How do new music genres emerge? Diversification processes in symbolic knowledge bases

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ABSTRACT
Using data on the emergence of music genres from 1970 to 2015, this paper examines the relative importance of related and unrelated diversification processes for symbolic knowledge creation. Modelling 33 urban music scenes from Northern America and Europe as network-based symbolic knowledge bases allows for the testing of whether new genres are related or unrelated to pre-existing knowledge bases. The results show that new music genres spawn mainly from local knowledge sources in the centre of music scenes. However, symbolic knowledge creation rarely happens without contributions of extra-local knowledge. These unrelated diversification processes are grounded in the anchoring of trends and fashions originating elsewhere.

KEYWORDS
symbolic knowledge; related diversification; unrelated diversification; knowledge base; music

INTRODUCTION
How do new music genres emerge and lead to a diversification of music scenes? Do these processes resemble those identified in the contexts of regional industrial, technological or scientific diversification? In recent years, several studies in the field of Evolutionary Economic Geography (EEG) have analyzed the diversification of regional knowledge bases as the emergence of new industries (Essletzbichler, 2015; Neffke, Henning, & Boschma, 2011), technologies (Rigby, 2015) or scientific fields (Feldman, Kogler, & Rigby, 2015; Heimeriks & Boschma, 2014). These studies have focused on whether new activities emerging in a region are related or unrelated to existing regional knowledge bases. Correspondingly, processes of diversification are described as related or unrelated diversification. It has been shown by several studies that processes of related diversification are relatively more frequent than those of unrelated diversification, as regions apparently are more likely to branch into activities that are close to their existing portfolio of activities. Nevertheless, unrelated diversification appears to be central for the creation of new regional development paths (Boschma, 2017; Boschma, Coenen, Frenken, & Truffer, 2017; Content & Frenken, 2016; Tödtling & Tripp, 2018).

Can something be learnt from this literature for the emergence of new art forms, and vice versa? To answer this question, this study transfers concepts and methods from the literature on regional diversification to the analysis of how new music genres emerge from existing urban music scenes. Compared with the existing diversification literature, new music genres correspond to new technologies or industries and symbolic knowledge bases of urban music scenes correspond to regional industrial/technological/scientific knowledge bases. For present purposes, however, these symbolic knowledge bases (Asheim, 2007) are not constituted by their composition of industries or technologies, but by the music genres to which local artists belong.

While related and unrelated diversification processes have been identified in many areas of industries, technology and science, these processes have not been studied in the context of symbolic knowledge, which plays a great role for innovation in creative and cultural industries (Asheim, Boschma, & Cooke, 2011). Like industries based on technological or scientific innovation, these industries also face a constantly shifting landscape of fads, fashions, trends, technological and social changes (Brandeliero & Kloosterman, 2010). Nevertheless, only a few scholars have applied...
concepts of EEG to the analysis of creative industries (Berg & Hassink, 2014), even though there are notable differences between symbolic knowledge-creation processes in creative industries and the creation of analytical and synthetic knowledge creation in science and technology, for instance, a higher dependency on social contexts (Asheim, 2007; Asheim et al., 2011).

These differences may result in a different relative importance of related and unrelated diversification processes for symbolic knowledge creation in creative industries, resulting in the following open research questions:

- Is the emergence of new symbolic knowledge also mostly a result of related diversification?
- In which cases is symbolic knowledge related or unrelated to existing symbolic knowledge bases?

Tackling these questions tests whether the findings on the related and unrelated diversification of technologies and industries also apply to creative industries. It may also contribute to a better understanding of the mechanisms leading to different diversification processes.

To address these questions in this study, local music scenes (Florida, Mellander, & Stolarick, 2010) are modelled as network-based symbolic knowledge bases similar to those used to study the emergence of technologies, scientific knowledge or industries (Essetzbichler, 2015; Kogler, Rigby, & Tucker, 2013; Martin, 2012). In these studies, knowledge bases of regions, sectors or scientific fields characterize the knowledge produced or held by associated actors. The structure of these knowledge bases is mostly illustrated by networks between subunits of knowledge that display accumulations and combinations of these subunits (Krafft, Quatraro, & Saviotti, 2011). Correspondingly, in this study symbolic knowledge bases of music scenes are constituted by the symbolic knowledge produced by local artists and operationalized as network-based knowledge ‘spaces’ (Kogler et al., 2013; Rigby, 2015), from which new symbolic knowledge emerges in the form of music genres.

To construct these symbolic knowledge bases, this study employs the co-occurrences of user-generated tags (Trant, 2008) from digital social data (Poothrhis, Zook, Shelton, Graham, & Stephens, 2016). To capture whether new symbolic knowledge is related or unrelated to existing symbolic knowledge bases, we analyze the nature of those parent genres from which new music genres spawned. The results of this contribution suggest that while the existence, specialization and centrality of parent genres in symbolic knowledge bases are positively associated with the emergence of new symbolic knowledge, extra-local symbolic knowledge also contributes strongly to the emergence of new genres through a process of anchoring (Crevoisier & Jeannerat, 2009).

The paper is structured as follows. The next two sections form the theoretical framework for this study by applying concepts of (un)related diversification to symbolic knowledge creation. They are followed by the methodological section in which the method of constructing music scenes as network-based symbolic knowledge spaces is presented. The two concluding sections present the empirical results and conclude.

**SYMBOLIC KNOWLEDGE CREATION**

In the differentiated knowledge bases approach (Asheim, 2007), which was initially developed to characterize the knowledge bases of regions and actors, the notion of symbolic knowledge refers to knowledge required to create and interpret socially constructed symbols, ideas, habits and norms that trigger reactions in the mind of consumers (Martin & Moodysson, 2011, p. 1188). It is especially significant for creative/cultural industries. It is used to attribute products and services with meaning, aesthetic content and affect and is essential for the creation of sign-value and product differentiation (Asheim, 2007). This is of particular importance in the field of music, as the success of artists is strongly tied to their ability to cater to an audience’s taste (Pinheiro & Dowd, 2009; Zwaan, ter Bogt, & Raaijmakers, 2009). Audiences do not evaluate music merely by its musicological qualities but by the symbolic meaning of language, dress codes, images, social practices or conventions of musical performance that differ between types of music (Lena, 2012).

This stands in stark contrast to technological knowledge, the science-based analytical knowledge and engineering-based synthetic knowledge that is required to discover and apply natural phenomena to human needs (Asheim et al., 2011). Whereas natural phenomena are universal and independent of social or geographical context, symbols are socially constructed by and within social contexts. Consequently, symbolic knowledge is highly context specific and very sensitive to distance-decay effects (Asheim et al., 2011; Martin & Moodysson, 2011; Strambach, 2008). The spatial organization of innovation processes based on symbolic knowledge tends to be localized and linked to local specificities (Martin & Moodysson, 2011; Martin & Moodysson, 2013; Rekers, 2016). The following section explores how these differences to technological knowledge creation may result from a different importance of diversification processes in symbolic knowledge bases.

**THE EMERGENCE OF NEW GENRES: ARE THEY RELATED OR UNRELATED TO EXISTING SCENES?**

Related diversification has been identified as the most common way of how regions develop new activities. Several studies have replicated the results of Neffke et al. (2011) showing that new activities have a higher probability to enter a region when they are related to the existing knowledge base. Pre-existing regional knowledge bases obviously shape the direction of the diversification paths of industrial structures (Boschma, Minondo, & Navarro, 2013; Essetzbichler, 2015), as well as technological (Rigby, 2015) and scientific advancement (Feldman et al., 2015; Heimeriks & Boschma, 2014). As related activities demand similar
capabilities’ (Boschma, 2017), new activities are easier to acquire or develop when they are close to the existing knowledge base in a region.

Recent contributions to the path development literature (Binz & Anadon, 2018; Grillitsch & Trippl, 2016; Mörner & Trippl, 2017), however, emphasize that processes of unrelated diversification may be rarer than related diversification, but not necessarily of lesser importance. In most studies, the notion of unrelated diversification describes situations in which regions diversify by the introduction of new activities that are unrelated to the existing portfolio of industries of a region. Yet, in some studies that look more at the combination of knowledge, it refers to processes in which previously unrelated, dissimilar pieces of knowledge are combined. The latter understanding, however, has not yet been applied to the field of diversification (Boschma, 2017; Boschma et al., 2017). As this contribution tests whether the findings of the existing diversification literature apply also to symbolic knowledge, the former understanding of unrelated knowledge as knowledge that is not present in the existing regional knowledge base is used here.

Unrelated diversification is especially important for regions with limited knowledge bases (e.g., organizationally thin, peripheral or latecomer regions) that are confronted with several challenges when attempting to diversify from it. Their ability to achieve unrelated diversification are often rooted in the ability of regional actors to access, and most importantly, anchor external knowledge from extra-regional sources. (Binz & Anadon, 2018; Jeannerat & Crevoisier, 2016; Vale & Carvalho, 2013). The notion of anchoring refers to the contextualization of external knowledge during which mobile knowledge interacts with local knowledge. Anchoring mobile knowledge that originated elsewhere does not happen everywhere: some regions are better at this than others because they are able to build connections between extra-local and local networks of knowledge circulation (Crevoisier, 2016; Crevoisier & Jeannerat, 2009; James, Vissers, Larsson, & Dahlström, 2016; Jeannerat & Crevoisier, 2016). Even though the high context dependency of symbolic knowledge poses particular challenges for the anchoring process, the notion of anchoring has been applied mostly to industries in which synthetic and analytical knowledge predominate (Binz & Anadon, 2018; Binz, Truffer, & Coenen, 2016; Hermelin, Dahlström, & Smas, 2014; Vale & Carvalho, 2013). This paper, however, will provide insights into anchoring processes in an industry in which symbolic knowledge is most important.

The emergence of new genres as related diversification
Against this backdrop, there are a number of reasons why the emergence of new music genres could be a product of related or unrelated diversification. First, processes of related diversification may be most important for music, as the spatial nature of innovation processes of symbolic industries has been characterized as being very dependent on local forms of knowledge sourcing (Martin & Moodysson, 2011). Being embedded in local contexts is beneficial to the performance of actors in creative industries and helps them to accumulate context-specific knowledge (Andersen, 2013). As the results and success of creative works is highly uncertain, a flexible, project-based organization of work has developed that often manifests spatially in clusters, such as Bollywood (Lorenzen & Mudambi, 2013). Thus, it is highly likely that new knowledge is also related to existing knowledge bases of these localized contexts.

Also, the music industry tends to locate in clusters (Florida et al., 2010), even in the digital age, as cities provide a thicket of local, flexible and volatile interactions of producers, consumers and intermediaries (Hracs, 2015; Tironi, 2012; Watson, 2008). Sometimes, the emergence of new genres can even be traced back to individual neighbourhoods, outside of which new music styles are initially not well understood or even disregarded (Lena, 2012).

Furthermore, places become associated with certain music styles that can shape the direction of further development, as existing narratives or specializations of scenes may incentivize artists to develop new styles alongside them. Johansson and Bell (2009) show for a selection of newly emerged rock genres that these mostly originated from cities with already thriving rock scenes. Another example of this process is provided by the music scene of Manchester, which became associated with a strong post-punk scene in the late 1970s. Some years later, post-punk was mixed with dance music in the emergence of the new genre Madchester, from which, in turn, a thriving acid house/rave scene1449

The emergence of new genres as unrelated diversification
Yet, there are also good reasons for unrelated diversification being the dominant process in the emergence of new genres. First, probably more than scientists or engineers, artists seek to express themselves through their work. Thus, in order to find individual fulfilment or give a voice to the problems and identities of distinct social groups, pioneering artists may be eager to break with mainstream rules and deviate from existing scenes (Cobdenet, Grandadam, Simon, & Capdevila, 2014).

Moreover, it is argued that the intangible nature of music allows its practically limitless geographical diffusion, especially in the age of digital distribution of music files (Hracs, 2015; Leyshon, 2001). In fact, foreign music is increasingly present in most national music charts (Verboord & Brandellero, 2016). By the diffusion of genres through distribution, media and performances, trans-local scenes are formed (Bennett, 2004). The more mobile music becomes, the more relevant anchoring processes may become for the diversification of music scenes. Anchoring refers to the decontextualization of mobile knowledge from its origin and its interaction with new contexts (Crevoisier & Jeannerat, 2009). For instance, the
previously mentioned post-punk specialization in Manchester was apparently spawned by two concerts of the London-based Sex Pistols in 1976. The import punk music and lifestyle inspired several Mancunian artists who turned out to become essential figures of the local music scene in the following years (Botta, 2009). Especially in rap music, processes of local appropriation and adaptation of rap to local contexts can be witnessed. In places devoid of an existing rap scene, new local variants of rap emerge that are closely related to specificities of places (Androutsopoulos & Scholz, 2003; French, 2017). In these cases, the nature of local music scenes apparently played no role for the emergence of new genres. For these reasons, unrelated diversification may play a great role for the emergence of new symbolic knowledge.

From the previous elaboration it follows that there are good reasons for both related and unrelated diversification processes to play a meaningful role for the emergence of new music genres. On the one hand, the high-context dependency of symbolic knowledge calls for related diversification to be more important. Genres may be more likely to spawn in contexts in which they are at least partly understood and appreciated. On the other hand, the high intangibility of music makes it difficult to argue for the validity of the processes that typically promote related diversification. For instance, in technology and science, capabilities are connected to underlying R&D infrastructures, industrial settings or skills formed over long periods of time. To a certain degree, it makes intuitive sense that it is difficult for a region to create new cars when it has previously specialized in clothes. But is this also true for something as intangible as music? Is it really similarly difficult for a music scene to become the birthplace of a new rock music genre when it has been specialized in electronic music? The following sections tackle this question by testing whether diversification processes in urban music scenes are similar to those found in industrial, technological or scientific settings.

**DATA AND METHODS**

The measurement of symbolic knowledge poses several challenges. Due to its context-dependency and subjective nature (Asheim et al., 2011; Martin & Moodysson, 2011), there is no central organization concerned with classifying symbolic knowledge and determining its novelty (Sordo, Celma, Blech, & Guaus, 2008). Technically, every product of creative industries is new. But ultimately, consumers decide whether or not its aesthetic content is novel or valuable to them (Brandellero & Kloosterman, 2010; Stoneman, 2015).

As the main goal of creating symbolic knowledge is to ‘trig reactions in the minds of consumers’ (Martin & Moodysson, 2011, p. 1188), using consumers’ reactions in determining the nature and novelty of symbolic knowledge makes sense. Social media allows one to capture how products resonate with consumers by consumers’ expressions of evaluation, classification and description, which can be searched for via keywords and (hash)tags (Brydges & Hracs, 2018; Reithmeier, Buschbaum, Blitz, & Kanwischer, 2016; Trant, 2008). In addition, on many social media platforms, geographical information is voluntarily produced, either proactively in the form of geographically related tags or passively as geographical footprints of users’ actions (Crampton et al., 2013).

**Constructing symbolic knowledge bases from user-generated data**

Thus, this contribution employs user-generated data from the social music platform last.fm downloaded via the site’s application programming interface (API) that provides geographical content as well as information on consumers’ classifications of pieces of music. Last.fm was established in 2002 in London (UK) and possesses a user base of 50 million profiles. Users of last.fm allow the site to track automatically what they listen to on digital devices, music players or streaming platforms via a small application that records musical metadata. In return, users gain access to personalized profiles, radio stations and recommendations based on their musical preferences (Mauch, Callum, Levy, & Leroi, 2015).

Most important for this analysis, users are encouraged to describe artists with tags. Already in 2007, two million tags were applied by last.fm users per month, resulting in the most frequently tagged artist being tagged about 25,000 times (Lamere, 2008). The five tags most frequently used by last.fm users are displayed publicly on the website.1 Tags mostly refer to genres, but also to general descriptions regarding instruments, gender or geographical origin (Sordo et al., 2008; Trant, 2008). The latter ones were used to create a sample of cities for this study. Cities whose city-related tags (e.g., memphis rap, seattle, south london) were used by more than 1000 users were included in our sample.2 Only cities from North America and Western Europe were included, as analyzing user-generated content written in alphabets other than Latin would have been beyond the authors’ capabilities. Reducing the sample to the Global North was also necessary as 85% of the user base of last.fm is concentrated in the 19 countries most penetrated by last.fm, which are also located in the Global North (Vigliensoni & Fujinaga, 2017). Hence, genres from the Global South are probably underrepresented in last.fm data. Unfortunately, this excludes the rich musical landscape of the Global South from this analysis and may limit the applicability of its results to these contexts. Another problem with digital social data is also present with last.fm data – the user base skews towards a young, male audience with a mean age of 25 years, and 58% of users identifying as male (Vigliensoni & Fujinaga, 2017).

For every tag, last.fm lists the artists most frequently described with this tag (for instance, see https://www.last.fm/tag/rock/artists). We collected data for artists who originated from the sampled cities, were active between 1970 and 2015, and belonged to the top 100 artists of relevant city-related tags or the top 100 of genre-related tags.3 We collected additional data on the five tags most frequently used to describe them, their number of last.fm listeners, and user-contributed biographical data on their
origin and years of activity. Spatial and temporal data were acquired from last.fm when available, but also researched and cross-referenced on other music-related websites, such as discogs.com, allmusic.com, artists’ web presences and Wikipedia. Artists were attributed to a city’s music scene when their location at the time of their first record release belonged to a sample city’s metropolitan area. Artists with fewer than 1000 listeners, genres that were used to tag fewer than 30 artists and tags not referring to music genres were omitted from the database. Spelling variations for artists and tags were consolidated so that eventually the database contained 8769 artists from 33 North American and European cities.

Of course, using last.fm data on music from 1970 to 2015 means that some taggers are not contemporary witnesses to the emergence of new music genres. However, contemporary witnesses are not always the best observers of evolutionary processes. Gradual changes may be too small to notice, while radical changes may be misinterpreted and described in terms of existing knowledge. For instance, the band Black Sabbath, which is commonly understood as one of the founding fathers of Heavy Metal, was described by contemporary music critics as bad copies of the blues acts of the time (Weinstein, 2014).

These data were used to construct symbolic knowledge bases of urban music scenes at five-year intervals, starting from 1 January 1970 (measuring point t1). These symbolic knowledge bases (music scenes) are constituted by the genres that local symbolic knowledge creators (artists) are tagged with. When an artist is tagged with two genres, this implies a co-occurrence of genres. Co-occurrences of genres can be interpreted similarly to the co-occurrences of technologies (Antonelli, Kraft, & Quatraro, 2010; Kogler et al., 2013) or products (Hidalgo, Klinger, Barabási, & Hausmann, 2007; Neffke et al., 2011) in portfolios of economic entities. These have been used to create network-based knowledge spaces that characterize knowledge bases of territories (Hidalgo et al., 2007; Kogler et al., 2013; Rigby, 2015). In a similar fashion, from the co-occurrence data we construct a matrix of n×n genres for each music scene at each measured point in time. From these adjacency matrices, music scenes are constructed as network-based knowledge spaces in which the centrality of each genre in a music scene can be computed.

Measuring new genres and their parent genres
In the focus of this paper stands the emergence of new music genres as examples for symbolic knowledge creation. For present purposes, a new genre is one not used to tag any artist from the database who was established before 1970. Furthermore, it has to show a certain relevance, indicated by it being used to tag at least 30 artists in the database. This is required to reduce noise resulting from genre names being created as an imagination of novelty that benefits artists, press and fans alike (McLeod, 2001).

The year of birth of a new genre is given by the earliest establishment date of all artists tagged with it. In this study, artists who were founded during the four years following the year of birth are called pioneers. This time span is practically oriented at the five-year time interval used to measure symbolic knowledge bases. Even though the speed of diffusion of every genre is different, this time span appeared to be reasonably short to distinguish pioneers from adopters, and reasonably long enough for genres to develop.

The origins of pioneers are understood as birthplaces of genres. To analyze the relationship between characteristics of these birthplaces and new music genres, it is necessary to establish a link between both. Similar to Tanner (2016), we identify for each new genre those genres that pioneers are co-tagged with and have emerged earlier than the new genre itself. These genres chronologically precede the new genres and are related to them at the time of its emergence. Hence, they are called parent genres. Parent genres are linked to the respective time and place of activity of the pioneers who are tagged with them. For instance, when a new genre n is born in year y following the previous measuring point t_n in city c and co-tagged with genre g_c, g_c is a parent genre of n. The characteristics of all g_c of a new genre display the relatedness between the new genre and the music scenes from which it originated. To measure the presence of parent genres in the respective knowledge bases of birthplaces before the emergence of music genres, we use two indicators called local index (LI) and specialization index (SI), which are inspired by the closeness indicator of Neffke et al. (2011).

These indicators characterize new genres by a simple ratio of parent genres meeting a certain criterion. First, the LI of a new genre measures the share of its parent genres that existed in the respective symbolic knowledge bases before its emergence on all its parent genres. Second, the SI of a new genre is the share of its parent genres that have a location quotient > 1 on all its parent genres. The range of both measures is between 0 and 1, whereas low values point to unrelated diversification and high values are signs of related diversification processes.

Another way to measure to what extent a parent genre has accumulated in the symbolic knowledge bases of birthplaces is to analyze their network centrality (Newman, 2013). This allows an examination of whether new genres emerge in the centre or the periphery of symbolic knowledge bases, which points to possible mechanisms behind related diversification processes. While the node strength (sum of weights of a node’s ties) and degree (number of separate nodes tied to the genre) are dependent on the number of artists tagged with a genre, centrality measures such as betweenness (number of shortest paths that pass through the node, tie weights ignored), eigenvector centrality (connectivity to other well-connected nodes, ties weighted), and closeness (inverse total length of paths from the node to all other nodes in disconnected networks with ignored weights following Opsahl et al., 2010) are dependent on the structure of the network and the genre’s position in it. To allow comparability across music scenes with different sizes, centrality measures are normalized when possible.
EMPIRICAL RESULTS

Table 1 lists all genres identified as new genres for this study. Most emerged between 1975 and 1990, but not necessarily because of a diminishing creativity in music. There may be issues with right truncation of the data as the process of establishing naming conventions around genres takes a certain time (Lena, 2012).

To examine whether related or unrelated diversification plays a greater role for the emergence of new genres, first it is of interest whether parent genres existed in the birthplaces of new genres at all. In a second step, we show whether music scenes are also specialized in the parent genres of new genres. A closer look is then taken upon the nature of parent genres. In the next subsection, factors influencing the likelihood of a genre to become a parent genre are analyzed in order to illustrate the process of related diversification. In a fourth step, characteristics of parent genres indicating unrelated diversification processes are examined.

The new genres as identified in Table 1 were pioneered by 661 artists, who were co-tagged with 1604 unique parent genres. Every parent genre was counted only once to avoid bias when multiple pioneers from the same city were tagged with the new genre and the same co-tags. Of the remaining 1604 parent genres, 1079 (67.3%) were present before in the respective knowledge base. These are called local parent genres in the following. The remaining 525 parent genres that were not present in the birthplace before are understood as extra-local. While local parent genres point to the process of related diversification, extra-local parent genres point to the importance of unrelated diversification. On the basis of these data, the relative importance of related versus unrelated diversification for symbolic knowledge creation can be described as a mix of two parts related and one part unrelated diversification.

Of course, a closer look at the processes leading to the emergence of new genres is required. Table 2 provides descriptive statistics of the new genres identified in this analysis. On average, a new genre has 13.59 parent genres. Every parent genre was counted only once to avoid bias when multiple pioneers from the same city were tagged with the new genre and the same co-tags. Of the remaining 1604 parent genres, 1079 (67.3%) were present before in the respective knowledge base. These are called local parent genres in the following. The remaining 525 parent genres that were not present in the birthplace before are understood as extra-local. While local parent genres point to the process of related diversification, extra-local parent genres point to the importance of unrelated diversification. On the basis of these data, the relative importance of related versus unrelated diversification for symbolic knowledge creation can be described as a mix of two parts related and one part unrelated diversification.

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Table 2. Descriptive statistics of new genres.

| Characteristics of new genres | Observed | Mean  | Standard deviation | Median | Minimum | Maximum |
|-----------------------------|---------|-------|--------------------|-------|---------|---------|
| Year of birth               | 118     | 1983.08 | 8.24              | 1981.50 | 1970.00 | 2006.00 |
| Number of pioneers          | 118     | 7.14     | 5.96              | 5.00  | 1.00    | 32.00   |
| Number of birthplaces       | 118     | 3.32     | 2.44              | 3.00  | 1.00    | 15.00   |
| Number of parent genres     | 118     | 13.59    | 10.79             | 11.00 | 1.00    | 56.00   |
| Local index                 | 118     | 0.67     | 0.23              | 0.69  | 0.00    | 1.00    |
| Specialization index        | 118     | 0.52     | 0.23              | 0.50  | 0.00    | 1.00    |
of parent genres are also specializations of birthplaces. This also points to the greater importance of related diversification for the emergence of new music genres.

Figure 1 shows that it is most probable that a new genre emerges with at least 50% of their parent genres being present in their respective birthplaces. However, there are only 15 genres (e.g., rap, jungle, emo, g-funk) in which no unrelated diversification processes play a role. At the same time, it is also extremely rare that new genres only have extra-local knowledge sources. This applied only for the genres detroit techno, doom metal and west coast rap.

Yet, not only is the mere presence of parent genres of interest but also whether or not symbolic knowledge bases were specialized in them. The corresponding distribution of SI in Figure 1 shows that most new genres emerged when half their parents also had been specializations of their birthplaces. Rarely, genres originate from the combination of specializations of its birthplace. Only for nine new genres, all parent genres had a location quotient > 1, for example, jungle, emo or beatdown.

These descriptive insights show that related diversification plays a greater role for the emergence of new symbolic knowledge than unrelated diversification. However, at the same time, only for 15 genres extra-local symbolic knowledge, indicating unrelated diversification, did not play any role. Obviously, it is a mix of related and unrelated diversification that leads to the emergence of most new music genres. The following two sections provide a closer look into both diversification processes to illustrate this interplay.

Characteristics of local parent genres

After analyzing whether parent genres of new genres were existing or specialized in symbolic knowledge bases before the emergence of new genres, in this section only the characteristics of local parent genres are examined to gain a more complete picture of the emergence of new genres as related diversification. Having modelled music scenes as network-based symbolic knowledge bases allows one to analyze whether new symbolic knowledge tends to emerge in the centre or at the periphery of symbolic knowledge bases. To analyze the characteristics of local parent genres, logit models are used to estimate whether or not the probability of a genre becoming a parent genre depends on its network centrality. All genres in all symbolic knowledge bases from 1970 to 2010 were coded with a dichotomous variable indicating whether they became a parent genre in the subsequent five-year interval. After testing for multicollinearity, the following set of network centrality measures (Table 3) with $1.608 \leq \text{variance inflation factor (VIF)} \leq 4.572$ was chosen as independent variables. Additionally, the number of nodes of knowledge bases and year-specific dummies control for size and time effects. Model (1) includes only control variables, model (2) comprises network centrality measures indicating the accumulation of symbolic knowledge and model (3) uses only network centrality measures that depend on the position of a genre in the network. Model (4) displays the full model including all network centrality measures.

The control variables had the expected influence on the probability of a genre becoming a parent in all models. The low fit of the model points to the fact that claiming to be able to predict musical creativity would be overconfident. Still, the results suggest that the creation of new symbolic knowledge does not appear to happen by chance but is based on pre-existing symbolic knowledge bases.

Among the analyzed network centrality measures, the node strength of a genre is significantly and positively related to parent genres. This simple measure reflects the accumulation of symbolic knowledge and is closely linked to the number of artists tagged with a genre. The normalized degree, which refers to the number of genres linked to a genre, is also positively associated with parent genres. This shows that complementary genres that can be more easily combined with other genres are more likely to become a parent genre.

Interestingly, among those network centrality measures that depend on structural properties of symbolic knowledge bases.
bases, only the normalized betweenness turns out to be significantly and positively related to parent genres in both models (3) and (4). Consequently, new symbolic knowledge is apparently not created at the fringes of music scenes but in their centre. Within these centres, it is the more complementary, popular genres that tend to spawn new genres.

However, not all network centrality measures are associated with the emergence of music genres. Eigenvector centrality, which is high for sub-genres in clusters of central genres, was only significant in model (3), but not in model (4). This speaks against symbolic knowledge creation being a result of continued specialization along existing paths.

**Characteristics of extra-local parent genres**

The characteristics of extra-local knowledge sources provide insights into the process of unrelated diversification. Figure 2 compares the age (difference in years to the first appearance in the database), diffusion (number of music scenes in which genre was present), and popularity (number of artists tagged with the genre) of extra-local and local parent genres at the time when they became parent genres. This indicates that unrelated diversification entails the localization of current trends emerged elsewhere. Together with the empirical findings, which show that those genres in music scenes that are central are more likely to become parent genres, the emergence of new symbolic knowledge can be described as a process of linking local specializations with newly emergent global trends. It may be a good example for the process of ‘anchoring’ (Crevoisier & Jean-nerat, 2009) of mobile knowledge with the more immobile knowledge accumulated as specialized knowledge bases that had co-evolved and were embedded in specific institutional contexts (Strambach & Klement, 2012). In the anchoring of symbolic knowledge, the distinctive feature of symbolic knowledge that it can have very different meanings in different contexts (Asheim & Hansen, 2009) has to be considered. While the natural world, whose understanding constitutes analytic or synthetic knowledge, remains relatively unchanged across social or geographical contexts, the social world (and the symbolic knowledge required to succeed in it) varies strongly. Symbolic knowledge only appears to move in a limitless fashion, but it does not remain unchanged while travelling. Our findings indicate that when these general trends diffuse through the contexts of different music scenes, new genres emerge through the interplay of this mobile knowledge with the contexts constituted by existing symbolic knowledge bases.

**Table 3.** Logit models for the relationship between the network centrality of genres and their probability to become parent genres.

| Dependent variable: Parent genre (1/0) | Logit models |
|---------------------------------------|-------------|
|                                       | (1)         | (2)         | (3)         | (4)         |
| Network size                          | 0.006***    | 0.006***    | 0.008***    | 0.007***    |
|                                       | (0.001)     | (0.001)     | (0.001)     | (0.001)     |
| Node strength                         | 0.008***    | 0.008***    | (0.001)     | (0.001)     |
| Degree (normalized)                   | 2.747***    | 1.556**     | (0.353)     | (0.608)     |
| Betweenness (normalized)              |             | 4.305***    | 3.186***    |
|                                       |             | (0.533)     | (0.598)     |
| Eigenvector centrality                | 1.403***    | 0.022       |
|                                       | (0.312)     | (0.382)     |
| Closeness (normalized)                | 0.269       | −0.427      |
|                                       | (0.400)     | (0.414)     |
| Constant                              | −3.327***   | −3.937***   |
|                                       | (0.188)     | (0.216)     |
| Year dummies                          | Yes         | Yes         |
| Observations                          | 18,875      | 18,875      |
| Log-likelihood                        | −2676.96    | −2562.37    |
|                                   | −2586.00    | −2548.68    |
| Akaike information criterion (AIC)    | 5355.93     | 5148.75     |
|                                       | 5127.36     |
| McFadden’s $R^2$                      | 0.110       | 0.148       |
|                                       | 0.141       | 0.153       |

Note: *p < 0.1; **p < 0.05; ***p < 0.01.
CONCLUSIONS

This paper analyzed the relative importance of related and unrelated diversification in symbolic knowledge bases by analyzing the emergence of new music genres. It introduced a novel method to model music scenes as network-based symbolic knowledge bases (Kogler et al., 2013; Rigby, 2015) by employing volunteered, user-generated data.

A major contribution of this study is the in-depth analysis of local and extra-local knowledge sources. The results suggest that the existence of locally accumulated knowledge sources affects the direction of symbolic knowledge creation, while the complementarity of knowledge bits promote their likelihood to become parent genres. Thereby, these empirical findings support the general arguments made in the relatedness literature that show the relatively higher importance of related diversification processes (Boschma, 2017; Neffke et al., 2011). Yet apparently the emergence of new symbolic knowledge rarely happens without any contributions of extra-local knowledge. Unrelated diversification plays a considerable role in symbolic knowledge creation, especially by the mechanism of anchoring (Crevoisier & Jeannerat, 2009) of trends and fashions from elsewhere. Hence, the emergence of new symbolic knowledge is apparently a result of the interplay of cumulative and combinatorial knowledge dynamics (Strambach & Klement, 2012), in which mobile trends are combined with place specificities. Thereby, this study has illustrated that unrelated diversification processes may be rarer than related ones, but not less relevant. In fact, in the majority of cases an interplay of both processes was detected. Analyzing the interplay of context-specific locally existing knowledge and external knowledge offers future research opportunities. For instance, the findings of this study research should be complemented by a more qualitative analysis of processes, institutions and actors that promote the anchoring of symbolic knowledge.

As this study looked only at the production side, especially the role of different actors such as consumers or intermediaries (such as tastemakers, curators or gatekeepers) for diversification processes should be examined, also in technological contexts. Furthermore, our findings can also provide insights into the non-technological components of technological and scientific innovation, which have become increasingly relevant (D’Ippolito & Timpano, 2016; Tödtling & Grillitsch, 2015). Thus, a promising avenue of further research would be to look closer into the combination of different technological and non-technological knowledge bits that played a role for the emergence of new scientific fields or technologies, and to analyze their interaction, characteristics and transformation into new knowledge.

Figure 2. Violin plots comparing the age, diffusion and popularity of local and extra-local parent genres.
The main contribution of this study to the literature on regional diversification, however, is the provision of a long-needed micro-perspective on related and unrelated diversification processes (Boschma, 2017). It does so by introducing the concept of parent genres. Thereby, new genres are deconstructed as a combination of symbolic knowledge bits, from which antecedents (parents) of new symbolic knowledge are identified. This also allows one to account for the dynamics of relatedness between knowledge bits (Boschma, 2017) as it captures the relatedness between new and existing knowledge at the point of time in which new knowledge emerges. The concept of parent genres can also be applied to the emergence of industries and technologies by identifying and analyzing more closely the ones these spawned from at the time of their emergence. Finally, the use of novel data sources such as volunteered, user-generated data as demonstrated by this study could also be especially helpful for investigating those novel data sources such as volunteered, user-generated data as demonstrated by this study.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

NOTES

1. After a site relaunch in 2015, six tags are displayed. The data acquisition started before the site relaunch.
2. For the cities included in this study, see Table A1 in Appendix A in the supplemental data online, which also shows the number of taggers using city-related tags for each city.
3. As artists sourced by city-related tags filled the database, the database also filled with genre-related tags which were used in this step. The top 100 artists of genre-related tags used for more than 20 artists in the database were included in the database.

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