	open
EV	Erdöl-Vereinigung	energy	mat	cap	open
Energieforum	Energieforum Schweiz	energy	mat	cap	open
FER	Fédération des Entreprises Romandes	economy	mat	cap	open
FFU	Fach Frauen Umwelt	env-renew	postmat	lab	open
FH	Verband der Schweizerischen Uhrenindustrie	economy	mat	cap	open
FME	Forum Medizin und Energie	energy	mat	cap	trad
FRC	Fédération romande des consommateurs	civil	ambi	ambi	ambi
FROM	FROMARTE Die Schweizer Käsespezialisten	agri-forst	mat	cap	trad

FRS	strasseschweiz	traffic	mat	cap	trad
FVPL	La Fédération Vaudoise des Producteurs de Légumes	agri-forst	mat	lab	trad
FWS	Fördergemeinschaft Wärmepumpen	building	mat	cap	open
GLAS	Vereinigung Schweizer Glasfabriken	economy	mat	cap	ambi
GREEN	Greenpeace Schweiz	env-renew	postmat	lab	open
GVB	Schweizerischer Gemeindeverband	civil	ambi	ambi	trad
HENG	Verein Holzenergie Schweiz	env-renew	mat	cap	trad
HEV	Hauseigentümerverband Schweiz (HEV)	building	mat	cap	trad
HKB	Handelskammer beider Basel	economy	mat	cap	open
HOLZ	Holzindustrie Schweiz	economy	mat	cap	trad
HOTEL	Schweizer Hotelier-Verein hotelleriesuisse	economy	mat	cap	open
IGEB	Interessensgemeinschaft energieintensiver Branchen	energy	mat	cap	open
IGWV	IG Wirtschaft und Verkehr	traffic	mat	cap	trad
ISOL	Verband Schweizerischer Isolierfirmen	building	mat	cap	open
KLIA	Allianz für eine verantwortungsvolle Klimapolitik	env-renew	postmat	ambi	open
KLIS	KlimaBündnis-Städte Schweiz	env-renew	postmat	ambi	open
KMU	KMU Forum	economy	mat	cap	ambi
KSE	Konferenz Steine und Erden	economy	mat	cap	ambi
LIGN	Lignum Holzwirtschaft Schweiz	agri-forst	mat	cap	open
LITRA	Informationsdienst für den öffentlichen Verkehr	traffic	mat	cap	open
NFS	Naturfreunde Schweiz	agri-forst	ambi	lab	trad
NOE	noé 21 économie, énergie et sociéte	env-renew	postmat	ambi	open
OEBU	Netz für nachhaltiges Wirtschaften	env-renew	postmat	lab	open
OEKU	Oekumenische Arbeitsgemeinschaft Kirche und Umwelt	env-renew	postmat	lab	open
PAT	Centre Patronal	economy	mat	cap	trad
PRON	Pro Natura	env-renew	postmat	lab	open
PUSH	Stiftung Praktischer Umweltschutz	env-renew	postmat	lab	ambi
SAB	Schweizerische Arbeitsgemeinschaft für die Berggebiete	economy	mat	cap	trad
SBV	Schweizerischer Bauernverband	agri-forst	mat	cap	trad
SEK	Schweizerischer Evangelischer Kirchenbund	civil	postmat	ambi	ambi
SELEC	swisselectric	energy	mat	cap	open
SES	Schweizerische Energiestiftung	env-renew	postmat	lab	open
SEV	Schweizerischer Eisenbahn- und Verkehrspersonal-Verband	traffic	mat	lab	open

SFV	Schweizerischer Forstverein	agri-forst	postmat	ambi	open
SGB	Schweizerischer Gewerkschaftsbund	civil	postmat	lab	trad
SGCI	Chemie Pharma Schweiz	economy	mat	cap	open
SGV	Schweizerischer Gewerbeverband, Dachorganisation der Schweizer KMU	economy	mat	cap	ambi
SIA	Schweizerischer Ingenieur- und Architektenverein	building	mat	cap	trad
SKF	Schweizerischer Katholischer Frauenbund	civil	postmat	lab	open
SKS	Stiftung Konsumentenschutz	civil	ambi	ambi	ambi
SMEM	Swissmem	economy	mat	cap	open
SMU	Arbeitgeberverband Schweizerische Metall-Union	economy	mat	cap	open
SMV	Schweizerischer Mieterinnen- und Mieterverband	civil	ambi	lab	trad
SOIL	swissoil	energy	mat	cap	open
SOLAR	Schweizerischer Fachverband für Sonnenenergie	env-renew	mat	cap	open
SSES	Schweizerische Vereinigung für Sonnenenergie	env-renew	postmat	lab	open
STEC	Schweizerisch-Liechtensteiner Gebäudetechnikverband	building	mat	cap	open
STV	Schweizerischer Tourismusverband	economy	mat	cap	open
SVB	Schweizerischer Städteverband	civil	ambi	ambi	open
SVU	Schweizerischer Verband der Umweltfachleute	env-renew	postmat	lab	open
SVV	Schweizerischer Versicherungsverband	economy	mat	cap	open
SWV	Schweizerischer Wasserwirtschaftsverband	economy	mat	cap	open
TCS	Touring Club Schweiz	economy	mat	cap	trad
TRAV	Travaille.Suisse	civil	mat	cap	open
TVS	Textil Verband Schweiz	economy	mat	cap	open
USIC	Schweizerischer Vereinigung Beratender Ingenieurunternehmungen	economy	mat	lab	trad
VCS	Verkehrsclub Schweiz	economy	mat	cap	open
VELO	Pro Velo Schweiz	traffic	postmat	lab	open
VOEV	Verband öffentlicher Verkehr	traffic	postmat	lab	open
VPE	Verband der Personalvertretungen der Schweizerischen Elektrizitätswirtschaft	traffic	mat	cap	trad
VSE	Verband der Schweizerischen Elektrizitätsunternehmen	energy	mat	lab	open
VSFU	Verband der Schweizerischen Forstunternehmungen	agri-forst	mat	cap	trad
VSG	Verband der Schweizerischen Gasindustrie	energy	mat	cap	open

VSIG	VSIG Handel Schweiz	economy	mat	cap	open
VSMR	Verband Stahl-, Metall- und Papier-Recycling Schweiz	economy	postmat	cap	open
VSZ	Verband Schweizerischer Ziegelindustrie	economy	mat	cap	trad
VTS	Verband Textilpflege Schweiz	economy	mat	cap	trad
WWF	WWF Schweiz	env-renew	postmat	lab	open
WWS	Waldwirtschaft Schweiz	agri-forst	mat	cap	trad
ZPK	Verband der Schw. Zellstoff-, Papier- und Kartonindustrie	economy	mat	cap	open

Appendix 3: Overview on Variables and Data Sources

VARIABLE TYPE	VARIABLE NAME	EXPLANATION	DATA SOURCE	RESEARCH DESIGN
DEPENDENT VARIABLE	Policy preferences	Tie in the discourse network that reflects whether an interest group supports a policy preference	Discourse network based on 2009 Public Consultation	Bipartite ERGM
	Core contestations	Positions towards contestation identified in the consultation (position towards the flexibility of reduction measure and a carbon levy on fuels)	2009 Public Consultation summary report	Descriptive analysis Chi-square test
DYAD-DEPENDENT COVARIATES	Left vs. Right Cleavage	Number of adopted climate change mitigation policies in period t	Official documents	Descriptive analysis Chi-square test Bipartite ERGM
	Liberal vs. Traditional Cleavage	Average vulnerability of country towards climate change risk in period t	Official documents	Descriptive analysis Chi-square test Bipartite ERGM
	Pro Economy vs. Pro Ecology	Average absolute emissions ($ktCO_2e$, logged) in period t	Official documents Ingold	Control variable
	Policy Niche	Average rents from coal, oil, and natural gas production (% GDP) in period t	Official documents	Control variable
NETWORK RELATIONS	Edges	This baseline parameter models the density of the network and expresses the balance between creating and deleting ties.	Network Statistic	Control
	2-Star Interest Group & Alternating Star Interest Group	This model term captures the 'activity' of interest groups in terms of supporting different policy positions. I included a 2-star model term based on Markov dependence (two ties are conditionally independent unless they share a tie and an alternating star parameter. While the Markov terms capture the overall activity of actors better, the alternating star parameter is superior in modelling the spread of the activity. A positive Markov term combined with a negative alternating star parameter implies a relatively equal distribution of activity among interest groups across the	Network Statistic	Control

		networks with a small number of highly active interest groups.		
200	2-Star Preference & Alternating Star Preferences	This model term captures the popularity of policy positions. Analogous to the interest group activity terms, I included both a 2-star Markov term and an alternating star parameter term. While the Markov terms captures the overall popularity of policy positions, the alternating star parameter models the spread of popularity across policy positions. A positive Markov term in combination with a negative alternating star parameter indicates a relatively equal distribution of popularity of policy positions across the networks with a small number of high degree policy positions. This reflects a tendency to support policy positions that are supported by many others. In the network literature, this effect is usually referred to as preferential attachment or degree assortativity (Wasserman and Faust 1994).	Network Statistic	Control
	Clustering Interest Group	This dependence term is the bipartite version of network closure (Wang 2013) based on actor activity. Network closure here reflects whether interest groups tend to share the same policy positions. Hence, a significant and positive parameter estimate points to a tendency of two interest groups to have more than one policy position in common.	Network Statistic	Control
	Clustering Preferences	2-path: This dependence term is the bipartite version of network closure based on the popularity of policy positions. Network closure here reflects whether policy positions tend to be supported by the same actors. Hence, a significant and positive parameter estimate points to a tendency of two policy positions to have more than one interest group in common.	Network Statistic	Control

Appendix 4: Goodness of Fit

PARAMETER	COUNT	MEAN	SD	T-RATIO
XEDGE	783	785,454	97,868	-0,025
XSTAR2A	2973	2940,862	711,564	0,045
XSTAR2B	16037	15536,558	4995,242	0,1
XSTAR3A	7306	7029,088	2469,936	0,112
XSTAR3B	270797	244185,905	127631,949	0,208
X3PATH	241217	241208,421	101967,671	0
X4CYCLE	29927	26866,199	15910,563	0,192
XECA	421138	404325,77	271338,927	0,062
XECB	2971255	2674721,45	2050225,7	0,145
ISOLATESXA	0	0,126	0,363	-0,347
ISOLATESXB	0	0	0	NaN
XASA	1168,1488	1171,4956	191,715	-0,017
XASB	1448,1259	1452,9841	196,354	-0,025
XACA	570,0527	581,1365	32,014	-0,346
XACB	7440,4863	7527,9877	1117,246	-0,078
XAECA	117147,58	105938,999	63441,951	0,177
XAECB	119633,42	107433,865	63629,974	0,192
UMBRELLA_XEDGEA	105	108,65	14,871	-0,245
UMBRELLA_XEDGEB	0	0	0	NaN
UMBRELLA_X2STARA010	383	409,328	107,675	-0,245
UMBRELLA_X2STARB010	0	0	0	NaN
UMBRELLA_X2STARA100	0	0	0	NaN
UMBRELLA_X2STARB100	4238	4019,169	1330,568	0,164
UMBRELLA_X2STARA101	0	0	0	NaN
UMBRELLA_X2STARB101	286	275,925	98,76	0,102
UMBRELLA_X4CYCLEA1	7907	6749,641	4230,538	0,274
UMBRELLA_X4CYCLEB1	0	0	0	NaN
UMBRELLA_X4CYCLEA2	549	475,48	309,481	0,238
UMBRELLA_X4CYCLEB2	0	0	0	NaN
UMBRELLA_XEDGEAB	0	0	0	NaN
NICHE_X2STARAMATCH	3536	3471,45	1052,578	0,061
NICHE_X2STARBMATCH	2973	2940,862	711,564	0,045
NICHE_X2STARAMISMATCH	12501	12065,108	3954,893	0,11
NICHE_X2STARBMISMATCH	0	0	0	NaN
NICHE_X4CYCLEAMATCH	7993	7232,303	3996,92	0,19
NICHE_X4CYCLEBMATCH	29927	26866,199	15910,563	0,192
NICHE_X4CYCLEAMISMATCH	21934	19633,896	11967,114	0,192
NICHE_X4CYCLEBMISMATCH	0	0	0	NaN
NICHE_XEDGEMATCHAB	0	0	0	NaN
NICHE_XEDGEMISMATCHAB	3060	3062,454	97,868	-0,025
ECONECOL_X2STARAMATCH	8669	8376,207	2666,653	0,11
ECONECOL_X2STARBMATCH	2973	2940,862	711,564	0,045
ECONECOL_X2STARAMISMATCH	7368	7160,351	2348,588	0,088
ECONECOL_X2STARBMISMATCH	0	0	0	NaN
ECONECOL_X4CYCLEAMATCH	17127	15116,126	8782,629	0,229

ECONECOL_X4CYCLEBMATCH	29927	26866,199	15910,563	0,192
ECONECOL_X4CYCLEAMISMATCH	12800	11750,073	7192,978	0,146
ECONECOL_X4CYCLEBMISMATCH	0	0	0	NaN
ECONECOL_XEDGEMATCHAB	0	0	0	NaN
ECONECOL_XEDGEMISMATCHAB	3060	3062,454	97,868	-0,025
CAPLAB_X2STARAMATCH	7847	7578,219	2428,149	0,111
CAPLAB_X2STARAMISMATCH	8190	7958,339	2583,68	0,09
CAPLAB_X2STARBMISMATCH	0	0	0	NaN
CAPLAB_X4CYCLEAMATCH	14961	13282,318	7786,156	0,216
CAPLAB_X4CYCLEBMATCH	29927	26866,199	15910,563	0,192
CAPLAB_X4CYCLEAMISMATCH	14966	13583,881	8181,882	0,169
CAPLAB_X4CYCLEBMISMATCH	0	0	0	NaN
CAPLAB_XEDGEMATCHAB	0	0	0	NaN
CAPLAB_XEDGEMISMATCHAB	3060	3062,454	97,868	-0,025
OPTRAD_X2STARAMATCH	8382	8133,713	2635,548	0,094
OPTRAD_X2STARBMATCH	2973	2940,862	711,564	0,045
OPTRAD_X2STARAMISMATCH	7655	7402,845	2381,96	0,106
OPTRAD_X2STARBMISMATCH	0	0	0	NaN
OPTRAD_X4CYCLEAMATCH	16394	14975,221	8894,231	0,16
OPTRAD_X4CYCLEBMATCH	29927	26866,199	15910,563	0,192
OPTRAD_X4CYCLEAMISMATCH	13533	11890,978	7093,789	0,231
OPTRAD_X4CYCLEBMISMATCH	0	0	0	NaN
OPTRAD_XEDGEMATCHAB	0	0	0	NaN
OPTRAD_XEDGEMISMATCHAB	3060	3062,454	97,868	-0,025
STDDEV_DEGREEX_A	2,6669	2,2717	0,189	2,085
SKEW_DEGREEX_A	-0,117	-0,2677	0,274	0,551
STDDEV_DEGREEX_B	20,6954	18,8754	4,707	0,387
SKEW_DEGREEX_B	0,8118	0,2816	0,238	2,223
CLUSTERINGX	0,4963	0,4108	0,085	1,01
MAHALANOBIS DISTANCE = -2036003				
MAXIMUM QASI-AUTOCORRELATION IN ABSOLUTE VALUE = ∞				