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DUALITY BEYOND DYADS: MULTIPLEX PATTERNING OF SOCIAL TIES AND CULTURAL MEANINGS

Nikita Basov and Julia Brennecke

ABSTRACT

The social and cultural duality perspective suggests dual ordering of interpersonal ties and cultural similarities. Studies to date primarily focus on cultural similarities in interpersonal dyads driven by principles such as homophily and contagion. We aim to extend these principles for sociocultural networks and investigate potentially competing micro-principles that generate these networks, taking into account not only direct dyadic overlap between interpersonal ties and cultural structures, but also the indirect interplay between the social and the cultural.

The empirical analysis utilizes social and semantic network data gathered through ethnographic studies of five creative organizations around Europe. We apply exponential random graph models (ERGMs) for multiplex networks to model the simultaneous operation of several generative principles of sociocultural structuring yielding multiplex dyads and triads that combine interpersonal ties with meaning sharing links.

The results suggest that in addition to the direct overlap of shared meanings and interpersonal ties, sociocultural structure formation is also affected by extra-dyadic links. Namely, expressive interpersonal ties with common third

persons condition meaning sharing between individuals, while meaning sharing with common alters leads to interpersonal collaborations. Beyond dyads, the dual ordering of the social and the cultural thus operates as asymmetrical with regard to different types of interpersonal ties.

The paper shows that in addition to direct dyadic overlap, network ties with third parties play an important role for the co-constitution of the social and the cultural. Moreover, we highlight that the concept of network multiplexity can be extended beyond social networks to investigate competing micro-principles guiding the interplay of social and cultural structures.

Keywords: Meaning sharing; instrumental network; expressive network; social and cultural duality; creative organization; exponential random graph model

INTRODUCTION

A long line of scholars have argued that the cultural is co-constitutive with the social, thereby implying social and cultural duality (e.g., Berger & Luckmann, 1966; Bourdieu, 1984; Mohr, 1998; Pachucki & Breiger, 2010). Studies on organizations have shown that interpersonal networks influence individuals' cultural perceptions, views, and preferences (e.g., Carley, 1986, 1991; Contractor & Grant, 1996; Krackhardt & Kilduff, 1990; Umphress, Labianca, Brass, Kass, & Scholten, 2003). Likewise, scholars have highlighted how individuals' perceptions, views, and preferences affect the structure of their interpersonal networks (e.g., Emirbayer & Goodwin, 1994; Ibarra, 1995; Lizardo, 2006). However, most of the existing works focus on the interplay of the social and the cultural in dyads (e.g., Kilduff, 1990; Krackhardt & Kilduff, 1990; Rice & Aydin, 1991; Umphress et al., 2003), and there is scarce empirical evidence on the role of third parties in sociocultural patterning. Meanwhile, multiple micro-principles guiding the interplay of the social and the cultural may operate simultaneously and may be observed also in network patterns involving more than two individuals. Defining the social as interpersonal network ties, particularly collaboration and friendship, while treating culture as a system of shared meanings (Carley, 1994, 1997; Geertz, 1973; Krackhardt & Kilduff, 1990; Mohr, 1998), this study asks: *What are the generative micro-principles of sociocultural structuring?* To answer this question, we investigate how patterns of shared meaning structures expressed by individuals belonging to the same organizations are related to patterns of interpersonal ties between them.

Following prior research on social and cultural duality that suggests such notions as cultural holes and weak cultural ties (Pachucki & Breiger, 2010; Schultz & Breiger, 2010), we expand on other cornerstone mechanisms revealed

by social network analysis, such as homophily (Lazarsfeld & Merton, 1954; McPherson, Smith-Lovin, & Cook, 2001) and contagion (Borgatti & Cross, 2003; Carley, 1986, 1991; Meyer, 1994), to derive hypotheses on multiple micro-principles of sociocultural structuring. In this, we not only propose the notion of sociocultural homophily/contagion, but also move beyond previous research on social and cultural duality that has mainly focused on the direct overlap of social and cultural structures at the dyadic level, and simultaneously take into account the role of third parties in the emergence of duality. More precisely, we investigate how shared ties with the same third person might give rise to meaning sharing or interpersonal ties between two individuals, thereby creating patterns of sociocultural triadic closure. By doing so, we contribute to the emerging debate on the micro-foundations of organizational networks (Tasselli, Kilduff, & Menges, 2015).

Jointly investigating dyadic and triadic multiplex patterns, we aim to provide a more detailed understanding of how the social and the cultural co-constitute one another in the context of creative organizations. We draw attention to previously overlooked interdependencies between meaning sharing and interpersonal ties and thereby enhance knowledge on the origins of organizational networks as a so far neglected area of study (Ahuja, Soda, & Zaheer, 2012). For instance, particularly in a creative context, collaboration between heterogeneous individuals is assumed to be beneficial (Perry-Smith & Shalley, 2014) but not always observed. Cultural similarities have been shown to give rise to barriers or lock-ins that impede collaboration (Burt, 2004; Srivastava & Banaji, 2011). Inferring how collaborative ties between individuals are influenced by sharing meanings with third parties, we seek to reveal how extra-dyadic cultural similarities shape work-related interactions, thereby potentially affecting work-related outcomes as well. Accounting for the influence of third parties, we evaluate more systematically why certain interpersonal ties are formed while others are not, thereby shaping the properties of the overall network with potential implications for the functioning of the entire organization. Similarly, we expose the role of interpersonal ties to third parties as potential drivers of meaning sharing between individuals, which may lead us to a more precise understanding of how shared meanings come into being in organizational culture. By expanding on core social network theories such as homophily and contagion to describe relations between individual meanings, shared meanings and interpersonal ties, our study more generally adds to understanding cognition in organizations (Lazega, 2014; Umphress et al., 2003) and thus addresses recent calls for cognitive theorizing in organizational network research (Casciaro et al., 2015; Tasselli et al., 2015).

We conducted in-depth ethnographic studies in five self-run creative organizations located in different cities of Europe. These organizations differ from more traditional ones, where interpersonal ties and cultural discourses follow formal organizational structures, goals, and procedures (McEvily, Soda, & Tortoriello, 2014) that may alienate individuals from their personal decisions.

In creative organizations, individuals are typically little constrained by formal regulations. Instead, they are relatively free in their choices of collaborators and friends as well as in the meanings they express. This setting thereby enables us to reveal the generative principles according to which the social and the cultural co-constitute each other without having to account for a variety of formal organizational features.

Methodologically, the distinctiveness of this study lies in, as put by [Mohr \(1998, p. 348\)](#), “folding together [...] cultural meanings and social structures as primary elements within the same research design.” Particularly, we take a formal structural approach both to social relationships and to culture. We trace the content of individuals’ meanings as associations between concepts in individuals’ discourses as done in semantic network analysis ([Carley, 1994](#); [Diesner, 2013](#); [Roth & Cointet, 2010](#)). Further, we evaluate the extent of meaning sharing between individuals as similarities in their structures of conceptual associations. Then, we take a network multiplexity approach ([Rui, Covert, Stefanone, & Mukherjee, 2015](#); [Shipilov, Gulati, Kilduff, Li, & Tsai, 2014](#)) to combine cultural networks of meaning sharing based on similarity of conceptual structures with social networks of interpersonal ties between members of each creative organization (for other approaches also relating cultural similarities and interpersonal ties, yet treating the similarities differently, see for instance [Basov, Lee, & Antoniuk, 2017](#); [Contractor, Eisenberg, & Monge, 1996](#); [Monge & Eisenberg, 1987](#); [Roth & Cointet, 2010](#)). Network multiplexity is defined as the existence of multiple types of relations between network actors ([Shipilov et al., 2014](#)). While the concept is typically applied to investigate the interplay between different types of social networks connecting actors within and between organizations (e.g., [Lazega & Pattison, 1999](#); [Shipilov & Li, 2014](#)), we extend it to investigate the duality of social and cultural structures. We apply exponential random graph models (ERGMs) for multiplex networks ([Lusher, Koskinen, & Robins, 2013](#); [Wang, 2013](#)) to examine sociocultural structure formation in creative organizations as driven by a potentially competitive interplay of multiple micro-principles that yield both dyadic and more complex multiplex network patterns.

LITERATURE BACKGROUND AND HYPOTHESES

The framework of social and cultural duality proposes a view of cultural structures as co-constitutive with social structures. This view emerged from seeing the social world as constructed through interactions ([Berger & Luckmann, 1966](#)) and is in line with an activist perspective on culture as symbols, tastes, ideas, meanings, discourses, norms, and views generated by individuals ([Bourdieu, 1984](#); [Geertz, 1973](#)). Organizational scholars have built upon this

framework for instance to extend knowledge on the origins of structure (Bechky, 2003) and cognition (Umphress et al., 2003) in organizations.

Network-analytical approaches combining culture and networks have elaborated on the above framework showing how culture is linked to social interaction (for an overview see, Pachucki & Breiger, 2010), among others in the context of organizations (e.g., Bechky, 2003; Srivastava & Banaji, 2011). On the one hand, culture is reproduced through interactions and therefore relies on concrete interpersonal ties (Carley, 1986, 1991; Krackhardt & Kilduff, 1990). On the other hand, cultural items such as tastes, ideas and discourses have been shown to affect social structure (e.g., Dahlander & McFarland, 2013; Lizardo, 2006; Yeung, 2005). Finally, culture and social networks have been argued to constitute one another (Breiger & Puetz, 2015; Pachucki & Breiger, 2010).

Following the original suggestion of Geertz (1973), the majority of the above research treats culture as a system of meanings shared between individuals (for an overview of this research, see Mohr, 1998). These shared meanings form the basis for similar ways of perceiving and interpreting the world and condition similarities in individuals' preferences, tastes, ideas, and judgements (Pachucki & Breiger, 2010). Furthermore, it has been shown that shared meanings are exhibited in verbal (written or spoken) expressions of people who belong to the same culture and correspond to certain social relations and social practices (Mohr & Duquenne, 1997; Yeung, 2005). From a sociolinguistic perspective, expressed shared meanings are essentially intertwined with social relations and there is no meaning out of the social context of particular social relations and practices (Wittgenstein, 1953). As shown by structural linguistics, in such expressions structures of associations between words rather than the words themselves correspond to meanings (De Saussure & Hidayat, 1988). Therefore, research that focuses on relations between culture and networks has proposed a structural approach to the content of verbal expressions, capturing cultural meanings specific for a certain social context as associations between words in texts produced by members of a certain social group (Carley, 1994, 1997).

Based on the duality framework, we expect structures of shared cultural meanings traced in verbal expressions of creatives to be co-dependent with interpersonal social networks between them. The latter consist for instance of instrumental ties such as collaboration or expressive ties such as friendship. We hypothesize that the interplay between the social and the cultural in creative organizations gives rise to multiplex patterns including both meaning sharing and interpersonal ties. Our assumption is that these patterns result from different generative micro-principles, which we discuss in the following. It will become clear that in line with the duality framework, we expect interpersonal structures and structures of shared meaning to affect each other, which is reflected in the micro-principles we discuss. Because of this bidirectionality of causation, we express our subsequent hypotheses as expectations of co-constitution between meaning sharing structures and interpersonal structures.

Cultural Homophily and Cultural Contagion

The duality of meaning sharing and interpersonal ties can first be addressed at the dyadic level, that is, with respect to the direct correspondence or overlap of meaning sharing and interpersonal ties. Building on the work by [Lazarsfeld and Merton \(1954\)](#), a large number of network-analytical studies using the notion of homophily has shown that “birds of a feather flock together” ([Heider, 1958](#); [McPherson et al., 2001](#)), also in organizations (e.g., [Dahlander & McFarland, 2013](#); [Ibarra, 1992](#)). In other words, similar individuals are more likely to be connected by interpersonal network ties. We assume that homophily as a micro-principle of interpersonal tie creation also applies to meaning sharing: Ties occur between individuals who share meanings. In line with the social and cultural duality framework, past research has shown that discursive, cognitive, and semantic similarities give rise to interpersonal ties between individuals ([Diesner, 2013](#); [Roth & Cointet, 2010](#)). This micro-principle can be thought of as “cultural homophily” and it is likely to apply to different types of interpersonal ties, such as instrumental or expressive relations (for a review of studies, see [McPherson et al., 2001](#)).

While cultural homophily suggests that shared meanings give rise to interpersonal ties, the inverse process has also been observed. Relational proximity ([Borgatti & Foster, 2003](#); [Rice, 1993](#)) and constructural ([Carley, 1986, 1991](#)) theories suggest contagion via social ties: Studies have demonstrated that instrumental ([Carley, 1986, 1991](#); [Rice & Aydin, 1991](#); [Umphress et al., 2003](#)) and expressive ([Kilduff, 1990](#); [Krackhardt & Kilduff, 1990](#); [Umphress et al., 2003](#)) ties between individuals result in similar meanings, choices, and perceptions. In particular, the emergence of similarities in discourse, interpretations, or meanings has been attributed to strong interpersonal ties ([Erickson, 1988](#); [Granovetter, 1973](#)). Complementing cultural homophily, this principle can be termed “cultural contagion” with regard to the duality of social structures and meaning structures.

Building on the principles of cultural homophily and cultural contagion, we expect meaning sharing and interpersonal ties to overlap. Stated formally:

H1: Pairs of individuals connected by interpersonal ties are likely to share meanings.

Sociocultural Balance

To further extend prior research, we argue that there are not only dyadic dependencies between meaning sharing and interpersonal ties. The proposed micro-principles of sociocultural structuring based on cultural homophily and on cultural contagion are also likely to guide the interplay between social structure and meaning sharing structure indirectly, via the involvement of common

third parties. These micro-principles can give rise to patterns of mixed triadic closure, where meaning sharing ties are combined with interpersonal ties into triadic sociocultural clusters. The first pattern which we discuss with this regard can be termed “sociocultural balance.” There, a person A shares meanings with individuals B and C, who themselves are connected by an interpersonal tie.

Heider’s (1958) balance theory suggests “psychological comfort” as an explanation of triadic closure. It proposes that individuals strive toward consistency when developing attitudes toward or relationships with other individuals, otherwise feeling uncomfortable. Thus, if an individual has two friends who are not friends with each other, either these two become friends themselves or the individual does not remain friends with one or both of them. Mechanisms such as these lead to patterns of triadic closure that are frequently observed in interpersonal networks in organizations (e.g., Agneessens & Wittek, 2012; Lazega & Pattison, 1999).

Reflecting on balance theory, Granovetter (1973, p. 1362) provides an alternative explanation of triadic closure in interpersonal networks based on homophily. He suggests that strong ties, similarity, and triadic closure are related: “[I]f strong ties connect A to B and A to C, both C and B, being similar to A, are probably similar to one another, increasing the likelihood of a friendship once they have met.” Thus, Granovetter assumes that homophily (for instance, based on shared meaning), rather than balance, which does not involve individuals’ properties, may lead to triadic closure in a social network. Transferring the ideas of Granovetter to the interplay between social structures and meaning sharing structures in creative organizations, mixed triadic closure that involves social and cultural ties can be expected as a result of homophily. Interpersonal ties closing triads occur because individuals sharing meanings with the same third person are similar themselves, and as a consequence get connected by a strong interpersonal tie.

Based on the principle described by Granovetter, we expect to observe “sociocultural balance” with regard to the duality of social structure and meaning sharing structure in creative organizations. We hypothesize:

H2: Pairs of individuals sharing meanings with the same third person are likely to be connected by interpersonal ties.

Inverse Sociocultural Balance

Indirect relations between meaning sharing and interpersonal ties may be guided not only by the homophily principle, but by contagion as well. With regard to sociocultural triadic closure, contagion implies that if A is a common contact of B and C, they are likely to grow similar to A and subsequently become similar to each other because of that. That is, a meaning sharing is supposed to be observed between B and C. Therefore, because of contagion,

Fig. 1. Network Patterns Produced by Micro-Principles of Sociocultural Structuring.

individuals embedded in the same social circles may as well get to share meanings reflected by their way to interpret matters and combine terms, thus developing a distinctive common language. Hence, social structure conditions the emergence of a shared culture even between those who are not directly connected with interpersonal ties. In the organizational context, such extra-dyadic effects of contagion were observed among members of a group developing shared cognition (for a review, see Cannon-Bowers & Salas, 2001).

Based on these arguments, we suggest that the interplay between social structures and meaning sharing structures in creative organizations might lead to a second pattern of mixed triadic closure representing the inverse of sociocultural balance. Analogous to the above, we propose to name this pattern “inverse sociocultural balance.” We hypothesize:

H3: Pairs of individuals having interpersonal ties to the same third person are likely to share meanings.

Fig. 1 visualizes the patterns related to our three hypotheses. Importantly, all of the outlined principles may operate simultaneously, giving rise to the overall structure of the network and the patterns it consists of (Contractor, Wasserman, & Faust, 2006). Sociocultural structures may form because of dyadic cultural homophily/contagion or because of (inverse) sociocultural balance, or all three. That is, the different micro-principles and accordingly our hypotheses are interdependent.

DATA AND METHODS

Empirical Setting

Our empirical analysis focuses on five self-run creative organizations located in St. Petersburg, Hamburg, Madrid, London, and Barcelona. The organizations are similar in many ways, providing a profound basis for comparisons. While the formats, genres and techniques of artworks vary from painting, graphic

arts, sculpture, mosaics, and photography to video and sound art, installations, and performances, all of the organizations focus on visual arts. The members share living and/or working spaces, frequently interact, and are engaged in multiple friendships and collaborations. In addition, all organizations are quite small in size: The number of core members varies between six and 13. The key difference between the organizations is their embeddedness in different cultural contexts of European cities. Hence, the five cases also provide a good basis for generalizations.

Data

The data was collected during 2014 in each of the five organizations simultaneously by five teams of professional sociologists via in-depth ethnographic studies following uniform procedures. This study utilizes two main types of this data: social network data and textual data.

Because the organizations do not have formal boundaries, we decided to only include core members in the data collection, that is, those members with stable membership and continuous involvement in the organizational practice. All core members participated in our study resulting in a response rate of 100%.

Following prior organizational research, we collected data on two types of interpersonal networks: instrumental and expressive. Instrumental networks are cognition-based and ties serve as conduits of work-relevant information and support. By contrast, expressive networks are more affect-laden and ties convene social support and values (Ibarra, 1995; Lincoln & Miller, 1979; Umphress et al., 2003). The two nondirected interpersonal networks were captured based on verified sociometric surveys. First, for the instrumental network, we asked individuals to indicate everyone in their organization who they collaborated with at least once a week during six months prior to the study. To capture the expressive network, we asked the participants to indicate everyone in their organization who they feel strongly emotionally attached to. Thus, in line with the theoretical principles discussed above, both network questions captured strong interpersonal ties. The data obtained via surveys was collected using the roster method.

In a second step, we compared all the answers and kept ties confirmed by both individuals in a dyad. Then we verified ties indicated by only one individual in a dyad by showing all organizational members a network diagram drawn based on the survey results, where ties confirmed by both in dyads were solid lines and ties confirmed by only one in a dyad were dotted lines. We asked the respondents if the dotted lines in the diagram, except for their own ties, correspond to existing or to missing ties. We kept only those ties in question, which

were confirmed by more than half of the respondents during the verification procedure.

To capture meaning sharing, we collected texts by each of the individual members. The main method was in-depth interviews with the artists. The interviewers asked up to 50 open-ended questions related to creative work and practice of the organizations from a standard list, such as: “What is art and creativity to you?” “How would you describe your style?” and “What do you do together with other members?” The 58 interviews lasted from 30 minutes to 4 hours. We also collected texts written by members of the collectives from the webpages and blogs, and provided by the informants themselves. These include descriptions of the collective and its vision, annotations of artworks, newspaper articles, poetry, novels, and other, covering various topics related to art and creativity, creative processes and practices of the organizations, artistic scenes, cultural institutions, social, political and economic contexts of various scales, from local to global. Finally, we did 56 visual ethnographies in artistic studios and at exhibitions lasting for about two hours and registering the processes of individual and collective artistic work, informal interaction between members, encounters of the artists with other creative professionals and broader publics, and exhibitions preparations. Longer expressions in conversations witnessed during these observations were transcribed to produce additional textual data. All the collected textual materials were included in analysis. The average size of an individual corpus is between 8,000 and 15,000 words. Although for some members there was more textual material than for others, it is reasonable to assume that this corresponds to the fact that some artists are more vocal than others.

Since our research design accounts for both structures of meanings and structures of interpersonal ties, we combine social and semantic network analyses as called for by Carley (1986, 1991) and Roth and Bourguine (2003). Social network analysis has been widely applied to study creativity and interpersonal relations between artists (e.g., De Nooy, 1999; Uzzi & Spiro, 2005) enabling researchers to evaluate individuals’ social ties and structural positions. At the same time, studying language use by employing semantic network analysis has been argued to be “a powerful way to study the collective action of cultural production in art worlds” (Cluley, 2012, p. 201). Combining the two analytical approaches allows us to simultaneously account for cultural structures and social structures, and to investigate their interplay in creative organizations.

Unravelling Meaning Sharing Using Semantic Network Analysis

Prior studies relating interpersonal network ties to similarities in the content of communication mainly approached the latter as similarities in sets of words individuals use (Contractor et al., 1996; Monge & Eisenberg, 1987;

Roth & Cointet, 2010). Such approaches neglect the ways individuals relate words and thus do not account for variations in the social context and individual interpretations. According to structural perspectives in linguistics (De Saussure & Hidayat, 1988) and philosophy (Wittgenstein, 1953), only a relational account of language provides an insight in meaning, as notions gain meaning only in relations with other notions in particular social contexts. Recent studies statistically prove that terms with similar meanings tend to appear in similar contexts (Sahlgren, 2005; Stanisavljevic, Hasani-Mavriqi, Lex, Strohmaier, & Helic, 2016).

In order to account for context-specific relations between words, we employed co-occurrence-based semantic network analysis (Carley, 1994; Diesner, 2013), like some other authors in this volume (Godart & Claes, 2017; Lee, 2017). We first used Automap software (Carley, Columbus, & Azoulay, 2012) to map each person's semantic network using all texts collected for this person and tracing conceptual associations between word stems (traditionally named "concepts" in this literature) as the words appeared within a certain interval in the corpus of texts produced by the individual. We started with marking stop words irrelevant to meaning structures such as articles, particles, prepositions, and pronouns. Then we applied Porter's stemming procedure to collapse variants of the same word, e.g., singular and plural forms, to their stems by removing suffixes (Porter, 1980), to get concepts – the nodes in semantic networks. Finally, we created an undirected link between each two concepts which appeared at least once next to each other in the individual's texts to produce the individual semantic network. For example, if member A's texts would consist only of the sentence "Oleg organizes exhibitions; Oleg's exhibitions remain popular," the semantic network consists of five concepts, namely *Oleg*, *exhibition*, *organize*, *remain*, and *popular*, and five links – *Oleg–exhibition*, *organize–exhibition*, *Oleg–organize*, *exhibition–remain*, and *remain–popular*. The resulting individual semantic networks ranged in size from 359 concepts connected with 178 lines to 4,420 concepts and 5,389 lines.

Mapping semantic networks using an aggregation of texts produced by an individual in various situations and for different purposes allowed us to capture meanings specific to her across social contexts and topics she chose to address in different texts, instead of imposing certain coding categories on the setting (for arguments in favor of mapping against coding see: M. Lee & Martin, 2015). Consider a naïve example from our empirical data. All individuals in our setting use the concept "art." However, their understanding of art often principally differs. This difference is captured by the relations this concept has with other concepts in the semantic networks we mapped. In the variety of contexts and topics covered by the texts, some individuals would persistently associate *art* with concepts such as *transformation*, *culture*, and *history*, but express very few associations between *art* and concepts like *canvas*, *brush*, and *palette*. Others would have numerous associations of the same concept *art* with the artistic tools and techniques, but almost never link it with the concepts

indicative of role and place of art in society, irrespective of the topics and contexts. To us, this implies that “art” means different things for them. Certain meanings normally correspond to particular social positions. For instance, politically engaged creatives tend to view art as related to social and historical transformations, while for creatives positioned closer to the autonomous pole of the artistic field, so called “pure” artists, the meaning of art is, generally, more about professional techniques and tools.

In a second step, we compared meanings expressed by members of each organization pairwise – in order to map similarities of their meanings as a separate network. The pairs significantly vary in the amounts of concepts shared: the smallest amount of concepts shared by a pair across all the groups is six and largest amount of concepts shared by a pair is 819. Meanwhile, the total amounts of concepts of pairs are quite comparable: the former has a sum of 2,234 concepts and the latter 2,746 concepts. This signals for potentially significant differences in meaning sharing between different pairs of creatives. Taking into account that these two pairs both represent the same organization, variations in meaning sharing may be great even within one organization.

Yet, since our approach to meaning is structural, we were more interested in links than in nodes when evaluating meaning similarities. For instance, if individuals A and B both associate *art* and *transformation* (for example, they reflect on how *art transforms* society), to us they are similar in meanings, while an individual C, who also addresses art and transformation and hence uses the same concepts, but does not associate them (for example, speaks about *pure art* and, separately, about *transformations* of artworks in the creative process), is dissimilar to them. In our dataset, the pair sharing the lowest amount of concepts among all groups has a sum of 2,389 links in total. Of these, only three links are shared between the two. A pair sharing most concepts has a sum of 3,643 links in total, of which 447 links are shared between the individuals. So, variation in links sharing is even greater than in concepts sharing.

Nevertheless, concept sharing was important for us as well, as we were less interested in capturing the extent of similarity in topics (which would imply accounting for the extent individuals share concept links overall) than in how similar individuals are in the meanings they express. Therefore, we focused on resembling topics by considering only the concepts individuals share and evaluating how similarly they associate these concepts.

To account for meaning structures as overlaps in associations between concepts individuals share we produced a matrix of meaning similarities between each pair of individuals for each of the five organizations correlating individual semantic networks pairwise after conforming the nodesets to each other. Hence, the correlated networks contained only concepts that were present in both of the initial networks and links between these concepts were taken from the initial networks.

The correlation coefficients were produced for each pair applying QAP correlation procedure implemented in UCINET (Borgatti, Everett, & Freeman, 2002).

Jaccard coefficients ranged from 0.0215 to 0.6413, whereas all correlations appeared to be significant. Fig. 2 represents links resembling across semantic networks of individuals in two exemplary pairs that exhibit correlation values the highest and the lowest for one of the organizations. We selected the organization where pairs share relatively small amounts of links, hence enabling readable visualizations.

The coefficients were then entered into a meaning similarity matrix consisting of valued meaning sharing ties connecting the individuals. Finally, this meaning similarity matrix was dichotomized by mean line value thus resulting in a network where ties reflect relatively high meaning similarities.

Multiplex Network Analysis Using ERGMs

In order to test our hypotheses, we combine the created networks of meaning sharing with the instrumental and expressive networks consisting of strong interpersonal ties. As a result, two multiplex networks are examined: one including meaning sharing links and instrumental collaborations between individuals and the other combining meaning sharing links with expressive ties captured as emotional attachment of individuals to each other. As theory suggests different potentially competing and mutually reinforcing micro-principles of sociocultural structuring, we aim to simultaneously account for the patterns of direct overlap between interpersonal ties and meaning sharing links, and for more complex, triadic multiplex patterns. Moreover, network structuring may also be guided by the principles that operate within meaning sharing networks and interpersonal networks themselves, rather than involving both of these networks. For instance, according to Heider (1958), triadic closure in interpersonal networks is self-induced, and hence would happen irrespectively of meaning similarity between individuals. To simultaneously account for multiple potentially co-dependent structuring processes we apply exponential random graph models (ERGMs) for multiplex networks (Wang, 2013).

ERGMs implicitly assume a dynamic process of tie formation which corresponds to the framework of social and cultural duality as well as to the micro-principles of tie creation we investigate. These models express the probability of observing a specific network in terms of parameter estimates associated with different network patterns. The patterns considered in the models are determined by theory-based interdependence assumptions regarding meaning sharing and interpersonal ties. In each model we include patterns involving a single type of links and patterns that reflect multiplexity and thus involve links of two types. For instance, we consider patterns of triadic closure characterizing only the interpersonal and meaning sharing networks as well as patterns of mixed triadic closure. Hence, we can derive conclusions about the micro-principles of co-constitution between meaning sharing and interpersonal ties that go over

and above the structuring mechanisms determining the patterning of each network on its own. Moreover, we control for the influence of individual attributes (i.e., gender and age). We estimate the relative contribution of all patterns simultaneously as potentially competing drivers of tie creation while conditioning their occurrence on the likelihood of observing the overall network (Robins, Pattison, Kalish, & Lusher, 2007). All patterns included in our models are summarized and briefly explained in Table 1.

Since we are aiming to draw overall conclusions on the micro-principles that guide the duality of the social and the cultural, we analyze the networks observed in different organizations in an aggregated fashion. For each relation, we combine the adjacency matrices for each organization and create one overall matrix. To take into account that ties are only possible within but not between

Table 1. Overview of Patterns Included in the Exponential Random Graph Models.

Pattern	Visualization	Interpretation
<i>Patterns relating to a single network</i>		
Edge		Baseline tendency to create a tie
Centralization		Tendency for variation in the degree to which artists create ties
Closure		Tendency for artists to form closed triads
<i>Attribute based patterns</i>		
Gender homophily		Tendency for artists with the same gender to create ties
Age difference		Tendency for artists with a large age difference to create ties
<i>Multiplex network patterns</i>		
Cultural homophily/contagion		Tendency for interpersonal ties and meaning sharing to co-occur
Multiplex diversification		Tendency to have interpersonal ties and meaning sharing ties with different others
Sociocultural balance		Tendency for meaning sharing paths to be closed by interpersonal ties
Inverse sociocultural balance		Tendency for interpersonal paths to be closed by meaning sharing ties

Notes:

= generalized tie (either instrumental or expressive or shared meaning)

= interpersonal tie

= shared meaning tie

organizations, we follow [Kalish and Luria \(2013\)](#) and fix ties between organizations by using so called “structural zeros.” This way, ties between organizations are disavowed and not incorporated in the estimation. Essentially, this approach takes all groups and analyzes them in a single ERGM, implying that the modeling results apply to all organizations alike.

Using the XPNNet-software ([Wang, Robins, & Pattison, 2006](#)), we apply Markov-Chain Monte-Carlo maximum-likelihood to estimate the parameter values for each pattern. Following the estimation, we tested the models for their goodness of fit (GOF) based on the procedures suggested by [Hunter, Goodreau, and Handcock \(2008\)](#). We simulated 10 million networks from the fitted models and compared the characteristics of a sample of 1,000 simulated networks to the characteristics of the observed networks. We found that all GOF-statistics are below the threshold criteria recommended by [Robins, Pattison, and Wang \(2009\)](#), indicating a good model fit.

RESULTS

[Fig. 3](#) represents visualizations of the multiplex networks in each organization and [Table 2](#) summarizes key descriptive statistics. The visualizations and descriptives show that even though the groups are in different cultural contexts of Europe, they are quite similar in the structures of their networks.

[Table 3](#) displays the results of the two models we estimated. The Instrumental Model captures the duality of meaning sharing and instrumental ties and the Expressive Model the duality of meaning sharing and expressive ties, respectively. We first present the results regarding the interpersonal and meaning sharing patterns separately before we describe the findings regarding the multiplex patterns that we used to test our hypotheses.

The edge parameter for each network is akin to an intercept term in a regression and not interpreted itself. The patterns relating to the interpersonal networks point toward tendencies for closure in both the instrumental and the expressive network. That is, individuals tend to create interpersonal ties such that they form closed triads. In addition, we find a weak tendency toward gender homophily driving the formation of instrumental ties. In other words, artists of the same gender are more likely to collaborate. Regarding meaning sharing, the modeling results indicate decentralization in the Instrumental Model. Thus, all artists have approximately the same number of meaning sharing ties and there are no particularly central artists in the network. This effect disappears in the Expressive Model where we do not find a significant tendency for or against centralization. Just like interpersonal networks, networks of shared meaning are characterized by triadic closure. The artists' gender and age do not influence their meaning sharing structures.

Fig. 3. Visualizations of the Multiplex Networks in Each Organization.

Table 2. Descriptive Statistics Summarizing the Network Structures in the Five Organizations.

	Mean	SD	Min	Max
Number of individual per organization	9.4	2.7	6	13
<i>Instrumental networks</i>				
Density	51.4	19.0	26.9	80
Average degree	3.9	0.6	3.2	4.9
Minimum degree	1.4	1.1	0	3
Maximum degree	6.6	1.5	5	9
<i>Expressive networks</i>				
Density	53.5	21.7	20	80
Average degree	4.3	1.9	2	7.1
Minimum degree	2.2	1.5	0	4
Maximum degree	6.8	2.5	5	11
<i>Meaning sharing networks</i>				
Density	41.8	8.4	34.5	55.6
Average degree	3.4	1.0	2	4.4
Minimum degree	0.2	0.4	0	1
Maximum degree	6.6	2.5	3	10
<i>Multiplex networks</i>				
Percentage of multiplex ties: meaning sharing – instrumental networks	30.8	6.5	24.3	38.5
Percentage of multiplex ties: meaning sharing – expressive networks	37.9	11.6	20.0	51.9

In support of our Hypothesis 1, the cultural homophily/contagion pattern is positive in both models. Hence, we observe dyadic overlap of meaning sharing with interpersonal ties both for working relations and friendships. The Expressive Model additionally features a negative multiplex diversification parameter, indicating the artists tend not to have expressive ties and to share meanings with separate alters. We further find a positive sociocultural balance parameter, and thus support for H2, in the Instrumental Model but not in the Expressive Model. Meaning sharing paths tend to be closed by instrumental ties, but not expressive ties. Conversely, our results point toward inverse socio-cultural balance (H3) in the Expressive Model but not in the Instrumental Model. Paths of expressive – but not of instrumental – ties tend to be closed by meaning sharing. Hypotheses 2 and 3 are thus both partly supported. Gender and age do not influence the interplay between meaning sharing and interpersonal ties.

Table 3. Results of the Exponential Random Graph Models.

Pattern	Instrumental Model Parameter (S.E.)	Expressive Model Parameter (S.E.)
<i>Interpersonal network patterns</i>		
Edge	-1.863 [†] (1.066)	-1.352 (0.962)
Centralization	-0.558 (0.386)	-0.168 (0.377)
Closure	1.556** (0.336)	0.607* (0.295)
Gender homophily	0.809 [†] (0.416)	-0.204 (0.411)
Age difference	0.028 (0.021)	0.029 (0.020)
<i>Meaning sharing network patterns</i>		
Edge	-0.428 (0.864)	-1.232 (0.923)
Centralization	-0.707* (0.330)	-0.290 (0.376)
Closure	1.016** (0.315)	0.954** (0.302)
Gender homophily	0.627 (0.450)	0.348 (0.419)
Age difference	-0.005 (0.027)	-0.030 (0.034)
<i>Multiplex network patterns</i>		
Cultural homophily/contagion	1.110* (0.501)	0.904* (0.454)
Multiplex diversification	-0.084 (0.059)	-0.164** (0.050)
Sociocultural balance	0.232 [†] (0.134)	0.005 (0.139)
Inverse sociocultural balance	-0.207 (0.152)	0.300* (0.123)
Gender homophily	-0.737 (0.667)	-0.077 (0.659)
Age difference	-0.490 (0.043)	-0.008 (0.043)

Note: Unstandardized coefficients; two-tailed tests reported; [†]*p* < .10; **p* < .05; ***p* < .01

DISCUSSION AND CONCLUSION

Simultaneously accounting for several micro-principles that condition the co-constitution of meaning sharing and interpersonal structures operative in creative organizations, we find evidence of a complex interplay between the social and the cultural.

First, at the dyadic level, cultural homophily and/or cultural contagion seem to work with regard to both instrumental – collaborative – relations and expressive ties, in this case emotional attachment. Even when we account for other patterns, meaning sharing structures and interpersonal ties condition each other directly, leading to patterns of overlap between the two. This finding confirms earlier research (e.g., Kilduff, 1990; Krackhardt & Kilduff, 1990; Rice & Aydin, 1991; Umphress et al., 2003) and extends it by showing that cultural homophily and/or cultural contagion apply to instrumental and expressive ties alike.

Second, along with direct dyadic overlap, the role of third parties for the co-constitution of the social and the cultural appears to be substantial, as the observed patterns of multiplex triadic closure indicate. Surplus to the sociocultural specification of the well-known principles of homophily and contagion, sociocultural balance and inverse sociocultural balance based on the ideas of Granovetter (1973) also explain the emergence of network structures.

Note that Granovetter compares two explanations of triadic closure. One is based on balance theory (Heider, 1958) and states that “If strong ties A-B and A-C exist, and if B and C are aware of one another, anything short of a positive tie would introduce a ‘psychological strain’ into the situation since C will want his own feelings to be congruent with those of his good friend, A, and similarly, for B and his friend, A” (Granovetter, 1973, p. 1362). So, triadic closure occurs because individuals simply tend to create triadic clusters in their social networks; no specific individual-level properties are involved. We observe such closure patterns both in the instrumental and in the expressive networks. The explanation Granovetter proposes as an alternative is an extra-dyadic extension of the homophily principle, which does account for individuals’ properties: “[I]f strong ties connect A to B and A to C, both C and B, being similar to A, are probably similar to one another, increasing the likelihood of a friendship once they have met” (Granovetter, 1973, pp. 1363–1364). For social and cultural duality, the difference between these two explanations is important: The first one explains social structuring purely psychologically, with an inclination of individuals to form triadic clusters, while the second one links social structuring to the properties individuals share (e.g., cultural properties). These findings indicate that both Heider’s and Granovetter’s explanations may hold simultaneously, implying that culture matters for social closure even when the tendency of individuals to form triads is controlled for.

Third, the interplay of the social and the cultural observed as multiplex triads works differently for instrumental and expressive ties. Sociocultural balance is operative when two collaborators share meanings with the same alter, while friendships do not correspond to sharing meanings with the same individuals. On the opposite, inverse sociocultural balance works when two individuals have strong expressive ties to the same third person, while the existence of strong instrumental ties to the same third person does not correspond to high similarity of individuals’ meanings. Hence, the link between the social and the cultural is specific for different types of interpersonal relations.

Due to the nature of our empirical approach we are unable to test for causality at the dyadic level thus hypothesizing about the principles of cultural homophily and cultural contagion in a bidirectional manner. However, as we have shown developing the hypotheses, the two triadic closure mechanisms – sociocultural balance and inverse sociocultural balance, – rely on different causalities. Sociocultural balance works via cultural homophily, when cultural similarity produces interpersonal ties and inverse sociocultural balance operates via cultural contagion, when interpersonal ties produce similarity. Hence, our

results still allow for broader extensions on the ways the social and the cultural impact each other. Applied to larger cliques of individuals, where multiple common third parties are present, inverse sociocultural balance implies that common *friendship circles push individuals to engage in the same culture*. By contrast, the sociocultural balance principle implies that *shared cultural environments stimulate joint work*. This suggests that the social and the cultural stimulate each other inversely across friendship and work. So beyond the dyadic level, where their dual ordering is observed in the direct overlaps of interpersonal ties and meaning sharing, the interplay of the social and the cultural is realized asymmetrically for instrumental and expressive ties.

This is relevant for understanding the micro-foundations of networks in creative organizations. The finding regarding sociocultural balance – and thus cultural similarity – driving instrumental but not expressive tie creation is surprising, because it has been argued in the recent decades that innovation and creativity require variation and combination of difference rather than similarity (e.g., Lee, 2010; Perry-Smith & Shalley, 2014). Thus, in creative organizations one would expect collaboration to be driven by heterogeneity, for instance in order to avoid creative lock-in (Burt, 2004; Srivastava & Banaji, 2011). Our study shows that even in small creative organizations working relationships rely more on similarities in views, as argued within the Bourdieuan tradition (Bourdieu & Johnson, 1993). Similarly, White (1993) has argued that art is a collective endeavor and changes in artistic paradigms are enabled by coordinated action and coherence in styles, statements and artistic ideologies. As a matter of fact, organizational literature has shown that similarity may be desired as it reduces the costs for collaboration, for instance because communication is easier and the exchange of ideas is thus more efficient (Ertug & Gargiulo, 2012). Overall, sociocultural balance implies that organizations and their members need to be aware of how cultural similarity conditions collaborative structures. This may bring about both positive and negative effects on creative exchange.

At the same time, prior literature has argued that emotional attachment between creatives is related to similarity in their views. Struggling with the conservative environment, creatives benefit from friendships and emotional support of each other (Farrell, 2003). Hence, they feel emotional pleasure in finding others with “similar eye” (Elsbach, 2009). Our study suggests that in situations related to emotional attachment, not homophily but contagion seems to drive multiplex triadic clustering. Thus, the structures of emotional ties serve sharing of views and perspectives in creative organizations. While the vast majority of existing studies focuses on instrumental ties and their relationship with the generation and the spread of ideas and diffusion of innovation (e.g., Burt, 2004; Perry-Smith, 2006), expressive ties also need to be taken into account.

The methodological contributions are twofold. First, ERGMs can extend the formal analysis of social and cultural duality relating meaning structure to the structure of interpersonal networks by combining textual and sociometric

data and finding structural configurations that affect the co-constitution of those networks. ERGMs enable taking into account a set of interrelated micro-principles yielding different patterns of sociocultural structuring, and hence testing multiple hypotheses as competitive. Second and related, while the concept of network multiplexity typically refers to the co-existence of different types of social networks between actors, it can also be extended to investigate the duality of social and cultural structures.

To conclude, we acknowledge that the five organizations under study are relatively small and we analyze them in an aggregated fashion. Our findings thus indicate overall trends of micro-principles of sociocultural structuring. Boundary conditions might apply and should be investigated in the future. Furthermore, this study relies on cross-sectional data, which prevents us from tracing sociocultural dynamics. Surplus, we are not able to directly account for causality. Longitudinal data analysis is to fill these gaps. An account for different types of meanings or topics in the meaning similarity links is another direction for future analysis.

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