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European administrative networks during times of crisis: Exploring the temporal development of the internal market network SOLVIT

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Abstract
European administrative networks (EANs) are an increasingly prominent form of European Union (EU) governance. Although these networks are typically portrayed as important and flexible forms of organization, we lack knowledge of their temporal dimension, including their development in times of crisis. This paper provides a first analysis of network interaction as it unfolds before and during times of severe crisis for the EU internal market. Specifically, we examine interactions in the EU internal market network SOLVIT. This network offers member states both a formalized procedure for the bilateral resolution of cases of alleged misapplication of EU law, and an informal network for general discussions on internal market topics and SOLVIT-related matters beyond specific case-resolution. Based on unique three-wave survey data, we develop a continuous-time model (stochastic actor-oriented model) to analyze the evolution of SOLVIT’s informal interactions over time. In explaining these developments, we reflect on the importance of two crises: the exit of a central SOLVIT member (the United Kingdom), which drove informal interactions to a great extent, and COVID-19, which led to great sudden uncertainty and challenges for the implementation of internal market law. Our results show that the network is remarkably stable and despite, or rather because of, these crises, has become denser over time.

Keywords: Brexit, COVID-19, crisis, European administrative networks, internal market, network interaction.

1. Introduction
On March 10, 2020, the Von der Leyen Commission presented its long-term action plan for better implementation and enforcement of single market rules. The strategy identified European administrative networks (EANs) as key instruments for improving compliance with EU law (European Commission, 2020). Soon after the presentation, the long-term action plan was overshadowed by the COVID-19 pandemic. Several member states imposed unilateral restrictions on international trade and travel, jeopardizing the EU’s internal market. This crisis put to test the instrumental value of SOLVIT, the key administrative network in the realm of the internal market. This external crisis followed on Brexit, an internal crisis likely to put a strain on SOLVIT interactions given the exit of a central and well-endowed actor in network cooperation—the United Kingdom (Huhe et al., 2018, p. 48). This study maps the effects of these twin crises on network functioning, with the aim of contributing to our understanding of the potential of EANs as key building blocks of the European administrative space (Hofmann, 2008).

The scholarly literature has taken a growing interest in EANs. Observers assign a central role to EANs as tools to close the gap between EU legislation and national implementation (Bach & Ruffing, 2018; Boeger & Corkin, 2017; Egan & Guimarães, 2017; Hobolth & Martinsen, 2013). As such, EANs are presented as providing...
middle-ground, more technocratic solutions to the dilemma of international interaction (Eberlein & Grande, 2005; Eberlein & Newman, 2008): they provide a setting for joint problem solving and focus on policy delivery while preventing a full-fledged delegation of national responsibilities to supranational organizations, such as the European Commission or EU agencies. However, despite the growing academic attention to EANs (Mastenbroek & Martinsen, 2018), the temporal dimension of network development remains understudied. Although the literature has described and analyzed the institutional development of networks into EU agencies, there has been limited attention to changes in the functioning of networks over time—partly because this would require comparative data gathered at multiple points in time. Consequently, we have a limited view of the evolution of interactions in networks. This paper seeks to address this research gap, by reporting on the results of a unique three-wave survey, first conducted in 2011 and then repeated in 2018 and 2021, on network interactions in SOLVIT. All surveys obtained full response.

Analyzing SOLVIT interactions over time also allows us to include the more specific question of what happens to network governance in times of crisis. This question follows from EANs’ rather technocratic nature. Composed of EU member state representatives from the national executives, EANs seek to address and resolve issues of national implementation or enforcement of EU policies through processes of information exchange, capacity building and learning (Mastenbroek & Martinsen, 2018). However, they may be ill-fitted in periods of crisis, which call for political leadership and emergency politics (White, 2019). A crisis can be defined as an “open moment” which “impact on rulers and ruled, testing existing paradigms, policies, institutional roles and rules” (Laffan, 2016, p. 916). It may well lead to disintegration (Schimmelfennig, 2017), also for networks. Thus on the one hand, crises tend to necessitate hierarchical steering, central coordination, and clear-cut responsibilities. At the same time, crises also may demand flexibility and autonomy at the operational level (Christensen et al., 2016), which is the stronghold of networks. These tend to be flexible and adaptive, as they can mobilize expertise quickly through the individuals engaged in mutually supportive interactions (Agranoff & McGuire, 2001; Slaughter, 2004a).

In order to shed light on these (juxtaposed) expectations, we study the development of network interactions over time and trace the effect of crises on them. We do so by exploring interactions in times of both stability and crisis in one of the key EANs: SOLVIT. This is a problem-solving network, which allows member states to resolve cases of alleged misapplication of EU internal market law. On top of this institutional infrastructure, SOLVIT is also a more informal network, in which the national SOLVIT centers interact to discuss matters like internal market policy, its implementation, and the operation of SOLVIT. It is this second type of network that is central to this study.

In recent years, two important crises have confronted SOLVIT: Brexit and the COVID-19 crisis. Previous research finds the United Kingdom to be a leading network actor in the Council of the European Union (Huhe et al., 2018), but to have lost that position after the Brexit referendum (Johansson, 2021). Concerning SOLVIT, previous research informs that the United Kingdom was among the best performing member states when it comes to solving cases of misapplied internal market law (Hobolth & Martinsen, 2013). Against this background, we assume the United Kingdom to be a core actor also in the informal network interactions of SOLVIT.

According to the literature on network governance, the core is critical to the overall performance of a network (Provan & Lemaire, 2012, p. 646). Thus, we assume that the turmoil surrounding Brexit affects not only the network position of the United Kingdom, but the network as a whole. In addition, we assume network interaction to be affected by the disruptions caused by the COVID-19 pandemic (Blauberger et al., 2023). More specifically, we ask how informal network interactions in SOLVIT developed over time and how Brexit, as a crisis of membership, and COVID-19, as a more functional crisis with a profound impact on the internal market and on bureaucratic routines, affected SOLVIT interactions. To answer these questions, we employ social network analysis (SNA) and stochastic actor-oriented models (SAOMs), guided by case-specific exploratory expectations. Our results show that the network is remarkably stable and that despite, or rather due to, it being exposed to crises, has become more densely knitted over time.

In the following section, we first introduce SOLVIT, a EAN situated in the core policy field of European integration: the internal market. Subsequently, we discuss different expectations on network development before and after crisis. Next, our research design and data collection is presented, followed by the results of our analysis. Finally, we conclude.
2. SOLVIT: EAN at the core of European integration

This article investigates informal interactions in a network at the heart of European integration: the internal market. The internal market program is unprecedented in scope and ambition: the abolishment of all tariff and non-tariff barriers to trade while establishing minimal standards of social, consumer, and environmental protection. Ultimately, the EU seeks to realize the free movement of services, goods, capital, and persons within its borders. However, progress is hampered by patchy national compliance (Egan & Guimarães, 2017). To improve the state of play, the member states established the administrative network SOLVIT in 2001. Crucially, this network has two “faces”: (1) a formal problem-solving network, in which member states engage bilaterally to resolve alleged cases of misapplication of internal market law and (2) a more informal network in which the member states engage to discuss the implementation of internal market law and the governance of SOLVIT. Although the second “face” of network is central to our analysis, we first describe SOLVIT’s formal problem-solving character and infrastructure, as this is bound to affect the functioning of the informal network.

In the first place, SOLVIT is a formal “problem-solving” network with the specific task of solving cases where internal market law has been misapplied (Martinsen et al., 2022; Vifell & Sjögren, 2014). It does so by offering a “unified system” supported by an online database (Lottini, 2016), aimed at the bilateral resolution of cases of alleged misapplication of EU internal market rules. If EU citizens or businesses find that EU law is not applied correctly in another member state, they may refer the case to the SOLVIT center in the member state where they reside or are established. The SOLVIT center here acts as home center, submitting the case. The SOLVIT center is then required to contact the SOLVIT center in the member state where the alleged misapplication took place. The SOLVIT center receiving the case acts as lead center. As a next step, the two SOLVIT centers are to examine the case. Together, they are responsible for handling cases of potentially misapplied EU law. Representatives from SOLVIT centers thus interact bilaterally when a case is filed with them. These interactions are underpinned by minimum standards and qualitative objectives set out in a Commission recommendation.

SOLVIT cases are numerous and have grown over time. In 2002, the SOLVIT network handled 38 cases. In 2022, the network dealt with no less than 2271 cases. Over time, we see an overall steady increase in caseload, albeit with a smaller drop during COVID-19 years. SOLVIT also aims at efficient case handling. The target deadline for a case to be resolved is a maximum of 10 weeks. In 2022, 64% of all cases met this deadline. SOLVIT centers responsible for the intake of complaints in the home country must reply within 7 days and prepare each case for the lead SOLVIT center within 30 days. According to the Single Market Scoreboard, this target is generally met. Finally, resolution rates are high. In 2022, 88% of the cases were solved.

In sum, SOLVIT provides member states with a formal institutional infrastructure for solving alleged problems of noncompliance with EU internal market law. In addition to this, however, SOLVIT is an informal policy network with a “network spirit” (Kokolia, 2018, p. 113). That is, civil servants from national SOLVIT centers regularly interact to discuss EU internal market matters beyond specific cases of misapplication. By doing so, SOLVIT has become an important governance tool to promote compliance with internal market law. Dealing with individual cases of misapplication, SOLVIT centers at times detect more general patterns of noncompliance with EU rules arising from national legislation, guidelines, or practices. Since 2013, procedures for dealing with these so-called structural cases have been put in place (Commission Staff Working Document, 2022). These structural cases go beyond individual dispute resolution and are noted to feed into the Commission’s work on both enforcement and policy (Commission Staff Working Document, 2022, p. 14). In addition, the SOLVIT network fosters administrative cooperation exchanging and pooling information about EU law between European and national peers. In the SOLVIT network, European peers interact to discuss how to promote the implementation and enforcement of EU internal market law and are informed about best practices on how to do so. This knowledge is then taken back home, making SOLVIT representatives better equipped to exert peer pressure from within their national administrations to ensure compliance (Commission Staff Working Document, 2022, p. 5).

Informal networking takes place both in various forms and at various occasions. First, bilateral informal contacts have been reported (explorative interviews with SOLVIT representatives, June 2018). Members may phone each other or visit each other with a delegation. Such contacts may concern bilateral dossiers that go beyond a single case of misapplication, more general matters of internal market policy implementation and enforcement,
as well as topics relating to the governance of SOLVIT, including guidelines to be developed, matters related to the SOLVIT database or how to ensure capacity building. Second, SOLVIT members sometimes meet in subgroups. One of the goals of such interaction is to put more general internal market and SOLVIT matters on the agenda of the Commission (National Board of Trade Sweden, 2022). For instance, in 2018 a number of SOLVIT centers met at least twice to develop a joint proposal on the improved enforcement of internal market law (explorative interviews with SOLVIT representatives, June 2018). In 2021, a SOLVIT network internal working group was formed to discuss ways of strengthening SOLVIT (National Board of Trade Sweden, 2022, p. 6). This working group was headed by SOLVIT Netherlands and Luxemburg, and counted 10 other SOLVIT centers as its members (National Board of Trade Sweden, 2022, p. 7). Third, SOLVIT members meet at least twice a year in plenum during SOLVIT workshops. These workshops typically last for 2–3 days, allowing for informal chats and exchanges over dinners and coffees as well as interaction in plenary and thematic meetings geared at exchanging information, best practices, and advice on general internal market issues and issues related to SOLVIT governance. For instance, in 2003 the centers and the Commission adopted a set of quality and performance standards shaping the work of SOLVIT in the years to come (Lottini, 2016, p. 142). Furthermore, a SOLVIT workshop served to spread a best practice by the Swedish SOLVIT center, which had developed an internal market guide for its national authorities to improve compliance with internal market law. This was presented, translated and, ultimately, shared with other SOLVIT centers (Vifell & Sjögren, 2014, p. 472). In 2021, the 51st SOLVIT workshop discussed themes such as general developments in the enforcement of single market law, cooperation with the European Labour Authority (ELA) and SOLVIT, exchanged best practices on how to attract more business cases and had feedback from an established think tank group on the future of SOLVIT (EC SOLVIT agenda, the 51st 2021 SOLVIT Brussels workshop).

This more informal, more general “face” of the SOLVIT network is central to our analysis, as these interactions reflect discretionary choices of exchange by network members. Whereas the direction of formal case-based interactions is decided by the case itself, informal interaction is more selective where peers exchange resources with whom they deem more relevant or more necessary to address joint action problems arising during the implementation and enforcement of common policies (Martinsen et al., 2022, p. 1530). This combination of a formal case-based network with an informal, more general network interacting on more general aspects of EU law is not unique to SOLVIT. A similar situation exists for the European competition network, which displays ample informal networking in terms of policy discussions and learning between national competition officials, on top of the formal and informal interactions in specific enforcement cases (Cengiz, 2010, pp. 667–668).

In our view, SOLVIT is a well-suited case for studying interactions as they develop over time. First, there is a felt need among EU member states for cooperation, while national temptations to circumvent or evade mutually agreed upon internal market rules are manifold (Egan & Guimarães, 2017, p. 296). The strategic benefits of defection result in longstanding problems of noncompliance, which hinder the construction of a level playing field. Second, SOLVIT constitutes a case in point for analyzing network development because the European single market was recently confronted with the inconsistency and unpredictability of both a crisis of membership and a functional crisis. First, the United Kingdom prepared to exit and then left the EU and SOLVIT. Third, the COVID-19 pandemic implied a fundamental setback to the internal market, with a strong decline in intra-EU trade and massive restrictions to cross border movement (Marcus et al., 2021). The pandemic caused member states to reinstall rigid borders to contain the virus and thus heavily impacted European cooperation and bureaucratic routines concerning the internal market (Blauberg et al., 2023). Overall, this “dramatic debordering” (Genschel & Jachtenfuchs, 2021, p. 253) was a critical challenge to the constitutive principles of the internal market.

We examine EAN informal interactions on the basis of a unique dataset, allowing us to compare interactions in SOLVIT at three different points in time: 2011, 2018, and 2021. We are thus able to compare interaction at points in time: in 2011 before crisis, in 2018 during the Brexit crisis, and in 2021 when EAN interactions were exposed to the COVID-19 pandemic. The first point in time allows us to identify the informal network structure and its central actors before crisis.
3. Development before and after crisis

EANs are networks of national administrative representatives, that is, civil servants, tasked with the implementation and enforcement of EU law (Hofmann, 2008; Mastenbroek & Martinsen, 2018) and sometimes called European regulatory networks (Blauberger & Ritterberger, 2015; Maggetti & Gilardi, 2014) or transgovernmental networks (Eberlein & Newman, 2008; Hobolth & Martinsen, 2013; Slaughter, 2004b). Although they have been identified as key components of European governance, we know very little about how members interact over time and particularly when hit by crisis.

In general, governance networks have no fixed pattern of interaction. Instead, their structure is conditioned by the exchange of resources between members. As a result, networks are perceived as dynamic rather than fixed. Conditional on evolutionary forces within and beyond the network, they are subject to change. Change could entail more integration, disintegration or even a full breakdown of the network (Newig et al., 2010). Over time, the question becomes whether network members come to interact more or less. When important decisions are made in the network and central resources are exchanged, network members are likely to acknowledge the relevance of the network, enabling interaction to be stable or become more frequent. However, network functioning may be affected by crises, which change incentives to interact and thereby levels and forms of interaction. The question thus becomes how EANs cope with such crises. Are they fragile, becoming less relevant and less effective or do they prove flexible and stable amid a storm? Below, we present three explorative expectations on network interactions before and after crises. We start with the former situation, which we label autonomous development.

3.1. Autonomous development

One assumption about EANs is that they develop into ever more centralized and formalized structures, as the principal EU institutions push for this, while the member states become more dependent on them (Héritier, 2007). Levi-Faur (2011) states that networks are more intermediate structures involved in a process toward a more developed form of institutionalization and notices a trend toward agencification in the EU governance system. Accordingly, the evolutionary trajectory implies that networks are either dissolved or changed into agencies by the EU Commission (Thatcher & Coen, 2008). At the same time, the potential of networks to draw on collective expertise and allow for more flexible governance responses may also prove to be a better form of organization (Slaughter, 2004a). Consequently, networks can also integrate over time and become more embedded in the European administrative space such that their speed and flexibility are used to coordinate supranational goals (Eberlein & Newman, 2008). Socialization and training develop domestic administrative capacity such that networks will increasingly integrate the administrative space and foster transgovernmental collaboration. The more network members meet and become acquainted with one another, the more they acknowledge the need for and benefit of exchanging resources and become willing to do so. Therefore, we expect interactions in the SOLVIT network to become denser over time, at least in the pre-crisis period (Expectation 1).

3.2. Membership crisis: Brexit

A key condition for network stability is the ability of a network to remain operational in the event of an approaching exit of a prominent player in the network (Bakker et al., 2012). A sudden change in the core of a network may have a major impact on its structure to the extent that the network as a whole may disintegrate (Albert et al., 2000; Borgatti et al., 2014; Duijn et al., 2014; Provan & Lemaire, 2012). In line with previous research on network interactions in the Council of the European Union (Huhe et al., 2018; Johansson, 2021) and high-performing SOLVIT centers (Hobolth & Martinsen, 2013), we expect the United Kingdom to play a key role in informal SOLVIT interactions. However, since the 2016 referendum on the United Kingdom leaving the EU, its position in relation to the EU and, consequently, in SOLVIT was surrounded by uncertainty. The network study by Johansson (2021) shows that the United Kingdom lost significant network capital in its cooperation in the European Council, dropping from one of the most influential member states in its interactions somewhere in the middle. In addition, Huhe et al. (2018) found that Brexit jeopardized the network capital of a large proportion of the remaining member states in the Council. Network theory finds that key actors are crucial for the overall functioning of networks and that the exit of a highly central actor can negatively impact network cohesiveness and its overall density (Albert et al., 2000; Borgatti et al., 2014; Provan & Lemaire, 2012). Thus, we expect that as
of 2016, the pending Brexit could destabilize the United Kingdom’s position in the network and reduce the density of interactions in the network (Expectation 2a).

On the other hand, some networks also manage to remain intact in their basic functions when subject to pressure or sudden change (Newig et al., 2010). A certain overlap of both competencies and network relations makes a network less vulnerable to pressure and preserves the functions ascribed to the network. Crucially, if certain actors with a particular role in a network exit, other members could take over some of the tasks, replacing old ties with new ones. Along these lines of reasoning, SOLVIT could respond to the loss of the United Kingdom as a central member by replacing lost ties with new ones.

The main reason for this expectation is that national centers have strong incentives to prevent networks from breaking down. Being member state driven, this approach functions as a better alternative to a more supranational solution. Moreover, some members are likely to want to assume a more central position. As demonstrated by Huhe et al. (2018), Germany and, to a lesser degree, France are likely to enhance their mediating role in European networks in the face of Brexit. Similarly, for SOLVIT, a particularly likely case for a more central position is Germany, as it is a dominant and well-connected trade partner with one of the highest caseloads among SOLVIT members (European Commission, 2017, p. 9) and has ample administrative capacity to invest in the network. We thus assume that other member states, particularly Germany and to a lesser degree France, will take over the United Kingdom’s central position and compensate for its exit (Expectation 2b).

### 3.3. Functional crisis

However, there are limits to how many crises existing institutions can absorb. Crisis accounts emphasize the institutional incompleteness of the EU, and that the system is not designed to respond to large-scale crises (Goetz & Martinsen, 2021; Jones et al., 2016; Laffan, 2016). The COVID-19 pandemic constitutes a large-scale and functional crisis, stretching EU governance to its limits.

Less than two months after Brexit, EU leaders publicly acknowledged the severity of the COVID-19 pandemic. In early March 2020, business-as-usual politics was still ongoing in most member states, but by late March, the COVID crisis hit headlines throughout Europe and became the overall concern of all political actions (Ferrera et al., 2021). It soon became clear that the COVID-19 pandemic was a crisis “in extremis” that swept away any standard repertoire of political responses (Ansell et al., 2021, p. 949). Instead, emergency politics took over (White, 2019). EU crisis accounts have examined institutional adaptation prompted by the COVID-19 crisis. Here, the focus has, however, foremost been on cooperation, rivalry and shifts of power between and within the European Commission, the Council, agencies or in relation to individual member states (Deruelle & Engeli, 2021; Ferrera et al., 2021; Jones, 2020; Rauh, 2022; Truchlewski et al., 2021). Instead, research into the adaptive capacities of more informal, expert-driven institutions, such as governance networks, is limited. While Blauberger et al. (2023) find that flexible solutions and pragmatism resulting from pre-existing transgovernmental networks aided the functioning of the internal market during the COVID-19 pandemic, we still know little about the impact of such crises on the functioning of informal and networked institutions (Blauberger et al., 2023). These structures are likely to do best in times of stability, where problems can be addressed within the range of existing competencies, codified rules, and established codes of conduct. Crises, however, imply uncertainty and unpredictability and preclude the use of ready-made, standard solutions (Ansell et al., 2021). They pose a challenge to bureaucratic routines and cooperation (White, 2019). Therefore, network actors’ ability and willingness to engage in joint solutions are tested. In addition, the COVID-19 pandemic had a profound impact on the functions of the internal market. This implied a dramatic decrease in intra-EU trade and imposed restrictions on the free flow of individuals (Blauberger et al., 2023; Marcus et al., 2021). Thus, the very core of the internal market was challenged, and we can expect an internal market network such as SOLVIT to resultingly become less relevant and its members to turn their attention and problem-solving capacity back home. In sum, we expect the COVID-19 pandemic to make interactions in SOLVIT less dense (Expectation 3a).

Furthermore, a functional crisis may reorient a network’s relations with external centers of authority. While networks facilitate cooperative efforts to deal with transboundary crises, such crises also emphasize the need for strong leadership, central direction, and the clarification of responsibilities (Christensen et al., 2016). Networks are often considered flexible, adaptive, and horizontal modes of governance, but they are also embedded in a
“shadow of hierarchy” (Héritier & Lehmkuhl, 2008). In the case of SOLVIT, this shadow is cast by the Commission in its role as a guardian of the treaties.

In times of crisis, the Commission has proven to become an engine of integration. EU scholars find that while its tasks and powers change, moving toward policy management and political leadership, its position remains at the center of crisis handling (Bauer & Becker, 2014; Becker et al., 2016). Not long after the COVID-19 pandemic hit Europe, a notable shift in power and responsibility to the Commission occurred (Goetz & Martinsen, 2021). Furthermore, Deruelle and Engeli’s (2021) study on the role of COVID-19 as a catalyst for institutional shifts concludes that rather than institutional rivalry, the Commission, committees, and agencies developed increased interaction and coordination of shared functions (Deruelle & Engeli, 2021). Consequently, we expect that network members increasingly turned to the Commission during the COVID-19 pandemic for it to clarify rules and reestablish order in the turmoil of crisis (Expectation 3b).

4. Method and data

4.1. Social network analysis and stochastic actor-oriented models

The primary unit of analysis used to study the driving forces behind network governance are the self-reported informal interactions among SOLVIT centers. We use SNA because we assume that the pattern of interactions reflecting these forces are the result of both attributes of the national units involved as well as the characteristics of the network as a whole (Borgatti et al., 2014).

To examine our expectations on the evolution of SOLVIT and its development in the face of crises, we employ SAOM (Snijders & Pickup, 2017). This type of modeling allows for a simultaneous study of agency and structure and enables us to determine the evolution of the studied network by evaluating its interactions at different time points. We use SAOM to model the change process, conditioned on the network as we observed it in 2011 and 2018, and to examine how it developed into the network as we observed it in 2021. To see whether different processes of network evolution are at play during the period of inner turmoil due to the pending Brexit and during the functional crisis period caused by the COVID-19 pandemic, we develop a first model covering 2011 and 2018 and a second model covering the entire period of network development from 2011 and 2018, including 2021. In this way, we can ascertain whether the pending Brexit decision had a different effect on the evolution of the network than the COVID-19 pandemic. In parallel, we model whether the frequency of contact with the Commission changed during these time periods.

We estimate the parameters that affect the probability of each SOLVIT center choosing to either add a certain contact, drop a certain contact, or change nothing at all. We treat the panel data (2011, 2018, and 2021) as repeated snapshots of a process evolving in continuous time and estimate these parameters with a Markov model (Snijders & Pickup, 2017). Changing independent variables are treated to have constant values from one observation moment to the next. This means that for our model including all three time periods (2011, 2018, and 2021), the changing variables refer to two moments: (1) between 2011 and 2018 and (2) between 2018 and 2021. Because changing independent variables are meaningful only if there are three or more observation moments, we treat the independent variables as constant for our model including the years 2011 and 2018 only. We use the Rsiena package to develop and fit our models (Ripley et al., 2011).

4.2. Data collection

The main reason we know little about the evolution of EANs over time is because of the difficulty of obtaining reliable data on interactions at different time points (see Vantaggiato, 2022 for a discussion of this methodological problem). We have the unique opportunity to make use of data on self-reported informal interactions between SOLVIT centers as well as their organizational characteristics from a survey conducted in 2011. We were able to repeat this same survey with all network members (now also including Croatia) first in 2018. In 2021, we repeated the same survey again with all network members, excluding the United Kingdom. Moreover, we had a full response rate for this three-wave survey, enabling us to accurately model the network as if it were complete (Borgatti, 2006). These unique three-wave panel data on SOLVIT center interactions and characteristics allow us to study the development of the network in a crucial timeframe covering the exit of the United Kingdom, and
the unrest caused by the COVID-19 pandemic. Responses to the 2021 survey were collected in October, thus covering approximately the first 1.5 years of the COVID-19 pandemic.

The main dependent variable of our analysis is contact between one SOLVIT center and another regarding a SOLVIT-related matter. For all three surveys, the data on self-reported contact between SOLVIT centers were collected by asking each SOLVIT center which other centers it had contact with in the previous year. Specifically we asked with which other SOLVIT centers the surveyed center was most frequently in contact with when dealing with SOLVIT-related matters. To capture informal interaction beyond bilateral case-handling, the survey explained that “contact” referred to general discussions, exchange of views as well as exchange of informal advice. In the survey, respondents could tick a maximum of five boxes of individual centers most frequently contacted. Therefore, our data contain information on only the strongest connections among SOLVIT centers. At the same time, five names are still considered sufficient to accurately measure network characteristics (Merluzzi & Burt, 2013).

We treat all network interactions as nondirected network ties. This means that if one SOLVIT center indicated having contact with another SOLVIT center, we assume mutual exchange between these centers. Moreover, we choose to model interactions under the assumption that the establishment of a new contact needs to be confirmed by both parties, while the decision to drop a tie can be made without confirmation by the recipient. This best reflects interaction in the SOLVIT network, as general discussions and the exchange of views or informal advice is a two-way street requiring both parties’ involvement.

To examine whether network interactions become denser over time, leading to an increasingly dense network (Expectation 1), similarly dense network (Expectation 2b) or less dense network (Expectations 2a and 3a), we include a density parameter, as well as a parameter measuring the transitive interactions. Transitivity is the overall tendency of network actors to close triads, which is a widely reported pattern in social networks (Snijders et al., 2010, p. 47), including information exchange networks and European regulatory networks (Vantaggiato, 2019). Triads can be defined as all contacts that are connected through one common partner. In instances where contacts connect to contacts they are already indirectly connected to, these triads are closed and turn into a transitive triad. Transitive triads lead to an overall denser and more integrated network structure and can be seen as an important lubricant for social trust. Simply put, this effect captures the social pattern of being more open to interactions with “a friend of a friend.” The effect is operationalized by geometrically weighted edgewise shared partners, commonly used to measure transitivity in advanced social network models, as it accounts for a declining positive impact for each additional shared partner (Snijders et al., 2006).

Moreover, we include a variable in the model measuring the effect of general activity in establishing contacts to examine whether key SOLVIT centers with a high degree, that is, a large number of contacts, become increasingly active in the network. In this way, we can ascertain whether the network becomes more centralized with other SOLVIT centers taking over the United Kingdom’s position in the network or whether further network integration is more horizontal in nature.

Furthermore, in line with Expectation 3b, we include a behavioral component in each model to see whether SOLVIT centers had more or less frequent contact with the Commission during these different crises. Commission contact is based on our repeated survey question on how often SOLVIT centers were in contact with the European Commission for general discussions, the exchange of views and informal advice concerning SOLVIT-related matters. The variable is coded as (1) to denote contact occurring a few times per year, (2) to denote contact occurring a few times a month, (3) to denote contact occurring nearly every day, and (4) to denote contact occurring once a day. We base two parameters on this variable, namely, one parameter measuring the linear effect and one measuring the quadratic effect. The former tells us whether Commission contact increases over time. The latter tells us whether Commission contact increases for actors who were already more in contact with the Commission (i.e., a reinforcing effect).

In addition, we take into account different drivers of network interactions that evolve over time. First, we measure main trade partners as a matrix of countries that are among the top three countries involved in intra-EU exports of goods (1) or not (0). Data on the export of goods among member states were taken from 2017 and 2020 Eurostat data. Similarly, EU mobility is a matrix of countries receiving citizens from other member states as residents, measured as a proportion of their total population. Data on internal mobility were taken from 2017 and 2020 from Eurostat.
Finally, we consider the caseload of SOLVIT centers in terms of the total number of cases they take responsibility for as lead (the country where the problem occurred) and home centers (the country where the citizen resides or the enterprise is located). Data on caseloads were collected for the years 2017 and 2020 from the Commission’s Single Market Scoreboard.

5. Results

5.1. Visualizing network configurations
First, we examine the network structure ex-ante, that is, as forming pre-crisis, in order to identify whether the United Kingdom was a central actor in informal network interaction. Actors can be central in different ways. First, actors with a high number of contacts (degree centrality) have better access to resources, act as hubs in a network, and have the potential to hold influence over their peers. Second, actors that serve as a broker between other actors in a network (betweenness centrality) have more control over what is being exchanged in the network (Burt, 2017). Both types of centrality make an actor critical for the overall functioning of a network (Duijn et al., 2014). Figure 1 presents the SOLVIT network in 2011.

We do indeed see that the United Kingdom is the most central actor in the 2011 constellation. The United Kingdom sits at the center of the network, engaging in general discussions and the exchange of views and informal advice with other network members. Not only does the United Kingdom have the highest number of contacts (degree = 26), it also plays an important bridging role (as shown by its high betweenness centrality [78.40]). Due to its high-degree centrality, the United Kingdom holds a powerful position in the network as it has better access to resources from other actors (information, views, advice) and acting as a hub between actors, it is in a strong position to control the flow of resources. Both forms of centrality are described by Burt (2017, p. 52) as important indicators of social capital. Actors in that position are particularly important for the overall functioning of the network. Therefore, the exit of an actor such as the United Kingdom could potentially harm the network as a whole.

Second, before modeling SOLVIT’s evolutionary processes, we visualize the network at the different time points to see how its members are configured (see Figs 1 and 2). At first sight, we do not find that the network became more or less dense over time. We can ascertain, however, that the configuration of network patterns changed over time. In 2011, the United Kingdom was by far the most central player in the network. It is apparent here that many other SOLVIT centers turned particularly to the United Kingdom for information, views, and

![Figure 1](image_url) Observed SOLVIT network in 2011. The size of the node reflects degree centrality, while the opacity of the node reflects betweenness centrality. The stronger the contact, the darker the tie.
advice on SOLVIT—and internal market-related matters. In 2018, we already see some movement on this front. We see that the United Kingdom is now sharing its central role in the network with SOLVIT centers from Germany and France. In support of Expectation 2b, this finding demonstrates a horizontal shift of power toward other key network members during the period of internal turmoil surrounding the announced exit of the most central player. In 2021, the network constellation changed dramatically. The United Kingdom is now out of the picture, and Germany has taken over the central role to some extent. However, we see that overall network interactions revolve less around one central player. Italy, Spain, and France take on a more prominent position as well, and interactions seem to have spread out more evenly. To see which factors of change have significantly affected network development, we now turn to our models.

5.2. Modeling network development

We fitted two SAOM models to determine which evolutionary processes shaped the network (see Figs S1 and S2 in Appendix S1 for goodness-of-fit diagnostics). The estimations in Table 1 represent the odds of one member establishing a tie with another. Choices are based on their own attributes (such as being a generally active member), the attributes of the other (such as being the main trade partner) and the structure of interaction patterns (such as transitivity). All factors considered relevant to examine our expectations are modeled to accurately estimate their effects on the odds of a tie, all else being equal. The first model accounts for the entire period from 2011 to 2021, covering both the pending Brexit decision as well as the impact of the COVID-19 pandemic (examining Expectations 1, 2a, and 3a). The second model takes into account the period of 2011 to 2018 so that we can see whether the pending exit of a key player had a different effect on the evolution of network interactions than the crisis posed by COVID-19 (examining Expectation 2a). In addition to network dynamics, we model behavior dynamics in both models, namely, the evolution of Commission contact frequency for SOLVIT centers over time (examining Expectation 3b).

First, Model 1 shows that in line with Expectation 1, the network has in fact become more densely knitted over time. While the parameter for density, which is positive and strongly significant, cannot be interpreted by itself, we find a significant positive effect of transitivity on network interactions. This denotes an increasing tendency to close triads over time and that the network is becoming denser over time.

Next, we do not see the same effect of transitivity on network interactions in the period up to 2018. During this period, network interactions did not become significantly more or less transitive over time. This is in line
with Expectation 2b, which assumes that the pending exit of the United Kingdom, as a central player in terms of both the number of contacts and its brokerage position, would not lead to a disruption of network interaction. We see that interactions in this period more or less remained similar, and the network was stable, despite to this potentially disruptive looming change.

Interestingly, from the different evolutionary processes presented in Model 1 and Model 2, we see that in contrast to Expectation 3a, the functional crisis of the COVID-19 pandemic has in fact led to a denser and more transitive network. The fact that we find no significant effect of transitivity from 2011 to 2018 but a significant positive effect of transitivity on network interactions across 2011–2021 demonstrates that the crisis in the latter years put its mark on the evolution of the network. Instead of causing it to fall apart, these crisis years consolidated the network and led to a pattern of interactions that is highly transitive.

This finding is further substantiated by the fact that there is no effect of general activity on network interactions. This means that SOLVIT centers with more contacts did not become even more central in the network, instead allowing for a more horizontal pattern of interactions to develop.

Furthermore, important drivers of network interactions are interdependencies due to EU mobility and main trade relations. Both types of interdependencies are particularly significant in the period including the functional crisis years. We also see that SOLVIT centers with an increasing caseload are becoming significantly more involved in the network. These findings suggest that the SOLVIT network may have proven especially relevant during the COVID-19 pandemic, leading to an increasingly densely knitted network.

### Table 1  Stochastic actor-oriented models

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2011–2021</td>
<td>2011–2018</td>
</tr>
<tr>
<td><strong>Network dynamics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.100)</td>
<td>(1.283)</td>
</tr>
<tr>
<td>Change rate (2018–2021)</td>
<td>7.642***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.379)</td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>1.508***</td>
<td>0.292</td>
</tr>
<tr>
<td></td>
<td>(0.341)</td>
<td>(1.034)</td>
</tr>
<tr>
<td>Transitivity</td>
<td>0.926***</td>
<td>0.637</td>
</tr>
<tr>
<td>(geometrically weighted edgewise shared partner)</td>
<td>(0.294)</td>
<td>(0.439)</td>
</tr>
<tr>
<td>General level of activity</td>
<td>0.029</td>
<td>0.069</td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td>(0.069)</td>
</tr>
<tr>
<td>EU mobility</td>
<td>0.266*</td>
<td>0.356+</td>
</tr>
<tr>
<td></td>
<td>(0.135)</td>
<td>(0.209)</td>
</tr>
<tr>
<td>Main trade partners</td>
<td>1.913***</td>
<td>2.020*</td>
</tr>
<tr>
<td></td>
<td>(0.353)</td>
<td>(0.794)</td>
</tr>
<tr>
<td>Caseload</td>
<td>0.003**</td>
<td>0.011+</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.006)</td>
</tr>
<tr>
<td><strong>Behavior dynamics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commission contact change rate (2011–2018)</td>
<td>1.092**</td>
<td>2.127**</td>
</tr>
<tr>
<td></td>
<td>(0.762)</td>
<td>(0.771)</td>
</tr>
<tr>
<td>Commission contact change rate (2018–2021)</td>
<td>1.896</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.385)</td>
<td></td>
</tr>
<tr>
<td>Commission contact linear shape</td>
<td>0.219</td>
<td>0.842</td>
</tr>
<tr>
<td></td>
<td>(0.217)</td>
<td>(0.740)</td>
</tr>
<tr>
<td>Commission contact quadratic shape</td>
<td>0.803**</td>
<td>0.975</td>
</tr>
<tr>
<td></td>
<td>(0.302)</td>
<td>(0.782)</td>
</tr>
<tr>
<td>Convergence t ratios</td>
<td>&lt;0.12</td>
<td>&lt;0.19</td>
</tr>
</tbody>
</table>

*Note: Standard errors are shown in parentheses. +p < 0.1; *p < 0.05; **p < 0.01; ***p < 0.001.*
Finally, in accordance with Expectation 3b, we see that the crises led to a change in contact between network members and the Commission. We find that the direction of change is a reorientation toward the supranational level. SOLVIT centers are increasingly in contact with the Commission. However, the effect is not the same for all members. The significant positive quadratic shape of this effect shows that SOLVIT centers that were already frequently in contact with the Commission have grown even more frequently in contact over time, creating a reinforcing effect. The fact that we do not find a similar effect for 2011–2018 demonstrates that this reinforcing effect is particularly driven by the COVID-19 pandemic.

Previous research pointed out that although presented as a horizontal network constituted by interaction between member state representatives, the Commission had an important role in the daily management of the network, in clarifying rules and solving disagreements between SOLVIT centers (Hobolth & Martinsen, 2013). In order to better understand if the role of the Commission changed during crises, our 2021 survey asked if Brexit and COVID-19 had impacted on the frequency of SOLVIT center’s contacts with the European Commission. Most SOLVIT centers responded that contact with the Commission increased during both crises but more due to COVID-19 than as a result of Brexit (lower part of Fig. 3). The reasons behind contact with the Commission also changed slightly. Particularly interesting is the fact that contact with the Commission was to assist them in solving disagreements with other SOLVIT centers and with national public authorities. We thus see a Commission which is actively involved in clarification of rules, has increased its role in the training of civil servants in SOLVIT related matters and more frequently steps into problem solving when disagreements have to be settled between SOLVIT centers. While these figures are purely descriptive, in addition to our explanatory analysis, they paint a picture of the Commission being at the center of crisis handling and network interactions.

6. Conclusion

EANs have become defining features of European governance. Even in times of crisis, when established rules and routines breakdown, they prove to be flexible and adaptive instruments in improving the implementation and enforcement of EU law (Christensen et al., 2016; Slaughter, 2004a). In this paper, we have examined the
development of an EAN at the core of European integration, that is, the internal market where the examined SOLVIT network has the task of solving problems of misapplied EU law. In addition hereto SOLVIT members interact informally on a broader range of issues concerning joint action problems and the governance hereof. Using unique three-wave survey data and network analysis, we investigated network interaction over time and during the membership Brexit crisis and functional COVID-19 crisis.

First, we found the network to be a remarkably stable and adaptive governance tool. During the examined decade of 2011–2021, network members engage more with one another, and the network as a whole became denser and more transitive. During this decade, member states had much time to build up or delegate problem-solving capacities to more formal and centralized structures. Nevertheless, they did not do so. Instead, more cases were addressed within the network, and members also interacted more beyond bilateral case-handling, exchanging information and views as well as seeking advice on how to address misapplied internal market law.

Second, our analysis demonstrates that interactions in SOLVIT were not affected by the exit of the United Kingdom. In 2011, the United Kingdom was by far the most central player in the network, both in terms of its number of contacts and its brokerage position. Sitting at the core of the network, the United Kingdom was most often turned to for information, best practices, and advice. In 2018, we see that Germany and France become part of the center, sharing the defining core of the network with the United Kingdom. However, in 2021, the internal market network underwent a dramatic change, with the United Kingdom stepping down as the heart of the network. The new core is more pluralized than before, where Germany has the central position but is joined by Italy, Spain, and France. Network interactions thus proved capable of absorbing the pending exit of the United Kingdom (2018) as well as after Brexit (2021). Other actors were ready to take over, and network interactions stabilized around the new core. Given the United Kingdom’s centrality to the network, this is a remarkable finding: if an actor which such extensive ties can be replaced, this tells us that the network is rather stable over time, and able to maintain its degree of integration. This finding, however, can not necessarily be generalized to all EANs and types of exit. Replacing the ties of a central player requires other members to step in. In order to do so, they must have sufficient capacities and incentives. These may vary between players and policy areas. In newer and more politicized areas of European integration, such as migration or health policy, capacities and incentives are likely to be more variant. This may limit networks’ abilities to respond to changes in membership.

For this reason, it would be good to conduct further studies on crises responses in such policy areas. Similarly, we have only studied SOLVIT. It would be interesting to conduct a further temporal study in other mature policy fields with ample incentives for cooperation. The European competition network would be a good case for a similar study on cross-temporal development in interactions.

Third, in contrast to our third expectation, we observe a network with crisis handling capacity. Rather than downsizing network interaction, the functional crisis due to COVID-19 has led to a denser and more transitive network. This finding suggests that EANs are flexible and adaptive structures within which problems and solutions extending far beyond the standard repertoire can be addressed (Christensen et al., 2016; Slaughter, 2004a). Despite dramatic crisis years, the network became more consolidated. Both the Brexit vote and the COVID-19 pandemic were major crises for the network, but at different tempi. For years, Brexit was pending, and other network members could gradually take over the position at the core. Although the United Kingdom was the most powerful and influential central player, the network had time to recalibrate itself. In 2018, the United Kingdom was still at the core but no longer took position as the main leading actor. By 2021, a more pluralized core had taken over. Having just overcome Brexit, COVID-19 put even more sudden and extreme pressure on the network. The pandemic basically put the internal market on hold, and in the EU, as in most of the world, civil servants were called home. Network meetings changed from face-to-face interactions to online meetings and from a focus on standard repertoire and ready-made solutions to unforeseen problems, turmoil and unpredictability.

However, even under these circumstances of a functional crisis, we see a network that became crucial to problem solving and consolidated itself into a more integrated, more transitive network.

Fourth, in these times of crisis, SOLVIT reoriented itself toward the supranational level. The Commission became an increasingly important reference point for solving disagreements between national units and for training, while it upheld its key role for clarifying the rules at play. These findings show that also beyond high politics, executive empowerment in crisis handling takes place. Additionally, in these more informal, expert-driven governance structures, network members turn to the supranational rather than to home for solutions.
Taken together, these findings challenge the conception of EANs as temporary governance structures and demonstrate that they instead form a useful, remarkably stable complement to member states with a functional stake in cooperation and even more so in times of crisis. They also show that although a central actor, in this case the United Kingdom, may be key to the network with high influence on network interaction and high ability to act as broker between network members, EANs are able to reconstitute themselves and may even do so around a more pluralistic core and evolve into a more integrated structure. Contrary to network theory’s emphasis on the importance of key actors, our findings suggest that no one is irreplaceable and that during the open moments of crisis, members still on board move closer together.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

Endnotes
1 As is explained in section 2, this paper does not take formal bilateral case resolution interactions as its ties but the informal network that develops in addition to these case-based interactions. The reason is that case-based interactions do not allow us to trace networking choices by the network’s members, as the cases are brought by internal market target groups (citizens or business) who are confronted by misapplication of a case. Our interest, however, concerns the discretionary networking behavior by SOLVIT members. We elaborate on this decision in section 2.
2 SOLVIT is formal in that it provides an institutional infrastructure for processing cases of alleged misapplication. In other senses, it cannot be considered formal: it does not have a formal legal basis (EliaAntonio, 2016, p. 535) but is underpinned by a recommendation, and lacks a shadow of hierarchy in its case resolution (Egan & Guimarães, 2017, p. 295) and working methods (Vifell & Sjögren, 2014, p. 468). For these reasons, some observers also denote the first, institutionalized face of SOLVIT informal (e.g., Kokolia, 2018, p. 111; Lottini, 2016, p. 135; Vifell & Sjögren, 2014).
3 Commission Recommendation 2013/461/EU of 17 September 2013 on the principles governing SOLVIT.
4 For yearly number of cases, see the Single Market Scoreboard: https://single-market-scoreboard.ec.europa.eu/enforcement-tools/solvit_en
5 See the Single Market Scoreboard.
6 We did not receive a response from SOLVIT Iceland in 2018. Because this center was not mentioned by any other SOLVIT center, it was treated as missing from the network in 2018.
7 All incoming ties were modeled as a unilateral initiative with reciprocal confirmation (modelType = 3 in Rsiena).
8 Online data code: Eurostat DS-057009.
9 Online data code: Eurostat MIGR_POP9CTZ.

References


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**Supporting information**

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:  
**Appendix S1.** Supporting information.