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# Music, social structure and connection: Exploring and explaining core-periphery structure in a two-mode network of music festivals and artists in Turkey

Music is a form of social interaction, embedded in social structures which both shape and are shaped by it. These structures have various dimensions but our principal concern here is network structure. The actors, events, and places involved in musical interaction are connected in various ways while the patterns of their connection generate both opportunities and constraints for participants, shaping their interactions. In this paper, we take a two-mode network of 98 Turkish music festivals and 177 artists who play at them as a case study and draw upon techniques of formal social network analysis (SNA) in order to explore a structural property of such networks which we believe to be both important and prevalent in musical networks: core-periphery structure. We both explore that structure and identify key factors which explain its formation. The paper develops our knowledge of the Turkish music world, which is barely explored in English-speaking sociology, and in particular of the annual round of university festivals which forms an important component of that world. Methodologically the paper adds to the small but growing body of literature employing SNA to explore culture and more particularly music by using recently developed 'dual projection' techniques to explore core/periphery structure. Theoretically, the paper offers a novel way of conceptualising 'social structure' in relation to music and contributes to the emerging relational perspective in sociology by offering a clear example of that theory in action.

**Key words:** Turkey, networks, core-periphery, music, social structure, social network analysis

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## Introduction

Music is a form of social interaction; one amongst many which combine, often overlapping and interpenetrating, in the on-going process of social life (Becker 1982; Crossley 2020; Small 1989; Turino 2008). As such it is both embedded within and generative of social structures, not least the network structures which connect its various participants. These network structures are important and need to be analysed and understood in music sociology. Whilst their precise effects are influenced by a range of contextual factors, including the agency of the social actors involved in them, they mediate and shape social processes which play out across them, such as the diffusion of culture and innovation, and they generate opportunities and constraints for those embedded within them. The structure of a network matters. It affects what can happen within the network.

No less importantly, however, it is shaped by what happens within it; by social interaction. Successful musical interaction or 'musicking', as Small (1989) calls it, demands cooperation between participants and mutual orientation to shared conventions. This does not preclude competition and conflict, however. Interaction can combine elements of both cooperation and competition and conflict (Huizinga 1950; Simmel 1955). Moreover, divides and inequalities can emerge as an unintended consequence of cooperative interaction, especially where some participants are better resourced than others. These divides and inequalities can manifest within networks in a variety of ways but we are particularly interested here in 'core-periphery structures', which we define and discuss further below and which previous studies have identified in a number of different musicking networks (Crossley 2015a; Emms and Crossley 2018).

In this paper we offer a preliminary investigation of the latter process and the factors affecting it. Using formal social network analysis (SNA) and more specifically the UCInet SNA software package (Borgatti *et al.* 2002), we explore social structure within a 'two-mode network' (defined below) of artists and festivals generated by the annual round of university-based music festivals in Turkey. We explore "whether a core-periphery structure can be identified in this network and, if so, what factors influence the emergence of that structure and more specifically which factors influence membership of the core". Within our sets of both artists and festivals we identify an unequal distribution of the resources that, in our view, are likely to contribute to success (defined as core membership). We would expect this inequality to generate a core-periphery division and to determine which nodes belong to the core and periphery respectively. The paper explores whether or not this is so.

As noted above, core-periphery structures have been identified in previous work on other musicking networks (ibid.). This paper advances on the previous

work in two respects. Firstly, we analyse a core-periphery structure within a two-mode network, using new 'dual projection' methods (Everett 2016; Everett and Borgatti 2013). Previous studies have focused either upon single-mode networks or single-mode projections from two-mode networks. We therefore extend the scope of previous analyses and explore the utility of new methods. Secondly, we have sufficient attribute data for both of our sets of nodes to attempt a rigorous exploration of the factors affecting core membership, using (network friendly[3]) regression models. Previous studies have lacked that data and have therefore been more constrained in the determination of the causes of core-periphery differentiation. These are methodological advances and we believe that our paper, at least in relation to the analysis of musicking networks, is methodologically innovative. Beyond methodology, however, we aim to make a substantive contribution to the understanding of musicking networks and, in particular, the core-periphery structures that seem to be common within them.

At a higher level, the paper is intended as a contribution to the growing but still new and small body of literature which uses SNA to explore music, and as an application of the emerging 'relational' perspective in sociology' which grounds much of this work theoretically (on relational sociology see Crossley 2011, 2015b, 2020). Network analysis is relatively novel in cultural sociology (though see McLean 2017) and even more so in music sociology but it has huge potential. This potential can be explained theoretically but it must also be demonstrated empirically. Our paper is intended as one such demonstration.

We contend that the analysis of network structures allows us to better understand the social facticity of music and also the opportunities and constraints faced by those involved in it. One of the key aims of the present paper is to show that by reference to a specific example. We recognise that networks are only one part of the social structure of music and are influenced by, as much as they influence, other aspects of social structure. Nonetheless, they are important.

In focusing upon musicking in Turkey we take a country whose music is little discussed in English speaking sociology and musicology, and whose pivotal position between the predominantly Islamic societies of the Middle East and the secular/Christian societies of the West lends it particular sociological interest. We do not have enough space to explore the Turkish context in detail here but at least we hope to inspire further reflection and research.

We begin the paper with a brief reflection upon social structure in music which contextualises our study and situates it theoretically. Having done this we

[3] Network data violate the assumptions of traditional statistical approaches. They are not samples from a population, for example, and their nodes, as nodes in a network, are not independent cases. The standard way of circumventing this difficulty is to use permutation tests to assess statistical significance. The UCInet routines that we have employed in the analysis in this paper all do this.

offer a brief introduction to SNA and to the concepts of two-mode networks, core-periphery structures and the dual projection method in particular. We then introduce and analyse our data.

## Music and social structure

When sociologists and musicologists discuss 'social structure' in relation to music they often conceptualise the former as existing outside of and independently from the latter, albeit in a position from which each can influence the other. Social structure is envisaged as shaping and/or being shaped by music, or homologies are identified between the two (e.g. Adorno 1997, 2004; Lomax 1962). We take a different approach, rooted in relational sociology (Crossley 2011, 2015b, 2020). Music is not external to social structure, on our account, or at least not exclusively so. Rather music 'has' and 'is' a social structure. This claim needs to be unpacked.

Music, as both Becker (1974, 1982) and Small (1989) have argued, is a form of collective action involving interaction between multiple social actors, both human and corporate[4], playing a variety of different roles: e.g. composer, performer, audience member, producer, promoter, engineer etc. These interactions are structured in many ways, lending 'musicking' a social structure. For present purposes this social structure can be said to have three dimensions.

Firstly, participants coordinate their interactions by orienting to conventions. Conventions structure musicking at many levels: from tonal distances, scales and notation procedures which are shared across many 'music worlds' to stylistic markers and organisational practices which vary between worlds and, as Finnegan (1989) observes, mark them out as distinct (on 'worlds' see Becker 1982; Crossley 2015a, 2020; Crossley *et al.* 2015; Finnegan 1989; Gilmore 1987, 1988; Lopes 2002; Martin 2005, 2006). Composers and performers orient to conventions and so do audiences; both in the way in which they listen (Meyer 1956) and their wider practices of appreciation (Finnegan 1989). Indeed, as Becker (1982) stresses, it is because everybody involved in musicking, from composers through performers and 'support personnel' to audiences, orient to the same conventions, structuring their activity accordingly, that they are able to coordinate their activities. Conventions resolve the 'coordination problems' that otherwise beset interaction, and music, as McClary (2001) claims, is convention 'all the way down' (on coordination problems see also Lewis 1969).

[4] A corporate actor comprises a collective of actors configured so as to be capable of making and acting upon decisions in a manner which is strictly irreducible to the individual actors involved in them (Hindess 1988). Examples in music include record labels, musician's unions and arts councils.

Secondly, musicking involves exchanges of resources, including competence, money, equipment, time and access to space, which are unevenly distributed amongst participants. Again this lends musicking a (social) structure. All participants are dependent upon others for the goods and resources they require to participate but some are richer in goods and resources than others and some more dependent than others, generating power imbalances and hierarchies which constitute a social structure.

Thirdly, and most important for present purposes, musicking both draws upon and (re)generates a network which both shapes and is shaped by it, affecting the processes which flow through it and creating both opportunities and constraints for the participants who constitute its nodes. A network has or rather is a social structure, with measurable properties and effects. It is this aspect of music's social structure that we explore in this paper.

Network structure both embeds and is embedded within other aspects of social structure, shaping and being shaped by these other structures. It affects and is affected by the conventions and resources which structure musicking and also by the distribution of resources across its node set. As Blau's (1974, 1977) concept of 'social space' suggests, it is shaped by status differentials and divides amongst its nodes. Furthermore, it both affects and is affected by the semiotic structures that make music meaningful. We capture some of this in the second part of our paper, where we explore the impact of resources and their distribution on the core-periphery divides which we observe in our network. In the interests of clarity and brevity, however, we mostly restrict our focus to network structure, abstracting it from its various embeddings in order to subject it to detailed analysis.

## Network structure, core-periphery configurations and two-mode networks

Network structures, their properties and effects can be visualised, measured and analysed using the (mathematically-rooted) techniques of formal social network analysis (SNA) (Borgatti *et al.* 2013; Scott 2000; Wasserman and Faust 1994). There is a growing interest in the use of SNA to explore issues in cultural sociology (McLean 2017) and a growing body of literature which uses it to explore musicking networks (e.g. Allington *et al.* 2015; Crossley 2015a; Crossley *et al.* 2015; Crossley and Emms 2016; Emms and Crossley 2018; Hield and Crossley 2015; McAndrew and Everett 2015a, b; McAndrew, Widdop and Stevenson 2015; Milward *et al.* 2017). Amongst the topics covered by these studies are: the formation of 'music worlds'; the impact of network position upon musical success; factors shaping patterns of musical collaboration; the diffusion and formation of musical

tastes; imbalances of power and influence; and patterns of translocal connection. In this paper we contribute to this literature and further advance debates by exploring a *core-periphery structure* within a *two-mode network*.

A core-periphery structure is a commonly found pattern within social networks in which we can identify a subset of nodes (the core) characterised by a high 'density' of connection between their members when compared to other nodes in the network (the periphery). Density is defined as the number of ties observed between a set of nodes, expressed as a proportion of the total number of ties possible for that set of nodes. In a network of 10 nodes, for example, assuming that we are looking at one type of tie only and that this tie is undirected[5], there are a possible $10 \times 9 : 2 = 45$ ties. If we observe 30 ties the density of the network is therefore $30 : 45 = 0.67$. Where ties are binary[6] density scores vary between 1 (every possible tie is observed) and 0 (no ties are observed). Where ties are valued[7], to capture the strength of connection or some such variable, density scores capture mean tie values.

Density may be measured for a particular set of nodes, as described above, but it may also be measured between sets. If we have one set of 5 nodes and a further set of 7 nodes, for example, we can count both the number of ties within each set and also the number of ties crossing between sets. In this case there would be a potential of $5 \times 7 = 35$ ties between the two sets. The density of inter-set ties would be the number of ties observed between the sets divided by 35. Each set would have its own internal density and there would be a density value for ties crossing between them.

In a classic core-periphery structure, where core and periphery are treated for analytic purposes as two discrete node sets, the density of the core is higher than either that of the periphery or that between core and periphery, and the density between core and periphery is greater than that within the periphery. Members of the periphery are more densely connected to the core, on aggregate, than to one another. Whilst the core constitutes a cohesive subgroup within the network, therefore, the periphery do not. They are defined negatively, by their marginal connection to the core.

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[5] Some ties are directed. They can point in one direction without necessarily pointing back in the other. 'Liking' for example: John may like Jane without Jane necessarily liking John. Undirected ties, by contrast, do not point and are mutual by definition. There are potentially twice as many directed ties than undirected ties for any network because, for each pair of nodes, two ties are possible (John to Jane and Jane to John).

[6] That is, deemed either to exist or not and therefore coded either 1 (exists) or 0 (doesn't exist).

[7] In the case of valued ties we allow that ties may have different strengths, represented by a number. They may be either ordinal or continuous. When we decompose a two-mode network into two single mode networks ties in the single mode network are typically valued. Ties between participants will reflect the number of events in which they both participate, for example, and ties between events will reflect the number of participants they share in common.

The sociological significance of this configuration has to be interpreted in context in every case. However, it is often indicative of an inequality in the network, with the core constituting an in-group or elite who are centrally involved and dominant in whatever domain of activity is under investigation. That is the basis of our interest in it here. In exploring core-periphery structures in musicking networks we are capturing inequalities in the process of musicking itself.

The UCInet software that we use for the analysis presented in this paper affords two approaches to the investigation of core-periphery structures: a categorical approach, which employs an optimising procedure to find the binary partitioning of the network which most closely approximates a core-periphery structure, generating outputs which allow the analyst to determine whether this partition is indeed a core-periphery structure; and a continuous measure (for each node) of 'coreness' (Borgatti *et al.* 2013). Each approach has different strengths and weaknesses but we use the categorical procedure because it more easily facilitates 'dual projection' analyses of two-mode networks.

A two-mode network is a network which involves two different types of node and a type of tie which (only) crosses types. In our case nodes are either musical artists or university festivals and the tie which we have observed is 'appearing at'. We have surveyed which artists 'appear at' which festivals. This differs from a single mode network, in which we have only one type of node and a type of tie which may connect any pair of nodes, and it generates certain methodological complications. It is common practice for analysts to decompose two-mode networks into (two) single mode networks or 'projections'. A network of artists linked to festivals, for example, would be decomposed into: (1) a network of artists deemed to be connected to one another where they are observed to play at one or more of the same festivals, and (2) a network of festivals deemed to be connected where they are observed to share one or more of the same artists. An analysis which focuses upon only one of these projections is, in some cases, vulnerable to the criticism that it loses important structural information. However, if the analyst analyses each of the derived networks and then brings these analyses back together, in synthesis, information loss is avoided and two-mode structure fully captured (Everett 2016; Everett and Borgatti 2013). This 'dual projection' approach can be relatively straightforwardly achieved in relation to a categorical core-periphery analysis and that is what we propose to do here, in what we believe to be one of the first empirical studies to employ this approach, and certainly the only study of musicking networks to do so.

As noted above, network structures do not exist in isolation from other structures either of musicking or the wider social world. They both embed and are embedded within such structures. In this paper we are particularly interested, in relation to artists, in the impact of their gender, musical style and record label on

their network position; and in relation to festivals, the impact of the economic status, population size and size of the student population of their host city. Specifically, drawing both on the wider literature and the second author's immersion in and experience of the Turkish music world, we believe that artists are advantaged when male, signed to a major label and, in the Turkish case specifically, associated with rock music, which tends to be the genre of preference for more highly educated, middle class youths. We believe that festivals are advantaged when hosted by public (rather than private) educational institutions in wealthier cities with bigger populations and bigger student populations in particular. The latter, we submit, afford the 'critical mass' of audience members which allows festivals to flourish (on critical mass see Crossley 2015a, Emms and Crossley 2018). In relation to both artists and festivals we believe that the uneven distribution of these resources will result in the generation of core-periphery divides. In what follows we test these claims.

## A network of music festivals and artists

The network which we will analyse, to reiterate, comprises musical artists and the festivals at which they perform. More specifically, it is a network of artists performing at university-based music festivals in Turkey. Every year, during the spring, most universities in Turkey host a music festival over several days, featuring artists known-to and popular amongst their student body. We gathered data on all universities in Turkey hosting festivals during the springs of 2012 and 2013 respectively (n = 98) and all artists playing at a festival during this period (n = 177). Data were gathered by way of a survey of university websites, backed up by e-mails and telephone calls (requesting information) to universities for which we could not find the relevant information. In addition 20 interviews were conducted with incumbents of different roles in the organisation of the festivals in order to glean contextual information.

Altogether the 98 festivals and 177 artists form our network of interest (see Figure 1). This network is interesting because the festivals involved form an important and prominent part of Turkey's national music world. Thus, it provides a useful lens through which we look at the Turkish music world more generally.

## Node attributes

The existence of a core-periphery structure in our network is suggested by the graph in Figure 1. There appears to be a dense cluster of nodes in the middle of

the network, surrounded by a layer of much less densely connected nodes. Visualisations can be misleading, however, and we need to verify the existence of this structure. Before we do, however, it would be instructive to discuss some of the attributes of the nodes in more detail.

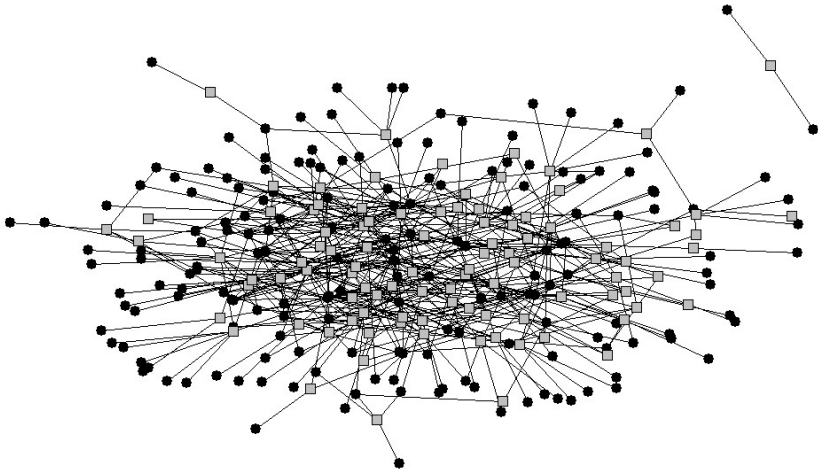


Figure 1. Turkish university music festivals and their artists 2012–2013 (artists are represented as black circles and universities as grey squares)

Source: own study.

Our node set, to recap, comprises 98 university-based festivals, all of which ran in both 2012 and 2013 (each festival being hosted by a separate university or higher education institution) and 177 artists who played in either one (n = 114) or both (n = 63) of these years. 67 of the universities were public; 31 private. 14 were based in Istanbul and a further four cities hosted between 3 and 7 but the remaining 53 were each in separate cities. Of the 58 cities, Istanbul has the largest population (14,804,116) and the largest student population (742,373). Bingol has the smallest population (26,956) and Igdir the smallest student population (582). The means for city and student population, respectively, are 1,169,523 and 51,967. As noted earlier, we expect population/student population size to have an impact upon musical activity because bigger populations, all things being equal, should translate into bigger audiences and pools of indigenous musicians, generating the 'critical mass' necessary for more, bigger and more varied events (on critical mass see Crossley 2015a; Emms and Crossley 2018). We would also expect the public/private divide to have an impact because public universities generally enjoy a higher status and are widely perceived as more cosmopolitan, enjoying an association with Western popular music and the progressive secularism it to some extent signifies in the popular imagination.

The artists were almost exclusively of Turkish origin (95%). This is interesting because it suggests that the Turkish music world or at least this 'slice' of it is relatively disconnected from musicking elsewhere in Europe or the wider world, whilst also pointing to a healthy supply of indigenous artists. It is of course cheaper to book indigenous artists to play and this may be part of the reason why we find such a strong Turkish contingent. This does not alter the fact that an important slice of the Turkish music world is comprised almost exclusively of Turkish artists, however, nor of the fact that supply and demand are both strong enough to sustain this. The university festival world is Turkish not only in virtue of location but also in terms of the background of the vast majority of its artists.

Table 1. Artist by (self-defined) genre

| | |
|---|---|
| Pop/Electronic/Dance | 60 (34%) |
| Rock/Alternative/Anatolian Rock | 55 (31%) |
| Traditional | 42 (24%) |
| DJ | 9 (5%) |
| Other Western Influenced | 11 (6%) |

Source: own study.

Having said this, musical styles indicate a clear Western influence. Using the genre tags used by artists themselves on their websites and related social media we were able to classify artists. As Table 1 shows, only 24% of artists described their style as traditionally Turkish, with the remainder all subscribing to one or more versions of a 'Western' genre, albeit in some cases (chiefly, Anatolian Rock) a hybrid form combining Western and traditional Turkish aspects. Interestingly, moreover, 'traditional' did not appear to mean 'Islamic' in any of the cases. The Islamic musical resistance to contemporary Turkish society identified by Tak (2014) has evidently not (at least yet) breached the country's university-based festival world.

The gender balance of the artists was strongly tipped in favour of males, with 72% of artists (solo artists or bands) being exclusively male, 23% exclusively female and 5% mixed. Furthermore, as Table 2 shows, although both genders are more likely to appear as solo artists (a tendency which we believe is relatively distinct in relation to European music festivals more generally), females in particular are more likely to appear as solo artists and there is only one all-female band. This matches the tendency found in other European countries and the global north more generally, reflecting the gendered and patriarchal nature of musicking in these regions (Bayton 1998; Leonard 2007; Whiteley 1997).

Table 2. Bands and solo artists by gender

| Gender | Solo artist | Band |
|---|---|---|
| Male | 87 | 41 |
| Female | 40 | 1 |
| Mixed | n/a | 8 |

Source: own study.

53 of the artists were signed to a major record label[8]. 99 were signed to a small, independent label, and the remaining 25 were unsigned. Again we would expect this to impact upon network structure because major labels generally have more resources available to promote their artists, which should result in those artists enjoying greater prominence within the network.

## Core and periphery

As noted above our main focus in this paper is the core-periphery structure suggested by the graph in Figure 1. In order to explore this idea further, following the 'dual projection' model referred to above, we first decomposed our two-mode network into two single-mode networks: a network of artists, linked where they appeared at one or more of the same university festivals; and a network of festivals, linked where they share one or more of the same artists (see Figure 2). One festival in the festival networks is an isolate[9] and two artists in the artist network (the artists who played at this isolate festival) form a separate component[10]. With these exceptions, however, each projection forms a single component: every node is at least indirectly connected to every other node by a path. As in the two-mode visualisation, moreover, and perhaps more clearly, we see what appears to be a core-periphery structure in each case; that is, a patch of dense connection surrounded by a layer of more sparsely connected nodes.

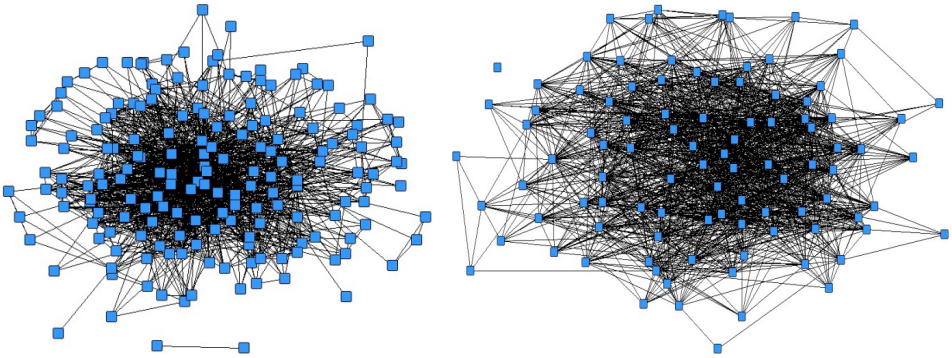
To test this we ran the above-mentioned categorical core-periphery routine on each projection. The results, which are reported in Table 3, indicate a strong core-periphery structure in each case. In the artist core the mean value of ties is 1.55, compared to 0.05 within the periphery and 0.26 between core and periph-

[8] In all but 4 cases this held across the whole period of the survey. 4 artists were signed during the period covered by the survey.

[9] That is, it was connected to any of the other festivals.

[10] A component is a subset of nodes, each of which is linked to the others by a path (of connections). Members of separate components are not linked to one another. The point in relation to our analysis is that we have two artists who are linked to one another (because they played the same festival) but not to any of the other artists.

ery. Similarly within the festival network; core-core density is 1.38 compared to 0.2 within the periphery and 0.38 between core and periphery. The core is smaller in the artist network, however, comprising only 14% of nodes, compared to 34% for the festival network. In both cases, however, we have a classic core-periphery structure. Core density is higher than core-periphery density, which is higher than periphery density.



Artists Festivals

Figure 2. The artist and festival networks

Source: own study.

What do 'core' and 'periphery' mean in this context? We suggest that they can be quite straightforwardly interpreted in terms of prominence and importance. There is a greater flow of artists between core festivals, suggesting that artists favour those festivals and pointing to an informal 'circuit', in which artists playing one core festival will tend to play several of the others. There are 98 festivals that artists could play at but a substantial proportion of the traffic is between just 33 of them, suggesting that the 33 enjoy elevated importance. We were able to further substantiate this, moreover, by comparing the mean number of artists playing at core and peripheral festivals respectively. The mean for core festivals is 9, compared to 4 for peripheral festivals. Core festivals have more than twice the number of artists. A t-test, adapted for use on network data[11], indicates that this difference is statistically significant at $p < 0.000$.

Similarly, of the 177 artists playing the festivals we find that 24 of them are crossing paths much more often than the rest, suggesting the existence of an artist elite who enjoy increased popularity and prominence. Again this was further established by a comparison of number of festivals played. Core artists played

[11] See note 2.

11 festivals over the two years, on average, compared to 2 for peripheral artists, and this difference was found to be statistically significant ($p < 0.000$).

Table 3. Single mode core-periphery density tables

| | **Artists** | | **Festivals** | |
|---|---|---|---|---|
| | Core (n = 24) | Periphery (n = 153) | Core (n = 33) | Periphery (n = 65) |
| Core | 1.55 | 0.26 | 1.38 | 0.38 |
| Periphery | 0.26 | 0.05 | 0.38 | 0.20 |

Source: own study.

The next stage of a dual projection core-periphery model is to put the projections back together (Borgatti and Everett 2013). Doing this we see that core and peripheral artists each have a stronger density of connection to the core festivals, than to the peripheral festivals (see Table 4). This is what we would expect, given that the core festivals are 'core' and it further supports our interpretation of them as such. Furthermore, we find that the core artists have a stronger density of connection to both core and peripheral festivals, compared to the peripheral artists. Indeed, core artists have a stronger density of connection to the peripheral festivals than the peripheral artists have to the core festivals. Again this is consistent with and supports our interpretation of them as core. In effect both sets of artists are better represented at core festivals, confirming their status as core festivals, and core artists are better represented at both sets of festivals, confirming their status as core artists.

Table 4. Two-mode core-periphery density table

| | | **Festivals** | |
|---|---|---|---|
| | | Core | Periphery |
| **Artists** | Core | 0.20 | 0.06 |
| | Periphery | 0.03 | 0.02 |

Source: own study.

There is a twofold structure of inequality in our network therefore. Within our sets of both artists and festivals we find divides between those which are core within their network and those which are peripheral. Bringing the two partitions together within a dual projection model allows us to see how they articulate with one another. More specifically, in this case it further supports our interpretation of the 'coreness' of the cores by showing that core festivals attract a higher proportion of artists from both the core and periphery (of artists), whilst core artists are better represented at both core and peripheral festivals.

## Explaining core membership

The identification of a core-periphery structure in the artist-festival network points to stratification in the Turkish music world. Some artists and some festivals assume more importance in the annual round of university festivals than others. Our next question concerns the mechanisms which enable some to assume this elevated status at the expense of others.

In relation to artists we initially hypothesised that core status would be correlated with the number of festivals at which an artist played, as playing more festivals will, all things being equal, increase the number of other artists with whom an artist becomes linked. This, we further hypothesised, would be directly linked to an artist having played in both of the years captured in our survey. Playing in two years rather than one should increase the number of festivals at which an artist plays. In addition, we hypothesised that those artists signed to a major label, who play rock music and are male will be more likely to enjoy core status. Being signed to a major label would be important, we hypothesised, because major labels have the influence and resources to ensure that their artists get the exposure necessary to secure the publicity which sells records; major label artists should therefore play more and more important festivals. Playing rock would be important, we believed, drawing upon the insider knowledge of the second author, because rock signifies a progressive secular ethos in the Turkish context which is associated also with major universities and which makes it popular amongst university students. Rock has a particular meaning and value in the Turkish context which we would expect to elevate it within the festival world (see also Tas 2014). We believed that gender would make a difference because we had already found that women are underrepresented and largely confined to solo artist status in the festival world (see above), suggesting that, as in many other national contexts, women are taken less seriously as musicians. We expected this to carry over into network structure.

Table 5. Mechanisms shaping core membership amongst artists

| | **Model one** | **Model two** | **Model three** | **Model four** | **Model five** | **Model six** |
|---|---|---|---|---|---|---|
| Intercept | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| No. of Festivals | 0.779 | | | | | 0.804 |
| Two Years | | 0.429 | | | | –0.099 |
| Major Label | | | 0.318 | | | 0.102 |
| Rock Genre | | | | 0.198 | | 0.028 |
| Gender | | | | | –0.013 | |
| $R^2$ | 0.602*** | 0.175*** | 0.091*** | 0.028* | 0.011 | 0.611*** |

* significant at $p < 0.05$; *** significant at $p < 0.000$

Source: own study.

Our first step in testing these ideas was to run a series of (network friendly[12]) regression models, taking core membership as our dependent variable and each of the above factors as independent variables. We began with five models which each took one of our independent variables in isolation before combining all of those found to be significant in a sixth model (see Table 5). The only factor not found to be significant was gender and interestingly its effect was slightly negative: if anything being male decreases one's likelihood of making the core. More striking, however, was the overwhelming effect of 'number of festivals played' and the negligible contribution which all other factors added to the amount of variance explained. Core status, it appears, is explained by number of festivals played.

This begs a further question of the factors affecting 'number of festivals played'? We hypothesised that the same factors described above would be important, for the same reasons, and we therefore re-ran our regression models, this time taking 'number of festivals played' as our dependent variable and dropping 'played both years' from our independent variables as its relationship to number of festivals played is trivial in the present context (see Table 6). Again gender ('male') had a small, negative, non-significant effect but both other factors were found to have a positive effect. Playing rock and being signed to a major label explain 11% of the variance in number of festivals played. In effect then we arrived at a two stage model, in which playing rock and being signed to a major label increases the number of festivals at which an artist/band plays, and number of festivals played, in turn, affects likelihood of being in the core of the network.

Table 6. Mechanisms affecting number of festivals played

| | **Model one** | **Model two** | **Model three** | **Model four** |
|---|---|---|---|---|
| Intercept | 0.000 | 0.000 | 0.000 | 0.000 |
| Label | 0.293 | | | 0.268 |
| Rock | | 0.231 | | 0.199 |
| Gender | | | −0.048 | |
| $R^2$ | 0.075*** | 0.043** | 0.009 | 0.110*** |

** significant at $p < 0.00$; *** significant at $p < 0.000$

Source: own study.

A similar two-step model was adopted for explaining core membership amongst the universities but for slightly different reasons. We believed that the likelihood of belonging to the core would be increased for those festivals who featured the most artists, for much the same reason that 'number of festivals' is important in the artist network, and we also believed that festivals hosted by public universities might be

[12] See note 2.

advantaged because of the generally higher status of the latter. In addition, however, we believed that festivals might be advantaged by features of the city in which their university is based. Specifically, for reasons of critical mass referred to above, we believed that festivals held in cities with bigger populations and bigger student populations would be advantaged as the population size translates into the size of potential artist and audience pools, which in turn increases levels of musical activity, which is more likely to increase the importance of those cities in respect of music. In addition we hypothesised that the economic affluence of the city would increase the likelihood of it hosting a successful (i.e. core) festival. However, we cannot attribute properties of a city to a festival or university because some of the bigger cities host several universities and festivals. We therefore ran two sets of models. Firstly, taking core status as our dependent variable, we tested for the significance of 'number of artists' and 'public/private status' (see Table 7). Then, taking 'number of artists', aggregated to the city level, as our dependent variable, we tested for the significance of population and affluence, using the International Organisation for Standardisation's (ISO) city-level measure of affluence and well-being[13] (see Table 8).

Table 7. Mechanisms explaining core status amongst festivals

| | **Model one** | **Model two** |
|---|---|---|
| Intercept | 0.000 | 0.000 |
| Number of Artists | 0.625 | |
| Public/Private | | 0.038 |
| $R^2$ | 0.380*** | 0.019 |

*** significant at $p < 0.000$

Source: own study.

Our first set of models suggested that 'number of artists' is, indeed, a strong and significant predictor of core status but public/private status of the university host is not. Our second set of models suggested that, whilst the affluence of a city does not explain the number of artists it hosts, the combined effect of population and student population almost completely explains it. We understand this, to reiterate, in terms of 'critical mass'. Bigger cities and cities with bigger student populations have the critical mass of both artists and audiences necessary to host more, bigger and more specialised musical events, which elevates their prominence and importance as sites of musical activity. In a study of UK indie music Fonarow (2006) notes the importance of university towns which, she argues, have big enough audience pools to allow live music to flourish. Our study suggests that this effect varies markedly with the size of the student population of the city.

[13] https://www.iso.org/news/2014/05/Ref1848.html (accessed: 29.03.2018).

Table 8. Mechanisms explaining number of artists

| | Model one | Model two | Model three | Model four |
|---|---|---|---|---|
| Intercept | 0.000 | 0.000 | 0.000 | 0.000 |
| Population | 0.946 | | | 0.246 |
| Student population | | 0.974 | | 0.741 |
| ISO | | | 0.135 | |
| $R^2$ | 0.891*** | 0.946*** | 0.016 | 0.952** |

** significant at $p < 0.00$; *** significant at $p < 0.000$

Source: own study.

## Concluding discussion

Music is a form of social interaction in which participants pool and exchange services and resources. As such it both draws upon and generates a variety of social structures, including a network structure. In this paper we have examined the network formed between artists and festivals in the annual cycle of university-based music festivals in Turkey during 2012 and 2013.

Successful musicking requires cooperation and agreement over key conventions. However, its participants often enjoy different kinds and levels of resources and for this amongst other reasons inequality is common, often becoming instituted within network structure. In this paper we focused upon one type of network inequality: a core-periphery structure. Specifically we looked for a core-periphery structure in the two-mode network of artists and festivals just described, using new 'dual projection' methods to preserve and capture the integrity its two-mode structure.

The network was found to have a core-periphery structure, which the dual projection approach proved useful in elaborating, and we sought to explain this structure by reference to differences in the resources of both artists and festivals. In relation to artists we had imagined that gender, considered as a social status affecting life chances and opportunities, would make a difference. In terms of sheer numbers of artists involved it did. Women are considerably outnumbered by men in the network, as we had expected. However, gender did not affect core membership. The key factor affecting core membership was the number of festivals played, which was in turn positively influenced by major label sponsorship and adherence to a rock style (the preferred musical style amongst more highly educated middle-class youth in Turkey).

In relation to festivals we had expected that being hosted in a public (rather than private) educational institution in a wealthy city would be important. This hypothesis was not supported. However, our further hypothesis, that core status

would be positively influenced by the size of the student population (and a bigger population more generally) in the city in which a festival is hosted, generating critical mass for a flourishing music world, was supported. Specifically, bigger student populations attract higher numbers of artists, which increases the likelihood of a festival belonging to the network core.

This analysis has furthered our understanding of the social structures of musicking and in particular of the way in which inequalities are instituted within these structures. However, it is only the beginning. Our analysis needs to be repeated across a variety of further music worlds. Additional analysis, exploring the effect of other resources and factors, both endogenous and exogenous to the network, need to be conducted. A detailed ethnographic analyses which directly observe musical interactions, potentially capturing the mechanisms whereby core-periphery divides are generated directly, would also be useful. As always, further research is required.

More generally, it is our contention that conceptualising music relationally, as interaction, will allow us to develop a deeper and better sociological understanding of it, and that SNA is a crucial tool if this is to be achieved. Many successful and interesting analyses will be required if these contentions are to be demonstrated convincingly. We hope, however, that we have made a positive start here.

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