

Complex Policy Trajectories in Risk Domains: Nuclear Power in Canada, Germany and Japan

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1 Introduction

How do different jurisdictions deal with complex, risk-prone and ‘creeping’ (Schneider et al 2013) policy issues such as the threat of global pandemics, or the use of nuclear power?

Policy patterns and responses in these risk domains garner particular attention and urgency when highly visible, major events or shocks occur, which propel latent or creeping problems onto the main stage of policy-making. The March 2011 Fukushima nuclear accident is a good example. It raises the question if and how different jurisdictions adjust their policies in response to external shocks.

Typically, in these cases, policy research is drawn to the binary lens of (non-incremental) policy change, triggered by external stimuli, versus policy continuity, accounted for by powerful vested interests or institutional barriers. Researchers also tend to locate the causes for either policy change or continuity at the broad macro-level of national polities or societies (e.g. strength of Green parties or movements).

However, extant theories of the policy process have yet to develop a coherent theory to explain the link between external shocks and policy response, a theory that would specify how underlying causal mechanisms and processes may drive specific policy trajectories into variable directions (degrees of change) over time.

We argue first, that a policy trajectory analysis can gain from detailed tracing of policy developments at the empirically grounded discourse level. And second, that a diachronic, policy process analysis needs to be combined with cross-unit, synchronous comparison to make progress towards explaining the variability of the link between external stimuli and policy response.

More specifically, we propose in this paper a ‘nested’ approach that first investigates large-N macro-level variables to then focus on a detailed tracing of diachronic policy developments on the micro-level of policy discourse within a small-N comparative framework. We consider policy discourse not only as integral part of the policy process but also as key to understanding how issues that gain heightened prominence through crisis are processed and transformed into political action.

In particular, we develop our argument through a comparative case study of policy responses in Canada, Germany and Japan to the Fukushima nuclear accident. We use the innovative Discourse Network Analysis (DNA) methodology to map and trace actor relationships in the nuclear policy arena of the three jurisdictions over distinct, and relatively short ‘slices’ of time. This allows us to provide a dynamic and actor-centered micro-foundation to policy developments, while capturing cross-unit differences by identifying factors that mediate policy responses to external stimulus in the three jurisdictions.

The paper proceeds as follows. This section reviews and critiques the extant literature on policy change and proposes an integrated, comparative approach to account for the variability of policy response to external stimuli across different policy systems.

The second section provides the first stage of our integrated, ‘nested’ approach: the large-N, comparative macro-perspective on nuclear power policy choices by way of testing the explanatory power of material, ideational and institutional determinants on policy change. The limitations of this approach then lead us to the third and main section of the paper, which presents the small-N comparative study of policy discourse and responses in Japan, Germany, and Canada. In this third section we first introduce discourse network analysis as most promising choice for the purpose of detailed temporal analysis of a small number of cases; explain our methodological choice in terms of data selection; map and analyse discourse sequences as well as actor networks before and after the Fukushima accident for the three countries individually; and then compare the different actor dynamics and policy responses across Japan, Germany, and Canada. The fourth section summarizes the results of our investigation, discusses limitations of our approach, and concludes with implications for the extant literature and for future research.

External Events and Policy Responses: A Window into Policy Dynamics

It is a common observation in policy research that external shocks or crises can serve as catalysts for major policy change. As such, disasters or catastrophic events such as the 9/11 terrorist attacks or the Fukushima nuclear accident offer a privileged window into non-incremental policy change.

The three major policy theories that focus on explaining policy change all foreground external shocks (or related concepts) as one if not the major source of policy change, in the face of institutional inertia. In the Multiple-Streams Framework (Kingdon 1984) ‘focusing events’ may help latent issues to enter the ‘problem stream’ and open a ‘window of opportunity’ that policy entrepreneurs can capitalize on to initiate major change. The Punctuated Equilibrium (PE) framework (Baumgartner and Jones 1993) is rooted in an evolutionary conception of the policy process in which long periods of equilibrium are punctuated by brief but major policy change. The latter can occur if policy opponents manage to put forward new ‘policy images’ that successfully diffuse into (decision-making) policy venues. Historical institutionalism (Pierson 2011) draws on a similar logic by relying on ‘critical junctures’ to explain incidences of change in otherwise stable policy patterns and paths.

The Advocacy-Coalition Framework (ACF, Sabatier and Jenkins-Smith 1993) focuses on the competition of advocacy coalitions within a policy subsystem that brings together various actors who share similar and relatively stable policy beliefs. Within the ACF, ‘significant perturbations external to the subsystem’ are identified as one “necessary but not sufficient cause of change” (Weible and Nohrstedt 2013: 133). These perturbations “can foster change in a subsystem by shifting and augmenting resources, tipping the power of coalitions, and changing beliefs” (Weible, Sabatier & McQueen 2009: 124). It is worth noting that the belief-based, cognitive grounding of ACF is not incompatible with instrumental rationality or “material self-interest” in the coalitions’ pursuit of their respective policy beliefs (Sabatier 1998: 110).

What unites these approaches is that external shocks or focusing events provide opportunities and avenues for political mobilization and advocacy, often for minority coalitions or politically disadvantaged groups, through heightening public attention for policy problems in the governance of risk domains. Yet, policy change is not a necessary or automatic response to external shock but is contingent on additional conditions.

Other elements are, however, much less clear or shared, beginning with the definition of external shocks, crises or perturbation. The extremely broad definition of the former concept in the ACF (including socio-economic changes) makes the establishment of a link between instances of crisis and policy outcomes very difficult. Here, we opt to side with the ‘focusing event’ originally introduced by Kingdon and later specified by Birkland (1997, 1998, Birkland and DeYoung 2013) as sudden, uncommon, and harmful, with “harms concentrated in a geographical area of community of interest, and that is known to policy-makers and the public simultaneously” (Birkland 1998: 54). This still leaves the threshold question of how severe an event needs to be to trigger a response – and opens the door to the facile argument that change did not occur because an event was too weak - but Birkland’s definition provides at least some parameters.

A second concern relates to the definition of policy change as the dependent variable, both in terms of depth of change and of its location in the policy process. What constitutes major policy change? Both the MS and PE models focus on the agenda-setting stage and somewhat neglect the question to which extent there is follow-through all the way to change in legislation and possibly implementation. ACF by contrast offers a workable distinction between major and minor policy change where ‘major’ involves changes to the core of government programs. In our case, this distinction helps us separate a case in which, for example, policy response could be limited to a more active mobilization of minority coalitions around the dangers of nuclear power use from another case in which the government decides to suspend or phase-out the use of nuclear power (core or paradigm shift).

The third and most important concern relates to mechanisms and causal pathways that offer plausible links between focusing events and policy outcomes: assuming that we do have a sufficiently severe event and that we would know major change if we saw it - what explains that in one case the opportunity is “skillfully exploited by proponents of change” (Sabatier and Jenkins-Smith 1998: 148) to successfully produce legislative change, whereas in other cases this kind of mobilization, and policy change, is effectively blocked by counter mobilization?

In essence, this is the key question about the variability of policy response in the face of similar events. We argue that this question can only be addressed within a comparative framework that elucidates causal mechanisms and pathways of change.

Focusing Events and Variability of Policy Response: the need for an integrated, comparative approach

It is safe to state that a fully-fledged theory to explain the link between focusing events and policy change has not yet been established (see Nohrstedt 2008: 259; t’Hart and Boin 2001: 43). What we do have is some mid-range frameworks and conjectures about this linkage.

Coming from the crisis management literature, Boin et al. (2009), for example, infer four factors from case studies in ‘crisis exploitation’ that may explain outcomes, both at the political (incumbents-opposition) and policy (opponents and proponents of change) levels: the impact of the media arena on the ‘framing contest’ between proponents and opponents; the impact of the post-crisis inquiry arena (politicized versus expertise-based) on the same framing contest; the nature of the emergency that triggers the crisis (perceived as more exogenous or partially endogenous); the situation of the crisis in

political time (proximity to elections).

In the policy literature, Nohrstedt and Weible (2010), building on insights from crisis management scholarship and working from the ACF, have put forward one of the most developed attempts to link external events to policy change at the policy subsystem level. They hypothesize, first, that “the greater the geographic and policy proximities, the greater the impact of the crisis on a given subsystem in terms of incentives it creates for policy action” (21). If a crisis ‘hits home’, i.e. it has local effects and strikes at the heart of the policy subsystem (perception of failure), it will result “in mobilization of reform-oriented coalitions and counter-mobilization of more conservative coalitions” (22). Second, they combine the proximity-of-crisis factor (immediate/proximate vs. vicarious) with the three types of policy subsystem (unitary, collaborative, or adversarial) to propose five different pathways from crisis to policy subsystem response.

However, the predicted outcomes remain quite indeterminate, not to say inconclusive: for example, in an adversarial policy subsystem, an immediate/proximate crisis can lead to either polarization, creation of one dominant coalition, or a negotiated shift from a “hurting stalemate” between adversarial coalitions to a collaborative subsystem. Furthermore, while Nohrstedt and Weible offer six categories of “plausible intervening mechanisms” linking crisis and subsystem change or stagnation (ranging from redistribution of resources to framing contests and policy entrepreneurship) they fail to specify which mechanisms inform or drive specific pathways from crisis to response.

While, by their own admission, Nohrstedt and Weible thus leave us with little more than an “embryonic attempt toward constructing a more general theory of crisis-induced policy impacts” (25), they do point us to the importance of ‘cross-system’ (policy subsystem and crisis-system) differences to explain the variations in crisis-induced policy responses or impacts.

Indeed, there is a simple lesson to be drawn from the limits encountered by conceptualizing the crisis-response link from a pure policy process perspective. Beyond contextual and situational factors, as identified by the crisis management literature, the complex diachronic sequences between external stimuli and policy responses are mediated by synchronous factors that can only be analyzed by way of cross-unit comparison. In some sense, then, to properly study the impact of events on policy response, we need to bring back exactly those institutional factors that are at the root of the inertia or veto positions that external shocks are posited to break with!

To develop this point, it is worth remembering that the question of which role external shocks play in the change of policy paradigms is part of a larger debate on when and how basic policy orientations change. The policy literature relating to event-induced policy change tends to draw mostly on theories that emphasize diachronic or temporal patterns in policy development. There is another group of theories that focuses on synchronous patterns and that typically distinguishes three determinants: a) configurations of political institutions (e.g. number veto players, Tsebelis 2011) and actor constellations (party coalitions and interest group alliances), b) ideational dimensions such as discourse structures, frames and belief systems (e.g. Béland and Cox 2011), and c) material, socio-economic structures that may drive or inhibit policy change (e.g. in climate policy see Fisher 2006). Thus, one or a combination of these three differences relating to ‘institutions, ideas or material interests’ may explain differences in policy responses to a catastrophic event such as the Fukushima.

At the same time, the focus on mediating differences gives us better access to potential causal mechanisms and pathways: for example, a decentralized or plural configuration of political institutions that provides more access points for diverse interests to decision-making can be hypothesized to be more friendly to policy entrepreneurship than a more centralized and closed institutional configuration.

The typical strength of small-N comparative work lies in revealing the complex interplay between ‘institutions, ideas, and interest’ to produce ‘configurations’ of determining factors. The weakness is the static character of the explanations that sometimes suffer from ‘over-determination’ and lack of replicability.

In this sense, synchronous and diachronic approaches are complementary and should be integrated. As already stated in a pioneering work in the energy policy field (Kitschelt 1986: 101), “a dynamic theory of change is in no way incompatible with the comparative approach.”

Referring to how ACF scholars have wrestled with the importance of varying institutional settings, Gupta (2012: 15) writes “they understand that institutional configurations govern these processes, including variations in the degree of consensus necessary for policy change and the openness of the political system. Although this is an improvement, scholars have noted that that future research should focus explicitly on the way in which these structures moderate the relationship between external parameters and coalition activity within the subsystem.”

More recent work in the PE framework, for example, combines the study of diachronic ‘punctuations’ with comparisons of how institutional configurations mediate punctuations or shifts in policy attention and action (Baumgartner, Jones & Wilkerson 2011).

This leads us to opt for an approach that focuses on the diachronic analysis of the event-response sequence while incorporating the mediating role of synchronous factors through systematic comparison, both on a global macro-level as well as through focused comparison of three carefully selected cases.

The latter point also sets us apart from much of the – single case study based – work on policy response to events that dominates in particular in the literature on responses to nuclear accidents (e.g. Nohrstedt 2005; Nohrstedt 2008; Haunss et al. 2013). Obviously, single cases do not allow uncovering variations in the way institutional configurations moderate the external event-response link.

We approach the diachronic study of crisis-response policy trajectories through the comparative analysis of discourse networks, which is the application of social network analysis to actor configurations in policy-making (more under 3.1).

It should be pointed out that the methodological choice of discourse analysis is different from privileging ideational positions in the explanation of policy. Put differently, to take discourse seriously does not mean to say that ideas trump institutions or material interest. Rather, we view discourse as the arena of different coalitions who press for preferred policy choices. Discourse analysis does not only reflect policy beliefs – it also helps to trace how groups position and align themselves in the political contest, and how

over time – and maybe in response to focusing events – actor groups shift policy positions and alliances. As highlighted by other scholars in the strategic-constructivist strand of research (e.g. Jabko 2006), groups use crisis narratives and frames in strategic ways to advance their policy objectives ('framing contest', Boin et al 2009).

2 Nuclear Power Policy: A comparative macro-perspective

In the previous section of this paper we emphasized that a diachronic, event-focused analysis should be combined with a synchronous, cross-sectional comparison. In addition, we proposed to investigate in particular if general laws and mechanisms are at work at the macro-level of countries that might explain our case of policy change. In this sense we will combine a large-N comparative analysis (LNA) and small-N case studies (SNA) in a way Lieberman (2005) proposed as "nested analysis". LNA is used to discover causal statistical inferences (based on quantitative estimates of the robustness of a theoretical model), and to sort out rival explanations. In addition, it helps to inform and motivate case selection for SNA.

2.1 Theoretical Considerations

Large-N analysis based on a macro quantitative perspective supposes that there are general laws and mechanisms at work that embrace total political systems, independent of time and place. In comparative politics and policy research there is a broad array of such approaches. To mention only the most important ones, there are approaches explaining policy outputs by governing party orientation (Hibbs, 1977; Schmidt, 1996), by the dispersion or concentration of power (Lijphart, 2012) or the mere number of veto players in political systems (Tsebelis, 1995). Others concentrate explanations on the power resources of civil society organizations such as trade unions or consumer groups (Korpi, 2006), or the openness of political systems for social and environmental movements (Kriesi et al., 1992). All these explanatory variables refer to system-wide influences and laws.

Many of these approaches are unclear or eclectic with respect to the levels or dimensions of analysis. In our research strategy we differentiate clearly between materialist, ideational, and institutional levels and perspectives.

Materialist perspectives have the longest tradition in the social sciences and put their emphasis on socio-techno-economic structures like economic power or technological dependencies. Coming from this angle, material structures generate not only informal power positions but also socio-political interests and preferences. Such a perspective implies that powerful social and economic groups are using their political power and influence to prevent policy changes that are directed against their material interests. In contrast, institutionalist perspectives problematize that material power resources cannot directly be translated into political influence but are mediated by political institutions such as governmental regimes, administrative structures and party systems, etc.

The relationship between institutional configurations and policy change, however, is not that simple. On the one hand we could easily hypothesize that more plural, fragmented and open political systems (i.e. proportional voting regimes and pluralist party systems) are more likely to introduce innovative policy changes than closed and centralized

systems. But on the other hand, according to Tsebelis' veto player approach, we would predict that the more veto players are involved in a policy process, the more difficult it is to change a status quo.

Finally, ideational approaches include an additional intermediating level in stressing that interests are not given but have to be socially defined, articulated and politically represented. These approaches emphasize the role of discourse structures and belief systems in political decision-making and policy formulation.

In the following analysis we try to measure system-wide influences on policy change at the macro level based on material, ideational, and institutional perspectives.

2.2 Variables and Data

Our explanandum and dependent variable is policy change of nuclear energy policies. Policy change can either be measured in a binary way based on policy outputs such as the decision to phase out nuclear power, as the German and Swiss governments have done in the wake of the Fukushima accident. However, it seems more convincing to apply a more nuanced perspective that takes policy outcomes into account and hence to conceptualize policy change not only as political intentions alone, but as the overall national reliance on nuclear energy over a longer period of time. A proxy measure for this kind of »real energy transformation« in nuclear policy is the changing share of nuclear energy within the national energy mix.

To measure macro level determinants, we use data on the relative importance of national nuclear energy industries, the respective position of renewable energy within the energy mix, politico-institutional factors such as the strength of green parties, and the orientation of public opinion with respect to nuclear energy as an ideational variable (for data sources see appendix).

2.3 Statistical Analysis

In a first analytical step we investigate if changes in the share of nuclear energy within a national energy mix between 2000 and 2010 are related to the importance of nuclear energy in a given country. According to our materialist perspective this would imply that the larger the share of nuclear energy in a country, the lower the likelihood that this share is reduced by transformative energy policies. Figure 1 displays this relationship for 30 countries in a scatterplot. The diagram also depicts the result of a linear bivariate cross-sectional OLS-regression model. Country labels correspond to internet country codes (i.e. to ISO 3166).

In contrast to our expectations, the regression line indicates a slight negative relationship. A number of countries with a large share of nuclear energy indicate larger percentages of reduction than countries with a lower share. However, the small adjusted multiple R^2 of 0,031 and the p-value of 0,18 indicate that we cannot talk of a general law or mechanism operating system-wide with statistical significance. There is a cluster of countries with a relatively small share of nuclear energy (among them are Canada, Romania and the Czech Republic) that is increasing the share, and there is also a cluster of countries with a medium share that reduced the importance of nuclear energy between 2000 and 2010 (among them Japan, Germany, and the UK). Only very few of the »downsizers« became complete drop-outs or converts after the Fukushima accident. In

Figure 1 these countries are depicted as solid black points.

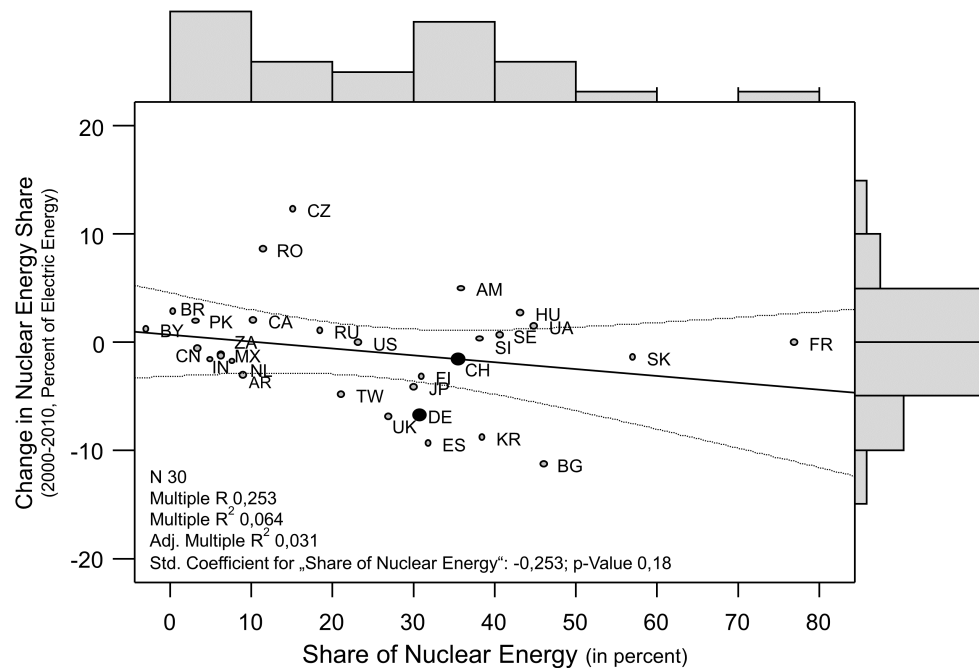


Figure 1: Nuclear policy change between 2000 and 2010 and the relative importance of nuclear energy in 30 countries. Country labels correspond to internet country codes. Solid black points indicate countries that opted for a complete abandonment of nuclear energy.

In a next step, we are interested in general politico-institutional and ideational influences on policy change. This is measured by the differential strength of green parties in the various political systems and also by the orientation of public opinion in these countries with regard to nuclear energy. Because of limited data availability, this analysis can only be performed with 25 countries. Figure 2 displays these relationships in scatterplots. The diagram on the left visualizes the relationship between nuclear policy change and the strength of Green parties in different countries. The diagram on the right visualizes the relationship between nuclear change and the public opinion about nuclear energy. The x-axis represents critical opinion in percent (i.e. “against nuclear energy”). The size of the various symbols in this diagram visualizes our first independent variable (share of nuclear energy in the energy mix of a country).

The analysis raises some problems. At least two of the distributions look a bit awkward with regard to the assumptions underlying linear and multiple regression. Whereas the dependent variable is close to normal distribution, the histograms for the axes “Share of Nuclear Energy” and “Green Party Share” show that at least two the dependent variables are skewed and heteroscedastic.

In addition, in a bivariate perspective, none of the displayed independent variables indicates a significant effect on the changes in the nuclear energy share. Mere visual inspection shows that both regression lines are almost horizontal. There are some countries with relatively strong green parties (Germany and Finland) that have reduced their nuclear energy shares. Yet, there are also countries with weak or even inexistent green parties that have reduced the nuclear segment in their energy mix in a significant way (Taiwan, UK, Korea, Spain and Bulgaria).

The same is true with regard to the effect of public opinion. Although Germany stands out with a significant reduction of the nuclear share and a very critical view of the general public with regard to nuclear energy, there are also some countries where the population looks upon atomic energy in a more positive way and that still undertake a reduction of the nuclear share. Even more puzzling is that there are also countries such as Canada and Brazil, in which the nuclear share has increased between 2000 and 2010, despite some strong public criticism of this form of energy in these countries.¹

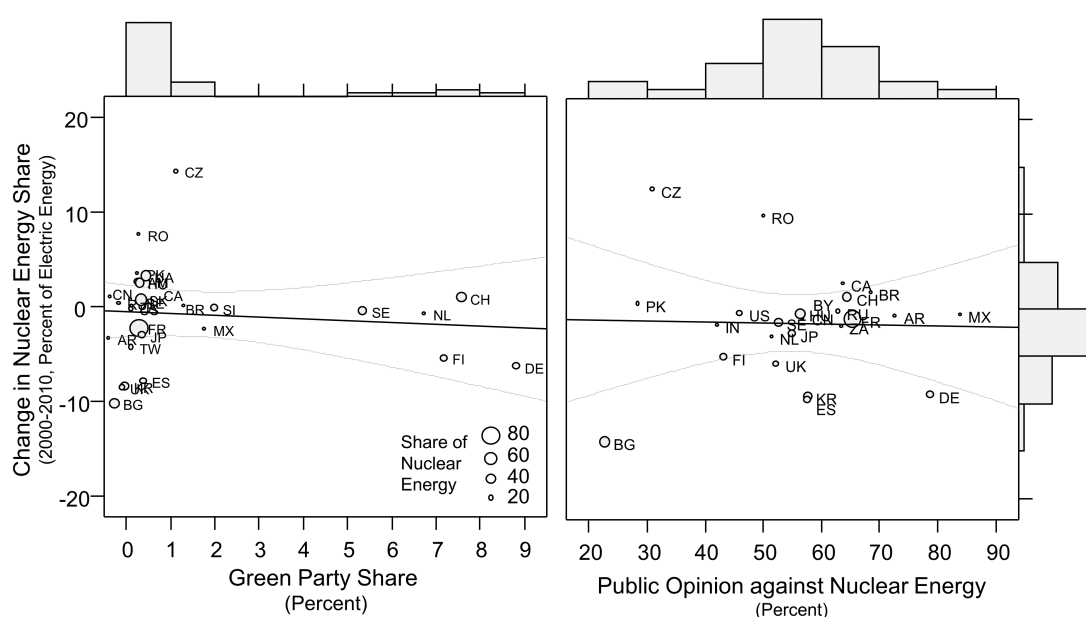


Figure 2: Nuclear policy change, Green Parties and Public Opinion against Nuclear Energy. Scatterplots with regressions lines, confidence intervals, and histograms.

In order to get a more complete and integrated macro picture, we have to insert the various determinants into a multiple regression model. The results of this analysis are depicted in Table 1.

¹ We will see for Canada in the case study that the explanation is the marked difference between provincial (Ontario) and Canada-wide public opinion on nuclear energy.

Table 1: Multiple Regression Model explaining Change in Nuclear Energy Policy. Change is measured in terms of increase or decrease of the share of nuclear energy in the national energy mix.

Dependent Variable	Change in Nuclear Energy			
Effect	Coefficient	Standard Error	Standardized Coefficient	p-Value
CONSTANT	3,137	4,386	0,000	0,482
Share of Nuclear Energy	-0,095	0,058	-0,343	0,114
Green Party	-0,048	0,387	-0,026	0,903
Public Opinion against Nuclear Energy	-0,037	0,074	-0,103	0,621
N	25			
Adj. Multiple R^2	0,009			

Supporting our hypotheses is that two signs of the three explanatory variables point into the expected direction: The stronger the green parties and the more critical public opinion is about nuclear power, the more likely is a reduction in the proportion of nuclear power in the energy mix. The effect of the relative share of nuclear energy points in the same direction. But this runs against our hypothesis that large nuclear industries would oppose such a policy. That none of the effects is statistically significant and the explained variance (R^2) is almost zero, could be due to insufficient data to assess statistical correlations. However, it is also possible that the nature and complexity of causal mechanisms cannot be confidently inferred by conventional statistical analysis that we have applied. At least with regard to our three analytical dimension the results are strong indications that there are no »general laws« and macro influences at work that account for all of the countries.

2.4 Conclusions and Case Selection for in-depth analysis

The scatterplots and regression analysis indicate that our hypothesized causal inferences only work for specific clusters of cases. This finding suggests that some mechanisms might only work in specific contexts or in complex configurations that cannot be generalized in a cross-sectional manner. This is the point where small-N research comes in. The complexity of policy developments in different countries calls for a more detailed analysis of individual configurations and a process-oriented analysis of political and policy sequences in different cases across time.

Our LNA thus raises a number of important questions that only can be answered with a complementing SNA, which will be conducted in the following sections. Japan, the country where the nuclear accident of 2011 took place, is the natural starting point for a comparison. We contrast the Japanese case with the German and Canadian developments. Germany, which reduced its nuclear share quite significantly between 2000 and 2010 and took the decision to phase out nuclear power by 2022 shortly after the Fukushima accident, represents a combination of a moderately strong nuclear sector, strong political representation by a powerful anti-nuclear Green Party, and a highly critical public opinion with respect to nuclear energy. In the view of nested analysis, Germany is clearly an “on-the-line-case”. Canada, on the other hand is an interesting puzzle in several respects: Its nuclear industry is relatively weak and its

national public shows a rather critical attitude towards nuclear power. Yet, it increased its nuclear share despite other energy opportunities such as renewable energies including hydroelectric power.

3 Comparative Case Studies: Policy Discourses and Responses to Fukushima in Japan, Germany and Canada

Following the research design described above, we now move to a detailed temporal analysis of a small number of cases for qualitative, in-depth analysis. The purpose here is to investigate the complexity of policy responses and profiles around the Fukushima stimulus in Japan, Canada and Germany.

3.1 Discourse Network Analysis: Method and Data

Political discourse is an essential ingredient to the policy process (Anderson 1978: 23; Hall 1993: 289; Schneider and Ollmann 2013: 160). Policy experts rely on discourse in order to communicate their “demands, criticisms, or proposals” – in short, to advance political claims (Koopmans and Statham 1999). With regards to the process of event-induced policy making, political discourse can be assumed to play a decisive role since both opponents as well as proponents of change will likely rely on discourse to promote their respective demands and proposals in the policy subsystem. The resulting interplay of approving and dissenting views creates patterns of repeated interaction that can be traced by the method of Discourse Network Analysis (DNA; Leifeld 2011, 2013).²

The unit of analysis in DNA is the statement. Depending on the research question, statements can encode different theoretical constructs, e.g. „policy beliefs“ (Fisher et al. 2013), „core policy preferences“ (Leifeld 2013), or „frames“ and „positions“ (Schneider and Ollmann 2013). Similar to Leifeld and Haunss (2012) and Haunss et al. (2013), we opt for exploring actor relationships based on the „claims“ made in the policy discourse. As an umbrella concept, claims can cover not only „beliefs“ or „ideas“ of policy experts, but also strategic proposals and criticisms as well as interest-driven demands.

Based on discourse network data, different network types can be generated. The analysis of actor configurations in a policy subsystem can best be conducted by means of actor congruence networks. This network type contains a set of actors that are linked based on the amount of shared claims. If actors are densely connected in the network, they share a relatively high number of claims, whereas loose connections suggest that the degree of congruence is rather low. Actor congruence networks can thus be seen as a «map of the discourse where clusters of actors represent advocacy coalitions» (Leifeld 2013: 174). They help to trace the number of groups within a subsystem, their degree of internal cohesion, and possible re-configurations over time.

The majority of DNA applications rely on data extracted from newspaper articles (Haunss et al. 2013; Hurka and Nebel 2013; Leifeld 2011, 2013; Leifeld and Haunss 2012; Schneider and Ollmann 2013). One reason is that news media data «capture a wider variety of political actors» (Leifeld 2013: 195) than data based on position papers or legislative hearing protocols. Moreover, newspapers are published frequently and are

² A detailed introduction into DNA can be found in Leifeld (2011); extensive formal expositions are also contained in Leifeld (2010) and Leifeld (2013).

thus apt to generate a solid empirical base for a systematic investigation.

For the present study, discourse data have been obtained from „The Japan News“ (Japan), „Süddeutsche Zeitung“ (Germany) and „The Globe and Mail“ (Canada). All three newspapers were selected according to the „quality press“ criterion (Barranco and Wisler 1999), i.e., they represent general news-oriented papers of high reputation and are known as politically moderate.

The strategy to select not more than one newspaper for each country has to be carefully justified. We follow Barranco and Wisler (1999: 303-308) who argue that „one newspaper is often enough“ because „the use of a single national newspaper is particularly cost effective“. In other words, the benefits from adding further sources with regards to the unbiased and exhaustive representation of political discourse is quite limited. Moreover, the initial bias that is involved in relying on a single national newspaper is not removed substantially if a second newspaper is added. Besides, the selection of more than one newspaper leads to a substantial rise in costs and can bring along „problems with double coverage of events“ (Leifeld 2013: 177).

The coding of statements contained in newspaper articles was conducted with the software Discourse Network Analyzer (DNA, see Leifeld 2009). In order to identify the relevant articles within the electronic archives of the newspapers, a search string based on the truncated terms *NPP*, *Atomic*, *Nuclear*, *Energy Policy* and *Fukushima* was employed. All articles identified through the string that were published within the period of investigation (see below) and contained at least one statement that represented a claim with regards to nuclear power policy were inserted in the software. Next, each statement was coded manually according to five variables: first, the date when the statement appeared; second, the name of the actor who gave the statement (considering both individual and complex actors); third, the respective organization of the actor; fourth, the concrete claim which was revealed in the statement; and fifth, whether the actor approved or rejected the claim.

In order to make the coding process as transparent as possible, a fine-grained coding manual was developed. The main coders for all three cases were native speakers, which was helpful to rule out as much ambiguity as possible.

The network layouts are based on a stress minimization (MDS) of graph-theoretic distances as it is implemented in the «quick layout» in Visone (Brandes & Pich, 2009). But have been slightly rearranged for reasons of perceptibility. Actors are represented by squares. The strength of association between actors based on their shared claims is depicted by edge width. Node color corresponds to actor types as follows: orange indicates federal/central government, purple indicates parliamentary opposition, light blue indicates actors from the sub-national level, green indicates non-governmental organizations, red indicates associations and interest groups, pink indicates international organizations, grey indicates federal agencies, yellow indicates science, dark blue indicates business, and black indicates the utility companies that run NPPs.

Actors, Statements and the Fukushima Effect in National Newspapers

Table 2 Descriptive statistics: Media coverage of nuclear power policy before and after 3/11 in Japan, Germany and Canada.

	Japan	Germany	Canada
Period of Investigation	01 March 2010 – 17 December 2012	01 September 2010 – 31 August 2011	30 June 2009 – 11 September 2013
Articles	72	313	45
Articles/Day	0.197	0.858	0.029
Statements	210	1,203	187
Actors	172	284	117

The discourse networks for Japan, Germany and Canada rely on 1,600 statements that were conveyed in 430 newspaper articles.³ Table 2 depicts the absolute numbers for the three countries. Despite the longest period of investigation, the numbers of articles, policy statements and participating actors are smallest for Canada. For Germany, on the other hand, the policy discourse as conveyed by the *Süddeutsche Zeitung* comprised comparatively high numbers of articles, statements and actors. The ratio of articles per day highlights the differences in discourse density across the three cases. Whereas this ratio is 0.029 for Canada and 0.197 for Japan, it amounts to 0.858 for Germany.

Figure 3 depicts the density of the nuclear policy discourse as it evolved in the three countries between January and September 2011 (see x-axis). The y-axis maps the standardized statement density for each country (statements per day / statements in total). The illustration shows a considerable spike with regards to the statement density directly after 3/11 only for the case of Germany. Whereas media attention in Canada was somehow directed to the policy implications of the accident, too, it was centered around more immediate issues like disaster management in Japan, resulting only in a negligible policy discourse density during the first weeks after 3/11.

The discourse density remained rather high for Germany until June, when the phase-out decision was finally taken, and faded out during summer. Japan shows the opposite pattern: Whereas the discourse on nuclear policy was not extensive in the first few months after the accident, it reached higher density levels during July and August. For Canada, on the other side, the pattern seems to be rather erratic: After a modest spike directly after the quake, the discursive activity was sparse, with claims conveyed only every once in a while.

In order to compare and explain the evolution of nuclear power policy, the following sections comprise sequential pre-post-comparisons of the policy discourses around the focusing event in our three cases. The discourse analysis makes use of actor congruence networks in order to map and trace actor configurations. The periods of investigation were not fixed a-priori, but adjusted with regards to different sequential patterns, temporal structures and discourse dynamics in the respective subsystems. Thus, taking

³ A list of analysed newspaper articles can be made available upon request.

into account that the unfolding of policy discourses is highly contingent on specific configurations of political-economic and cultural factors, the periods of investigation for Japan, Germany and Canada differ.

Whereas nuclear power policy was a very contentious topic in Germany already before Fukushima, there were only very few claims with regards to the issue in Japan and Canada until March 2011. Due to the low statement density in Japan and Canada before the crisis, a time frame of at least one year is necessary to draw inferences concerning the spatial setup of the pre-Fukushima nuclear power policy subsystems. Therefore, the analysis starts in March 2010 for Japan and already in June 2009 for Canada (compared to September 2010 for Germany).

Tracing the policy discourse after Fukushima, the analysis is based on two further disaggregated time slices for each case. Instead of rigidly observing nature-given cycles like months or years, the adjustment of time slices is conducted in light of the discourse density and relevant political events in each country. This enables to put the discourse into context, allowing for an in-depth analysis of precisely separable stages.

For the case of Japan, the first time slice after 3/11 covers the tenure of Prime Minister Naoto Kan (until August 31, 2011), and the second slice entails the complete term of his successor, Yoshihiko Noda (until December 17, 2012). For Germany, the first post-Fukushima time slice ends the day after the influential Reactor Safety Commission presented its final report on German nuclear power plants, which emphasized gaps in the protection against terrorism attacks and plane crashes (May 17, 2011). The last period of observation covers the weeks until the Bundestag decided to phase out nuclear power (June 30, 2011). For Canada, the first post-crisis time slice ends two months after 3/11, where the policy discourse reached near-pre-Fukushima levels with regards to its density. The last time slide traces the discourse until more than two years after the accident (June 2013).

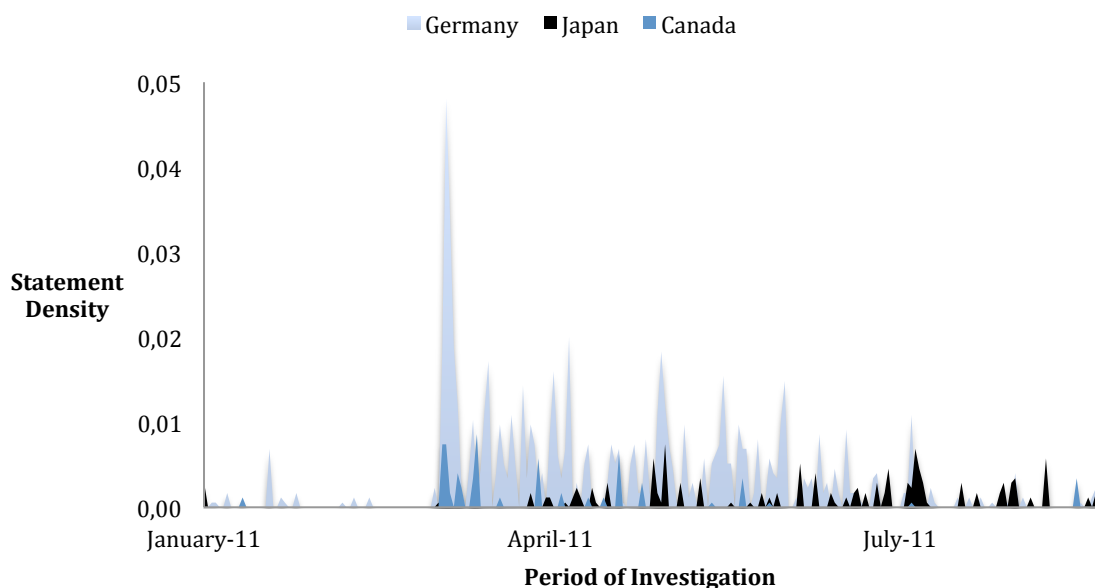


Figure 3 Discourse density before and after 3/11 in Germany, Japan and Canada. Notes: The x-axis maps the period between January and September 2011, the y-axis entails the standardized statement density (statements per day / statements in total). The illustration is based on a seven-day moving average.

3.2 Discursive Sequences before and after Fukushima

Our analysis of discursive sequences before and after the focusing event of Fukushima proceeds from the triad of materialist, institutionalist and ideational perspectives. Discourse analysis, in its classical applications is the detailed scrutiny of ideational structures such as beliefs, ideas and values, as they are conveyed in a discourse. The DNA approach combines this ideational, qualitatively oriented perspective with quantitative social network analysis. Traditionally, the latter has its root in the analysis of relational structures based on categories like power, influence and material relationships. DNA can thus help to trace both – materialist and ideational drivers of policy change or stasis, respectively, as well as their interactions. Moreover, in complementing DNA with in-depth process evidence from secondary sources, the relevance of institutional factors in post-event policy-making can be examined as well.

The study of political discourse and the surrounding policy developments in the following sections is guided by a set of questions that can be analytically disaggregated according to the triad from which our contribution proceeds. With regards to the influence of material interests on policies and the policy process, the application of DNA helps to clarify the representation of different interests in the political discourse. In particular, the role of the nuclear industry and utilities can be illuminated, as well as the question whether nuclear interests dominate the political discourse to some extent in one or several of our cases. Generally, a high representation of nuclear interests in the discourse would be indicative of policy stasis or incremental changes at best.

In terms of institutional factors, our analysis foremost tries to carve out the mobilization potential of minority coalitions, which can be traced by means of actor congruence networks. Minority coalition mobilization depends on the openness of a political system, which, apart from an indirect assessment with DNA, has to be ascertained by complementing qualitative analysis. Moreover, our analysis sheds light on institutionally and sectorally specific characteristics of nuclear policy in each of the cases, characteristics that facilitate or impede the translation of „opportunities“ into actual policy change.

Apart from the analysis of material and institutional determinants of policy-making, DNA helps to trace the ideational dimension in policy formulation as well. In this regard, the question arises how and why certain claims are present in some cases, but absent or negligible in others, given the same external stimulus. Moreover, assessing usage patterns of certain political claims in the discourse, the significance of policy entrepreneurship as well as processes of policy-oriented learning are part of our case studies.

3.2.1 Japan

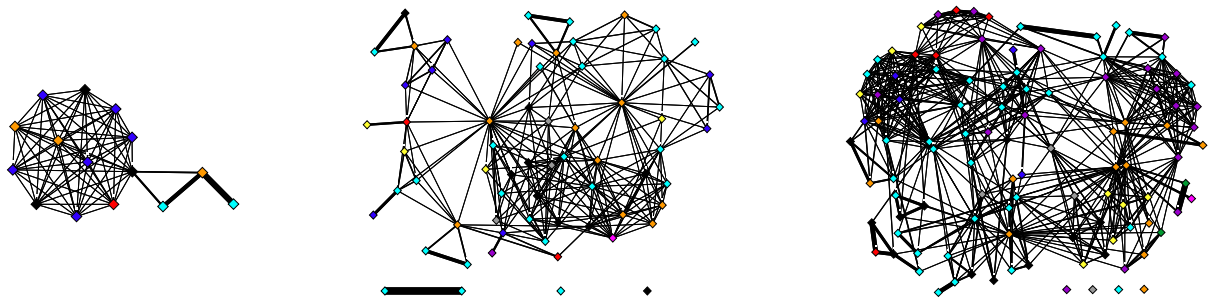


Figure 4 Actor Congruence Networks of the Nuclear Power Policy Discourse in Japan before the Fukushima crisis (left network, 01 March 2010 – 11 March 2011), shortly after Fukushima (middle network, 12 March 2011 – 31 August 2011) and during the Noda administration (right network, 1 September 2011 – 17 December 2012).

Figure 4 shows the actor congruence networks for the nuclear power policy discourse in Japan before the 3/11 crisis (left network), during the first six months of the crisis (middle network) and during the administration of prime minister Yoshihiko Noda (right network). The three sequences illustrate the evolution of the nuclear power policy subsystem before and after the 3/11 event and map the shift in actor constellations over time.

The pre-Fukushima network highlights that the nuclear power policy discourse was dominated by a single hegemonic coalition before the crisis. Almost all actors that were present in the discourse were part of the closely tied conglomerate in the left part of the network, bound together by the belief that Japan should contribute to a „nuclear renaissance“. This pro-nuclear advocacy coalition covered all the important players of the nuclear industry as well as the utilities, the powerful business federation Nippon Keidanren and governmental actors. The actors in the right part of the network were engaged in pro-nuclear sub-discourses, while still being connected to the hegemonic coalition.

The pre-Fukushima snapshot elucidates a more general pattern of Japan's economy, which is marked by a very sticky form of sectoral differentiation and, correspondingly, by rigidly compartmentalized policy networks (Lehmbruch, 1995). Vertically integrated economic sectors impede horizontal mobility between sectors, while facilitating vertical mobility like civil servants changing over to high-profile positions in the private sector or public enterprises – a Japanese tradition called *amakudari*. Moreover, retirees from the public administration frequently continue their careers as members of parliament in Japan (Lehmbruch 1995: 82-84).

With regards to nuclear power policy, these characteristics favoured the formation of close sectoral ties between policy-makers, government agencies, nuclear vendors and utilities, which were supported by the financial sector, judicial and scientific actors as well as the mass media (Koch 2001: 400; Kingston 2012: 2). The so-called „nuclear village“ developed predominance within the nuclear power policy subsystem since the 1950s, and ever since, interaction patterns between regulatory agencies, the utilities and (particularly LDP-) Diet members were marked by tight cooperation.

In contrast to the pre-Fukushima actor congruence network, the discourse about nuclear power policy had much more participants and was fragmented into various clusters representing more or less coherent bundles of claim between March and August

2011 (see Figure 4, second network).

The cluster of vertices in the west represents actors that were bound together by „nuclear renaissance“ claims and a preference for a soon restart of idled reactors. This pro-nuclear coalition comprised important actors from the nuclear village, including actors representing the nuclear industry, the business federation Nippon Keidanren, local policy-makers and the Chief Cabinet Secretary, Y. Edano. Yet, the nuclear proponents were outnumbered by the coalition of safety advocates in the center-south. This coalition included predominantly local authorities and big utility companies who called for safety investments and a review of safety standards. Besides, a rather splintered cluster emerged in the north-east, whose members advocated a nuclear phase-out and investments in renewable energies.

Remarkably, members of the ruling party DPJ and even various cabinet members were present in all discursive coalitions after 3/11. The antagonism of economy minister Banri Kaieda and prime minister Naoto Kan best illustrates the heterogeneity of political claims within the DPJ. In the post-Fukushima discourse, both were „paradigmatic“ actors as they represented different interpretations of the Fukushima crisis as well as opposing visions of Japan’s future energy policy. Whereas Kaieda was the only actor who linked the safety coalition (center-south) and the nuclear proponents (west), Kan built the bridge between safety advocates and proponents of a nuclear phase-out (north-east). Kan himself declared after Fukushima that the risks involved in nuclear power were unacceptable and that, therefore, “we should reduce our dependence on nuclear power [...] to realize a society in the future where we can do without nuclear power stations”.⁴ However, the prime minister did not find substantial support for this position within his own party DPJ.

Having promoted nuclear power for decades, the LDP, on the other hand, did not participate in the public discourse directly after Fukushima. Nevertheless, the party worked behind the scenes to destabilize its political counterpart by organizing the prime minister’s departure from office (Al-Badri 2013: 49). Despite facing a no-confidence vote by LDP and intra-party opponents, prime minister Kan managed to organize the passage of a feed-in-tariff bill for the promotion of renewable energies (Al-Badri 2013: 50), thus carrying through an important energy policy measure that opened up the extremely enclosed power generating sector.⁵ Yet, Kan had to resign before concrete denuclearization plans could be established. As the fragmented second actor network in Figure 4 suggests, keeping the ruling coalition together in light of the Fukushima crisis was a challenging task. Prime minister Kan neither succeeded in building bridges between the most divergent discourse coalitions, nor were his claims shared by a critical number of governmental actors from his party.

The term of Kan’s successor Yoshihiko Noda saw a consolidated bipolarization of the discourse, yet including several “bridging” actors between the coalitions (see right network in Figure 4). Japan’s choice in energy policy turned out to be a binary one

⁴ See the speech in July 2011 of Naoto Kan:

<http://www.kantei.go.jp/jp/kan/statement/201107/13kaiken.html>

⁵ The design of the Japanese electricity market had not been changed substantially since the 1950’s. The power supply system is still characterized by regional monopolies of ten regionally organized private electricity companies. Following a partial market reform in the 1990s, smaller power suppliers were allowed to access the market as well, but in 2011, these “outsiders” accounted only for 3.5 % of the entire electricity supply in Japan (Oppenheim 2013: 87).

between either to pursue a denuclearization path or to narrow further policy changes down to safety improvements of existing power plants. The pro-nuclear „villagers“ (in the north-west) tried to give direction to the policy discourse through emphasizing the overall economic benefits of nuclear power. At the same time, actors representing government as well as several smaller, newly founded opposition parties (in the east) conveyed their commitment to the development of renewable energies and the preference for a full nuclear phase-out. The discursive balance between both coalitions corresponds to the policy gridlock during Noda's term. Whereas Noda did not adhere to the denuclearization path, the new economy minister Yukio Edano pushed the DPJ towards a final decision on the issue. His efforts resulted in the adoption of the «Innovative Strategy for Energy and the Environment», which included a gradual phase-out policy, a ban on nuclear new build and an ambitious expansion of renewable energies.

Yet, after the phase-out plan had been endorsed by the DPJ, Japan's three largest business associations released a joint statement in which they accused the government of having ignored their objections to the plan. In an immediate reaction, the prime minister back-pedaled from the original proposition and postponed the preparation of concrete measures required for turning on the denuclearization path. These developments can be seen as a «major victory for the nuclear village» in that they entailed a «kowtowing to the large business lobby Keidanren [...], a major pillar of the nuclear village», and other nuclear proponents (Kingston 2013: 505). All at once, they cemented the new polarization of the discourse and created new venues for nuclear-sceptic claims by giving birth to various new political parties. The mobilization potential of the new nuclear-sceptic minority coalition was underscored by a public opinion shift that occurred after the Fukushima accident. Whereas a majority of 72 % supported nuclear power before 3/11, this number decreased to 41 % after the meltdown.⁶

The Noda administration came to an end when the LDP garnered a landslide victory at the legislative elections in December 2012, marking the return to power of the party that had for decades been in a cozy relationship with the nuclear industry. After the elections, the discourse calmed down significantly. In order to regain economic strength, the newly elected prime minister Shinzo Abe endorsed the construction of new nuclear power plants and urged for the restart of reactors currently off the grid, praising nuclear power as “the best and most cost-effective option” with regards to energy supply (Kingston 2013: 519).

To conclude, the sequential observation of the Japanese nuclear policy discourse around the Fukushima crisis shows how the unitary subsystem characterized by homogeneity of political claims about nuclear power policy evolved into a heterogeneous and contested one. Breaking up the “policy monopoly” (Baumgartner et al. 2014) of the nuclear village, the Fukushima events generated a diversity of claims within the subsystem and punctuated its structural setup. Nevertheless, the meltdown did not lead to immediate and far-reaching policy shifts as could have been expected in light of the severity of the crisis.

⁶ The numbers are drawn from a representative survey carried out by IPSOS MORI in 2011: <https://www.ipsos-mori.com/Assets/Docs/Polls/ipsos-global-advisor-nuclear-power-june-2011.pdf>

3.2.2 Germany

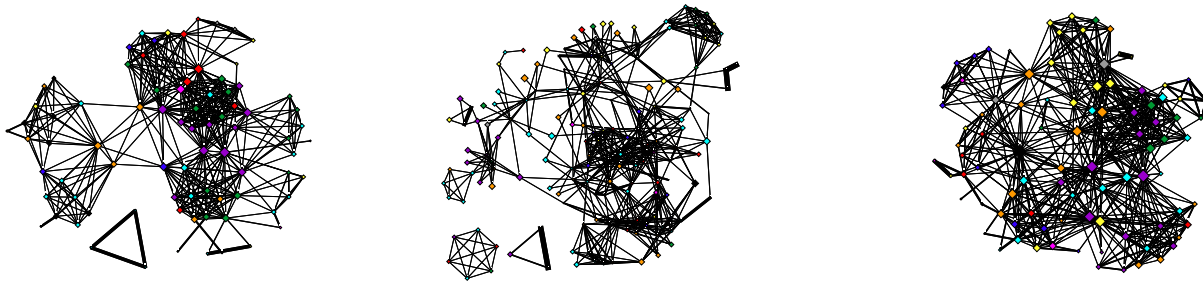


Figure 5 Actor Congruence Networks of the Nuclear Power Policy Discourse in Germany before the Fukushima crisis (left network, 01 September 2010 – 11 March 2011), shortly after Fukushima (middle network, 12 March 2011 – 18 May 2011) and until the decision of the Bundestag to phase out nuclear power (right network, 19 May 2011 – 1 July 2011).

Figure 5 shows the actor congruence networks for the nuclear power policy discourse in Germany before 3/11 (left network), during the first 10 weeks after the nuclear accident (middle network) and until the Bundestag decided to phase out nuclear power by the end of June (right network).

The German nuclear power policy discourse between September 2010 and August 2011 centered on the controversy of life-time extensions for the German reactors and mirrored the evolution of the policy subsystem over the previous 30 years or so. Similar to Japan, Germany launched its nuclear program including publicly financed research centers in the 1950's, with the first experimental reactor starting in 1960 and «giant German corporations» like AEG, Siemens and ThyssenKrupp leading the way in the emerging industry (Jahn and Korolczuk 2012: 159). Whereas support for the technology remained initially fairly high among the population and all relevant political parties, it began to wane in the late 1970's and early 1980's, when persistent antinuclear protests against the planned power plants in Whyl and Brokdorf gained nationwide attention, partly leading to «civil war-like confrontations with police» (Glaser 2012: 10). The protests gave rise to a strong and enduring anti-nuclear-movement out of which the German Green Party emerged. In light of the Chernobyl catastrophe, the Social Democratic Party (SPD) became the second political party to oppose nuclear power, stating «We want to achieve a safe, environmentally friendly energy supply without nuclear power as soon as possible. We consider the plutonium economy the wrong track» (SPD 1989: 40, translated by the authors).

Due to the pro-nuclear stance of the incumbent conservative-liberal coalition-government, it took another decade for the phase-out to be eventually adopted. In a consensual agreement, the new coalition government consisting of SPD and Greens (in office since 1998) and the energy utilities carried out a major policy shift, according to which the last NPP in Germany would go offline at the beginning of the 2020's (Koch 2001: 378; Glaser 2012: 17).

However, conservatives and liberals remained supportive of nuclear power throughout. After taking office in 2009, they seized the opportunity to revise the previous phase-out policy. Eventually, the Bundestag passed an amendment to the German Atomic Energy Act on October 28, 2010. Codifying the life-time extension of 17 German nuclear reactors, the decision has been termed a «radical policy shift» (Nullmeier and Dietz 2012: 88), implying a «huge setback to ongoing efforts to transform the energy mix» (Jahn and Korolczuk 2012: 161). The life-time extension provides the context for the German nuclear power policy discourse around the focusing event of Fukushima.

The first actor congruence network that includes roughly six months before the nuclear accident (Figure 5, left network) captures the bipolarization between proponents and opponents of nuclear power. The nuclear advocates are located in two cliques in the west of the network, being bound together by the more general claim that „nuclear power is safe“ and by the concrete demand for a «life-time extension of nuclear power plants», respectively. Comprising representatives of the big utilities RWE, E.ON and Vattenfall as well as policy-makers from the federal states and central government, the pro-nuclear cliques are clearly outnumbered by the nuclear opponents which appear in three dense clusters and several smaller cliques in the east of the network. Among the members of the anti-nuclear coalition are actors with diverse affiliations, in particular policy-makers from the opposition parties, non-governmental organizations, public utilities and renewable energy associations.

The discursive dominance of the anti-nuclear coalition was in accordance with the public mood. In September 2010, the Forschungsgruppe Wahlen observed a two-thirds majority of nuclear opponents among the German population.⁷ Moreover, the amendment led to a massive decline in electoral support for the government coalition (Jahn and Korolczuk 2012: 161). In particular, the coalition was persistently accused of having extremely tight bonds with the nuclear utilities. Nevertheless, after the decision was taken, the nuclear power policy discourse markedly calmed down in November 2010 (Figure 3).

Immediately after the outbreak of the Fukushima disaster, the German nuclear power policy subsystem experienced a drastic discursive outburst as well as an astonishing policy activism. Three days after the earthquake, the chancellor announced a three-month moratorium on the life-time extension, and less than 12 weeks after the disaster, the (still conservative-liberal) government decided to phase out nuclear energy.

The first post-Fukushima DNA time slice shows the development of the subsystem configuration between March 11 and May 19, 2011. During this period, the bipolarization of the subsystem began to recede, rendering the subsystem less adversarial than before. In particular, three processes characterize the policy discourse:

(a) Former pro-nuclear actors from central government and from the federal states successively began to articulate pro-change claims. However, the percolation of anti-nuclear claims through the political discourse did not emerge out of the blue. Rather, it was triggered by and depended on a limited number of key individuals that revised their assessment of nuclear power in light of the Fukushima crisis. Among these actors was the chancellor, who declared that the “incredible events in Japan teach us that something that was considered impossible by all scientific standards finally became possible”, concluding that “this changes the situation” (Deutsche Bundesregierung, 2011, translated by the authors).

(b) Entrenched pro-nuclear advocates like the nuclear utilities RWE and E.ON tried to halt the discursive consolidation of pro-change arguments within the government by way of offering a coherent bundle of claims and arguments about the benefits of nuclear power (hence the dense connectivity of the most central cluster of nodes in the middle network). However, their attempts were not successful.

⁷ See <http://www.forschungsgruppe.de/Umfragen/Politbarometer/Archiv/>

(c) The number of claims constantly increased during this period and the discourse temporarily became very fragmented. This was due to the emergence of a diverse set of policy proposals. Bound together by the demand for a nuclear phase-out, various claims differed in particular with regards to secondary aspects like the exact timing of the phase-out or the mix of energy types to be deployed instead of nuclear energy.

The first two months after Fukushima were also marked by several reports from expert commissions like the “Council on Global Change” and the „Reactor Safety Commission“. Additionally to these already existing advisory bodies, Angela Merkel appointed an „Ethics Commission for a secure energy supply“ on March 22, 2011, in order to review the technical and ethical aspects of nuclear energy in light of 3/11. Representing an instance of venue shifting, this strategic move was meant to underpin the phase-out decision and to weaken persistent pro-status quo voices within the formerly pro-nuclear coalition.

The last actor congruence network sheds light on the discursive structure after this transition period. As a visual inspection suggests, the subsystem finally left its adversarial setup between May 19 and July 1. Yet, the discourse was “seething” below the surface and fragmented into various clusters of claims. For example, the two densely interconnected clusters in the north-west including nuclear utilities and further representatives of a centralized energy system were based on pro-nuclear claims emphasizing the dangers of a nuclear phase-out with regards to power supply, increasing energy prices and dependence on foreign energy production. However, while opposing a quick nuclear phase-out, several members of these clusters pointed towards requirements to be met for a transformation of the energy mix, such as an expansion of transmission networks or investments in energy efficiency. The same demands were in turn shared by a number of actors representing government, among them the minister for environment and the chancellor. The government, on the other hand, shared strong discursive ties with the advocates of a quick phase-out that occupy the eastern and southern parts of the network. Comprising a multitude of actors with different backgrounds, the phase-out advocates connected their main claim with further demands regarding a nuclear-free future, among them concrete phase-out time frames or investments in renewable energies.

The dense interconnections of discourse clusters via a great number of discursive bridges, or, in the ACF terminology, “policy brokers”, constitutes the remarkable difference between the pre-Fukushima subsystem configuration and the post-Fukushima consolidation period between May and June 2011. Given the pre-Fukushima preference among dominant coalition members for a life-time extension and their belief that nuclear power was a safe technology, the approval of a nuclear phase-out by a large majority of parliamentarians can be seen as the endpoint of a positive feedback process that worked its way through the post-crisis discourse (see Baumgartner and Jones 2009, 16). This process resulted in a notable policy shift on June 30, 2011, when the Bundestag voted in favor of the irreversible shutdown of all remaining German NPPs until 2022. After the amendment was passed, the nuclear power policy discourse significantly calmed down.

3.2.1 Canada

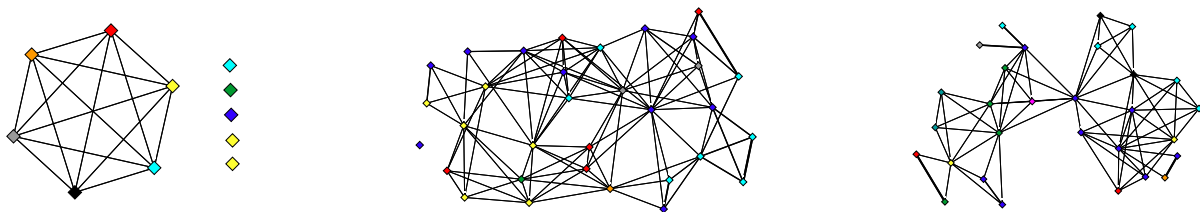


Figure 6 Actor Congruence Networks of the Nuclear Power Policy Discourse in Canada before the Fukushima crisis (left network, 30 June 2009 – 11 March 2011), shortly after Fukushima (middle network, 12 March 2011 – 12 May 2011) and two months after Fukushima onwards (right network, 13 May 2011 – 11 June 2013).

Figure 4 shows the actor congruence networks for the nuclear power discourse in Canada before the 3/11 crisis (left network), shortly after the crisis (middle network) and for the following two years post-crisis.

The relative sparse pre-Fukushima network highlights that the nuclear power policy discourse in Canada was not very active and limited to a few actors in the public realm. By way of background, it is important to note that in Canada, unlike in Germany and more recently in Japan, “nuclear policy was never a central feature of overall national industrial or energy policy nor in any consistent way to national environmental policy” (Mez & Doern 2009: 143). Canada does have a long nuclear tradition, through its involvement in US-led wartime atomic bomb research, and thanks its large uranium reserves. From it emerged Canada’s home developed CANDU heavy water reactor, and a separate nuclear medicine component of global significance, but no ambition to engage in the full fuel cycle.

Also, until recently, nuclear power policy evolved exclusively in the public sector: “The history of nuclear power in Canada, until recently, was of a partnership between the federal government and the province of Ontario” (Bratt 2012: 141). Atomic Energy of Canada (AECL), a federal crown corporation, developed the CANDU reactor, with some export ambition (Bratt 2006) while Ontario, the most populous province, built and operated reactors for electricity generation, in the context of a government-run utility sector. In Canada today, out of 19 reactors that provide about 15% of national electricity, 17 are located in Ontario (plus one each in New Brunswick and Quebec). In Ontario, nuclear power accounts for 58% of electricity generated (in 2013).

Nuclear public policy has been dominated by a broad pro-nuclear coalition that coalesces around the core belief that “nuclear power is safe”. Interestingly, this coalition includes, in addition to government and industry players, the union (CNWC) that represents workers in various sectors of the nuclear industry, as well as nuclear scientists (Bratt 2012: 25). Public opinion, actively cultivated in Ontario by nuclear industry PR campaigns, is divided between a majority pro-nuclear Ontario (58% support) where the industry and its jobs are concentrated, and the rest of Canada (especially Quebec) where on average there is only 37% support.⁸

In some ways, the traditional Ontario pro-nuclear constellation could be considered similar to the “nuclear village” in Japan, as a tight sectoral alliance between government,

⁸ Numbers are from 2012 and come from public opinion research commissioned by the Canadian Nuclear Association (CAN, see <https://cna.ca/wp-content/uploads/2014/05/2012-Public-Opinion-Research---National-Nuclear-Attitude-Survey.pdf>)

industry and scientists that could build on diffuse public support.⁹ However, this is not typical of Canada's "pluralist business lobbying" type of government-industry relations that dominate in the energy sector (Eberlein and Doern 2009: 28). The nuclear sector is hence somewhat unique in the national context as it is highly technocratic in nature and has played out within the public sector.

Since the 1970s, there has been an anti-nuclear coalition but it is much less vocal and organized than say in Germany. It appears as marginalized in the discourse prior to Fukushima. While there is a core of dedicated anti-nuclear groups - the Canadian Coalition for Nuclear Responsibility serving as the first umbrella organization - the key actors now are found in environmental organizations (Pembina, Sierra Club, and Greenpeace). The core belief is that "nuclear reactors are unsafe".

Two factors in particular have more recently undermined the cozy 'closed shop' of pro-nuclear policy elites, and have helped to strengthen anti-nuclear groups. First, a history of major cost overruns, temporary shutdowns and management failures at the Ontario utility company in the 1990s has plagued the nuclear fleet, tarnishing its image and causing cost increases to consumers. Secondly, the electricity sector restructuring in the early 2000s increased fuel-to-fuel competition and has put into question the commercial viability of further investments into nuclear. In fact, the provincial government first put on hold and then shelved (in 2013) any plans for nuclear expansion. Furthermore, the sale of AECL's commercial division (CANDU reactors) by the federal government to SNC-Lavalin in 2011 further complicated the partnership between the federal and provincial governments, with the provincial government less willing to play the 'procurement role' for CANDU reactor in a more commercial environment.

More recent developments thus added powerful 'business-case' arguments to the anti-nuclear side: "nuclear is expensive". An added complication in the Ontario case, however, is that the environmental commitment of the government to phase out coal-fired generation left the nuclear option more securely on the table than otherwise might have been the case.

The two-months window directly after the Fukushima accident shows a striking densification of the discourse, and an interesting differentiation of the discourse landscape. Unsurprisingly maybe, the accident had the effect to elevate nuclear policy to a national issue of debate. The pro-nuclear coalition remains intact, with the provincial and federal government defending the benefits of nuclear power. But there has been a slight shift in emphasis regarding the safety topic. There is an acknowledgement that in light of the Fukushima disaster the safety standards for nuclear reactors in Canada should be reviewed. In fact, shortly after the accident, the federal industry regulator, the Canadian Nuclear Safety Commission (CNSC) launched a review of all nuclear facilities. And after review and consultation CNSC developed an action plan to "further strengthen the safety of nuclear power plants."¹⁰ More interestingly, perhaps, there is also recognition among some government and industry players, including Ontario Power Generation (that operates most reactors) that "Fukushima has changed the conditions for nuclear power" – although this is mostly implied to mean that the industry will be held to even higher safety standards in the future, and that it needs to act and

⁹ Bratt (2012: 144) characterizes nuclear policy in the 1960s and 1970s as "closed shop decided on by AECL, Ontario Hydro, and government bureaucrats."

¹⁰ <http://nuclearsafety.gc.ca/eng/resources/fukushima/>

communicate accordingly.¹¹

We see on the skeptical and anti-nuclear side an increase in the number of actors present, for example from the academic sector and also US based individuals and organizations, for example famous environmentalist and energy specialist Amory Lovins from the Rocky Mountain Institute. In terms of differentiation of discourse, the topic of “nuclear power as expensive” gains in importance, in addition to the traditional concern about safety.

Looking, finally, at the last actor congruence network that captures the following two-year long period, we see a surprisingly clear polarization of the discourse and of the two coalitions that is strikingly different from the pre-Fukushima picture.

Whereas prior to the accident, the anti-nuclear coalition was all but marginalized, it now appears as one of two coalitions. We find the usual actors from environmental public interest groups and academic supporters. But there are also connections to the growing renewable industry in Ontario (Canadian Solar) on the one hand, and to the Ontario Ministry of the Environment on the other. Interestingly, the OPG (Ontario Power Generation) is situated as ‘policy broker’ between the two coalitions, and the theme of “Fukushima changed the conditions for NP” seems to operate as a bridge from the anti- to the pro-nuclear side.

This constellation requires further investigation and refinement. It may in part be a reflection of the rapid expansion of a renewable sector and portfolio, through the provincial Green Energy Act that introduced generous feed-in tariffs for renewable suppliers modeled on the German example. OPG as provincial power producer certainly takes a more balanced view of its generation portfolio, giving a larger role to renewables and energy conversation, while the share of nuclear is projected to drop below the 50 per cent.

That said, it is also clear that nuclear power will cover a large portion of Ontario’s electricity needs into at least the medium-term. While, as mentioned, new-build has been ruled out for the moment for economic reasons, refurbishment of existing plants will continue to stabilize the contribution of nuclear power at a lower level. And public opinion support in Ontario remains stable even after the Fukushima accident.

As such, one has to be cautious in the Canadian case to interpret Fukushima as a punctuation event or critical juncture. It may have accelerated some larger economic and environmental developments towards a lesser role for nuclear power in the Ontario energy mix, and may make its expansion into other provinces very difficult if not impossible. But, as Bratt writing in 2012 (: 292) notes, the ‘external perturbation’ of Fukushima “does not appear to have altered the nuclear agenda of any of the policy brokers in Canada.”¹² Nuclear power remains a respectable contribution to Ontario

¹¹ See the speech in May 2011 of Wayne Robbins, Chief Nuclear Officer at OPG: [http://www.opg.com/news-and-media/Documents/Wayne%20Robbins%20Ontario%20Power%20Summit%20May%2010%202011%20FINAL%20\(u\).pdf](http://www.opg.com/news-and-media/Documents/Wayne%20Robbins%20Ontario%20Power%20Summit%20May%2010%202011%20FINAL%20(u).pdf)

¹² Addressing the case of Quebec, Bratt (2012: 291) writes: “Only in Quebec was there an apparent policy reversal resulting from Fukushima-Daiichi when the Charest government delayed the refurbishment of Gentilly-2 pending more analysis. However, even in Quebec, this simply reflected a stronger anti-nuclear sentiment that had existed in the province *before* Fukushima-Daiichi.”

energy needs - but it is now being held to higher safety and transparency standards, and, in addition, is being looked at more critically through a commercial, and not any longer purely technocratic, lens. To be sure, this may, over time, erode its viability – but this appears to be a rather incremental process.

3.3 Comparing Policy Sequences in Japan, Germany and Canada

The longitudinal comparison of policy discourses in Japan, Germany and Canada yields a number of insights. First, following Pierson's (2000: 264) expectation that the same event "may have a different effect depending on when in a sequence of events it occurs", the Fukushima stimulus had quite different effects on issue definition and policy-making across different countries.

Whereas the Fukushima stimulus decisively attenuated the subsystem polarization in Germany and resulted in a largely unitary configuration that underpinned major policy change, the discursive landscape in Japan developed from a unitary to a polarized configuration. This finding corroborates the expectation that crises can lead to the mobilization of a new minority coalition and thus punctuate the institutional setting of an initially unitary subsystem (see Nohrstedt & Weible 2010). In Canada, the pattern of a hegemonic pro-nuclear coalition with marginalized anti-nuclear opponents seems to evolve into a polarized configuration with a stronger representation of nuclear skeptics and opponents; however, we need to keep in mind the fundamental difference in nuclear power policy between the provincial (subnational) Ontario constellation and the federal (national) level when interpreting the Canadian case. These findings highlight the expectation that "the specific setup of a policy subsystem [...] has implications for policymaking dynamics in the wake of crisis" (Nohrstedt & Weible 2010, 3).

Having a closer look at actual policy changes, Germany stands out as the case where the most far-reaching policy change after Fukushima was enacted. Canada, representing the other extreme, represents a case of policy stasis. Here, the 3/11 accident only marginally affected the political agenda. Japan did not see a major policy shift either, but underwent a series of seemingly minor policy adjustments that changed the conditions for nuclear power to a considerable extent. For example, the introduction of "the world's most generous FIT" (feed-in-tariff) scheme in 2012 (Oppenheim 2013, 99) has contributed to breaking up the previous policy monopoly of the "nuclear village" by substantially cutting the entrance barrier for new competitors in the energy market.

Our analysis illustrates that major policy change after a focusing event does not materialize out of the blue. Instead, a polarization of the subsystem – i.e., a receptive institutional setting – and the availability of alternative policy ideas and proposals seems to be a necessary condition for major change. In addition, the significance of policy entrepreneurship as it could be observed in Germany should not be underestimated.

4 Discussion and Conclusions

The detailed and longitudinal analysis of policy discourses in the three countries was at the core of our empirical analysis. Providing us with a solid micro-foundation of actor dynamics in the nuclear policy field before and after the pivotal moment of the

Fukushima accident, the discourse network analysis revealed shifting actor coalitions in the three countries under scrutiny.

The comparison of these different dynamics reveals, first, that focusing events such as the Fukushima accident do matter, but that they matter in quite different ways, and in ways that are difficult to deduce from macro-level variables that may distinguish the different cases. Moreover, how they matter is also not simply a function of 'crisis proximity' (Nohrstedt & Weible 2010), as the contrasting policy outcomes in Japan and Germany show. An interesting form of crisis impact is the Canadian case where we have less of a shock-like jolt but rather an accentuation of broader forces that impact the policy subsystem such as sector restructuring over a longer time window.

Discourse network analysis proved very useful in shedding light on and substantiating diachronic policy trajectories. Yet we need to contextualize these shifts in discourse and actor constellations by a nuanced understanding of the specific material and institutional legacies and settings that mediate the event impact in the three cases. In addition, situational factors like the timing of elections influence the policy trajectory, as is true for both Japan and Germany.

Appendix: Description of Data and Sources

Variable	Description	Unit	Sources
<i>Dependent variable</i>			
Change in Nuclear Energy Share	Change of electricity production from nuclear power from 2000 to 2010	Difference between 2000 and 2010 in percent	US Energy Information Administration (http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=2&pid=27&aid=12&cid=regions&syid=2000&eyid=2012&unit=BKWH)
<i>Independent variables</i>			
Share of Nuclear Energy	Electricity production from nuclear power from 2000 to 2010	Average between 2000 and 2010 in percent	US Energy Information Administration (http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=2&pid=27&aid=12&cid=regions&syid=2000&eyid=2012&unit=BKWH)
Green Parties Share	Seatshare of Green Parties in National Parliaments (First Chambers in Bicameral Systems).	Average between 2000 and 2010 in percent	Heichel, Rinscheid and Knill, (forthcoming) Party Family Dataset "PARFAM" Nohlen and Stöver (2010) Elections in Europe: A data handbook Döring and Manow: ParlGov Database wikipedia (Mongolia and Mexico).
Public Opinion against Nuclear Energy	Share of respondents with attitudes against nuclear energy	Percentage in 2011	IPSOS MORI (2011): https://www.ipsos-mori.com/Assets/Docs/Polls/ipsos-global-advisor-nuclear-power-june-2011.pdf WIN-Gallup (2011) Japan Earthquake Jolts Global Views on Nuclear Energy: Findings from a Global Snap Poll in 47 countries by WIN-Gallup International

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