Policy Networks as Governance Forms and Power Structures

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ABSTRACT

This paper gives a theoretical and methodological overview on the research on policy networks. In spite of the many theoretical variants in which this new concept is used and applied, one can essentially distinguish two main directions: One concept understands networks a non-hierarchical cooperative contexts consisting of diverse private and public actors formulating and implementing a given policy. Another concept derived is from graph theory and includes all conceivable networked configurations as network. After an exemplary presentation of different study types and methods within this second research direction, it is shown that this research orientation can be combined with (almost) all policy theories. It is important that political networks from this perspective can be analysed not only as forms of governance, but also as power structures. On the basis of the theory development in the last decades it is argued that most research programmes are focused on the micro and meso levels of society, while there is a lack of studies by which the macro structure of the society is integrated into the analytical picture. Policy networks are also embedded to patterns of functional and organizational differentiations of society. It is stress that this analytical level should be reintroduced into the analysis of policy-making. An example from climate research briefly shows how such a macro-level oriented policy network research could proceed.

INTRODUCTION

An important innovation in policy research in the last decades of the 20th century was the discovery of non-hierarchical, decentralized configurations in policy-making, in which state and non-state actors exchanged information, pooled resources and collaborated in the formulation and implementation of public policies. In such a perspective, the state-centric view of public policy making had been abandoned and in a certain sense, a societal perspective was inserted into public policy analysis. In order to grasp this extended view of policy-making, two complementary concepts had been introduced, the policy network concept as well as the concept of networked or collaborative governance. In addition, new relational methods of empirical social research – social network analysis - were used to precisely describe these complex configurations.

This extended perspective on policy-making also implied that aspects such as power and conflict, core problematics in political theory and the theory of the state, became less important. Studies from the governance perspective were more interested in the comparative efficiency of different problem-solving mechanisms than in issues of power-sharing and conflict-resolution. The reproach that the governance perspective tends to depoliticized technocratic problem-solutions is not entirely unjustified. Frequently, efficiency criteria are in the foreground, at the expense of the political dimension of societal problem-processing. In this perspective, critical questions with regard to social differentiation, power structures, and democratic deficits get easily dismissed.

One might suspect that this technocratic bias is already applied in the methods of network research, because networks intuitively suggest a voluntary interaction of autonomous actors. However, this paper will show, that the blindness to the power dimension is not a general feature of network studies, since many network studies were particularly inspired by sociological power structure research. Many studies of this research orientation tried to uncover power structures, relations of domination, and various forms of social differentiation by new techniques of structural and relational analysis. Their aim was to unveil the inner core of power structures to reveal political inequalities, political closure and democratic shortcomings.

The theoretical and conceptual basic problem in the research on policy networks is the fact that there are essentially two policy network concepts that basically imply completely different meanings. Only one concept is limited to the implicit restrictions of the governance perspective, whereas the second concept is compatible with many policy theories in which power and conflict play an important role.

The aim of this paper is to clarify these conceptual differences and, in particular, to emphasize the contribution of the formal network concept to the broad field of policy studies. Since the great strength of the formal network concept is its applicability to all networked configurations, it is not limited to a singular theory, but can be combined with many policy theories. In a sketch of the theory landscape of policy research, these potential and existent combinations are illustrated. In the last section, it is emphasized that the quantitative network analysis in policy research, which until now has been strongly focused on the micro and meso levels, should be opened up for macro and multi-level analysis.

THE POLICY NETWORK BETWEEN THEORETICAL FRAMEWORK AND METHODOLOGICAL TOOLBOX

Since the rise of network thinking in the social sciences during the 1970s, the network concept also gained currency in policy research. In very general terms, it aims to depict the interaction of multiple actors in policy-making as interconnected sets of points and links. Metaphors from the everyday language such as the spider web or the fishing network make such complex arrangements easily comprehensible and also emphasize a key proposition of this concept: a multiplicity of actors involved and the decentralized character of this structure.

Beyond these basic assumptions, however, a multitude of different ideas have developed on what policy networks precisely represent and what distinguishes them from competing concepts, such as policy communities, subsystems, or policy action sets. In a review, Tanja Börzel compared this situation to the Babylonian language confusion (Borzel, 1998). In the meantime, there are dozens of review articles on policy networks which collect a broad range of ideas about this social science concept. In an attempt to resolve this confusion by a recent meta review, Heike Brugger shows that the policy network approach often is conceived not only as an amalgamation of multiple antecedential theories, but also as a theory net involving a number of other often complementary theories on politics and policy-making (Brugger, 2017).

In a somewhat simplified categorization, there are two different views on the analytical potential of the policy network concept:

(1) There is one group of scholars who speak of policy network theory in the sense of an integrated substantive theory which aims to conceptualize a generic socio-political configuration represented by the policy network concept (Enroth, 2011; Kenis and Schneider, 1991). This perspective is strongly influenced by neo-institutionalism in sociology (Powell, 1990). A central proposition in this perspective is that policy networks should be conceived as a specific form of governance in which a multiplicity of actors

work together, share information and other resources in the process of political problem-solving. This governing process includes not only the usual suspects of actors within the jurisdiction of government and administration, but also non-governmental players that have stake in political problem-processing. While there is a shared view that networks consist of multiple actors, non-hierarchical relations and repeated interactions, empirical network patterns are so diverse that it is difficult to generalize a given form. The explanatory power of this concept is thus limited, and analysis in this theoretical orientation is often done in a purely interpretative or metaphorical way.

(2) A more diverse group uses the notion »policy network« less for the precise description and analysis of a specific socio-political configuration, but rather as an umbrella term for diverse actor constellations and multiple relational layers (Pappi, 1993). The term network here is a purely formal concept representing all conceivable configurations of nodes and links. This concept is based on graph theory which can be combined with a variety of substantive theories. Graph theoretical concepts can be used to describe and analyse the above mentioned configurations of networked governance, but they can also be used to describe power structures (e.g. hierarchical control) or even decentralized forms of market coordination.

In mathematical graph theory a network is abstractly defined as a set of nodes and edges (Brandes, 2010; Brandes and Erlebach, 2005). All configurations discussed in the first group can be represented by this concept, but also a relation between only two nodes, and even a hierarchical structure in this formal perspective is a network. A decentralized structure, durability and reciprocity of relations are not defining features of networks in a formal perspective. Thus, all entities that can be analysed in terms of nodes and edges that are involved in policy-making can make up a policy network. The difference between the two concepts mentioned above is clearly illustrated by the various diagrams in Figure 1 where all seven configuration are networks in graph theory, whereas only configuration h) is a network in a sociological-institutionalist perspective.

Graph theory includes a large number of formal concepts for the description of relational configurations. A simple chain of subordinate relationships (f) is a graph and a network. An all-channel network (c), in which each node is connected to each other, is called a "complete graph". The configuration d) is a ring, and d) a star. For the configurations (g) to (j), there are no terms in graph theory, which would at the same time denote a substantive theory as well as a formal system of concepts, such as the theory of a perfect market. The latter most closely corresponds to an all-channel network, in which every buyer is perfectly informed about every seller.

insert Figure 1 about here: Two types of network concepts

The study of policy networks in this formal perspective implies the application of quantitative network analysis to the structures and processes of policy-making. Network analysis in this respect is primarily a methodical toolbox based on a specific collection of mathematical concepts, statistical procedures, and visualization techniques. There are essentially seven types of methods that have proved to be fruitful in the analysis of policy-making:

1. Methods to delineate network boundaries and to select the various nodes, i.e. policy actors or stake holders;
2. Concepts and procedures to describe network structures and to specify prominent positions in the network based on centrality, status or other indexing concepts;
3. Concepts and methods to decompose the network into regions or subgroups, applying concepts such as cliques, communities, blocks or clusters.
4. Concepts for the description of total networks such as density, connectedness, or clustering.
5. Concepts and procedures for the analysis of indirect connections based on compound relations. A popular method is the creation of one-mode projections of two-mode affiliation networks, for instance to identify actors that are connected by events, or events that are linked by participating actors.
6. Statistical procedures for the identification of networking determinants, e.g. to explain why actors exchange information with other actors either by the coexistence of other relations of by actor attributes.
7. Simulation, tracing, and statistical modelling techniques for the analysis of network dynamics.

Useful methods to identify policy actors are influence reputation surveys or media studies. Actors are included in a policy actor set if they reach a certain minimum level of influence scores, or if they attain have a certain degree media attention. A sophisticated multi-step approach was proposed already in the 1980s, combining expert panels, media analysis and a network survey (Laumann and Knoke, 1987). Just for the delineation and identification of the policy actor system network analysis alone can make a valuable contribution (Hermans and Thissen, 2009).

insert Figure 2 about here: Network Layouts and Analytical Levels

A given set can be analysed in many ways using the above mentioned methods of positional analysis, subgroup detection or total network description. Already a visual analysis based on various network layouts is instructive (Brandes et al., 1999). Figure 2 illustrates an exemplary graph and some of these analytical steps.

For exemplary purposes we analyse a fictitious network of twelve actors, consisting of two governmental organizations, three parties, three interest groups, two firms and two international organizations, and the actors are engaged in information exchange. The network is depicted in Figure 2. There are different layouts in the first row that show different aspects of the network.

The first diagram classifies the actor into organizational types; the second shows a configuration in which each connection implies the same distance so that the central region is clearly exposed; the third is putting the actors on a circle in order to make network density intuitively visible. In the second row the network is analysed with respect to different aspects: Centrality analysis based on "degree centrality"; a specific form of subgroup analysis, and density analysis in a visual form.

Centrality based on degree indicates the number of links in which an actor is involved. There are many other centrality indices that measure different aspects of network prominence. Well known is also the concept centrality based closeness. It measures the number of path links an actor needs to reach all other actors in the network. The actor with the lowest number of path links is most central. Another popular indicator is betweenness centrality, which measures the number of shortest paths on which a node is positioned. This is commonly conceived as an actor's capacity to control network flows or connections.

Figure 3 depicts a graph designed by Brandes and Hildenbrand which shows a single configuration in which different nodes occupy centrality positions according to the applied centrality concept (Brandes and Hildenbrand, 2014). Node D is central with respect to centrality based on degree. Node C is central with respect to centrality based on closeness, and Node B is central based on betweenness.

insert Figure 3 about here: Centrality Concepts

The analysis of subgroups as depicted in Figure 2 is based on the Girvan–Newman algorithm which aims to split up the network in subgroups to create a macro structure of the network. This procedure detects communities by stepwise removing edges from the original network and leaves the connected components as the subgroups of the network. The algorithms for centrality analysis and subgroup detection is implemented in the network analysis software *visone* which was used also for other visualizations (Brandes and Wagner, 2004). For its basic principles for network layouts see also (Brandes et al., 1999).

A further analysis involves the creation of compound networks for the detection of indirect links via one-mode projections of two-mode network relations. Such combinations are created by matrix algebra. The various diagrams in figure represent this type of analysis. From a one-

mode network indicating the actors and their involvement in policy venues (a), two networks of indirect connections can be generated by multiplying the original matrix with its transposed version: A network that represents connections between actors participating in the same policy venue (b), and a network that shows connections between policy venues when there is at least on actor that is participating in both policy venues (c). In the second row of diagrams this type of analysis is also applied to the study of belief networks leading to co-occurrence networks of actors sharing the same belief, and beliefs sharing the same actors. This one-mode projection of affiliation networks is a key method for the analysis of discourse networks (Leifeld, 2016a).

insert Figure 4 about here: Affiliation Networks and Networks of Cooccurence

The sixth type of analysis is the statistical modelling of network relations. Because networks consist of interdependent entities, conventional regression analysis is not applicable, which presupposes independent variables. Specific methods have been developed by which these restrictions are overcome, which became popular as Exponential Random Graphs (for an application see Leifeld and Schneider, 2012). Using these statistical approaches, a large number of policy theories can be examined in terms of their relational hypotheses (Lubell et al., 2012).

The last mentioned type of analysis deals with network dynamics. It aims to understand the dynamics of link creation, but also the logic of network growth and network change. It is also interesting in this context, which effects the disconnection of nodes has for the overall stability of a networks. Such questions, for instance directed to network resilience, have been addressed particularly by network scientist in the context of internet research (Schneider and Bauer, 2016). In the field of political networks, the dynamic analysis of network is still in its infancy. An interesting development in this respect is shown particularly by discourse network analysis (Leifeld, 2016b). In social network analysis and general graph analysis, however, it is currently an academic growth industry (Beck et al., 2017; Snijders and Doreian, 2010).

NETWORK STUDIES IN POLICY-MAKING

While the basic idea of graph theory has a long history, most of the methods have been developed since the last few decades. In a first wave, method development was mainly driven by psychologists and sociologists in the context of social network analysis (SNA) (Borgatti et al., 2009; Hennig et al., 2012). In a second wave since the end of the 1990s, further impulses came from physics and computer science, merging multiple disciplinary network studies into network science (Brandes et al., 2013; a textbook in this perspective provides Newman, 2010; for an overview see Schneider and Bauer, 2016).

During the last three decades, formal network analysis also has entered political science, and in particular policy research and public administration (Isett et al., 2011; Ward et al., 2011). Networks in policy-making include a wide range of material, institutional, and ideational relations which link actors directly and indirectly to the initiation, formulation and implementation of public policy. Frequently mentioned relations are support, cooperation and information exchange. Nodes can be individuals, organizations or entire nation states.

Network research has discovered this research topic in the 1970s and 1980s. Inspired by anthropological studies of small communities, the first prominent political network analysis dealt with networks in a German small town and focused on informal relations within the functional elites of local policy-makers (Laumann, Pappi 1976). During the 1980 and 1990s network studies spread into all other areas of political analysis, such as domestic politics, comparative politics, international politics, policy studies, and public administration (a short overview gives Schneider 2017).

The formal use of the network concept in these studies does not mean that these are purely descriptive. In most cases quantitative network analysis is combined with social or political theories in such a way that formal network concepts are used to operationalize substantive theories. For instance, Laumann and Pappi used a structural-functionalist framework to link the various elite positions to Parson's four societal subsystems (AGIL), and to study informal relations of the local decision-making elite within and between these societal subsystems (Laumann and Pappi, 1976). On this basis methods like multidimensional scaling and clique analysis were used to describe influence structures within decision-making elites with respect to conflicts over local policy issues.

Later network analysis diffused to policy research at the national level and also to the international and supranational levels. Studies either covered whole policy areas (energy, health, labour, etc.) or individual policy processes, for instance of law formation or regulation. Many policy-network studies emerged since that time, in which policy actors as nodes and a variety of relationships had been studied at all political levels and in all stages of the policy process. The variety of relationships that are effective in policy processes is considerable. The spectrum reaches form information exchange, collaboration over institutional intermediation to ideational patterns of inter-actor affiliation. In a systematic overview on quantitative policy network studies, it was found that in most cases data on information exchange, contact, cooperation and influence reputation had been collected. Less studied are alliances, common interest, conflict, competition and trust. At that time relationships via common beliefs were the least investigated (Leifeld, 2007).

In the meantime, however, more and more network studies are exploring this ideational sphere of policy-making (Fisher et al., 2013; Ingold, 2011; Leifeld, 2013; Schneider and Ollmann, 2013). Popular research subjects are policy debates in parliaments or in mass media, and also increasingly in social media. Some of the studies focus on specific analytical frameworks, others combine different policy theories. In the meantime such multiple theories and methods combinations can be found in many policy studies. The number of substantive theories and conceptual frameworks that are compatible with and complementary to the formal network concept is large. In the next section an attempt is made to unfold and map this theory landscape that could be explored by network analysists.

THE THEORY LANDSCAPE OF POLICY ANALYSIS TO BE EXPLORED BY NETWORK ANALYSISTS

The theory landscape of policy network analysis is inhabited by a number policy theories that are based on relational concepts, or show least some degree of compatibility with relational thinking. Concepts are compatible if the complexities of a policy development can be formalized by configurations involving nodes and links. There are many possibilities for this, and because of its multi-dimensionality, the conceptual state space is huge. At the same time, however, it must also be noted that not every formal concept is appropriate and makes sense for the analysis of policy-making. Here one must find the right cut between substantial research questions and formal concepts.

In the following comparison the following facets of a policy theory are distinguished: Societal levels, societal spheres, territorial levels, policy phases, and, finally, the question of governance or power orientation of a theory.

Societal levels. Theories can have a purely individualistic orientation and try to trace policies back to the actions of individuals at the micro level. Theories and concepts of this mode of theorizing are often based on methodological individualism, most popular is the rational choice perspective. The counterpart in this analytical continuum is holism. Holistic theories explaining policies by societal macro structures, and most prominent here is Marxism. In a Marxist perspective all societal levels and spheres (politics, law, culture, etc.) are derived from the working logic of capitalist economy. In this view society is a totality, in which all subunits are mere functions of the highest level that are deprived of any autonomous logic.

Between the micro and macro levels several layers can be distinguished. Looking from bottom up, the next societal layer is the organizational level. Here, individuals are grouped into organizations (corporate actors). Above that is the level of social groups or classes, and a further level directly below the macro level is the level of societal subsystems. At this level society

differentiates into functionally specialized areas such as politics, economy, science, education, law, etc.

Social spheres. The second dimension differentiates between four spheres or facets of social reality – the material, institutional, relational, and ideational. The material sphere of society refers to concrete, physical, biological, etc. things and related interests, resources and interactions. Typical material interests refer to human basic needs. For example, the interest in jobs being in conflict with a particular energy policy decision, is a typical material interest. Or the actual lack of energy resources to heat a home is a material problem, while the discourse about energy poverty at the perceptual level can be completely detached from the actual lack of resources (Imbert, 2016).

In the sphere of "the relational", social relations between individuals and organizations are at the forefront. It is assumed that interpersonal relations create trust and empathy. At this point, however, it should not be overlooked that there are similar ideas of the relational as a kind of holism, as it was described above. A radically relationalist view deduces even nodes from relations (for an overview see Schneider, 2015a).

The institutional sphere refers to rules and norms that structure problem perception, interests and actions. This institutional sphere is sometimes difficult to separate from the ideational. In some perspectives (e.g. within sociological institutionalism) both spheres overlap. However, if constitutions, laws and administrative procedures stand out more than others within the institutional sphere, the distinction is easier.

The ideational is accordingly the sphere of cognitive representations of reality. It is the sphere of ideas, beliefs, and images. Recent policy theories put emphasis on discourses, frames and narratives to grasp this ideational level in policy processes.

Territorial levels. Although most studies are based on the national level, policy networks can be explored at all territorial levels, from the launch of a new infrastructural project in a city (Nagel, 2015) or from local climate policy (Brugger, 2017) to climate negotiations in an international organization (Sprinz et al., 2016), to name but a few specific examples.

Policy phases. Just as policy studies can relate to total policy fields or entire policy processes, the analysis of a networks of actors involved in policy-making can also focus only on specific phases, such as on agenda-setting, or policy implementation. Relatively new are dynamic network studies on overall policy processes, which require entirely new methods for relational process tracing and also for dynamic analysis.

Governance or power orientation. This last facet classifies theories according to their answers that they give to the classical question of political theory, which goals a government or a ruler should pursue from a normative point of view. The extreme poles in this dimension are marked by Plato on the one hand and Machiavelli on the other. Plato compares the good ruler with a helmsman who steers his ship through a stormy sea with the best expertise, and with regard to the common good for his crew and his passengers. Machiavelli, on the other hand, advises his prince to direct all actions and strategies to the goal of gaining and maintaining power. Plato's helmsman, in Greek Cybernetes, provided the foundational idea for the science of cybernetics, in which the process of governing is conceived as a quasi-automatic self-regulation mechanism in which sensors detect undesirable states and initiate corrective action by actuators. From a cybernetic perspective, policies are therefore processes of problem processing, in contrast to the power perspective in which policies are only instrumental actions for the ultimate goal of gaining and preserving power. For many centuries, political theory has sought to find middle ways in which both perspectives - power and governance - are united. This is done on the one hand by specifying how problem-solving can be achieved under the conditions of maintenance of power. Or, on the other hand, how power-seeking can be successful without the recurrent displacement or suppression of societal problems.

This section is an attempt to list the major – also classical - policy theories in order to mark the opportunity space for studies where formal network concepts are applicable. The various theories are depicted in a temporal order within a kind of "evolutionary sketch" (Lang et al., 2008), to highlight the most important intellectual development lines.

In this respect, the various policy theories (1) are located in periods in which they became popular, (2) positioned in the social sphere on which analysis is mainly based, and (3) intellectual influence relations between theories are represented by arrows. Some of these theories penetrate different societal spheres. This applies in particular to institutional and relational concepts, which are placed in the middle of the diagram. On the left-hand side are theories, which emphasize material aspects, whereas the right-hand side collects the ideational stream of policy theories, which is growing steadily in recent decades.

insert Figure 5 about here: The Evolution of Policy Theories

These theories are now presented in detail, and some selected examples of policy network studies are quoted as applications. Some approaches where applied quite often, some network studies combine multiple theories, and some policy theories are potential candidates that are not yet used in policy network studies.

The diagram begins with **Marxist theories** of class struggle, in which public policies express the material interests of the ruling class or class alliance. In this perspective, governmental action has nothing to do with problem solving, but only with economic interests and power politics. Pluralist group theory broadened this idea of understanding politics as power struggle to a struggle within a spectrum of multiple groups, which also may include ideational groups (Bentley, 1926). In this perspective, policies are then conceived as the expression of an equilibrium in a system of group pressures.

It was only with **system theories** that ideas became popular in which societies and states had to deal with challenges from their environment and problems of adaptation within society, to preserve existing orders. It was no coincidence that the policy sciences had been developed in this period based on the idea, that societal problems could be better solved with a broad pooling of scientific expertise. During this period, many approaches of system science emerged which applied cybernetic models to politics and conceived the governing process as a process of self-regulation in which the political system detects undesirable states and initiates corrective action by the formulation public policies.

System theories were holistic, their analytical level was the macro plane, which abstracted from groups and individuals. In response to holistic macro theories, which have been accused of functionalist fallacies, individualist theories put emphasis at decisions at the micro level, and collective action and exchange were explained by the rational choice of actors in the pursuit of their material and power interests. Individualist **exchange theories** first developed in sociology and subsequently diffused into political science, particularly through James Coleman's model of political exchange (Coleman, 1972). By this way, sophisticated mathematical modelling of exchange and bargaining relations - analogous to those in economics – entered the realm of policy studies (Knoke et al., 1996; Pappi and Henning, 1999; Stokman and Van Oosten, 1994; Thurner and Pappi, 2009).

In this exchange model policy actors - individuals or organizations - need resources to shape policy outputs. Lacking resources can be mobilized through exchange, and in these transactions, relative prices emerge that express supply and demand for influence resources. Starting point is an "interest network" which depicts the intensity of interest the actors have in a set of salient policy issues. The power resources that actors control in order to influence their policy issues there is depicted as "control network". Some actors have control on issues in which they are less interested and lack control on issues in which they have stronger interests. Lacking control is mobilized by exchange, thus actors ultimately exchange control. This baseline model and more complicated versions had been applied to a number of policy areas and levels

of policy-making. One variant made the important distinction that not all actors involved in ex-change relations have direct access to decision-making venues, and they are thus intermedi-ated by agents (Knoke et al., 1996).

A recent example of such a model is applied to climate policy at the global level (Sprinz et al., 2016). In the problem-versus-power orientation perspective, this model is clearly mixed. On the one hand it emphasizes the distributed mobilization of resources and collective pooling by exchange and bargaining processes. This is clearly oriented towards collective problem-solv-ing. On the other hand, the model also identifies influential positions and power structures based on asymmetric dependencies in such networks.

Another stream of theory development that arose in response to system theory was **rational choice** theory. This is an umbrella term for a variety of actor-centred theories in which policy-making is based on rational interaction of individuals or organizations. In this perspective, an actor's decision is studied within conflict constellations in which utility-maximizing supposes strategic interaction. This implies the anticipations of the actions of others in a system of action. Typical constellations are formalized by game theory. An important distinction there is between cooperative and non-cooperative games. In non-cooperative games, all players choose their strategies independent of each other while in cooperative games players may coordinate their behaviour by information exchange and bargaining. Network analysis can be used, to study such communication links, but only few applications of this perspective exist in policy analysis.

Neo-corporatism can be considered as a combination of group theory and exchange theory at the macro level of a political system. Policies in this perspective are bargained compromises between the government and large societal groups, particularly capital and labour. Analysis here is focussing on tripartite configurations in economic and fiscal policy which involve gov-ernment, employers and the trade unions, where the last two are represented by their peak associations. With respect to the power-seeking versus problem-solving topic, the orientation of this approach is mixed, since an important assumption is that corporatist arrangements en-able bargained policy outcomes that are superior to policy outcomes that emerge from unco-ordinated political-economic power struggles in pluralist policy arenas (Schmitter, 1981). Cor-poratist negotiation systems have been entrusted to reconcile various macro-economic goals such as high growth, low inflation, low unemployment, and exchange rate stability (Streeck and Kenworthy, 2005). There are some applications of formal network analysis in this perspec-tive studying networks of information exchange and bargaining between peak associations and government as well as between peak associations and their affiliated members (Grote et al., 2008). A recent analysis attempts to check, whether coalition formation in Finland's climate policy-making can be explained either by neo-corporatist or by competing concepts. It is an

interesting approaches that relates policy networks to societal macro structures (Gronow and Ylä-Anttila, 2016).

Some more simple theories are applying a resource-based view of group politics also to the organizational level. In the **power resources approach**, public policies (e.g. the expansion of the welfare state) are explained by the long-term organizational power of trade unions in one country (Korpi, 1985). The **party government approach** explains public policy tendencies in government spending or privatization by the long-term government takeover of left or right wing parties (Schmidt, 1996). With respect to the power-seeking vs. problem-solving perspective, these approaches are clearly power oriented, since the analysis of interest realization of social groups has absolute priority in this analysis. This type of macro group analysis has not yet been carried out by network analysts, although various aspects in the analysis of policy preferences and influence reputation of parties or trade unions could be carried out with such methods (Kleinnijenhuis and Pennings, 2001). Also statistical modelling could be a strategy to test implicit relational propositions of these policy theories.

The complex combination of concepts in **"patterns of democracy"** (Lijphart, 2012) can be understood as a framework that integrates aspects of neo-corporatism, party government, and other institutional aspects for the study of power distribution in political systems. Major institutional features of democratic systems are presented by a battery of variables measuring items such as numbers of parties, level of bicameralism, degree of interest group pluralism, etc. In a second step, these patterns are aggregated into two dimensions of power distribution: A vertical dimension differentiates between unitary and federalized political systems, and a horizontal dimension differentiates between systems exhibiting high degrees of power concentration in governments and parties versus systems with a high dispersion of power among non-majoritarian actors in politics and society. From the macrostructural patterns of political systems, hypotheses about policy actors and patterns of power distribution can be derived, which can easily be checked by the boundary-specification methods of network analysis described in the section above. In addition, also in this context statistical models can easily be applied to test the distribution of power in policy networks.

A similar power-centred perspective applies Tsebelis' **veto player approach,** which is also influenced by a combination of structuralist and institutionalist perspectives (Tsebelis, 2002). Policy influence here is large derived from veto positions which policy formulating actors acquire via institutional structures and party system configurations. This may be, for instance, the power of a second parliamentary chamber to veto a law, or the power to stop a governmental action by each of the parties in a coalition government. Political systems differ in this respect by their institutionally determined number of veto players. Spatial analysis in decision-making shows that the greater the number of veto players in a political system is, the more difficult it

is to generate policy change. While this perspective became quite popular also in recent policy studies because of its clear mathematical foundation. Until now there are no or only few network studies which test this rather bold veto player hypothesis. But also in here the boundary specification and statistical modelling methods of policy network analysis can be used to check the predictions about the impact of veto players in a policy system.

There are further neo-institutionalist versions in which game theoretic modelling is combined with institutional analysis. Here it is assumed that actors are constrained but also enabled by institutional rule systems. The **institutional analysis and development framework** (IAD) of Ostrom (1991; 2011) and the **actor-centered institutionalism** of Mayntz and Scharpf (Mayntz, 2003; Mayntz and Scharpf, 1995; Scharpf, 1997) are examples with rather specific implications for interaction and network structures.

Ostrom's IAD framework emphasizes that policy making systems not only contain rules that specify actor's attributes and interaction outcomes, but also relations between actors, such as information rules: "Information rules authorize … channels of communications among participants in positions and specify the language and form in which communication will take place" (Ostrom, 1986: 19). With network analysis, the effectiveness of these information rules can be checked on the basis of information exchange data. There are, in fact, some studies that apply at least some propositions of the IAD approach in network studies.

In actor-centered institutionalism (ACI) too, multiple actors with different interests, specific action orientations, and typical conflict constellations are the starting point. Conflicts are mediated by various institutional arrangements which facilitate or hinder certain policy outcomes. Since institutions facilitate coordination, various forms of coordination imply different transaction costs. Scharpf (1997) distinguishes between positive and negative coordination: In a positive coordination game, all actors communicate and bargain with all other actors on each policy option, whereas in a negative coordination game all policy options are excluded to which at least one actor voices a veto. This leads to a significant reduction of communication flows.

ACI and IAD are mixed approaches in a power-structure vs. problem-solving perspective. While they assume that actors strive to optimize their material benefits and also to improve their power positions, the analysis is also interested in identifying institutional arrangements that prevent suboptimal political problem-solving. Also this perspective can be applied in a formal manner in the study of communication links between different actors involved.

A special perspective is taken by the **eco-system approach**, which became prominent in several variants during the last few decades: Human ecology, population ecology, and organizational ecology, all apply biological concepts of the eco-sphere to social areas (Barnett, 1990;

Baum, 1996; Hannan and Freeman, 1977; Hawley, 1944). Some of the concepts can also be applied to policy-making. This perspective examines habitats, resources and interrelationships between species (symbiosis, mutualism, but also predatory relations, etc.) to determine equilibria and adaptation capabilities of these systems. Particularly in the field of innovation research, this perspective is very popular, and there is a number of applications where network analysis is used to describe such "innovation ecosystems" (Adner, 2006). In such systems, different "organizational species" interact in a complex way. Universities, research organizations, business firms, finance capitalists, trade associations, funding agencies, policy makers, etc. collaborate and exchange specialized resources in order to create and advance innovations.

A rather new conceptual development in such an ecosystems perspective is the **Ecology of Games** approach (Lubell et al., 2010). This framework partly overlaps with ACI and IAD and creates a complex conceptual combination. Its key idea is based on nested policy games in which actors – e.g. a resource users or regulators – have conflictual relations. These conflicts and dependencies are mediated by a spectrum of institutional venues that enable collaboration, information sharing and joint problem-solving. With respect to the problem-versus-governance orientation, this approach is clearly governance oriented, although aspects of conflict and power are not overlooked. According to this approach, policies succeed in problem solving, if conflicting policy actors are linked by institutional fora and policy venues that support collaborative action. The EoG thus adds a clear relational facet to the IAD and ACI perspectives by combining the analysis of conflict constellations with institutional affiliations and relations of collaboration. A number of recent network studies use this perspective in their policy analysis (Dutton et al., 2012; Lubell, 2013; Lubell et al., 2010).

The relational dimension is, of course, also important in **social capital theory**. Meanwhile it has gained the status of a kind of general theory used in sociology, economics and political science. In policy analysis too, this theory is increasingly used, particularly within network studies. Social capital theory emphasizes interpersonal relations, and assumes that these relations generate long-term trust and reciprocity. A strong influence also had the assertion of Putnam that (multiple) membership relations in associations are of great importance for the emergence of trust (Putnam, 1995). This theory can be applied on several levels (form local communities to whole nations), some network studies test this theory together with competing approaches (Henry et al., 2011).

On the right side of the diagram are several ideational approaches and frameworks in policy analysis. One ideational approach is working primarily at the level of macro politics with an emphasis on **policy paradigms**. In applying a Kuhnian paradigm perspective to the world of policy-making, policy conflicts are understood as a kind of religious war between paradigms,

such as for instance the conflict between Keynesianism and monetarism in economic policy-making (Hall, 1993). The approach then concentrates on mechanisms that generate paradigm change. There no studies applying this perspective within the context of policy networks. However, this perspective too, could be operationalized by affiliation networks and analysed as paradigm coalitions within discourse networks.

One approach that applies the same principle at the level of belief systems is the **Advocacy Coalition Framework** (ACF)(Sabatier, 1988). A central premise of ACF is that policy actors form coalitions based on competing belief systems, which aim to turn their beliefs into actions. Beliefs are hierarchically structured, involving a deep core and two peripheral layers. The deep core consists of deeply rooted basic convictions about normative and ontological aspects of the world. Next to the deep core are policy beliefs that include policy positions and strategies which are easier to change on the bases of new experiences. At the periphery are secondary beliefs on instrumental and informational aspects which adapt to changing circumstances most easily. A further assumption of ACF is that conflicts between coalitions are mediated by policy brokers. Belief change occurs by means of external shocks, communication and learning. Since information exchange plays an important role in maintaining coalitions, there is a broad spectrum of communicative networks that can be studied in this perspective. In the meantime there are many network studies that apply this framework in their policy research (Ingold, 2011; Kukkonen et al., 2017; Leifeld, 2013; Weible, 2005).

The **Multiple Streams Framework** (MSF) also has an ideational orientation (Zahariadis, 2007). It views policy making as a confluence of three autonomous processes. There is a process in which problems are perceived and debated in specific policy areas; in a second process ideas for problem-solutions emerge and diffuse among experts and policy specialists; a third process takes place at the political macro level were factors such as election campaigns, legislative turnovers, and pressure group action are important. The coupling of these streams sometimes opens policy windows in which political entrepreneurs are able to push their issues on the policy agenda. This approach does not explicitly take network relations into account, but some politics streams – e.g. debates and conflicts on problem perception and problem solving – can be studied in a relational perspective. The MSF is thus highly compatible with relational studies of policy discourse (see for instance the use of this framework by Brugger, 2017).

A closely related perspective is **Punctuated Equilibrium** theory (PE) which combines group interaction and macro dynamics in the political system in a similar way. Its key idea is that policies evolve in an incremental manner most of the time, and only occasionally depart from a steady path by big aberrations (Baumgartner and Jones, 1993). Policy punctuations are explained by contingent capacities of groups for agenda setting. PE distinguishes in this respect

between subsystem politics and macro-politics. Issues can be transferred from a rather technical matter at local level to an issue of national concern when there is a switch in its policy image. A new policy image can open up a previously closed policy venue in which a supportive actor constellation may exist. Because of its emphasis on policy images, PE clearly has an ideational facet. Applications of PE in combination with network analysis can thus study the change of policy images or other ideational aspects (e.g. frames) in discourse networks, to explain punctuations and other dynamics in policy discourse. There are studies, which take, for instance, the financial crisis of 2008 or the Fukushima accident and the subsequent German Energy transition to study policy punctuations at the level of discourse (Brugger, 2017; Rinscheid, 2015; Schneider and Ollmann, 2013).

In the last few years, various currents of ideational policy research have emerged, which not only describe and trace discourse formations but also more strongly emphasize the power aspect in discourses. Discourse is power in the sense that policy problems are defined in a way that certain social groups benefit by a given definition. One approach that pursues this view is the **Narrative Policy Framework** (Shanahan et al., 2011). It emphasizes the role of narratives in the perception of reality and the definition of situations in political discourse. Policies are influenced by power relations in discourse, in which actors try to implement strategic narratives, which make their (power) interests appear as public welfare interests. A recent study applies this perspective to policy discourse at local level within Germany energy policy-making (Brugger, 2017).

There are still two theories at the left-hand side of Figure 5, which have not yet been explained. This is on the one hand the Varieties of Capitalism (VoC) theory, on the other hand the theory of Post-Democracy. In contrast to the ideational approaches just discussed, these two perspectives focus on the material sphere of politics, and both bring into play a modernized version of Marxism in which macro analysis and economic structures are placed at the center of the analysis.

The **Varieties of Capitalism** approach has a clear governance orientation in which different structures of capitalist economies are distinguished that vary in their economic and social policy performance due to different forms of coordination (market versus state plus associations, to put it simply) (Hall and Soskice, 2001). In order to explain policies, this approach emphasizes the role of companies, in particular those of large companies, and some other economic institutions such as vocational training systems. While there is a growing number of scholars that use this perspective in their policy research (see the overview by Höpner, 2009), there are no network analytic applications, although VoC would clearly be compatible with this method, given the long tradition of network studies on cross-ownership and interlocking directorates

(however, for a interlocking directorates study in this orientation see Höpner and Krempel, 2004).

A currently very popular political theory with affinity to VoC is the theory of **Post-Democracy** (Crouch, 2004). The prefix "post-" claims a trend reversal of democratic development since the 1980s when globalization transformed large corporations to become the main business actors, whereas business associations and trade unions would become marginalized in the policy process. Governments would get increasingly dependent on the expertise and other relevant policy resources from large corporations. Policy formulation would take place in small circles including government and the business elite. Elections and parliamentary debates would be pure theatrical spectacles with little effect on policy formulation. The focus of this theory is clearly less on governance than on power structures. A test of the basic assumptions of this theory by means of network analysis is provided by the author of this paper in the area of environmental and climate policy (Schneider, 2015b).

NETWORKS AS GOVERNANCE FORMS AND POWER STRUCTURES: THE DIVERSITY OF RELATIONS

The overview on policy theories has shown that policy explanations can operate at various levels and with reference to different social spheres. Basically all theories can be combined with the formal network approach, since there is a great diversity of formal concepts and methods that can be applied to network configurations in policy-making. The policy network as a specific relational and institutional regime for the governance of modern societies, as described and hoped for in the literature in the 1990s, is only a small part of the many possible configurations in which a diversity of actors is involved in policy-making. But involvement does not mean that all actors share the same goals and situational definitions. Different preferences, conflicts of interest, and struggle over problem definitions are just as part of such configurations as information sharing, pooling of expertise, and collaboration other important resources to work together for a joint solution of urgent problems.

insert Figure 6 on relations about here

Figure 6 lists a variety of different networks in all formats that can be studied with respect to policy-making. Both, the analysis of collaboration relations and of power structures is possible in this perspective. And even for the analysis of influence differentials in collaboration and exchange networks, these methods are suitable. In particular, the new regression methods in the statistical modelling of networks dynamics enable in principle the test of most of the policy theories that are currently in circulation.

Networks can be investigated at many levels. At the micro level, policy-making can be seen as an interaction of individuals or organizations in which individual actors may have specific interests, perceptions of the situation, and policy positions. Networks can serve to communicate these preferences and bargaining promises, but also arguments about the definition of a situation, the legitimacy of norms, and the appropriateness of action orientations.

Network analysis at this level can identify actor positions in the overall network structure and demonstrate that some actors are more centrally or more peripherally located. This implies power differentials even in polycentric and decentralized settings.

At the meso level, policy-making is more than an individualistic process of expressing subjective preferences and exchanging resources, but the interaction of large societal groups as collective actors. Actors in these collectivities may have similar material interests or institutional positions as well as similar definitions of the situation. The similarity of action orientations may also result from the fact that they adhere to similar hegemonic world views, paradigms or belief systems. At this level, it is interesting how collective actors and large social coalitions share interests and beliefs, and how communication within or between these groups are sustaining these collective social constructions. In this respect, it is instructive to aggregated network relations at the level of societal groups or actor types.

A recent example of studies in which these ideational aggregates give important insights into societal structures is climate policy. International comparisons of climate discourse in the media show that issue attention and situational definitions vary widely (Broadbent et al., 2016). At the macro level, it is also important to see how the overall differentiation of modern societies is reflected in the segregation of a policy network into various subsystems and the participation of actors from various societal subsystems is reflected in the policy process. The affiliation of policy actors to specific societal subsystems implies that these macro-structures constrain their action orientation by specific criteria of relevance. In such a view it is expected, for instance, that a political actor has other criteria of relevance than an actor from business or from science to sort the political situation and to design action strategies. System theories, especially the one of Niklas Luhmann, emphasize this functional differentiation of social spheres (Luhmann, 1977).

Luhmann has the merit to point to multiple subsystems in modern societies that are much more diverse than the sparse AGIL scheme that was offered by Parsons. However, a serious shortcoming of this theory is that society and its subsystems are only reduced to relations of communication. Communication may be an important aspect of social differentiation. In addition, there are other layers in our complex social fabric, which contribute to an increasing performance of subsystems to problem-processing qua specialization. In addition to communication

there are many more relations involved that connect individuals and organizations on many levels. Of particular importance is the exchange of resources, a kind of counterpart to the energy exchange in ecosystems. The reduction of societal relations to communication leads to a kind of "pigeon hole" thinking with respect to systemic differentiation, in which each subsystem is completely sealed off and self-referential. However, inter-systemic links between science and politics in policy formation, or between the science system and the education system in an innovation eco system, or between the health systems, the energy systems and the tele-communication systems in a system of critical infrastructures are key features of complex societies. Ironically, one of the major problems of modern societies is that their different parts are functionally so interconnected, coupled, and nested that the failure in one part can have equally significant effects on all other parts.

Perspectives that are guide by system theories stress macro-structural differentiations between the economy, politics, science, and other societal areas. These patterns of differentiation are important, but they should rather be based on ideas in which aforementioned ecological approaches of organizational differentiation and differentiation at system level are combined. Also an actor-centered differentiation approach, which makes social differentiation at the macro level more strongly based on organizational studies, would fit into such a perspective (Schimank, 2015).

In addition to functional differentiation into social subsystems, the organizational differentiation of subsystems is also important. In each subsystem, specific organizations develop that are particularly adapted for specific tasks. Within the economic system, the corporate organization of large firms, the specific role of business associations, and the variety of finance institutions are important aspects of the social organization of this subsystem. In this respect, the institutional differentiation perspective within the VoC approach can also provide some instructive insights which possibly could combined with an ecosystem perspective. Different organizational field often occupy different habitats that imply specific resources and interests. For instance, in the current research on climate policy it is important to distinguish between the traditional and the green economy which have different material interests and not simply different preferences due to different belief systems.

At the systems level, institutional and ecological perspectives should be integrated in a fruitful way. In this perspective, not only specialization and differentiation patterns between social systems have analytical relevance, but also the differentiation into specialized organizational species. A good example in this respect is the science system, which differs among countries (based on different historical trajectories) by their populations of specialized organizations, and by the configuration of network relations in which these organizations are embedded. If we are not only interested in beliefs or narratives that dominate certain organizational contexts, but

assume that good and evidence-based knowledge can significantly improve collective problem-solving, it is of great importance how the production process of policy-relevant knowledge works in a country, and how this knowledge is distributed and is funnelled into politically important venues and places. For instance, if we take independent public organizations in the German science system such as Max Planck Institutes or public universities, we assume a more reliable production of facts-based knowledge on climate change than knowledge produced by a think tank, financed by the oil industry.

insert Figure 7 on Scientific Information Exchange

If one knows the organizational ecology of different national science systems, it is also interesting to examine their specific relational patterns of exchange with the political and the economic system. In a comparative study on climate policy in Japan and Germany we are currently investigating the complex structure of such an organizational ecology within the sub-systems of politics, economics and science (Schneider et al., 2016). Figure 7 depicts the two national relational configurations base on scientific information exchange. Blue organizational types represent the science system (University and other independent research institutes, yellow nodes the economic system (Business associations, large firms, and business initiatives), and red nodes the major actors of the political system (parties and governmental organizations), and the green nodes diverse actors from civil society.

In this paper there is no place to describe the individual configurations in detail. However, the two diagrams show impressively how climate policy-making is embedded very differently into the tow national systems of policy knowledge production and distribution. The reliance of the political system on evidence-based knowledge in Germany seems to be much more intense, but at the same time also much more plural than in Japan. Germany differs from Japan in the differentiation of the subsystem and in the organizational ecology not only by the fact that more intensive communication between the science system and the political system exists, but also by the fact that the organizational ecology is more diversified in Germany, and above all also the civil society organizations are more strongly involved in the production and exchange of policy-relevant knowledge. We assume, that this difference explains to a large part the variation among the two countries in their climate policy outputs.

Network analysis on policy-making often focuses on the individual and organizational micro level. By such a focus *society at large* is often out of sight. We should therefore reintroduce society as a complex multi-levelled system into the analysis in which not only individuals and organizations are directing their activities towards specific issues, but also societal and institutional sectors with unique organizational ecologies specialize in societal problem-processing. Modern policy-explanations should integrate these levels into a multi-layered perspective in

which policy actors are embedded in and constrained by higher order social systems. Actors are supposed not just to have individual interests and preferences, but also fulfil specialized roles in a differentiated society and depend on generalized patterns of perception and meaning. Individual preferences and interest orientations are thus conditioned by political, economic and cultural structures, both in terms of their genesis and perception by the actors, as well as in terms of how they are politicized and implemented in policy processes. Such a systemic or "socio-centric" perspective (Cornwell and Laumann, 2017) seems to offer a new analytical potential for network research in the domain of policy analysis which was largely neglected in the last decades. The analysis of policy networks should therefore not only be confined to the identification of actors and relationships that work together in the solution of specific policy problems at the micro level. The overall societal formation by which sectoral and organizational specialization patterns and the distribution of power in a given society is determined, should also move into the center of the analytical picture.

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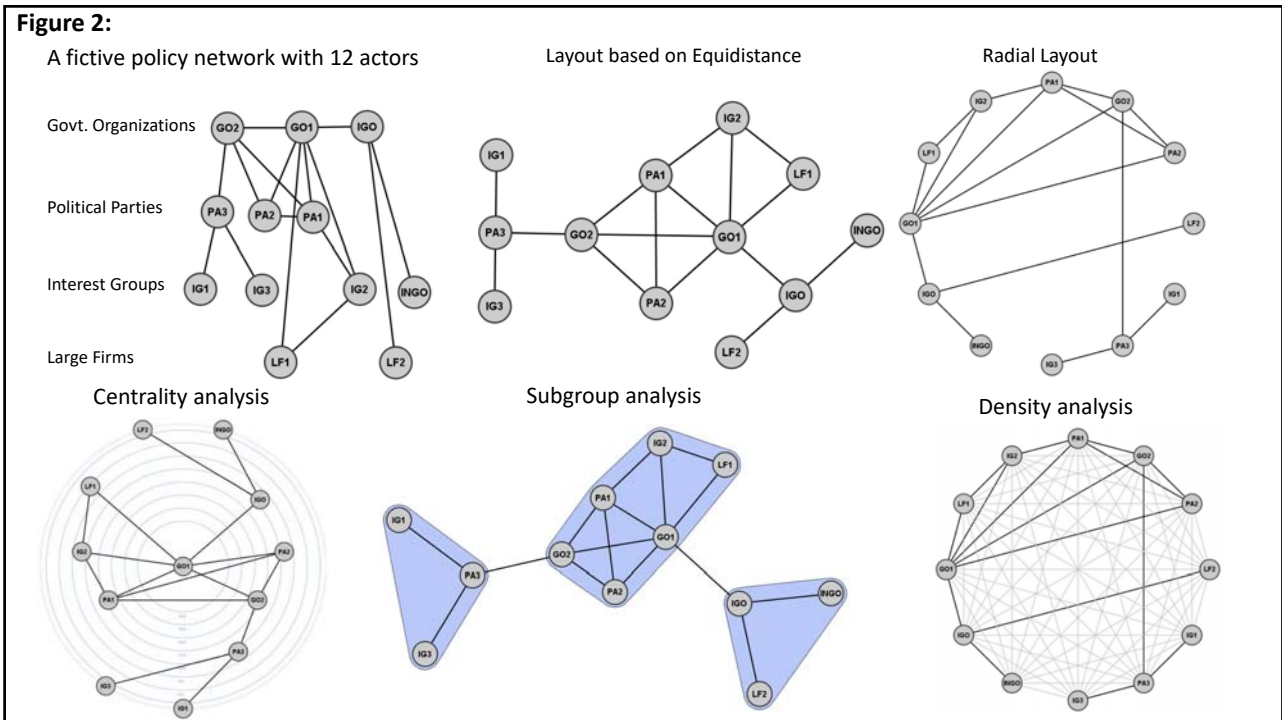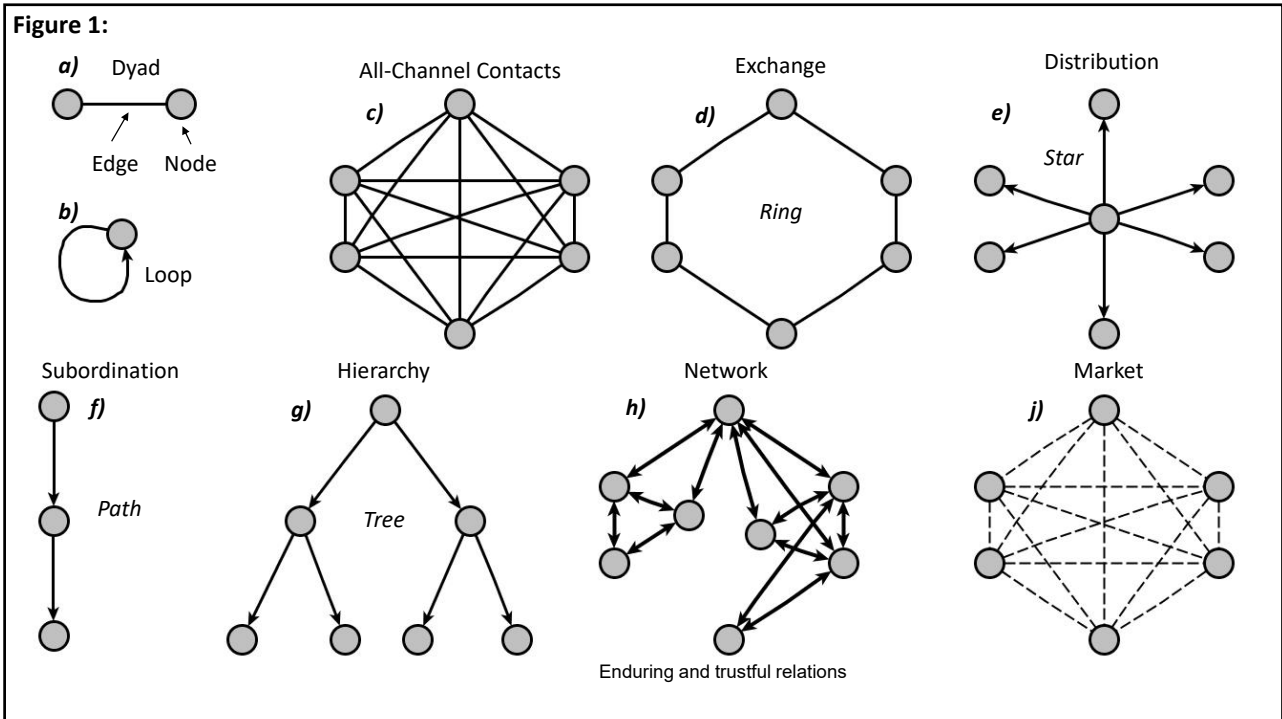
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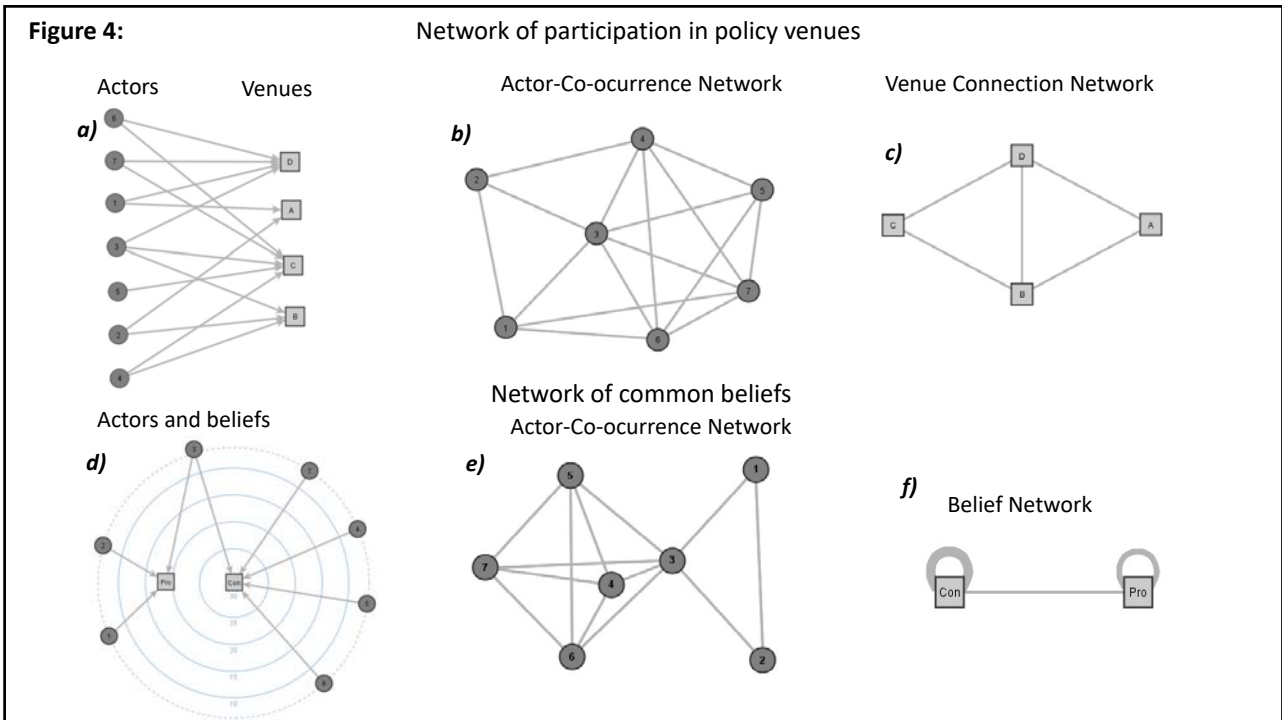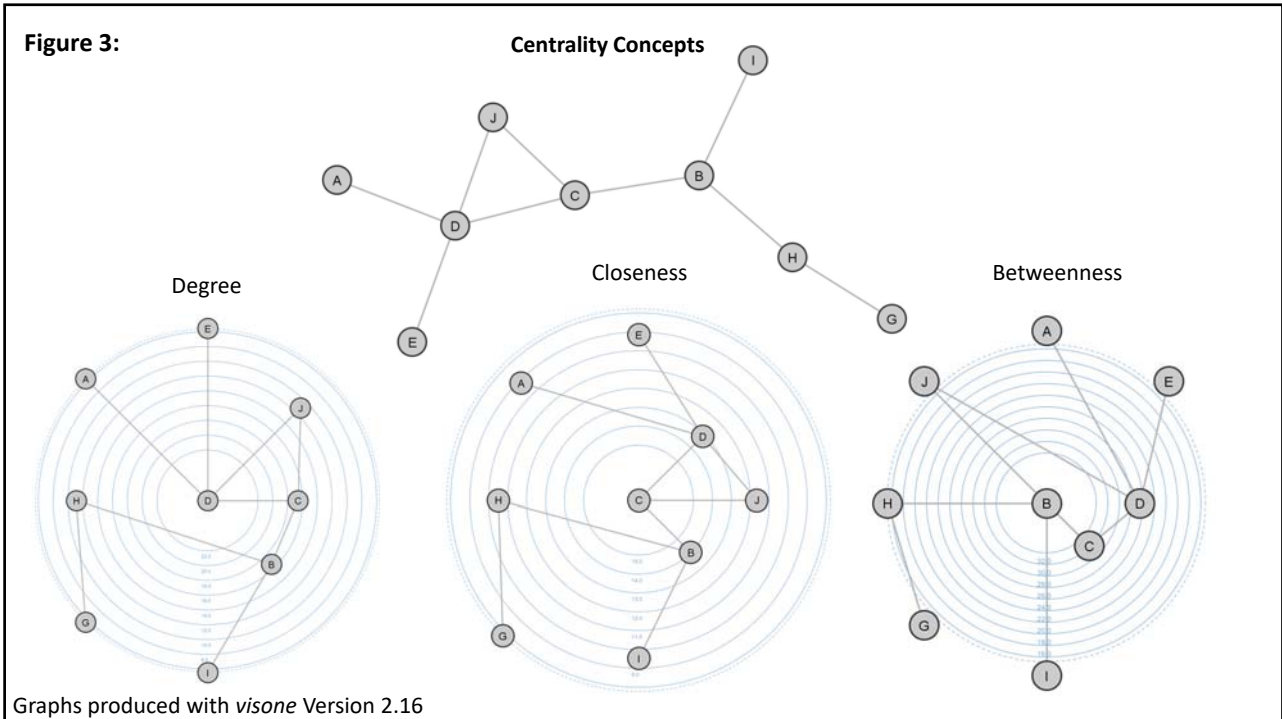
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Figure 1:

Figure 2:

Figure 3: **Centrality Concepts**

Degree Closeness Betweenness

Graphs produced with *visone* Version 2.16

Figure 4: Network of participation in policy venues

Actors Venues Actor-Co-ocurrence Network Venue Connection Network

a) b) c)

Actors and beliefs Network of common beliefs
Actor-Co-ocurrence Network

d) e) f)

Belief Network

Figure 4:

| | Material Approaches | Institutional Approaches | Ideational Approaches |

1840s — Class

1900s — Groups

1960s — Systems

1970s — Exchange

1980s — Rational Choice — (Neo-)Corporatism — Power Resources — Patterns of Democracy — Party Government

1990s — Governance — ACI — IAD — Social Capital — Multiple Streams — Policy Paradigms — Advocacy Coalitions

2000s — VoC — Eco-Systems — Veto Players — Punctuated Equilibrium — Discourse Coalitions

2010s — Post-Democracy — Ecologies of Games — Policy Narratives

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Network types

Figure 5:

One-mode Networks

Communication networks
- Political information
- Scientific knowledge
- Advice

Influence networks
- Attribution of influence
- Attribution of decision-making power
- Attribution of relational and ideational resources

Interaction and transaction networks
- Collaboration
- Coordination
- Negotiation
- Support
- Informal contacts
- Exchange of resources

Two-Mode-Networks
(Affiliation networks)

Material Affiliations
- Interests
- (Power)-Resources

Discursive Affiliations
- Policy positions and beliefs
- Arguments and metaphors
- Frames and narratives

Institutional Affiliations
- Decision-making positions
- Advisory bodies and policy venues
- Organizations and associations

Systemic Affiliations
- Societal Subsystems
- Economic Sectors
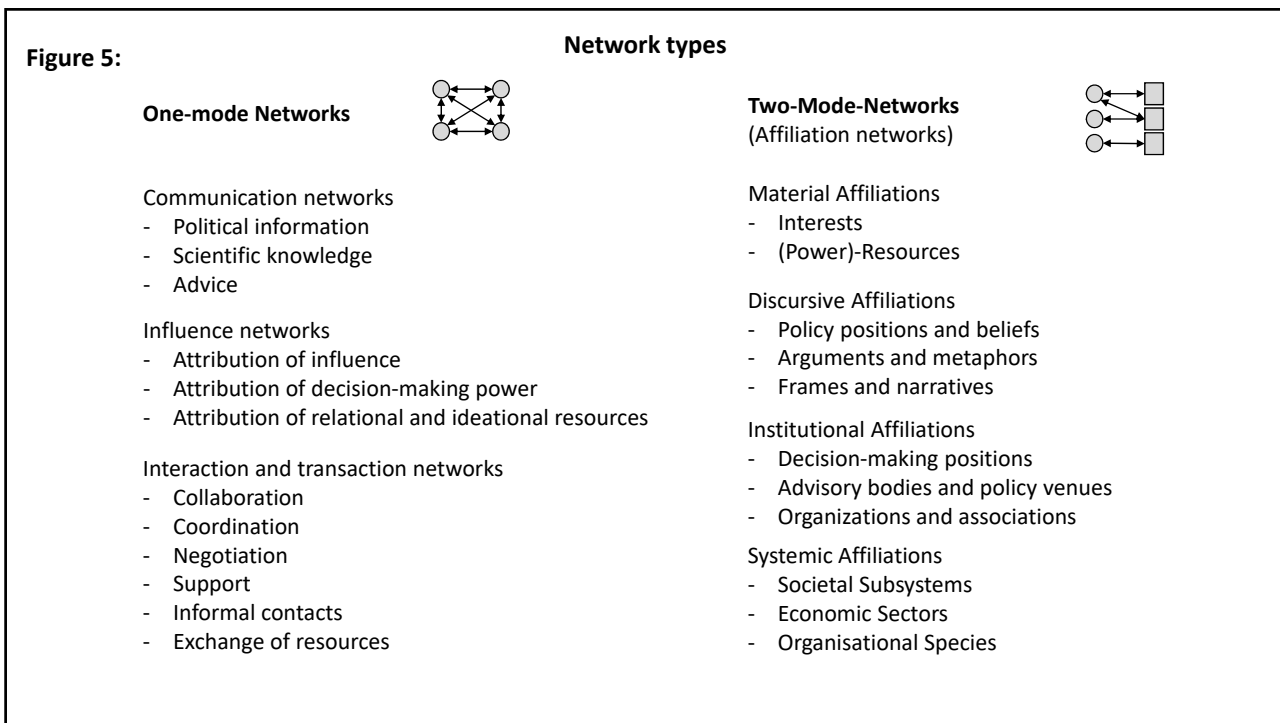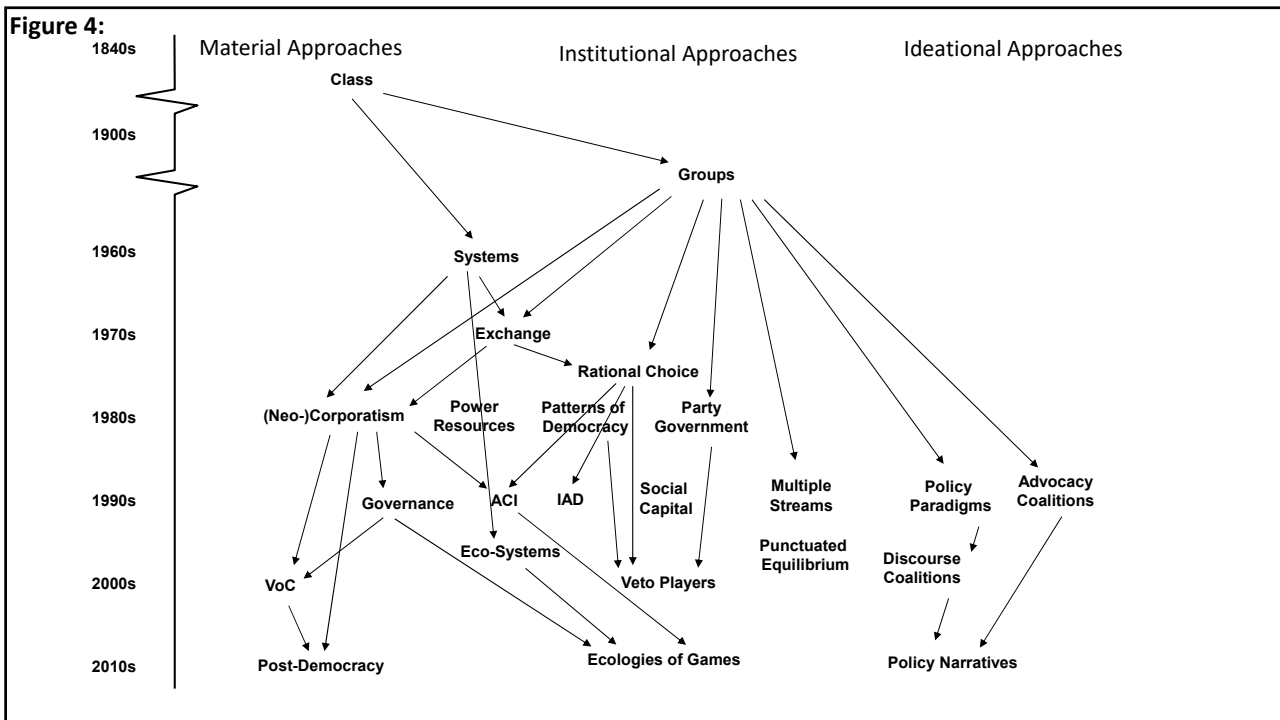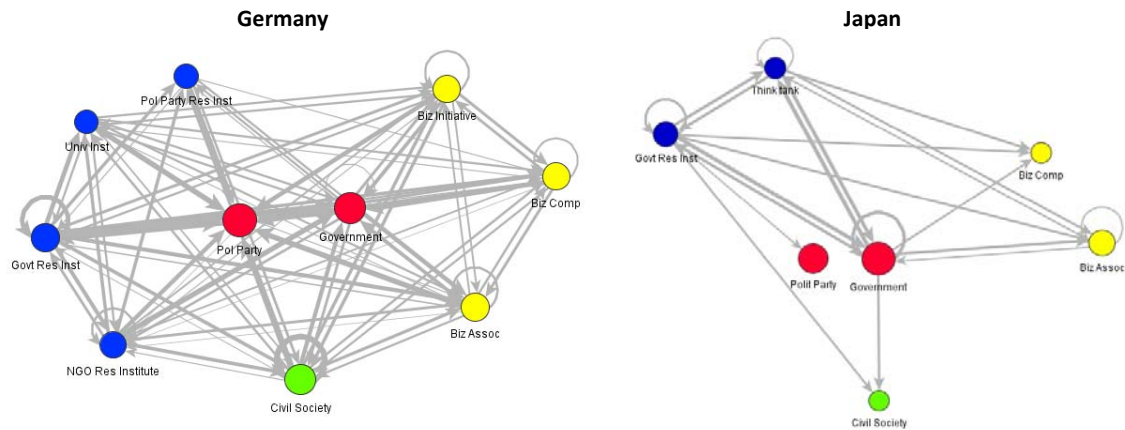- Organisational Species

3

Figure 6: Scientific Information Exchange at Organizational and Systems Level

Network relations: Science information "source" and "destination" (combined)
Size of Nodes: Mean of the Reputation Score. Width of ties: Ties shown more than overall density in each country

Graphs produced with *visone* Version 2.17