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Article

The Impact of Virtual Community Participation on Youth Cultural Consumption: Evidence from User Behavior Data in Interest-Based Communities

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Abstract: Virtual interest-based communities have emerged as pivotal digital spaces through which young people discover, select, and consume cultural content. However, prior research has relied predominantly on survey-based methodologies, self-reported measures of participation, and stated consumption intentions, with limited integration of actual social-network structures and observable behavioral consumption traces. Addressing this gap, this study leverages linked public datasets from the music-scrobbling platform Last.fm to analyze the behavioral patterns of 3,764 users aged 18 to 35. Virtual community participation is operationalized through three structural dimensions: participation breadth, network embeddedness, and community cohesion. Cultural consumption is measured across four complementary indicators: consumption intensity, consumption breadth, consumption diversity, and novelty preference. Employing social network analysis, multivariate regression, and a series of robustness checks, the study examines the relationships between these participation dimensions and consumption outcomes. The findings reveal that participation breadth is most strongly associated with consumption intensity, while network embeddedness is positively related to both consumption breadth and diversity. Community cohesion, by contrast, is negatively associated with novelty preference, suggesting that tightly connected local networks may reinforce familiar cultural choices. These relationships are generally more pronounced among users aged 18 to 24 than among those aged 25 to 35. The study contributes behavioral evidence to the literature on youth cultural consumption and offers practical implications for cross-community recommendation systems and cultural-content discovery. Nevertheless, the observational design cannot fully disentangle social influence from homophily or reverse selection.

Keywords: virtual community; cultural consumption; youth; social network analysis; interest-based community

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1. Introduction

Youth cultural consumption is undergoing a marked transformation driven by digitalization, platformization, and community-based interaction. Cultural products such as music, films, books, animation, and games are increasingly accessed, evaluated, and circulated through online platforms rather than through isolated individual choices. Young users not only browse or consume cultural content directly but also establish friendship and follower relationships, observe the consumption records of other users, share interests and preferences, obtain information about cultural products, and develop a sense of group belonging within interest-based communities. As a result, cultural consumption has become embedded in virtual social networks in which users' choices may be shaped by their positions, connections, and relational environments.

Virtual community participation may be associated with youth cultural consumption through two contrasting processes. On the one hand, a larger number of social connections and a more central network position may be associated with broader opportunities for cultural information exposure. Highly connected users are more likely to encounter recommendations, ratings, playlists, reviews, and consumption traces generated by other community members, which may increase their consumption activity and broaden the range of cultural products they explore. On the other hand, highly cohesive interest-based communities may repeatedly circulate similar content and reinforce shared tastes [1]. Dense local connections can strengthen preference consistency among members, but they may also reduce exposure to unfamiliar or less popular cultural products. Virtual community participation may therefore promote both information dissemination and preference convergence, and these relationships may vary across different dimensions of cultural consumption.

Existing studies provide important insights into online communities and cultural participation, but several limitations remain. First, much of the previous research relies on questionnaires, self-reported participation frequency, or stated consumption intentions. Such measures are useful for understanding attitudes, but they do not fully capture users' actual social connections and observed cultural consumption behavior. Second, virtual community participation is often treated as a single variable, without distinguishing the number of social connections, users' structural positions in the broader network, and the cohesion of their immediate social environments. Third, studies of cultural consumption frequently emphasize consumption frequency or total volume, while paying less attention to consumption breadth, diversity, and novelty [2]. Consequently, it remains unclear whether stronger community participation simply increases consumption activity or also changes the composition and variety of cultural choices.

To address these gaps, this study uses three publicly available and linkable research datasets derived from Last.fm to examine the relationship between virtual community participation and youth cultural consumption. Community participation is measured through multiple network dimensions, including participation breadth, network embeddedness, and local community cohesion. Cultural consumption is examined in terms of intensity, breadth, diversity, and novelty preference. By combining social network structures with actual cultural consumption records, this study provides behavioral evidence that complements survey-based research. It examines patterns consistent with information dissemination and preference convergence across different network dimensions. The findings are expected to contribute to research on digital cultural consumption and provide practical evidence for cultural platform recommendation systems and youth-oriented cultural services [3].

2. Literature Review and Hypotheses

2.1. Virtual Community Participation

Virtual communities are digitally mediated social spaces in which users interact, exchange information, and form relationships around shared interests or activities. Interest-based communities are organized around common cultural interests, product preferences, or content themes, including music, films, books, animation, and games [3].

Virtual community participation is often measured through posting, commenting, sharing, or rating. It can also be reflected in users' network structures: friendship and follower relationships indicate social connections, while the number and configuration of these links reveal users' positions within the wider community. This study divides virtual community participation into three dimensions. Participation breadth refers to the number of direct social connections. Network embeddedness reflects a user's structural position in the overall network and connection to influential members. Community cohesion describes the closeness of relationships around a user, particularly whether the

user's contacts are also connected [4]. These dimensions may have different relationships with cultural consumption.

2.2. Youth Cultural Consumption Behavior

Youth cultural consumption behavior refers to how young users access, select, use, and repeatedly engage with cultural products or content. In digital environments, such behavior is observable through platform records, including plays, ratings, views, collections, reviews, and interactions with cultural products or creators [5].

This study examines four dimensions: consumption intensity, reflecting the frequency or total volume of cultural consumption; consumption breadth, indicating the number of distinct products, creators, or categories accessed; consumption diversity, measuring the evenness of distribution across cultural categories; and novelty preference, capturing the tendency to explore new, unfamiliar, less popular, or previously unconsumed content [3]. Together, these dimensions offer a more comprehensive understanding of cultural consumption than activity volume alone.

2.3. Participation Breadth and Consumption Intensity

Users with more social connections are likely to encounter greater volumes of cultural information, including rankings, recommendations, reviews, playlists, and peers' consumption activities. Broader networks may enhance both opportunities and motivation for cultural participation. Highly connected users may also access platforms more frequently to follow others and sustain their cultural profiles. Consequently, wider participation is expected to correlate with higher consumption activity [6].

H1: The breadth of virtual community participation is positively associated with the intensity of youth cultural consumption [6].

2.4. Network Embeddedness and Consumption Breadth

Network embeddedness reflects not only the quantity of direct connections but also structural access to diverse subgroups, enabling users in central positions to receive information from a broader membership base. Such positions lower the cognitive and temporal costs of discovering cultural products and expand exposure to varied creators, genres, and content sources [7].

H2: Greater network embeddedness is positively associated with broader youth cultural consumption [7].

2.5. Network Embeddedness and Consumption Diversity

Consuming many products does not necessarily reflect a diverse consumption structure, as users may concentrate predominantly within a single category. However, occupying central positions in a network may facilitate cross-group information flow and broaden exposure to heterogeneous preferences [8]. Consequently, network embeddedness may support both an expanded cultural repertoire and a more balanced distribution across consumption categories.

H3: Higher network embeddedness is positively associated with greater diversity in youth cultural consumption [9].

2.6. Community Cohesion and Cultural Preferences

Highly cohesive networks tend to circulate similar recommendations, evaluations, and consumption choices repeatedly [10]. Dense interpersonal connections can enhance trust and collective identity, yet may also amplify information redundancy and reinforce homogenous cultural preferences. Consequently, users within such communities often exhibit reduced openness to unfamiliar or non-mainstream cultural content.

H4: Greater virtual community cohesion is negatively associated with young users' preference for novel cultural content.

Where reliable indicators exist, this pattern may manifest as a heightened preference for widely consumed or mainstream cultural products [11].

3. Data and Methods

3.1. Data Source

This study integrates three linkable Last.fm datasets: LFM-1b, the Last.fm Social Connections dataset, and the LFM-1b User Genre Profile dataset. Last.fm captures listening behaviors, user-to-user connections, and music preference patterns, enabling integrated analysis of virtual community engagement and digital cultural consumption [4].

LFM-1b comprises 120,322 anonymized users, 3,190,371 artists, and 1,088,161,692 listening events [12]. Each event records associations with a user, artist, album, track, and timestamp. User-level metadata includes country, age, gender, registration time, total playcount, number of distinct artists listened to, weekly listening frequency, artist novelty, and mainstreaminess metrics.

The Social Connections dataset contains 78,989 undirected friendship links among 11,792 users from LFM-1b. These links were aligned with demographic and listening records using anonymized user identifiers. Genre-level consumption profiles were derived from the User Genre Profile dataset, which maps artists to 1,998 genres and styles and aggregates playcounts by user [13].

Digital music listening is conceptualized as an observable indicator of cultural consumption [4, 10]. Consequently, the findings pertain specifically to platform-mediated digital cultural behavior, rather than offline participation, physical media acquisition, or aggregate cultural expenditure.

3.2. Sample Selection

The initial social network comprised 11,792 users [2]. Demographic, friendship, listening, and genre-profile data were linked using user identifiers assigned for research purposes. Users lacking valid age information were excluded, and the analysis was limited to those aged 18–35.

Records with missing network, listening, or preference variables were omitted. Accounts exhibiting implausible age values, atypical activity patterns, or fewer than 10 distinct artists were also excluded, as sparse profiles could not reliably support measurement of consumption breadth and diversity [13].

The final analytical sample consisted of 3,764 users. Continuous variables were winsorized at the 1st and 99th percentiles to mitigate influence from extreme outliers in activity or connectivity. Gender and country variables with missing values were retained as distinct categories [1]. A restricted sample of users aged 18–29 was used for robustness analysis.

3.3. Variable Measurement

3.3.1. Virtual Community Participation

Virtual community participation was assessed using three dimensions: participation breadth, network embeddedness, and community cohesion.

Participation breadth was quantified by the number of direct friendship links, corresponding to degree in an undirected network [2, 4]. Due to right-skewness, degree was log-transformed as:

$$PB_i = \ln(1 + Degree_i). \quad (1)$$

Network embeddedness was evaluated using PageRank centrality, which accounts for both the quantity of direct connections and the structural prominence of neighboring users [4]. PageRank scores were standardized to zero mean and unit standard deviation. Eigenvector centrality served as a complementary metric.

Community cohesion was operationalized via the local clustering coefficient:

$$CC_i = \frac{2T_i}{k_i(k_i-1)}, \quad (2)$$

where T_i denotes the number of observed links among user i's friends and k_i represents the user's degree. Higher values reflect greater local interconnectivity.

3.3.2. Youth Cultural Consumption Behavior

Consumption intensity was quantified as the natural logarithm of total listening events.

$$CI_i = \ln(1 + \text{ListeningEvents}_i). \quad (3)$$

Consumption breadth was quantified by the number of distinct artists listened to during the observation period, reflecting the range of creators accessed [4, 6].

Consumption diversity was computed from user-level genre playcounts using normalized Shannon entropy:

$$CD_i = -\frac{\sum_{j=1}^{J} p_{ij} \ln(p_{ij})}{\ln(J)}, \quad (4)$$

where p_{ij} is the proportion of user i's listening activity assigned to genre j, and J is the number of genres represented in the user profile. Values range from zero to one, with higher values indicating a more evenly distributed cultural repertoire [6].

Novelty preference was quantified using the annual artist-novelty score in LFM-1b, defined as the average proportion of newly encountered artists across 12-month observation windows [3, 12].

Control variables included age, gender, account tenure, effective observation duration, and country fixed effects. Account tenure was calculated as the number of years between registration and the final observation date. Total listening volume was excluded as a control when consumption intensity served as the dependent variable, as it constituted the foundational measure of that outcome.

Table 1 indicates substantial variation in community participation and cultural consumption. Consumption breadth exhibited right skewness, with the mean distinct artist count exceeding the median [4]. Participation breadth and PageRank centrality were similarly concentrated, suggesting that relatively few users occupied highly connected positions. The median age of 23 years confirms that the sample was predominantly composed of individuals in early adulthood.

Table 1. Variable Definitions and Descriptive Statistics

Variable	Measurement	Mean	SD	Median	Min	Max
Consumption intensity	Natural log of total listening events	8.47	1.06	8.53	5.39	11.58
Consumption breadth	Number of distinct artists listened to	548.62	557.34	381.00	18.00	3,126.00
Consumption diversity	Normalized genre-based Shannon entropy	0.667	0.118	0.681	0.274	0.896
Novelty preference	Annual proportion of newly encountered artists	0.519	0.199	0.516	0.071	0.932
Participation breadth	Natural log of one plus friendship degree	2.14	0.79	2.08	0.69	4.80
Network embeddedness	Standardized PageRank centrality	0.000	1.000	−0.31	−0.78	4.67
Community cohesion	Local clustering coefficient	0.146	0.171	0.074	0.000	0.819
Age	Age in years	24.18	4.27	23.00	18.00	35.00
Account tenure	Years since registration	5.16	2.14	5.08	0.54	10.96

3.4. Empirical Model

Separate empirical models were estimated for consumption intensity, breadth, diversity, and novelty preference.

$$Y_i = \beta_0 + \beta_1 PB_i + \beta_2 NE_i + \beta_3 CC_i + \gamma X_i + \varepsilon_i, \quad (5)$$

where Y_i represents a cultural consumption outcome, PB_i denotes participation breadth, NE_i denotes network embeddedness, CC_i denotes community cohesion, and X_i contains demographic and account-level controls [5].

Ordinary least squares estimation with heteroskedasticity-robust standard errors was employed for the main analysis. Due to right-skewed distributions, consumption

intensity and breadth were logarithmically transformed. As an alternative specification for consumption breadth, a negative binomial model was estimated using the untransformed distinct artist count.

Fractional logit models were applied to consumption diversity and novelty preference, both of which are bounded between zero and one. Reported results include coefficients, robust standard errors, p-values, and 95% confidence intervals. Variance inflation factors were assessed to evaluate multicollinearity among the network indicators.

The models estimate conditional associations rather than causal effects. Friendship formation and cultural preferences may jointly reflect homophilous tendencies, and users with higher cultural engagement may be more likely to form social connections. Consequently, the findings are interpreted as associations between community participation and cultural consumption patterns.

3.5. Robustness and Heterogeneity Analysis

Three robustness tests were conducted: first, restricting the sample to users aged 18–29; second, substituting eigenvector centrality for PageRank centrality; and third, re-estimating the models after excluding the lowest 5% of users by listening activity and adjusting the winsorization threshold from 1% to 2.5%.

Age-based heterogeneity was assessed by estimating separate models for users aged 18–24 and 25–35, with standardized coefficients compared to evaluate whether associations between virtual community participation and cultural consumption varied across developmental stages of young adulthood.

4. Results

4.1. Descriptive Results and Bivariate Relationships

Table 1 presents substantial variation in virtual community participation and cultural consumption among the 3,764 users. The mean age was 24.18 years and the median was 23 years, indicating that the sample was concentrated in early adulthood. Mean account tenure was 5.16 years.

Participation breadth had a mean log-transformed value of 2.14 and a median of 2.08, corresponding to approximately seven direct friendship connections for the typical user. PageRank centrality was right-skewed, with a median of −0.31 despite a standardized mean of zero. Community cohesion had a mean of 0.146 and a median of 0.074, indicating that most users belonged to relatively loose local networks.

Cultural consumption exhibited marked unevenness. The mean number of distinct artists was 548.62, compared with a median of 381. The average consumption-diversity score was 0.667, while mean novelty preference was 0.519.

Figure 1 illustrates the unadjusted relationships between network indicators and consumption outcomes. Participation breadth was positively associated with consumption intensity [4, 7]. Network embeddedness showed positive relationships with consumption breadth and diversity, while community cohesion was negatively related to novelty preference. Confidence intervals widened at high and low network values due to smaller user counts in those ranges.

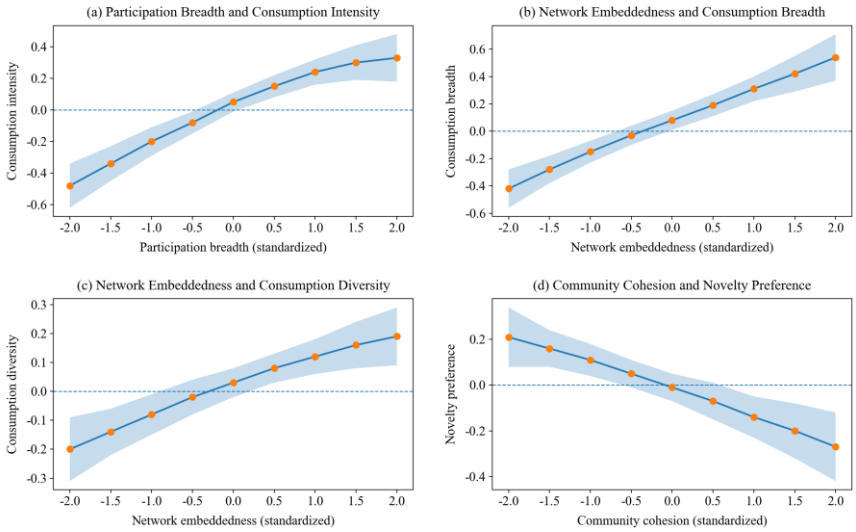

Figure 1. Bivariate Relationships between Virtual Community Participation and Youth Cultural Consumption: (A) Participation Breadth and Consumption Intensity, (B) Network Embeddedness and Consumption Breadth, (C) Network Embeddedness and Consumption Diversity, and (D) Community Cohesion and Novelty Preference

4.2. Community Participation and Consumption Intensity

Participation breadth exhibited a consistently positive association with consumption intensity across all analytical models. Its standardized coefficient declined slightly from 0.246 in Model 1 to 0.218 in the fully adjusted model, yet remained statistically significant (SE = 0.019, $p < 0.001$). Accordingly, a one-standard-deviation increase in participation breadth corresponded to a 0.218-standard-deviation increase in consumption intensity.

Network embeddedness showed a modest positive association (coefficient = 0.071), whereas community cohesion displayed no significant relationship with consumption intensity [5, 10]. Thus, the number of direct social connections demonstrated a stronger link to consumption activity than local network density. Hypothesis 1 was supported.

4.3. Network Embeddedness, Consumption Breadth, and Diversity

Network embeddedness exhibited a positive association with consumption breadth. In the fully adjusted model, its standardized coefficient was 0.167 (SE=0.019, $p<0.001$), exceeding that of participation breadth (0.109). This indicates that connections to structurally central users were more strongly linked to an increase in the number of artists consumed than the count of direct friendships alone.

The negative binomial model yielded a consistent finding: a one-standard-deviation increase in network embeddedness corresponded to an estimated 13% rise in the expected number of distinct artists. Hypothesis H2 was supported.

Network embeddedness also demonstrated a positive but attenuated relationship with consumption diversity ($\beta=0.082$, SE=0.018, $p<0.001$). Participation breadth showed a smaller effect ($\beta=0.044$), whereas community cohesion was negatively associated with diversity. These results suggest that users occupying central network positions engaged with a greater number of artists and distributed their listening more evenly across genres. However, broader artist consumption did not translate proportionally into higher genre diversity [4, 10]. Hypothesis H3 was supported.

4.4. Community Cohesion and Novelty Preference

Community cohesion exhibited a statistically significant negative association with novelty preference ($\beta=-0.104$, SE=0.018, $p<0.001$). A one-standard-deviation increase in cohesion corresponded to an approximately 2.1-percentage-point decline in the proportion of newly encountered artists.

Participation breadth showed no significant relationship with novelty preference, whereas network embeddedness yielded a small positive coefficient of 0.056. This pattern

suggests that global centrality may broaden exposure to new content, while dense local networks may reinforce established preferences. Hypothesis 4 was supported, though the finding does not imply a direct causal effect of cohesion on preference convergence [8] (As shown in Table 2).

Table 2. Regression Results for Virtual Community Participation and Youth Cultural Consumption

Variables	Consumption Intensity	Consumption Breadth	Consumption Diversity	Novelty Preference
Participation breadth	0.218*** (0.019)	0.109*** (0.018)	0.044** (0.017)	0.021 (0.017)
Network embeddedness	0.071*** (0.018)	0.167*** (0.019)	0.082*** (0.018)	0.056** (0.018)
Community cohesion	0.026 (0.017)	−0.049** (0.018)	−0.071*** (0.017)	−0.104*** (0.018)
Age	−0.063*** (0.017)	−0.041* (0.017)	−0.019 (0.016)	−0.088*** (0.017)
Gender (male = 1)	0.031 (0.019)	0.038* (0.019)	−0.024 (0.018)	−0.034 (0.018)
Account tenure	0.145*** (0.018)	0.174*** (0.019)	0.033* (0.017)	−0.157*** (0.019)
Observation duration	0.203*** (0.018)	0.132*** (0.018)	0.016 (0.017)	−0.061*** (0.018)
Country fixed effects	Yes	Yes	Yes	Yes
Observations	3,764	3,764	3,764	3,764
Adjusted R^2	0.257	0.281	0.123	0.212

Notes: Robust standard errors are in parentheses. Continuous variables were standardized after transformation. All models include demographic and account-level controls and country fixed effects. ∗p<0.05, ∗∗p<0.01, ∗∗∗p<0.001.

4.4.1. Panel a. Main Regression Results

4.4.2. Panel B. Robustness Results

Specification	Intensity: Participation Breadth	Breadth: Network Embeddedness	Diversity: Network Embeddedness	Novelty: Community Cohesion
Users aged 18–29	0.224*** (0.022)	0.174*** (0.023)	0.086*** (0.021)	−0.112*** (0.022)
Alternative centrality measure	0.214*** (0.019)	0.159*** (0.019)	0.078*** (0.018)	−0.101*** (0.018)
Excluding low-activity users and 2.5% winsorization	0.209*** (0.019)	0.162*** (0.019)	0.080*** (0.018)	−0.097*** (0.018)

4.5. Robustness and Age Heterogeneity

The robustness tests yielded results consistent with the main models. Restricting the sample to users aged 18–29 slightly strengthened the coefficients associated with the four hypotheses. Replacing PageRank with eigenvector centrality and excluding low-activity users did not alter the direction or statistical significance of the coefficients. Negative binomial and fractional logit specifications produced substantively similar conclusions [2].

The associations were generally stronger among users aged 18–24. The coefficient linking participation breadth to consumption intensity was 0.246 for users aged 18–24 and 0.181 for those aged 25–35 (p = 0.032). Community cohesion exhibited a stronger negative association with novelty preference in the younger group (−0.121 versus −0.081, p = 0.046).

Differences in the effects of network embeddedness on participation breadth and diversity were smaller and lacked consistent statistical significance.

Figure 2 presents the standardized coefficients and corresponding 95% confidence intervals. Participation breadth showed the strongest association with consumption intensity, network embeddedness with consumption breadth, and community cohesion with novelty preference.

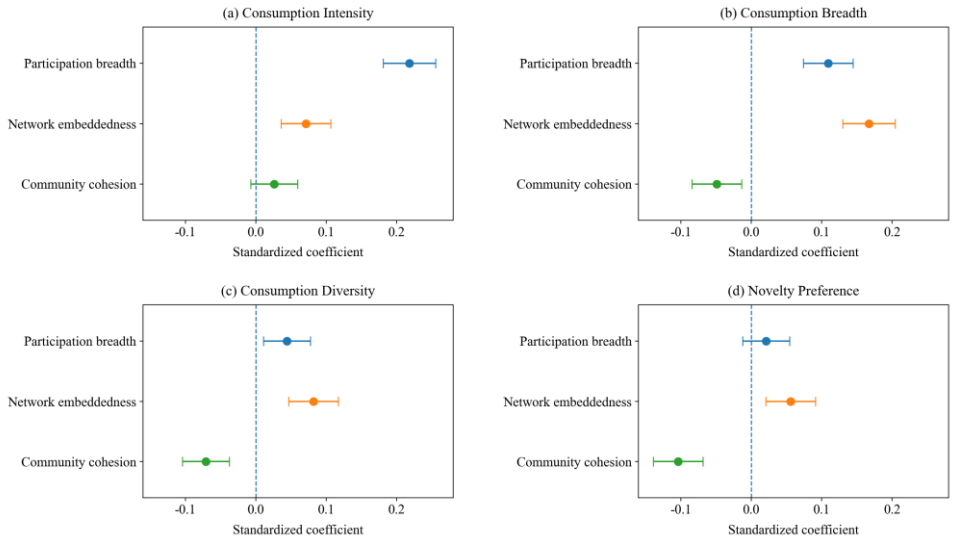

Figure 2. Standardized Effects of Virtual Community Participation on Youth Cultural Consumption Outcomes: (A) Consumption Intensity, (B) Consumption Breadth, (C) Consumption Diversity, and (D) Novelty Preference

5. Discussion

5.1. Main Findings

Different dimensions of virtual community participation were associated with distinct aspects of youth cultural consumption. Participation breadth was most strongly linked to consumption intensity, indicating that users with more direct social connections tended to consume cultural content more frequently. Network embeddedness showed positive associations with both consumption breadth and diversity, though its association with breadth was stronger. Central network positions may thus expand access to cultural products without proportionally increasing category balance [1]. Community cohesion exhibited a negative association with novelty preference, suggesting that users in tightly connected local networks were less inclined to explore new artists. These patterns were generally more pronounced among users aged 18–24 than among those aged 25–35.

5.2. Theoretical Implications

The findings extend research on youth cultural consumption in three respects. First, cultural consumption reflects not only individual preferences but also users' structural positions within virtual communities. Second, participation in virtual communities is multidimensional: direct connections, overall network embeddedness, and local cohesion each correspond to distinct consumption outcomes. Third, virtual communities may simultaneously support two complementary processes—broad and central networks can expand exposure to diverse cultural information, whereas cohesive local networks may reinforce shared preferences and limit exploration of novel content. Thus, community structure may jointly facilitate broader cultural discovery and greater convergence of preferences.

5.3. Practical Implications

Cultural platforms should not rely exclusively on friendship-based similarity for content recommendation. Introducing cross-community recommendations can broaden

users' exposure to diverse creators and genres beyond their immediate social circles. Platforms may also enhance the visibility of niche and emerging content, especially for users within highly cohesive communities. Users with limited network connectivity could benefit from curated thematic collections and inclusive entry points into broader communities. Recommendation systems ought to strike a balance between community relevance and cultural diversity.

5.4. Limitations

The data reflect digital music consumption on a single platform and do not encompass all dimensions of youth cultural engagement. Friendship links serve as structural proxies but cannot quantify interaction frequency or relational depth, and demographic attributes may suffer from incompleteness or inaccuracy. As observational data, they inherently limit causal inference, making it difficult to disentangle social influence from homophily or reverse selection. The findings also exclude offline spending, physical media purchases, and attendance at live cultural events, thereby constraining generalizability across platforms and broader cultural domains [7].

6. Conclusion

This study examined the relationship between virtual community participation and youth cultural consumption using linked social-network, demographic, and listening data from Last.fm. By distinguishing participation breadth, network embeddedness, and community cohesion, the analysis revealed that distinct network characteristics corresponded to distinct consumption outcomes.

Participation breadth was primarily associated with consumption intensity, whereas network embeddedness correlated with broader and more diverse cultural repertoires. Community cohesion was linked to weaker novelty preference. Virtual community participation thus yielded heterogeneous cultural outcomes: broad and central network positions appeared to facilitate information exposure, while tightly connected local communities tended to reinforce familiar preferences. The stronger associations observed among younger users suggest that virtual community structures may be especially consequential during early adulthood.

The study advances prior work by integrating actual friendship networks with observed consumption records, moving beyond self-reported survey data. However, the findings reflect conditional associations rather than established causal effects.

Future research should employ longitudinal designs to track co-evolution of social ties and consumption patterns over time. Cross-platform comparisons—across film, reading, gaming, and other cultural domains—could assess the generalizability of these patterns. Richer behavioral indicators, such as interaction texts, sharing logs, and comment activity, may offer more granular measures of participation. Linking online behavior with offline cultural expenditure and applying robust causal identification strategies would further clarify the role of virtual communities in shaping youth cultural consumption.

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