

Policy Learning in Innovation Policy

A Comparative Analysis of European Union Member States

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POLICY LEARNING IN INNOVATION POLICY: A COMPARATIVE ANALYSIS OF EUROPEAN UNION MEMBER STATES

PhD Series 2-2019

Mart Laatsit

POLICY LEARNING IN INNOVATION POLICY

**A COMPARATIVE ANALYSIS OF EUROPEAN UNION
MEMBER STATES**

Doctoral School of Organisation and Management Studies

PhD Series 2-2019

CBS  **COPENHAGEN BUSINESS SCHOOL**
HANDELSHØJSKOLEN

Policy learning in innovation policy

A comparative analysis of European Union member states

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Foreword

Writing this PhD has been a great journey and I am thankful to my fellow passengers for making it such an enriching and enjoyable one.

First, I would like to thank my wife Silje for her support and patience throughout the three years. I am equally thankful to my parents for bringing me up in an environment where knowledge is held in high regard, and my sister for setting an example by completing her PhD programme years before me.

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Third, I would like to thank the many people who have discussed and commented on my papers and provided feedback in different ways. Mads Dagnis Jensen, Alan Irwin, Charles Edquist and Manuele Citi have all been discussants at my seminars. Jacob Hasselbalch and Christoph Grimpe commented on my draft papers. Louise Graulund Bøttkjær, Lasse Bundgaard, Jens Olav Dahlgaard, Niels Fuglsang, Lea Acre Foverskov, Carsten Greve, Dietmar Harhoff, Christian Hendriksen, Lasse Folke Henriksen, César Hidalgo, David Howoldt, Mogens Kamp Justesen, Christian Erik Kampmann, Janine Leschke, Katrine Lumbye, Rasmus Tue Pedersen and Antje Vetterlein (in alphabetical order) have provided valuable feedback at different occasions.

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Abstract

This thesis studies policy learning in the field of innovation policy. In particular, I look at the sources of policy learning, with a focus on evaluations and informal networks. I provide a comparative perspective across European Union (EU) member states on how they use these sources for policy learning. As such, this thesis is guided by the research question “what are the differences across countries regarding the way in which they use various sources of policy learning”.

The current literature on policy learning contains three important gaps. There is a lack of systematic attention to the sources of policy learning, coupled with a lack of conceptual understanding of these sources. In addition, there is a lack of empirical cross-country studies on how these sources are used in different national contexts. With this thesis and its three consisting articles, I address these challenges. In the first article I analyse evaluations a source of learning and provide an empirical overview of the extent to which EU countries have developed systemic approaches for policy evaluation. In the second and third article I study networks as a source of learning by mapping the informal networks of policy makers and analysing the proximity factors behind these networks.

The thesis is based on the theory of policy learning. This theory emphasises the role of knowledge in the process of policy-making, offering an alternative to the power-based explanations of policy change. Policy learning can have different sources – some approaches stress the importance of sophisticated analytical tools, others focus on learning from peers through network connections. In this thesis, I look at one example from both strands. On the one hand, I study how evaluations are used a source of learning, by developing the concept of ‘system oriented innovation policy evaluation’. On the other hand, I analyse how countries learn from their peers through informal networks.

The empirical focus of the thesis is on innovation policy in EU member states. Over the recent decades innovation policy has occupied a prominent position in the EU and several initiatives have been launched to enhance policy learning within and between member states. In order to gather data on the use of the two sources for learning, interviews were carried out with senior policy makers from the 28 member states. In addition, policy documents and international databases were used to complement the interview data on evaluations. This information was subsequently used to develop an overview of the evaluation practices in all 28 countries and to map the informal networks between policy makers.

The thesis yields several important findings. First, by looking at the question “How far, and if so how, are EU28 member states developing system oriented innovation policy evaluations” we discover that most member states use evaluations as a source of learning at least to some extent. However, the level of evaluating innovation policy is very different among member states. There are countries that have a very high level of evaluative activity and countries that rarely engage in evaluating their innovation policy. Furthermore, different elements that constitute a system oriented innovation policy evaluation are used with varying sophistication and intensity.

This demonstrates that the overall use of evaluations is uneven among EU member states and most countries are not using the full learning potential that evaluations provide.

Second, analysing the question “What are the patterns of informal networks between policy makers as a source for policy learning”, I find that there are significant differences in the extent to which countries across Europe use networks as a source of learning. I distinguish between asymmetric (confirmed by one country only) and symmetric ties (confirmed by both countries). Many countries have a large number of asymmetric ties to other countries, giving them access to unsophisticated knowledge. This is illustrated by a centre-periphery structure, with a core of countries in the centre and the rest orbiting them at a distance. At the same time, the number of symmetric ties between countries is smaller and reveals a clearly clustered structure. This shows that the transfer of sophisticated knowledge is largely confined to these clusters.

Third, studying the question of “What are the underlying factors that shape the informal networks of policy makers”, I find that different factors play a role in determining whether countries are connected in informal networks. Both for asymmetric and symmetric ties, geographical and cultural proximity matter. At the same time, a similar level of policy performance is important for symmetric ties, while a different level of policy performance is important for asymmetric ties. This demonstrates that for exchanging sophisticated knowledge, countries need to be on a similar level of policy performance. Being on a different level of performance, however, does not prevent countries from reaching out to their peers and exchange unsophisticated knowledge.

All-in-all, the findings of this thesis show that countries in the EU are very different in the extent and sophistication of how they make use of the two types of sources for policy learning. At the same time, it is remarkable that countries that are more advanced in using one type of source are also better at using the other type. This observation likely relates to the issue of policy capacities, whereby countries with stronger capacities are also better in using different sources of policy learning. These observations have policy implications on both national and EU levels. On national level, a conscious effort should be made to identify and exploit the sources of learning available. On the EU level, the efforts to enhance mutual learning and network-connections between member states should be continued and reinforced.

Resume

Denne afhandling undersøger 'policy learning' (policylæring) indenfor innovationspolitik. I særdeleshed kigger jeg på kilderne for policy learning med et fokus på evalueringer og uformelle netværk. Jeg bidrager med et komparativt perspektiv på tværs af den Europæiske Unions (EU) medlemsstater i forhold til hvordan de bruger disse kilder til policy learning. Afhandlingen er guidet af problemformuleringen "hvad er forskellene på tværs af lande i forhold til den måde hvorpå de bruger diverse kilder til policy learning?".

Den nuværende litteratur om policy learning har tre væsentlige mangler. Der mangler en systematisk granskning af kilderne til policy learning, som er forbundet med en manglende konceptuel forståelse af disse kilder. Endvidere mangler der også empiriske studier på tværs af lande om hvordan disse kilder bliver brugt i forskellige nationale kontekster. Med denne afhandling og dennes tre artikler adresserer jeg disse udfordringer. I den første artikel analyserer jeg evalueringer som en kilde til læring og bidrager med et empirisk overblik over omfanget af hvilke EU medlemsstater der har udviklet systemiske tilgange til policy evaluering. I den anden og tredje artikel studerer jeg netværk som en kilde til læring ved at kortlægge de uformelle netværk af beslutningstagere og analysere nærhedsfaktorerne bag disse netværk.

Afhandlingen er baseret på policy learning teori. Denne teori fokuserer på rollen af viden i policy-making processen, hvilket byder ind med et alternativ til de magtbaserede forklaringer på policy forandringer. Policy learning kan have forskellige kilder - nogle tilgange lægger vægt på vigtigheden af sofistikerede analytiske instrumenter mens andre fokuserer på læring fra ligesindede igennem netværksforbindelser. I denne afhandling kigger jeg på ét eksempel fra begge synspunkter. På den ene side studerer jeg hvordan evalueringer er brugt som en kilde til læring ved at udvikle et koncept ved navn 'systemorienteret innovation policy evaluering', og på den anden side analyserer jeg hvordan lande lærer fra deres ligesindede igennem uformelle netværk.

Det empiriske fokus for denne afhandling er på innovationspolitik i EU-medlemsstater. I løbet af de seneste årtier har innovationspolitik haft en fremtrædende position i EU og adskillige initiativer er blevet lanceret for at forstærke policy learning både i og mellem medlemsstater. For at samle data på brugen af disse kilder til læring blev der lavet interviews med politiske beslutningstagere fra de 28 medlemsstater. Herudover blev policy dokumenter og internationale databaser brugt til at komplementere interviewdataen på evalueringer. Denne information blev efterfølgende brugt til at udvikle et overblik af evalueringspraksisser i alle 28 lande og til at kortlægge de uformelle netværk mellem beslutningstagerne.

Denne afhandling har givet adskillige vigtige resultater. For det første har det at kigge på spørgsmålet "Hvor langt er EU28 medlemsstaterne med at udvikle systemorienteret innovation policy evalueringer og hvordan bærer de sig ad med det?" klargjort at medlemsstaterne bruger evalueringer som en kilde til læring i hvert fald i et begrænset omfang. Imidlertid er niveauet af evalueringerne meget forskelligt mellem medlemsstaterne. Der er lande som har et højt niveau af evaluerende aktivitet og lande som sjældent engagerer sig i at evaluere deres innovationspolitik. Derudover bliver de forskellige elementer, der sammen udgør systemorienteret innovation policy evaluering, brugt med varierende kompleksitet og intensitet. Dette viser at det overordnede brug af evalueringer er ulige på tværs af EU medlemsstater og at de fleste lande ikke gør brug af det fulde læringspotentiale som evalueringer kan tilbyde.

For det andet, ved at analysere spørgsmålet "Hvor vidt udgør uformelle netværk mellem beslutningstagere en kilde til policy learning?" har jeg fundet at der er signifikante forskelle på udstrækningen hvortil landene i Europa bruger netværk som en kilde til læring. Jeg skelner mellem

asymmetriske (bekræftet af kun ét land) og symmetriske bånd (bekræftet af begge lande). Mange lande har et højt antal af asymmetriske bånd til andre lande, hvilket giver dem adgang til basal viden. Dette er illustreret ved en center-periferi struktur, som har en kerne af lande i centrum med resten kredsende omkring dem. På samme tid er antallet af symmetriske bånd mellem landene mindre og afslører en tydelig struktur karakteriseret af klynger. Dette viser at overførslen af avanceret viden er i høj grad begrænset til disse klynger.

Som det tredje har jeg ved at undersøge spørgsmålet “Hvad er de underliggende faktorer der former de uformelle netværk af beslutningstagere?” fundet ud af at forskellige faktorer spiller en rolle i at bestemme hvilke lande er forbundet i uformelle netværk. Både asymmetriske og symmetriske bånd, geografisk og kulturel nærhed betyder noget i denne situation. Samtidig er et overensstemmende niveau af innovationspolitisk præstation vigtigt for symmetriske bånd, mens forskellighed i præstation er vigtig for asymmetriske bånd. Dette demonstrerer at for at udveksle avanceret viden er det nødvendigt at lande er på et sammenligneligt niveau i forhold til innovationspolitisk præstation. At være på forskellige niveauer frholder dog ikke lande fra at række ud til deres ligeværdige og udveksle basal viden.

Alt i alt er konklusionerne som denne afhandling drager at landene i EU er meget forskellige i deres omfang og niveau af kompleksitet i forhold til hvordan de gør brug af de to kilder til policy learning. På samme tid er det bemærkelsesværdigt at lande som er i stand til at bruge én type kilde mere avanceret også er bedre til at bruge den anden type. Denne observation er højst sandsynligvis relateret til policy kapacitet, hvorved landene med de større kapaciteter også er bedre til at bruge forskellige kilder til policy learning. Disse observationer har policy implikationer både på nationalt og EU-niveau. På nationalt niveau burde en klar indsats ydes til at identificere og udnytte de tilgængelige kilder til læring. På EU-niveau skal indsatsen på at forøge gensidig læring og netværkstilknytninger mellem medlemsstater både fortsættes og forstærkes.

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1. Introduction

This thesis explores policy learning in the field of innovation policy. In particular, I focus on the sources of learning – how do governments obtain the knowledge and information necessary for learning? Focusing on innovation policy, I offer a comparative perspective on how European Union (EU) member states use different sources of learning.

Policy learning, according to the generic definition, is the alteration or change in the thinking or beliefs of actors in the policy setting, based on experience, information or knowledge and concerned with policy objectives (Bennett & Howlett, 1992; Dunlop & Radaelli, 2013; Heclo, 1974; Sabatier & Jenkins-Smith, 1999). As such, we can distinguish both its sources (experience, information or knowledge) and its result (change in the thinking or beliefs of actors) in the overall context of public policy.

The issue of sources is particularly relevant in today's policy context, given the growing attention towards evidence-based policy making (Foray & Lundvall, 1998; Sanderson, 2002). The ambition to place analysis and knowledge at the forefront in the public policy process has been emphasised on both the national and regional levels (Asheim, Coenen, Moodysson, & Vang, 2007) as well as on the international level (Wong, 2004). However, despite the importance of the topic, little is known regarding what actually constitutes the necessary 'evidence-base' for policy making. In the policy learning literature, the question raised by May (1992) – "what is the basis for learning?" – has until now been offered only partial answers and has not been approached systematically (see section 1.2 for a literature review).

Moyson et al. (2017), building on Dunlop and Radaelli (2013), have suggested a two-fold framework for studying the sources of learning. On the one hand there are sources where the learner exercises a high level of control over the process of learning. These include sophisticated analytical sources such as regulatory impact assessments (Radaelli, 2009), evaluations (Borrás & Højlund, 2015) and foresight activities (Havas, Schartinger, & Weber, 2010). On the other hand, there are sources where the learner's level control is more limited. Examples of such sources include networks (Howlett, Mukherjee, & Koppenjan, 2017) as well as 'disruptions' (Moyson et al., 2017). This distinction has also been highlighted by Dolowitz and Marsh (1996), who pointed out that the sources of learning can be both endogenous and exogenous to a country. While domestic sources are often the preferred option for policy makers, authoritative foreign sources can also be considered a valid source for learning (Dolowitz & Marsh, 1996).

In this thesis I look at both types of sources. My goal is to study **what are the differences across countries, regarding the way in which they use these different sources of policy learning**. Given the

limitations regarding the available time and space for writing this thesis, I focus on one source from both categories: evaluations and networks. I choose evaluations, as it is often considered a central analytical tool for governments to learn about the efficiency and effectiveness of their policies (Innovate UK, 2018). The second focus is on networks, because while there is a rich body of literature on networks of various innovation actors (Cantner & Rake, 2014; De Noni, Orsi, & Belussi, 2018; Morescalchi, Pammolli, Penner, Petersen, & Riccaboni, 2015), very little is known about informal networks among innovation policy makers. The scope of the thesis is set to the EU, in order to provide a relatively similar politico-administrative context for a comparative study of national practices. The EU has been labelled a ‘massive transfer platform’ in the literature (Radaelli, 2000) given the significant supranational policy efforts for fostering learning within and between member states. The specific case under investigation is innovation policy, which has occupied a prominent position in the EU policy agenda (European Commission, 2010; European Council, 2000), receiving considerable investments from the EU budget as well as seeing successive initiatives for enhancing learning among member states.

In the articles that constitute this thesis, I will study the two sources of learning – evaluations and networks. First, I conceptualise them with regard to policy learning, and then provide comparative empirical evidence on how they are used by policy makers in real-life settings. The first article looks at the use of evaluations as a systemic tool for providing evidence on the national innovation policy performance. The second article maps the informal networks of policy makers as a way to seek advice about policies. The third article explores the factors that determine the likelihood of countries being connected through those informal networks.

The current framing paper serves to provide the overall framework for the thesis. It starts with an overview of the state of the art in the literature of policy learning and discusses its gaps. Based on this, I suggest an overall research question and three sub-questions. Secondly, I give an overview of the theoretical foundations of the thesis, with a focus on the policy learning theory. Thirdly, I introduce the main concepts of the thesis – system-oriented innovation policy evaluation and informal networks. Fourthly, I describe the research design, data and methodology. Finally, I provide concluding remarks on how the research questions have been answered and what the implications are for future research.

1.1 Literature review

The theory of policy learning studies how the beliefs of actors in public policy settings are being updated as a result of various factors (Dunlop & Radaelli, 2013). The policy-learning literature emerged as an alternative to power-based understandings of policy change. Its early proponents stated that power and conflict are not the only factors explaining policy change, but both cognition and knowledge utilisation

also deserve equal attention in explaining change. (Grin & Loeber, 2007) One of the pioneers in the field, Heclo (1974), has called learning a process of “collective puzzlement”. In his words: “tradition teaches that politics is about power and conflict /.../ Politics finds its sources not only in power, but also in uncertainty – men collectively wondering what to do /.../ Policy-making is a form of collective puzzlement on society’s behalf; it entails both deciding and knowing” (Heclo, 1974). This realisation of collective thinking established the foundation for subsequent studies on learning in policy settings, where knowledge and making sense of it is now seen as a crucial part of the policy process.

Since its advent in the 1950s, the field has experienced a considerable evolution and has seen the birth of several sub-fields. In a recent review of the state of the art, Moyson et al. (Moyson et al., 2017) distinguish between the micro, meso and macro levels in learning studies. Micro-level approaches focus on the individual (Moyson et al., 2017) and include concepts such as epistemic communities (Haas, 1992), social learning (Hall, 1993) and advocacy coalitions (Sabatier, 1987). Studies on the meso-level emphasise the role of organisations and how adopting a business perspective (Metcalf, 1993) as well as organisational learning approaches (Argyris & Schön, 1978) could be used for studying learning in public policy settings. Macro-level research looks at the system level and comprises the fields of policy transfer (Dolowitz & Marsh, 1996, 2000), diffusion (Marsh & Sharman, 2009; Meseguer, 2005), convergence (Bennett, 1991) and lesson drawing (Rose, 1991).

This variety of approaches can be seen as a sign of prospering academic activity, but at the same time is also seen as evidence of fragmentation of the field. Dunlop and Radaelli (2013) have noted that “the field is struggling to produce systematic and cumulative knowledge” on learning. Because of the ‘lack of communication’ between the sub-fields, it is characterised by both ‘conceptual stretching’ and a weakened ‘analytical purchase’ (Dunlop & Radaelli, 2013). Some attempts have been made to respond to these challenges and systematise the field. Bennett and Howlett (1992) identified the key questions of learning to distinguish between the different concepts. Grin and Loeber (2007) placed emphasis on the relationship between agency and structure in the different approaches, thus distinguishing between three types of learning. Dunlop and Radaelli (Dunlop & Radaelli, 2013) provided a system based on four learning genera for conceptualising learning. Moyson et al. (Moyson et al., 2017) categorised the field according to the level of analysis.

Among these attempts of systematisation, the approach used by Bennett and Howlett (1992) is of particular relevance for the current research, revealing the key topics with which the field at large is concerned. It identifies the crucial questions such as who learns, what is learned and what is the effect of learning (Bennett & Howlett, 1992). Borrás (2011) has also added a fourth question to the list – what are the organisational capacities required for learning? Interestingly enough, none of these questions raises the issue of what is learning based upon. In other words, what are the sources of learning? The definition

of policy learning used in this article states that it is the alteration or change in the thinking or beliefs of actors in the policy setting, based on experience, analysis or social interaction and concerned with policy objectives (Bennett & Howlett, 1992; Dunlop & Radaelli, 2013; Heclo, 1974; Sabatier & Jenkins-Smith, 1999). As such, it clearly identifies ‘experience, analysis and social interaction’ as possible sources of learning. However, there are no accounts in the literature looking at these sources systematically. The many reviews that have been mentioned in this chapter (Bennett & Howlett, 1992; Dunlop & Radaelli, 2013; Grin & Loeber, 2007; Moyson et al., 2017) have not gone beyond listing the ‘knowledge, information and experience’ as sources of learning. This leaves open several questions, such as: how is the knowledge and information acquired in the first place? how do policy makers gather and systematise the knowledge on policies? how do they make sense of the experience in policy making? how is the knowledge, information and experience shared among the learning actors within and beyond policy communities? In order to fully understand policy learning, it is necessary to study the sources the learning is founded upon. Without the latter we risk discussing only the process of learning without approaching its substance in a meaningful and thorough manner.

Over the years, some cues going beyond the generic terms have been suggested on the possible sources of learning. As one such example, Moyson et al. (2017), building on Dunlop and Radaelli (2013), offer a dual distinction of the sources of learning, based on the level of control exercised over the objectives and means of learning. If actors are in control of the objective and means of learning, i.e. they know what they want to learn about and how, then they are likely to use ‘formal and sophisticated’ methods, such as science-based or experimental approaches. In cases where actors are not in control of the objectives and means, the learning process is more spontaneous and influenced by ‘social interactions and disruptions’ (Moyson et al., 2017). This dimension of learning has also been referred to as ‘level of uncertainty’ or ‘problem tractability’ (Dunlop & Radaelli, 2013). Following Dunlop and Radaelli (Dunlop & Radaelli, 2013), uncertainty is indeed the “main discriminatory factor between ‘thick’ and ‘thin’ learning”. As such, looking at the level of control or uncertainty offers a useful way for distinguishing between formal, sophisticated methods and informal, less analytical methods.

The literature offers some insights into both of these two types of sources. Regarding the ‘formal and sophisticated’ methods, May (May, 1992) has highlighted the importance of policy analysis and evaluation in instrumental learning. He argues that the “clearest evidence [of instrumental learning] consists of studies or analyses that policy elites cite as a basis for drawing lessons about policy interventions or implementation. The studies may entail formal evaluations of policy instruments or more ad hoc analyses” (May, 1992). Subsequent discussions and empirical analyses on the importance of analysis and evaluations as a source for learning have nevertheless not been plentiful. The few existing examples include Radaelli (2009) analysing regulatory impact assessment in Europe, Sanderson (2002)

looking at the evolution of evidence-based policy making and Borrás and Højlund (2015) studying the learners' perspective of evaluations. One can thus see that the use of evaluations and analysis has been acknowledged in the literature as a base for policy learning, but has received relatively little conceptual attention compared to the overall volume of studies in the field.

The second type of sources, referred to by Moyson et al. (2017) as 'social interactions', has received somewhat more attention over the years, as learning is often considered to occur within and between networks (Busenberg, 2001). According to Zito and Schout (2009), the "idea of networks /.../ carrying ideas is an extremely critical dimension to the learning process" and "appears in most theories in a more or less explicit fashion". Examples of such theories or concepts include the advocacy coalition framework by Sabatier (1987), where policy communities are formed by groups of actors that share the same beliefs and values, and the policy transfer school (together with its parent-concept lesson drawing) that looks at how policies in one political system are used as an inspiration for developing policies in others, often through networks (Benson & Jordan, 2011; Dolowitz & Marsh, 1996). Closely related to the latter is the concept of policy diffusion (often considered as a part of policy transfer, or *vice versa* (Marsh & Sharman, 2009), focusing on how ideas and knowledge 'diffuse across organisations and political systems' (Zito & Schout, 2009). Arguably, we can see here a much stronger and more diverse conceptual base than in the case of evaluations as a source of policy learning.

However, looking deeper, it is evident that not all aspects of networks have actually been considered in these studies. From studies in the fields of network research and organisational learning we know that network structures are a key component in understanding the role that networks really play in social phenomena such as learning (Barabasi & Albert, 1999; Hansen, 1999; Reagans & McEvily, 2003; Uzzi & Lancaster, 2003). However, this role of structures has only barely been mentioned as a factor shaping the policy learning process (Moyson et al., 2017; Witting & Moyson, 2015). Consequently, we can say that the role of networks in policy learning is still not comprehensively conceptualised, as we do not really know how the different structures that networks can take could influence policy learning. Furthermore, while the organisational learning literature clearly distinguishes between formal and informal networks (Cowan & Jonard, 2004; Krackhardt & Hanson, 1993), such a distinction has not been made in the policy learning literature, possibly missing out on an important nuance for understanding the dynamics of learning through networks.

Last, but not least, despite the several decades of development, numerous authors have reported a dissatisfaction with the level of empirical studies in the field (Benson & Jordan, 2011; Borrás & Højlund, 2015; Dunlop & Radaelli, 2013). According to Dunlop and Radaelli (2013), "we still know very little about how communities of policy makers learn in real-world settings". While some studies and special issues on policy learning have been published since, notably a recent volume edited by Moyson et al.

(Moyson et al., 2017), the situation today is not noticeably different. Furthermore, the studies on policy learning tend to focus on a few cases at a time and neglect larger n approaches. This leaves us without a comparative perspective on different aspects of policy learning, such as how do the formal evaluation-based learning practices differ from country to country, or how are the less formalised, network interaction-based types of learning conditioned by broader cross-country networks. Therefore, the limited empirical breadth of the current research in policy learning poses an important constraint for a comprehensive understanding of how policy makers learn.

Based on this discussion I conclude that there are three important gaps in the current literature in relation to the sources of learning. The first gap lies in the lack of systematic attention to the sources of policy learning. While there have been several prominent reviews over the years taking stock of and systematising the existing studies, the issue of sources has not emerged as one of the key topics for learning. The second gap is manifested in the lack of conceptual understanding of specific sources of learning. Despite some of the specific sources being mentioned in the literature, such as evaluations or informal networks, they have not been thoroughly conceptualised to provide for adequate analysis on their role in the learning process. The third gap concerns the lack of empirical studies on how the sources of learning are being employed in real-life policy settings. Adding to, and perhaps due to, the limited theoretical attention paid to the sources of learning, there is little empirical evidence of how the different sources are used by policy makers. In order to develop a more comprehensive understanding of policy learning, it is therefore necessary to address these three gaps in a systematic way. In the next sub-chapter I will explain in more detail how this thesis aims to achieve this.

Table 1. Gaps in the literature

Gap 1	Lack of systematic attention to the sources of policy learning
Gap 2	Lack of conceptual understanding of specific sources of policy learning
Gap 3	Lack of empirical cross-country studies on the use of these sources of policy learning

1.2 Research question

The previous section discussed the gaps in the existing literature on policy learning. I demonstrated that there is an overall lack of systematic attention to the sources of policy learning. Furthermore, the specific sources of policy learning, such as evaluations and networks, are under-conceptualised. Finally, there is a lack of empirical and comparative knowledge on how the sources actually contribute to policy learning in different countries.

This thesis aims at bridging these gaps; therefore, the main question this study addresses is, **what are the differences across countries, regarding the way in which they use these different sources of policy learning?**

In particular, following the distinction between two types of learning according to the level of control by the learners (Moyson et al., 2017) (or ‘problem tractability’ (Dunlop & Radaelli, 2013)), I look at two specific sources of learning: evaluations and networks.

Following the choice of these sources, I look at the following sub-questions:

Sub-question 1: How far, and if so how, are EU 28 member states developing system-oriented innovation policy evaluations as a source of policy learning?

Sub-question 2a: What are the patterns of informal networks between policy makers as a source of policy learning?

Sub-question 2b: What are the underlying factors that shape the informal networks of policy makers as a source of policy learning?

The first sub-question emphasises evaluations as a source for learning that is both analytical and controlled by the learner. While the role of evaluations in innovation policy making has been widely analysed, their role as a source for policy learning has mostly been covered implicitly, rather than explicitly. In addition, studies looking at evaluations of innovation policy, as well as actual evaluation practices, have only rarely taken a systemic perspective (see Article 1 for a thorough discussion) necessary for understanding its broader effect for learning.

The second sub-question looks at the role of informal networks as a source of learning through interactions between policy makers of different countries. The knowledge transfer and diffusion schools have addressed the issue of how knowledge about policies travels across borders and the role of networks to some extent, but empirical accounts comprising several countries remain scarce (Benson & Jordan, 2011). Moreover, there is little to no information on the role that informal networks between policy makers play in the field of innovation policy.

The third sub-question is related to the previous one, extending the discussion on informal networks to the factors that shape the structures of these networks. There is an active discussion in innovation studies literature on what are the proximity factors that influence the network structures of innovation actors and their relative importance (Boschma, 2005; Crescenzi, Nathan, & Rodríguez-Pose, 2016; Graf &

Kalthaus, 2018). However, none of these accounts has looked at networks between policy makers, where considerable policy efforts by the EU and OECD have been directed for enhancing mutual learning.

Table 2. Research question and sub-questions

Type	Research question	Relation to articles
Main research question	What are the differences across countries, regarding the way in which they use these different sources of policy learning?	Articles 1, 2, 3
Sub-question 1	How far, and if so how, are EU 28 member states developing system-oriented innovation policy evaluations as a source of policy learning?	Article 1
Sub-question 2a	What are the patterns of informal networks between policy makers as a source of policy learning?	Article 2
Sub-question 2b	What are the underlying factors that shape the informal networks of policy makers as a source of policy learning?	Article 3

1.3 Structure of dissertation and contributions

The thesis consists of the framing paper and three articles. The framing paper provides an overview of the research questions, theoretical foundations and the main concepts guiding the dissertation. The three constituting articles of the thesis study different aspects related to the research question.

The framing paper ties together the individual articles. Within this framing, I introduce the theoretical framework of the thesis and provide an overview of the main concepts. I also present the object of study, the data, and the research design. I conclude the framing paper by discussing the answers to the research questions and avenues for future research.

The first article of the thesis is called “Towards System-Oriented Innovation Policy Evaluation? Evidence from EU28 Member States” and is co-authored with Prof. Susana Borrás. In this article we focus on one of the sources of policy learning – evaluations. More specifically, we set out to answer the question of how far, and if so how, are EU 28 member states developing system-oriented innovation policy evaluations? We create a novel conceptual framework to assess the ‘systemness’ of national

evaluation practices, consisting of four attributes: coverage, perspective, temporality and sources. Using data from 62 interviews and policy documents, we find large differences between member states, with only a few countries having developed structures for innovation policy evaluation which are system oriented.

Table 3. Overview of articles

No.	Title	Research question	Status
1	Towards System-Oriented Innovation Policy Evaluation? Evidence from EU28 Member States (co-authored with Susana Borrás)	How far, and if so how, are EU 28 member states developing system-oriented innovation policy evaluations as a source of policy learning?	Accepted by Research Policy
2	Policy learning in the EU: The informal networks of innovation policy directors	What are the patterns of informal networks of policy makers as a source for policy learning?	Not submitted
3	The Rules of Attraction: Informal Networks of Innovation Policy Makers in the EU28	What are the underlying factors that shape the informal networks of policy makers as a source for policy learning?	Not submitted

This article makes an important contribution to the literature on policy learning, by conceptualising one of the key sources of policy learning and offering an empirical cross-country comparison. The literature review of this thesis showed that there is a general lack of systematic attention paid to the sources of policy learning as well as a lack of conceptual understanding of specific sources of policy learning. This article addressed evaluations as a source of policy learning and provided a thorough conceptualisation of what dimensions are critical for evaluating innovation policy in a system-oriented manner. Furthermore, it addressed the third gap in the literature, by adopting a comparative empirical perspective and delivering data on the evaluation practices across a large set of countries. In so doing, this article enhances our theoretical and empirical understanding of evaluations as a source of policy learning and ultimately provides a robust conceptual toolset for further analysis into the issue.

The article makes an equally important contribution from the innovation policy perspective. While the system of innovation approach has been widely recognised by innovation scholars and policy makers alike (Kuhlmann, Shapira, & Smits, 2010), there is still a lack of empirical knowledge of whether evaluation practices have actually followed suit. Previous work in the field of evaluations has taken either a normative stance of how evaluators and policy makers should design specific models of ‘system evaluation’ (Edler, Ebersberger, & Lo, 2008; Magro & Wilson, 2013) or focused on integrating the evaluation results of individual policies with broader insights about problems in the innovation system (Arnold, 2004; Hage, Jordan, & Mote, 2007; Jordan, Hage, & Mote, 2008). Furthermore, there has been a significant lack of empirical evidence on if and how different countries in Europe and beyond conduct evaluations in a systemic way (Nightingale & Yegros-Yegros, 2012). This article responds to these two points of concern by discussing the ways systems of innovation should be addressed by evaluations and presenting original empirical data on the extent to which the current practices are actually system oriented.

The second article carries the title “Policy learning in the EU: The informal networks of innovation policy directors”. It studies the other source of policy learning under observation in this thesis – the networks of innovation policy makers. In this paper I look at the extent to which policy makers discuss policy matters with their peers from other countries and with which of their colleagues they are more likely to discuss policy. Put simply, the research question I aim to answer with this paper is, what are the patterns of informal networks between policy makers as a source for policy learning? I use social network analysis and data from interviews with 28 innovation policy directors to map their informal networks. The analysis reveals three distinctive and roughly geographical groups of member states: northern, central-eastern and southern, with significant differences in their respective connectedness.

The contribution of the article to the studies on policy learning lies in conceptualising informal networks as a source of learning and providing an empirical mapping of the network patterns in Europe. As demonstrated in the literature review section of this thesis, while the role of networks has been acknowledged in broad terms in studies on policy learning, the role that network structures exercise for learning has largely been overlooked. At the same time, the organisational learning literature has studied this effect of network structures on learning within and between organisations much more systematically (Argote, 2013; Hansen, 1999; Reagans & McEvily, 2003). Therefore, making use of the organisational learning theory for analysing networks as a source of learning provides a conceptual advancement for the field of policy learning. In addition, I provide novel empirical data on the cross-country structure of the policy-maker networks, thus providing a baseline for future research on networks in innovation policy.

Table 4. Contribution of articles

Article	Gap(s) addressed	Contribution to the policy learning literature
Article 1	Gaps 1, 2 and 3	<ul style="list-style-type: none"> - conceptualising system evaluation as a source of policy learning - providing novel empirical evidence on the actual evaluation practices in EU countries
Article 2	Gaps 1, 2 and 3	<ul style="list-style-type: none"> - conceptualising informal networks as a source of learning - providing a unique empirical mapping of the network patterns in Europe
Article 3	Gaps 1,2 and 3	<ul style="list-style-type: none"> - advancing the conceptual understanding of what types of ties are more likely to contribute to learning - providing new empirical information on the factors that enable policy learning through networks

The third article, “The Rules of Attraction: Informal Networks of Innovation Policy Makers in the EU28”, analyses the factors that influence the network structures of policy makers. It builds on the second article where the informal patterns were mapped and tests the effect of three types of variables: geographical, cultural and policy proximity. Using regression analysis, I demonstrate that geographical and cultural proximity are important determinants for both asymmetric (confirmed by one country only) and symmetric ties (mutually confirmed by both countries). The effect of policy performance differed for the two kinds of ties: for asymmetric ties, a larger difference in policy performance between two countries is a stronger predictor of a connection; for symmetric ties, a smaller difference is stronger. This shows that countries tend to stay within their cultural and geographical ‘comfort zone’, but are ready reach beyond it for a prospect of learning about policy.

This article advances the conceptual understanding on the role of networks as a source of policy learning. It complements Article 2 by providing an in-depth look into the factors that enable or constrain the formation of network structures and, as a result, policy learning. The concept of networks as a source of policy learning was given a more nuanced understanding, as I demonstrated that it is the asymmetric ties that are first and foremost related to learning, while symmetric ties reflect more profound ties between

countries, possibly extending beyond learning. Furthermore, it provides a relevant empirical contribution from the innovation studies perspective, as it tested the previously identified proximity factors in a novel empirical setting. Earlier literature on innovation-related networks has shown that in addition to pure geographical proximity, several other factors influence the connectedness of actors, such as institutional, cognitive, cultural-ethnic, linguistic and social determinants (Boschma, 2005; Torre & Rallet, 2005). The strength of these factors has been tested in different empirical contexts, such as the photovoltaic industry (Graf & Kalthaus, 2018), interregional scientific cooperation (Hoekman, Frenken, & Van Oort, 2008), collaboration between inventors (Crescenzi et al., 2016; De Noni et al., 2018; Morescalchi et al., 2015) and pharmaceutical research networks (Cantner & Rake, 2014). At the same time, these proximity factors have not been used to explain the patterns in innovation policy making and neither have their results been interpreted from a policy learning perspective. Accordingly, this article contributed to both the conceptual and empirical knowledge in the fields of policy learning and innovation studies alike.

In summary, the main contribution of this thesis lies in its focus on the previously underexplored side of policy learning – its sources. By studying how countries use evaluations and networks as sources of learning, I have added a previously missing conceptual piece for understanding how policy learning works and the factors that shape it. I conceptualised both sources to understand their role in the context of policy learning and in a way that allowed for subsequent empirical analysis in a comparative cross-country perspective. As the field of policy learning has been previously characterised by a lack of empirical and comparative studies, this provided a substantial advancement in understanding how different sources of policy learning are used in real-life settings. Consequently, this thesis makes both a conceptual and empirical contribution to our understanding of policy learning and its sources.

2. Theoretical framework

The theoretical foundation of this thesis rests on the theory of policy learning. Policy learning theory seeks to explain how governments learn and what constitutes the critical factors in this process. As such it provides a suitable framework for addressing the issue of how governments make use of different sources for learning about the policies they pursue.

2.1 What is policy learning?

Why do policies change and what are the factors that trigger that change? These have been central questions guiding the discussions on learning in the field of political science. For a long time the dominant view used to be that policy is shaped by social pressures and government itself is a passive actor (Nordlinger, 1982). This power-based view was first challenged by Heclo (1974) and later by other

authors (Etheredge, 1981; Haas, 1992; Rose, 1991; Sabatier, 1987), leading to several approaches that brought about a new focus, giving knowledge a central position in studying the processes of learning and change.

Bennett and Howlett (1992), in an early review of the literature, identified five such conceptions emphasising the role of knowledge and learning in public policy formation: political learning, government learning, policy-oriented learning, lesson-drawing and social learning. Bennett and Howlett (1992) argued that the three key questions in the field are: who learns, what is learned, and to what effect. Based on this three-fold framework, they suggested that one could in fact distinguish three main types of learning: government learning, lesson-drawing and social learning (Bennett & Howlett, 1992). May (1992), in a parallel review, suggested an alternative two-fold distinction in types of policy learning: instrumental learning concerned about policy instruments and social learning focusing on broader issues of policy formation (May, 1992). Moreover, recent decades have added new approaches to the ones identified by Bennett and Howlett (1992) and May (1992), as seen in a rise in studies on how policies in one jurisdiction can influence the policies in another (Marsh & Sharman, 2009). Most notably, this is seen in the approaches of knowledge-transfer (Dolowitz & Marsh, 2000) and knowledge diffusion (Simmons & Elkins, 2004).

Bennett and Howlett (1992) in their analysis conceded to the difficulties in reconciling the different approaches under a single term of ‘policy learning’, instead suggesting that a distinction be made between the three types of learning mentioned above. However, as a lowest common denominator, they agreed that all the different approaches are similar as they address the “commonly described tendency for some policy decisions to be made on the basis of knowledge and past experiences and knowledge-based judgements as to future expectations”. Dunlop and Radaelli (2013), faced with a similar challenge in reviewing the literature 20 years later, suggest an encompassing definition of learning approaches as “the updating of beliefs at its most general level”, based on “lived or witnessed experiences, analysis or social interaction”. As such we can see that, despite the large number of approaches in the field, policy learning can be considered to be a process that is based on experience or knowledge and relates to the decision-making process in a policy setting. At the same time, while Bennett and Howlett (1992) emphasise more the substance of what learning is based on (knowledge and past experience), Dunlop and Radaelli (2013) focus on the method or process of reaching that substance (analysis and social interaction). As the issue of what leads to policy learning, e.g. what is the basis of learning, is of particular relevance to this study, the next sub-section will look at this in more detail.

2.2. What is policy learning based on?

This thesis looks at the sources of policy learning. In order to analyse the sources, it is important to discuss what the policy learning theory and its different approaches see as the basis of learning. Echoing May's classical question: "What is learning based on?" (May, 1992), knowing what policy learning is based on allows us to develop a discussion on the sources later on. Therefore, this subsection reviews some of the earlier as well as later approaches with a regard to how they define learning.

In an early definition of 'policy-oriented learning', Sabatier (1993) suggests that policy learning is the "relatively enduring alteration of thought or behavioural intentions that result from experience and are concerned with the attainment (or revision) of policy objectives." In addition, in a later review of the concept, Sabatier and Jenkins-Smith (1999) add the notion of 'information' to the equation, stating that the alteration of thought is based on "experience and/or new information". This dual basis of experience and information is also found in Hall's (1993) definition of social learning: "a deliberate attempt to adjust the goals or techniques of policy in response to past experience and new information". From these early definitions we can thus see a clear agreement in placing experience and knowledge at the forefront as bases of learning.

The approach of lesson-drawing (Rose, 1991) takes a slightly different perspective. It looks at learning as the process "by which programs and policies developed in one country are emulated by others and diffused throughout the world" (Bennett & Howlett, 1992). This idea of seeking inspiration from other countries as a basis for learning has been further developed by the later approaches of policy transfer and policy diffusion. Policy transfer scholars define it as a process where "knowledge about policies, administrative arrangements, institutions and ideas in one political setting (past or present) is used in the development of policies, administrative arrangements, institutions and ideas in another political setting" (Dolowitz & Marsh, 2000). In a similar fashion, policy diffusion is defined as "a process through which policy choices in one country affect those made in a second country" (Marsh & Sharman, 2009). One can clearly see that these approaches are relatively similar in the way they see the sources of learning – in all three definitions we see an emphasis on the knowledge about policies in other countries.

Comparing these two broad sets of approaches, we can see the emergence of two types of sources. There is a clear distinction between approaches that see learning as based on endogenous factors and the ones that focus on the exogenous factors (following the distinction by Dolowitz and Marsh (1996)). The former includes policy-oriented learning and the overarching definitions of policy learning that consider learning as being first and foremost based on experience, knowledge and information. The latter approaches include lesson-drawing, policy transfer and policy diffusion, all seeing learning as being based on knowledge about policies in other countries. The same distinction has also been highlighted by Dolowitz and Marsh (1996), who have argued that learning can be based on sources both endogenous

and exogenous to a country, even though the former is preferred. This dual endogenous vs. exogenous understanding of the sources of learning provides us with a useful theoretical backing in exploring the specific sources of learning. These sources will be presented in the next chapter on the conceptual framework of the thesis.

Table 5. Sources of policy learning in its different definitions

	Policy learning (Bennett & Howlett, 1992)	Policy learning (Dunlop & Radaelli, 2013)	Policy- oriented learning (Sabatier & Jenkins-Smith, 1999)	Social learning (Hall, 1993)	Lesson-drawing (Rose, 1991) Policy transfer (Dolowitz & Marsh, 2000) Policy diffusion (Simmons & Elkins, 2004)
What is policy learning based on?	Knowledge, past experiences, knowledge- based judgements	Lived or witnessed experiences, analysis or social interaction	Experience and/or new information	Past experience and new information	(Knowledge about) programmes and policies in other countries

3. Conceptual framework

In order to answer the research questions and properly analyse the two sources of policy learning in the focus of this thesis – evaluations and networks – this chapter will explain the key concepts of the thesis. I will first discuss the conceptualisation of system-oriented innovation policy evaluations, i.e. how should innovation policy be assessed from a system of innovation perspective. Secondly, I will discuss the concept of informal networks – what makes an informal network in a policy-making context and what role does it play for policy learning.

3.1 System-oriented innovation policy evaluation

Evaluations are a valuable source for policy learning. It is through evaluations that policy makers gather the information and knowledge necessary for improving their policies. Therefore, by looking at the evaluation practices of a country, we also understand the knowledge base available for designing and developing their innovation policy.

Evaluations are an essential part of the policy-making process. A common definition says that they are a “systematic inquiry leading to judgements about program (or organisation) merit, worth, and significance, and support for program (or organisational) decision making” (Cousins, Goh, Clark, & Lee, 2004). More specifically, their purpose is seen as being to “inform policy-makers, program managers and other stakeholders about the effectiveness, efficiency, appropriateness and impact of policy interventions” (Edler et al., 2008). Remarkably, while playing a critical role in the policy-making process, the way evaluations are conducted has not kept up with the development of systems thinking in innovation policy. While policy makers have embraced the concept of system of innovation in designing their policies (Kuhlmann et al., 2010), the theoretical approaches on how to ‘capture’ the systemic effects have been scarce (see Article 1 for an overview) and we have little empirical information on if and how policy makers apply a systems approach to evaluating innovation policies.

Therefore, together with Susana Borrás, we have proposed a definition and conceptualisation of the notion ‘system-oriented innovation policy evaluation’ (Article 1). We define it as the regular and knowledge-based set of practices that evaluate the effects of innovation policy within the innovation system. In order to assess if the evaluation practices in a country are truly system-oriented, we distinguish between four attributes that all contribute to capturing the system-wide effects of innovation policy. These attributes are: wide coverage of evaluation elements, systemic perspective assessing innovation policy performance and innovation system performance, high regularity of evaluation practices, diversity of sources of expertise (Article 1). In the following, I will provide a brief overview of each of the attributes.

The first attribute, **coverage**, captures the extent to which evaluations in a country cover the different levels of innovation policy. These levels include policy instruments (such as individual programmes), policy mixes (how do the different instruments aimed at a common goal interact with each other – what is their additionality and complementarity) and the socio-economic performance (looking at the innovation system as a whole, by combining information from different indicators with sophisticated analytical efforts). Overall, the elements listed under this attribute capture the different levels of policy.

The second attribute is called **systemic perspective**. It is directly connected to the definition of system of innovation, as it seeks to capture the extent to which the institutional set-up (including innovation policy) has an impact on the socio-economic performance of the country (driven by the production sector). By combining these two constitutive elements of a system of innovation, this attribute assesses whether policy makers strive for a strategic overview of how their policies influence the performance of the innovation system as a whole. This kind of systemic perspective is often included in strategic reviews carried out by international organisations, or sometimes even by governments on their own.

The third attribute in our conceptualisation is **temporality**. This focuses on whether governments evaluate the different levels and aspects of their innovation policy on a regular basis and, if so, then how regularly. It is an important aspect to consider since the regularity of assessments determines the amount and quality of data available for analytical processing and decision making.

The fourth and final attribute is called **sources**. Under this title we look at whether the innovation policy evaluations make use of various kinds of expertise to ensure a broad knowledge-base and diverse perspectives on the policies. The selection of possible sources can include ones that are either internal or external to the organisations making policy, as well as internal or external to the national system of innovation involved. Thereby this attribute provides an overview of whether there is a habit of involving a broad range of competencies in the evaluation practices of a country.

Table 6: The four attributes of ‘system-oriented innovation policy evaluation’ (adapted from Article 1)

Definition of the attributes	Operationalisation for empirical analysis
Coverage: The extent to which the evaluation covers the three most important elements (see the cell to the right)	We examine whether countries are conducting evaluations of the following three elements: <ul style="list-style-type: none"> - Innovation policy Instruments - Innovation policy mixes - Socio-economic performance
Systemic perspective : The extent to which countries analyse the systemic perspective between innovation policy performance and innovation system performance	We examine whether or not countries have produced reports with a systemic perspective.
Temporality: The extent of regularity in the evaluation in all	We examine whether countries have conducted evaluations on a regular basis

the three coverage elements	
Sources: The extent to which different sources are involved in conducting evaluations of the three elements above	We examine whether countries use diversified sources of evaluation, particularly the combination of national and international, internal (ministerial/public) and external (private consultancies, universities, think-tanks, etc.)

In summary, the concept of system-oriented innovation policy evaluation aims to capture the extent to which the evaluation practices by governments follow a systemic perspective suggested by the national systems of innovation concept. It does so by using a set of four attributes: coverage, systemic perspective, temporality and sources. The combination of these attributes provides us with a comprehensive overview of the sophistication of national evaluation routines from a system of innovation standpoint.

3.2. Informal networks

Informal networks constitute one of the sources of policy learning and also one of the vehicles through which the interactions in innovation systems take place. In this study I focus on informal networks between policy makers. While evaluations enable governments to learn from their own experience, network connections enable them to learn from the experiences of others. It is therefore important to understand the nature of informal networks in order to develop a comprehensive understanding of policy learning.

In network studies, networks are generally seen as consisting of nodes and the ties connecting them (Scott, 2017; Wassermann & Faust, 1994). With regard to the object of analysis of the current thesis, the nodes can be seen as policy makers and the ties as exchanges between them (arguably via some form of communication). While there are several formal structures facilitating contacts between European policy makers, such as the EU or OECD committees and working parties, we can easily assume that there are also exchanges that take place informally outside these official structures. It is important to consider these informal structures, since previous research has shown that the structures of these two types of networks can actually be very different. In their classic study on informal networks within an organisation, Krackhardt and Hanson (1993) compared the informal and formal structures in a company and noted that while formal networks reflect the structure of the company, it is the informal networks that

reflect the underlying social ties and play a crucial role in the activities of the company. Therefore, this study looks at the informal structures that often remain outside of the public scope.

As the nodes can designate different types of actors in different networks, so can the ties be based on different criteria. In this study, given the nature of the data available, I distinguish between ties that are reported by only one respondent and those that are reported by both respondents. I call the former type an asymmetric tie (as it is not reciprocal) and the latter a symmetric tie (as the connection between two nodes is mutually established). For example, if a respondent from country A reported an interaction with country B, but the respondent from country B did not mention country A, then there would have been an asymmetric tie. However, if the interaction was reported by both country A and country B, a symmetric connection would be established.

These two types of ties also carry different properties. A classic debate in the field has evolved around the dichotomy of ‘strong’ and ‘weak’ ties (Granovetter, 1973, 1983). While the strength of ties is not given on its own and has been defined in several ways, in this study I use the approach suggested by Friedkin (1982) that considers a symmetrical tie ‘strong’ and an asymmetrical tie ‘weak’. The properties of the strong and weak ties are best explained through the example of transaction costs related to knowledge transfer. For relaying sophisticated and uncoded knowledge the transaction costs in terms of time and effort are higher, therefore a strong relationship between the parties involved is desirable (Hansen, 1999; Reagans & McEvily, 2003). For the transfer of unsophisticated and codified knowledge, the transfer costs are lower, and thereby a weak tie can be sufficient. At the same time, the weak ties have also been shown to carry structural advantages for the transfer of new ideas. While strong ties usually tie together partners that are already similar, weak ties allow for the creation of ‘bridges’ between clusters and thus enable the spread of innovative ideas (Granovetter, 1973).

A network can be seen as a sum of nodes and ties and the way that the ties are distributed between the nodes forms the structure of the network. This often means groups of nodes forming clusters that can be either connected to each other or disconnected. These different structures can carry particular properties on their own. One of the main structural features of a network is its density or cohesion. It is defined as “the extent to which a relationship is surrounded by strong third-party ties”, meaning how tightly the nodes in a particular cluster are connected to each other. This level of connectedness has been shown to carry particular importance for the learning capacity of the network (Reagans & McEvily, 2003), owing to both reputational concerns (Coleman, 1990) and reinforced cooperative norms (Granovetter, 1992).

Table 7. Properties of the main concepts (as in Article 2)

Concept	Definition	Properties
Symmetric tie	A tie confirmed by both nodes	Promote the transfer of sophisticated knowledge
Asymmetric tie	A tie reported by one node	Promote the transfer of simple knowledge
Network density/cohesion	The extent to which a relationship is surrounded by strong third-party connections	Increased willingness of individuals to help each other by engaging in knowledge transfer

Furthermore, several proximity measures have been identified that help determine which nodes are more likely to be connected to each other. In the field of innovation studies, the most common types of similarities include geographic proximity, policy proximity and cultural proximity. Geographic proximity is the most common of the measures demonstrating similarity between countries (Boschma, 2005; Hoekman et al., 2008), showing the physical distance between two actors. Another common measure is policy proximity, which indicates the similarity of institutions in the policy field in question (De Noni et al., 2018; Morescalchi et al., 2015). Finally, cultural similarity, often rooted in language, geography or history (or a combination of the three), shows the degree to which two nodes share a common set of values and norms (Hoekman, Frenken, & Tijssen, 2010; Luukkonen, Persson, & Sivertsen, 1992; Zitt, Bassecouard, & Okubo, 2000). All these dimensions provide a useful framework for understanding the underlying drivers in network formation and thereby possible learning relationships.

In conclusion, informal networks play an important role in acting as a source for policy learning based on interactions in innovation systems. The networks consist of different types of ties and form various structures, all of which carry different properties. Asymmetric ties facilitate the transfer of codified knowledge between nodes and novel ideas between clusters of nodes. Symmetric ties are, in contrast, better suited for interactions related to uncodified knowledge. Furthermore, the structure of the network determines whether it is likely to act as a facilitating factor for learning or be an impediment to it.

Therefore distinguishing between the different types of ties and network structures provides a useful conceptual framework for studying the role of informal networks in policy learning.

4. Object of study

The object of study of this thesis is innovation policy, focusing specifically on the EU member states and studying how they make use of two kinds of sources for learning – evaluations and networks (see also Chapter 1 on sources). Innovation policy, aimed at influencing innovation processes (Borrás & Edquist, 2013), has acquired a prominent status over the past few decades, particularly given its position at the forefront of the EU competitiveness agenda. This rise in visibility as well as in expectations towards it has resulted in policy efforts from both the member states as well as international organisations. These include various measures to enhance policy learning, both internally, through encouraging a more thorough use of evaluations, and externally, through mutual learning and sharing of good practices. The intensity of these efforts makes innovation policy in EU member states an attractive case to look at from a policy learning perspective. A comparative view of the member states is likely to reveal the extent to which they have benefitted from those efforts and are making use of different sources of learning.

4.1 Innovation policy in EU member states

Innovation policy is generally defined as a combination of “actions that are undertaken by public organizations that influence innovation processes” (Borrás & Edquist, 2013). As such it includes a wide variety of tools available for policy makers: regulatory instruments, economic and financial instruments as well as soft instruments. These different policy instruments can be combined into policy mixes based on the different national contexts and the particular challenges each country faces. Importantly, this diversity in turn leads to opportunities for mutual learning. According to Borrás and Edquist (2013): “while acknowledging differences and idiosyncrasies across countries, it is still possible to dissect and analyse why and why-not some instrument mixes are better at addressing complex problems in the innovation system than others”. The EU, with its 28 member states, constitutes a good ground for such learning, especially given the wide variety of innovation policy practices among the member states (Izsak, Markianidou, & Radošević, 2015).

Innovation policy has enjoyed a particularly important status on the EU level as a part of its competitiveness agenda (Borrás, 2003). Indeed, innovation has been seen as one of the primary factors to help the EU compete with its international rivals on the economic front. The role of innovation has been emphasised in the successive strategic plans for raising the competitiveness of the EU: the Lisbon Agenda and EU 2020. The Lisbon Agenda set ‘enhancing innovation and economic reform’ as one of its

key priorities and called for the foundation of the European Area of Research and Innovation (European Council, 2000). The EU 2020 framework follows up 10 years later by declaring ‘smart growth – developing an economy based on knowledge and innovation’ as one of its three priorities and establishing the ‘Innovation Union’ as one of its flagship programmes (European Commission, 2010).

With innovation policy high on its strategic agenda, the European Commission has introduced many specific steps to enhance the development of innovation policies in the member states. A particular emphasis in this regard has been placed on advancing policy learning within and between countries. On the one hand, through the evaluation requirements and guidance for using the EU funds for innovation policy, it encourages member states to regularly assess their policies. On the other hand, through several initiatives of mutual learning, it is promoting knowledge-sharing and network-creation among its member states. The latter initiatives include, for example, the OMC and ERAC peer-reviews and the ongoing Policy Support Facility programme. Consequently we can see that the EU provides a certain common framework for its member states in terms of policy learning.

Given the importance of innovation policy on the strategic EU competitiveness agenda and the several initiatives to enhance policy making in the member states through policy learning, a cross-country comparison of member states can reveal important observations regarding the differences in the actual use of different types of sources for policy learning in innovation policy. However, it is important to note that the current thesis does not constitute an evaluation of the EU initiatives for enhancing policy learning as it does not aim at establishing a causal link between these efforts and actual learning practices in the member states. This would require a very different approach, given the multitude of factors that may influence learning. Instead, this thesis looks at the current status among the member states regarding the use of specific sources of policy learning, taking into account that it takes place in a common policy space.

5. Research design, data and methodology

This chapter describes the research design and data used in the three articles. First, I describe the general dataset and the data collection methods. Following this, I will provide an overview of the methodologies used in each article: qualitative content analysis, social networks analysis and regression analysis.

5.1 Data

The thesis is based on both primary and secondary data. The primary data were collected through interviews with policy makers and experts, the secondary data are based on policy documents. In substance the dataset consists of two parts: information on evaluation practices and data on informal networks. The dataset is focused on the 28 member states of the European Union that constitute the

population of this study. I focus on the EU countries, given the substantial initiatives that have been undertaken over the years in both academic literature (Borrás, 2004) as well as by international organisations (such as the European Commission and OECD) to encourage mutual learning and the spreading of good practices among the policy makers. Accordingly, the population of the EU member states provides a good opportunity to study the possible differences among countries belonging to a broadly similar policy space.

The primary data were collected through interviews. In total, 62 interviews were conducted¹, 52 with policy makers and 10 with academic or independent experts. The aim was to carry out at least two interviews per country, one with a senior innovation policy manager for a strategic perspective and one with a senior policy evaluation manager or expert with in-depth knowledge about the evaluation practices for innovation policy. Most of the interviewees were from national ministries or agencies responsible for innovation policy. In some cases where it was perceived that additional information was required, academic or independent policy experts were also interviewed.

The interviews combined semi-structured and structured designs. The former was required to provide space for improvisation when deemed necessary by the interviewer, and the latter to provide uniformity in the way the interviewees were presented with the questions. The interview guide consisted of two main blocks, the first using a semi-structured approach and the latter a structured one. The first block focused on the national evaluation practices, for example on the types of evaluation carried out and their frequency. The second block looked at the informal networks of policy makers. The questions about the informal networks were not asked from the academic or independent experts, as, for the purpose of this thesis, I was interested in the networks of policy makers only.

In order to verify and complement the data collected through interviews, I acquired secondary data from policy documents. The types of documents included, for example, evaluation reports and national evaluation strategies. The documents were received in part from the interviewees and in part from public sources, such as the RIO database (Research and Innovation Observatory) and the SIPER database (Science and Innovation Policy Evaluation Repository). We triangulated the secondary data with the primary data to check for possible mismatches.

5.2. Methodologies

Each of the three articles of this dissertation is guided by a specific research question and therefore all of them required a different methodological approach. Article 1 uses qualitative content analysis, Article 2 employs social network analysis and Article 3 utilises regression analysis. I will proceed by describing the methodological approaches of each article separately.

¹ Susana Borrás kindly conducted some of the interviews.

5.2.1. Article 1 – quantitative content analysis

The empirical aim of Article 1 was to explore the extent to which national evaluation practices match our concept of system-oriented innovation policy evaluation. The data used for this article included the primary data from interviews and the secondary data from policy documents. Combining these data sources and checking them against each other enabled me to build a solid dataset on national evaluation practices that would be used for subsequent comparative analysis.

In order to analyse the qualitative data on each country and to be able to compare countries against each other, we used qualitative content analysis (Kohlbacher, 2006; Schreier, 2012). Based on our analytical framework (see Table 1 in Article 1) we assigned values on a three-point scale (from ‘0’ to ‘2’, according to their intensity) to each of the conceptual attributes. Arguably, the quantitative value assignment loses some of the depth of information as compared to qualitative value assignment. However, given the relatively large number of cases under observation, the quantitative value assignment was necessary to enable a comparative perspective across the 28 countries and the conceptual attributes.

5.2.2. Article 2 – social network analysis

The second article aimed at exploring the structures of the informal networks of policy makers in innovation policy and analysing their consequences for policy learning. To fulfil this empirical aim, I made use of the interview data on informal networks. During the interviews with policy makers the interviewees were presented a list of EU member states and asked to rate each country on a four-point scale (“often”, “sometimes”, “rarely”, “never”), according to the intensity of the perceived interaction². In order to establish a coherent and comparable subset of data, I included only the interviews conducted with the national head of innovation policy or equivalent³. This was necessary in order to ensure that the perspective from each country would come from a roughly similar level and thus ensure comparability across countries. In addition, one can assume that the heads of innovation policy are in a good position to adopt a general overview of the informal networks in their area of responsibility.

² The exact wording of the question was: “Please mark how often do you exchange views on innovation policy with the following countries”.

³ In a small number of countries where the competence of innovation policy is equally divided between two government offices, I merged the answers of the two respective heads of innovation policy.

Table 3. Methodologies and methods used

No.	Title	Methodology	Methods	Data sources
1	Towards System-Oriented Innovation Policy Evaluation? Evidence from EU28 Member States (co-authored with Susana Borrás)	Quantitative content analysis	Semi-structured interviewing Document review	Transcribed interviews Documents and websites
2	Policy learning in the EU: The informal networks of innovation policy directors	Social network analysis	Structured interviewing	Transcribed interviews
3	The Rules of Attraction: Informal Networks of Innovation Policy Makers in the EU28	Regression analysis	Structured interviewing	Transcribed interviews for dependent variables Public databases for independent variables

I analysed the data using social network analysis (Scott, 2017; Wassermann & Faust, 1994). This method is specifically designed to analyse the structures of social relations in a particular setting. A social network is perceived as a combination of nodes and ties, where the nodes are actors and ties are the interactions between them. In my dataset I assigned values to the ties between countries based on the intensity of data. In order to mitigate the possible discrepancies in interpreting the four categories of intensity by the interviewees, I treated ‘often’ and ‘sometimes’ as ‘1’ and ‘rarely’ and ‘never’ as ‘0’. This binary dataset allowed me to establish a robust dataset of actors and the ties between them.

5.2.3. Article 3 – regression analysis

In the third article I set out to analyse the determinants of the network structures, in other words, what are the variables that are most likely to determine whether there is a tie between two countries or not. In order to answer the question I first distinguished between dependent and independent variables. The two dependent variables were ‘the existence of a symmetric tie’ and the ‘the existence of an asymmetric tie’, both based on the network data collected through interviews. The independent variables included a range of indicators under the categories of geographic, policy and cultural proximity (see Table 1 in Article 3 for a detailed overview). The independent variables were based on publically available data sources, such as the Doing Business Index or the World Borders Dataset. Furthermore, two control variables – ‘GDP per capita’ and ‘population’ – were used, both based on data from Eurostat.

The effects of the various factors on the existence of ties were estimated through regression analysis. More specifically, I used logit regressions (Menard, 2002), which are commonly used for analysing binary data and therefore well suited for analysing dyadic network data. I build six models by adding independent variables one at a time and testing them. This allows for the successive assessment of the effects of each individual variable.

6. Conclusions

This thesis studied the topic of policy learning and the way in which countries make use of different sources for policy learning. In particular, I focused on two distinctive sources – evaluations and informal networks. The former was addressed in Article 1 (co-authored with Susana Borrás), where we looked at if and how EU 28 member states are developing system-oriented innovation policy evaluations. In Article 2, I studied the latter by exploring the patterns of informal networks between policy makers. This was further developed in Article 3, where I analysed the underlying factors influencing the informal networks of policy makers. In this concluding chapter, I will start by discussing the main research question and then proceed to answer the sub-questions one by one. I will finish with some thoughts on a future research agenda.

6.1. Answering the sub-questions

6.1.1. Sub-question 1 “How far, and if so how, are EU 28 member states developing system-oriented innovation policy evaluations?”

Article 1 looked at the extent to which member states are evaluating their innovation policies and whether they are doing so in a systemic way. We developed a new term, ‘system-oriented innovation policy evaluation’, and created a conceptual framework to allow for a comparative analysis of evaluation

practices. The frameworks consisted of four attributes, each representing a theoretically founded element relevant for capturing the ‘systemness’ of evaluations in a country. These attributes were: coverage, perspective, temporality and sources.

Empirical analysis based on both original interview data and secondary data from the 28 EU member states demonstrated important discrepancies among member states and attributes alike. We found that, based on our analytical criteria, four distinct groups of countries appear. In the first group we saw that six countries have reached the threshold of having system-oriented innovation policy evaluation practices. These countries have established practices that are both highly developed and well balanced in all of their attributes. In the second group were eight countries with relatively good overall scores, but an unbalanced performance across the attributes. There was evidence of high levels of performance in some aspects, but lower scores in others. In the third group of five countries we found similarly unbalanced performances across attributes, but with lower overall scores. Finally, the last and relatively large group of nine countries showed very little evidence of having any evaluations at all.

These differences are equally pronounced with regard to the specific attributes. Within the attribute coverage, we could see that most governments conduct evaluations of their policy instruments, albeit with different levels of sophistication and intensity. A majority of countries also keep track of their innovation indicators and thus assess the socio-economic performance of their innovation systems. The least common type is the policy-mix assessment, with only a small number of countries reporting such exercises. Looking at the second attribute – systemic perspective – we see that a majority of countries have incorporated such exercises into their evaluation frameworks, largely owing to the efforts of international organisations conducting and facilitating them. The attribute of temporality once again reveals large differences between member states, with some conducting evaluations with high regularity, some only on an *ad hoc* basis, and most countries in between the two extremes. The results for the last attribute – sources – showed that most countries use more than one source of expertise for evaluating their policies (and several even three or more).

Altogether, this shows that the use of the source ‘analysis’ for policy learning is very different among member states. On the one hand, we can see that most countries carry out evaluations at least to some extent and thus ensure an analytical input to their policy learning processes. On the other hand, some countries have next to no evaluative practices, and many have only rudimentary exercises. This means that the policy makers in many countries can be considered similar to drivers operating their vehicles blindfolded, thus placing severe limits on their abilities to learn about their policies in an analytical manner.

6.1.2. Sub-question 2a “What are the patterns of informal networks between policy makers as a source for policy learning?”

In Article 2, I analysed the second source of policy learning – informal networks between policy makers. I used data from interviews with innovation directors from each of the 28 EU member states, to see the connection of each individual country and to calculate the general network structures in the European innovation policy sphere. I distinguished between asymmetric ties (reported by one country only) and symmetric ties (confirmed by both countries), with both revealing distinct structures. The asymmetric ties showed a core-periphery pattern and the symmetric ties a clear cluster structure. Both of the structures reveal different consequences for policy learning.

Looking at the asymmetric ties, I discovered a core-periphery pattern. In the core of the network we could see a small number of countries with a strong innovation performance. The rest of the countries surrounded them at some distance. Drawing cues from the organisational literature on the relationship between the type of tie and learning, one could expect this pattern to reveal the transfer of simple and codified knowledge. The relay of this kind of knowledge does not carry high transaction costs, therefore these kinds of ties are plentiful across the countries, but also show knowledge from some countries being in more demand than others.

The symmetric ties took a clear cluster structure. One could notice a visible geographic pattern – a tightly connected cluster of ‘northern’ member states, connected to both ‘central-eastern’ and ‘southern’ countries. As the symmetric ties are ‘stronger’ in nature, they provide a good foundation for the transfer of sophisticated, tacit knowledge where the transaction costs would be higher. Therefore, one can perceive better conditions for mutual learning and knowledge transfer among the groups that are more tightly connected through symmetric ties. However, without knowing exactly what factors draw countries together, it is difficult to draw any stronger conclusions from a learning perspective, apart from being able to note the existence of the sources for possible learning. Therefore, the next sub-question addresses this topic more specifically.

6.1.3. Sub-question 2b “What are the underlying factors that shape the informal networks of policy makers?”

Article 3 explores the issue of what drives the connections between countries in the informal networks of innovation policy makers. As a foundation, I used the same network data as in Article 2 and compared it against variables based on multiple public data sources. I treated both the asymmetric and symmetric ties as separate dependent variables. Following the previous studies on network proximities, I used three sets of independent variables: geographical, policy and cultural proximity. In addition, I controlled for GDP per capita and population.

Using regression analysis, I estimated the effect of each of the proximity factors on the two types of ties. Geographical and cultural proximity returned a significant and positive relationship for both kinds of ties. Policy proximity, however, revealed a significant and positive effect for the formation of symmetric ties, but a significant and negative effect for asymmetric ties. In other words, countries are likely to be connected to their peers who are geographically and culturally similar to them. Given this, they are more likely to have a symmetric tie with their peers whose policy performance is similar to them and an asymmetric tie with countries with a different level of innovation policy performance.

From a policy learning perspective, this shows that the asymmetric ties are likely to capture the process of learning between countries, while the symmetric ties are more likely to represent established patterns of cooperation. One can assume that due to the transaction costs associated with any interaction, countries are inclined towards minimising these costs. This is evident in the similarly strong effect of geographic and cultural proximity for both types of ties. However, the observation that policy proximity has a negative effect for asymmetric ties, shows that countries are ready to ignore the higher transaction costs in return for new knowledge from a superior performing peer. As this is a one-way relationship (the superior performing peer is not necessarily interested in the know-how from the lesser peer), it was not reflected in symmetric connections. Thus we can conclude that the asymmetric ties are quite possibly a source for policy learning in their more immediate form of information seeking, while the symmetric ties are likely to project more established cooperation patterns extending beyond learning.

6.2 Answering the main research question

The main research question of the thesis was: “What are the differences across countries, regarding the way in which they use the specific sources of policy learning?”

Overall, the results of these cross-country comparisons allowed for two important observations. The first observation showed that both cases were strikingly similar in the degree polarisation between member states with regard to their use of the two types of sources for policy learning. For the evaluations and networks alike, the intensity of their use by member states was very different from one country to the next. The second observation revealed that there were important similarities in how specific countries make use of both types of sources. Interestingly, the countries that were advanced in using one type of source were also making more use of the other type of source. I will elaborate on both of these findings below.

With regard to the first observation, the research revealed that there is a strong variation among EU countries in how they use evaluations in a systemic way to learn about their innovation policy. Looking at the use of evaluations, we could notice that only six member states out of 28 approached a

comprehensive perspective of their innovation policies by using evaluations in a system-oriented way. At the same time, more than half of the member states reached a very low score for their use of evaluations, suggesting that policy making in these countries is carried out without a strong evidence-base. A similar highly polarised pattern could be seen in the use of informal networks as a source of learning. There we could see that the only eight countries gathered 55% of all connections in the EU. Furthermore, about two-thirds of the countries made up almost 90% of all connections. This shows a very strong degree of polarisation in both of the two cases, each having a relatively small number of highly ‘advanced’ users of the sources and a larger number of countries ‘lagging’ behind.

Regarding the second observation, we could see that the specific countries that were more advanced in their use of the two sources of learning, as well as the one with poorer performance, tended to be roughly the same. In the case of evaluations, the member states that were closest to a system-oriented innovation policy evaluation were also the ones with higher innovation performance in general. The top ten countries according to their evaluation practices were Austria, Finland, Germany, Ireland, the Netherlands, Denmark, France, the United Kingdom and Belgium. These countries also hold the top positions in international rankings of innovation performance. Similarly, the structures of informal networks as a source of learning revealed a core group of countries that interact closely with each other and whom others seek to interact with. This core group consisted of the same countries: Belgium, France, the United Kingdom, Sweden, Germany, Denmark, Finland, the Netherlands, Austria and Ireland. Thus we can see a strong similarity between the two cases – a good performance in the use of one source corresponded to a similarly advanced use of the other.

These two observations seem to point to the issue of capacities. Borrás (Borrás, 2011) has demonstrated that organisational capacities play a key role in policy learning. This also seems to be the case here. On the one hand, the countries with established innovation policies are likely to have stronger organisational capacities in general. These stronger capacities are then either already reflected in their advanced use of different sources of learning, or lead to the possibility of making use of the various sources available for learning and doing so to a significant extent. On the other hand, the countries with weaker organisational capacities might not be able to make full use of the sources for learning, as they probably lack the administrative resources necessary for engaging in policy learning on many different fronts simultaneously. This calls for a dual policy action on the EU level: both for strengthening these capacities on a member state level to allow for a better use of the available sources of policy learning as well as introducing initiatives to make these sources more accessible. This would likely bring more cohesion to the practices of policy learning and, as a result, help advance national innovation policies and competitiveness.

6.3. Policy implications and perspectives for future research

The results of the thesis reveal two-fold implications for policy. Firstly, they highlight the need for policy makers to invest more in the national evaluative capacities to ensure a strong analytical foundation for policy learning and eventual decision making. On the European level this implies reinforced efforts in facilitating mutual learning and exchange of best practices as well as technical assistance on evaluation techniques and methodologies. One can see a particular need for practical tools in capturing the interactions within policy mixes, i.e. how different programmes complement each other.

Secondly, the results of the study show that there is a clear demand for knowledge from the advanced performers and a drive from the member states to access that knowledge through informal networks. Satisfying this demand could also be aided by the reinforced efforts of the European Commission and OECD to facilitate contacts between policy makers and providing forums for mutual learning. This is especially important with regard to overcoming the current cluster structures.

With a view to a future research agenda on policy learning, there are two paths to follow. The first should aim at an improved understanding of the mechanisms and actors that through evaluations contribute to policy learning (and the extent to which they actually influence policy change). In addition, more analytical work is necessary for developing tools that can convincingly capture the interactions between different policies and thus enable policy makers to improve their policy mixes. The second path should be directed towards an advanced understanding of the relationship between social networks and policy learning. This would likely require longitudinal studies and comparisons with other policy fields.

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Appendix – Articles

Article 1 - Towards System Oriented Innovation Policy Evaluation?

Evidence from EU28 Member States

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Towards System Oriented Innovation Policy Evaluation?

Evidence from EU28 Member States

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Highlights

- Most national innovation policy evaluation practices are still not truly ‘systemic’.
- Only 6 out of EU28 countries have developed a system oriented innovation policy evaluation.
- 13 countries have some traits of it; whereas 9 countries have no real evaluation practices.
- It is urgent to build capacity in the EU28 for system oriented innovation policy evaluation
- It is the cornerstone for evidence-based and distributed intelligence in innovation policy-making

Abstract:

Many years after the introduction of the innovation system concept in innovation policy design, it is still not clear whether innovation policy evaluation practices follow a system approach. Building on evaluation and innovation studies, this article develops the concept ‘system oriented innovation policy evaluation’ based on four attributes (coverage, perspective, temporality and sources). The attributes are used as analytical devices for gathering extensive empirical evidence on the actual practices of EU28 member states. The findings show that few countries have developed a type of innovation policy evaluation that is system oriented. The advent of a system approach to innovation policy evaluation offers the opportunity of comprehensive, contextualized and evidence-based innovation policy-making. However, there are still serious obstacles as such an approach requires important knowledge and organisational capacities. Overcoming these obstacles would need more decided evaluation capacity-building at the national level.

Keywords: Evaluation, innovation policy, innovation system, innovation indicators, evidence-based policy, European Union, holistic.

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1. Introduction

During the past decades there has been an increasing focus on the need to provide innovation policy-makers with more comprehensive and knowledge-based tools for policy-making. The complexity of innovation systems and the recent developments in new policy initiatives require more sophisticated intelligence and knowledge, as key sources for policy learning. Further improvements in science and technology foresight, technology assessment and, innovation policy evaluation have been largely seen as key areas for strong, comprehensive and strategic policy learning (Kuhlmann et al., 1999). This paper focuses on one of these, namely, innovation policy evaluation. In particular, the paper aims at examining the extent to which countries have introduced system oriented innovation policy evaluation practices, and if so, what characterises them.

Policy-makers seem to have embraced the notion of innovation system when defining innovation policy interventions (Kuhlmann et al., 2010). However, it is still unclear the extent to which innovation policy evaluation practices have also embraced the system oriented-perspective. As we will review in the next section, most scholarly publications have addressed this matter from a normative perspective, suggesting specific models for how policy-makers and evaluators could go about it. Some of these normative models suggest the integration of different innovation policy evaluations to obtain a coherent overview (Edler et al., 2008) (Magro and Wilson, 2013). Others put more emphasis on integrating the results of policy evaluations with insights about specific problems and bottlenecks in the innovation system (Arnold, 2004) (Jordan et al., 2008) (Hage et al., 2007).

In spite of the relevance of these normative models for how to conduct the evaluation, we still do not have empirical studies substantiating whether or not European countries are in fact organizing and conducting system approach innovation policy evaluations, and if so, what characterizes them. In other words, we still lack empirical evidence about current practices across different countries (Martin et al., 2012). Building on the above-mentioned scholarly approaches, this article develops the concept 'system oriented innovation policy evaluation'. We define it as the regular and knowledge-based set of practices that evaluates the effects of innovation policy within the innovation system.

The key attributes that constitute the concept 'system oriented innovation policy evaluation' are used as analytical dimensions to gather and characterize empirical evidence about the actual evaluation practices of EU's 28 member states. Hence, the leading research question of this paper is: How far, and if so how, are EU 28 member states developing system oriented innovation policy evaluations?

The paper proceeds as follows. After reviewing the literature on this topic in section 2, section 3 builds from there and provides a clear-cut definition of system oriented innovation policy evaluation based on

four attributes. Those attributes are operationalized in order to undertake an orderly empirical analysis, and the data sources and some important methodological considerations of the analysis are reflected upon. Sections 4 and 5 present the analysis, first looking at how the EU28 countries perform in terms of each of the four attributes (section 4), and thereafter looking at a four-fold typology characterizing each of the 28 EU countries. The conclusions summarize the findings, pointing out cross-national diversity and discussing further research.

2. Models in the Literature

During the past two decades the innovation system approach has gained substantial endorsement among scholars and policy-makers alike. This approach sees innovation as a complex social process of a cumulative nature, embedded in complex institutional and organizational national contexts (Lundvall, 1992) (Nelson, 1993) (Edquist, 2005). It brings forward the notion of innovation as the outcome of complex interactions and dynamics in the idiosyncratic socio-economic context of an economy. Yet, the more the innovation system approach has gained the upper hand, the more apparent have the limitations of the current innovation policy evaluations become.

With its focus on interaction and interactive learning, the system approach of innovation policies requires more sophisticated tools to enable policy-makers to better grasp the system-wide impact of innovation policy instruments and mixes (Smits and Kuhlmann, 2004). In his seminal paper about the new frontiers of evaluation studies, Irwin Feller (2007) reflected upon this need for more encompassing approaches stemming from the innovation system approach on the one hand; and the conventional praxis of research evaluation of individual R&D programs on the other. Single evaluations are increasingly perceived to be too limited to provide answers regarding the impacts of public initiatives in the wide framework of the economy. “Existing evaluations touch only lightly, however, on how the strategies, behavior, performance of the sectors or actors described in the national innovation taxonomy change as a result of the cumulative, long term impact of a cluster of programs” (Feller, 2007).

Likewise, in their review of the literature Molas-Gallart and Davis argue that “the practice of policy evaluation continues to lag behind advances in innovation theory. Innovation theory has produced successive generations of more sophisticated conceptual models that seek to explain how the relationship between scientific and technological research and the market opportunities for innovation occurs.” (Molas-Gallart and Davies, 2006). Nevertheless, these authors argue, much of the evaluation undertaken today is still performed at the project and program level, and is mainly based on simple models of impact assessment and accountability. Yet, they underline that it is not an easy task to aggregate and integrate

findings relating to specific policies and programs into an overarching framework that evaluates the effects of policies within the national innovation systems. The innovation system approach and the theoretical framework it implies “have proved difficult to use in the practice of evaluation, resulting in a gap between evaluation practice and Science Technology Innovation (STI) policy theory” (Molas-Gallart and Davies, 2006).

In response to the need of evaluation to move beyond the myriad of isolated individual program-focused evaluations, a few models have suggested different ways to guide policy-makers’ and evaluators’ practices. In the earliest work on this theme, Arnold (2004) suggests how to develop research and innovation policy evaluation in an innovation systems’ world. He proposes an approach to evaluation that considers “to a greater extent the interplay of these tools with their environments” (p.2). His model combines three levels: the traditional program evaluation, whose scope needs to be expanded to aim at identifying regularities across programs through meta-evaluations; the evaluation of the health of the innovation system based on a series of system-wide dimensions (such as the innovativeness of the business sector, adequacy and provision of infrastructures, the regulatory framework conditions for innovation, etc); and sub-systems evaluations, which target specific possible bottlenecks at a meso-level (policy mixes, or institutions performance). (Arnold 2004).

A similar multi-level model is proposed by Jordan and Hage. Mainly focusing on developing an epistemological and indicator-based model within which to integrate specific innovation policy instruments’ evaluations, these authors distinguish between the micro-, meso-levels (Jordan et al., 2008), and macro-level (Hage et al., 2007). Building on Arnold, the authors aim at outlining “a theories-based innovation systems framework (ISF) of indicators for RTD evaluations that can aid government policy makers in policy formulation and reformulation. The indicators that are proposed suggest protocols for performance monitoring and evaluation” integrating innovation policy instruments and mixes’ evaluations herein (Jordan et al., 2008) (p. 118).

Other approaches focus instead on the nature of the assessment data and material upon which the evaluation is currently based. In this sense, Edler et al (2008) suggest “using existing evaluations to learn about policy performance and policy effects on the system level”. Inside this frame they separate two concepts, namely, evaluation synthesis and meta-analysis, both of which serve as the basis for an overall framework for utilizing and analyzing existing evaluation data. Evaluation synthesis is understood as “an aggregated content analysis based on multiple evaluation reports on similar programs or projects” (Edler et al 2008). For its part, meta-analysis allows for “an improved comparison and understanding of interventions and their effects by taking into account the results of a large number of evaluations” (Edler et al 2008). Hence, whereas the former aggregates and synthesizes existing evidence, the latter provides

the basis for contextualizing such evidence in a broader context, allowing for more strategic insight and overview.

A somehow similar approach has been suggested by Magro and Wilson (2013), who focus on “meta-evaluations or secondary analyses that build on individual evaluations in trying to capture the system oriented nature of policies; moving ahead from isolated, individual evaluations”. In that respect, they share a common viewpoint with Edler et al (2008) focusing on the policy space, or, more concretely, on “the innovation policy system as the conjuncture of policy mix and multi-level dimensions” (p. 1647). They use this model in one case study, conducting an evaluation mix of the Basque Country innovation policy. The starting point of their model is the identification of individual policy rationales and their corresponding instruments. Hence, the evaluation mix protocol that they suggest is the practical articulation of how to conduct this evaluation in a way that brings together the focus of policy mixes with the recent calls for more system oriented approaches to innovation policy evaluation.

From the above we can see two main approaches. The first approach, by Arnold and Jordan-Hage, takes the starting point in the innovation system, and strives to identify specific indicators and contents that act as the framework within which to integrate the evaluation of specific innovation policy instruments and mixes. The second approach by Edler et al. and Magro & Wilson begins with pre-existing innovation policy evaluations and suggests active efforts and means to generate synthesis and meta-analysis from them, integrating them in order to create a comprehensive system oriented innovation policy evaluation.

3. Investigating the practices of ‘System Oriented Innovation Policy Evaluation’

3.1 Definition and Operationalization

However useful the normative models reviewed in the previous section, there is still a need to develop an analytical framework for studying empirically the current country-level practices. More concretely we need to define the concept of ‘system oriented innovation policy evaluation’ in a way that allows for an empirical analysis of EU28 countries practices. We need to be able to identify clearly whether or not a concrete country has developed a system oriented innovation policy evaluation. A clear definition and its operationalization will allow us to grasp the complexity of the empirical reality, while avoiding the classical problem in the social sciences of ‘concept stretching’ (Sartori, 1970). Likewise, a clear concept is important for clarifying the specific attributes that define it, and for highlighting the analytical

dimensions required to undertake empirical studies and to characterize the diversity of empirical practices.

We see system oriented innovation policy evaluation as a fundamental tool for creating strong, comprehensive and strategic policy advice. Its purpose is to provide an overall, critical and strategic overview of the performance of innovation policies in the context of the performance (and problems) of the innovation system. To be sure, “evaluations are used to inform policy-makers, program managers and other stakeholders about the effectiveness, efficiency, appropriateness and impact of policy interventions” (Edler et al., 2008) p. 175. Following from all this, we define ‘system oriented innovation policy evaluation’ as: the regular and knowledge-based set of practices that evaluates the effects of innovation policy within the innovation system. It is important to remind the readers that analytical concepts in the social sciences are constituted by attributes (Sartori, 1970) (Goertz, 2006), which are essential analytical elements in comparative studies and in theory-building exercises (Collier et al., 2008). Thus, we distinguish four constitutive attributes in system oriented innovation policy evaluations: a wide coverage of evaluation elements, a systemic perspective assessing innovation policy performance and innovation system performance, a high regularity of evaluation practices, and a diversity of expertise. The selection, definition and operationalization of these four attributes are explained below.

Our definition of system oriented innovation policy evaluation can be seen as an ‘ideal type’: a notion that defines the general traits of the expected phenomena, and which is used for analytical purposes (Goertz, 2006). Ideal models are formed deductively from theorizing endeavors and aim at providing clear guidance for empirical analysis (Swedberg, 2012). However, because they are ‘ideal’ they might not be found in their ‘purity’ or ‘entirety’ in the real world. They are abstractions, and may not necessarily be found 100% replicated in the empirical complexity of social phenomena.

For this reason, we rarely expect to find countries carrying out ideal types of system oriented innovation policy evaluation, because it is very demanding given the complexity of the task. Instead, in our empirical analysis we expect to find only few countries which are conducting ‘system oriented policy innovation evaluation’ or complying in an assertive manner with the four attributes that define our ideal model (see Table 1 below).

The first attribute, coverage, refers to the extent to which the most important elements (areas) of evaluation are included. This attribute refers to the contents of what is being actually evaluated. This attribute is inspired by earlier treatments in the literature that consider how extensive the object of evaluation actually is (Dahler-Larsen, 2012). In our study, we operationalize ‘coverage’ into three elements, namely, the evaluation of innovation policy instruments, of innovation policy mixes, and of socio-economic performance assessment.

By policy instrument evaluation we understand evaluation practices whose focus is to assess the impact of one particular innovation policy programme, for example, the impact of an R&D program or of a tax incentive scheme.

Policy mix evaluations are the assessments of more than one policy instrument at once, and take into consideration their joint impact (additionality and complementarity). Policy-mixes have been considered of fundamental importance in understanding the performance of innovation policies (Flanagan et al., 2011) (Cunningham et al., 2016) and thus are highly relevant in the context of system oriented innovation policy evaluation.

Socio-economic performance assessments refer to the appraisal of the innovation system as a whole. These assessments use input indicators (such as employment in knowledge-intensive activities), and output indicators (such as high-tech exports). They often discuss analytically the possible factors behind such indicators. There is a wide variety of approaches to this kind of assessment, carried out with varying degrees of sophistication, ranging from simple reporting of indicators to far more sophisticated large-scale innovation performance assessments. It is important to note that merely collecting and publishing statistical data does not amount to a socio-economic performance assessment. Instead the ‘raw’ data has to be appraised in the national context to be considered a proper assessment.

The second attribute in our definition of system oriented innovation policy evaluations has to do with its systemic perspective. This attribute is important for theoretical reasons. Theory holds that national systems of innovation are based on two dimensions, namely, the institutional set-up (formal and informal rules of the game and framework conditions – here including innovation policy) and the socio-economic dimension (the production sector that performs innovation) (Lundvall, 1992). For this reason, countries with system oriented innovation policy would invariably include a perspective that assesses both dimensions. This attribute is important for our definition because the purpose of system oriented innovation policy evaluation is to provide an overall and strategic overview of the performance of innovation policies in the context of the performance (and problems) of the innovation system. This takes place typically in the form of what Edler et al have conceptualized as ‘meta-analysis’, which provides the basis of contextualizing the evidence of various innovation policy evaluations in the context of the performance of the innovation system (Edler et al., 2008).

In order to operationalize the empirical analysis of whether a country has or not such a systemic perspective, we look into whether that country has produced reports with a systemic perspective of the performance of innovation policies in the context of the performance (and problems) of the innovation system. Examples of these include (but are not limited to) the OECD reviews of innovation policy and

country reviews by the European Commission Policy Support Facility. Thereafter we assess to what extent these reports include an extensive analysis of both dimensions, or only a limited analysis.

The third attribute that defines ‘system oriented innovation policy evaluations’ is temporality, namely, the extent to which there is a certain level of regularity in the evaluation of the three coverage elements (policy instruments, policy mix and socio-economic performance) and of the reports with systemic perspective. This attribute is part of our definition of system oriented innovation policy evaluation because the time-dimension of evaluation practices is a fundamental aspect for an on-going strategic overview. Furthermore, temporality is a dimension that has previously been included in evaluation studies, as a fundamental aspect of countries’ different approaches to evaluation practices (Dahler-Larsen, 2012). In this article we operationalize temporality by looking at whether countries have conducted evaluations on a regular basis or not. Admittedly, different types of evaluations might have a different temporality – for example, reports that look at systemic perspective are often undertaken in relation to particular strategic events, such as in anticipation or after major policy overhauls; whereas, socio-economic performance assessments might take place regularly every year. All in all, temporality is an important attribute, because evidence-based policy-making requires not only that different parts of innovation policy are evaluated, but also that the body of assessments is regularly updated.

Finally, the fourth constitutive attribute of ‘system oriented innovation policy evaluation’ refers to the expertise of the evaluations, namely, the different expertise involved when conducting different evaluation elements. Our definition emphasizes the knowledge-based nature of evaluation practices, which is a widespread view in the evaluation literature. This fourth attribute is an essential part of the concept because it is related to the formative dimension of evaluation in public policy contexts (rather than the summative dimension of evaluation). The theoretical assumption is that the broader the basis of knowledge-base, the broader the formative dimension of the evaluation practice. Formative evaluation of public policy emphasizes learning as the ultimate goal of evaluation. Therefore, it needs a broad basis of knowledge and expertise in order to better understand how policies achieve their effects (Sanderson, 2002).

In our operationalization we examine whether countries use diverse knowledge and expertise in evaluation, in particular, if they combine national and international expertise (conducted by international organisations such as OECD, EU, World Bank), as well as internal (conducted by governmental units) and external expertise (by private consultancies, universities, think-tanks, etc.). Recent studies about practices of instrument-level evaluation look at this (Edler et al., 2012); in addition, the theory of absorptive capacity stresses the importance of combining internal and external dimensions in organizational capabilities (Borrás, 2011). In the context of our conceptualization of ‘system oriented innovation policy evaluations’ this attribute is particularly relevant because of the widespread

competences needed to conduct the different elements of evaluations and to deal with the complexity of establishing a meaningful overview.

Table 1: The four attributes defining the concept “system oriented innovation policy evaluation”, their operationalization and measurement.

Definition of the attributes	Operationalization for empirical analysis	Measurement ⁴ scores
<p>Coverage:</p> <p>The extent to which the evaluation covers three most important elements (see the cell to the right)</p>	<p>We examine whether countries are conducting evaluations of the following three elements:</p> <ul style="list-style-type: none"> - Innovation policy Instruments - Innovation policy mixes - Socio-economic performance 	<p>Value 2: when there is a substantial number and sophisticated forms of evaluations</p> <p>Value 1: fewer numbers of evaluations and less sophisticated</p> <p>Value 0: very few or none of the above</p>
<p>Systemic perspective :</p> <p>The extent to which countries analyze the systemic perspective between innovation policy performance and innovation system performance</p>	<p>We examine whether or not countries have produced reports with systemic perspective.</p>	<p>Value 2: The reports include an extensive analysis of the systemic perspective.</p> <p>Value 1: The reports only include a limited analysis of the systemic perspective.</p> <p>Value 0: no reports.</p>
<p>Temporality:</p> <p>The extent of regularity in the evaluation in all the three coverage elements</p>	<p>We examine whether countries have conducted evaluations on a regular basis</p>	<p>Value 2: evaluations are conducted with a high level of regularity</p> <p>Value 1: some evaluations are conducted regularly, but others more</p>

⁴ *See section 3.2 on data and methodology, and Section 4 for more detailed operationalization of measurement.

		sporadically Value 0: evaluations are done sporadically and ad-hoc
Expertise: The extent to which different expertise is involved in conducting evaluation of the three elements above	We examine whether countries use diversified expertise on evaluation, particularly the combination of national and international, internal (ministerial/public) and external (private consultancies, universities, think-tanks, etc) expertise.	Value 2: when a country has a strong combination of national/international evaluations that are either internal/external to the government Value 1: when a country has significant record of only two of the above Value 0: when a country has only one or none of the above

3.2 The Data and Methodology

Data about the system oriented innovation policy evaluation practices in EU countries are not easily accessible. For this reason the research strategy of the present study has been to use a sequential research design to collect different types of data as a means of obtaining solid empirical evidence. Firstly, we have conducted a total of 62 semi-structured interviews in all EU28 countries: 52 with high-ranked government experts, and 10 with academic/independent researchers. The interviews were conducted between January 2016 and June 2017, with at least 2 interviews per EU28 country (see Annex 1). They were based on a guideline with specific semi-structured questions related to the items conceptualized above. Open room for discussion allowed gathering additional relevant information. The second set of data used in this study was gathered from a number of directly relevant documents on each country's evaluation practices. The RIO database⁵ (Research and Innovation Observatory) and the SIPER database⁶ (Science and Innovation Policy Evaluation Repository) have been particularly valuable in this regard. Additional documents were provided by interviewees, or found by the authors on the Web. The information obtained from the interviews was triangulated with those documents. On the few occasions when there was a mismatch, we conducted additional interviews and searches.

⁵ <https://rio.jrc.ec.europa.eu/en>

⁶ <http://si-per.eu/>

The next step of the research design was to assign specific values to each country's attributes (See Table 2). We assigned scores of 0, 1 or 2, according to the intensity in the data (see Table 1). Regarding the assignation of values it is important to note two methodological issues. First, creating an analytical conceptual framework that aims at being used in empirical context requires one way or another to assign values to the empirical data. The value assignment can be done qualitatively (qualitative analysis of cases with in-depth rich description, relating the descriptive empirical data with the attributes of the concept) or can be done quantitatively (doing the same by assigning quantitative values to each attribute of the empirical cases under study). Each method has its pros-and-cons: the qualitative provides very rich and nuanced case-by-case in-depth analysis which is suitable for a few cases; and the quantitative method provides a better overview and overall indication of general trends, which is suitable for larger n. In our paper we have chosen a quantitative approach to value assignment for the empirical analysis because we have a relative large sample of cases (all EU28 member states). This will allow us to keep the analysis at a level where we can meaningfully compare the countries under study.

Second, we assign ordinal values of 0, 1 or 2 according to the performance of the country on each of the four attributes. They position an item in an ordering scale, yet they do not measure any distance. This ordering is useful as it provides a conceptually solid overview of EU28 countries' evaluation practices, allowing a cross-country comparison.

In order to secure the reliability of the assignation of individual values (the coding of the data), the data was coded meticulously and repeatedly by the two authors, in an internal working procedure similar to inter-coder reliability practices.

After the full analysis of the data (assignation of scores), we verified the findings between September and October 2017 using feed-back from national experts in the field (see Annex 1). The findings were subsequently checked by the authors. The verification focused on eliminating possible misunderstandings or misinterpretations of the data. Adjustments were introduced where needed.

4. Empirical Evidence in EU28

This section provides empirical evidence about how EU28 countries are organising their evaluation practices. In this section we report the findings according to each of the four attributes. Thereafter, section 5 will report the findings according to cross-country comparison.

Table 2. Scores related to the four attributes defining system oriented innovation policy evaluation

	Coverage			Systemic perspective	Temporality	Expertise (internal/external)	Total score
	Instrument evaluation	Policy-mix evaluation	Socio-economic performance assessment				
Austria	2	2	1	2	2	2	11
Belgium	2	1	1	1	1	2	8
Bulgaria	0	0	0	1	0	1	2
Croatia	0	0	0	1	0	1	2
Cyprus	0	0	0	0	0	0	0
Czech Republic	0	0	1	1	0	1	3
Denmark	2	2	1	1	1	2	9
Estonia	1	1	1	1	1	2	7
Finland	2	2	1	2	2	2	11
France	2	1	1	2	1	2	9
Germany	2	1	2	2	2	1	10
Greece	0	0	0	0	0	0	0
Hungary	1	0	0	1	1	1	4
Ireland	2	2	2	2	2	1	11
Italy	1	0	0	0	0	0	1
Latvia	1	0	1	1	1	1	5
Lithuania	1	0	1	2	1	2	7
Luxembourg	0	0	0	1	0	1	2

Malta	0	0	0	0	0	0	0
Poland	1	1	1	2	1	2	8
Portugal	1	0	1	0	0	1	3
Romania	0	0	1	0	0	1	2
Slovakia	0	0	1	0	0	0	1
Slovenia	1	0	1	2	1	2	7
Spain	1	0	1	1	1	1	5
Sweden	2	1	2	2	2	2	11
The Netherlands	2	2	2	2	2	2	12
United Kingdom	2	1	1	1	2	1	8

4.1 Coverage

There is a wide diversity across EU28 countries in their extent of coverage of the three evaluation elements. Regarding *policy instrument evaluations*, we have divided countries into three categories: countries where all policy instruments are evaluated, countries where only some policy instruments are evaluated, and countries where only few policy instruments are evaluated (or are simply monitored, not evaluated as such). In the first category we have the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, the Netherlands, Sweden and the United Kingdom. In these countries there is a strong tendency to evaluate every programme, and hence we assign them a score of 2 (see table 2). Some of these countries have rigid structures for evaluations, grounded in legal or quasi-legal acts. For example, in the Netherlands, evaluations of programs are tied to the general budgetary framework and each instrument has to be evaluated (The_Netherlands_Government, 2014). In other countries, there is no specific legal obligation to evaluate every program but they have a strong evaluation culture. For example, in Austria or the UK, there is a strong tradition of evaluating all innovation policy programs, or a “general expectation” that all programs should be evaluated (see interviewees 1, 62).

Another group has less developed traditions and fewer legal requirements to evaluate programmes, but these countries still conduct a considerable amount of policy instrument evaluation. Such countries include Estonia, Hungary, Italy, Latvia, Lithuania, Poland, Portugal, Spain and Slovenia (score 1 in Table 2). Many of these countries assess the impact of their innovation policy instruments following the rules of the EU Structural Funds. While the ‘EU rules’ only prescribe some minimum requirements regarding the rigor of the evaluations, the countries in this group have developed approaches that exceed these minimum requirements.

Finally, countries for which there is very little evidence of conducting policy instrument evaluations (i.e. received a score of 0 in Table 2) are Bulgaria, Croatia, Cyprus, Czech Republic, Greece, Luxemburg, Malta, Romania and Slovakia. These countries typically resort to either the bare minimum required by the EU Structural Fund regulations, or their practices are closer to descriptive monitoring rather than real evaluations. For example, the Czech Republic has established procedures for the “evaluation of finished programmes”(Office_of_the_Government_of_the_Czech_Republic, 2013), but in practice only basic output data of the programmes are reported (Verification 1).

As the second element of the coverage attribute, we look at *policy-mix evaluations*. Our data show that policy-mix evaluations, being a relatively new phenomenon, are not as widespread as policy instrument evaluations. We have defined three groups of countries according to the level of their policy-mix assessments. Firstly, there are countries that have carried out assessments on additionality and/or complementarity in their policy mixes. Secondly, some countries have treated the issue of policy interactions on a smaller scale, often within the framework of other types of evaluations. While these countries do not apply policy-mix evaluations in a pure form, they are addressing the issues relevant to policy-mix and such endeavours should thus be recognized. Thirdly, there are countries with very weak or no signs of policy-mix evaluations taking place.

In the first group we find Austria, Denmark, Finland, Ireland and the Netherlands. For example, in Denmark, the Danish Agency for Science, Technology and Innovation commissioned two studies to assess the effects and interactions of different programmes on firm performance (DASTI, 2014) (Daly and Christensen, 2016). In Finland, different meta-analyses are bundled together to gain insight into the policy-mix performance (interviewee 20). In Ireland the analysis of the policy-mix forms an integral part of their comprehensive programme of evaluations (Department_of_Jobs, 2015). In the Netherlands, a policy mix analysis assessing the interactions between instruments has been carried out for the so-called top-sector policy, a strategic initiative launched by the Dutch government aimed at boosting the competitiveness of priority sectors through a combination of policy measures (interview 45).

The second group consists of countries where we have detected some signs of policy-mix thinking without full scale policy-mix evaluations: Belgium (Flanders), Estonia, France, Germany, Poland, Sweden, the United Kingdom. For example, the innovation agency Enterprise Estonia has been carrying out a biannual evaluation of the impact of its policy mix, addressing also the additionality effects of the policies (interviewee 18). In France, some of the interactions between policies have been covered in the evaluation of the “Programme d’Investissement d’Avenir” (interview 22). The countries in the third group, those that do not seem to assess the interactive effects of their policy-mixes, are Bulgaria, Croatia, Cyprus, Czech Republic, Greece, Hungary, Italy, Latvia, Lithuania, Luxemburg, Malta, Portugal, Romania, Slovakia, Slovenia and Spain.

Regarding the coverage element *socio-economic performance assessments*, the countries are as well divided into three groups: those conducting sophisticated exercises to assess their innovation performance; those who follow their innovation indicators analytically, but less rigorously; and those who merely resort to statistical reporting. The very few countries belonging to the first group have set up specific advanced formats for analytical assessments of their innovation performance, often maintained by non-governmental entities. Here we find Germany, Ireland, the Netherlands, and Sweden. In Germany, the scientific Commission of Experts for Research and Innovation (EFI) analyses the structure and trends of Germany’s innovation performance in an encompassing manner (EFI, 2017).

A large majority of the EU28 countries belong to the intermediate category, as they have developed some form of general analysis of their innovation indicators, often in association with the monitoring of national innovation strategies or similar. These countries typically assess their socio-economic performance by focusing on conventional analysis of general innovation indicators. This is the case for Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Latvia, Lithuania, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, the United Kingdom (with score 1 in Table 2). As an example, in Flanders, the Centre for Research & Development Monitoring (ECOOM) has been set up to provide the Flemish government with information on the innovation performance and reports on a biannual basis on the development of the key innovation indicators (Koenraad and Veugelers, 2015).

About one third of the EU member states do not have any specific practices for analysing their socio-economic innovation performance. Even if statistical data are collected, that is not supported by broader analytical efforts. These countries are Bulgaria, Croatia, Cyprus, Greece, Hungary, Italy, Luxemburg and Malta. As an example, in Cyprus the statistical data on innovation performance are reported to international organizations, such as the European Commission, but no specific analyses are conducted in the country.

4.2 Systemic perspective

With regard to reports that examine systemic perspective, our data show that the large majority of EU member states recognizes the importance of paying attention to innovation policy performance and innovation system performance. However, the level of attention to these issues differs among countries. Following the three-scale measurement above, we found the following countries in the first group: Austria, Finland, France, Germany, Ireland, Lithuania, the Netherlands, Poland, Slovenia and Sweden. All of these countries have had one or several reports analyzing extensively the performance of policy with the economic perspective regarding innovation performance. These reports have often been conducted by the OECD or the World Bank, but there have also been nationally-led exercises conducted by other institutions. As an example of the latter is the Austrian “System Evaluation”, carried out by a consortium of research institutes. It combines the analysis of Austrian innovation policy with insights into Austrian performance in productivity growth and innovation, its external competitiveness and the innovative performance of companies (Aiginger et al., 2009). Likewise, Germany’s Expert Commission for Research and Innovation (EFI) has conducted extensive analysis of issues which exhibit important shortcomings, such as the limited digitalization and entrepreneurship in the German innovation system and its policies.

In the intermediary group we have countries that have produced reports with a strong focus on evaluating the policy dimension, but less on its relation with the innovation performance of the country. Here we find Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Germany, Hungary, Latvia, Spain, Luxemburg and the United Kingdom. Most of these countries have had a European Commission facilitated peer-review (either CREST, ERAC or PSF), where the primary focus is on policy performance and less on its relation with the innovation system performance. It is worth noting that three of the countries in this group (Croatia, Bulgaria and Luxemburg) have ordered relatively sophisticated reports that focus on innovation system performance. However, we argue that because of the lack of quality input from policy evaluations in these countries (virtually no “coverage” in all three, and hence no possibility for meta-analysis – see above), the basis for the assessments is rather limited. It is worth noting that although the UK is a strong performer in “coverage” and in policy and economic assessments, it does not seem to be fully exploiting this potential, as it has a limited number of reports that truly examine systemic perspective. Possibly, the sheer size of its economy and its complex innovation system represents a challenge in those terms.

Finally, the last group of countries with no significant reports about systemic perspective is formed by Cyprus, Greece, Italy, Malta, Portugal, Romania and Slovakia. These countries have not taken part in any of the peer-review exercises facilitated by the European Commission, OECD or any other international organisation and neither have we found any other evidence in that regard.

4.3 Temporality

The analysis of the next attribute, namely, temporality applies the above classification of the countries into three main groups according to the data collected. First we have countries with a high degree of temporality, where various kinds of evaluations are conducted rather frequently and routinely. Secondly we have countries with a medium degree of temporality, where some types of evaluations are performed frequently, but others much less so. Finally we have countries with a low degree of temporality. In the first group of countries we find Austria, Finland, Germany, Ireland, the Netherlands, the UK and Sweden. In these countries the temporality of evaluative activity is high, with different elements of the innovation system being evaluated frequently and consistently. In the second group we have Belgium, Denmark, Estonia, France, Hungary, Latvia, Lithuania, Poland, Slovenia, and Spain. These countries display a medium level of temporality, meaning that their evaluation practices are very frequent in some aspects, but less frequent in others. In the third group we have countries such as Croatia, Czech Republic, Cyprus, Greece, Italy, Luxembourg, Malta, Portugal, Romania and Slovakia. In these countries the overall level of temporality is low, with evaluations being conducted rarely and infrequently.

4.4 Expertise

As the fourth attribute, we look at the diversity of expertise used in the system oriented evaluations of innovation policy. More specifically, we look at the extent to which EU member states are combining national and international, internal (ministerial/public) and external (e.g. private consultancies, universities, think-tanks) expertise in evaluating their innovation policies. We assign values to the countries according to the diversity of this expertise. Firstly there are countries that make use of diversified expertise, where the expertise is both internal and external to national government bodies and where international expertise is used in innovation policy evaluation. Secondly we have countries with less diversified expertise in evaluation, where only two of the different basis of expertise listed above is present. Finally, we find countries where only one of the basis of expertise mentioned is relied upon.

In the first group we have Austria, Belgium, Denmark, Estonia, Finland, France, Lithuania, the Netherlands, Poland, Slovenia and Sweden. These countries make use of all three basis of expertise in their evaluations. For example, Finland has strong evaluative capacities in its innovation-agency TEKES and its public research institution VTT, making as well strong use of external consultants and academic institutions. Furthermore, it has had two international reviews, an OECD innovation review (OECD, 2017) and an earlier 'custom-made' international review (Veugelers et al.). As two other examples, both Lithuania and Poland have demonstrated the use of a variety of expertise in assessing their innovation policies. Lithuania has had an OECD innovation review (OECD, 2016) and a CREST review (Edler, 2007), while a government think-tank MOSTA as well as private sector evaluators have contributed significantly to its evaluative activity. In Poland, the Polish Agency for Enterprise Development (PARP)

is using in-house resources as well as external evaluators to assess the innovation policy. On the international side, the World Bank carried out a strategic review of the Polish innovation system (Kapil, 2013).

The second group consists of Bulgaria, Croatia, Czech Republic, Germany, Hungary, Ireland, Latvia, Luxembourg, Portugal, Romania, Spain and the United Kingdom. They use a more limited range of expertise, combining either internal/external to the government (both national expertise), or internal to the government (national) and international expertise, or external to the government and international expertise. For example, Germany, Ireland and the United Kingdom have generally sophisticated evaluative activity, but all three use almost exclusively national expertise for evaluating their innovation policy. The UK had a CREST review in 2007 (Cunningham, 2007), but that was of limited scale and was not followed up since then.

In the third group we find Cyprus, Greece, Italy, Malta and Slovakia. These countries have a low evaluative activity in general and they typically make use of only of a single basis of expertise for their few evaluations.

5. Evidence of System oriented Innovation Policy Evaluations in EU28

Having examined the attributes one-by-one, we are going to make sense of these findings by dividing them into quartiles. Following our previous definition, a ‘system oriented innovation policy evaluation’ will exhibit high scores in all of the four attributes, that is: extensive coverage of evaluation elements, systemic perspective between innovation policy evaluation and innovation system assessments, high regularity, and broad expertise.

From our analysis we find that Austria, Finland, Germany, Ireland, the Netherlands and Sweden have developed comprehensive practices of system oriented innovation policy evaluation (which we might call ‘holistic’ due to their comprehensiveness in terms of system approach). All of these countries demonstrate a steady performance across the different categories of our typology. For example, Austria has a strong routine for evaluating all its innovation policy programmes, it presents an annual report to the parliament on the performance in the research and technology field, has had both a CREST peer review and a national “system evaluation” (also covering its policy-mix). As another example, in the Netherlands innovation policy programmes are routinely evaluated, with a policy-mix perspective being added at seven-year intervals. Furthermore, an annual report is prepared for the parliament on innovation performance, and both OECD as well as CREST reviews have been conducted.

In the second quartile of countries we find Belgium, Denmark, Estonia, France, Lithuania, Poland, Slovenia and the United Kingdom. What characterizes the countries in this group is that all of the attributes making a system oriented innovation policy evaluation are present, but with varying degrees of sophistication. In terms of coverage, while a large majority of the countries conduct evaluations in all the three main areas (policy instruments, policy-mixes and socioeconomic assessments), we find that some countries have strong instrument evaluation practices, but there is less activity in policy-mix evaluations and socio-economic performance assessments. We can also see that the countries in this group are relatively strong in employing a variety of expertise for evaluation, though with some important variation. When looking at the temporality of evaluations in the group we see that it is almost uniformly lower than in the holistic group. Again, the UK is an outlier here, as it has high regularity. Therefore, when looking at ‘temporality’ and ‘expertise’ we can see that the UK has sophisticated evaluation frameworks and demonstrates outstanding practices on several other dimensions, but is not there yet in terms of all the key features of system oriented evaluation.

In the third quartile we find countries that have generally little diversity of content and a low frequency of evaluative activity. The countries in this group include Czech Republic, Hungary, Latvia, Portugal and Spain. These countries all have some evaluation activity, but not a uniform coverage regarding content – some elements of “coverage” are there, but others not at all. We can see that none of the countries is conducting evaluations on their policy-mix. At the same time, a large majority of the countries in this group are making some effort of a systemic perspective, having ordered either a CREST, ERAC, PSF or a national strategic review. The latter effort is also contributing to some variety of expertise used in evaluations, adding an international dimension to a field mainly dominated by domestic actors. Similarly to the previous group, the overall frequency of evaluative activity in these countries is relatively low.

Last, we have countries which do not have any true system oriented innovation policy evaluation. The countries in this group are Bulgaria, Croatia, Cyprus, Greece, Italy, Malta, Luxemburg, Romania and Slovakia. None of these countries has any considerable evaluation activity. While some evaluations have taken place over time, they have been isolated examples. For example, Cyprus has had an ERAC peer review of its innovation system, but almost no other evaluations. Italy has carried out some evaluations on its policy instruments, but there is very scarce activity otherwise. While several of these countries have made plans for developing their evaluation capacities in order to provide a better understanding of the innovation system,⁷ these initiatives are yet to take effect.

⁷ For example Malta has ordered a PSF study on the monitoring of the Maltese national research and innovation strategy (Interview 43).

6. Conclusions

This paper has provided new empirical insights about an under-researched phenomenon in innovation and evaluation studies, namely, the actual practice in ‘system oriented innovation policy evaluations’. It has conceptualized this term, identifying its four constitutive attributes, which have then been operationalized and measured. The findings show that only six out of the EU28 countries have developed system oriented innovation policy evaluation practices (The Netherlands, Austria, Finland, Germany, Ireland and Sweden). These countries fulfil with great intensity the four attributes that define system oriented innovation policy evaluation. That is, a wide coverage of evaluations, analyses of systemic interactions between policy performance and socio-economic performance, a high level of regularity of those evaluations, and broad and varied basis of expertise. In the second group of countries their evaluation practices are less well developed. Eight out of 28 countries are found in this group: Denmark, France, Belgium, Poland, the UK, Estonia, Lithuania and Slovenia. While the countries in this second quartile are still relatively strong in instrument evaluations, the policy-mix evaluations and socio-economic performance assessments are less prominent. Also, the overall frequency of evaluations is visibly smaller. For this reason, they cannot be considered system oriented innovation policy evaluation.

The third quartile of countries consists of Latvia, Spain, Hungary, Czech Republic, and Portugal. These are countries with an uneven regularity of evaluation activities and uneven variation of the expertise. Their coverage is rather limited, and so is their systemic perspective. But these countries have made clear attempts to engage with the available expertise and tap into the available knowledge, typically from international expertise, and to comply with conditions slightly above the minimum required by external funders. These are countries which have taken the first steps towards creating some basic structures of what could in the future become a system oriented approach. Last, we find a relatively large group of countries in the European Union (9 out of 28) without any real evaluation, let alone what could be a system oriented innovation policy evaluation: Bulgaria, Croatia, Luxemburg, Romania, Italy, Slovakia, Cyprus, Greece and Malta. Our conceptual boundary is very clearly defined here, as these countries have none or extremely few of the attributes of coverage, perspective, temporality, and expertise. From our data we could not find any reasonable evidence of evaluation activities being conducted in a systemic manner. However, it is worth mentioning that some countries in this group are planning to do so in the future.

Given the current fundamental debates about the future of innovation policy in the context of innovation systems, it is somehow surprising to see that only few countries in the EU28 have truly developed a system oriented evaluation. The limited systemic approach in evaluation means that most policy makers

in Europe lack a very important source for policy learning, namely, the source that is based on a careful assessment of their own innovation system and policies' performance.

Our findings point as well to a series of highly relevant research questions for future analysis. The most obvious empirical questions have to do with how and how far system oriented innovation policy evaluations are being used: are they transformative in the sense of inducing relevant learning processes in policymaking? In what way is the evidence produced by the system oriented innovation policy evaluations used as a source for policy learning? Who are the policy learners in that process, and what are they actually learning? While some recent anecdotal evidence exists at regional and EU level (Aranguren et al., 2017) (Borrás and Højlund, 2015), further cross-national comparison is highly needed.

Moreover, there are also a series of questions which are more normative in nature, and which have to do with how countries could build up their capacity in terms of systemic evaluation approach. The questions here could be more focused on identifying the mechanisms and incentives that could make countries take that step, and the methodologies most suitable for their specific nature of innovation system and policies. We would need to start by acknowledging that there is no possible "one size fits all" model for innovation systems and policies; and that a systemic evaluation approach requires important knowledge and organisational capacities in each country. Hence, the critical question would be to identify suitable ways of building such systemic evaluation capacity at the national level.

New opportunities might emerge as well in the context of other sources of policy learning. Traditional sources of policy learning in innovation policy, such as evaluation, technology foresight and technology assessment could be combined with new sources of policy learning like experimental policy labs, ex-ante impact assessment, networks of policy-makers, or electronic forms of direct citizen engagement. Bringing these different sources together might create a solid and encompassing basis for policy learning. Therefore another set of crucial questions that remain unanswered is: to what extent are EU28 countries building capacities in these diverse sources of policy learning, and how could they best build that.

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Annex 1. List of interviewees

1	Austria	Senior manager	Austrian Ministry for Transport, Innovation and Technology	29.04.16
2	Austria	Senior manager	Joanneum Research	04.11.16
3	Austria	Senior policy expert	Austrian Institute of Technology	24.03.17
4	Belgium	Senior manager	Scientific and Technical Information Service	01.06.16
5	Belgium	Senior policy expert	Directorate of Economic Policy, Wallonia	16.11.16
6	Belgium	Associate professor	KU Leuven	14.06.17
7	Bulgaria	Senior manager	Ministry of Economy	01.06.16
8	Bulgaria	Independent innovation policy expert		19.05.17
9	Croatia	Senior manager	Ministry of Science, Education and Sports	06.05.16
10	Croatia	Senior manager	Ministry of Economy, Entrepreneurship and Crafts	27.01.17
11	Cyprus	Senior manager	Research Promotion Foundation	23.05.16
12	Cyprus	Senior manager	Ministry of Energy, Commerce, Industry and Tourism	22.11.16
13	Czech Republic	Senior manager	Prime Minister's Office	07.11.16 (written)
14	Czech Republic	Senior manager	Ministry of Economy and Trade	02.12.16 (written)
15	Denmark	Senior policy expert	Danish Agency for Science, Technology and Innovation	27.05.16

16	Denmark	Senior manager	Danish Agency for Science, Technology and Innovation	18.01.17
17	Estonia	Senior manager	Ministry of Economic Affairs and Communications	27.01.16
18	Estonia	Senior manager	Enterprise Estonia	30.12.16
19	Finland	Senior manager	Ministry of Employment and the Economy	20.01.16
20	Finland	Senior manager	TEKES	15.11.16
21	France	Senior manager	Ministry for Economy, Industry and Digital Affairs	09.12.15
22	France	Senior policy expert	France Strategie	17.11.16
23	France	Professor	Université de Paris-Est	15.03.17
24	Germany	Senior manager	Federal Ministry for Science and Technology	28.01.16
25	Germany	Senior manager	Max Planck Institute for Innovation and Competition, Munich	16.05.16
26	Greece	Senior manager	Ministry of Education, Research and Religious Affairs	04.05.16
27	Greece	Senior policy expert	Ministry of Economy	26.10.16 (written)
28	Greece	Professor	University of Athens	20.03.17
29	Hungary	Senior manager	National Research, Development and Innovation Office	23.05.16
30	Hungary	Senior manager	Prime Minister's Office	27.03.17
31	Ireland	Senior manager	Department of Jobs, Enterprise and Innovation	15.06.16
32	Ireland	Senior policy expert	Department of Jobs, Enterprise and Innovation	21.06.16
33	Italy	Policy officer	Ministry of Economic Development	24.10.26

34	Italy	Senior official	Agency for Cohesion Policy	07.04.17 (written)
35	Italy	Professor	Università degli Studi di Urbino	31.03.17
36	Latvia	Senior manager	Ministry of Economics of the Republic of Latvia	28.01.16
37	Latvia	Senior manager	Ministry of Education and Science	20.02.17
38	Latvia	Director	Ministry of Education and Science of Latvia	23.02.17
39	Lithuania	Senior manager	Ministry of Economics of the Republic of Lithuania	17.03.16
40	Lithuania	Senior manager	Research and Higher Education Monitoring and Analysis Centre (MOSTA)	12.01.17
41	Luxembourg	Senior manager	Ministry of Higher Education and Research	02.06.16
42	Luxembourg	Independent expert		24.05.17
43	Malta	Senior policy expert	Malta Council for Science and Technology	29.04.16
44	Malta	Senior manager	Malta Enterprise	15.02.17
45	The Netherlands	Senior manager	Ministry of Economic Affairs	26.01.16
46	The Netherlands	Senior strategist	the Netherlands Organisation for applied scientific research (TNO)	10.11.16
47	Poland	Senior manager	Ministry of Economic Development	19.05.16
48	Poland	Senior manager	Polish Agency for Enterprise Development (PARP)	08.11.16
49	Portugal	Senior manager	National Innovation Agency	20.05.16
50	Portugal	Senior policy expert	Ministry of Economy	17.01.17
51	Romania	Senior counsellor	National Authority for Scientific Research and	02.06.16

			Innovation	
52	Romania	Senior counsellor	National Authority for Scientific Research and Innovation	21.02.17 (written)
53	Slovakia	Senior manager	Ministry of Economy	30.05.16
54	Slovakia	Senior policy expert	Slovak Innovation and Energy Agency	24.11.16 (written)
55	Slovenia	Professor	University of Ljubljana	21.06.16
56	Slovenia	Senior manager	Ministry of Economy	01.07.16
57	Spain	Senior manager	Ministry of Economy and Competitiveness	02.06.16
58	Spain	Senior policy expert	Centre for Industrial Technological Development (CDTI)	10.11.16
59	Spain	Professor	Universidad Autónoma de Madrid	26.06.17
60	Sweden	Senior manager	Ministry of Enterprise and Innovation	14.01.16
61	Sweden	Senior manager	VINNOVA	29.11.16
62	United Kingdom	Senior manager	Department for Business, Innovation & Skills	25.05.16
63	United Kingdom	Senior manager	Innovate UK	18.11.16

Article 2 - Policy learning in the EU: The informal networks of innovation policy directors

Policy learning in the EU: The informal networks of innovation policy directors

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Abstract

This article explores the informal networks between the policy makers of the European Union member states – which countries are connected to which and what this tells us about policy learning. Previous literature in policy learning has only lightly touched on the role of networks as a source of learning and how the network structures hold different properties for learning. I use data from interviews with the senior innovation policy managers of the 28 EU countries to map the structures of their informal networks. I find a centre-periphery pattern based on asymmetric ties and a cluster structure based on symmetric ties. With regard to the different properties of the two kinds of tie, I find that the network structures provide favourable conditions for the exchange of unsophisticated knowledge across the EU, but the exchange of sophisticated knowledge is largely limited to specific clusters.

Keywords: policy learning, innovation policy, informal networks, social network analysis

1 Introduction

Previous research has shown that knowledge flows first via people. A well-known study by Tom Allen (1977) carried out in the 1970s at MIT showed that other people – as opposed to impersonal sources – were the primary source of knowledge for the surveyed scientists and engineers. In this article, I look at the sources of policy learning and focus on one in particular – the informal networks between policy makers. I do this in the context of the EU, where a significant effort has been made over time to create stronger ties between member states. This is especially evident in the case of innovation policy where several network-building and knowledge-sharing initiatives have been carried out in past decades or are still ongoing.

Policy learning can be defined as alteration or change in the thinking or beliefs of actors in the policy setting, based on experience, information or knowledge and concerned with policy objectives (Bennett and Howlett, 1992; Dunlop and Radaelli, 2013; Heclo, 1974; Sabatier and Jenkins-Smith, 1999). It emerged among several other learning approaches as an alternative to the power-based explanations of policy change, emphasising the importance of knowledge use in the policy process (Grin and Loeber, 2007). The knowledge that is used for learning can be collected from different sources, ranging from ‘formal and sophisticated’ methods to the more spontaneous ‘social interactions and disruptions’ (Moyson, Scholten and Weible, 2017). The former includes methods such as evaluations (Borrás and Højlund, 2015), regulatory impact assessment (Radaelli, 2009) and foresight activities (Havas, Schartinger and Weber, 2010). The latter mostly emphasises the role of networks (Howlett, Mukherjee and Koppenjan, 2017), which can be either formal (Hobolth and Sindbjerg Martinsen, 2013) or informal (Berardo, 2009), and disruptive events such as crises (Kamkhaji and Radaelli, 2017).

The EU context provides an important setting for studying policy learning, given the significant efforts to encourage knowledge sharing and learning among member states. It has even been described as a ‘massive transfer platform’ where knowledge and information about policies are disseminated among member states (Benson and Jordan, 2011; Radaelli, 2000). Despite this important role, Zito and Schout (2009, p.1116) noted, in a special issue on learning and governance in the *Journal of European Public Policy*, that there is a ‘mismatch between the extent to which learning instruments are now applied in the EU and our understanding of learning in complex multi-level systems’. While studies of policy learning in the EU have, over the years, looked at policy convergence (Busch and Jörgens, 2005; Knill, 2005) and specific tools for learning (Borrás and Jacobsson, 2004; Casey and Gold, 2005; Kaiser and Prange, 2004; Kerber and Eckardt, 2007), only a few have looked explicitly at the role of networks. Recent examples of these include studies on administrative networks in the EU (Mastenbroek and Sindbjerg Martinsen, 2018), transgovernmental networks (Hobolth and Sindbjerg Martinsen, 2013) and policy networks among selected member states (Kriesi, Adam and Jochum, 2006).

However, the current work on networks in the EU context has left two important aspects unattended – what the role of network structures is for learning and what the empirical patterns of informal networks are in the EU. The structures matter because the way the actors are connected to each other is deemed to be a crucial factor for spreading knowledge among different levels of an organisation (Witting and Moyson, 2015) as well as between organisations and jurisdictions (Lee, Lee and Feiock, 2012). Considering informal networks (as opposed to the formal ones mentioned above) is necessary because it provides insight into the interactions that are not directly visible for the casual observer but that, owing to their constitutive nature, can be important determinants of organisational success (Berardo, 2009; Krackhardt and Hanson, 1993).

This article therefore focuses on the question: what are the patterns of informal networks between policy makers as a source of policy learning? More specifically, I look at two aspects: how are the informal networks between policy makers structured and what do these network structures imply for policy learning?

To answer these questions, I study the case of innovation policy. Given its central role on the EU competitiveness agenda (European Commission, 2010; European Council, 2000), this field has seen a high level of attention from national and EU policy makers alike (Borrás, 2003; Edler and Fagerberg, 2017). This has been accompanied by a steady development of knowledge-sharing mechanisms aimed at fostering ties between member states, from the Open Method of Coordination (Borrás, 2011; Kerber and Eckardt, 2007) to the current Policy Support Facility.⁸

I use data gathered from interviews with the senior innovation policy managers of the 28 European Union member states and map their informal networks with their colleagues. I identify the ties between countries, rank the most central among them and visualise the clusters. Borrowing from the field of organisational learning, I analyse what the properties of different types of tie (Friedkin, 1982; Granovetter, 1973, 1983) and network structure (Reagans and McEvily, 2003) imply for learning in these informal networks.

The article makes a two-fold contribution to the field. On one hand, it renews emphasis on sources in the discussions on policy learning, focusing in particular on network structures between countries and using concepts from organisational learning to interpret these structures. On the other hand, it provides unique and original insight into the empirical structures of the informal networks among member state policy makers. Combining these conceptual and empirical contributions, this article provides an original and novel insight into policy learning in the EU.

I proceed as follows: first, I give an overview of the literature on networks as a source of policy learning and previous empirical evidence of it; second, I define the main concepts used in the analysis; third, I give an overview of the data and methodology; fourth, I provide a descriptive overview of the data and perform a network analysis; and, finally, I discuss the findings in relation to the research question.

2 Literature review

Policy learning emphasises the role of knowledge in the process of policy change. As such, it emerged as distinctive from the power-based explanations that dominated studies on policy processes until the 1970s (Grin and Loeber, 2007). Over the years, several approaches formed that contribute to these studies. In a

⁸ <https://rio.jrc.ec.europa.eu/en/policy-support-facility>.

recent review of the literature, Moyson et al. (2017) distinguish between three levels of approach: micro, meso and macro. The micro-level approach focuses on the individual and includes the schools of social learning (Hall, 1993), epistemic communities (Haas, 1992) and advocacy coalitions (Sabatier, 1987). The meso-level is primarily concerned with organisational learning (Argyris and Schön, 1978). The macro-level looks at learning on the system level, ‘often across government units’ (Moyson et al., 2017, p.163), and comprises lesson drawing (Rose, 1991), policy transfer (Dolowitz and Marsh, 1996) and diffusion (Braun and Gilardi, 2006). While quite different in the way that they see learning and its role in the policy process, Dunlop and Radaelli (2013, p.600) suggest that this diversity can be contained under a consensus that learning is the ‘updating of beliefs at its most general level’.

Traditionally, policy-learning literature has been concerned with questions of who learns, what they learn and the effect of learning (Bennett and Howlett, 1992). However, this does not touch on a critical issue – what is the source of learning, that is, where does the knowledge that learning is based on come from? Recent reviews have provided some cues on it; for example, Moyson et al. (2017), borrowing from Dunlop and Radaelli (2013), suggest that this depends on the level of control that learners have over the objectives and content of learning. In cases where learners are in control of the content of learning, formal and sophisticated approaches are used. Where learners have less control over the content, the learning is likely to rely on less-formal tools, such as ‘social interactions and disruptions’ (Moyson et al., 2017, p.167). The former can include different analytical methods (May, 1992), such as evaluations (Sanderson, 2002) and impact assessment (Radaelli, 2009). The latter can be on networks (Busenberg, 2001) or unforeseen events (Kamkhaji and Radaelli, 2017). While there has been quite some research on formal, analytical methods as a source of learning (Borrás and Højlund, 2015; May, 1992; Sanderson, 2002; Schneider and Ingram, 1990), the role of networks seems to have been given a somewhat less prominent role in the discussions on policy learning.

Looking into policy learning approaches, we can see that networks figure either explicitly or implicitly in several of these strands. According to Zito and Schout (2009, p.1107), the ‘idea of networks [...] carrying and inserting ideas is an extremely critical dimension to the learning process’. As such, they argue, the notion of networks has been more or less explicitly acknowledged by most of the theoretical strands of learning (Zito and Schout, 2009). This is particularly evident for the concepts of epistemic communities (Haas, 1992) and advocacy coalitions (Sabatier, 1987), both of which see learning as a result of specific interactions. Furthermore, networks are implicitly present in the schools of transfer (Dolowitz and Marsh, 1996; Stone, 2004), diffusion (Marsh and Sharman, 2009) and lesson drawing (Rose, 1991), all of which study ‘the process by which knowledge about policies [...] in one political system (past or present) is used in the development of policies [...] in another political system’ (Dolowitz and Marsh, 2000, p.5). This knowledge about policies is often accessed through networks (Rogers,

2003), either directly from ‘established innovators’ from abroad (Benson and Jordan, 2011) or through intermediary ‘transfer agents’ (Dolowitz and Marsh, 2000).

Recent examples of empirical studies on learning in the EU context focus mainly on issues of transfer and diffusion. These include the role of the EU as a transfer agent (Radaelli, 2000; Stone, 2004; Zito, 2009), other transfer agents active within the EU (Bomberg, 2007; De Jong and Edelenbos, 2007) and the institutional factors shaping the process of transfer (Bulmer and Padgett, 2005; Padgett, 2003). In addition, there have been a few recent studies on formal networks in the European public policy sphere that have not directly connected to the learning theories (Boswell, 2008; Hobolth and Sindbjerg Martinsen, 2013; Mastenbroek and Sindbjerg Martinsen, 2018). While all of these studies treat networks either implicitly or explicitly, none of them considers the role of network structures in the process of learning, focusing instead on other determinants. This largely echoes the early verdict by Dolowitz and Marsh (1996) that the transfer studies tend to focus primarily on content and other issues, while neglecting the underlying structures shaping the transfer process.

The issue of network structures is therefore important to consider. We also know from the organisational learning literature that networks hold different properties for learning according to how they are structured (Granovetter, 1973, 1983; Krackhardt, 1993). In the field of policy learning, we can see a few hints of the kinds of structure we could expect networks to take. For example, Radaelli (2000) and Benson and Jordan (2011) both suggest that dominant countries with stronger policy performance are likely to be more central in the learning networks. However, these assumptions have not been conceptualised to the extent that we can know more precisely what particular structures may mean for policy learning. In addition, we can see that recent examples of empirical studies focus mainly on formal networks. However, from the organisational learning literature, we know that the formal structures rarely provide a picture of the real interactions within or between organisations (Krackhardt and Hanson, 1993). These two issues combined – lack of information on the network structures in general and on informal networks in particular – leave us without a potentially valuable perspective for understanding the role of networks as a source of learning.

What are the key lessons from the current literature? To start with, we see that the literature acknowledges the importance of networks as one of the sources for acquiring the knowledge necessary for learning. However, we notice a lack of conceptual discussion on the role of network structures – we do not know much about their influence on learning. In addition, there is a lack of empirical knowledge on the structures that cross-country interactions take in the EU. Finally, the previous empirical work has mainly focused on formal networks, but we lack information on the informal networks. In order to address these challenges, I now conceptualise what different network structures imply for learning in order to allow for a subsequent empirical analysis of the informal networks.

3 Conceptual framework and operationalisation

In this section, I give an overview of the main concepts used in this study and their operationalisation. I discuss the different types of tie and network structure, as well as the properties they carry for learning.

The focus of this study is informal networks between EU member states. Guided by the concept of ‘advice networks’ (Krackhardt and Hanson, 1993) in organisational learning studies, I define informal networks as ‘networks of prominent policy makers in a policy field to whom other policy makers turn for policy-related information’. With this definition, I delimit the actors in the informal network to policy makers and its focus to information sharing on policies.

In order to map and analyse the informal networks, I use the conceptual tools from network analysis. The basic units of network analysis are nodes that are connected by ties (Wassermann and Faust, 1994). In the current analysis, the nodes are EU member states and the ties between them represent exchange of policy-related information. On the aggregate level, this provides us with an overall view of the informal networks in the given policy area. These general structures allow us to address the main question of the research project and discuss the role of informal networks between policy makers as a source of policy learning.

In the analysis of social networks, it is important to consider that both the individual ties between nodes and the resulting network structures can carry different properties. I discuss these properties in the following two subsections.

3.1 Properties of ties

In social network analysis, the relationships between countries can be characterised in different ways. We can look at whether a tie exists, what the direction of a tie is, whether the tie is mutual/symmetrical or unidirectional/asymmetric and what the relative strength of it is (Scott, 2017).

Often, discussion on the properties of ties revolves around the distinction between ‘strong’ and ‘weak’ ties (Granovetter, 1973; Krackhardt, Nohria and Eccles, 2003). For example, Hansen (1999) has argued that strong ties promote the transfer of complex knowledge and weak ties simple knowledge. Strong ties are said to be more likely to facilitate the transfer of complex, uncodified knowledge, because of the increased transaction costs in terms of time and effort (Reagans and McEvily, 2003). At the same time, weak ties carry ‘strengths’ of their own. Granovetter (1973) has argued that while strong ties tend to bind similar actors in an organisation into clusters, weak ties act as ‘bridges’ between the different clusters. Thus, they are particularly important for innovation, allowing for new ideas to transfer from one group to another.

Equally important to discussions on the properties of strong and weak ties is what constitutes a strong or a weak tie. Some have made the distinction according to the frequency of interactions between the nodes (Scott, 2017). Others have considered a mutually confirmed tie between two nodes a strong tie and a tie stated by only one node a weak tie (Friedkin, 1980). Given the binary nature of the data, I use the latter approach, considering a symmetric tie equivalent to a strong tie and an asymmetric tie to a weak tie.

3.2 *Properties of network structures*

Similarly to how individual ties can be analysed in different ways, network structures can be analysed through different measures. Examples of the structural features of networks include density, centrality, betweenness and range (Scott, 2017), each revealing a different part of the structural properties of a network.

It has been argued that the density of ties inside a cluster is particularly relevant for determining the learning potential inside a network (Reagans and McEvily, 2003). Often conceptualised as ‘cohesion’ in the organisational learning literature, it has been defined as ‘the extent to which network connections span institutional, organisational, or social boundaries’ (Reagans and McEvily, 2003, p.245). Cohesion is manifested in the relative density of ties within a cluster, showing the extent to which different members of the cluster are connected to each other. Owing to reputational concerns (Coleman, 1990) and reinforced cooperative norms (Granovetter, 1992), the overall density in a network (or part of it) is likely to increase knowledge sharing between individual actors.

In sum, conditions for learning are determined by both the types of tie between individual actors and the overall structures these ties form (Table 1). Symmetric ties are more likely to act as a channel for sophisticated, uncodified knowledge and asymmetric ties provide for the transfer of codified, unsophisticated knowledge. The structural features of networks can either reduce or amplify the properties of individual connections, often depending on the level of cohesion inside the network. Therefore, in order to discuss the role of networks as a source of policy learning, I look at both symmetric and asymmetric ties and consider their structural features.

Table 1 Properties of the main concepts

Concept	Definition	Properties
Symmetric tie	A tie confirmed by both nodes	Promotes the transfer of sophisticated knowledge

Asymmetric tie	A tie reported by one node	Promotes the transfer of simple knowledge
Network cohesion	The extent to which a connection is surrounded by other connections	Increases transfer of knowledge between individuals

4 Data and methods

To analyse the learning patterns in Europe, I gathered data on the informal network structures of the senior innovation policy makers from all EU member states. I targeted the heads of innovation policy (or equivalent), assuming that they would have the broadest and most strategic perception of cross-border contacts regarding innovation policy making. In a few cases where the head of innovation policy was unreachable, I turned to either the head of international cooperation or a senior innovation policy expert to provide a generalisable overview of the learning patterns in the policy area. Altogether, in 22 member states, I reached the head of innovation policy, in three cases the head of innovation policy analysis, in two cases a senior policy expert and in one case the head of international cooperation (Appendix 1). I conducted all of the interviews with officials in the national ministry responsible for innovation policy. In countries where innovation policy competence is divided between ministries (often between the ministry responsible for research and the ministry for economic affairs), I interviewed both respective directors and merged the answers (a country mentioned by either of the interviewees received a positive score).

I asked each interviewee whom they would consider the most important external partners in developing and evaluating innovation policy. More specifically, I provided the interviewees with a list of EU member states and asked them to mark how often they exchange views on innovation policy with other EU countries, using a four-point scale: ‘often’, ‘sometimes’, ‘rarely’, ‘never’ (see Appendix 2 for the questionnaire). Given the subjective nature of this classification, I reduced the four classes to a binary system – countries mentioned as ‘often’ or ‘sometimes’ scored 1 and countries mentioned as ‘rarely’ or ‘never’ scored 0. While giving up some of the nuance, we nevertheless received a more robust overview of the communication patterns. Overall, we can assume that a score of 1 indicates a solid connection and a score of 0 a relatively weak or inexistent connection.

For data analysis, I used the statistical computing and graphics software ‘R’, more specifically its packages ‘ggplot2’ and ‘igraph’.

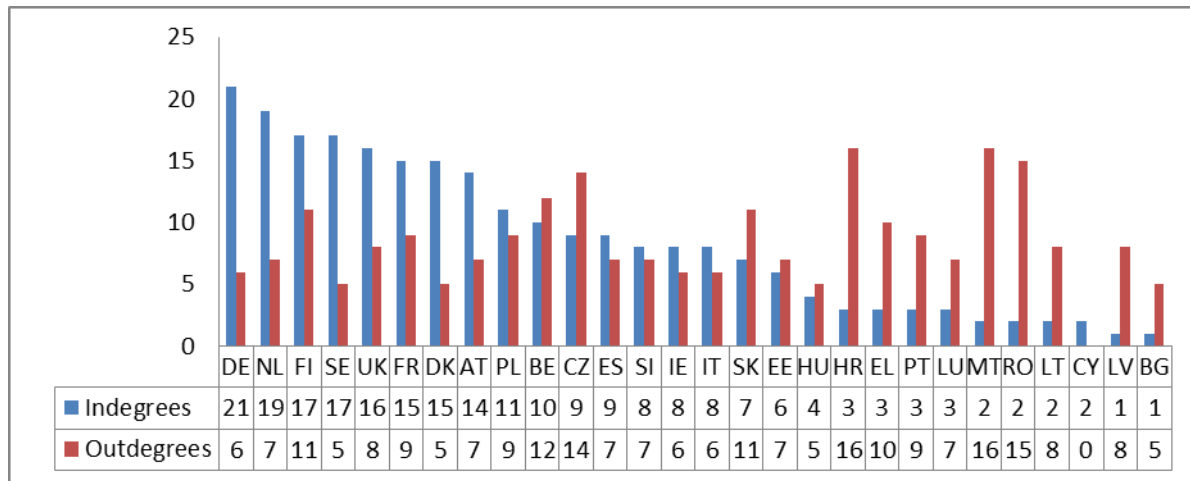
5 Analysis

In this section, I present the main findings of the analysis. I start with an overview of the basic network measures then proceed to mapping the network structures.

Looking at the overall counts of ties, we can see significant differences among member states regarding both asymmetric and symmetric ties. Starting with asymmetric ties, we first need to distinguish between indegrees and outdegrees. In network analysis terminology, an outdegree is a connection the node directs to others, that is, a country mentioning another country, while an indegree is a connection to the node, which, in the current context, means a country being mentioned by another country. For example, if Sweden mentions Spain, this means an outdegree for Sweden and an indegree for Spain. Thus, the number of outdegrees shows the extent to which a country reaches out to other countries and the number of indegrees demonstrates how sought after that country is by others. It also important to consider that both outdegrees and indegrees are the different sides of the same coin – an outdegree for one country is an indegree for another country. Therefore, the total number of both degrees remains exactly the same.

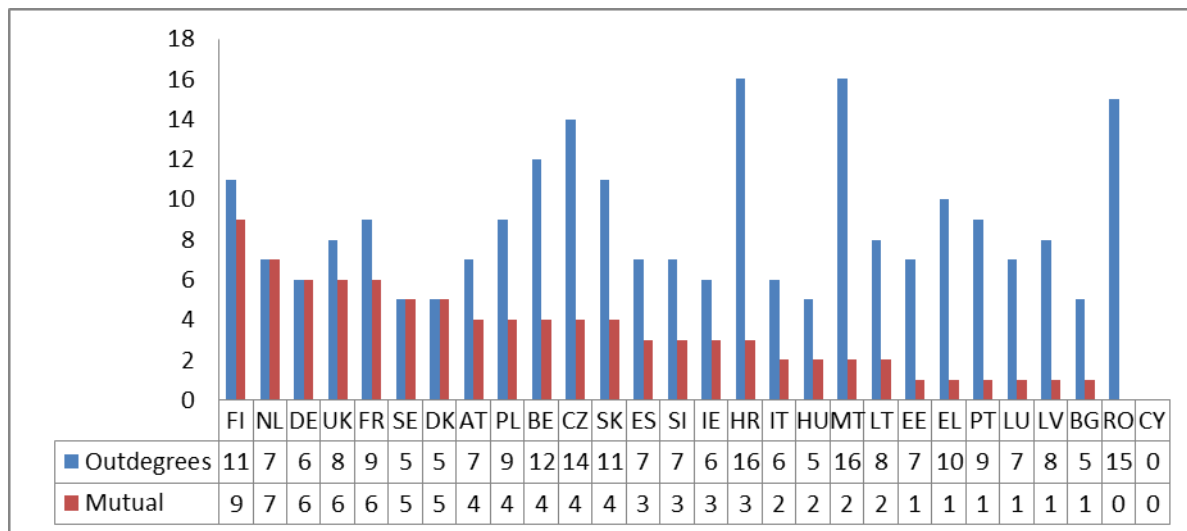
The data presented in Figure 1 provide evidence of large differences between the countries regarding the extent to which they are used as sources by others and the extent to which they see others as a source of learning. Looking at the indegrees, we can see that a few countries stand out from others as considerably sought-after. These countries are mainly the high innovation performers that occupy the top ranks of innovation scoreboards such as the European Innovation Scoreboard (European Commission, 2018). For example, Germany is the country most often turned to (mentioned 21 times), but has itself mentioned only six countries it interacts with. At the same time, the outdegrees show that a large number of countries reach out to other countries considerably more than they are contacted. Perhaps unsurprisingly, these countries are mainly among the smaller member states with relatively weaker innovation performance. As an example, Malta and Croatia both claim to reach out to the highest number of countries – 16; at the same time, they have themselves been mentioned only two and three times, respectively.

Figure 1 Count of asymmetric ties by indegrees and outdegrees



Considering the symmetric ties (Figure 2), we see that the same group of countries that proved to be more ‘attractive’ in terms of indegrees also has more symmetric ties. This makes sense from a mathematical point of view, since having more indegrees raises the probability of a match with the outdegrees. Even more interestingly, for the group of high innovation performers, the number of symmetric ties is either equal or close to the number of outdegrees. In other words, the countries that they pointed out mentioned them as well, hinting at a reciprocal relationship. These countries are, for example, Germany, the Netherlands, Sweden and Denmark, all of whom have an equal number of outdegrees and symmetric ties.

Figure 2 Count of asymmetric ties (outdegrees) and symmetric ties



Looking at the general network measurements (Table 2), we can see that the average number of connections is significantly higher in the case of asymmetric connections than for symmetric

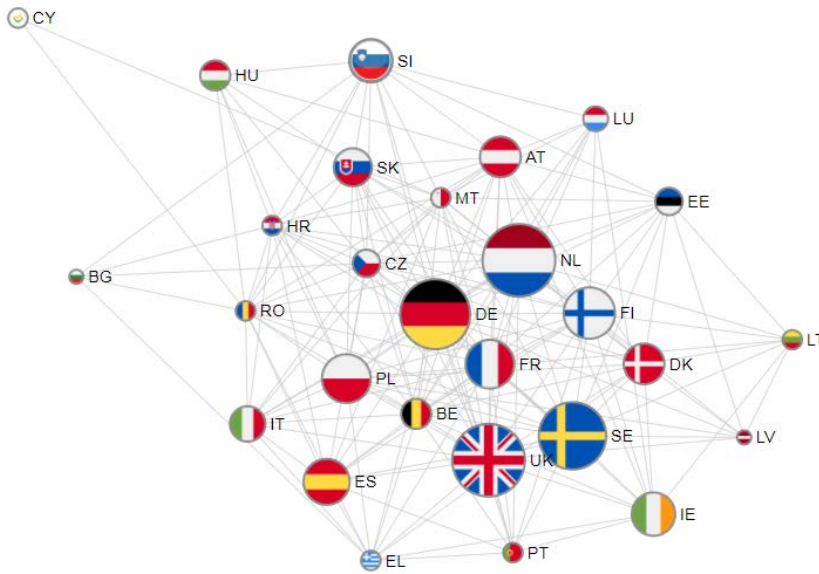
connections. This hints at a wide discrepancy between how policy makers see their network and how their peers see it. This is also reflected in the average path length – a measure of how many points would need to be passed to reach a destination (Scott, 2017). We see that these connections are much shorter for the network based on asymmetric ties than for symmetric connections, suggesting that the graph based on asymmetric ties is much more ‘tightly knit’ than the graph of symmetric ties. The density measure shows the extent to which all the potential ties are actually present. We can see that its value is roughly similar for both the asymmetric as well as the symmetric ties, demonstrating a relatively similar intensity of interaction in network graphs based on both types of tie.

Table 2 Overview of the main network measures

Measure	Value based on asymmetric ties	Value based on symmetric ties
Average path length	2.18	3.38
Average number of connections	8.42	3.21
Density	0.15	0.12

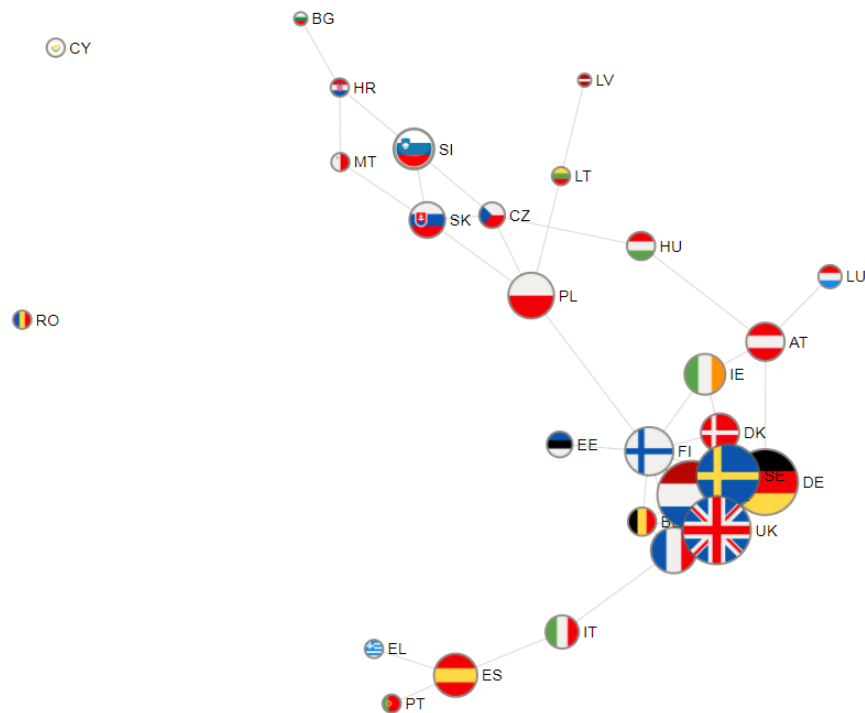
This descriptive overview of the data provides us with a rough idea of the extent to which countries in the EU use others as sources of learning or are used as sources. However, to know more precisely who is connected to whom, we need to map the network structures. Starting with the graph of asymmetric ties (Figure 3), we can see a centre-periphery pattern, with core actors in the middle and others surrounding them. The central cluster consists of countries with a large number of asymmetric ties. These include Belgium, France, Germany, the Netherlands, Sweden, Denmark, Finland and the United Kingdom. Orbiting the central cluster is the rest of the member states, spread out around the core relatively evenly. Given that this pattern is based on the centrality measures, it largely reflects the ‘popularity’ of the countries, placing the countries with the largest number of asymmetric ties pointed at them (as well as the countries tightly connected to them) in the middle. For a more nuanced picture, however, we would also have to consider the symmetric ties between countries.

Figure 3 Asymmetric ties between policy makers (weighted by the number of indegrees)



Graphing the mutual connections between countries – the symmetric ties – we can see a clearly clustered constellation (see Figure 4). First, we see a strong and tightly knit cluster of the ‘northern’ member states: Belgium, France, Germany, the Netherlands, Sweden, Denmark, Finland and the United Kingdom. Austria and Ireland are also connected to this group, but with a smaller number of ties. We can visually distinguish two more clusters of countries with closer ties between them. There is a smaller group of ‘southern’ member states – Italy, Spain, Portugal and Greece – with Spain in the middle. We can also see a larger group of ‘central-eastern’ member states comprising Poland, Czech Republic, Slovenia, Slovakia, Croatia and also Malta. All of them have symmetric ties with at least two other countries in the cluster. While there are a few countries with only one mutual connection, Cyprus and Romania stand apart from the rest, as our data did not reveal any symmetric ties in their case.

Figure 4 Symmetric ties between policy makers (weighted by the number of indegrees)



Having mapped the network structures, we can see a clear hierarchy between countries as expressed by the centre-periphery pattern emerging from the asymmetric ties. Looking at the symmetric ties, there is a more nuanced and distinctive cluster-structure with three distinct groups of countries – the ‘northern’, ‘central-eastern’ and ‘southern’ clusters. Furthermore, adding the layer of asymmetric ties to the structure of symmetric ties shows dense connections between the central cluster and the two peripheral ones, while connections between the peripheral groups are somewhat weaker. Having demonstrated the overall structure of the informal networks between policy makers, in the next section, I turn to the central issue of this article – how do these patterns act as a precondition for learning between countries?

6 Discussion

In this section, I focus on this article’s research question – what are the patterns of informal networks between policy makers as a source of policy learning? I start by discussing the extent to which informal networks are used as a source of learning and the structures these networks take. I then elaborate on the implications that particular network structures may have for policy learning.

From the data analysis, we can see that countries have very uneven practices regarding the extent to which they use informal networks as a source of learning. On the one hand, looking at asymmetric ties, we see that countries with relatively weaker innovation performance tend to reach out extensively to other countries, mostly to better performers. These good performers themselves tend to reach out to their

peers relatively less and mostly to other good performers. From the organisational learning literature, we learned that asymmetrical ties are best for transferring unsophisticated, codified knowledge. As the transaction costs for exchanging this kind of knowledge are relatively low (Reagans and McEvily, 2003), the asymmetric ties between actors can often be plentiful. We can see this in the relatively high overall number of asymmetric ties between countries as well as in their concentration towards a core of good performers. Therefore, we can say that there is generally good access to unsophisticated knowledge from other countries and that relatively weaker performers tend to be most keen to make use of that as a source of policy learning.

On the other hand, good performers are much better connected to each other through symmetric ties. This is well illustrated by the graph based on symmetric ties (Figure 4), where we see the countries in the 'northern' cluster tightly connected to each other. Studies on organisational learning show that symmetric ties are necessary for the transfer of sophisticated, codified knowledge. The costs associated with this kind of transfer are also much higher than for unsophisticated knowledge through asymmetric ties, making it harder to create and maintain this kind of tie. This is also evident in the current mapping, where symmetric ties are much less numerous than asymmetric ties and form a three-cluster pattern. Among the three clusters of countries, the 'northern' cluster is relatively tightly connected, but the countries in the other two clusters are much more loosely connected to each other and to the other clusters, limiting their access to sophisticated knowledge. This can have consequences for eventual policy learning, with a small number of countries having good access to sophisticated knowledge from other countries and a larger number of countries having only limited access to sophisticated knowledge.

The structures that the informal networks among policy makers take further emphasise these points. The asymmetric ties form a core-periphery pattern, meaning that unsophisticated knowledge is sought from a small number of core countries. The existence of these ties also means that these countries are accessible for providing this knowledge. The symmetric ties form a three-fold cluster structure, suggesting that the exchange of sophisticated knowledge is relatively constrained to particular groups of countries. We can see that there are three small and roughly geographically-bound groups that exchange knowledge with each other – the 'northern', 'southern' and 'central-eastern' clusters. These clusters have only a small number of ties between each other, meaning that the exchange of sophisticated knowledge is quite constrained between different groups of countries. Furthermore, the concept of network cohesion (Reagans and McEvily, 2003) tells us that the level of connectedness within a cluster determines the extent to which individual countries are likely to engage in knowledge transfer. The network analysis shows that cohesion is highest in the 'northern' cluster, lower in the 'central-eastern' cluster and very low in the 'southern' cluster. This provides further evidence of the unevenness in the use of informal networks as a source of learning as the 'northern' cluster provides better structural conditions for

learning than the other two clusters. In addition, the clusters are only weakly connected to each other, meaning that most of the exchange of sophisticated knowledge is constrained to particular clusters and does not travel easily across Europe.

In sum, we see a large degree of unevenness between countries with regard to the extent to which informal networks are used as a source of learning and the implications that these network structures eventually have for policy learning. First, we see that a large number of countries are reaching out to a small number of good innovation performers through asymmetric ties. Second, these good innovation performers are themselves mostly in connection with other good performers, resulting in a relatively larger number of symmetric ties among them. Given the different properties of the asymmetric and symmetric ties, these observations point at two consequences with regard to learning. On the one hand, there is good access for all member states to unsophisticated knowledge. On the other hand, a small number of countries has relatively better access to sophisticated knowledge and a large number of countries has only limited access to sophisticated knowledge. The latter is further emphasised by the network structures that show a high cohesion in the ‘northern’ cluster and lower cohesion in the other two clusters, providing better conditions for knowledge exchange in the ‘northern’ cluster than in the two others. This shows an uneven use of the sources of learning among EU member states, with exchange of unsophisticated knowledge being relatively common, but exchange of sophisticated knowledge highly divided.

7 Conclusions

This article addressed the issue of policy learning by looking at the informal networks of national policy makers in the EU. More specifically, I used interview data from all 28 EU member states to map the structures of the informal networks of innovation policy directors and discussed the findings in the context of policy learning. I found that the overall network structures favour the transfer of unsophisticated, codified knowledge, while the transfer of sophisticated, uncoded knowledge is more constrained.

Analysis of the previous literature revealed that policy learning can have several sources and that networks are acknowledged as one of them. However, I also identified two significant gaps in the current literature on policy learning in the EU context. First, while there is some discussion in the literature on the sources of learning, these accounts fall short of discussing how different network structures can influence learning. Second, despite the recent empirical work on networks in the EU, these studies do not attempt to map the actual structures that these networks take. These are relevant issues to consider, since studies in other strands of learning, notably organisational learning, have revealed the importance of network structures for learning outcomes.

I looked at two kinds of tie between countries: asymmetric, based on the reports of one country only, and symmetric, based on mutually confirmed reports from both sides. The aggregation of both types of tie revealed very different structures: a centre-periphery pattern for asymmetric ties and a cluster structure for symmetric ties. As both kinds of tie carry different properties for knowledge transfer between individual actors, they also constitute different conditions for learning among EU member states. Looking at the aggregate structures of asymmetric ties, I argued that this creates favourable conditions for the transfer of unsophisticated, codified knowledge among EU countries and that member states can reach out to each other relatively easily. This fits well with the previous knowledge in the organisational learning literature – as the transfer of codified knowledge does not demand significant resources, these ties are likely to be more abundant. The clustered pattern revealed by symmetric ties shows that exchange of uncodified knowledge between member states is likely to be less common and confined to specific clusters. This also fits the previous understanding that the higher transaction costs of uncodified knowledge set limits on the number of mutual connections a country is able to maintain. Furthermore, the differences in the internal cohesion of the clusters show that countries in the ‘northern’ cluster are relatively better positioned to exchange sophisticated knowledge among themselves than countries in the other two clusters.

In conclusion, I provided empirical evidence on the network structures of innovation policy makers in Europe and analysed the implications of these structures for policy learning. I demonstrated that the network based on asymmetric ties reveals a core-periphery pattern, providing good conditions for the exchange of unsophisticated knowledge across Europe. The network based on symmetric ties has a cluster structure, therefore largely limiting the transfer of sophisticated knowledge to within its boundaries. These findings have two-fold policy implications for EU policy makers. On one hand, they call for more action to reinforce the ties within clusters, to provide for better learning between similar countries. On the other hand, efforts should be made to strengthen ties between clusters and thus provide for the transfer of sophisticated knowledge beyond the small groups. These two goals could be achieved by reinforcing the mutual learning exercises of the European Commission, paying particular attention to ensuring a diverse range of participants and a broad dissemination of the results.

While the current study expanded our understanding of networks as a source of learning, it also opened new perspectives for future research. First, I showed which countries are connected through informal networks, but could not provide specific underlying reasons why certain countries are linked together. Could these linkages be based on geographical or cultural similarity or some other form of proximity? Second, I discussed how the network structures potentially condition learning, but did not analyse whether actual learning has taken place. Further research is thus necessary to provide evidence of actual policy change as a result of these networked interactions. Finally, the population of the study was limited

to the EU member states, but for a more comprehensive analysis of learning in a policy sector, a global perspective would be necessary.

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Appendix 1. List of interviewees

Nr	Country	Rank	Organisation	Date
1	Austria	Senior manager	Austrian Ministry for Transport, Innovation and Technology	29.04.16
2	Belgium	Senior manager	Scientific and Technical Information Service	01.06.16
3	Belgium	Senior policy expert	Directorate of Economic Policy, Wallonia	16.11.16
4	Bulgaria	Senior manager	Ministry of Economy	01.06.16
5	Croatia	Senior manager	Ministry of Science, Education and Sports	06.05.16
6	Croatia	Senior manager	Ministry of Economy, Entrepreneurship and Crafts	27.01.17
7	Cyprus	Senior manager	Ministry of Energy, Commerce, Industry and Tourism	22.11.16
8	Czech Republic	Senior manager	Ministry of Economy and Trade	02.12.16 (written)
9	Denmark	Senior manager (policy analysis)	Danish Agency for Science, Technology and Innovation	18.01.17
10	Estonia	Senior manager	Ministry of Economic Affairs and Communications	27.01.16
11	Finland	Senior manager	Ministry of Employment and the Economy	20.01.16
12	France	Senior manager	Ministry for Economy, Industry and Digital Affairs	09.12.15

13	France	Professor	Université de Paris-Est	15.03.17
14	Germany	Senior manager	Federal Ministry for Science and Technology	28.01.16
15	Greece	Senior manager	Ministry of Education, Research and Religious Affairs	04.05.16
16	Greece	Senior policy expert	Ministry of Economy	26.10.16 (written)
17	Hungary	Senior manager	National Research, Development and Innovation Office	23.05.16
18	Ireland	Senior manager	Department of Jobs, Enterprise and Innovation	15.06.16
19	Italy	Senior manager (international relations)	Ministry of Economic Development	24.10.26
20	Latvia	Senior manager	Ministry of Economics of the Republic of Latvia	28.01.16
21	Lithuania	Senior manager	Ministry of Economics of the Republic of Lithuania	17.03.16
22	Luxembourg	Senior manager	Ministry of Higher Education and Research	02.06.16
23	Malta	Senior policy expert	Malta Council for Science and Technology	29.04.16
24	Netherlands	Senior manager	Ministry of Economic Affairs	26.01.16
25	Poland	Senior manager	Ministry of Economic Development	19.05.16
26	Portugal	Senior policy expert	Ministry of Economy	17.01.17

27	Romania	Senior counsellor	National Authority for Scientific Research and Innovation	02.06.16
28	Slovakia	Senior manager	Ministry of Economy	30.05.16
29	Slovenia	Senior manager	Ministry of Economy	01.07.16
30	Spain	Senior manager	Ministry of Economy and Competitiveness	02.06.16
31	Sweden	Senior manager	Ministry of Enterprise and Innovation	14.01.16
32	United Kingdom	Senior manager (policy analysis)	Department for Business, Innovation & Skills	25.05.16

Appendix 2. Interview form

Policy learning networks in innovation policy

Interview guide

Name:

Date, place:

1. Who would you consider your most important external partners in developing and evaluating innovation policy?
 - a. Please mark how often you have exchanged views on innovation policy with the following countries:

	Often	Sometimes	Rarely	Never
Austria				
Belgium				
Bulgaria				
Croatia				
Rep. of Cyprus				
Czech Republic				
Denmark				
Estonia				
Finland				
France				
Germany				
Greece				
Hungary				
Ireland				
Italy				
Latvia				
Lithuania				
Luxembourg				
Malta				
Netherlands				
Poland				
Portugal				
Romania				
Slovakia				
Slovenia				
Spain				
Sweden				
UK				

Article 3 - Towards System Oriented Innovation Policy Evaluation?

Evidence from EU28 Member States

The rules of attraction: Informal networks of innovation policy makers in the EU28

Mart Laatsit, Copenhagen Business School

Abstract

The aim of this article is to analyse which proximity factors matter most for cross-country connections between policy makers and what this tells us about policy learning. Looking at the informal networks of the innovation policy directors from 28 EU member states and the resulting 756 possible pairs, I use logistic regressions to test three types of proximity: geographical, policy and cultural. I find that for both asymmetric and symmetric ties, geographical and cultural closeness is important. At the same time, for asymmetric ties a larger difference between policy performances is necessary, while for symmetric ties a similar level of performance is better. These findings provide useful knowledge on the process of policy learning, as we see countries reaching beyond their ‘natural’ peers in search of new knowledge.

Keywords: innovation policy, informal networks, proximity factors, policy learning

1 Introduction

Policy makers from EU countries meet often: they gather at committee meetings in Brussels, they are invited to the same conferences and many of them see each other at OECD fora. These meetings take place very much in the public eye and it is easy to follow who participates in these gatherings. However, what we cannot see is what happens between and beyond these meetings. Which of their international colleagues do these policy makers interact with once everyone is back at their desks? Do they talk to all of their colleagues regularly or are there some they are in contact with more often? Moreover, what do these patterns tell us about policy learning?

These are the questions that form the focus of this research. More specifically, I aim to explore what are the underlying factors that influence the informal networks of policy makers. In other words, what characteristics of a country make its policy makers more likely to be connected to their colleagues of another country – is it a shared language, similar policies or being geographically close? Furthermore, I

aim to look beyond the structures and explore to what extent these connections can be considered sources of policy learning.

In order to cast light on these issues, the study focuses on innovation policy, where considerable effort has been made over the past decades to strengthen ties between countries and foster mutual learning (Borrás and Jacobsson, 2004; Kerber and Eckardt, 2007). The international institutional framework of innovation policy also provides a considerable number of public fora for policy makers to meet and create ties. These include the EU's European Research Area and Innovation Council and the Economic Policy Group's subcommittee on innovation policy, as well the OECD Committee on Science and Technology Policy and its Working Group on Innovation and Technology Policy. Therefore, with this multitude of opportunities for networking, it is relevant to see how the informal networks compare against these formal structures.

Moreover, these developments in the world of practice have taken place in parallel with efforts in academia to reach a better understanding of how policy makers learn. An important subfield of political science where the process of learning in public policy settings is studied is called policy learning. The concept of policy learning is defined in this study as alteration or change in the thinking or beliefs of actors in the policy setting, based on experience, information or knowledge and concerned with policy objectives (Bennett and Howlett, 1992; Heclo, 1974; Sabatier and Jenkins-Smith, 1999). Since the 1990s, there has been an extensive conceptual effort to arrive at a better understanding of what the term entails and what the different expressions of it are (Bennett and Howlett, 1992; Dunlop and Radaelli, 2013; Radaelli, 1995; Sabatier, 1993). At the same time, the field is still characterised by a considerable lack of empirical work and real-world observations of policy learning (Dunlop and Radaelli, 2013). We do not really know how learning happens in the everyday life of policy making, how policy makers learn, or, most importantly, who they learn from.

In sharp contrast, in the fields of innovation studies and economic geography, the number of empirical studies on innovation-related networks has steadily increased over the past years. These networks studies have focused on the factors, apart from geographical proximity, that actually determine who is connected to whom (Boschma, 2005; Torre and Rallet, 2005). Several proximities suggested by these oft-cited papers have been empirically tested over the years, such as institutional (including the structure and functionality of national research systems), cognitive, cultural-ethnic, linguistic and social determinants (Cantner and Rake, 2014; Crescenzi, Nathan and Rodríguez-Pose, 2016; Graf and Kalthaus, 2018; Morescalchi, Pammolli, Penner, Petersen and Riccaboni, 2015). These recent accounts also cover a diverse set of cases, such as international knowledge networks in the photovoltaic industry (Graf and Kalthaus, 2018), patterns of scientific cooperation across European regions (Hoekman, Frenken and Tijssen, 2010), inventor collaboration (Crescenzi et al., 2016; De Noni, Orsi and Belussi, 2018;

Morescalchi et al., 2015) and international research networks in pharmaceuticals (Cantner and Rake, 2014). However, while these accounts are all, to some degree, related to innovation policy and often treat innovation policy as an independent variable, none of them actually looks at policy making, especially connections between civil servants as a dependent variable. At the same time, using these proximity factors to understand connections between national policy makers is likely to provide a unique insight into what makes policy actors connect to each other and possibly engage in policy learning.

I address these gaps in the literature by employing social network analysis to map the connections between policy makers and regression analysis to test which proximity factors are more likely to determine whether two countries are connected in the informal networks. I use data from interviews with the innovation policy directors from all 28 EU member states and analyse the resulting 756 pairs of countries that either have a connection or do not. I find that for the cases where countries are connected through an asymmetric tie (only one country reported the connection), the likelihood of a connection is increased by a shared border, linguistic similarity and a difference in policy performance. For symmetric ties (where both countries confirmed the connection), the likelihood of connecting is also determined by a shared border and language similarity, but, interestingly, by a similarity in policy performance. I argue that the asymmetric ties thus represent an immediate and direct form of policy learning (through a top-down, teacher-learner mechanism), while the symmetric ties embody established cooperation structures, where possible learning takes place over a longer time horizon and is based on an equal relationship and mutual learning.

I proceed as follows: first, I provide an overview of the literature and develop the hypotheses; second, I introduce the methodology and data; third, I present the variables and regression results; and finally, I discuss the results and conclude with notes for further research.

2 Literature review and hypotheses

This study, with its aim to demonstrate whether and how countries learn through informal networks, stands on three strands of literature. First, the policy learning literature provides a definition for learning and a general framework of how to understand learning. Second, the organisational learning literature helps to understand the mechanisms that drive specific countries to learn from each other. Finally, accounts from economic geography and innovation economics provide cues on the proximity factors that may play a role in explaining why some countries are more likely to be connected than others. In this chapter, I provide an overview of these three literatures.

2.1 Policy learning

The central focus of this research is on policy learning. While learning can have different sources, I am interested in how learning occurs through interpersonal and informal connections between policy makers. Moreover, I wish to explore to what extent these informal connections can actually be considered learning.

To start with, we need to define learning. From the literature on policy learning, we know that it is usually considered to be alteration or change in the thinking or beliefs of actors in the policy setting, based on experience, information or knowledge and concerned with policy objectives (Bennett and Howlett, 1992; Heclo, 1974; Radaelli and Dunlop, 2013; Sabatier and Jenkins-Smith, 1999). As such, we can see that policy learning has a clear input in the form of ‘experience, information or knowledge’ and this input can arguably originate from various sources. For example, we can think of policy makers in a country learning from their own experience, using different sorts of policy evaluations to capture that knowledge (Borrás and Højlund, 2015). At the same time, we can also think of learning from the experience of others, with the knowledge conveyed through either formal or informal channels.

A large share of the literature in the field has so far focused on the conceptual issues, including efforts to understand the link between learning and change (Bennett and Howlett, 1992) and differentiating among different types of learning (Dunlop and Radaelli, 2013; Radaelli, 2009). At the same time, there has been limited discussion in the field on how learning is actually arrived at, for example what exactly the inputs to learning are and how they are gathered and processed. Moreover, the field has been characterised by a lack of empirical work (Dunlop and Radaelli, 2013). *Inter alia*, there is very limited evidence of learning in an international and cross-border context.

2.2 Organisational learning

Given these gaps in the policy learning literature, organisational learning, with its more developed empirical perspective, is likely to cast light on what frames the interactions between countries. From the organisational learning literature, we know that learning between actors is bound by transaction costs (Hansen, 1999; Reagans and McEvily, 2003). The higher the transaction costs, the less likely it is that two actors engage in (interactions possibly leading to) learning. On the other hand, the lower the costs, the more likely it is that learning will happen.

This tension is well captured in the discussions on ‘strong ties’ and ‘weak ties’, whereby developing and maintaining the former carries higher transaction costs and *vice versa* (Friedkin, 1982; Granovetter, 1973, 1983). Information exchanged through the different kinds of tie can be either codified or uncoded, with both kinds posing a challenge for the strength of the interactions of the actors involved

(Friedkin, 1982; Granovetter, 1973; Reagans and McEvily, 2003). Transferring codified knowledge requires less effort, therefore the transaction costs are lower and ‘weak’ ties may be sufficient. Transferring uncoded knowledge requires more effort – significant investment in time and resources – therefore the transaction costs are higher (Hansen, 1999) and ‘strong’ ties are likely to be needed. Transaction costs can thus be reduced by similarities between the parties involved in the transfer.

We can argue that for a pair of countries to engage in a learning relationship, one of the two conditions would need to be satisfied: either the transaction costs would have to be sufficiently low to make the exchange of information worthwhile or the expected information would have to be deemed valuable enough by at least one of the parties to overcome the potential dissimilarities and the corresponding higher transaction costs.

We can also expect that learning would require something to learn about, that is, one party would need to possess some experience, knowledge or information that the other party did not have. Therefore, we could expect that, in learning relationships, there would be a difference between the levels of knowledge on subject matter in the two countries. In cross-border settings where significant transaction costs are involved almost by definition, this knowledge gap would have to be large enough to make the transaction worthwhile. In innovation policy, this is likely to be reflected in the difference between the innovation performances of the two countries: the larger the difference, the more there is for the learner to learn.

As transaction costs are strongly related to how similar countries are, it is important to consider these similarities because they can help us to develop hypotheses about who is likely to learn from whom in an intergovernmental policy context. In network studies, this concept is also known as *homophily* (McPherson, Smith-Lovin and Cook, 2001; Rivera, Soderstrom and Uzzi, 2010), suggesting that connections are likely to occur between actors who are in some way similar to each other. These similarities are likely to reduce information costs and therefore make it more likely for organisations to cooperate (Lee, Lee and Feiock, 2012). The possible similarities between countries are discussed more thoroughly in the next section.

2.3 Similarity measures

Transaction costs associated with learning can be mitigated through different measures of proximity. From the studies on innovation-related cooperation – an area in which the issue of cross-border cooperation has been particularly addressed – we have seen that several factors play a role in whether cooperation between two actors is likely to occur or not. In broad terms, we can distinguish between three groups of similarities or proximities: physical proximity looking at the geographic closeness of countries; institutional similarity focusing on policies and their performance; and cultural similarity often

looking at the linguistic closeness of countries. Below, I give an overview of each of these characteristics and derive relevant hypotheses from them.

2.3.1 Geographic proximity

Geographic proximity shows the physical distance between two countries, that is, how far two countries are situated from each other – what the distance between their capitals or geographic centres is and whether or not they share a border.

The distance between countries is considered an important proximity measure because it can make it either easier or more difficult for countries to interact. Owing to the costs associated with travel and communication, physical distance has been considered an obstacle for cooperation (Morescalchi et al., 2015). While it can be argued that, with the development of advanced means of communication, distance now plays a smaller role, physical co-presence is still considered important for interactions regarding sophisticated, knowledge-related matters (Hoekman et al., 2010), such as research, public policy and business administration.

First, communication does not entail language alone; much of the information in face-to-face interaction is passed on indirectly via different means involved in the behavioural complex (Hoekman et al., 2010; Storper and Venables, 2004). This carries particular importance in building a common understanding and reference frames among the partners, *inter alia* through real-time feedback, subtle and informal communication and shared local context (Olson and Olson, 2000). These kinds of direct interaction are crucial for creating trust between two partners, necessary for building sustained cooperation and transferring sophisticated, tacit knowledge (Hansen, 1999; Reagans and McEvily, 2003).

Second, geographic closeness can act as a proxy for other types of proximity, such as cultural closeness. If countries are situated next to each other, we can presume that exchanges between them have taken place over time and across sectors and are possibly also reflected in the current communication patterns.

Recent studies have looked at the role of geographical distance from different angles and, while mostly agreeing that distance matters (Boschma, 2005; Hoekman, Frenken and Van Oort, 2008), their conclusions differ on the extent to which it does. Research on patterns of scientific cooperation has shown that, while spatial proximity still matters, territorial borders have become less important over time (Hoekman et al., 2010). There has also been evidence to the contrary – studying the cooperation patterns of innovators in the EU over time, Morescalchi et al. (2015) showed that the constraint imposed by country border and distance decreased until a certain point in time and then started to increase again. In the same way, research on inventors' cooperation provided evidence that geographical proximity is still relevant for the development of networks (Crescenzi et al., 2016).

Furthermore, it has been demonstrated that, while both the average distance between cooperation partners and the relative cost of interregional research cooperation may have increased over time, the benefits of cooperation often outweigh those costs, thus reinforcing core-periphery type of ties (Morescalchi et al., 2015). This is especially relevant when distinguishing between asymmetric and symmetric ties, as we could expect the transaction costs for asymmetric interactions to be relatively lower, thus allowing for a possibly larger difference in distance. At the same time, the transaction costs for exchanging tacit knowledge through symmetric ties would already be very high, thus making the added burden associated with increased geographical distance undesirable.

Given that geographic proximity has been found relevant in analysing various networks where sophisticated knowledge and information are exchanged, I suggest two hypotheses for the context of policy-maker networks:

- Hypothesis 1a Geographical proximity has a positive effect on developing symmetric ties.
- Hypothesis 1b Geographic proximity does not have a positive effect on developing asymmetric ties.

2.3.2 Policy proximity

Policy proximity indicates the degree to which countries share similar institutions in a particular policy field. It can be based on similarity in individual policy measures, the composition of the policy mix, the modes of execution or, as a proxy, the results delivered.

Policy similarity is an important factor because it can facilitate policy discussions between countries by providing a common frame of reference. If all parties involved in the discussion have an equal level of expertise concerning the particular policies, it makes any exchange easier and faster given that less time has to be spent on mapping or explaining the issue. On the other hand, lack of such a common framework can render any policy discussions more difficult. For example, in the context of innovation policy, it has been argued that ‘institutional friction arising from country-to-country differences creates challenges for collaboration across national systems of innovation’ (Morescalchi et al., 2015, p.652). In addition, it has been argued that efficiency of knowledge transfer between regions depends on the structuring of the regional innovation systems (De Noni et al., 2018; Fritsch, 2000; Tödtling and Trippl, 2005). This is quite understandable, given the diversity of policies employed for fostering innovation in general (Borrás and Edquist, 2013; Flanagan, Uyarra and Laranja, 2011; Magro and Wilson, 2013) or in specific sectors (Costantini, Crespi and Palma, 2017; Kivimaa and Kern, 2016; Rogge and Reichardt, 2016).

Furthermore, policy performance can be considered a proxy for the innovation policy setting, as differences in policies employed are likely to result in different performance. Both in the European

context as well as globally, we can observe that countries delivering better results in terms of outputs and outcomes of innovation also have more sophisticated policies and structures for promoting innovation (Breschi and Lissoni, 2009). For example, it has been argued that, in research cooperation, it is the national innovation capacity that matters most, given its role in framing innovation activities and influencing long-term innovation performance (Furman, Porter and Stern, 2002). Before a meaningful conversation on policy issues can be developed, common understanding on them is likely to be reflected in roughly similar innovation performance, as it is difficult to imagine countries with a large difference in innovation policy employing policies of equal sophistication. On a regional level, it has been demonstrated that organisations in top-performing innovation systems tend to network first among themselves (Hoekman, Frenken and Van Oort, 2009; Ter Wal and Boschma, 2009). Therefore, to have a more sophisticated discussion, there would have to be a deeper level of mutually shared understanding of the policies. On the other hand, we can also argue that for more extensive learning (as opposed to deeper learning) to take place, a gap between the policies might not necessarily be a hindrance, because it would increase the potential learning space for the learner. However, whereas a smaller distance would lead to a more equal and possibly mutual discussion, a wider distance would likely lead to more one-sided learning.

With regard to the role of policy/institutional similarity in shaping cross-border interactions, earlier research has largely argued for the positive effect of policy similarities between countries. Looking at factors determining countries' positions in the international photovoltaics knowledge network, Graf and Kalthaus (2018) showed that both the structure and the functionality of national research systems as well as the overall policy mix act as important factors. In a study on international research networks in pharmaceuticals, Cantner and Rake (2014) found that similarity in the research strengths of two countries is a significant predictor of mutual cross-border research cooperation. The more similar are two countries in terms of performance measured by research output, the more likely it is that they will cooperate together on research. Finally, research on collaboration between inventors in the UK showed that organisational proximity is strongly and positively associated with likelihood to cooperate (Crescenzi et al., 2016).

Given these results of previous studies and the discussion above, I propose two hypotheses:

- Hypothesis 2a Similarity in institutional settings and innovation policy performance has a positive effect on developing symmetric ties.
- Hypothesis 2b Dissimilarity in institutional settings and innovation policy performance has a positive effect on developing asymmetric ties.

2.3.3 Cultural proximity

Cultural proximity indicates the extent to which countries have a shared understanding of different aspects related to their societies, common values and the world at large. This can be rooted in various aspects, such as common historical background or geographical closeness, and be reflected in linguistic similarities.

Having a shared culture is relevant for cooperation and knowledge sharing between countries because it can create a common frame of reference for understanding each other and thus reduce the transaction costs of mutual exchanges. While cultural similarity is difficult to capture directly owing to its complexity, a proxy that closely reflects it is common language. It is widely recognised that language plays an important role in both structuring and communicating our understanding of the world (Balconi, Pozzali and Viale, 2007). We can think of the linguistic closeness between two countries being beneficial in two ways. First, if the policy makers from two countries speak the same language as a mother tongue, it is likely to reduce transaction costs and allow for a faster as well as more nuanced communication. Speaking English, the *lingua franca* among policy makers, or another language fluently can ease communication to a great extent. Second, sharing a linguistic background can also reflect a deeper cultural proximity. Even if two countries' native speakers do not fully understand each other's native language, they are likely to share a common frame of reference, facilitating interactions between them. Moreover, sharing a deeper understanding of each other's culture helps to navigate the more complex layers of communication and thus extract more meaning from the communication as well as avoiding possible misunderstandings. For example, sharing a common cultural background can lead to a shared 'logic of appropriateness' (March and Olsen, 2004) and thus contribute to more efficient communication.

Several of the previous studies on cooperation networks have looked at culture or language as a possible factor influencing interactions between actors. Studying research collaboration across European regions, Hoekman et al. (2010) found that linguistic borders have an effect on cooperation ties, with co-publication rates between researchers being higher in linguistically similar areas. Moreover, Luukkonen et al. (1992) and Zitt et al. (2000) demonstrated the importance of culture when choosing collaboration partners for international scientific cooperation. However, a recent study on international knowledge networks in pharmaceutical research did not reveal that similarity of languages in two countries would have a strong effect on their inclination to collaborate (Cantner and Rake, 2014).

All in all, the previous discussions and empirical studies on the importance of cultural proximity provide a rationale for testing its importance in the context of international cooperation. I therefore suggest two hypotheses:

- Hypothesis 3a Similar cultural background has a positive effect on developing symmetric ties.
- Hypothesis 3b Similar cultural background does not have a positive effect on developing asymmetric ties.

3 Data and research methodology

3.1 Data

This study is based on data purposefully gathered through interviews with national policy makers from the 28 EU member states. The aim of the interviews was to map who tends to discuss policy with whom, thereby serving as a basis for the subsequent network and regression analyses.

The interviews were conducted with innovation policy directors from each of the EU member states. I aimed at reaching the management level, as managers are arguably well positioned to have the best overview of interactions with other countries. While the networks of individual policy officials in a national innovation policy team may vary to some extent, the directors are likely to have a strategic perspective on the most important cross-border exchanges. As such, the responses from directors of innovation policy act as proxies for countries. Altogether, I reached the head of innovation policy in 22 member states, while in the remaining six cases the interview was conducted with the head of international cooperation, the head of innovation policy analysis or a senior innovation policy expert (Appendix 1). In each country, I targeted the ministry responsible for developing national innovation policy. In a few countries where the innovation policy competences were equally divided between two ministries (for example the ministry of economic affairs and the ministry of research), I merged the answers of the two directors.

The interviewees were asked who they would consider the most important external partners in developing and evaluating innovation policy. The question was accompanied by a list of all EU member states, where the respondents could mark each of the countries on a four-point scale: ‘often’, ‘sometimes’, ‘rarely’ or ‘never’ (Appendix 2). In order to reduce the potential subjectivity in the respondents’ perceptions of these categories, I converted the responses into a binary system, with ‘often’ and ‘sometimes’ counting as 1 and ‘rarely’ and ‘never’ counting as 0. I considered that while this might reduce the overall level of detail of the data, it would likely return a more coherent picture distinguishing between solid and weak/non-existent connections.

3.2 Variables

3.2.1 Dependent variables

The two dependent variables are asymmetric ties and symmetric ties.

Asymmetric ties

An asymmetric tie is a connection between two countries based on whether one country has been mentioned by the other. The reciprocity of the connection is not controlled for.

Symmetric ties

A symmetric tie signifies a connection where the reciprocity has been controlled for, that is, both countries have mentioned each other (see Section 3.3.1 for a more specific explanation).

In the context of the current article, the asymmetric ties are a proxy for immediate policy learning, that is, learning based on swift exchange of knowledge and information (codified knowledge). The symmetric ties are seen as a proxy for established cooperation, where learning takes place on a more sophisticated level, based on the exchange and creation of tacit, uncoded knowledge.

3.2.2 Independent variables

Shared border

Here I look at whether any two countries in our population of 28 share the same border, either a land border or a maritime border. The latter is included because, given the relatively small distances in Europe, countries divided by sea can still be relatively close culturally. The examples include (but are not limited to) the United Kingdom and Ireland, Sweden and Denmark, and Finland and Estonia.

National policy mix

This represents a measure of policy similarity between countries. I use a classification by Izsak et al. (2015) as a baseline to check whether both countries in a given pair have a similar type of innovation policy mix. They used data from Erawatch and INNO Policy TrendChart to perform different clustering analyses and found that the EU member states can be divided into five groups based on the features of their innovation policy. I check whether the two members of each pair belong to the same group.

Table 1 Overview of the variables

	Proximity factor	Measure	Source	Type
<i>Dependent variables</i>				
Asymmetric tie		A tie between two countries that is reported by one country only	Own data set, based on interview data	Binary
Symmetric tie		A tie between two countries that is confirmed by both countries	Own data set, based on interview data	Binary
<i>Independent variables</i>				
Shared border	Geographic proximity	Whether two countries have a shared border or not (inc. maritime borders), binary variable	World Borders Dataset	Binary
National policy mix	Policy proximity	Classification of countries according to their policy types, binary variable	Izsak et al. (2015)	Binary
Innovation performance	Policy proximity	Difference in country scores in the Global Innovation Index (GII)	Global Innovation Index 2017	Continuous
Business environment	Policy proximity	Difference in country scores in the Doing Business scorecard	Doing Business 2018	Continuous
Language	Cultural proximity	Language group by the main language spoken, binary variable		Binary
Income	Structural distance	Difference in GDP per capita	Eurostat, National Accounts	Continuous
Population	Structural distance	Difference in the number of inhabitants	Eurostat, Population	Continuous

Innovation performance

To provide a comparison between the innovation performance of countries, I use the Global Innovation Index (GII).⁹ Published in cooperation between Cornell University, INSEAD and WIPO, it uses 81 indicators to assess the innovation performance of countries. Its European analogue, the European Innovation Scoreboard,¹⁰ while widely used among practitioners, has been chastised for its (lack) of methodological underpinnings (Edquist and Zabala, 2015). Thus, the GII, owing to its more sophisticated coverage, can as such be considered a more reliable measure. I look at the difference between the scores of the pairs of countries.

Business environment

This variable enables comparison of the overall business environment of countries and is based on the Doing Business scoreboard developed by the World Bank and consisting of 11 indicator sets focusing on different aspects of the national business regulation environment. Providing a broad view of the regulatory environment in a country, it can also be a proxy for the policy distance more generally. Similarly to the previous variable, I check the difference in scores for each pair of countries.

Language

In order to look at the broader cultural proximity of countries, I use language as a proxy. More specifically, I look at whether countries belong to the same linguistic area, based on the main language spoken. Overall, I distinguish between the six main language groups in Europe and check for a match in the pairs of countries.

3.2.3 Control variables

Income

I use GDP per capita as a proxy for the wealth of a country, controlling for the structural differences between countries. The data is derived from the National Accounts section of the Eurostat database. I use it to control for the extent that the overall wealth of a country may interfere with the other variables. I look at the difference of its value for the pairs of countries.

Population

⁹ <https://www.globalinnovationindex.org/>.

¹⁰ http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en.

This variable refers to the number of inhabitants in a country according to the Population section of the Eurostat database. I use it as a proxy for the size of the country, given that the population is a better measure accounting for the economic potential of a country than the size of sheer geographic surface. As such, it provides another measure for controlling for the structural differences between countries I check for the difference of the total population of two countries in a pair.

3.3 Methodology

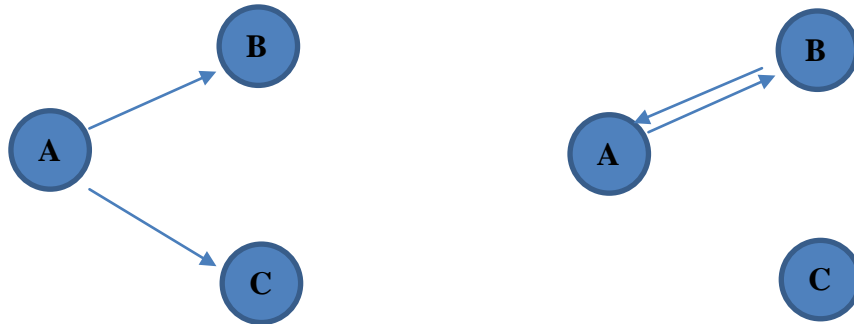
3.3.1 Social network analysis

Social network analysis aims at highlighting the interactive relationships between actors in a system (Scott, 2017; Wassermann and Faust, 1994). In social network analysis, the key components making a network are nodes and ties. Nodes are the actors within a network and ties are the relationships between them.

In the framework of the current research, the nodes are countries – the 28 EU member states. The ties signify the connections between these countries, more specifically the flows of information between them. The combination of the nodes and connecting ties allows us to establish the general structure of the network, by revealing who is connected to whom and which (if any) clusters emerge from that. Therefore, social network analysis allows us to establish an overview of the connections between countries in the EU, thus providing information on the overall cross-border flows of information and knowledge in the field of innovation policy.

Our data allow for distinction between asymmetric and symmetric ties. Asymmetric ties are all the instances where one country mentions another. For example, when Country A mentions Country B and Country C then we have identified two asymmetric ties. Symmetric ties, on the other hand, reflect the instances where countries' reports match with each other. If we continue on the previous example, then, if Country A mentions Country B and Country B also mentions Country A then there is a symmetric connection between Countries A and B. As Country C has not mentioned anyone, or been mentioned by anyone, it does not have any connections in our mapping.

Figure 1 Examples of asymmetric connections (left) and a symmetric connection (right, between A and B)



3.3.2 Regressions

I use regression analysis to analyse the impact that different similarities have on the existence and type of connections between countries. More specifically, and given the characteristics of the data (that is, dyadic relationships expressed via binary dependent variables), I use logistic regressions.

Altogether, 756 connections are possible among the current set of countries. Out of these potential connections, my data show 236 asymmetrical connections and 45 symmetrical connections between countries. The average number of asymmetric ties between countries is 8.4 and the average number of symmetric ties is 3.2.

I analyse the extent to which the independent variables affect the likelihood of having a connection between each of the possible pairs by employing logistic models of generalised linear regressions. I control for the GDP per capita of the country and the population. I estimate six models with variables added one at a time in order to see the robustness of the coefficients of previous models with the inclusion of each new variable.

4 Empirical results

In this section, I present the regression results. As the analysis has two dependent variables – asymmetric and symmetric ties – I have created a similar set of models for both of them, adding independent variables in the order in which they were described in Section 2. I first present the results for asymmetric and symmetric ties separately and then discuss them comparatively.

4.1 Asymmetric ties

Table 2 demonstrates the regression results for asymmetric ties.

The first model contains the variables *shared border* and *policy similarity*. We see that a shared border has a positive and significant effect on the likelihood of having an asymmetric tie between the two neighbours. Deploying a similar innovation policy mix (following the categorisation by Izsak et al. (2015)) has an insignificant effect.

In the second model, the variable *innovation performance* is added to the previous two variables. It is evident from the results that the difference between the innovation performances of two countries, as estimated by their GII scores, is both positive and significant.

In the third model, the variable *business environment* is introduced. We can notice that the difference between the business friendliness of two countries' regulatory environments (according to their scores in Doing Business) is both positive and significant.

The fourth model sees the introduction of the variable *language*. The regression shows that the effect of two countries belonging to the same language family by the main language spoken is both positive and significant.

In the fifth and sixth model, the two control variables – *income* and *population* – are added. Difference in income between two countries does not return a significant effect, but difference in population shows a significant and positive effect. This indicates that the larger the difference between the populations of two countries, the more likely it is that we will see an asymmetric tie between them. Arguably, this hints at a possibility that the larger member states of the European Union occupy a more central position in the informal networks in innovation policy and are often turned to by their colleagues from smaller countries.

The effect of the shared border remains positive and significant through all of the six models. Thus, it rejects Hypothesis 1b, which stated that geographic proximity does not have a positive effect on developing asymmetric ties. In fact, while we could think that because transaction costs are relatively lower, geographic proximity might not matter as much, the regression results show that it still does. This tells us that even for cases where the threshold of cooperation is already low, policy makers are still inclined to look for a lower cost. As the distance itself should not matter as much for asymmetric ties (possibly much of the exchange of uncodified knowledge happens via phone or email), it might instead reveal a possible covariation of cultural and geographical proximity.

Table 2 Regression results for asymmetric ties

	1	2	3	4	5	6
	Estimate					
Shared border	1.930164*** (0.228)	2.196685*** (0.245)	2.24118*** (0.248)	2.00385*** (0.257)	2.013728*** (0.258)	2.0594799*** (0.263)
National policy mix	-0.004072 (0.215)	0.033625 (0.227)	0.04571 (0.230)	0.03810 (0.234)	0.050488 (0.234)	0.0946289 (0.236)
Δ Innovation performance		0.080871*** (0.009)	0.06496*** (0.010)	0.06955*** (0.010)	0.082640*** (0.015)	0.0742015*** (0.015)
Δ Business environment			0.06134*** (0.016)	0.06199*** (0.016)	0.053018** (0.017)	0.0431303* (0.018)
Language				1.17070*** (0.225)	1.178978*** (0.225)	1.1963779*** (0.229)
Δ Income					-0.002677 (0.002)	-0.0004436 (0.002)
Δ Population						0.4368080*** (0.117)
Constant	-1.108203 (0.098)	-1.304786 (0.113)	-1.34377 (0.116)	-1.56892 (0.129)	-1.575573 (0.130)	-1.6188582 (0.133)

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

With regard to Hypothesis 2b – dissimilarity in institutional settings and innovation policy performance has a positive effect on developing asymmetric ties – our analysis shows that it is partially confirmed. The difference between the overall innovation performances of two countries is a strong and consistent predictor of asymmetric ties. The difference in business environments also appears as a relatively solid indicator of the likelihood of having an asymmetric tie between countries. The combined strength of these two variables shows that countries are likely to seek to ‘learn from the best’ and are possibly inclined to ‘preferential attachment’ (Barabasi and Albert, 1999). However, difference in national innovation policy mixes did not show any significance using the given measures. Thus, we can consider the hypothesis partially confirmed.

The results of the regressions effectively reject Hypothesis 3b, which predicted that a similar cultural background does not have a positive effect on developing asymmetric ties. Using language as a proxy for shared cultural background, we see that it carries a significant role through all the regression models. This is surprising, since we could expect that, with English being effectively the *lingua franca* among policy makers, the role of language in shaping cross-border connections would be less important.

Furthermore, as language was treated here as a proxy for cultural proximity, it is interesting that it matters as much for asymmetric ties, where we would not expect the transaction costs to matter as much. However, the results showing the importance of language are consistent with those showing the importance of geographic proximity, as both are, to a certain extent, proxies for shared cultural/historical/social ties that are very likely to be based on physical proximity and reflected in linguistic closeness.

All-in-all, we can notice that asymmetric ties provide an interesting combination of similarities and differences. First, there is a tendency towards more similarity in terms of physical and cultural closeness. Second, there is an inclination towards more difference regarding policy performance (both innovation policy performance and that of the business environment in general). The former can be explained by a search for lower transaction costs, while the latter seems to point to a search for new ideas and better knowledge. On one hand, countries seem to be reaching beyond their comfort zone for the prize of better knowledge, but, on the other hand, they are still pulled towards countries that are somewhat similar. This is a model that very much depicts policy makers as rational actors, seeking to balance the gains and pains while reaching out to their colleagues for information and knowledge.

4.2 Symmetric ties

The regression results for symmetric ties are presented in Table 3.

I pursue a similar modelling strategy as previously, with the first model including the variables *shared borders* and *policy similarity*. We can observe that sharing a border has a significant and positive effect on the development of symmetric ties. At the same time, the effect of having a similar innovation policy mix is insignificant.

Adding the variable *innovation performance* in the second model returns a significant and negative effect. It tells us that the smaller the gap between the innovation performances of two countries, the more likely it is that they have a mutual connection.

In the third model, *innovation performance* is added as a variable, showing the difference in the innovation performances of two countries, as measured by the GII. Its effect is significant and negative, indicating that the more similar two countries are regarding their innovation performance, the more likely it is that they are mutually connected.

Fourth, the variable *business environment* is included in the model. The effect of the gap between the levels of enterprise friendliness of regulatory environments, based on the Doing Business scores, is negative but insignificant.

In the fifth model, I add the variable *language*, demonstrating whether two countries belong to the same language family. The estimation results are significant and positive.

Table 3 Regression results for symmetric ties

	1	2	3	4	5	6
	Estimate					
Shared border	2.4356*** (0.355)	2.28911*** (0.364)	2.18001*** (0.372)	1.88884*** (0.395)	1.852799*** (0.404)	1.933587*** (0.416)
National policy mix	0.2791 (0.417)	0.25085 (0.420)	0.18706 (0.425)	0.20758 (0.445)	0.149053 (0.452)	-0.096178 (0.469)
Δ Innovation performance		-0.12242** (0.038)	-0.11815** (0.038)	-0.09760* (0.041)	-0.068709 (0.044)	-0.087154 . (0.046)
Δ Business Environment			-0.06832 (0.058)	-0.06774 (0.058)	-0.058013 (0.058)	-0.027308 (0.063)
Language				1.63130*** (0.380)	1.591554*** (0.385)	1.556284*** (0.389)
Δ Income					-0.015709 . (0.008)	-0.012009 (0.008)
Δ Population						-1.019431* (0.479)
Constant	-2.7266 (0.242)	-1.81243 (0.336)	-1.49002 (0.423)	-2.09454 (0.468)	-1.834964 (0.482)	-1.285643 (0.548)

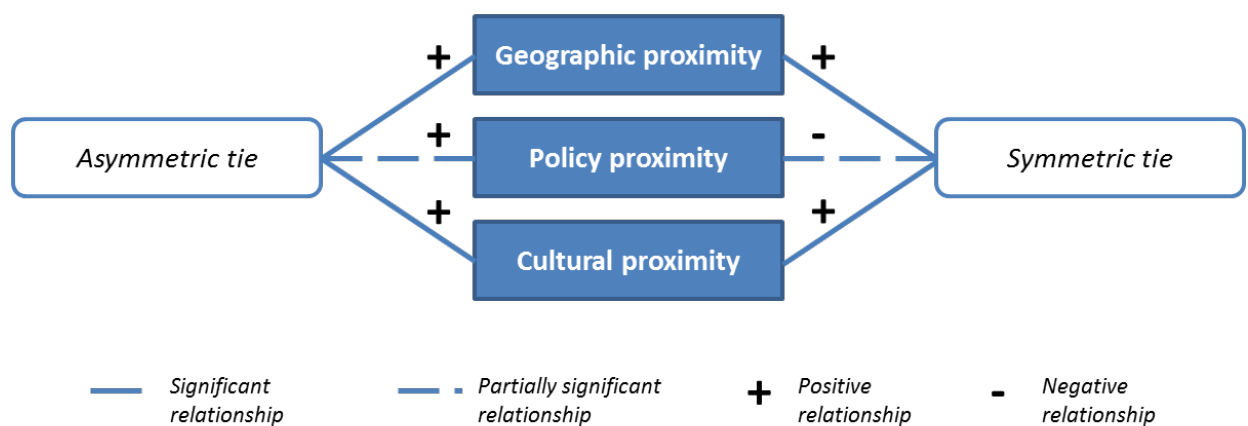
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Of the two control variables *income* and *population*, only population shows a degree of significance. The relationship between population size and asymmetric ties is negative, indicating that the more similar are the population sizes of countries, the more likely it is that they will have a symmetric tie between them.

Looking at the hypotheses, we can first observe that sharing a border has a significant and positive effect through all the models, thereby effectively confirming Hypothesis 1b (geographical proximity has a positive effect on developing symmetric ties). This is consistent with the discussion in Section 2 on the idea that developing and maintaining symmetric ties involves high transaction costs, and therefore countries being physically close to each other may help to reduce those costs. In addition, we can also expect that geographic proximity is likely to include a degree of cultural similarity, further reinforcing the argument about lower transaction costs.

Regarding Hypothesis 2a – similarity in institutional settings and innovation policy performance has a positive effect on developing symmetric ties – we can consider it partially confirmed. While similarity in policy mixes employed and in the business environment did not return significant results, looking at innovation performance showed across several models a significant but negative relationship. This means that the smaller the difference in the innovation performance scores of two countries, the more likely they are to develop symmetric ties. It fits well with the previous findings in the field that actors with similar performance are more likely to be attached (Cantner and Rake, 2014; Hoekman et al., 2009; Ter Wal and Boschma, 2009).

Figure 2 Summary of relationships between dependent and independent variables



Finally, Hypothesis 3a stated that a similar cultural background has a positive effect on developing symmetric ties. The regression results confirm this hypothesis, as language (used as a proxy for cultural similarity) proved to be significant and positively related through the different models. This showed that belonging to the same language group, even if this does not necessarily mean sharing the mother tongue, is an important factor in reducing the transaction costs of the otherwise costly symmetric ties. This is in line with previous accounts that have demonstrated the relevance of linguistic ties for facilitating cross-border cooperation in various innovation-related activities (Hoekman et al., 2010; Luukkonen et al., 1992).

In sum, we can see that, for symmetric ties, the proximities that matter most are geographical and cultural. Being physically close and belonging to the same language group are strong predictors for a symmetric tie between countries. In addition and contrary to what we saw with asymmetric ties, similarity in policy has a positive effect on tie formation. Therefore, we can say that, for symmetric ties, the key is to be as close as possible on as many levels as possible.

5 Discussion

Comparing the regression results for both asymmetric and symmetric ties, we notice two important tendencies. First, the gaps in both innovation performance and business environment are positively and significantly correlated to the development of asymmetric ties, while for symmetric ties, only the gap in innovation performance shows some (and negative) correlation to the creation of symmetric ties. This is an interesting finding, pointing at a likely explanation that the results for are makers choose their partners to discuss policy with according to their (superior) innovation policy performance and business-friendly regulatory environment, then we can easily argue that the purpose is to gather the necessary knowledge and information on which policy learning is ultimately based. After all, from the definition of policy learning (see Section 2), we recall that for any interaction to be considered policy learning, it has to concern policy objectives. As our data show that difference in policy performance plays an outstanding role in the relationship, we can also presume that it is likely to constitute policy learning. Furthermore, during the interviews, I asked each policy maker to name three countries they considered important to follow (not necessarily to contact) with regard to policy development. Interestingly, all of the European countries mentioned (the question was not limited to any geographical region) matched the countries actually contacted often, thus reinforcing this conclusion.

On the other hand, in the case of symmetric ties, the effect of innovation policy performance was negative and only weakly significant, meaning that countries are somewhat likely to interact with countries on the same level with them. This shows that asymmetric ties provide evidence for a much more immediate kind of policy learning with a clear mentor–mentee relationship (expressed by difference in innovation performance), while symmetric ties, being much more stable over time (Rivera et al., 2010), are likely to show more established cooperation patterns between equal partners. As transaction costs are lower for asymmetric connections, it makes it also easier to bridge gaps in performance and connect to countries that are better performers. For symmetric connections, transaction costs are higher and therefore it is likely to be more demanding to establish and maintain such connections between countries that are very different in terms of the levels of their policy development.

This corresponds well to the classic discussions on organisational learning, where ‘weak ties’ (comparable to asymmetric ties) have been considered beneficial for the search for new ideas and the transfer of codified knowledge outside one’s immediate entourage, whereas ‘strong ties’ (comparable to symmetric ties) show established connections through which sophisticated and tacit knowledge is exchanged within one’s own cluster (Granovetter, 1983; Reagans and McEvily, 2003).

Second, physical and cultural proximity matter for both kinds of tie. While this could have been expected for symmetric ties, it was surprising to see the importance of these variables also for asymmetric ties.

Building on the argument about transaction costs, it seems that there are costs involved in any kind of relationship, therefore it is intuitive to try to minimise these costs by always looking for more similarity. This also supports the classical argument of *homophily* that ‘birds of a feather flock together’ (McPherson et al., 2001), as we see a striving for a higher degree of physical/cultural proximity in both kinds of tie.

In order to control for the personal level characteristics, I also gathered biographical data on the respondents from LinkedIn and other publicly available sources. However, testing the results against variables such as gender, age and education did not yield significant results.

6 Conclusions

The aim of this article was to show which proximity factors matter most for connections between policy makers in different countries and what this tells us about policy learning. Looking at the informal networks of the innovation policy directors from the 28 EU member states, I distinguished between asymmetric and symmetric connections. I used pairwise regression analysis to test three categories of variable explaining proximity: geographical, policy and cultural proximity. I found that, for both asymmetric and symmetric ties, geographical and cultural closeness are important. At the same time, for asymmetric ties, a larger difference in policy performance is necessary, while for symmetric ties, a similar level of performance is better. This finding provides useful knowledge about the process of policy learning, as we see countries reaching beyond their immediate peers in the search for new knowledge and the information necessary for learning.

Previous research on policy learning has provided us with a strong conceptual understanding of what constitutes learning and what the different kinds of learning are. At the same time, we still lack empirical knowledge on how policy learning materialises in cross-country settings and what factors determine who is learning from whom. As policy learning is often regarded as a latent phenomenon that is difficult to observe directly, I focused on the flow of information and knowledge as a necessary input for learning. I treated the informal networks as a source providing the knowledge and information necessary for learning.

I used a novel data set based on interviews with the innovation policy directors of the 28 EU member states. Through social network analysis, I was able to map the network of connections between countries and distinguish between asymmetric and symmetric ties. I used logistic regressions to analyse the strength of different independent variables in predicting the likelihood of existence of these two types of tie. Building on previous work on cross-border cooperation in the field of innovation and research, I focused on three groups of proximities: geographical, policy-based and cultural.

The results of the regression analysis showed that for asymmetric ties, all three proximities yielded mostly significant and positive effects. This means that for two countries to have a strong likelihood of having an asymmetric tie, they would need to be close geographically and culturally and, at the same time, have different levels of policy performance. For symmetric ties, geographic and cultural closeness are still strong predictors, but the effect of policy performance is inverted – the smaller the performance difference, the more likely a symmetric connection is.

Comparing the results for the two types of tie sharpens our understanding of policy learning. For both kinds of tie, countries seek to connect to partners that are geographically and culturally similar. This is natural, given that in any kind of network interaction, the logical thing would be to seek to keep transaction costs low. However, for asymmetric ties, a higher degree of difference in policy performance is actually a catalyst, while for symmetric ties a smaller difference is better. This distinction shows that by looking at asymmetric ties we have been able to capture a quest for learning – the connections tend to be between countries of unequal performance level, thus indicating a clear teacher–learner relationship. Indeed, we could think that it is this difference in performance that motivates one country to reach out to the other, overcoming the potentially higher transaction costs associated with this difference. On the other hand, with asymmetric ties, we see cooperation between equals. Given their equal similar level of performance, it is not likely to be about the immediate search for new ideas or knowledge; rather, it is likely to be an expression of more established and long-term-oriented relationships. This is also evident in the difference in numbers of tie types – as it is less costly to create an asymmetric tie, they are more plentiful, while there are significantly fewer symmetric ties because they demand more time and resources.

I have thus demonstrated that asymmetric ties capture policy learning in its immediate form of knowledge and information seeking. I have also shown that symmetric ties likely reveal established relationships that may involve more long-term-oriented cooperation. As performance difference is significant for asymmetric ties, we can expect this to be a faster and more immediate way of learning in the form of a teacher–learner relationship. This is different from symmetric ties, where any learning may take the form of a joint search, where equal partners discover novelties over a long time horizon.

Having demonstrated these general patterns, more work is left for future research on what exactly lies behind these ties and what kind of information policy makers actually trade through these connections? Furthermore, while this research tried to capture learning by focusing on its inputs, more research is necessary to look at learning from the opposite angle – its outputs – for example by looking at cases of actual policy change as a result of information acquired through these connections. Only by connecting the inputs with the outputs will we be able to surround and capture the latent phenomenon of policy learning.

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Appendix 1. List of interviewees

Nr	Country	Rank	Organisation	Date
1	Austria	Senior manager	Austrian Ministry for Transport, Innovation and Technology	29.04.16
2	Belgium	Senior manager	Scientific and Technical Information Service	01.06.16
3	Belgium	Senior policy expert	Directorate of Economic Policy, Wallonia	16.11.16
4	Bulgaria	Senior manager	Ministry of Economy	01.06.16
5	Croatia	Senior manager	Ministry of Science, Education and Sports	06.05.16
6	Croatia	Senior manager	Ministry of Economy, Entrepreneurship and Crafts	27.01.17
7	Cyprus	Senior manager	Ministry of Energy, Commerce, Industry and Tourism	22.11.16
8	Czech Republic	Senior manager	Ministry of Economy and Trade	02.12.16 (written)
9	Denmark	Senior manager (policy analysis)	Danish Agency for Science, Technology and Innovation	18.01.17
10	Estonia	Senior manager	Ministry of Economic Affairs and Communications	27.01.16
11	Finland	Senior manager	Ministry of Employment and the Economy	20.01.16
12	France	Senior manager	Ministry for Economy, Industry and Digital Affairs	09.12.15

13	France	Professor	Université de Paris-Est	15.03.17
14	Germany	Senior manager	Federal Ministry for Science and Technology	28.01.16
15	Greece	Senior manager	Ministry of Education, Research and Religious Affairs	04.05.16
16	Greece	Senior policy expert	Ministry of Economy	26.10.16 (written)
17	Hungary	Senior manager	National Research, Development and Innovation Office	23.05.16
18	Ireland	Senior manager	Department of Jobs, Enterprise and Innovation	15.06.16
19	Italy	Senior manager (international relations)	Ministry of Economic Development	24.10.26
20	Latvia	Senior manager	Ministry of Economics of the Republic of Latvia	28.01.16
21	Lithuania	Senior manager	Ministry of Economics of the Republic of Lithuania	17.03.16
22	Luxembourg	Senior manager	Ministry of Higher Education and Research	02.06.16
23	Malta	Senior policy expert	Malta Council for Science and Technology	29.04.16
24	Netherlands	Senior manager	Ministry of Economic Affairs	26.01.16
25	Poland	Senior manager	Ministry of Economic Development	19.05.16
26	Portugal	Senior policy expert	Ministry of Economy	17.01.17

27	Romania	Senior counsellor	National Authority for Scientific Research and Innovation	02.06.16
28	Slovakia	Senior manager	Ministry of Economy	30.05.16
29	Slovenia	Senior manager	Ministry of Economy	01.07.16
30	Spain	Senior manager	Ministry of Economy and Competitiveness	02.06.16
31	Sweden	Senior manager	Ministry of Enterprise and Innovation	14.01.16
32	United Kingdom	Senior manager (policy analysis)	Department for Business, Innovation & Skills	25.05.16

Appendix 2. Interview form

Policy learning networks in innovation policy

Interview guide

Name:

Date, place:


1. Who would you consider your most important external partners in developing and evaluating innovation policy?
 - a. Please mark how often you have exchanged views on innovation policy with the following countries:


	Often	Sometimes	Rarely	Never
Austria				
Belgium				
Bulgaria				
Croatia				
Rep. of Cyprus				
Czech Republic				
Denmark				
Estonia				
Finland				
France				
Germany				
Greece				
Hungary				
Ireland				
Italy				
Latvia				
Lithuania				
Luxembourg				
Malta				
Netherlands				
Poland				
Portugal				
Romania				
Slovakia				
Slovenia				
Spain				
Sweden				
UK				

Co-author statement

Title of paper	Towards system oriented innovation policy evaluation? Evidence from EU28 member states
Journal and date (if published)	Research Policy, forthcoming

1. Formulation/identification of the scientific problem to be investigated and its operationalization into an appropriate set of research questions to be answered through empirical research and/or conceptual development
<p>Description of contribution: The scientific problem to be investigated formed part of the broader framework of the thesis of Mart Laatsit. The specific set of research questions was agreed upon collaboratively by the co-authors.</p>
2. Planning of the research, including selection of methods and method development
<p>Description of contribution: Planning of the research was developed collaboratively.</p>
3. Involvement in data collection and data analysis
<p>Description of contribution: Data was collected in most part by Mart Laatsit, with Susana Borrás carrying out some of the interviews. Mart Laatsit conducted the first round of data analysis that was then cross-checked collaboratively between the authors.</p>
4. Presentation, interpretation and discussion of the analysis in the form of an article or manuscript
<p>Description of contribution: The presentation, interpretation and discussion was carried out collaboratively.</p>

1. Co-author (PhD student)	
I hereby declare that the above information is correct	
04.10.18	
Date	Signature

2. Co-author	
I hereby declare that the above information is correct	
4 th OCTOBER 2018	
Date	Signature

3. Co-author	
I hereby declare that the above information is correct	
Date	Signature

4. Co-author	
I hereby declare that the above information is correct	
Date	Signature

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