



CROSS-BORDER INTEGRATION PATTERNS IN THE CONTEXT OF DOMESTIC ECONOMIC DEVELOPMENT: A CASE STUDY OF THE UPPER RHINE

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Abstract. Cross-border integration is assumed to promote European cohesion. Yet the relationships between different forms of integration and the social and political outcomes they supposedly promote vary. In this paper, we investigate forms of cross-border integration in the Upper Rhine, comparing patterns of functional integration (socioeconomic indicators) with patterns of organizational integration (network ties between economic development organizations). Using network analysis techniques and qualitative interview data, we find that both forms of integration are driven by the presence of economic differentials between countries, but that spatial patterns of functional integration differ from those of organizational integration. We propose a typology of potential relationships between regions that explains these differing patterns of integration, and highlights how economic development actors respond to the effects of economic differentials on their regional economies. In addition, we highlight complex relationships between organizational and functional integration, institutional integration, and structural contexts.

Keywords: border regions, cohesion, cross-border integration, economic development, network analysis.

Introduction

Integration across national borders is a core objective for the European Union (EU), as it is supposed to facilitate economic, political, and social cohesion and stability (Medeiros, 2014; Evrard & Chilla, 2021). Mechanisms of integration, including liberalization of policy, reduction of barriers, and coordination of regulatory frameworks, should theoretically increase mobility of people, goods, and capital across borders. These flows of factors are (often) normatively assumed to promote a range of desirable outcomes, including enlarged markets (Capello, Caragliu & Fratesi, 2018), improvement in (border) regional economic resilience (Andersen & Prokkola, 2022; Chilla, Große, Hippe & Walker, 2022; Novotný & Böhm, 2022; Hippe, Bertram & Chilla, 2023), development of strong cross-border innovation systems (Makkonen & Rohde, 2016), and potential convergence of socioeconomic

conditions on either side of the border (De Boe, Grasland & Healy, 1999). EU policy further assumes that these outcomes promote overall economic growth as well as social and political cohesion; as a result, the EU invests heavily in promoting cross-border integration (van Houtum & van der Velde, 2004; Evers, 2008; Medeiros, 2019; Basboga, 2020; Chilla & Lambracht, 2022).

Yet the actual relationships between these mechanisms for cross-border integration, the integration outcomes, and their social and economic implications are fuzzier. Integration has been shown to take multiple forms. Some have clear positive relationships with the liberalization and coordination of policy, but others do not. In particular, the presence of economic differentials appears to drive divergent patterns of some forms of integration. Research investigating the relationships between types of integration has also privileged formal and top-down institutional integration, leaving a gap in understanding of semi- and informal institutional integration.

This paper examines the relationships between organizational and functional cross-border integration in the Upper Rhine region, which is characterized both by high levels of formal institutional integration and cross-border economic differentials. We compare cross-border networks of domestic economic development organizations (indicating organizational integration) with socioeconomic indicators (indicating functional integration). The research addresses the broad question of how patterns of organizational integration and functional integration relate. In doing so, we pay particular attention to two mechanisms that affect cross-border integration: the presence of economic differentials on either side of a border, and the presence and evolution of less formal and informal forms of institutional integration.

Findings indicate that patterns of organizational integration and functional integration are both driven by the presence (or perceived presence) of economic differentials, but in substantively different ways. As an indicator, organizational integration reflects both formal and informal types of institutional integration. Finally, the relationships between functional integration, organizational integration, and institutional integration are complex, mutually reinforcing, and influenced by structural features of the border region.

Conceptual framework

The idea of cross-border integration is closely interwoven with EU policies and their objective of promoting cohesion between and within the nations of the EU, and has therefore been studied extensively (EC, 2017). Yet cross-border integration is a concept frequently invoked without an explicit definition, and research on the topic has used a variety of operationalizations. This lack of explicit definition is a particular challenge because some of the different definitions given to 'integration' may, at times, be contradictory.

Integration is often defined as an increase in the interactions that occur across a border (Buch, Dall Schmidt & Niebuhr, 2009). At times, it is also used to refer to a convergence in territorial conditions on either side of a border (De Boe et al., 1999). Some research, such as Svensson and Nordlund's case study of Euroregions in Sweden and Hungary, includes both 'interactions' and 'convergence' in the definition of integration (2015). However, research has demonstrated that interactions across borders do not necessarily correlate with convergence and in some cases may even be driven by the presence of differentials (Decoville et al., 2013; Chilla & Heugel, 2019). In a paper examining the theoretical foundation of cross-border integration, Sohn (2014) notes that it could include a diversity of flows and transactions that simultaneously lead to convergence and divergence in different arenas.

Integration could also comprise the interaction or convergence of many different elements, with scholars distinguishing different forms of integration. Most common, and most relevant for this paper, are ‘functional integration’ and ‘institutional integration,’ but other conceptualizations of integration have also been proposed. For example, Reitel’s case study of the Basel cross-border metropolitan region identifies four types of integration: morphological, territorial, intentional and institutional (2013). Durand’s case study of the Lille cross-border metropolitan region identifies a different four: structural, functional, institutional and ideational (Durand, 2015; Durand & Perrin, 2018). Among others, Decoville et al. (2013) refer to ‘economic integration,’ and Evrard and Chilla (2021) to ‘political integration’.

Scholars use the term ‘functional cross-border integration’ to refer to flows of people, goods, services and capital across borders, as well as the larger socioeconomic implications of this (e.g. trends in population or incomes, or supply chain/production system configurations) (Capello et al., 2018). One of the most common metrics for operationalizing functional integration are commuting flows; other include migration/resident citizenship, and cross-border consumption or retail flows (Matthiessen, 2004; Sohn, Reitel & Walther, 2009; ESPON, 2010; Meijers, Hoogerbrugge & Cardoso, 2017). Yet functional cross-border flows themselves appear to vary. For example, van Houtum and van der Velde (2004) show that the mobility of goods has increased more than the mobility of labor under liberalized European policy. Consistent among the definitions for functional integration is that it consists of socioeconomic interaction in the form of flow or exchange.

‘Institutional integration’ has been defined, or its definition implied, in a broader variety of ways. The concept of an institution in social science varies, but a widely used definition is that of the ‘rules of the game’, including formal and informal laws and regulations, norms, and codes that shape interactions (North, 1990). Under this definition, institutional integration could refer to a number of diverse concepts and metrics. In practice, ‘institutional integration’ has been used to describe cooperation between public and public-private representatives of cities, metropolitan areas, or regions (Matthiessen, 2004), any ‘potentially cooperative’ interactions between formal actors (Sohn et al., 2009), the development of formal governance structures (Reitel, 2013), the coordination of regulatory or juridical structures (van der Broek & Smulders, 2015), the creation or formalization of cross-border administrative or cooperative actors or bodies (Blatter, 2003; Engl, 2016), or common or shared linguistic or cultural identities, norms or routines (Paasi, 2012; Harrison & Growe, 2015; Capellano & Makkonen, 2020; Bakry & Growe, 2021). Most empirical cross-border research examining institutional integration has focused exclusively on formal institutions and interactions that are generated by actors, particularly those generated through EU-incentivized cross-border initiatives. They evaluate either the relationships between a specific subset of formalized actors or the level to which regulatory and legal frameworks have been coordinated (Buch et al., 2009; Sohn et al., 2009; Reitel, 2013).

There is a crucial lack of clarity concerning whether the defining element of institutional and functional integration is the subject of integration or the process of integration. If institutional and functional integration are defined by the process through which they occur, then institutional integration represents interactions generated by formal, actor-driven processes (e.g. a political mandate) and functional integration represents ‘market-driven’ or *de facto* interactions. If defined by the subject, then institutional integration represents interactions that occur between or involve the formal and informal laws and regulations, norms and codes that govern behavior. Functional integration then represents interactions involving economic factor flows.

This distinction is important, because some interactions would be considered 'functional' under the former method and 'institutional' under the latter. As an example, the emergence of one dominantly-used language in business or governance in a multilingual border region could be considered a form of functional integration if the process is the defining factor (as it could emerge *de facto*), or as a form of institutional integration if the subject is the defining factor (as unofficial choice of language represents an informal institution).

A second lack of clarity concerns the use of formal actors – organizations – as proxies for institutional integration. Several scholars have argued that this conflates institutions with organizations, two concepts that should be distinct (Farole, Rodríguez-Pose & Storper, 2011; Bathelt & Glückler, 2014; Zukauskaitė, Trippl & Plechero, 2017). To some extent, it can be argued that organizations are a representation of institutions, as organizations are constructed in and reproduced by social environments. Yet organizations are also actors with agency. They can be formed in order to perpetuate or to challenge existing institutional contexts, or they may not engage with them at all (Zukauskaitė et al., 2017).

Given this context, we adopt the following definitions and operationalizations. First, we define cross-border integration as the intensity of interactions occurring across the border. The presence of differentials, divergence and convergence between the territories of the border region underpins much of the political and economic impetus for integration efforts, as well as influencing different forms of integration. However, as the research investigates how integration relates to the presence of differentials and the broader context of convergence/divergence, we distinguish these two concepts. Second, we distinguish functional and institutional integration on the basis of the subject of integration rather than the process of integration. Therefore, functional integration consists of factor flows or exchange, and institutional integration consists of interactions involving formal or informal institutions.

The paper examines integration between a subset of formal institutional actors: organizations that are engaged in promoting economic development in the case study area. Economic development organizations are of particular relevance in the study of cross-border integration. A significant portion of these actors are domestic public entities representing local and regional political jurisdictions, meaning that these constituencies' interests are prioritized above objectives of European cohesion. Because they are engaged in economic development promotion, these organizations are responsible for intermediating, responding to, and strategizing regarding both functional integration and the presence of differentials on either side of the border. These organizations have explicit, if varied, objectives regarding convergence of economic conditions in the border region. For some, the border may represent a resource to be exploited; for others, it may represent a threat to their economic health, or both simultaneously (Chilla & Evvard, 2013; Decoville et al., 2013; Sohn, 2014). As such, integration between these organizations represents a form – one form – of institutional integration that interacts uniquely and intensively with questions of differentials and convergence across borders.

Several papers have studied networks between organizational actors in cross-border regions. But these give a particular focus to organizations that represent cross-border interests (e.g. governance or advisory entities with representatives from both/all sides of a border), and/or to topics that are not inherently defined by tensions around convergence, differentials, and functional integration (e.g. the provision of cross-border transport¹) (Dörny & Walther, 2015; Svensson, 2015;

¹ The presence of socioeconomic differentials is, of course, relevant to cross-border cooperation on topics like public infrastructure or public transport. However, economic development is unique in that there are situations in which organizations on one side of the border can clearly benefit from strategically maintaining or perpetuating differentials.

Dörry & Decoville, 2016; Hippe, Bertram & Chilla, 2022). Economic development organizations, however, must engage with these tensions. For this reason, they deserve particular attention.

We therefore investigate patterns of formal and semi-formal cross-border networks between economic organizations in the case study region and compare them to patterns of functional integration. We operationalize functional integration as cross-border commuting flows, due to data accessibility, and use descriptive socioeconomic and population data to establish context. In addition to using social network analysis techniques to establish and analyze patterns of institutional integration between organizations, we use qualitative interviews with stakeholders to identify potential drivers of this integration and to understand how informal institutions, including culture and norms, influence network formation.

Methodology

Case selection

We use a mixed-methods case study of the Upper Rhine region, using the boundary of the Upper Rhine Conference, a multilevel cooperative governance entity that covers two French départements, four German regions, and five Swiss cantons (Bakry & Growe, 2021). The Upper Rhine provides a critical case for investigating relationships between cross-border institutional and functional integration, particularly regarding questions of economic development. Through long-term, intensive efforts, the Upper Rhine has a history of successful cross-border coordination and extensive cross-border institutional and organizational infrastructure (Pupier, 2020). Furthermore, the region has a high degree of functional integration in terms of commuter flows, advanced physical cross-border infrastructure, and is economically strong as a whole (Walther & Reitel, 2013).

However, while the Upper Rhine represents an ‘advanced’ border region, differentials persist (see Fig. 2 & 3). The cost of housing, average salaries and incomes, industrial specializations, and in- and out-commuting patterns vary across the Upper Rhine. Consequently, the Upper Rhine presents a case in which there are exemplary conditions for institutional and functional integration, but these are still likely to be shaped by the presence of economic differentials. Integration outcomes that occur should therefore hold significance for the general problem of cross-border integration (Flyvbjerg, 2006).

Evaluating functional integration

We use cross-border commuting flows to measure functional integration. Although functional integration can have multiple (and sometimes contradictory) facets, of which commuting flows are only one, strong commuting flows do indicate a form of functional integration. They represent integration of cross-border labor markets, a particular issue of concern for organizations seeking to promote the development of firms and jobs in their region. To provide context, we also present indicators capturing socioeconomic conditions – and their variability – in the Upper Rhine.

Evaluating organizational and institutional integration

We use social network analysis tools to quantitatively and descriptively evaluate patterns of relationships between economic development organizations in the Upper Rhine. The network

analyzed consists of 1594 unique links between 357 nodes, and is a static capture of data gathered between April 2020 and April 2022.

Nodes in the database represent formal organizations involved in fostering economic development in the Upper Rhine. They include local and regional public economic development agencies, organizations that advocate or provide intermediation for industries or trade, public and public-private entities whose primary mission is supporting small businesses and startups, universities, research institutions, technology transfer centers, networks for the exchange of research or technology, cross-border organizations with economic development promotion as part of their missions, organizations that promote and support innovation, and organizations that serve as intermediaries for workers and employers. These categories reflect organizations identified in literature on regional institutional environments and their effect on economic development (Cooke & Morgan, 1993). All nodes represent formal organizations – they are either public or incorporated entities. Networks or joint projects were included only if they had their own independent governing board and budget. Node headquarters are located either within the Upper Rhine region, or their service area includes part or all of the Upper Rhine. Organizations operating at the national level were only included if their headquarters were located within the case study region.

Specifying the boundaries of a network is a core problem in social network analysis. For meaningful empirical analysis, it is necessary to correctly define which nodes and what kinds of relationships between them are included (Galaso & Kovárik, 2018). To compile an initial list of node entities, we began by conducting a web search using search terms for the organizations of interest within the territorial boundary of interest. We then compiled a database of these entities' partnerships and the affiliations of their board members, using web-scraping of publicly provided data. In an iterative/snowball approach, we then checked these partner entities for eligibility to be included in the database.

'Partnerships' between nodes in the database represent a variety of relationships: founders, members of the organization, sponsors, partners in general or project-specific aims, and shared members on governing boards. The intent is to capture relationships between organizations that could represent communication and coordination between them. Consistent among these relationships is the organization's choice to publish their existence on their website, in other public materials, or to disclose it in a survey. We assume that these links are bidirectional – in other words, if institution A lists institution B as a partner, the partnership is assumed to be reciprocal even if B does not list A as a partner.

Although this definition of link is broad and likely includes links with different levels of importance and influence, alternative methods for weighting or categorizing links would either fail to capture distinctions or be flawed themselves. For example, while interlocking directorates might differ in their effect from 'partnerships' named on websites, there is so much potential variation in the actions of a board member or an unspecified partner that differentiating them does not add to the analysis. Another alternative would be to rely solely on survey data, as done in other network studies, but this method requires very high rates of response (in order to meet the needs of a social network analysis) and can suffer from roster-recall issues (the possible inability of respondents to accurately remember and describe all links) (Kossinets, 2006; Ter Wal & Boschma, 2008). This method thus sacrifices specificity but gains comprehensiveness.

Data on partnerships was gathered using three methods. First, organization websites were scraped for mentions of other organizations. Second, a supplementary survey of 105 nodes (those without published information on their boards and/or partners) was sent via email, with a response rate of 42%. Finally, representatives of 26 nodes participated in interviews; the question

about partnerships was repeated in the interview. 89% of the nodes in the network provided information on their partnerships via at least one of these methods. This high rate of response, combined with the assumption of reciprocal links, produces a sufficient real complete network estimate (Kossinets, 2006; Dörry & Walther, 2015).

We examine node centrality and participation, identify clusters using algorithm detection and compare these to regional affiliations, and compile descriptive statistics about cross-border links. We use R library *igraph* and Python library *NetworkX* to conduct these analyses, and open-source software program *Gephi* to visualize the network.

Network description

Nodes in the network have a set of attribute data, including their ‘type’ category, which defines their general activities, their country and region, and the scale at which they operate. We use regional and national affiliations to examine cross-border integration patterns in the network. Regional geographies are defined by administrative boundaries (*canton*, *département*, and regional planning area – *Planungsregion*). These boundaries reflect roughly comparable organizational structures for economic development functions across the three countries of the Upper Rhine.

We also test these boundaries against relational communities identified in the network data. We use the *spinglass* algorithm to detect the existence of communities (also referred to as clusters or modules) within the network, as it produces the highest modularity score for our data and is well-suited to small-*n* networks (Yang, Algesheimer & Tessone, 2016). Comparing the location and content of algorithm-detected communities can indicate whether organizations are likely to network with other nodes based on physical proximity, political-territorial proximity (e.g. organizations that serve the same jurisdiction), or similar roles or functions.

Comparing the algorithm-detected communities with regional networks reveals three findings with relevance to questions about cross-border economic development networks. First, the consistent grouping of a majority of regional nodes within a single algorithm-detected community indicates that network-defined communities do correspond closely with those defined by regional jurisdictional boundaries. The *spinglass* algorithm detected nine distinct communities in the Upper Rhine network. At least 75% of each region’s node were placed in the same community. Two regions were grouped with a (domestic) neighbor, with most of *Südpfalz*’s nodes grouped with *Mittlerer Oberrhein*, and most of *Haut-Rhin*’s with *Bas-Rhin*.

The community with the most diverse representation of different regions consisted of nodes located at the trinational border area near *Basel*, indicating close cross-border organizational integration. Finally, it is notable that cross-border organizations (those representing the interests of multiple countries) were distributed throughout six of the nine communities. This suggests that cross-border organizations are embedded within domestic regional networks, rather than forming their own community of cross-border entities.

Qualitative methods

To investigate potential mechanisms driving patterns of organizational and institutional integration and shaping their relationship with patterns of functional integration, we supplement the social network analysis data with qualitative interviews (Reid & Smith, 2009). 30 nodes were approached for interviews based on three criteria (holding highly central positions in an initial analysis of the network, representing public actors with regional service areas, and/or providing

for overall diversity in geography, scale, and type among the interviewee pool). Between August 2020 and April 2022, we conducted 26 semi-structured interviews between 30 and 120 minutes in length with representatives of organizations in the network.

In the interviews, we asked organizational representatives to identify and describe their organization's partnerships, to explain or theorize why and how partnerships emerged and why they might vary between areas, and to explain what outcomes they saw emerge from these networks. Interviews were transcribed and responses categorized by both interview question and by a set of content themes corresponding with the research questions (Mayring, 2014). Adding the qualitative interviews helps identify variation in quality, content, and duration of links within the network, allowing triangulation with the data provided by the network analysis and helping to compensate for the broad definition of 'link' (Giuliani & Pietrobelli, 2011).

Findings

Functional integration: Socioeconomic context

The Upper Rhine's population has grown steadily over the past ten years, but this growth is unevenly distributed and appears to be driven by different factors. In Switzerland and Germany, municipalities located in or near urban areas were more likely to have experienced population growth. In contrast, French municipalities' growth appears driven by their proximity to Germany or Switzerland. Both urban and rural areas located near the borders grew, while those further from the border declined (Fig. 1).

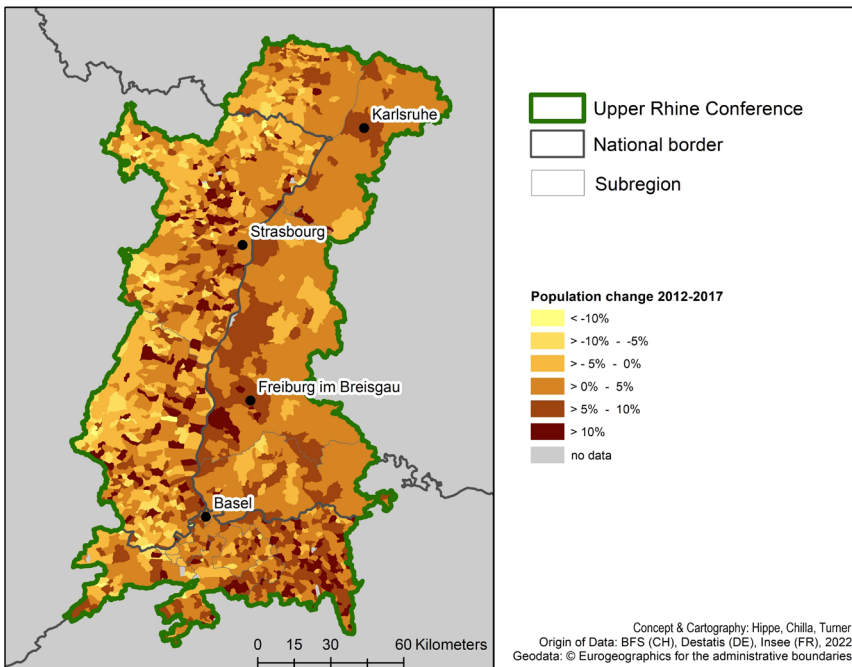


Figure 1. Population change in the Upper Rhine, 2012-2017

Economic productivity varies across the Upper Rhine. Annual gross domestic product per capita ranged from €35,692 in Haut-Rhin to €102,564 in the Basel cantons (OECD, 2022). Growth in GDP was similarly variable, though all regions in the Upper Rhine experienced faster GDP growth than their home countries as a whole. Similarly, different regions within the Upper Rhine have different industrial mixes. Haut-Rhin, Bas-Rhin, Jura, Aargau, and Hochrhein all have high concentration of employment in manufacturing industries relative to their home countries. Mittlerer Oberrhein has a concentration in information and communication industries, Basel-Stadt in technical and scientific services, and Solothurn in logistics and warehousing (AfA, 2018; BFS, 2018; INSEE, 2019).

Functional integration: Commuter flows

Figure 2 shows the number of foreign commuters at the municipal level. The commuter flows in the Upper Rhine reflect both the economic differences described and metropolitan effects. Previous research analyses the salary differences between the involved regions (Chilla & Heugel, 2019). This shows that far more can be earned in the Swiss regions than in the German or French regions. Thus, the areas that attract the most cross-border workers are those that offer higher salaries, such as the Basel region and the Swiss municipalities along the border with Germany (see Fig. 2). French municipalities received fewer cross-border commuters than their closest neighbors in Germany and Switzerland, with the exception of some French municipalities bordering Basel. Existing wage differentials alone do not explain patterns between France and Germany. Furthermore, unemployment rates tend to be higher in Bas-Rhin and Haut-Rhin versus in their neighboring German regions, which could drive commuting from France to Germany (OECD, 2022).

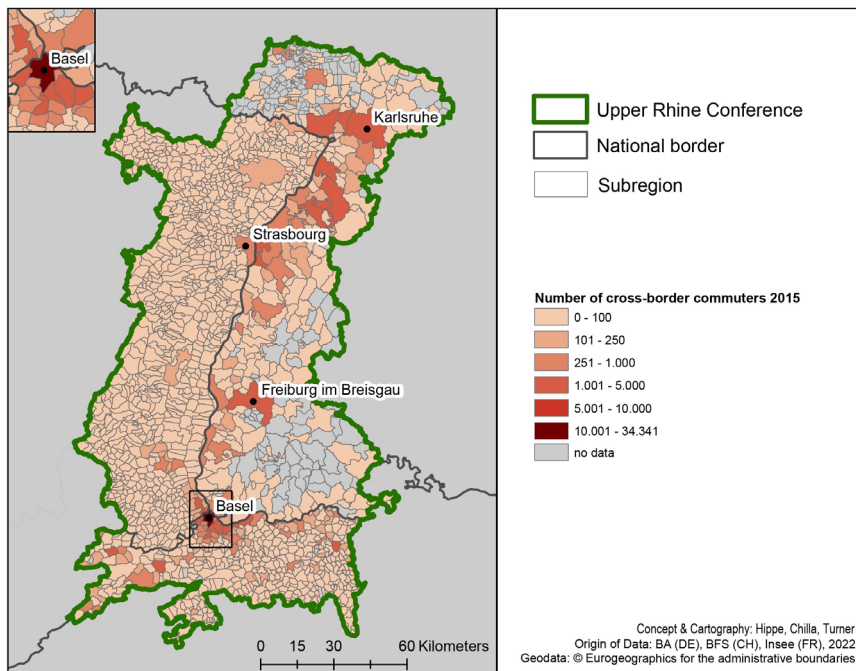


Figure 2. Cross-border commuters at place of work in the Upper Rhine, 2015

Metropolitan areas have higher levels of cross-border commuters, with the municipalities of Strasbourg, Colmar, Haguenau, and Mulhouse (the largest urban agglomerations in Haut-Rhin and Bas-Rhin) receiving the highest numbers of cross-border commuters among French municipalities. In Germany, the areas near Freiburg, Ortenau, Kehl and Karlsruhe received the most cross-border commuters.

Organizational and institutional integration: Network partnerships

For all involved regions in the network analysis, the majority of organizational connections are domestic. The Swiss regions had the greatest percentage of international connections (between a Swiss node and a French or German node), and the smallest percentage of connections between a Swiss node and a cross-border organization. However, this is likely due to the extensive cross-border organizational infrastructure along the French-German border, most of which is established and supported through EU programs. Similarly, while there are comparatively few connections between French and German organizations, connections are dense between French organizations and French-German cross-border organizations, and German organizations and French-German cross-border organizations.

Organizational connections between Switzerland, Germany, and France do not follow a single clear logic. For example, shared language does not appear to give rise to more cross-border collaboration between two particular countries. Switzerland has more connections with Germany than France, France has more direct or cross-border connections with Germany than Switzerland, and Germany has a similar number of connections with each.

Table 1. Closest domestic and international partner regions by number of links in network

Region	Closest Domestic Partner (number of links)	Closest International Partner (number of links)
Bas-Rhin (FR)	Haut-Rhin (85)	Südlicher Oberrhein (11)
Haut-Rhin (FR)	Bas-Rhin (85)	Basel-Stadt/Basel-Land (6)
Hochrhein (DE)	Südlicher Oberrhein (26)	Basel-Stadt/Basel-Land (14)
Südlicher Oberrhein (DE)	Hochrhein (26)	Bas-Rhin (11)
Mittlerer Oberrhein (DE)	Südlicher Oberrhein (10)	Aargau / Basel-Stadt/Basel-Land / Haut-Rhin (1)
Südpfalz (DE)	Mittlerer Oberrhein (3)	none
Aargau (CH)	Basel-Stadt/Basel-Land (14)	Hochrhein (3)
Basel-Stadt/Basel-Land (CH)	Aargau / Solothurn (14)	Hochrhein (14)
Jura (CH)	Basel-Stadt/Basel-Land (8)	none
Solothurn (CH)	Basel-Stadt/Basel-Land (14)	none

At the regional level, internal connections also predominate, with the exception of Haut-Rhin, whose organizations have more connections with those in Bas-Rhin than they do among themselves. Regions' institutions tend to have the greatest number of non-internal connections with their domestic neighbors, as their closest partner. Table 1 details these relationships.

Regions with major metropolitan areas appear to act as hubs, with many connections to less-metropolitan neighboring regions (Fig. 3). For example, Aargau, Solothurn, and Jura all have Basel as their closest regional partner, but have very few links with each other.

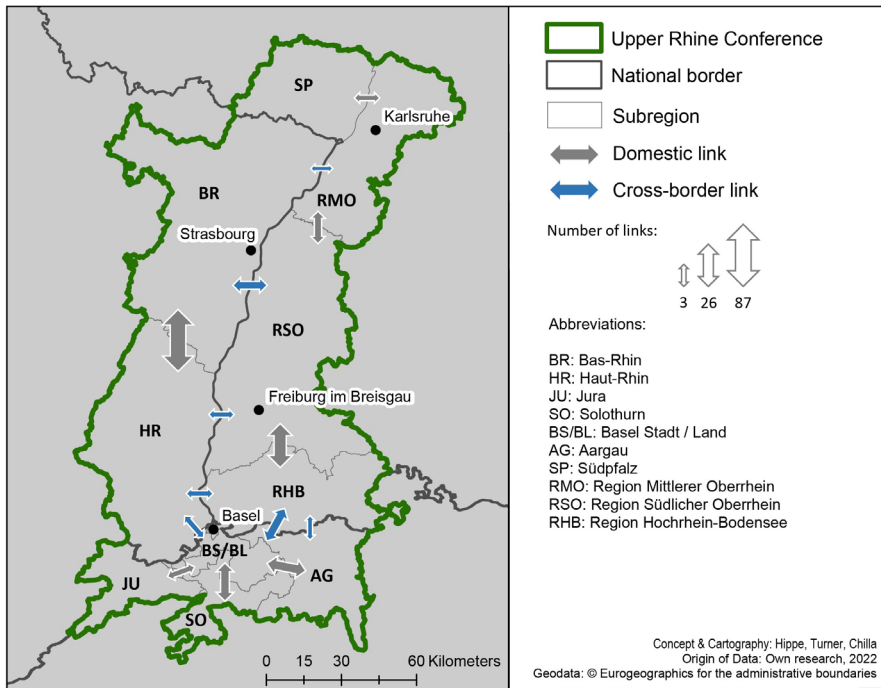


Figure 3. Organizational domestic and cross-border links

Organizational integration: Key nodes and node roles

Node-level measures of closeness and betweenness centrality indicate the ease of access to other nodes and the extent to which a node lies on a path between two other nodes, respectively. In the context of economic development, a more central node might be more likely to participate in or shape joint strategies, have access to more and more recent information, or be able to connect other organizations from neighboring geographies, diverse sectoral or industry backgrounds, or diverse functions and activities.

The category of cross-border organizations (those whose mission focuses on promoting cross-border cooperation) had the greatest average values for betweenness centrality and for closeness centrality. Cross-border organizations also made up eight of the 25 nodes with the highest betweenness centrality and 9 of the 25 nodes with the highest closeness centrality. This suggests that cross-border organizations could play a bridging role between domestic organizations, and that they tend to be connected to a large number of economic development organizations directly.

However, cross-border organizations largely did not serve as hubs for individual communities. Participation coefficients (PCs) and within-community 'z-scores' measure the extent to which a node participates within its own region or cluster, and the extent to which it interacts with nodes in other clusters (Guimerá, Mossa, Turttschi & Nunes Amaral, 2005). Together, these two metrics can be used to identify the roles played by specific nodes within a network with smaller communities, such as the Upper Rhine with its ten sub-regions. Based on their z-scores, nodes can be classified under a typology of 'hub nodes', which are strongly connected within their communities, and 'non-hubs'; each of these typologies is further segmented based on their PCs.

Using PCs and z-scores, ten nodes were identified as ‘connector hubs’, or nodes that are strongly connected within their own community and moderately connected to others. Of these, only one was a cross-border organization. The other nine included two universities, a research institution, a university network, an innovation promotion institution, an industry network organization, and three economic development agencies. All operated at the macroregional or regional level. A significant majority (70%) of the other cross-border organizations were classified as ‘non-hub kinless’ nodes, or nodes that have relatively low levels of connection. These findings suggest that cross-border organizations are unlikely to replace or substitute for domestic organizations in providing regional or local leadership in economic development.

Qualitative data: Stakeholder perspectives

Interview data reveal potential mechanisms that could explain the patterns of functional, organizational and/or institutional integration within the Upper Rhine. Discussing the national level, interview respondents noted two main explanations for why one country’s organizations might have more connections with another’s. Both reflected forms of informal institutional similarity (or lack thereof). A more similar business culture in Switzerland and Germany versus France reportedly facilitated German-Swiss collaboration. A stakeholder leading public cross-border collaboration efforts in the greater Basel area described how German and Swiss decision-making processes were largely conducted during official meetings, while French decision-making processes extended into informal lunch meetings following shorter official meetings (2020, interview). A Swiss stakeholder engaged in economic development felt that the ‘philosophy of how to do business’ differed between Switzerland and the rest of the Upper Rhine, making collaboration more challenging.

In addition, shared language and shared experience with multilingualism were noted by multiple stakeholders as facilitating collaboration between institutions. A representative of a public agency in Basel stated that it was slightly more difficult to work with French partners than German partners because of language barriers. This held true even when compared to Swiss partners from French-speaking Switzerland as the latter were more accustomed to working in multilingual situations in which translation was needed (2020, interview).

Three additional factors shaping integration patterns at the regional level were identified through interviews. First, physical geography and infrastructure affect how regions interact (or don’t) with their neighbors. Travel connections significantly facilitate not only functional, but also organizational ties. A stakeholder from the Lörrach area stated that poor transport and road connections were responsible for their low level of interaction and collaboration with the Bodensee region, despite it being a domestic neighbor (2020, interview). Among subregions in Solothurn, one (Schwarzbubenland) was described by a stakeholder as closely oriented to Basel due to the presence of a tram line, while another subregion at a similar physical distance had very few connections because the Jura mountains formed a physical barrier (2020, interview). This corresponded with the algorithm-identified communities in the social network – the local development agency for the former was grouped with primarily Basel-based nodes, while the latter’s regional planning was grouped with other Solothurn nodes.

Second, economic strategy and orientation shaped interregional relationships, as regions incorporated neighbors in their strategy in order to capture various economic benefits. As an example, Basel-Stadt and Basel-Land have collaborated with Jura on a joint economic development plan since 2020. As per stakeholders from a public agency and a public-private economic develop-

ment institution in Basel, Jura chose to begin orienting the canton's economic development plan toward the Basel region rather than towards its traditional orientation to Western Switzerland (2020, interview). Aargau, a prior partner of Basel-Stadt and Basel-Land for economic development planning, had chosen to take on more of its economic strategy independently of neighbor regions (2020, interview). In a cross-border context, all border cities in Hochrhein advertise their proximity to Basel (particularly the Basel-Mulhouse Airport) and Zürich as advantages to firms and professionals (WFL Lörrach, 2022; WST Rheinfelden, 2022; WRWT, 2022; Grenzach-Wyhlen, 2022; Bad Säckingen, 2022). These strategies corroborate broader empirical findings that smaller and medium-sized cities can leverage economic and infrastructure advantages from larger neighbors, even across borders (Meijers et al., 2017; Sohn, Licheron & Meijers, 2021).

Third is the influence of economic complementarities between regions. Economic complementarities include sectoral or industry mixes, such as precision manufacturing in Jura and medical technology in Basel (2020, interview). They can also include supply chains and investment capital relationships between regions, such as the presence of Swiss capital and suppliers in Hochrhein (2020, interview). Another economic complementarity is that of economically advantageous political differentials; a representative of an economic development agency in Lörrach reported that firms seeking an EU location would choose Lörrach for its proximity to Basel (2020, interview). Finally, 'bedroom communities' that provide neighborhoods for workers with jobs in other cities represent exploitation of differentials in the cost and/or quality of living.

This leads to the fundamental question of how and why organization integration develops between countries and regions. First, many cross-border organizations were developed and persist in response to demands generated by functional cross-border integration, particularly flows of commuters and goods. For example, the EURES-T Oberrhein entity, which advises cross-border workers on the technical and legal aspects of cross-border employment, was created in response to large flows of cross-border commuters in the Upper Rhine region.

The establishment of cross-border organizations and organizational links also led to a self-reinforcing relationship between functional, organizational, and institutional integration: more functional integration creates a demand for more organizational and institutional integration, which in turn facilitates more functional integration (2020, interview).

An additional driver for organizational integration, as well as other forms of formal institutional integration, is the practical need to respond to challenges that cannot be politically bounded. As an example, the construction of infrastructure (particularly transportation infrastructure) was frequently mentioned by stakeholders as an essential area for cross-border cooperation, and specific projects were cited as catalysts for continuing cross-border collaboration. Infrastructure development was of particular interest for both public and private economic development actors, as it facilitated not only cooperative relationships but also continued functional flows of commuters and trade.

Finally, personal contacts between institutions were identified by stakeholders as decisive drivers (2020, interview). Through meetings and collaborations, representatives from organizations met their counterparts on either side of the border and developed a culture for working together. However, familiarity alone was not sufficient to drive organizational collaboration; rather, the development of strong personal relationships was cited as a key element. In describing his institution's collaboration with French and Swiss institutions, a stakeholder from Hochrhein noted that their strongest connections were due to the presence of motivated individuals with whom they had close relationships (2020, interview). As an example, the institution previously had a strong contact in France and had engaged in extensive cross-border work there. Since that person's departure, they were in a phase of rebuilding relationships, and their closest current connections were with the Freiburg area (2020, interview).

Discussion and conclusion

Relating functional, organizational, and institutional forms of integration

This paper investigates the relationship between organizational integration, institutional integration, and functional integration. Data reveals not only patterns and potential drivers of relationships between organizational integration and functional integration, but also provides insight into the complex relationships between organizational integration and informal forms of institutional integration.

Metropolitan hubs both drive functional integration and serve as axes of organizational cooperation, especially among ‘scale-less’ or macroregional organizations (these being universities, research institutes, and cross-border organizations, but also including regional and major cities’ economic development agencies). The major cities of the Upper Rhine act as magnets for cross-border commuting; they also disproportionately host formal organizations. In particular, Basel, Freiburg and Strasbourg host the three largest and most connected universities, headquarters for regional public economic development agencies, and large firms. Networks between these three cities were mentioned as significant to both general and sector-specific economic development (2020, interview).

Functional and organizational integration also appear to have a mutually reinforcing causal relationship in some cases. This is particularly the case for formal cross-border structures, but also the case for domestic organizations.

However, geographic patterns of organizational and functional integration are not identical. Some regions with similar functional flows to a neighboring region have different levels of organizational integration with that neighbor. Some regions with little functional integration due to distance still maintain close organizational ties.

We theorize that these differences in patterns of organizational and functional integration can be conceptualized as patterns of economic complementarity between neighboring regions, and propose a typology of three broad types (Table 2). It reflects how domestic organizations perceive complementarities between regions. Descriptive statistics show that economic differentials exist, and qualitative interview data reflects how stakeholders in domestic organizations attempt to react to these differentials.

The first type of integration pattern, similarities, describes a relationship in which both regions have similar sectoral strengths and similar costs of living. The second, multidirectional complementarity, describes a relationship in which two neighboring regions have distinct but related sectoral and industrial strengths that complement one another in a mutually interdependent way. The third, unidirectional complementarity, describes a relationship in which two neighboring regions have related sectoral and industrial strengths, but one region’s primary economic base is dependent upon that of the other.

The relationship between the regions of Südlicher Oberrhein and Basel could be characterized as one of similarities. Both Basel and Freiburg have significant life sciences industry clusters, are home to major universities, and are cultural centers for their regions. The two metropolitan centers are within an hour of one another by train, and some smaller towns in Südlicher Oberrhein are approximately half an hour from Basel by car. Yet, functional flows between the regions are comparatively less intensive. However, organizational connections are thick, particularly between the universities in Basel and Freiburg. In this case, economic similarities appear to discourage significant functional flows, but encourage organizational networking.

Table 2. Typology of integration patterns

Regional examples	Integration pattern		Integration drivers
	Functional integration intensity	Organizational integration intensity	
Südlicher Oberrhein (DE) – Basel (CH)	+	++	Similarities
Bas-Rhin (FR) – Südlicher Oberrhein Hochrhein-Bodensee (DE) – Basel (CH)	++	+++	Multidirectional complementarities
Basel (CH) – Haut Rhin (FR)	+++	+	Unidirectional complementarities

The relationship between Hochrhein and Basel is an example of multidirectional complementarities. There are differentials in salaries and the cost of living between the two countries, leading to significant flows of workers commuting from the Lörrach area to Basel. However, there are also extensive organizational ties between the two regions, with economic development organizations collaborating not just on cross-border infrastructure and regional projects, but on support for startups and entrepreneurship, education and youth programs, and innovation support. While the city of Lörrach is often viewed as a ‘bedroom community’ for Basel, it is also a regional job center, with more in-commuters than out-commuters. Many of these commuters work in Lörrach’s retail sector, which is dependent upon shoppers crossing the border from Switzerland. But Lörrach also has significant employment in a variety of sectors, many of which are related to Basel’s health care cluster. Lörrach also has a young startup scene that is closely networked with the Swiss startup ecosystem. The area also hosts firms that wish to locate close to Basel but have an EU location, either instead of or in addition to a Swiss location (2020, interview).

Lörrach’s economy is closely interwoven with that of Basel, but it leverages its lower costs of labor and land and its EU regulatory structures to offer complementary economic opportunities that Basel does not. Through these strategies, it creates its own base of industrial productivity and employment. Lörrach is not wholly dependent upon Basel as either a customer for housing and services or for shopping tourism, though both sectors comprise significant employment and tax revenues, and contribute to the large functional flows between Hochrhein and Basel. We describe this relationship as multidirectional complementarity. We argue that multidirectional complementarity both encourages functional flows through the exploitation of differentials between the two sides of the border, and also encourages organizational integration as both regions attempt to develop a diverse cross-border regional economy.

The relationship between Haut-Rhin and Basel is an example of unidirectional complementarity. As with Lörrach, there are high functional flows across the border, as many people who work in Basel choose to live in France due to the low cost of living and the public educational system (2020, interview). However, the French areas near the border with Basel either serve primarily as bedroom communities and shopping destinations (for example, the commune of St.-Louis) or lack sectoral connections to Basel’s economy (for example, the former industrial city of Mulhouse). St.-Louis hosts a second location of Novartis, one of the two major anchor firms of Basel’s life sciences cluster, but it has relatively few smaller firms or spinoffs (LSCB, 2022). According to one stakeholder, this relationship has been changing for St.-Louis in recent years as the commune has begun to find a better ‘economic positioning’ to Basel.

These economic relationships are ‘unidirectional’ insofar as one side of the border (the French side, in this example), is wholly dependent upon the other to demand its services or goods. There is a supply relationship, but the vast majority of demand comes from the other side of the border. Unidirectional complementarity drives functional flows by exploiting differentials, but organizational integration is comparatively weak.

Placing organizational integration within broader contexts of cross-border integration

While the above typology represents mechanisms shaping the organizational-functional relationship, our research also finds that these mechanisms play out in an ‘arena’ shaped by the presence of structural factors. We also find that these structural factors have ongoing, complex, and mutually reinforcing relationships with one another (Fig. 4).

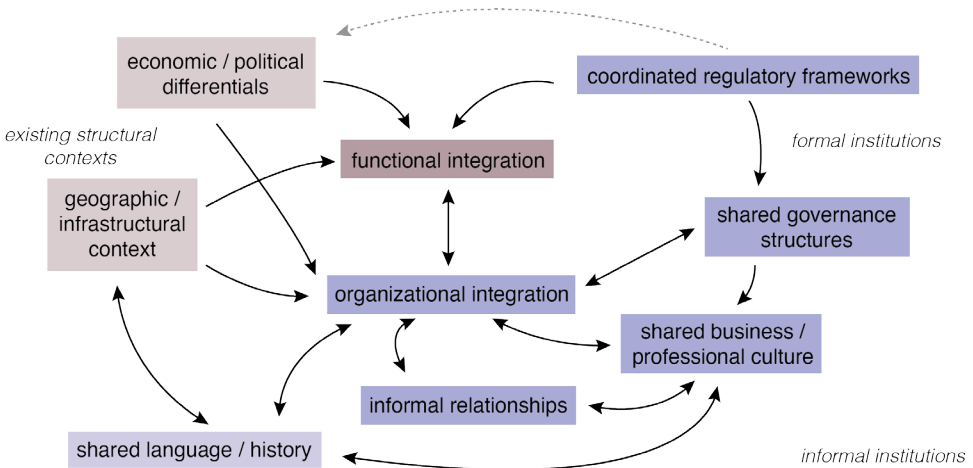


Figure 4. Interactions between forms of integration and structural contexts

Disentangling drivers of integration from forms of integration is challenging. Structural elements like geographic features and infrastructure for transportation and communication underpin interregional and cross-border relationships. These elements affect both functional integration and the existence of informal institutions like cultural norms. Similarly, the presence of economic differentials affects functional integration and organizational integration, which in turn mutually reinforce one another. And economic differentials are themselves shaped by formal institutions. Formal institutions intended to promote cross-border cooperation drive the integration of organizations, in part by facilitating the development of informal institutions like shared business cultures and communication practices, and in part by directly facilitating connections between organizations.

Organizational integration thus bridges both formal and informal institutional integration, and encompasses the broader concept of ‘institution’ that is frequently overlooked in favor of studying more quantifiable formal institutions. Organizational integration can also reflect both ‘top-down’ and ‘bottom-up’ forms of cross-border integration. Formal cross-border structures provide top-down incentives and pathways for it, but domestic organizational interconnections also develop and persist outside of formal frameworks.

In particular, the study of organizational integration between domestic economic development organizations contributes to understanding of how integration processes interact with the presence of economic differentials in border regions. Economic development organizations are affected directly and indirectly by differentials. Several have mandates or incentives to engage with the threats and opportunities that differentials pose. As a result, organizational integration reflects organizations' reactions – especially their perceptions of complementarities between themselves and their neighboring regions.

This paper highlights organizational integration between domestic organizations and compares it to patterns of functional integration. We demonstrate that these patterns differ, and provide evidence that organizations' strategies regarding economic differentials drive the differences. However, our findings also emphasize that this takes place within unique regional contexts shaped by structural factors and influenced by informal institutions.

Why does this matter? Economic development and cross-border cooperation are goals of both domestic and European policy respectively. Top-down policy directives with the broad objective of integration need examine not only the potential diversity in how regions approach integration, but also how their specific institutions and structural factors interact with different forms of integration. For domestic practitioners, understanding both their own situation and its potential complex interactions with their immediate international neighbors is also paramount. Policy and programs in pursuit of these objectives must recognize not only the presence of economic differentials and other structural factors, but also how multiple types of integration interact.

Acknowledgements

The authors thank the reviewers for constructive remarks that significantly improved our paper. Furthermore, we would like to thank Anja Sperr for her support in data collection.

Funding

This research and collaboration were supported by the Berkeley-Erlangen/Nuremberg Research Fellowship, a partnership between the University of California-Berkeley's Institute for European Studies and the University of Erlangen-Nuremberg.

References

- AfA (2018). *Beschäftigung nach Wirtschaftszweigen, Monatszahlen*. Agentur für Arbeit.
- Andersen, D.J., & Prokkola, E. (2022). Introduction: Embedding Borderlands Resilience. In D.J., Andersen & E., Prokkola (Eds.). *Borderlands Resilience. Transitions, Adaptation and Resistance at Borders* (pp. 1-18). London: Routledge.
- Bad Säckingen (2022). *Wirtschaftsförderung*. Bad Säckingen, Stadt. Retrieved from <https://www.bad-saeckingen.de/unsere-stadt/wirtschaft-handel/wirtschaftsfoerderung>
- Bakry, A., & Growe, A. (2021). Analysing cultural networks in cross-border metropolitan regions. The case of the Upper Rhine region (Germany–Switzerland–France). *Erdkunde*, 75(3), 169-190. <https://doi.org/10.3112/erdkunde.2021.03.01>
- Basboga, K. (2020). The role of open borders and cross-border cooperation in regional growth across Europe. *Regional Studies, Regional Science*, 7(1). 532-549. <https://doi.org/10.1080/21681376.2020.1842800>

- Bathelt, H., & Glückler, J. (2014). Institutional change in economic geography. *Progress in Human Geography*, 38(3), 340-363. <https://doi.org/10.1177/0309132513507823>
- BFS (2018). *STATENT Beschäftigte und Vollzeitäquivalente nach Wirtschaftszweigen*. Bundesamt für Statistik.
- Blatter, J. (2003). Beyond hierarchies and networks: Institutional logics and change in transboundary spaces. *Governance*, 16(4), 503-526. <https://doi.org/10.1111/1468-0491.00226>
- Buch, T., Dall Schmidt, T., & Niebuhr, A. (2009). Cross-border commuting in the Danish-German border region - integration, institutions and cross-border interaction. *Journal of Borderlands Studies*, 24(2), 38-54. <https://doi.org/10.1080/08865655.2009.9695726>
- Capello, R., Caragliu, A., & Fratesi, U. (2018). Breaking Down the Border: Physical, Institutional and Cultural Obstacles. *Economic Geography*, 94(5), 485-513. <https://doi.org/10.1080/00130095.2018.1444988>
- Cappellano, F., & Makkonen, T. (2020). The proximity puzzle in cross-border regions. *Planning Practice and Research*, 35(3), 283-301. <https://doi.org/10.1080/02697459.2020.1743921>
- Chilla, T., & Evrard, E. (2013). Spatial integration revisited – new insights for cross-border and transnational contexts. In F., Holstein, S., Zillmer & K., Böhme (Eds.). *Science in support of European Territorial Development and Cohesion. Second ESPON 2013 Scientific Report* (pp. 44-49). Luxembourg: ESPON.
- Chilla, T., & Heugel, A. (2019). Cross-border commuting dynamics: patterns and driving forces in the Alpine macro-region. *Journal of Borderlands Studies*, 37(1), 17-35. <https://doi.org/10.1080/08865655.2019.1700822>
- Chilla, T., & Lambracht, M. (2022). Institutional mapping of cross-border cooperation. INTERREG programme analyses with KEEP data. *European Planning Studies*. <https://doi.org/10.1080/09654313.2022.2058321>
- Chilla, T., Große, T., Hippe, S., & Walker, B.B. (2022). COVID-19 incidence in border regions: spatiotemporal patterns and border control measures. *Public Health*, 202, 80-83. <https://doi.org/10.1016/j.puhe.2021.11.006>
- Cooke, P., & Morgan, K. (1993). The network paradigm: New departures in corporate and regional development. *Environment and Planning D: Society and Space*, 11(5), 543-564. <https://doi.org/10.1068/d110543>
- De Boe, P., Grasland, C., & Healy, A. (1999). *Spatial integration. Workgroup 1.4. Study Programme on European Spatial Planning*.
- Decoville, A., Durand, F., Sohn, C., & Walther, O. (2013). Comparing cross-border metropolitan integration in Europe: Towards a functional typology. *Journal of Borderlands Studies*, 28(2), 221-237. <https://doi.org/10.1080/08865655.2013.854654>
- Dörny, S., & Decoville, A. (2016). Governance and transportation policy networks in the cross-border metropolitan region of Luxembourg: A social network analysis. *European Urban and Regional Studies*, 23(1), 69-85. <https://doi.org/10.1177/0969776413490528>
- Dörny, S., & Walther, O. (2015). Contested 'relational policy spaces' in two European border regions. *Environment and Planning A: Economy and Space*, 47, 338-355. <https://doi.org/10.1068/a130315p>
- Durand, F. (2015). Theoretical framework of the cross-border space production: The case of the Eurometropolis Lille-Kortrijk-Tournai. *Journal of Borderlands Studies*, 30(3), 309-328. <https://doi.org/10.1080/08865655.2015.1066701>
- Durand, F., & Perrin, T. (2018). Eurometropolis Lille-Kortrijk-Tournai: Cross-border integration with or without the border? *European Urban and Regional Studies*, 25(3), 320-336. <https://doi.org/10.1177/0969776417704688>
- EC (2017). *Boosting growth and cohesion in EU border regions*. Communication from the Commission to the Council and the European Parliament. Brussels: European Commission.
- Engl, A. (2016). Bridging borders through institution-building: the EGTC as a facilitator of institutional integration in cross-border regions. *Regional and Federal Studies*, 26(2), 143-169. <https://doi.org/10.1080/13597566.2016.1158164>
- ESPON (2010). *METROBORDER. Cross-border polycentric metropolitan regions*. Final Report. Luxembourg: ESPON.
- Evers, D. (2008). Reflections on territorial cohesion and European spatial planning. *Tijdschrift voor economische en sociale geografie*, 99(3), 303-315. <https://doi.org/10.1111/j.1467-9663.2008.00463.x>

- Evrard, E., & Chilla, T. (2021). European (dis)integration: implications for the Cohesion Policy. In D., Rauhut, F., Sielker & A., Humer (Eds.). *EU Cohesion Policy and Spatial Governance* (pp. 98-114). Cheltenham: Edward Elgar.
- Farole, T. A., Rodríguez-Pose, & Storper, M. (2011). Cohesion policy in the European Union: Growth, geography, institutions. *Journal of Common Market Studies*, 49(5), 1089-1111. <https://doi.org/10.1111/j.1468-5965.2010.02161.x>
- Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, 12(2), 219-245. <https://doi.org/10.48550/arXiv.1304.1186>
- Galaso, P., & Kovářík, J. (2018). *Collaboration networks and innovation: How to define network boundaries*. MPRA Paper, 85108.
- Giuliani, E., & Pietrobelli, C. (2011). *Social network analysis methodologies for the evaluation of cluster development programs*. Inter-American Development Bank.
- Grenzach-Wyhlen (2022). Wirtschaftsförderung. Grenzach-Wyhlen Stadt. Retrieved from <https://www.grenzach-wyhlen.de/de/Wirtschaft-Bauen/Wirtschaftsfoerderung>
- Guimerá, R., Mossa, S., Turtschi, A., & Nunes Amaral, L. (2005). The worldwide air transportation network: Anomalous centrality, community structure, and cities' global roles. *Proceedings of the National Academy of Sciences*, 102(22), 7794-7799. <https://doi.org/10.1073/pnas.0407994102>
- Harrison, J., & Growe, A. (2014). From places to flows? Planning for the new 'regional world' in Germany. *European Urban and Regional Studies*, 21(1), 21-41. <https://doi.org/10.1177/0969776412441191>
- Hippe, S., Bertram, D., & Chilla, T. (2022). The COVID-19 pandemic as a catalyst for cross-border cooperation? Lessons learnt for border-regional resilience. *Europa XXI*, 43, 1. <https://doi.org/10.7163/Eu21.2022.43.1>
- Hippe, S., Bertram, D., & Chilla, T. (2023). Convergence and resilience in border regions. *European Planning Studies*. <https://doi.org/10.1080/09654313.2023.2170214>
- Kossinets, G. (2006). Effects of missing data in social networks. *Social Networks*, 28, 247-268. <https://doi.org/10.1016/j.socnet.2005.07.002>
- LSCB (2022). *Life Sciences Cluster Basel*. Retrieved from <https://lscb.lifesciencesbasel.com/#/>
- Makkonen, T., & Rohde, S. (2016). Cross-border regional innovation systems: conceptual backgrounds, empirical evidence and policy implications. *European Planning Studies*, 24(9), 1623-1642. <https://doi.org/10.1080/09654313.2016.1184626>
- Matthiessen, C. (2004). The Öresund Area: Pre- and post-bridge cross-border functional integration: The binational regional question. *GeoJournal*, 61(1), 31-39. <https://doi.org/10.1007/s10708-005-5234-1>
- Mayring, P. (2014). *Qualitative Content Analysis: Theoretical Foundation, Basic Procedures and Software Solution*. Klagenfurt: Leibniz-Institut für Sozialwissenschaften.
- Medeiros, E. (2014). Assessing Territorial Impacts of the EU Cohesion Policy: The Portuguese Case. *European Planning Studies*, 22(9), 1960-1988. <https://doi.org/10.1080/09654313.2013.813910>
- Medeiros, E. (2019). Cross-border transports and cross-border mobility in EU border regions. *Case studies on transport policy*, 7(1), 1-12. <https://doi.org/10.1016/j.cstp.2018.11.001>
- Meijers, E., Hoogerbrugge, M., & Cardoso, R. (2017). Beyond polycentricity: Does strong integration between cities in polycentric urban regions improve performance? *Tijdschrift voor Economische en Sociale Geographie*, 109(1), 1-21. <https://doi.org/10.1111/tesg.12292>
- North, D. (1990). *Institutions, institutional change and economic performance*. Cambridge: Cambridge University Press.
- Novotný, L., & Böhm, H. (2022). New re-bordering left them alone and neglected: Czech cross-border commuters in German-Czech borderland. *European Societies*, 24(3), 333-353. <https://doi.org/10.1080/14616696.2022.2052144>
- OECD (2022). *Regional Statistics*. OECD.Stat. Retrieved from <https://stats.oecd.org/>
- Paasi, A. (2012). Border studies reanimated: Going beyond the territorial/relational divide. *Environment and Planning A: Economy and Space*, 44(10), 2303-2309. <https://doi.org/10.1068/a45282>
- Pupier, P. (2020). Spatial evolution of cross-border regions. Contrasted case studies in North-West Europe. *European Planning Studies*, 28(1), 81-104. <https://doi.org/10.1080/09654313.2019.1623975>
- Reid, N., & Smith, B. (2009). Social network analysis: Its use in local economic development. *Economic Development Journal*, 8(3), 48-55.

- Reitel, B. (2013). Border temporality and space integration in the European transborder agglomeration of Basel. *Journal of Borderlands Studies*, 28(2), 239-256. <https://doi.org/10.1080/08865655.2013.854657>
- Sohn, C. (2014). Modelling cross-border integration: The role of borders as a resource. *Geopolitics*, 19(3), 587-608. <https://doi.org/10.1080/14650045.2014.913029>
- Sohn, C., Licheron, J., & Meijers, E. (2021). Border cities: Out of the shadow. *Papers in Regional Science*, 101(2), 1-22. <https://doi.org/10.1111/pirs.12653>
- Sohn, C., Reitel, B., & Walther, O. (2009). Cross-border metropolitan integration in Europe: The case of Basel, Luxembourg and Geneva. *Environment and Planning C: Politics and Space*, 27(5), 922-939. <https://doi.org/10.1068/c0893r>
- Svensson, S. (2015). The bordered world of cross-border cooperation: The determinants of local government contact networks within Euroregions. *Regional and Federal Studies*, 25(3), 277-295. <https://doi.org/10.1080/13597566.2015.1043995>
- Svensson, S., & Nordlund, C. (2015). The building blocks of a Euroregion: Novel metrics to measure cross-border integration. *Journal of European Integration*, 37(3), 371-389. <https://doi.org/10.1080/07036337.2014.968568>
- Ter Wal, A., & Boschma, R. (2008). Applying social network analysis in economic geography: framing some key analytic issues. *Annals of Regional Science*, 43(3), 739-756. <https://doi.org/10.1007/s00168-008-0258-3>
- van der Broek, J., & Smulders, H. (2015). Institutional hindrances in cross-border regional innovation systems. *Regional Studies, Regional Science*, 2(1), 116-122. <https://doi.org/10.1080/21681376.2015.1007158>
- van Houtum, H., & van der Velde, M. (2004). The power of cross-border labour market immobility. *Tijdschrift voor economische en sociale geografie*, 95(1), 100-107. <https://doi.org/10.1111/j.0040-747X.2004.00296.x>
- Walther, O., & Reitel, B. (2013). Cross-border policy networks in the Basel region: the effect of national borders and brokerage roles. *Space and Polity*, 17, 217-236. <https://doi.org/10.1080/13562576.2013.817515>
- WFL Lörrach (2022). *Wirtschaftsstandort Lörrach*. Retrieved from <https://www.wfl-loerrach.de/standortportrait/wirtschaftsstandort-loerrach/>
- WRWT (2022). *Drei Nationen wachsen zusammen*. Weil am Rhein Wirtschaft and Tourismus . Retrieved from <https://w-wt.de/de/wwt/dreilaendereck/>
- WST Rheinfelden (2022). *100% grenzenlose Möglichkeiten*. Retrieved from <https://www.wirtschaft-rheinfelden.de/files/www.wifoe-rheinfelden.de/dokumente/Imagebroschuere%20Rheinfelden%202017.pdf>
- Yang, Z., Algesheimer, R., & Tessone, C. (2016). A comparative analysis of community detection algorithms on artificial networks. *Scientific Reports*, 6(1), 1-18. <https://doi.org/10.1038/srep30750>
- Zukauskaite, E., Trippl, M., & Plechero, M. (2017). Institutional thickness revisited. *Economic Geography*, 93(4), 325-345. <https://doi.org/10.1080/00130095.2017.1331703>

