The Co-evolution of Policy Agreement and Cooperation Networks in the Council of the EU

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Abstract

This study explores how policies and cooperation co-evolve overtime in different workings groups of the Council of the EU. Drawing mainly on data from two projects that have tracked policies and cooperation in the EU Council respectively for over two decades, we use stochastic actor-oriented models (SAOM) to model their co-evolution in four different Council committees (i.e., Coreper I, Agriculture, Economic Policies, and Environment) from 2003 to 2021. Our analysis confirms meaningful co-evolution of policies and cooperation in various committees of the EU Council. Particularly, we find that such co-evolution varies across policy areas and working groups. While in such long established policy areas as agriculture, the effects of cooperation on policy positions are more pronounced, for environmental issues where the policy agenda is more unstable, we find marked effects running from policy positions to cooperative activities.

The decision-making processes in the Council of the European Union (EU) has attracted much scholarly attention (e.g., Blom-Hansen and Finke, 2020; Häge and Naurin, 2013; Kim, 2020; Peterson, 1997; Thomson et al., 2006; Thomson, 2011). Many scholars focus on policy positions of individual EU member states and explore their relationship to domestic party politics (e.g., party ideologies) and EU formal decision rules. This *policy*-oriented approach thus assesses the extent to which the EU decision-making processes are shaped by the domestic politics of member states as well as the EU's formal institutional procedures. Partly due to its explicit emphasis on policy positions and formal institutional contexts, the policy-oriented approach provide limited knowledge about actual informal bargaining, coordination, and cooperation among the delegates from the EU member states that are vital to the EU decision-making. The *cooperation*-oriented approach then turns to informal ties and cooperative activities among delegates from EU member states (Häge and Naurin, 2013; Ingold, Fischer and Christopoulos, 2021). It has been shown that alongside policy homophily, such non-policy factors like central positions and common friends in informal cooperative networks could lead to more cooperative ties (e.g., Huhe, Naurin and Thomson, 2018, 2020; Huhe et al., 2022).

While both the policy- and cooperation-oriented approaches provide valuable insights about the EU decision-making, we know little about how policies and cooperation co-evolve in the EU decision-making over time. We lack concrete knowledge whether informal cooperative ties among EU actors could lead to further policy convergence, or whether such policy convergence may initiate more cooperative ties and thus give rise to a reinforcing loop of policy convergence and cooperation expansion. There are at least two prominent challenges to this research agenda. The first is about data collection. It is difficult to manage, collect, and code data of the policy positions of the EU member states as well as cooperative activities among their delegates in the complex institutional maze of EU. The second is methodological. A systematic examination of how polices and cooperation co-evolve requires us to model not only how policy positions and cooperation

patterns change over time, but more importantly, how they interact with each other. In other words, we need to model how the multiplex networks of policies and cooperation evolve over time (Becker et al., 2020; Hsiao, Leverso and Papachristos, 2023; Lazega and Pattison, 1999; Lazega, Quintane and Casenaz, 2017).

In this study, we focus on the Council of the EU and systematically explore how policies and cooperation co-evolve overtime in different workings groups of the Council. We expect dynamic co-evolution of polices and cooperation in the Council, and important variation across different policy areas and working groups. The Council is widely regarded as the most influential body in the EU's daily decision-making processes (Hayes-Renshaw and Wallace, 1997), as all essential EU legislation must receive the Council's approval. The Council also operates in a highly institutionalized negotiation setting, characterized by frequent, routine interactions and a long-term perspective. Finally, the Council operates various committees and working groups, ranging from the high-level Coreper I that overseas more sensitive political issues to the subordinate working groups that focus on more technical matters like agricultural, economic policy, and environmental policies. All of these factors contribute to making the EU Council is an ideal case for our exploration of the co-evolution of polices and cooperation.

This study draws on data from two projects that have tracked policy positions of EU member states and the cooperative activities among their delegates in the Council committees and working groups respectively for over two decades. For the policy positions of EU member states, we use data from the Decision-making in the EU dataset (DEU III) (Arregui and Perarnaud, 2022). For the cooperative activities, we rely on data from from the Negotiations in the Council of the European Union Dataset (NCEU; Naurin et al., 2020). Treating them as multiplex networks, we use stochastic actor-oriented models (SAOM) (Snijders and Baerveldt, 2003; Snijders, 2004; Snijders, Lomi and Torló, 2013; Steglich, Snijders and Pearson, 2010) to analyze the network co-evolution of policy congruence and cooperative ties in four different Council committees (i.e., Coreper I,

Agriculture, Economic Policy Committee, and Environment) from 2003 to 2021. Our analysis confirms meaningful co-evolution of policies and cooperation in various committees of the Council. Furthermore, we find that co-evolution varies across policy areas and working groups. While in long established policy areas sucha as agriculture, the effects of cooperation on policy positions are more pronounced, for environmental issues where the policy agenda is more unstable, we find marked effects running from policy positions to cooperative activities. Together, our findings depict a more nuanced picture of policy convergence and cooperation diffusion in the Council.

I   Coevolution of policy and cooperation networks

In this study, we introduce a co-evolutionary model of policies and cooperation. Moving beyond the internal dynamics within policy and cooperation networks respectively, our co-evolutionary approach highlights the dependencies across these two types of networks. The central aim of this article thus is to analyze how policy networks can be explained by the evolution of cooperation networks, as well as how previous cooperation networks can be accounted for by the evolution of policy networks. In other words, analysis focuses on capturing the complexity of policy ties within the structure of the Council of Ministers that bind previous cooperation to the evolution of cooperation networks. This approach not only allows us to better examine how policy preferences shape member states' cooperative activities, it also enables us to disentangle how existing cooperative ties among member states could feed back into their policy positions. There has been no previous study that examines the dynamic co-evolution of the cooperation network and policy network, meaning that we still lack a holistic view about international institutions like the Council. Moreover, the problem is particularly acute given the diversity and complexity of international institutions like the Council.

We define a policy network as a structured cluster of actors who are stakeholders

within a specific policy area and try to affect policy outcomes (also see, Blom-Hansen, 1997; Börzel, 1998; Gilardi and Wasserfallen, 2019; Marsh and Smith, 2000). On the other hand, we define a cooperation network as the complex set of social relations in which stakeholders are embedded Huhe, Naurin and Thomson (2018, 2020); Huhe et al. (2022). These informal social connections are more than just channels through which actors send information; they also support mechanisms through which actors monitor and sanction each other in the event of behavior that violates social norms and creates collectively sub-optimal outcomes (Leifeld and Schneider, 2012).

Our co-evolutionary model of policies and cooperation corresponds well to the concept of epistemic communities established by Haas (1992). Haas (1992) refers to epistemic communities as the best way to describe how policy-making can become controlled by "networks of professionals with recognized expertise and competence in a particular domain" (1992, p. 3). Subsequently, Sabatier (1993) introduced the advocacy coalition framework to explain policy change. According to Sabatier (1993), policy change takes place when sectoral agendas are apprehended by policy networks that work together over long periods of time to push policy change. These theoretical developments are related to the notion of policy networks insofar that epistemic communities and advocacy coalitions may make an alliance to shift the policy agenda. Thus, cooperation between members of a policy networks may take place according to more or less homogeneous or heterogeneous preference structure of different actor types (Peterson, 1997). When cooperation among actors of a policy network takes place it can lead to policy convergence (also see, Henry, 2011; Henry, Lubell and McCoy, 2011; Knoke and Kostiuchenko, 2016; Lubell, 2013). In light of this, one way to understand the decision-making process in the Council of the EU is to treat it as a set of evolving multiplex networks comprised of both policy and cooperation networks. We thus formulate our first hypothesis as follows.

Hypothesis 1: *Across working groups of the EU Councils, the policy and cooperation networks tend to co-evolve with each other, as there exist strong*

cross-network dependencies.

A Varying co-evolutionary dynamics in the Council

We also expect that the dynamic relationship between policy and cooperation networks could vary markedly across different working groups of the Council. Rhodes (1990) specifies three variables that might determine the sort and extent of cooperation within policy networks within a particular policy area: (1) the relative stability of a network's membership; (2) the network's relative insularity (whether it excludes outsiders or whether it is permeable by a variety of actors with different objectives); (3) the degree of resource dependencies that exist among actors of a policy network. By considering these three potential determinants, a continuum arises with highly integrated policy communities on the one hand which are better ready for a single minded cooperative and/or collective action and policy networks which find it more difficult to cooperate and mobilize collectively.

Beyond this, member states cooperate within the Council of Ministers to achieve common goals. However, cooperation is not always easy. Cooperative efforts might not be successful as a consequence of disagreements over the distribution of benefits (Stein, 1982). Furthermore, we should keep in mind that the nature of cooperation is going to be a consequence of the structure of the sub-system of policy making operating with a particular policy area.

Policy-making in the European Union takes place in specific subsystems across policy areas. These sub-systems operate independently from each other insofar that each sub-system include a number of public and private actors dealing with particular policy issues as well as different formal and informal decision rules. A consequence of this is that policy networks are rather different in the way they operate as well as they are essentially detached from each other.

In order to generalize about the effects that policy networks may have on

cooperation networks and the other way around, we need to clarify the key characteristics of policy networks in different policy areas. For example, the literature agrees that the EU agricultural policy community is relatively cohesive. As Peterson (1997, 2003) argues, within Agriculture there is a stable alliance between the Committee of Professional Agricultural Organisations (COPA), the special committee on Agriculture and DG Agri of the European Commission which is responsible for policies on the common agriculture policy and rural development. According to Peterson (2003), actors in CAP networks have compelling motives to speak with a single voice on most issues. This means that when policy convergence takes place in agriculture policy-making a pattern of cooperation has already taken place among the actors that are part of the policy network.

Networks of other policy areas such as environmental and other regulatory policies have a more loose structure insofar as they lack stable alliances among actors that integrate those networks. For example, Peterson (2003) argues that although transnational groups such as Greenpeace or the Worldwide Fund for Nature are active at the EU level, member states respond mainly to domestic interest groups when they negotiate in the Council of Ministers. This is why the EU's environmental policy network tends to be unstable and loosely integrated (Peterson, 1997). In other words, environmental policies are more fragmented in terms of the positions of the actors that are part of the policy networks meaning that cooperation ties are only forged by actors with similar policy positions and not the other way around.

Therefore, some policy networks such as agriculture are strongly integrated policy communities which maintain a stable control over the policy agenda (see, Coleman, 2001; Daugbjerg, 1999; Smith, 1990), while others are loosely structured networks with a limited capacity to exert control over the policy agenda, that is, with unstable and uneven membership together with self-sufficient actors in terms of resources (Peterson, 1997). This might be a reason why these types of policy networks do not effectively cooperate very often. As a consequence, we expect different outcomes in the patterns of interaction

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between policy and cooperative networks, and thus we develop our second hypothesis as follows.

> **Hypothesis 2:** *Across working groups of the EU Councils, the cross-network dependencies between policy and cooperation networks tend to vary significantly*

Even when member states are part of a policy network they may fail to cooperate. We aim to test the effects of policy agreement on the evolution of cooperation networks according to the structural characteristics of the policy networks in terms of having a more dynamic vs a stable/integrated policy agenda and membership. Therefore, we develop the last hypothesis as follows.

> **Hypothesis 2a:** *In policy areas with more dynamic and unstable agendas, we are more likely to observe strong effects from policy networks to cooperation networks.*

II Policy and cooperation network in the EU Council from 2003 to 2021

In this study, we draw on data mainly from two large research projects about the EU Council. The data allows us to construct both cooperation networks and policy networks of various working groups in the EU Council from 2003 to 2021. Specially, we focus on four key working groups of the EU Council: Coreper I, Special Committee on Agriculture (hereafter, Agriculture), Economic Policy Committee (EPC), and Working Party on the Environment (Environment).

A Policy networks, P

We build policy networks among EU member states based on their overall policy agreement and convergence. Specifically, the Decision-making in the EU (DEU III) project coded member states' policy positions over 364 specific issues. T he project covers a broad range of controversial issues in the EU during from 2003 to 2021, including agriculture, internal market, fisheries, environment, transport, employment, and consumer affairs. Proposals were selected if they raised a minimum level of controversy as indicated by European media reports, interviews with key informants, or voting records. Controversy is an appropriate selection criterion for the present purposes, because non-controversial proposals would not provide information about the relative degree of similarity between states' policy positions.

The DEU dataset was assembled by successive teams of researchers over a 20-year period. They held over 450 lengthy semi-structured interviews with key informants, who were usually participants in the negotiations, mostly from member states' permanent representations. These interviews each focused on one of the legislative proposals, and in them researchers and informants reconstructed the controversies raised by each proposal. The controversies were depicted as policy scales, each ranging from 0 to 100. Researchers asked informants to indicate the policy alternative initially favoured by each actor after the introduction of the proposal and before the Council formulated its common position.

The DEU dataset's information on states' policy positions on specific issues is illustrated with an issue raised by a proposed regulation on the free flow of non-personal data in the EU, which aims to achieve a more competitive and integrated internal market for data storage (2017/0228/COD). The main controversial issue dividing member states consisted of the number and scope of the derogations, which would limit the free flow of non-personal data. A majority of member states favoured very limited derogations in line with the legislative proposal (Position 100). Among these states was Estonia, which has a highly digitised economy and whose government saw great benefits from easing data transfer across borders. On the other hand, a number of states favoured derogations

particularly for public data on the grounds of public safety (Position 20), and in a number of additional domains such as public archives, culture and national treasury, partly on the grounds of national security (Position 0). French and German representatives were among those who had concerns about the negative effects of data transfers on intellectual property and cybersecurity. The regulation that was adopted included a number of derogations and a provision allowing member states to impose penalties if national authorities could not access data stored in another member state. The clauses in the final version did not go as far as France and Germany's preferred policy positions, and the key informants located the outcome at position 70 on the policy scale.

To construct the policy networks in 2003, 2012, and 2021, we group all the issues into three time periods, pre-2003, 2003-2012, and 2012-2021. For a specific policy tie between country i and j, p_{ij}, in a given working group, we code it as 1 if their dyadic agreement level is in the upper quartile (i.e., above the 75th percentile) when all issues pertaining to the working group are considered. For example, for COREPER I, we included all the issues except those related justice and home affairs. In other words, a positive dyadic between a pair of countries, p_{ij}, thus indicates a strong policy agreement. All these dyadic policy ties allow us to build the policy network, P, for a given working group. In the first row of Figure 1, we present the policy networks of Coreper I from 2003 to 2021.

[**Figure 1 is about here.**]

CP1 Policy Network, 2003
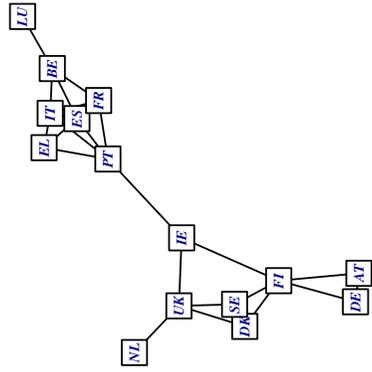
CP1 Policy Network, 2012
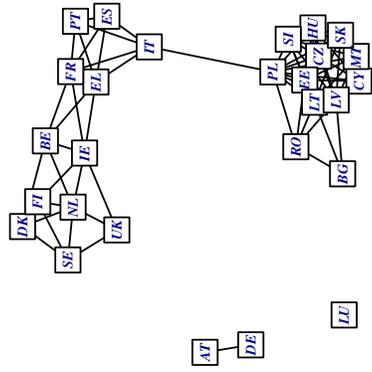
CP1 Policy Network, 2021

CP1 Cooperation Network, 2003

CP1 Cooperation Network, 2012
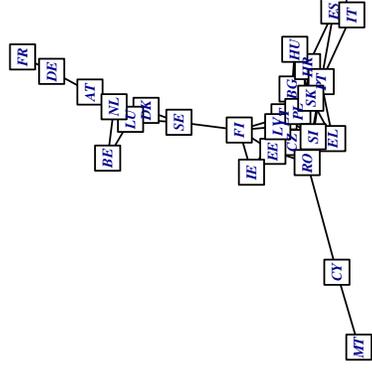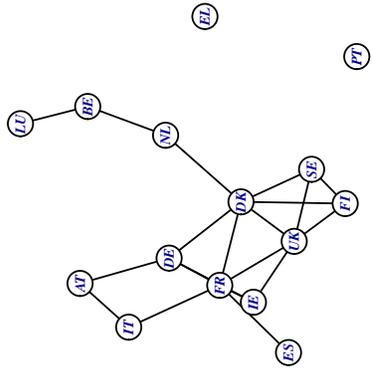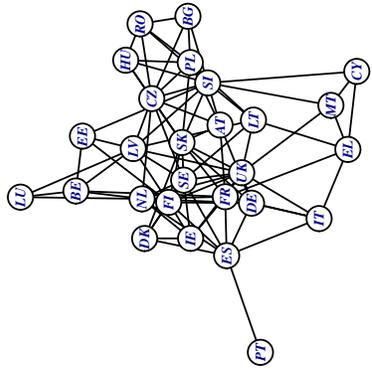
CP1 Cooperation Network, 2021

Figure 1: COREPER I

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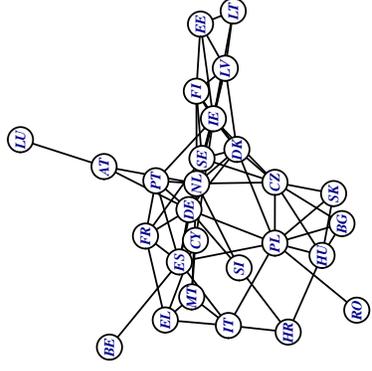
B   Cooperation networks, C

We reconstruct cooperation networks based on data from the Negotiations in the Council of the European Union (NCEU) project (Naurin et al 2022, https://snd.se/en/catalogue/dataset/snd1143-1/2). The NCEU project has surveyed a broad set of committees and working parties in the Council. The NCEU project held telephone surveys with representatives from all member states in from 2003 to 2021.

For cooperation networks, we focus on respondents' answers to the question: "Which member states do you most often cooperate with within your working group, in order to develop a common position?." When a respondent from country i mentioned another country j , we code there exist a cooperative tie between country i and j, $c_{ij} = 1$, otherwise 0 . Respondents usually reported three to five other states. Based on all dyadic c_{ij} in a working group, we construct the cooperation network, C of a given working group. In the second row of Figure 1, we plot the cooperation networks of Coreper I from 2003 to 2021, and Figure 2 shows both the policy and cooperation networks of the other three working groups, that is, agriculture, economic policy, and environment.

[**Figure 2 is about here.**]

Agriculture Policy Network, 2003 **Agriculture Policy Network, 2012** **Agriculture Policy Network, 2021** **EPC Policy Network, 2003** **EPC Policy Network, 2012** **EPC Policy Network, 2021**

Agriculture Cooperation Network, 2003 **Agriculture Cooperation Network, 2012** **Agriculture Cooperation Network, 2021** **EPC Cooperation Network, 2003** **EPC Cooperation Network, 2012** **EPC Cooperation Network, 2021**

(a) Agriculture

(b) EPC

Environment Policy Network, 2003 **Environment Policy Network, 2012** **Environment Policy Network, 2021**

Environment Cooperation Network, 2003 **Environment Cooperation Network, 2012** **Environment Cooperation Network, 2021**

(c) Environment

Figure 2: Cooperation and policy networks of three working groups

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III Empirical strategies

To empirically explore how cooperation networks, C, co-evolve with policy networks, P, we introduce the stochastic agent-oriented model (SAOM) (Snijders and Baerveldt, 2003). SAOM is actor-centered, simulating network evolution by focusing on individual actors, but not their specific ties. SAOM has been widely used to model how a network evolve over time (Snijders, 2004; Snijders, Lomi and Torló, 2013; Steglich, Snijders and Pearson, 2010). It assumes that actors form or dissolve ties as part of a strategy to maximize their utility functions (also known as, "objective functions"). Actors constantly update their decisions to create or drop ties based on their perceived interests in a networked community.

The actor-oriented framework of SAOM could be expanded to model how two networks co-evolve by incorporating cross-network effects and dependencies. In this case, we begin with two utility functions for cooperation networks networks, C, and policy networks, P, respectively:

$$f_i^C(\boldsymbol{c}, \boldsymbol{p}) = \sum_k \beta_k^C s_{ki}^C(\boldsymbol{c}, \boldsymbol{p}) \tag{1}$$

and

$$f_i^P(\boldsymbol{c}, \boldsymbol{p}) = \sum_k \beta_k^P s_{ki}^P(\boldsymbol{c}, \boldsymbol{p}) \tag{2}$$

where $s_{ki}^C(\boldsymbol{c}, \boldsymbol{p})$ and $s_{ki}^P(\boldsymbol{c}, \boldsymbol{p})$ stand for various effects that shape how cooperation networks C, and policy networks, P, evolve, respectively, and β_k^C and β_k^P stand for the parameters corresponding to these effects. Each actor i is modeled to optimize the two functions by forming or dropping ties in cooperation networks, C, and policy networks, P. As actor i is embedded in and constrained by a given network structure, its decisions could alter its expected utility. In this framework, we model cross-network dependencies by assuming $s_{ki}^C(\boldsymbol{c}, \boldsymbol{p})$ depend on $\boldsymbol{p}$ and $s_{ki}^P(\boldsymbol{c}, \boldsymbol{p})$ depend on $\boldsymbol{c}$. In this way, we could model the dynamic feedback loops between cooperation networks, C, and policy networks, P.

A   Cross-network effects: $P \to C$ and $C \to P$

In this study, we explore the co-evolution of C and P by focusing on two key cross-network effects, the direct dyadic effect of P on C, $P \to C$ (also known as the dyadic entrainment of C by P) and direct effect of C on P, $C \to P$. Specifically, the direct dyadic effect of P on C is about the the extent to which the existence of a policy tie p_{ij} promotes the creation or maintenance of a cooperation tie c_{ij}. On the other hand, the effect of C on P is about how cooperation ties could feed back to policy ties.

B   Within-network effects, P: Left-right, market, and EU in policy networks

Beyond cross-network effects $P \to C$ and $C \to P$, we also model various within-network effects that shape the evolution of policy networks, P, and cooperation networks, C. For policy networks, it has been found that the policy position of the EU member states could be strongly affected by the ideological orientations of their national governments (Huhe, Naurin and Thomson, 2018, 2020; Huhe et al., 2022). Drawing on data from the Comparative Manifesto Project (CMP, see, Volkens et al.), we calculate the ideological orientations of each national government at the time of three waves of the NCEU survey in 2003, 2012, and 2021. We use the three most relevant measures of parties' ideological orientations, that is, the left-right, the free market economy, and the EU integration dimensions.

C   Within-network effects, C: Transitivity and popularity in cooperation networks

For cooperation networks, C, we incorporate two key structural effects, the transitivity effect and popularity effect (Huhe, Naurin and Thomson, 2018, 2020; Huhe et al., 2022). Specifically, transitivity is the commonly found pattern where friends of friends are friends.

In this study, we geometrically weighted edgewise shared partners (GWESP) to capture the transitivity effects, as GWESP is able to provide a reliable estimate when two countries share multiple common friends. The popularity effect highlights the importance central players in cooperation networks (Huhe, Naurin and Thomson, 2018, 2020; Ingold, Fischer and Christopoulos, 2021). The "popluar" country in a cooperation network, which have many network ties,tend to enjoy a cumulative advantage, in which these popular actors are more likely to be selected than unpopular ones.

IV   Results and findings

We proceed our analysis by first adding the direct dyadic effect of P on C, $P \rightarrow C$, and then the effects of C on P, $C \rightarrow P$. We conduct the analysis for the four working groups, Coreper I, Agriculture, Economic Policy and Environment. The main results of our SAOM analysis are reported in Table 1 (for full results, see appendices), and several important findings stand out. First, as highlighted in Table 1, we find significant cross-network effects across the four working groups (i.e., M1, M3, M5, and M8), confirming our first hypothesis of the importance of co-evolution of cooperation networks C and policy networks P in the EU Council.

Table 1: SAOM analysis of the co-evolution of cooperation networks and policy networks

| | COREPER I | | Agriculture | | EPC | | Environment | |
	M1	M2	M3	M4	M5	M6	M7	M8
				Cooperation Networks, C				
C rate (2003-2012)	20.02	22.78***	5.07***	5.68***	6.32***	6.59***	17.86**	19.52
	(33.28)	(1.51)	(0.87)	(1.20)	(2.33)	(2.11)	(7.06)	(25.48)
C rate (2012-2021)	5.95***	4.42***	3.95***	4.04***	5.92***	5.68***	15.35**	7.21***
	(0.95)	(0.66)	(0.59)	(0.64)	(1.12)	(1.17)	(6.83)	(1.79)
Degree (density)	−0.72***	−6.39***	−0.40***	−0.58**	−0.87***	−1.18***	−1.98***	−0.93***
	(0.08)	(1.47)	(0.09)	(0.23)	(0.08)	(0.27)	(0.18)	(0.17)
$P \rightarrow C$		−6.10		0.14		1.07		**0.95****
		(63.39)		(0.67)		(0.74)		(0.32)
				Policy Networks, P				
P rate (2003-2012)	6.45***	15.88	9.22***	7.47***	25.87	19.82*	5.71***	5.19***
	(1.25)	(51.32)	(2.37)	(1.22)	(17.42)	(10.17)	(0.86)	(1.11)
P rate (2012-2021)	5.74***	3.88***	39.75**	29.50*	9.18***	9.53***	19.19*	13.62
	(0.94)	(0.74)	(15.77)	(16.86)	(2.06)	(1.62)	(11.51)	(8.31)
Degree (density)	−0.82***	−3.84***	−0.77***	−0.30***	−0.82***	−0.62***	−0.09	−0.67***
	(0.16)	(0.57)	(0.10)	(0.06)	(0.17)	(0.06)	(0.21)	(0.11)
$C \rightarrow P$	**0.88***		**1.46****		**1.02****		−1.91	
	(0.45)		(0.27)		(0.59)		(4.35)	
Iterations	2162	2162	2162	2162	2162	2162	2162	2162

Note:

Second and more importantly, our analysis suggests that cross-network effects vary significantly across the working groups in the EU Council. In Coreper I, agriculture, and EPC, there is a strong and significant the direct dyadic effect of C on P, $C \rightarrow P$, and the effect seems particularly strong in the working group of agriculture. On the other hand, we find no significant direct dyadic effect of P on C in either working groups. These findings suggest that in Coreper I, agriculture, and EPC, it is existing cooperation ties that lead to new policy ties, but not the other way around. In other words, cooperation activities in Coreper I, agriculture, and EPC lead to policy agreements among the member states, confirming our Hypothesis 2. Moreover, consistent with Hypothesis 2a, we could find that the direct dyadic effect of C on P, $C \rightarrow P$, is more prominent in the working group of Agriculture, where policy agendas are more established and stable.

When turning to the working group of environment, we find the co-evolution patterns are quite different from the other working groups. The cross-network effects in the environment cooperation networks and policy networks are running mainly from policy networks to cooperation networks. As shown in M7, we do not find strong impacts of cooperative ties on policy convergence, i.e., $C \rightarrow P$. Instead, M8 shows that policy convergence on environment issues seem to push member state to cooperate more with each other.

[**Figure 3 is about here.**]

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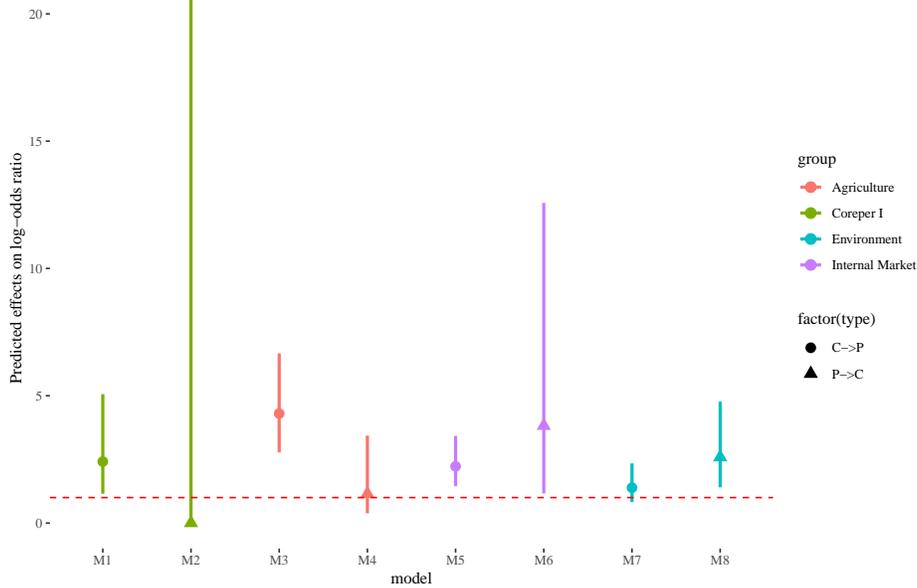
Figure 3: Predicted effects of $P \rightarrow C$ and $C \rightarrow P$ on log-odd ratios in forming a new tie

Figure 3 illustrates the predicted cross-network effects of $C \rightarrow P$ and $P \rightarrow C$. For example, $C \rightarrow P$ effect of M1 is the predicted impacts on log-odds ratio of creating a policy tie between country i and j, p_{ij}, when there is an existing cooperation tie between them, c_{ij}. The red dashed line is log-ratio of 1, suggesting null effects. From Figure 5, we can find the predicted cross-network effects of M1, M3, M5, M6, and M8 are well above the red dashed line.

V Conclusion and discussion

In this study, we focus on the Council of the EU and systematically explore how policies and cooperation co-evolve over time in different working groups within the Council. We utilize data from two projects that have tracked the policy positions of EU member states (i.e., DEU III) and the cooperative activities among their delegates in the EU Council (NCEU) over more than two decades. By treating these as multiplex networks, we apply SAOM model to analyze the network co-evolution of policy congruence and cooperative ties in four distinct Council committees (Coreper I, Agriculture, Economic Policies, and

Environment) from 2003 to 2021. Our analysis confirms a significant co-evolution of policies and cooperation within various committees of the EU Council. Notably, we find that this co-evolution varies across policy areas and working groups. In long-established policy areas such as agriculture, the effects of cooperation on policy positions are more pronounced, whereas in more unstable policy areas like environmental issues, we observe significant effects running from policy positions to cooperative activities.

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Appendix 1: SAOM analysis of COREPER I

Table 2: SAOM analysis of the co-evolution of cooperation networks and policy networks

	M1	M2	M3	M4	M5	M6	M7
	Cooperation Networks, C						
C rate (2003-2012)	5.07***	5.68***	5.33***	6.48	5.05***	5.16***	5.38
	(0.87)	(1.20)	(1.62)	(6.59)	(1.47)	(1.18)	(4.51)
C rate (2012-2021)	3.95***	4.04***	3.99***	4.17*	4.10***	4.00***	4.00***
	(0.59)	(0.64)	(0.87)	(2.23)	(0.75)	(0.70)	(1.22)
Degree (density)	−0.40***	−0.58**	−0.53	−0.72	−0.48	−0.50	−0.54
	(0.09)	(0.23)	(0.60)	(1.10)	(0.77)	(0.59)	(1.51)
$P \to C$		0.14	0.36	−0.16	0.47	0.38	0.28
		(0.67)	(1.41)	(2.98)	(1.52)	(1.28)	(2.13)
GWESP				1.15***			
				(0.40)			
Populariy				−0.05			
				(0.06)			
	Policy Networks, P						
P rate (2003-2012)	6.45***	15.88	0.08	6.06***	6.34	6.66**	9.54
	(1.25)	(51.32)	(0.06)	(1.56)	(26.25)	(2.86)	(42.83)
P rate (2012-2021)	5.74***	3.88***	67.25	5.83***	5.67***	5.83***	7.15
	(0.94)	(0.74)	(632.90)	(1.13)	(1.06)	(1.04)	(7.12)
Degree (density)	−0.82***	−3.84***	18.72	−0.83***	−0.81	−0.83***	−0.62
	(0.16)	(0.57)	(363.02)	(0.17)	(0.69)	(0.17)	(5.50)
$C \to P$	0.88*		−45.82	0.84*	0.87	0.90*	5.53
	(0.45)		(358.02)	(0.49)	(5.08)	(0.49)	(71.29)
Left-right					−0.37		
					(11.58)		
Market						0.24	
						(0.60)	
EU							2.92
							(30.58)
Iterations	2162	2162	2162	2162	2162	2162	2162

Note:

Appendix 2: SAOM analysis of agriculture

Table 3: SAOM analysis of the co-evolution of cooperation networks and policy networks

	M1	M2	M3	M4	M5	M6	M7
	Cooperation Networks, C						
C rate (2003-2012)	5.07***	5.68***	5.33***	23.30	19.96	21.48	36.78**
	(0.87)	(1.20)	(1.62)	(27.82)	(794.41)	(32.92)	(15.17)
C rate (2012-2021)	3.95***	4.04***	3.99***	7.06***	6.02***	5.87***	6.31***
	(0.59)	(0.64)	(0.87)	(1.50)	(1.92)	(1.06)	(1.06)
Degree (density)	−0.40***	−0.58**	−0.53	−1.08***	−0.71	−0.73***	−0.75***
	(0.09)	(0.23)	(0.60)	(0.28)	(0.64)	(0.08)	(0.21)
$P \rightarrow C$		0.14	0.36				
		(0.67)	(1.41)				
GWESP				1.42***			
				(0.22)			
Popularity				−0.06***			
				(0.02)			
	Policy Networks, P						
P rate (2003-2012)	9.22***	7.47***	9.49***	9.77***	9.38**	10.30***	9.55**
	(2.37)	(1.22)	(2.41)	(2.91)	(4.05)	(3.08)	(4.86)
P rate (2012-2021)	39.75**	29.50*	39.46	33.82	40.49**	42.60***	36.12
	(15.77)	(16.86)	(41.40)	(89.73)	(18.49)	(16.16)	(122.02)
Degree (density)	−0.77***	−0.30***	−0.84***	−0.85**	−1.61***	−1.00***	−0.75
	(0.10)	(0.06)	(0.15)	(0.40)	(0.51)	(0.21)	(0.64)
$C \rightarrow P$	1.46***		1.65***	1.65*	3.84**	2.08***	1.36**
	(0.27)		(0.32)	(0.98)	(1.57)	(0.60)	(0.69)
Left-right					4.36*		
					(2.59)		
Market						0.90	
						(0.55)	
EU							0.76*
							(0.42)
Iterations	2162	2162	2162	2162	2162	2162	2162

Note:

Appendix 3: SAOM Analysis of EPC

Table 4: SAOM analysis of the co-evolution of cooperation networks and policy networks

	M1	M2	M3	M4	M5	M6	M7
	Cooperation Networks, C						
C rate (2003-2012)	6.32***	6.59***	6.89*	16.59	6.91***	6.90***	6.89
	(2.33)	(2.11)	(3.88)	(10.45)	(2.68)	(1.95)	(8.31)
C rate (2012-2021)	5.92***	5.68***	6.21***	8.20***	6.21***	6.18***	6.25***
	(1.12)	(1.17)	(1.48)	(2.92)	(1.27)	(1.19)	(1.51)
Degree (density)	−0.87***	−1.18***	−1.32	−1.62***	−1.32***	−1.33***	−1.32**
	(0.08)	(0.27)	(3.68)	(0.36)	(0.40)	(0.32)	(0.60)
$P \rightarrow C$		1.07	1.21	0.84	1.21	1.23*	1.23
		(0.74)	(7.15)	(0.63)	(0.87)	(0.71)	(1.13)
GWESP				1.71***			
				(0.29)			
Popularity				−0.07***			
				(0.02)			
	Policy Networks, P						
P rate (2003-2012)	25.87	19.82*	28.00	28.36	28.13	28.16	27.20
	(17.42)	(10.17)	(245.35)	(25.06)	(47.13)	(24.44)	(88.34)
P rate (2012-2021)	9.18***	9.53***	10.16***	9.69***	10.29***	10.23***	10.20***
	(2.06)	(1.62)	(2.66)	(2.07)	(2.17)	(2.54)	(3.01)
Degree (density)	−0.82***	−0.62***	−0.84***	−0.85***	−0.85***	−0.86***	−0.85***
	(0.17)	(0.06)	(0.14)	(0.10)	(0.17)	(0.14)	(0.25)
$C \rightarrow P$	1.02*		1.06**	1.08***	1.07	1.09**	1.08
	(0.59)		(0.42)	(0.39)	(0.69)	(0.55)	(0.88)
Left-right					−0.06		
					(0.33)		
Market						0.33	
						(0.36)	
EU							−0.22
							(0.62)
Iterations	2162	2162	2162	2162	2162	2162	2162

Note:

Appendix 4: SAOM Analysis of Environment

Table 5: SAOM analysis of the co-evolution of cooperation networks and policy networks

	M1	M2	M3	M4	M5	M6	M7
				Cooperation Networks, C			
C rate (2003-2012)	17.86**	19.52	20.10	30.16*	19.46	19.09**	19.58
	(7.06)	(25.48)	(17.33)	(17.93)	(20.14)	(7.42)	(20.17)
C rate (2012-2021)	15.35**	7.21***	7.71***	9.04***	7.76***	7.69***	7.72***
	(6.83)	(1.79)	(1.72)	(2.04)	(1.59)	(1.74)	(1.37)
Degree (density)	−1.98***	−0.93***	−1.09***	−1.51***	−1.07***	−1.08***	−1.11***
	(0.18)	(0.17)	(0.13)	(0.30)	(0.17)	(0.16)	(0.17)
$P \to C$		0.95***	1.23***	1.13***	1.22**	1.25***	1.29***
		(0.32)	(0.36)	(0.40)	(0.51)	(0.38)	(0.45)
GWESP				1.40***			
				(0.26)			
Popularity				−0.06***			
				(0.02)			
				Policy Networks, P			
P rate (2003-2012)	5.71***	5.19***	4.88***	4.05***	4.84***	4.80***	4.85***
	(0.86)	(1.11)	(0.88)	(0.86)	(0.97)	(0.83)	(1.01)
P rate (2012-2021)	19.19*	13.62	15.70	16.17***	15.04	15.08**	15.46***
	(11.51)	(8.31)	(10.10)	(6.17)	(10.24)	(6.40)	(5.26)
Degree (density)	−0.09	−0.67***	−0.99***	−0.99***	−0.99***	−0.97***	−0.99***
	(0.21)	(0.11)	(0.19)	(0.18)	(0.23)	(0.16)	(0.22)
$C \to P$	−1.91		1.07**	1.06**	1.06**	1.00**	1.07*
	(4.35)		(0.47)	(0.46)	(0.54)	(0.42)	(0.57)
Left-right					−0.41		
					(0.54)		
Market						−0.62	
						(0.51)	
EU							−0.07
							(0.62)
Iterations	2162	2162	2162	2162	2162	2162	2162

Note: