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The film festival sector and its networked structures of gender inequality

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Abstract

The global film industry is shaped by gender inequality. Women are structurally under-represented in professional roles that include high levels of creative and economic decision-making power, such as directors, writers, and producers. In our study, we ask to what extent the film festival sector, a prestigious sub-field of the film industry, is structured by gender biases. To address this question, we conceptualize the festival sector as a one-mode network consisting of film festivals that are connected through screening the same film, and as a two-mode network consisting of films and festivals. The composition of film core creative teams (incl. directors, writers, and producers) varies by gender. While some films are made by mixed gender core creative teams, others are made by women-only or men-only core creative teams. We use data on 1323 films that circulate among 1523 festivals and apply network analysis to describe and disentangle the structural facets that underlie persistent gender inequality in the film festival sector. In the first step, we analyze to what extent the one-mode film festival network is connected through the circulation of films with varying gender compositions, and what festivals occupy broker positions in this network. In the second step, we analyze to what extent films of different gender compositions are equally distributed across the overall festival landscape. For the first step, we find that the festival network connected through films by women-only core creative teams is much sparser in comparison to the network connected through films by men-only core creative teams. We also find that the majority of festivals obtaining important broker positions in the network, has not signed the 5050 × 2020 Gender Parity Pledge, which has important policy implications. For the second step, we find that films by men-only core creative teams are on average screened at more festivals as compared to films by women-only core creative teams, and that the degree of distribution of films by men-only core creative teams is much more skewed indicating a more pronounced festival hit dynamic.

Keywords: Gender inequality, Film festival sector, Core creative team, Gendered communities, Brokerage

Introduction

This study examines the networked structures of gender inequality within an important subsector of the global film industry, namely the prestigious film festival sector. The film festival sector operates as a system of value addition, in the form of cultural capital to films and filmmakers (de Valck 2007). First attempts to grasp the film festival

sector's complexity by applying a network analytic lens to it were made by drawing on Actor-Network-Theory (de Valck 2007), system theory (Fischer 2013) and a mix thereof (Elsaesser 2005). While these studies have foregrounded solely a theoretical understanding of the film festival sector as a network, Vanhaelemeesch's study (2021) first employed network analysis to empirically grasp the structural complexity of this sector. While Vanhaelemeesch (2021) focuses on filmmaking communities in Central America, we build on the application of network analysis to the film festival sector. We conceptualize this sector as an undirected network in which festivals are connected through the flow of films (one-mode network) or films are connected to festivals (two-mode network). Since most films entering the sector are shown at a variety of festivals throughout their festival runs, this leads us to expect the emergence of a well-connected network.

It is against this backdrop of conceptualizing the film festival sector as a network, that we try to analyze the structural persistence of gender inequality in the industry. While several studies have shown that the film festival sector is characterized by a gender bias similar to that of the global film industry (Smith et al. 2019; Loist and Prommer 2019), we want to better understand where gender inequality emerges and where it is reproduced. Therefore, we analyze to what extent the festival network is connected through the flow of films made by core creative teams composed of either only women, only men, or both. By core creative team we refer to those positions in filmmaking that carry the highest creative and economic decision-making power: director, writer, and producer.

With our study we contribute to research on gender inequality in industry settings. We ask, first, to what extent the film circulation in the film festival network is structured by gender and, second, what role particular festivals play in (not) reproducing this structure. We analyze the undirected network of 1523 film festivals that are connected through the flow of 1323 films among them. We use a rich dataset collected in the 'Film Circulation in the International Festival Network and the Influence on Global Film Culture' research project¹ that includes festival runs of 1353 films in the circuit of 2013.² It is worth noting that prior to this data collection, there was no quantitative data available on film circulation in this industry. Thus, the data collection was an essential first step to enable carrying out a network analysis of this sector.

In the first step, the network consists of festivals as nodes connected by a tie, if a particular film was screened at both festivals within a given time period (one-mode network). We attribute gender to a film based on the gender ratio of the core creative team. For this purpose, we assign gender to producer, writer, and director in binary form as woman or man, based on their first names. We can thereby analyze the film festival network with respect to 'gendered communities', i.e., clusters of festivals that are disproportionately connected through films made by core creative teams composed of either only women, only men or both, and seek to identify festivals that bridge such 'gendered

¹ The project "Film circulation in the international festival network and the influence on global film culture" is funded by the German Federal Ministry of Education and Research (BMBF) under the grant number 01UL1710X, led by PI Skadi Loist.

² The sample is based on a non-probability sampling approach. Please see the section on data for further information on how this approach was implemented in the collection of data for the sample analyzed in this paper.

communities.³ In the second step, the network consists of festivals and films coded according to gendered core creative team composition (two-mode network). We analyze to what extent the degree distributions of films made by core creative teams composed of women differ from the degree distributions of films made by men-only or mixed gender teams. This approach allows us to improve our understanding of the structural components of gender inequality within the film festival network, which is useful for future policy initiative designs that address gender inequality in the film festival sector.

The remainder of the paper is organized as follows: The first part of the theoretical section provides an overview of diversity and inequality research regarding the film industry, while the second part discusses to what extent the film festival sector has been and can be understood as a network. In the third part, we point to the ways, in which previous studies have employed SNA to research different forms of inequality in industry settings. In the “Data” section, we provide a description of the empirical context of this study. In the “Method” section, we continue with an overview of the methods employed in the analysis. In the “Findings” section, we (1) discuss the descriptive statistics of the network, (2) identify gendered sub-communities and (3) analyze so-called broker festivals based on their betweenness centrality. The final section provides some concluding remarks.

Prior research on diversity and inequality in the film industry

Large sets of data have been gathered and analyzed in the past four decades unanimously showcasing the “stark, longstanding, and, in many cases, worsening inequalities relating to gender, race, ethnicity, class, age, and disability” in the global film industry (Verhoeven et al. 2020). The 2021 “Celluloid Ceiling” report by Lauzen, which has been counting the number of women employed behind the scenes of US-filmmaking annually for 23 years, reveals that women still only make up 23% of creative team members in the 250 top-grossing films. Similarly, recent reports from the UK show that even though “women make up 53.7% of the off-screen workforce, they represent only 26.2% of directors” (European Audiovisual Observatory 2020). As a report of the European Parliamentary Research Service (Katsarova 2019) critiques, “women are over-represented in professions traditionally considered feminine—such as costume design and editing—and under-represented” in all other professions, from more technical ones like sound and image to key creative roles, such as director, producer, and writer. Overall, projects with women as directors received on average a 40% lower budget of all projects submitted to Eurimages (European Cinema Support Fund) in 2015 (Katsarova 2019). Studies show that films with a woman director are less likely to receive a wide theatrical release. If they do, they start with fewer copies into the market and have less screenings per film, thereby making films by women even less visible on the big screen than pure percentages of films by women with release might suggest (Prommer and Loist 2015; Verhoeven et al. 2019). Recent reports on gender (in)equality in the film industries of Canada, Australia, Germany, and UK, for example, show this dormant structure of inequality:

³ Please note that the overall network is composed of a set of communities based on edge attributes (gendered film core creative team composition). We, thus, infer the *clustering* of the graph based on “a single modality” instead of following common practices for *community detection* based on network structural characteristics, inferred “as a function of connectivity involving social interaction” (Inuwa-Dutse et al. 2021). We, nonetheless, refer to the clusters of the graph as *gendered communities* throughout the text.

Women remain largely underrepresented in key creatives roles (Coles and Verhoeven 2021; Screen Australia 2019; Prommer and Loist 2020; BFI 2020). In addition, studies have shown that gender inequality, and also racial exclusion, run deep within this industry (CAMEo 2018; Citizens for Europe 2021; Cobb and Wreyford 2017; Hoyes 2016; Nwonka 2020; O'Brien et al. 2016; Randle 2015). The consistency and persistence of inequality in this industry has been catalogued over and over again by manifold research studies (Conor et al 2015; Lauzen 2018; Liddy 2020; Paydar 2017).

Yet, Sweden seems to have interrupted this vicious cycle. The most recent numbers show that in 2020 the share of feature-length fiction films with funding from film commissioners that were directed by a woman was at 64% (Svenska Filminstitutet 2020). This upward trend in the Swedish film industry can be observed for a few years and is presumably related to the systematic approach of equity initiatives employed by Swedish policy makers (Katsarova 2019). Though Sweden is said to be “the leading EU country in terms of regulatory policies” targeted at increasing gender equality in the film industry (Katsarova 2019: 7), film funding for women directors (the Rookie program in 2007 and Moviement from 2013 to 2014), talent programs targeting specific content related to the life of women (The Woman in my Life in 2010 and Nordic Women in Film in 2016), and funding for young women’s filmmaking (Young Women’s Filmmaking from 2011 to 2016) are better understood as initiatives rather than regulatory policies. Such initiatives have a positive impact on the production of films by women-led creative teams, but as they target gender inequality in the film industry more generally, this does not translate directly to the film festival sector (Loist and Prommer 2019: 104–106). While a general overhaul of the industry’s prevailing *structures*, *norms* and *practices* is still necessary, policies targeting the biased selection of films and programming in the film festival sector are additionally needed (Loist and Prommer 2019). Acknowledging that the film industry is gendered and racialized, means to problematize these *structures*, *norms* and *practices* buttressing the ongoing inequality. This is where our research anchors, as we show empirical evidence of *structural* gender inequality in the film festival sector.

The film festival sector as a network

The film festival sector is an important subsector of the global film industry. By adding cultural capital in the form of prizes, press-coverage, or other windows of attention to films, it operates as an alternative value adding system (De Valck 2007). The film festival sector is estimated to currently consist of more than 8000 festivals worldwide, which can be subsumed under different categories in terms of their importance for the overall industry, thematic focus or geopolitical relevance (Loist and Samoilova 2021). Since the film festival sector’s rise in the 1930s and up until the 1980s, festivals served primarily as showcasing spaces for new films that would ideally find their way into the cinema. With the advent of digitization in the 1980s and resulting shifts in film production, the tasks of film festivals shifted too. With ever more films entering the market, which, in turn, is becoming more differentiated, the film festival landscape has expanded considerably (Loist 2016). Film markets and major festivals are now closely interlocked (Smits 2019). In this context, festivals are evolving from showcasing and marketing platforms to agents in their own right of this sector (Loist 2020). They are intermediaries, connecting projects and people, such as producers, financiers, distributors, and even become

funding bodies themselves (Ostrowska 2010; Falicov 2016, 2018; Vallejo 2014, 2020; Peirano 2021).

In recent years, film festival research has examined this increasing complexity through concepts such as network structures and circulation processes (Loist 2016, 2020). Foremost drawing on Actor-Network-Theory (de Valck 2007), system theory (Fischer 2013) or a mix thereof (Elsaesser 2005), the film festival sector is not only understood as a network, but also as a circuit or as comprised of parallel circuits (Iordanova 2009). As the festival landscape comprises a vast multitude of festivals worldwide, particular properties, such as center and periphery, geopolitical hierarchies, different scales and weightings, can be identified for the sector (Loist 2016, 2020; Campos-Rabadan 2020). Yet, it seems that both Actor-Network-Theory and system theory do not lend themselves to the application of rigorous, empirical, and quantitative research methods that can grasp the complexity of interlocking structural properties which help reproduce the industry's (in)equalities. In fact, research on inequality in the film festival sector focuses either on theoretical considerations (De Valck 2007; Iordanova 2009; Loist 2016) or qualitative case-studies (Vallejo 2015; Sun 2015; Peirano 2020). Enriching, for example, niche-specific knowledge on festival genres or geographic areas (Loist 2018; Vanhaelemeesch 2021), these studies are crucial stepping stones to uncover the normative and practice-based facets of inequality. By applying a network analytical lens, these studies are, for the first time, able to address the festival sector's structural complexity (Vanhaelemeesch 2021). Though focused on a small sample of network agents in the context of Central America, Vanhaelemeesch's (2021) application of network analysis to the film festival sector seems promising for grasping structural complexities, which otherwise remain unexamined.

Other network analysis studies, though on the film industry more generally, have analyzed discriminatory practices of gatekeeping (Verhoeven et al. 2020). Notwithstanding still sparse, scholars located within film and media studies, digital humanities, and cultural studies have applied both network analysis and visualization methods to film and film festival studies (Cattani and Ferriani 2008; Miller 2011; Olesen et al. 2016; Porubcanská et al. 2020; Vanhaelemeesch 2021; Verhoeven et al. 2009, 2020). Studies demonstrate that the film festival sector shows a gender bias similar to that of the global film industry (Smith et al. 2015, 2019; Loist and Prommer 2019), proving that normative and practice-based properties of the industry wide gender bias are also reflected in the film festival sector. In fact, empirical studies have shown how the gender bias intersects with racial and other biases (Cobb 2020). These intersecting biases influence the inclusion of women, non-white filmmakers, and other underrepresented groups in film festival programs (Smith 2020). Reports on festival runs of films directed by women in the Austrian film industry show a similar bias (Scheibelhofer and Koblitz 2021; Flicker and Vogelmann 2018). Studies on the representation of women within the prestigious Berlin and Cannes film festivals show the exclusion of women in the film festival sector (both as filmmakers as well as festival heads), further supporting the reported prevalence of gender bias in the film festival sector (Collectif 50/50 2018a, 2018b). While the mentioned studies have scrutinized the reproduction of gender inequality through norms and practices, a systematic inspection of the *structural* properties of gendered inequality in this sector is still missing. Therefore, we apply network analysis to research the

prevailing gender bias in the film festival sector and its reproduction in the sector's network structure.

Network analysis and inequality

Studying gender inequality by applying network analysis to specific industry data is not new. Manifold studies, particularly in the fields of STEM research and organizational sociology, have focused on aspects such as network(ing) effects on social capital for women and men. These studies generally focus on the importance of closure to yield social capital in the form of trust, support, and advice as well as the importance of occupying broker positions in networks to yield social capital in the form of access and competitive advantages (Piselli 2009). In summary, some studies find that women tend to have less access to social capital than men as they are more likely embedded in dense, gender homophile networks (Badar et al. 2013; Belle et al. 2014; Bozeman and Corley 2004; Lutter 2015; De Benedictos and Leoni 2020; Whittington 2018). While some studies provide evidence that homophily and closure is not detrimental to accruing social capital for women (Kegen 2013, 2015; McDonald 2011; Rothstein and Davey 1995), other studies point to the importance of women occupying broker positions to reap the benefits networking could potentially offer them (Barthauer et al. 2016; Bioglio and Pensa 2018; Checchi et al. 2019; Ismail and Rasdi 2007; van den Brink and Benschop, 2013; Steffen-Fluhr 2006). Despite these studies' differences, they mostly rely on the idea of fundamental gender differences. Even though such studies employ network analysis foremost to understand how patterns of relations “influence gender inequalities [...], discriminat[e] against women [and] negatively influenc[e] women's career paths, conditio[n] their behaviour and restric[t] their activities and their efforts” (Piselli 2009: 153), they more often than not interpret the results in light of the ‘deficit discourse’ postulating that women do not (net)work correctly and that women need to adjust their efforts or behaviors in order to succeed in the economy. However, recent studies clearly show that women aren't the problem when it comes to networking in the film industry and that future research will have to break with precedent to be able to grasp not only the role men play in reproducing gender inequality, but also the networked structures this reproduction is embedded in (Verhoeven and Palmer 2016; Hochfeld et al. 2017; Flicker and Vogelmann 2018).

To this end, we employ network analysis in researching networked inequality in the film festival sector to capture the structural facets of discrimination, which are reproduced within this sector. By operationalizing festivals as network agents (nodes) and films as circulating among them (ties), we put the emphasis on aggregate social structures rather than individuals. Instead of analyzing the individual potential of reaping social capital from networks—like the majority of studies on gender (in)equality do—our study focuses on the (gendered) social capital embedded in and reproduced through the circulation of films on the festival circuit. Thereby we choose to depart from the ‘deficit discourse’ and instead move towards an understanding of the gendered dimensions of the structural properties of this particular sector. Though we do acknowledge the importance and centrality of human agents within this sector, as those who create content, who choose where content is shown, who consume and interact with content and who

Table 1 Descriptive summary of final sample

Unit	n (percentage)
Total number of films used for the analysis	1323 (100%)
Total number of festivals used for the analysis	1523 (100%)
Total number of films made by 'women-only' core creative teams	144 (11%)
Total number of films made by 'men-only' core creative teams	508 (38%)
Total number of films made by 'mixed' core creative teams	671 (51%)

market it, our study focuses on films' circulation amongst festivals. In fact, the underlying human activities surface in the actual screening of films at festivals, whereby a networked structure of film screenings is produced.

Building on previous studies that show the prevailing film industry's gender biases (Lutter 2015; Verhoeven et al. 2020), we expect that these biases are mirrored in the network structure of the film festival sector. We expect that the circulation of films amongst festivals is produced by and itself re-produces gendered network structures in the film festival sector. We ask to what extent the global film festival network reflects gendered network communities and which festivals play a central role in bridging different communities. By focusing on the structural dimension of inequality, we examine existing structural barriers to equality and discuss potential policy implications for mitigating such *structural* biases (Strong and Cannizzo 2020; Nwonka 2020; Verhoeven et al. 2020).

Data

So far, no complete datasets of film screenings in the film festival sector, even just for particular festival calendar years, exist. In fact, the few datasets that do exist either cover film screenings at single festivals or film circulation amongst particular regional cohorts of festivals. The sample that this paper draws on is unique since it covers the circulation of 1353 films amongst a vast subset of festivals in 2013. Table 1 also gives a first insight into the distribution of films according to the predominant gender of people comprising the core creative team of the films. The original sample consists of 1353 films and 1533 festivals. Because for 30 films no gender data was available, the sample for the analysis included 1323 films and 1523 festivals (see Table 1).

Film sample based on source festivals

Films were sampled based on a non-probability sampling approach. First, six major festivals were chosen to serve as sample festivals due to their internationally recognized high quality status in the film festival sector. This status enables them to act as launch pads for films circulating in the vast festival sector, i.e. after the premiere at a top-rank festival a film will screen at several other smaller festivals in different regions and various specializations before or instead of a commercial theatrical release (Loist 2016, 2020). The first three chosen festivals are so-called A-tier festivals—festivals with international influence on the circuit and in the film industry—which take place in different locations at different times in the festival calendar: The Berlin International Film Festival (Berlinale), the Festival de Cannes, and the Toronto International Film Festival (TIFF). Yet, in order not to limit the sample to A-tier festivals, three specialized film festivals (e.g.,

Table 2 Share of film data identified on IMDb by the sample festival

Festival	Percentage of films identified on IMDb with at least one festival screening available (n)
Berlin international film festival (berlinale)	99% (n = 351)
Festival de Cannes	98% (n = 113)
Toronto international film festival (TIFF)	90% (n = 293)
International documentary film festival Amsterdam (IDFA)	66% (n = 178)
Clermont-ferrand international short film festival	66% (n = 288)
Frameline: San Francisco international LGBTQ+ film festival	58% (n = 130)

documentary film, short film, and queer cinema) were added to the sample: The International Documentary Film Festival Amsterdam (IDFA), Clermont-Ferrand International Short Film Festival as a leading short film festival with a film market located in France, and Frameline as the oldest queer film festival based in San Francisco. In a second step, the programs of these six festivals were used to collect information on all films screened at their 2013 festival editions.⁴ Third, further data on the circulation of these films on the festival circuit was gathered, documenting their festival run by collecting screening data and building a festival sample, which our network is based on. To do so, data was collected via IMDb (Internet Movie Database). The project has also collected additional data for six additional festival years (2011–2017) as well as survey data (Loist and Samoilova 2019, 2020), however, within the scope of this article we only focus on the 2013 IMDb subsample.

IMDb festival data were available for 1353 films (78%) out of the 1727 films identified in the six festival programs. Table 2 shows the share of film data identified on IMDb by each of the six sample festivals. It is worth noting that the three A-tier film festivals are represented to a greater extent on IMDb than the three specialized film festivals. In addition, the final sample has over-representation of films longer than 40 min, as 93% of them have been identified on IMDb compared to only 66% of films shorter than 40 min (so-called shorts).

Based on the collection of data on film screenings at additional festivals through IMDb, a total of 1523 festivals were identified for the sample⁵ (see Appendix 1 for the distribution of festivals per film in our sample). The festivals comprising the final dataset are located in 98 countries with the highest concentration of festivals being in the United States (297 festivals) followed by France (135 festivals) and Spain (89 festivals). We manually assigned unique identifiers to each festival and categorized their profile based on available information on the web. Festivals vary in their focus and specialization. 176 of all festivals in our dataset are externally accredited by either the International Federation of Film Producers Associations (FIAPF) or qualify for nominations to the British Academy of Film and Television Arts (BAFTA), or the Academy of Motion Picture of Arts and Sciences (OSCARS).

⁴ All films in the complete festival programs were included into the data collection, i.e. deliberately *not* limiting the dataset to films from competition sections.

⁵ We used self-definition of festivals: If a festival labeled itself as a film festival in its definition, we defined it as such.

Ascribing gender to core creative teams

In our analysis, we focus on three roles within creative teams—directors, writers, and producers—as they hold the highest degree of creative and economic decision-making power. Previous studies show that the composition of film core creative teams in terms of their gender correlates with the economic and cultural capital of a film, such as being top-grossing, its obtained sum of funding, its number of screenings, its type of story told, and even the power distribution amongst the film’s core creative team members (Smith et al. 2015; Loist and Prommer 2019). Based on these findings, the ascription of gender to core creative team members is necessary to assess whether the circulation of films in the film festival sector is structured by gender bias.

Contrary to popular belief, gendered data is not a given, but a product of gender ascription processes. Discussions about how to measure gender in a big amount of digitally born or digitalized data are still primarily at the stage of technical questions. However, a number of researchers started bringing attention to the problem of gender operationalization and misgendering (incorrectly assigning gender categories based on sex traits or other arbitrary categories) in large-scale data collection (Hamidi et al. 2018; Keyes 2018; Keyes et al. 2021). While the current project is based on assigning binary gender based on first names, we want to stress that gender is not binary and use the space of some paragraphs to explain, how gender was ascribed for the data at hand and how this impacts the resulting sample.

Our sample depicts the 2013 IMDb subsample of the entire data collected in the “Film Circulation in the International Festival Network and the Influence on Global Film Culture” research project that includes additional 6 years (2011–2017). Given the size of the dataset and limited resources, it was not feasible to assign gender manually. As current automated tools are limited to binary name-based approaches, binary gender was assigned to individuals based on their first names using the GenderizeR application (Wais 2016). The sample analyzed here includes 1323 films with 6016 individuals comprising the films’ core creative teams (1507 directors, 2740 producers, and 1769 writers) with a median of four people per team. 386 individuals in the sample could not automatically be assigned a gender based on their first name, so their names and corresponding films were checked manually via Google search with a focus on pronoun use and gender specific cues for each individual (see Appendix 2 for the distribution of the number of people in the core creative team in the 2013 sample). We also used the results of this manual gender assignment approach, to evaluate data quality of our GenderizeR results as well as the results of an alternative binary application, namely Gender-guesser (Elmas 2016). Due to limited resources, this evaluation was done only for a subsample of 1435 directors (Samoilova and Loist 2019). Although Gender–Guesser had an advantage of allowing the use of country specification that could improve name-based predictions (we have used production country as a proxy), its results did not notably differ from the GenderizeR approach. Accuracy resulted in 82% for GenderizeR and 81% for Gender–Guesser. The expected accuracy, recall and precision of such automated gender detection methods are usually around 80%, which was achieved here for both women and men directors (Karimi et al. 2016).

Please note that after we ascribed a gender to each individual of a film’s core creative team as described above, we went on to calculate the film’s core creative team

composition based on the roles individuals occupy and not based on the individuals themselves. In other words, if a person occupies more than one role in the core creative team, such as director and producer, we count this person according to the number of roles. We define a core creative team as composed of women, if all positions of writer, director, and producer⁶ are filled by women. We define a core creative team as composed of men, if all positions of writer, director, and producer are filled by men. We define a core creative team as 'mixed' if it is composed of men and women in the position of writer, director, and producer. As a result of defining mixed core creative teams as consisting of men and women regardless of their share, our sample contains 144 films (11%) with only women, 508 (38%) with only men, and 671 (51%) films with mixed core creative teams. For 25 films (2%) at least one team member could not be assigned a binary gender.

Studies show that the producer exerts much influence on the gender balance of the core creative team and the visibility and representation of women on screen (Loist and Prommer 2019: 107; Prommer and Loist 2020: 50). In our sample, the mean share of women in core creative teams comprised 30% and the median was at 25% (see Appendix 3 for the distribution of the share of women in core creative teams). While 33% (n = 907) of all producers are women, the share was smaller for directors 27% (n = 410) and writers 26% (n = 466). We define core creative team as composed of directors, producers and writers, as those roles not only receive awards by relevant professional audiences (Cattani and Ferriani 2008), but hold the highest degree of creative and economic decision-making power (Loist and Prommer 2019; Ebbers and Wijnberg 2010; Puttnam 2004). Nevertheless, we also checked the share of women in other relevant roles and find that the share of women in the role of editors (31%, n = 545) is similar to that of producers, while the shares of women in the role of cinematographer (17%, n = 274) is much lower than in producers, writers and directors.

To check for robustness of results, we employed a second operationalization of mixed-gender core creative teams. For this second operationalization, we re-coded mixed-gender core creative teams as teams that hold an exact ratio of 50% women and 50% men, while women-dominated core creative teams have only women or more women than men in the core creative team and men-dominated core creative teams have only men or more men than women in the core creative team. These different ratios of gendered film core creative team composition resulted in a vast change in sample structure: Only 89 films (7%) are made by mixed core creative teams now, whereas the number of films made by men-dominated core creative teams grew to 944 (71%) and films made by women-dominated core creative teams to 90 (22%). In the following section on findings, we will present the results of the network visualization and analysis based on the first operationalization and solely discuss the results of the second operationalization when we calculated significant deviations between both operationalizations.

Films made by women-only core creative teams are not equally distributed throughout the sample. For example, the highly prestigious festivals TIFF and Cannes have only 6% (n = 17) and 9% (n = 10) of films made by women-only core creative teams,

⁶ For the role of producer, we include credited producers and co-producers, but leave out executive, associate, or line producers.

respectively. For Berlinale, IDFA, and Clermont–Ferrand the share of films made by women-only core creative teams is around 12% ($n = 40$, $n = 20$, $n = 35$ respectively). The share of films made by women-only core creative teams is highest for Frameline—17% ($n = 22$). In addition, films made by women-only core creative teams are predominantly shorts. The share for short films is 17% ($n = 92$), compared to only 7% ($n = 51$) for long films. For one film, no data on length was applicable (e.g., interactive).

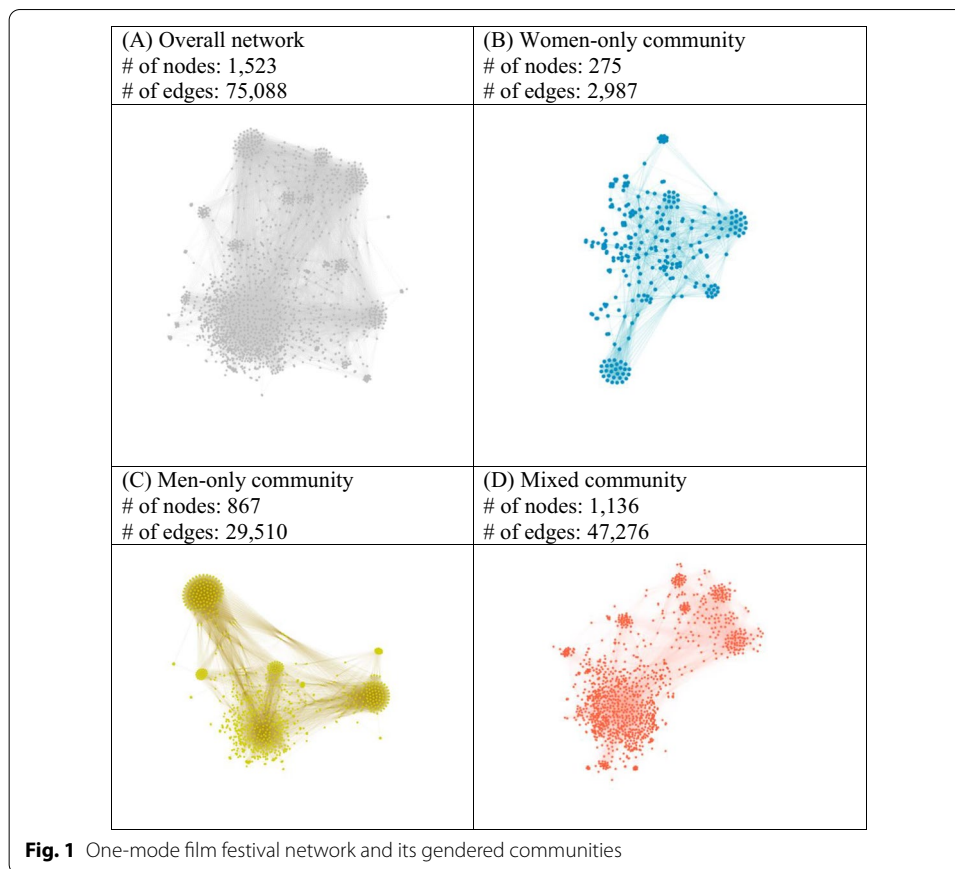
Method

Through a combination of visual network analysis (VNA) and descriptive network statistics we re-construct the gendered social structure underlying the film festival sector. We hereby combine the analysis of social structure as commonly pursued in quantitatively oriented network research as well as the strategies of qualitatively oriented network research by employing relatively open, flexible and descriptive methodologies for network analyses (Decuyper 2020). Our analysis captures the gendered structures of the film festival sector by means of visualizing the cultural and sociomaterial processes underlying circulation of films amongst festivals in the form of a network. To do so, we construct both a one-mode network graph based on festivals connected through *same*-film screenings and a two-mode network graph, in which films and festivals each depict nodes connected through film screenings. In the first step, we visualize and calculate descriptive network statistics for the one-mode network consisting of (A) all festivals connected through films and the gendered communities consisting of festivals connected through films (B) by women-only, (C) men-only, and (D) mixed-gender core creative teams.⁷ We then disentangle the gendered communities by their overlap with other gendered communities. For example, we analyze to what extent festivals that appear as nodes in the women-only network also appear as nodes in the men-only network. To assess potential brokering positions of selected festivals in the overall network, we calculate betweenness centrality scores. In the second step, we turn to the two-mode network consisting of films and festivals. We analyze the degree distributions of films made by women-only, men-only, and mixed-gender core creative teams across festivals. We compare degree distributions with regard to their maximum, median, mean, standard deviation, and skewness, and calculate pairwise comparisons (Kolmogorow–Smirnow) to assess if the empirical cumulative distributions differ significantly.

Findings

In light of our research interest to detect to what extent the film festival sector is gendered through film circulation, the one-mode overall network graph (A) depicts festivals as connected through shared film screenings (see Fig. 1). Since we added the ascribed gender of the core creative team as the respective film's attribute to this graph, it resulted

⁷ For visualizing the one-mode network graph we use the Force Atlas layout algorithm in Gephi and adjust the resulting visualization through the expansion and contraction algorithms. The Force Atlas layout algorithm “belongs to a class of networks known as force-directed algorithms, which “use the properties of the network to produce this kind of layout” (Khokhar 2015: 65). This allows us to draw a network graph based on spatializing the underlying practices as a “continuous interplay between forces of attraction and repulsion” between the agents of the network instead of their presumed relevance (Decuyper 2020: 81).



in weighted edges between nodes. For example, Locarno International Film Festival and TIFF are connected through 1 film by women-only, 5 films by men-only, and 14 films by mixed-gender core creative teams.

Overall, 1533 festivals are connected through the screening of 1323 films in the overall network graph (A). This induces 75,088 weighted edges between festivals. In the gray overall network (A) festivals can be connected by sharing one or more films made by women-only, men-only, and mixed core creative teams. The colored networks in Fig. 1 resemble a filtering of nodes from the overall network based on being connected through each gender (women-only, men-only, mixed) ties (based on films). They, thus, show festivals that are connected through sharing one or more films made by women-only (B), men-only (C), and mixed core creative teams (D).

The visualization illustrates that the mixed community (D) most closely resembles the overall network (A), as it depicts both the majority of densely connected clusters, as well as the majority of nodes scattered in peripheral circles around these clusters as visible in the overall network (A). The women-only community (B) is the most decentralized of all network graphs, meaning that most festivals, which screen films made by women-only core creative teams, do not tend to screen the exact same films, but a large variety of films made by only women. In other words, the women-only community (B) would look much more clustered, if a lot of festivals would tend to screen the exact same films. In

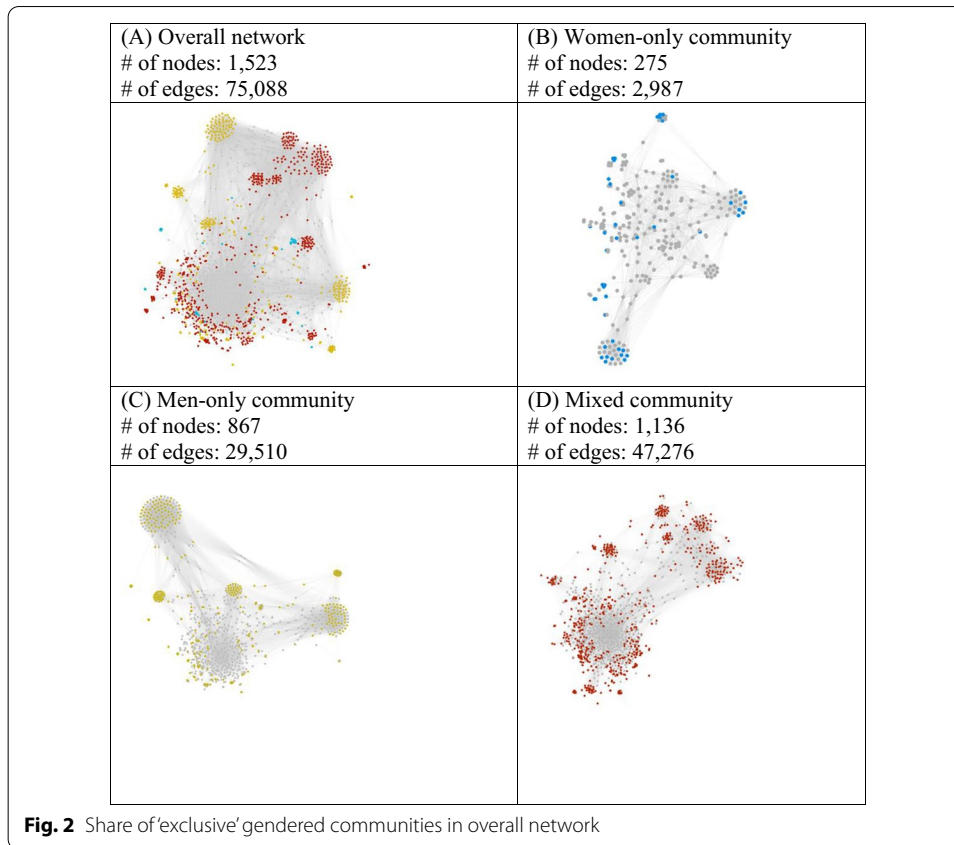
Table 3 Descriptive statistics and global network measures for all network graphs

	Network graph			
	Overall	Women-only	Men-only	Mixed
Number of festivals	1523 (100%)	275 (18%)	867 (57%)	1136 (75%)
Number of edges through shared films	75,088 (100%)	2987 (4%)	29,510 (39%)	47,276 (63%)
Number of weighted edges through shared films	101,244	3193	32,913	65,138
Number of films made by respective core creative teams	1323 (100%)	144 (11%)	508 (38%)	671 (51%)
Density	0.0648	0.0793	0.0786	0.0733
Centralization	0.4102	0.3185	0.3879	0.4306
Betweenness	0.0780	0.1490	0.1158	0.0601
Transitivity	0.4942	0.6026	0.7234	0.5099

fact, this is the case for the men-only community (C), which appears most clustered of all network graphs. Here, the majority of the 867 festivals screening films made by men-only core creative teams are densely connected.⁸ The festivals in the women-only community (B) appear least clustered and, thus, make up for most of the scattered nodes in the overall network (A). To support these visual impressions with systematic evidence, we report global network measures for the overall network and each gendered community in Table 3.

Table 3 displays descriptive statistics and global network measures for all four network graphs. We are careful in interpreting these results, as measures may depend on network size. Since festivals can be connected through the shared screening of one or more films made by women-only, men-only and mixed-gender core creative teams, the sum of nodes and edges of the gendered communities exceeds the total number of nodes and edges in the overall graph. The women-only community is the most densely connected of all four graphs (0.0793), which is not surprising since density tends to almost always be higher in smaller networks (women-only community) than bigger ones (men-only community). When turning instead to the average number of ties that each node has in each of the graphs (centralization based on degree), it becomes clear that in the mixed-gender community, festivals have on average more shared film screenings with other festivals (0.4306) than in any of the other graphs. The largest differences amongst the graphs exist when comparing their betweenness as well as transitivity values. In fact, in the women-only community betweenness centralization is highest (0.1490), meaning that in this network a few so-called broker festivals screen films, which are only screened at a small number of other festivals. Similarly, this also holds true for the men-only community, showing the second-highest betweenness centralization (0.1158). Transitivity captures the cohesion of networks, that is the number of closed triads in relation to all possible triads. In other words, if some festivals in our network would show a particular set of films, while other festivals would show another set of films and yet other festivals another set of films and so on, the festivals would cluster through these same-film screenings by being densely connected internally, which results in a high transitivity

⁸ These trends intensify in the second sample (see Appendix 6).



measure. In fact, we find that transitivity is highest for the men-only community. This means that festivals in this community tend to screen the exact same films, instead of screening a wider variety of films made by only men. To understand whether or not this results from a few so-called “festival hits” (films circulating amongst more than ten festivals) (Loist and Prommer 2019: 105), we also conducted a two-mode network analysis in the next empirical step. For now, the descriptive statistics suggest that a film’s circulation in the film festival sector is, at least to a certain extent, determined by the gender of its core creative team.⁹

These first findings are supported through a visualization of each community within the overall network. Figure 2 shows for each gendered community solely those festivals as colored that are *exclusively* connected through films made by (B) women-only, (C) men-only, or (D) mixed core creative teams.¹⁰ In other words, within the overall network (A) the three colors represent the same festivals as the corresponding colors in

⁹ The values only change slightly for all three communities, when calculations are based on the second operationalization (see Appendix 7). For this second operationalization the mixed-gender (50/50) community shows the highest transitivity value (0.7916). It is important to note, though, that for the men-dominated community the transitivity value is still second-highest (0.5309) with the lowest betweenness value of all graphs. This indicates that the men-dominated community exists of groups of festivals, which are very likely to share same films screenings made by men-dominated core creative teams.

¹⁰ For a visualization of the share of ‘exclusive’ gendered communities in the overall network for the second operationalization, please see Appendix 8.

Table 4 Connectedness of festivals per gendered community

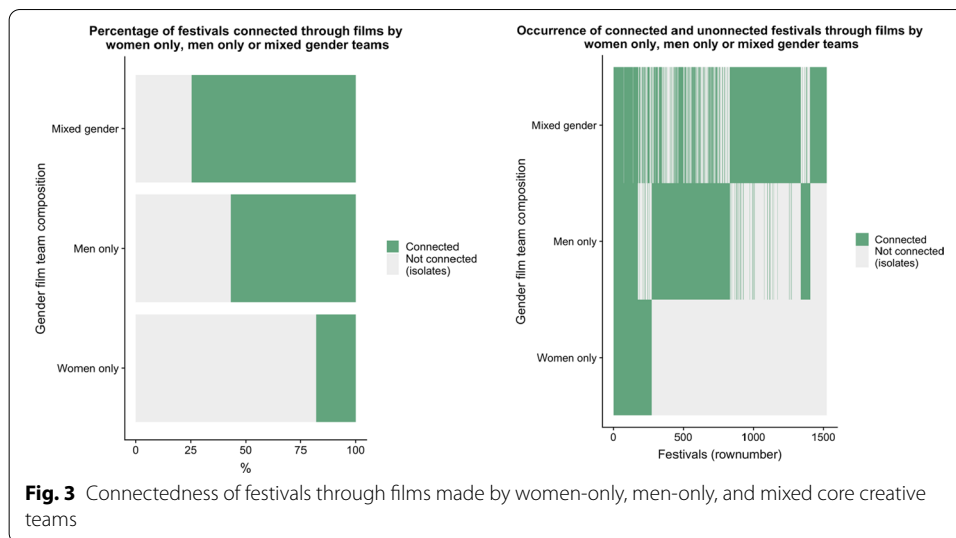
Network graph	Network graph				
	Overall	Women-only	Men-only	Mixed	Exclusive
Overall	1523	275	867	1136	0
Women-only	0	275	191	221	44
Men-only	0	0	867	524	333
Mixed	0	0	0	1136	572

community (B), (C) and (D). While it already shows that these festivals are much more densely connected in single clusters of same- film screenings for the mixed community (C) and the men-only community (D), the much more scattered and less connected festivals of the women-only community (B) are also scattered throughout the overall network (A). Here, the festivals exclusively showing films made by men-only core creative teams make up the most densely connected clusters by far.

When studying communities (or cliques) in a network, it is important to understand to which extent they overlap (Wasserman and Faust 1994). The overlap of gendered communities is displayed in Table 4. Out of the 275 festivals that are connected through films made by women-only core creative teams, 191 are also connected through films made by men-only core creative teams, and 221 are also connected through films made by mixed core creative teams. The 'Exclusive' column indicates the number of festivals exclusively connected through films made by either women-only, men-only or mixed core creative teams. These numbers also replicate the colored nodes of graph (B), (C) and (D) in Fig. 2, respectively. It is striking that out of 1523 festivals in our sample, nearly 22% ($n=333$) of these festivals are exclusively connected through screening films made by men-only core creative teams. Only 0.03% ($n=44$) of the 1523 festivals in our sample are exclusively connected through screening films made by women-only core creative teams.¹¹ Both groups contain a similar percentage of specialized festivals (34% for films made by men-only core creative teams and 32% for women-only films) as well as short film festivals (23% for men-only core creative team made films and 16% for women-only films). Yet, we do find more festivals with external accreditation in the men-only group than the women-only group of festivals. In fact, the men-only group contains two competitive specialized film festivals at FIAPF, two BAFTA and nine Academy Awards qualifying festivals, while the women-only group only contains Academy Awards qualifying festivals. These numbers clearly suggest that film circulation is indeed gendered, since films with men-only core creative teams (can) draw much more on symbolic capital in their circulation than films with women-only core creative teams (can).

Figure 3 expands on the connectedness of festivals through films. The left panel in Fig. 3 shows the percentage of isolated festivals for each gendered community. Isolates are those festivals that are not connected through film screenings. Since we look at gendered communities, it is possible that a festival counts as an isolate in the

¹¹ Though these numbers improve numerically when calculated for the second sample of women-dominated, men-dominated and mixed (50/50) core creative teams, the gap between women-dominated and men-dominated communities is even larger, with 58% of festivals exclusively connected through screening films made by men-dominated core creative teams and 0.06% of festivals exclusively connected through screening films made by women-dominated core creative teams (see Appendix 9).



women-only community, since it is not connected to other festivals through screening women-only films, but does not count as an isolate in the men-only community, since it is connected to other festivals through screening men-only films. While 867 out of all 1523 festivals are connected through films made by men-only core creative teams, only 275 out of all 1523 festivals are connected through films made by women-only core creative teams. This means that 75% of the overall festival network nodes count as isolates in the women-only community. The right panel in Fig. 3 shows the overlap of festivals through films made by women-only, men-only, and mixed core creative teams. Here, the green pattern shows that most of the 275 festivals connected through films made by women-only core creative teams, are also connected through films made by men-only ($n = 191$) and mixed core creative teams ($n = 221$). Only 44 of these 275 festivals are exclusively connected through films made by women-only core creative teams.¹² Thus, we can conclude that films made by women-only core creative teams contribute less to the festival sector's overall connectedness compared to films made by mixed or men-only core creative teams. One could interpret this as a measure for the recognition of films, pertaining to the selection bias women-only core creative team made films face in comparison to men-only core creative team made films circulating the festival network.

Next, we turn to analyzing the role that selected festivals can play in reproducing, respectively mitigating this gendered structure. In 2018–2019, a number of film festivals signed the 5050 × 2020 Gender Parity Pledge, which is geared towards increasing gender representation and transparency within the film festival sector. The pledging festivals agreed to create statistics on the gender and race of directors and team members, who's

¹² The connectedness of festivals through films changes numerically when calculated for the second operationalization, yet the trend remains that most of the 479 festivals connected through films made by women-dominated core creative teams, are also connected through films made by men-dominated core creative teams ($n = 385$), and through films made by mixed (50/50) core creative teams ($n = 194$). Similarly, to the first operationalization, in which 16 percent of festivals are exclusively connected through films made by women-dominated core creative teams, 17.7% of festivals (85 of 479 festivals) are now exclusively connected through films made by women-dominated core creative teams in the second operationalization (Appendix 10).

films entered the respective festival's selection, and also make the gender and race of the members of the selection committees and the executive boards and/or boards of directors available to the public, while also aiming to achieve parity in these bodies (Women and Hollywood 2019). Through analyzing the networked inequality structures of the film festival sector, we also aim to identify those festivals, which could play key roles in enacting their pleas and those, which do not.

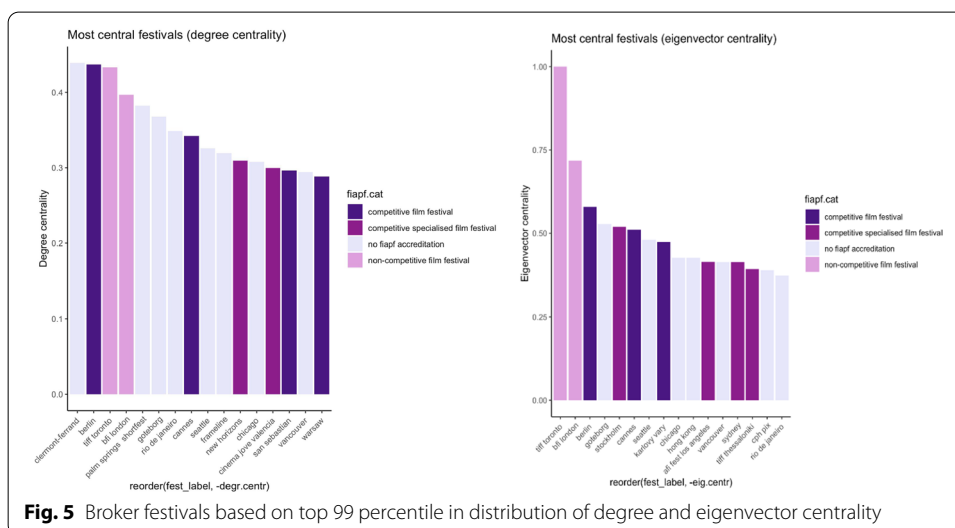
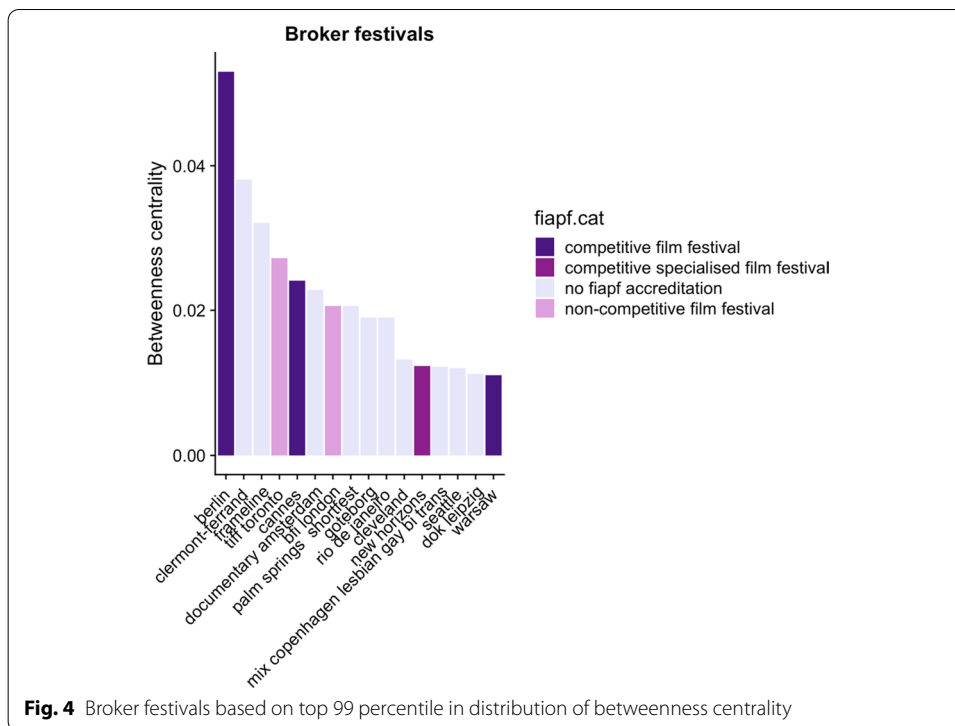
To do so, we calculate which festivals lay in the top 99 percentile of the betweenness centrality distribution. These festivals have a particularly high betweenness centrality compared to other festivals (with 99% being the convention for cutting outliers) and thus occupy brokerage positions in the network. These broker festivals could potentially exert influence upon the sector's gendered network structure depending on the screening of films made by women (only or dominated) core creative teams in order to enact the goals of the 5050 × 2020 Gender Parity Pledge. While the betweenness centrality score of a festival does not necessarily imply that it occupies a brokerage position between *gendered* communities, it does tell us, which festivals are overall more likely to connect otherwise disconnected festival communities.

We suggest that, if such broker festivals, i.e., festivals, which show films from network communities that otherwise have a low amount of overlapping film screenings, start screening more films by women-only and/or mixed core creative teams, these films as well as the underlying equality practices are more likely to reach otherwise disconnected communities of the network. While targeting the most central (degree centrality) or popular (eigenvector centrality) festivals might effectively diffuse new policy practices within the network core, such practices might not reach the festivals in the network periphery (Fernandez and Gould 1994; Stovel and Shaw 2012). In other words, while highly central festivals may have a strong signaling power for the festival sector when implementing equality policies, broker festivals occupy strategic local positions through which novel policies could be exerted. Think, for example, about a specialized festival like the International Documentary Film Festival Amsterdam (IDFA). While this festival is neither central in terms of degree nor eigenvector centrality, it occupies a broker position and likely provides access to a specialized sub-community, i.e. documentary film festivals. These specialized festivals may be less influenced by Cannes' policy changes and more influenced by IDFA's policy changes due to a more similar identity with IDFA.

Figure 4 displays the broker festivals in our sample based on the top 99 percentile in the betweenness centrality distribution.¹³ We see, that among these 16 broker festivals, six are included in the list of FIAPF accredited festivals and three of those FIAPF accredited festivals have signed the 5050 × 2020 Gender Parity Pledge (Berlin, TIFF and Cannes). Thus, policy makers, industry players, film makers and audiences could, in the future, target the remaining, non FIAPF-accredited broker festivals in an effort to further promote gender equality in the film festival sector on a structural level.

Additionally, we argue that it remains of importance to continue targeting the most central festivals (Berlin, TIFF, BFI London and Cannes) as they carry strong signaling power through their central positions in the network. Figure 5 depicts the festivals in our

¹³ Broker festival results remain nearly the same when calculated for the second operationalization (see Appendix 11).



sample based on the top 99 percentile in the degree centrality distribution as well as the eigenvector centrality distribution. Although our calculations are based on a sample of films circulating amongst festivals after their premiere in 2013 and festivals only started signing the pledge after its introduction at Cannes in 2018, one can assume that the politics and programming of these broker festivals in 2013 do correspond with their stance towards signing or not signing the pledge since 2018, in turn structuring the film festival sector between 2013 and 2018 accordingly.

Recent reports show that the 5050 × 2020 Gender Parity Pledge and the effect of being held accountable for the promise did have some impact in terms of diversity and equality standards in the four areas of the pledge (A—Statistics, B—Promoting the Distribution and Promotion of Films Directed by Women, C—in Teams, D—Diversity). When we look at the “Big Three”, i.e. the three most prestigious A-list festivals Cannes, Venice and Berlin, and their most coveted competition sections, we see some improvement. Cannes showed a small increase in women-directed films in their competition in 2019 after the 2018 protests staged by Collectif 50/50 en 2020 (Erbland 2019; DeRoo 2021). Venice showed an improvement to 44% of women-directed films in competition in 2020 (Erbland 2020). The Berlinale fared relatively well with 41% of women-directed films in competition in their first 2019 report when the Pledge was signed by the outgoing festival director Dieter Kosslick (Meza 2019; Internationale Filmfestspiele Berlin 2019). With the new mixed team of festival directors Mariette Rissenbeek and Carlo Chatrian the percentage slightly decreased at first and has gone up again (33% in 2020 and 2021, 39% in 2022) (Internationale Filmfestspiele Berlin 2022). This, of course, does not mean that the festivals, which signed the 5050 × 2020 Gender Parity Pledge, are forerunners in terms of diversity and equality standards. Nevertheless, a change in the industry seems on the way. Considering this along with our findings, leads us to suggest targeting particularly the remaining 12 broker festivals for signing the 5050 × 2020 Gender Parity Pledge.

So far, we have analyzed how festivals in the network are connected through screening films and how the resulting network structure is characterized by a gender bias. Yet, to gain further insights into the networked inequality at hand, we switch our focus from festivals to films. The question guiding us now, is how films are distributed throughout the overall network and its communities in regard to the gendered film core creative team composition. We also want to know, whether or not festival hits—namely a few, very successful films screened at a large number of festivals throughout their festival run—are the driving force behind the fact that festivals in the men-only community tend to screen the same films, instead of a wider variety of films made by only men. Therefore, we need to calculate how films connect the festivals in our network or, in other words, need to study the distribution of films amongst these festivals. To do so, we return to the original set-up of our collected data, namely festivals (node 1) connected to films (node 2) through screenings (tie). This so-called two-mode network (as we have two different modes of nodes), enables us to scrutinize the role films play in structuring the gendered network.

Figure 6 depicts the connectedness of films to festivals by gendered core creative team composition.¹⁴ The blue distribution indicates the connectedness of films made by women-only core creative teams to festivals in the network. The yellow distribution indicates the connectedness of films made by men-only core creative teams to festivals in the network. The red distribution indicates the connectedness of films made by mixed core creative teams to festivals in the network and the grey distribution

¹⁴ Please see Appendix 4 for the cumulative connectedness of films to festivals by gendered film core creative team composition based on the cumulative density function of degree centrality and Appendix 5 for the pairwise group comparisons (Kolmogorow–Smirnow-Test) for skewness degree of gendered communities.

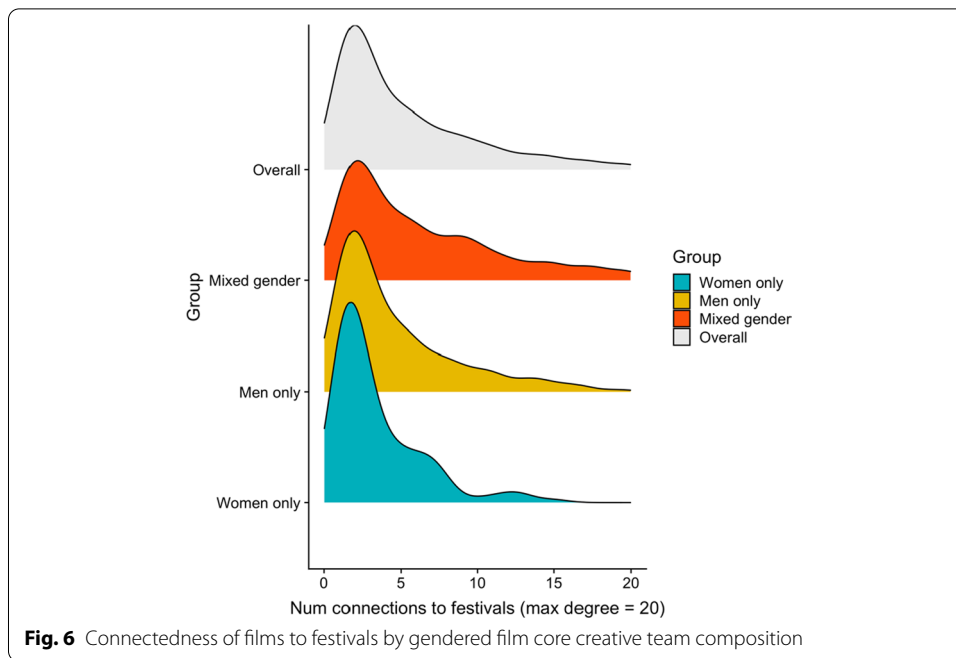


Table 5 Connectedness of films with festivals by gendered film core creative team composition

Network graph	Number of films	Max degree	Mean degree	Median degree	SD degree	Skewness degree
Overall	1323	140	7.19	4	10.42	6.08
Women-only	144	35	4.27	2	5.53	3.57
Men-only	508	140	5.92	3	10.03	8.35
Mixed	671	136	8.78	5	11.23	4.82

indicates the connectedness for all films, regardless of the gendered film core creative team composition, to the festivals in the network. The median connectedness of films made by women-only core creative teams equals 2, the median connectedness of films made by men-only core creative teams equals 3.¹⁵ Thus, the majority of films made by men-only core creative teams are screened at more festivals than the majority of women-only films. Films made by women-only core creative teams are on average shown at 4.27 festivals, whereas films made by men-only core creative teams are on average shown at 5.92 festivals. Comparing the skewness measure for films made by women-only core creative teams and men-only core creative teams reveals a striking pattern. While a large proportion of films made by women-only core creative teams is shown at a small proportion of all festivals, a small proportion of films made by

¹⁵ Note that for improved graphical display the distributions are cut at a maximum degree (number of ties a node has) of 20.

men-only core creative teams is shown at a large proportion of all festivals. This indicates that films made by men-only core creative teams tend to move through the film festival sector as festival hits, while this is not the case for films made by women-only or mixed core creative teams.

Table 5 supports this trend, displaying the descriptive statistics of the degree distribution of 1323 films made by women-only, men-only, and mixed-gender core creative teams that are connected to 1523 festivals. We see that films made by men-only core creative teams are screened at up to 140 different festivals, while the skewness degree indicates that it must be a small number of films, which travel the circuit with exceptional festival success. The distributions for each community differ significantly.¹⁶ In terms of policy implication, the dynamic of festival hits made primarily by men-only core creative teams suggests two possible routes. One possibility is that festival hits tend to be films created by established directors with strong reputation and historical legacies. Future policies could mitigate this bias by targeting festivals to provide more space for newcomer filmmakers. Another option is that the dynamic of festival hits evolves over time in the festival network, meaning that festivals, which take place later in the festival calendar are more likely to include films that were already shown at many other festivals rather than lesser known films into their programs. In this case, we would need to analyze more closely what type of films and festivals emerge in the long festival runs, as these might be smaller arthouse films which travel the circuit to many smaller audience festivals as an alternative to commercial distribution. In this case, it may be effective to target those festivals and raise their awareness on potentially unintended consequences of gender bias in their programming.

Conclusions

In this paper we posed the question to which extent the film festival sector is structured by gender bias. As previous research and data points to the fact that gender inequality is prevalent in much of the film industry more generally, as well as the film festival sector, we were curious to depict and analyze the networked inequality structures of film circulation.

What we expected to see is not only that the circulation of films amongst festivals is produced by and itself re-produces gendered network structures in the film festival sector, but that these work in favor of men. To get a hold of these gendered structures, we had to ascribe gender to the core creative teams of films in order to see, whether or not film circulation changes in accordance with the film festival sector's gendered communities. We find that, first, it matters how one operationalizes gendered film core creative team composition for the outcome of the analyses. In fact, our analyses show that when

¹⁶ Please see Appendix 2 for pairwise group comparisons (Kolmogorow–Smirnow-Test) to test, if the hypothesis that distributions were drawn from the same underlying distribution can be rejected. The p values indicate that all distributions are significantly different from each other. Though depicting similar trends, please note that we only find significant group differences between women and men for the second operationalization (see Appendix 12, Appendix 13, Appendix 14, and Appendix 15).

we take into account the relative power that roles in core creative teams carry (referring to our second operationalization), the gender bias in terms of how successfully films circulate in the festival network intensifies further. We, therefore, suggest that future research needs to account for the different core creative team roles women and men take up in filmmaking, when researching gender bias in the film festival sector.

Secondly, we find that for both operationalizations films made by women-only or women-dominated core creative teams tend to circulate quite differently in the film festival sector. Festivals that screen films made by women-only or women-dominated core creative teams do not tend to screen the same films as much as festivals that screen films made by men-only or men-dominated core creative teams. In fact, a small, but relevant number of films made by men-only or men-dominated core creative teams travel the circuit much more successfully in terms of screenings from one festival to another.

Third, we were able to identify 16 festivals, which occupy brokerage positions, meaning that they carry the potential to influence the gendered network structure by their film screenings. Cross-checking this list with those festivals that signed the 5050 × 2020 Gender Parity Pledge, we suggest that policy makers and industry agents target those 12 broker festivals, which have not yet signed the 5050 × 2020 Gender Parity Pledge, to possibly achieve less biased, gendered network structures in the future.

Future research would greatly benefit from taking a longitudinal perspective, which allows to follow the circulation of films through multiple festival calendar years amongst a majority of festivals. Hereby, one could not only trace if and in how far the film festival sector's networked inequality changed on a structural level, but in how far the broker festivals possibly influenced such a change through consciously altering their programming and screenings in terms of reaching gender equality.

Though our data allows for a much more comprehensive picture of the film festival sector than previous datasets were able to, the underlying sampling procedure is still based on six prestigious film festivals. Thus, when interpreting the results, we have to keep in mind that films that have started at other A-tier premier festivals as well as less prominent festivals are not represented in the network in the same way. This, in turn, means that our sample in no way represents the circulation dynamics of the entire film festival sector.

In fact, picking six other festivals at the start of the non-probability sampling would potentially result in a completely different network structure. If the potential other six festivals resemble the six festivals that were chosen at the outset of the study in terms of different parameters (temporal, geographical, specialization, or acknowledgement of a festival's importance by external stakeholders such as FIAPE, BAFTA, and Academy Awards), we can assume a fairly similar network structure. Yet, the more a hypothetical new sample of six festivals differs in the mentioned parameters from the first set of six festivals, the more the network structure would diverge as well. For example, if we pick

six smaller and specialized festivals, located at the periphery of our current network, we can safely assume that they would have more connections among each other than to more central and popular festivals in the network core of the current network model. Thus, future research should account for different sampling strategies to gain a more comprehensive picture of the entire festival sector.

As a result of our sampling technique, our network analysis is biased towards a Euro- and Global North-centric perspective of the global film festival sector. Future research could improve on this matter by adding another round of non-probability sampling to the data at hand: (1) six initial festivals and the films screened there, (2) all other festivals these initial films were screened at, (3) all films screened at these other festivals. By adding another round of non-probability sampling, we most likely end up with a far bigger number of films than festivals (in our current sample these numbers are quite similar), which could impact, how the gender biased circulation of films is resembled in the network structure. Furthermore, future research would greatly benefit from drawing on multiple data sources, beyond IMDb, to enhance data quality in terms of completeness, reliability, and validity. While we can assume that data on broker festivals is well-represented on IMDb, this might not be the case for specialized film festivals and the films screened there (such as LGBTQI* festivals, feminist festivals etc.). Thus, for future analyses of gendered film circulation, it would be interesting to collect data more diversely.

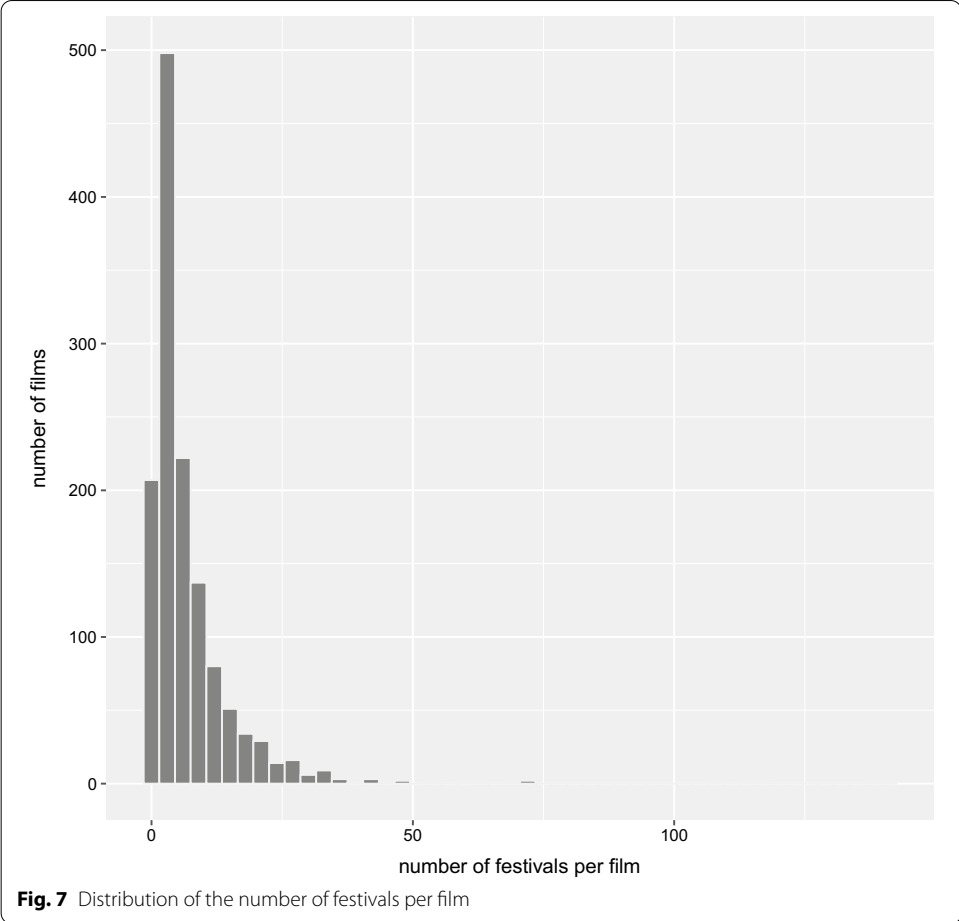
Lastly, we would like to point out that future research needs to consider other forms of structural inequality regarding, but not limited to, race, class, (dis)ability and migration background. It is well known that structural discrimination is intersectional urging research to account for this intersectionality in their theoretical and methodological approaches. Due to pertaining difficulties in collecting data containing self-assigned identity markers for people working in the film industry (see for example: Aikins et al. 2020; Else and Perkel 2022), our sample was limited to scrutinizing gendered inequality in the film festival sector.

Despite these limitations, our sample does scrutinize networked gender inequality of film circulation in the film festival sector. This is important as film festivals are crucial to a film's accumulation of manifold forms of capital. Due to the gender bias prevailing in the industry, advancing our understanding as to how such capital is obtained through film circulation despite, or because of, the underlying biased structure of the sector is of utmost importance. Though still seldom researched in a quantitative fashion, and especially not from a network perspective, our research illuminates the gender bias determining film circulation in the film festival sector and lends ground to tackling these networked inequalities.

Appendices

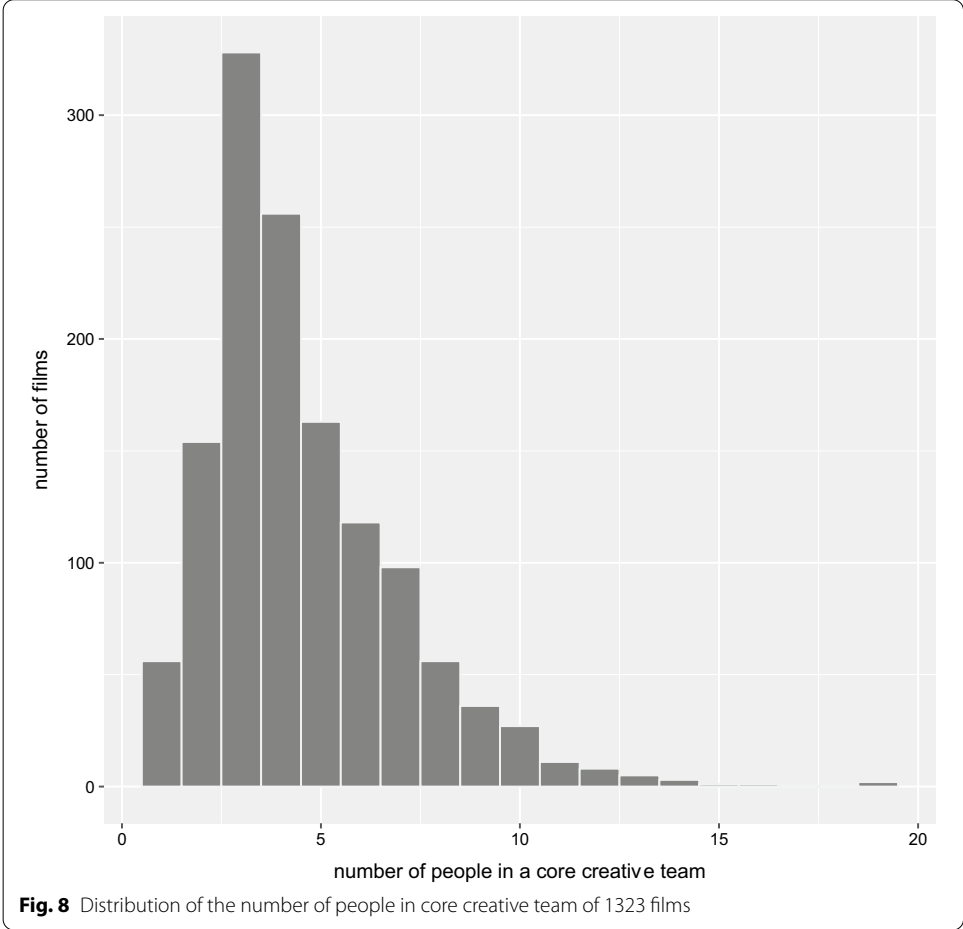
Appendix 1

See Fig. 7.



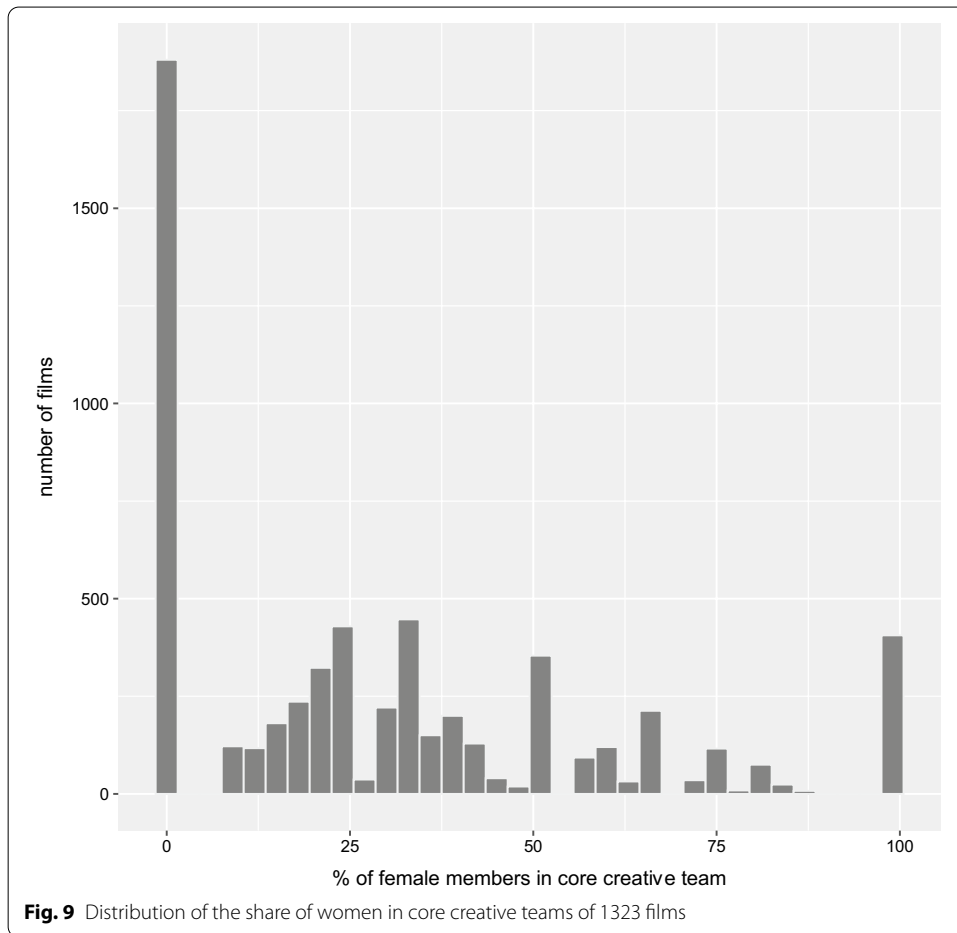
Appendix 2

See Fig. 8.



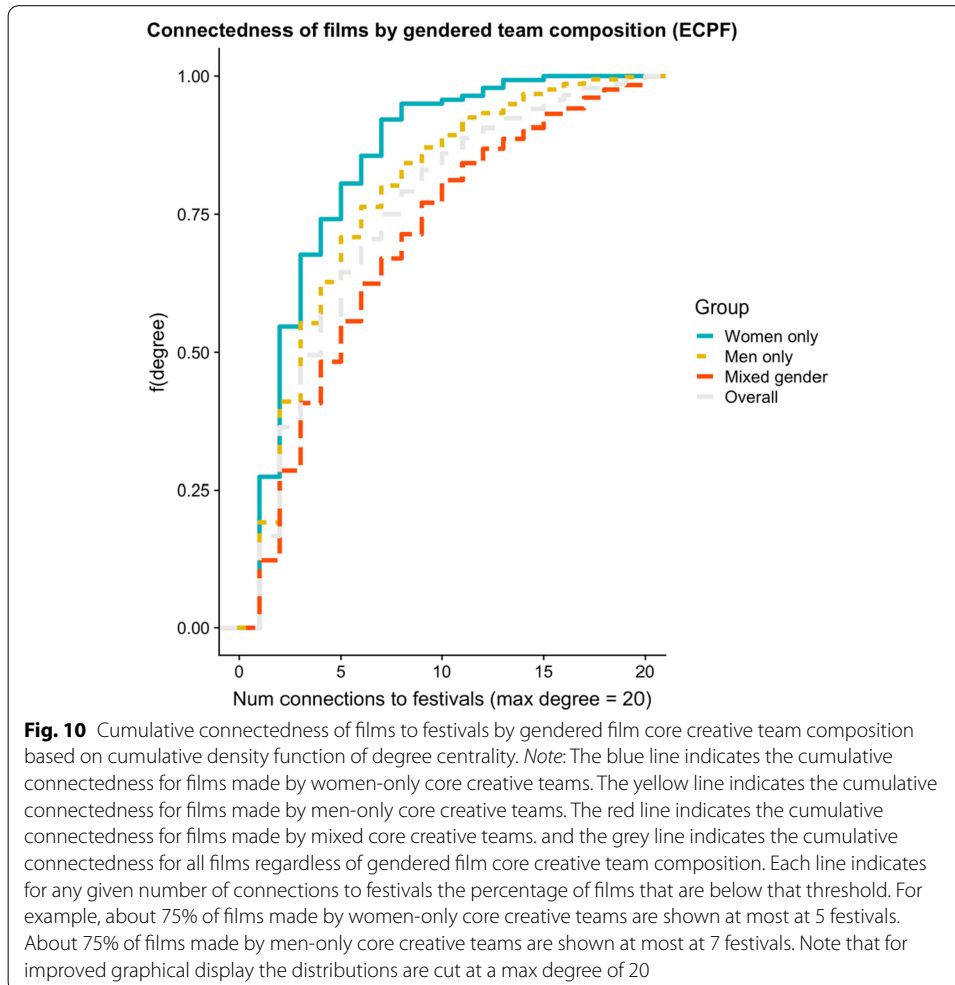
Appendix 3

See Fig. 9.



Appendix 4

See Fig. 10.



Appendix 5

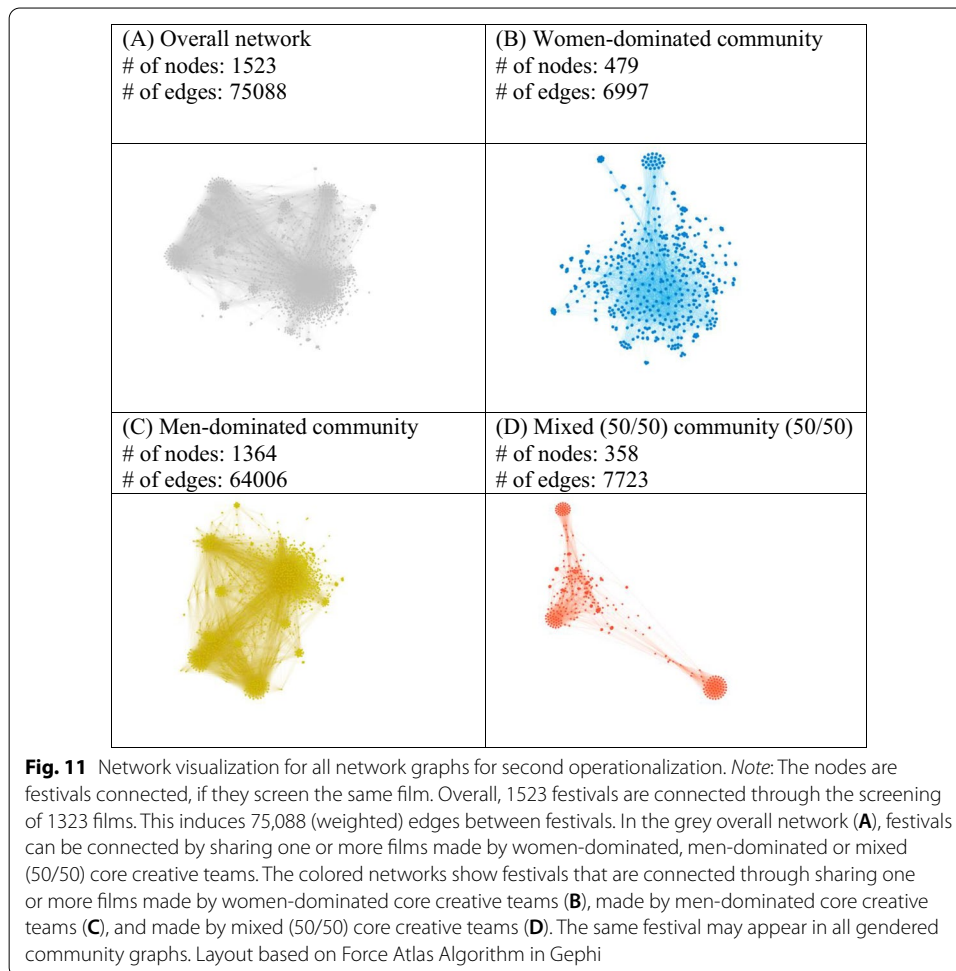
See Table 6.

Table 6 Pairwise group comparisons (Kolmogorow–Smirnow-test) for skewness degree of gendered communities

	Group comparison KS-test	D value	p value
D	ks.women.men	0.1321	0.0398
D	ks.women.mixed	0.2817	0
D	ks.mixed.men	0.1764	0

Appendix 6

See Fig. 11.



Appendix 7

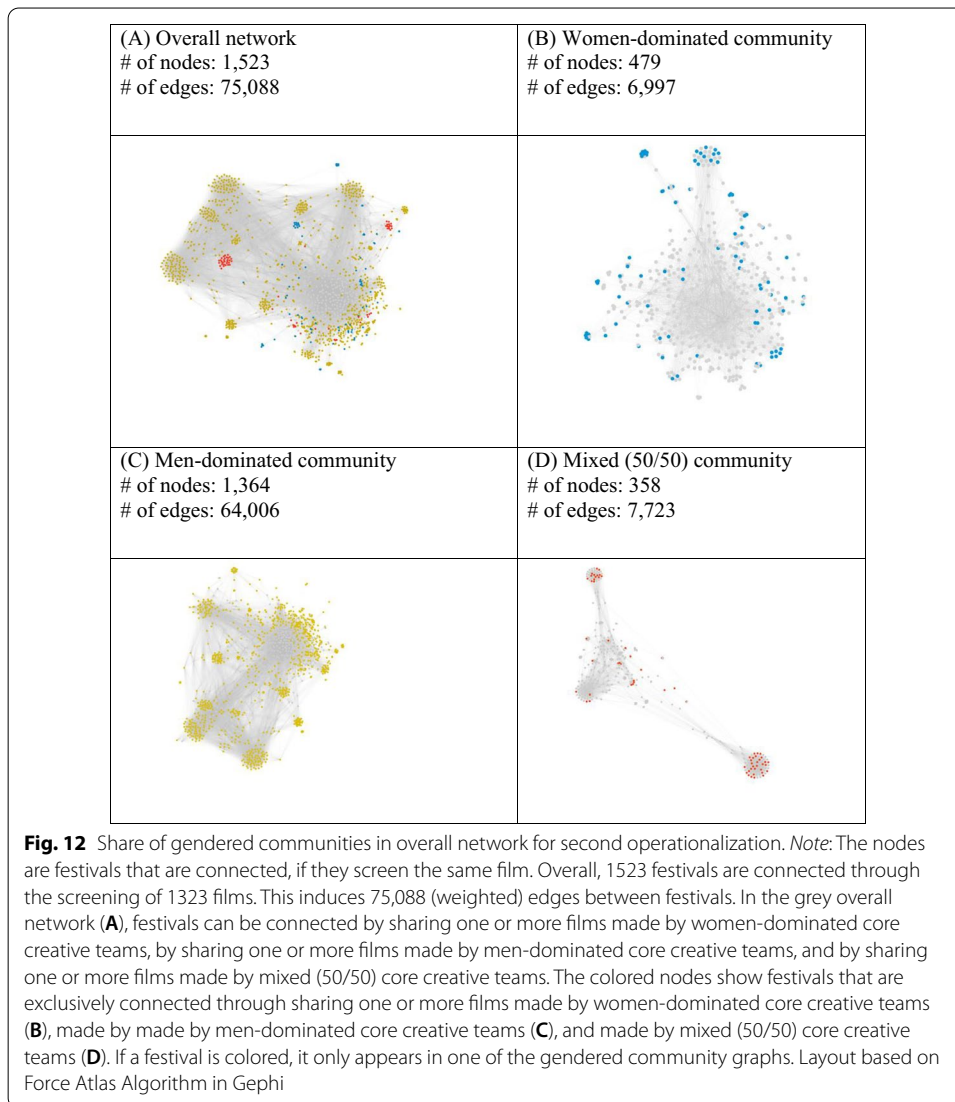
See Table 7.

Table 7 Descriptive statistics and global network measures for all network graphs for second operationalization

	Network graph			
	Overall	Women-dominated	Men-dominated	Mixed (50/50)
Number of festivals	1523 (100%)	479 (31%)	1364 (90%)	358 (24%)
Number of distinct edges through shared films	74,738 (100%)	6997 (9%)	64,006 (86%)	7723 (10%)
Number of weighted edges through shared films	101,244	8589	84,481	8174
Density	0.0645	0.0611	0.0689	0.1209
Degree	0.3987	0.4159	0.3838	0.3749
Betweenness	0.0785	0.1325	0.0682	0.2001
Transitivity	0.4942	0.3966	0.5309	0.7916

Appendix 8

See Fig. 12.



Appendix 9

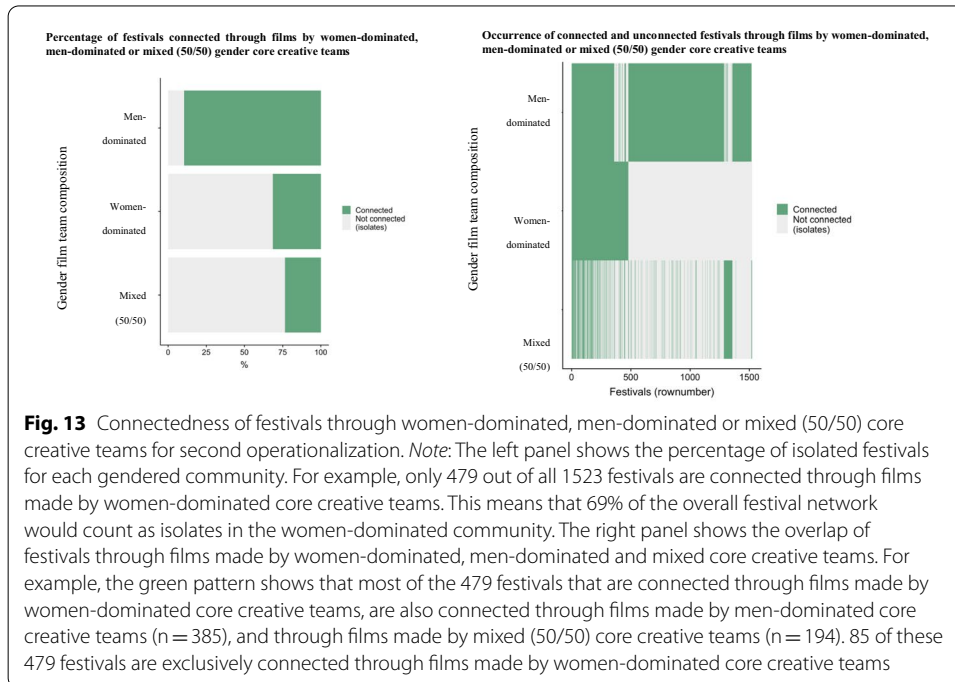
See Table 8.

Table 8 Connectedness of festivals per gendered community for second operationalization

Network graph	Network graph				No overlap
	Overall	Women-only	Men-only	Mixed (50/50)	
Overall	1523	479	1364	385	0
Women-dominated	0	479	385	194	85
Men-dominated	0	0	1364	284	880
Mixed (50/50)	0	0	0	385	65

Appendix 10

See Fig. 13.



Appendix 11

See Fig. 14.

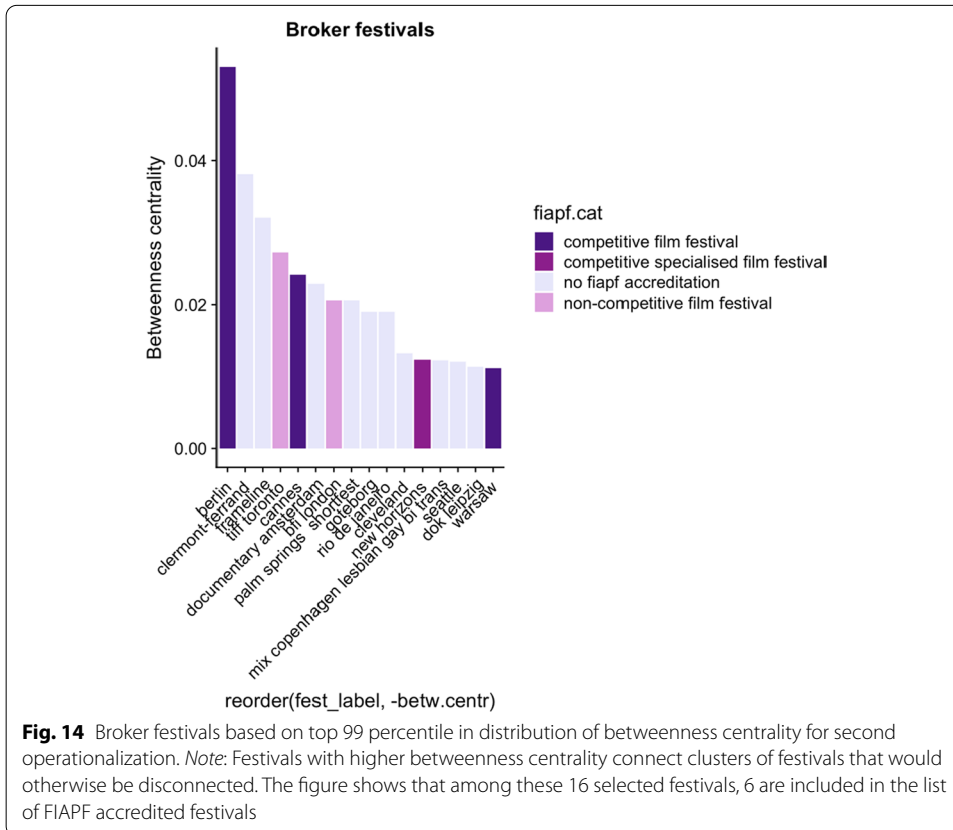
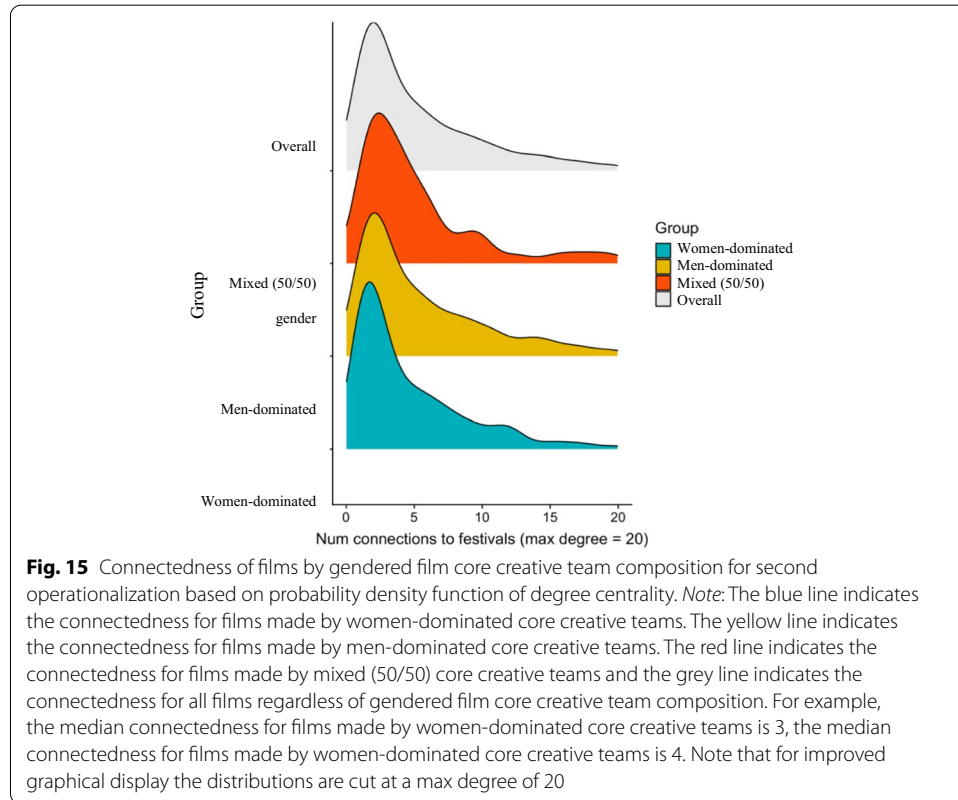


Fig. 14 Broker festivals based on top 99 percentile in distribution of betweenness centrality for second operationalization. Note: Festivals with higher betweenness centrality connect clusters of festivals that would otherwise be disconnected. The figure shows that among these 16 selected festivals, 6 are included in the list of FIAPF accredited festivals

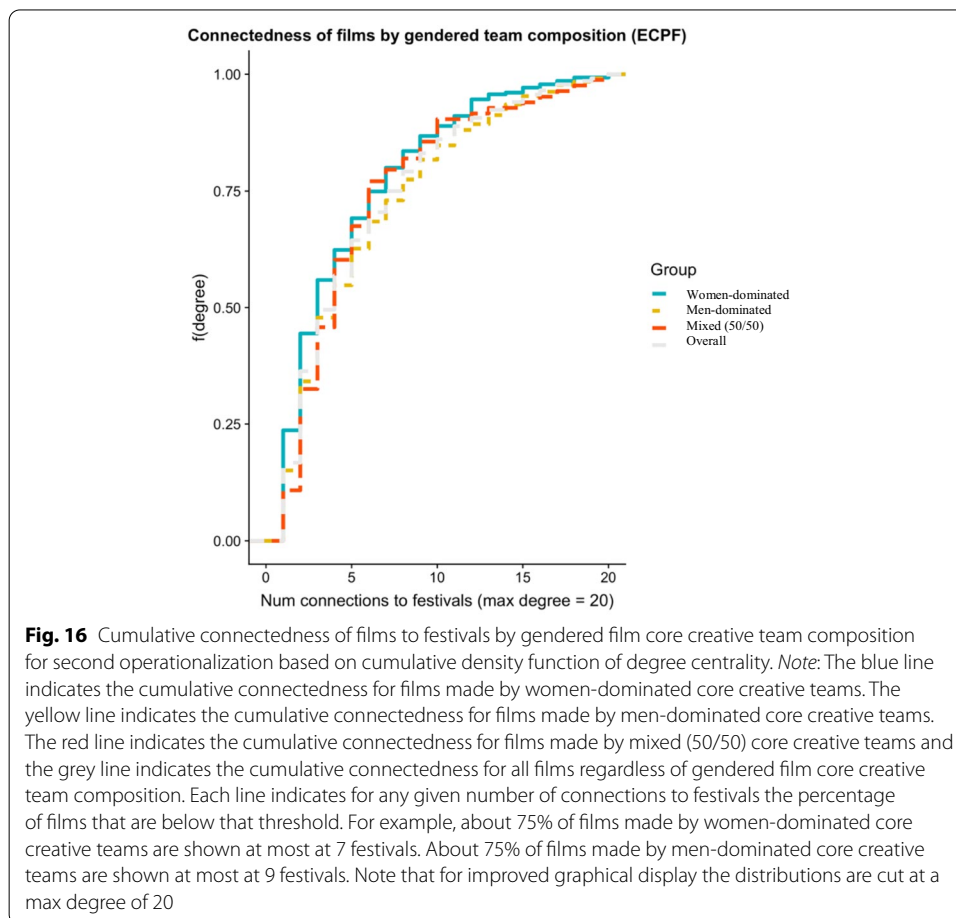
Appendix 12

See Fig. 15.



Appendix 13

See Fig. 16.



Appendix 14

See Table 9.

Table 9 Connectedness of films with festivals by gendered film core creative team composition for second operationalization (calculations based on degree distributions)

Group	Number of films	Max degree	Mean degree	Median degree	SD degree	Skewness degree
Overall	1323	140	7.19	4	10.42	6.08
Women-dominated	290	35	5.44	3	5.93	2.33
Men-dominated	944	140	7.68	4	11.31	6.11
Mixed (50/50)	89	71	7.74	4	11.53	3.63

The table displays the descriptive statistics of the degree distribution of 1323 films made by all core creative teams, women-dominated, men-dominated, and mixed (50/50) core creative teams that are connected to 1523 festivals

Appendix 15

See Table 10.

Table 10 Pairwise group comparisons (Kolmogorow–Smirnow-test) for skewness degree of gendered communities for second operationalization

	Group comparison KS-Test	D value	p value
D	ks.women.men	0.1098	0.0095
D	ks.women.mixed (50/50)	0.1265	0.2262
D	ks.mixed (50/50).men	0.0824	0.638

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Authors' contributions

M.E.E. was a major contributor in writing the manuscript as well as in interpreting the data. K.B. carried out all data analysis, contributed to interpreting the data and to writing the manuscript. Z.S. carried out all data collection and data preparation for analysis. S.L. contributed to writing the manuscript and interpreting the data. All authors read and approved the final manuscript.

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Availability of data and materials

The data supporting the results reported in the article is not published, but is available from the authors upon request.

Declarations

Competing interests

The authors declare that they have no competing interests.

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