

Abbasihahrofteh, Milad; Brökel, Tom:

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the case of Germany**

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Milad Abbasiharofteh, Tom Brökel

TOWARD A COMPREHENSIVE MEASURE OF SOCIO-CULTURAL DIVERSITY: THE CASE OF GERMANY

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Abstract

The positive impact of socio-cultural diversity on innovation and economic prosperity has been widely discussed. Yet, there is a lack of a clear quantitative indicator of socio-cultural diversity. Most empirical works are limited to small case studies that follow various methods. This gap in the literature calls for a comprehensive measure whereby researchers could assess and compare diversity across cities and regions at the national level. Building on a unique database of registered associations (in German: *eingetragene Vereine*), this study provides a hierarchical categorization of associations based on their field of activities. Applying the Shannon entropy index, the socio-cultural diversity of German regions is measured. The findings indicate a disparity between East and West Germany, reflecting the path-dependent nature of historical events. This article sets an agenda for future research.

Keywords

Socio-cultural diversity – associations – innovation – German regions

Messung von soziokultureller Diversität: der Fall Deutschlands

Kurzfassung

Die soziokulturelle Diversität wirkt sich positiv auf Innovation und wirtschaftlichen Wohlstand aus. Es fehlt jedoch ein klarer quantitativer Indikator für die soziokulturelle Diversität. Anhand eines Datensatzes der eingetragenen Vereine verwendet diese Studie den Shannon-Entropie-Index, um die soziokulturelle Diversität deutscher Regionen zu messen.

Schlüsselwörter

Soziokulturelle Diversität – eingetragene Vereine – Innovation – deutsche Regionen

1 Introduction: Socio-cultural diversity and economic prosperity

The impact of human communities on individuals has been a field of interest among sociologists and economists for a long time. This topic is of particular significance because socio-economical trajectories are, to a certain extent, sub-products of the socio-cultural portfolios of cities and regions (Florida 2002). Building on Jacobs' seminal work (1970), Bettencourt et al. (2014) argue that diversity plays a crucial role in terms of individual productivity and the economic performance of cities. Diversity also facilitates innovation and technological change because it triggers 'creative destruction' and changes economic structures from within (Tzeng 2014).

Recent empirical work indicates that diversity creates more potential growth paths for local economies because industries can more easily diversify through 'related and unrelated varieties' (Frenken et al. 2007). Also, diverse regions include various sectors and industries. This multiplicity paves the way for creating economic landscapes, which are more resilient to exogenous crises. Thus, there is an increasing need to understand how socio-cultural diversity and its complexity facilitate or hinder economic performance (Uzzi and Spiro 2005). Lastly, diversity contributes to entrepreneurship as *'entrepreneurs [...] are in the best position to discover the domains of R&D and innovation in which a region is likely to excel given its existing capabilities and productive assets'* (Foray et al. 2011: 7). In this light, diversity provides more opportunities for recombining actual knowledge and materials in order to trigger entrepreneurial activities (Foray et al. 2011) and innovation (Weitzman 1998) and thus to add to the current economic portfolios of cities and regions.

Socio-cultural diversity takes different forms, which is also highlighted in many qualitative studies (see Table 1). However, this variety does not translate to the quantitative empirical literature, which is dominated by two rather similar indicators, namely: immigration and ethnicity.

The present study seeks to add to this literature by presenting an alternative yet complementary indicator of socio-cultural diversity, which is based on detailed information of associations. It extends the commonly used indicator of association-based social capital by van Deth et al. (2016) approximating the diversity of formalized social activities in regions. Hence, this sheds light on another dimension of socio-cultural diversity. It is available for all regions in a country and for different moments in time. Accordingly, it allows the study of potential spatial interdependencies of socio-cultural diversity, its relation with other socio-economic characteristics of regions, and its development over time, all of which have received little attention so far.

Study	Focus	Indicator	Result
Florida (2002)	US Cities	The number of gays, immigrants and bohemians	Positive correlation between tolerance, diversity, creativity, and prosperity in cities.
Gianmarco et al. (2004)	US Cities	Foreign-born citizens	Positive correlation between the number of foreign-born citizens and increase in wages and in the rental price of housing.
Suedekum et al. (2014)	German labor market	Foreign workers	Positive impact of cultural diversity on native workers' wages and local productivity.
Vermeulen et al. (2012)	Amsterdam neighborhoods	Ethnic diversity	Different effect of ethnic diversity on the homogeneous (more individual) and heterogeneous social networks.
Lee (2010)	53 English cities	Migrants and ethnic diversity	Positive impact of both indicators on city growth. Positive impact of the number of migrants on employment growth.
Sandoval (2013)	Chicago neighborhoods	Racial diversity	Negative correlation between racial diversity and segregation.
Walks & Maaranen (2013)	Toronto, Montreal and Vancouver	Social mix, ethnic diversity and immigrant concentration	Potential positive impact of declining levels of social mix and ethnic diversity on gentrification and inequality.
Nathan (2014)	Patents in the UK	Minority ethnic inventors	Positive impact of minority ethnic inventors on the number of individual patents and potential multiplier effects.
Nathan (2016)	Firm-level data in the UK	Ethnic diversity	Positive diversity-performance links for larger, knowledge-intensive firms, and positive firm-city interactions.

Study	Focus	Indicator	Result
Lee (2015)	UK small and medium-sized enterprises	Migrant business owners or partners	Positive impact of a greater share of migrant owners or partners on introducing new products and processes.
Cooke & Kemeny (2018)	Employer – employee dataset	Immigrant diversity	A direct relation between immigrant diversity and higher wages for workers involving high levels of innovation.
Nathan and Lee (2013)	Firm-level data in London businesses	Migrant managers	Positive impact of diverse management on innovation and entrepreneurship.
Rodríguez-Pose & von Berlepsch (2015)	American cities	Population diversity	Population diversity plays a crucial role in the prosperity of American cities in the long run.

Table 1: Brief overview of key empirical studies of social diversity in urban and regional studies

2 Associations as a proxy for socio-cultural diversity

Registered associations¹ serve as organizations where participants collaborate based on common interests and/or similar goals. In this paper, we use a database of registered associations² as a basis for designing a comprehensive measure of socio-cultural diversity. Between 2012 and 2016 Stifterverband collected data on 668,011 registered associations from local courts in Germany (Priemer et al. 2017). This database includes the full names of associations, their geographical location (address), the district court at which they registered, the date of registration, and, if available, the date of dissolution. In 2016, there were 597,388 active associations and 70,623 dissolved associations. Based on the provided addresses, we assigned NUTS3 classification codes³. For 99% (592,164) of associations this was successful, the rest were removed from the data. Figure 1 demonstrates the number of registered associations in relation to the number of inhabitants in the regions.

1 In German, *eingetragene Vereine*.
2 In this study, we assume that associations are of equal size and homogenous in structure because no data in relation to these factors are provided.
3 *Nomenclature des unités territoriales statistiques* (The Nomenclature of Territorial Units for Statistics).

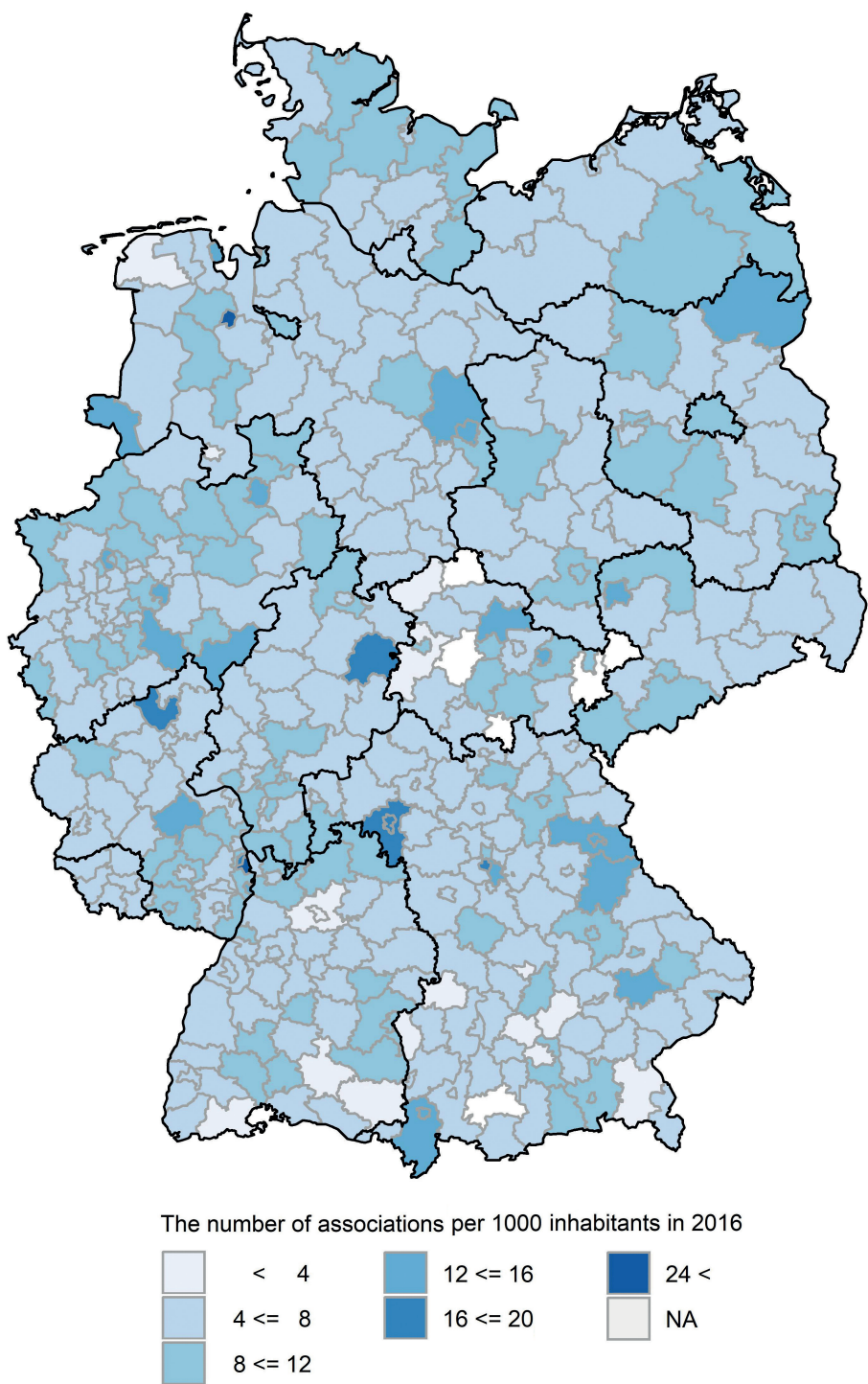


Figure 1: The number of associations per one thousand inhabitants in 2016 (based on Priemer et al. 2017).

In addition to geolocating the associations, the names of the associations are thematically classified. For this, a thematic-hierarchical classification is developed based on the words contained in the 668,011 names of the associations. Firstly, we remove single words in the names that do not contain information for a thematic classification (e.g., ‘associations’) or have merely grammatical functions (e.g., ‘the’). Secondly, to reduce the complexity of the task, the list of relevant words is limited to those that occur in at least two different names. This method helps us to narrow down the number of words from 40,000 to about 8,000. Thirdly, elaborating on ZiviZ (2013), these 8,000 words are grouped thematically, providing 16 thematic groups: (1) economy and business related, (2) social services, (3) sponsoring foundations, (4) research and education, (5) healthcare, (6) social and community, (7) belief, (8) culture and media, (9) sport, (10) music, (11) leisure and socializing, (12) spatial reference, (13) age specific, (14) gender-specific, (15) nature and environment, and (16) others. The 16 main categories are further disaggregated over four hierarchical levels and 817 subcategories (hereafter classes). For example, the word ‘fishing group’ falls into the class ‘fishing’, this belongs to the category ‘outdoor’, which falls under the overall theme of ‘hunting sports’, whose main category is ‘sport’. In case of multiple matches, several classes are assigned to an association. In total, 78.4% of all associations are related to at least one thematic category, i.e. 129,032 associations are characterized either exclusively by words that cannot be classified thematically (e.g., ‘Red-White Erfurt⁴’), or words that do not occur in any other association’s name.

To measure diversity, we use the Shannon (1948) entropy index, which originally comes from information theory and measures the degree of entropy in communication. This index has been implemented as a measure of diversity in a wide range of disciplines ranging from biology to economics (Vozna 2016). Since regions include a various number of associations, it is worth mentioning that the measure needs to be modified in order to provide the ‘effective number’ of associations. Thus, we use the exponentiated form of the measure to express ‘real’ diversity (Jost 2006). Equation 1 represents the measure of socio-cultural diversity, where S_i represents the share of associations active in the i th class in a given region.

$$\exp\left(\sum_{i=0}^n S_i \ln\left(\frac{1}{S_i}\right)\right) \quad (1)$$

3 Results and discussion

Figure 2 summarizes the statistical features of the measure of socio-cultural diversity for German regions. While the statistical distribution of this measure resembles a normal distribution (with a slight positive value of kurtosis and skewness), the geographical distribution of the measure is strongly uneven. Population-rich regions such as Stuttgart, Munich, Berlin, Hamburg, the Rhine-Ruhr and the Rhine-Main areas show a high degree of diversity, whereas in particular central and eastern regions are found to be least diverse. Intuitively, this pattern follows the population distribution of Ger-

4 ‘Erfurt’ is the just the name of the city where the association is located.

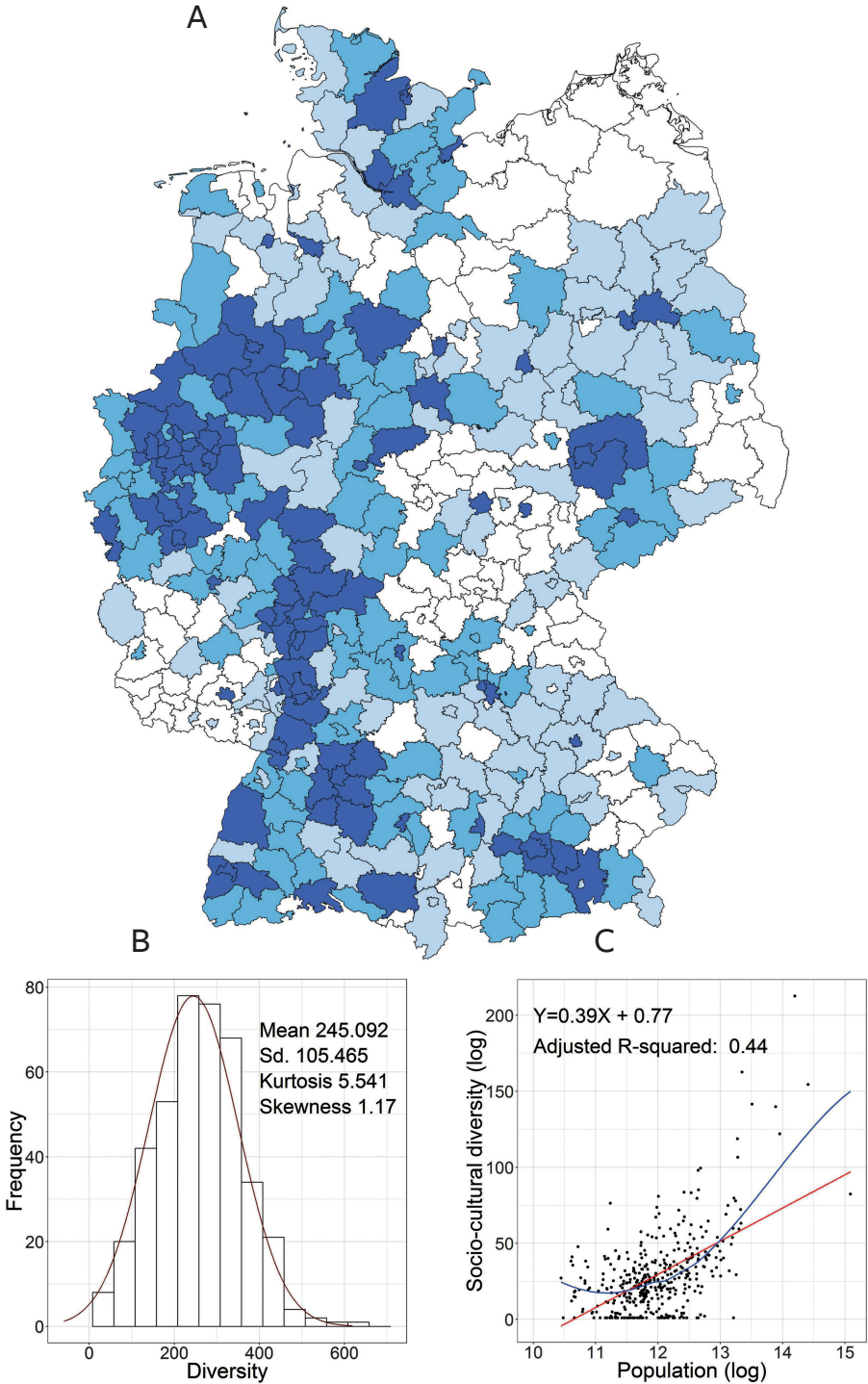


Figure 2: Socio-cultural diversity in German regions where darker colors represent a higher degree of diversity (Panel A), the statistical distribution of the diversity measure across regions (Panel B), and the positive correlation of population and socio-cultural diversity (Panel C) in 2016.

many, where larger cities (in terms of population) include a higher number of associations, which also translates into variation in the topics of associations and, hence, into a higher degree of socio-cultural diversity. Yet, Figure 2 (Panel C) demonstrates that the interplay between region size and diversity is more complex. This finding challenges the results of the study by Bettencourt et al. (2007), which suggest above-linear scaling relations for most socio-economic measures at the city level. The non-linear (blue) fitted line in the regression model indicates that the degree of socio-cultural diversity grows at a faster rate than population (as a proxy of the size of regions) when the size of regions goes beyond a certain threshold. Future empirical studies need to address this issue in order to assimilate the interplay between diversity and population and its critical thresholds.

Our results hint at differences between East and West Germany that are also observed by other socio-economic measures (e.g., see BMWi 2015). We therefore take a closer look at the degree of regional diversity in relation to regions' geographical location and historical background. The database provides the possibility to measure the diversity of German regions over the last 50 years, as we know the dates of associations' registration and deregistration. Empirically, we use a two-tailed t-test⁵ to probe into the relation between diversity and a region's location in East or West Germany. In other words, similar values of t-test (an overlap of the corresponding confidence intervals) imply that regions in East and West Germany have a rather similar degree of diversity. An increase in the dissimilarity of coefficients represents a growing East-West disparity, i.e. regions with higher socio-cultural diversity tend to be in East or in West Germany. Figure 3 (Panel A) shows a significant difference in the degree of diversity between the eastern and western parts of Germany (p-value indicates statistical significance in all years), implying that most diverse regions are located in West Germany. The difference is relatively small in magnitude in the 1950s. Interestingly, the magnitude increases over time, hinting at the impact of various events and changes in association density and the relative diversity of regions. The highest disparity between East and West Germany is observed in the years before the fall of the Berlin Wall. In the early 1990s, the number of associations (Panel B) increases, leading to a sudden increase in the value of coefficients related to East Germany. We also observe a strong increase in association registrations in East Germany in this time. There might be two explanations for this. It may reflect a convergence of East Germany to West German structures. Alternatively, the increase might be due to the re-registration of associations that already existed in East Germany before the reunification. However, the latter effect should be concentrated in 1990 and 1991 while the strong growth seems to extend beyond these years. Future research needs to take a closer look at this issue.

After the fall of the Wall, the number of classes in both parts of the country converges, whereas there is still a large gap between the numbers of associations. This effect might correlate with a lower degree of 'personal initiative' in East Germany, rooted deeply in the cultural differences (Frese et al. 1996), or a slow change in social behavior after the reunification of Germany (Brosig-Koch et al. 2011). Clearly, this needs to be addressed in more depth by future research.

5 A parametric method for examining the difference in the means of two populations.

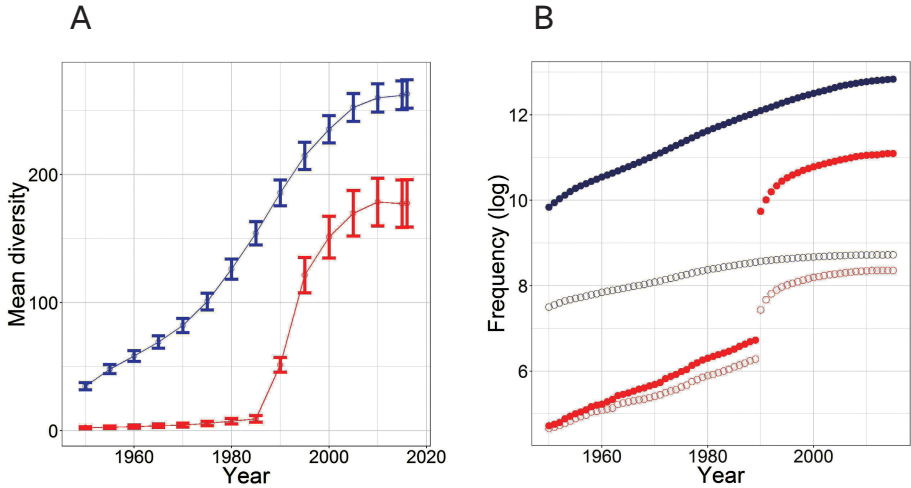


Figure 3: Mean diversity and corresponding 95% confidence intervals for the socio-cultural diversity of German regions (Panel A), and the number of associations (solid circles) and classes (circles) (Panel B) in East (red) and West (blue) Germany over time.

4 Conclusion and setting an agenda for future research

The impact of socio-cultural diversity on the economic performance of cities and regions has been acknowledged in various studies (see Table 1). While studying socio-cultural diversity is of great interest, there are still few quantitative measures that represent the breadth of socio-cultural diversity. In this study, we used a novel database of German associations covering more than 50 years of data. We applied simple text mining techniques and the Shannon entropy index to create and assess the diversity of the socio-cultural portfolios of German regions. Our results indicate that the degree of socio-cultural diversity follows the distribution of population in Germany in general; however it is also characterized by a strong East-West disparity. Lastly, the findings show that socio-cultural diversity and its geographic distribution have a temporal dimension, which we showed to be in part related to distinct developments in East and West Germany.

While the results contribute to our understanding of how German regions differ in terms of socio-cultural diversity, much remains to be done. Firstly, associations vary in terms of size, homogeneity and the geographical distributions of their members. Thus, data on these variables need to be collected in order to enable researchers to track the impact of associations at the regional levels. Secondly, diversity is closely related to socio-economic development and innovation (Florida 2002). Thus, a body of research should be devoted to this issue and systematically investigating whether a higher degree of diversity contributes to innovative activities at the city and regional level. Thirdly, immigration is known to foster socio-cultural diversity (Rodríguez-Pose and Berlepsch 2014, 2015). This calls for investigations of how different waves of immigration to (and from) Germany have influenced the socio-cultural diversity of Ger-

man cities. Fourthly, regions benefit greatly from gaining skilled labor, graduates and star scientists (see, for instance, Buenstorf et al. 2016). To date, the driving forces behind the immigration of skilled labor have not been very well understood. However, Florida (2002) emphasizes the attracting role of socially and culturally diverse regional atmospheres. Using the measure developed in this paper, future studies can investigate whether there is a significant correlation between inter-regional labor mobility and the socio-cultural portfolios of regions. Lastly, our results indicate that socio-cultural diversity sublinearly grows with the size (in terms of population) of regions. This is in line with the ‘the universal laws of growth, innovation, [and] sustainability’ (West 2017). Positioning this study in a wider context of scaling literature provides fruitful insights into how socio-cultural diversity correlates with other factors, providing an analytical framework for policymakers.

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Authors

Milad Abbasiharofteh (*1985) studied urban planning at Yazd University, Iran. In 2013, he graduated from Frankfurt/Main University of Applied Sciences with a Masters degree in "Urban Agglomeration". He is currently a research assistant at the Academy for Spatial Research and Planning (ARL). He is a PhD candidate at Utrecht University. His PhD project revolves around the coevolutionary process between knowledge networks and proximity dimensions.

Tom Brökel (*1978) is Associate Professor of Regional Innovation at the University of Stavanger Business School. He obtained a PhD in Economics from the Faculty of Economics of the Friedrich-Schiller-University in Jena (2008) and his Habilitation in Economic Geography from the Leibniz University of Hannover (2015). His research is focused on the geography of innovation, knowledge networks, the analysis of R&D policy, methods of social network analysis, regional innovation systems, renewable energies, and tourism.