

OPERATIONALISING PLATFORM PUBLIC SPHERE CONTENTIOUSNESS: A DESCRIPTIVE FRAMEWORK FOR PUBLIC DISCUSSION

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This study proposes the concept of platform public sphere contentiousness and further develops it into an automated measurement framework based on unsupervised learning methods, aiming to provide a descriptive-analytical approach for public discussion research. Addressing the limitations of existing studies that reduces the quality of public discussion to its proximity to rational consensus, this study is grounded in the Chinese context and defines contentiousness as the extent to which public disagreement unfolds and diffuses within the public sphere. Drawing on and reconstructing the Discourse Quality Index (DQI), the study develops, based on this concept, an indicator system comprising four dimensions: diversity, oppositionality, rationality, and reciprocity. Taking Weibo and Douyin as case studies, the research conducts cross-platform comparisons at both the account and topic levels to demonstrate the application of the indicators. Based on an analysis of more than 300,000 cross-level data entries, the study finds that contentiousness is highly sensitive to discussion contexts and platform structures. The study understands the public sphere as a discussion structure that is continuously generated and adjusted within specific institutional and media conditions, thereby providing a reference point for public sphere research under similar non-ideal institutional conditions.

KEYWORDS Platform public sphere; Contentiousness; Deliberative quality; Automated measurement; China

Introduction

In theoretical terms, the internet provides a practical possibility for an idealised public sphere in the Habermasian sense, which has long been the vision of advocates of deliberative democratic theory (Graham and Witschge 2003). Accordingly, empirical studies of online public discussion have largely focused on the measurement and comparison of deliberative quality, that is, examining the extent to which, and how, public discussion can approach Habermasian normative assumptions, and have developed

methods that operationalise deliberative ideals into manual coding frameworks to identify “high-quality” dialogues or sites of discussion (e.g., Graham 2008; Steenbergen et al. 2003).

However, this normative approach has difficulty explaining how public discussion continues to operate and be governed within specific institutional contexts when it fails to meet ideal conditions. Existing studies suggest that public discussions that do not conform to ideal deliberative conditions may still perform positive functions under certain circumstances (Dahlberg 2007; Papacharissi 2004; Parkinson and Mansbridge 2012). This issue is particularly salient in authoritarian contexts such as China, where historical experience, institutional structures, and cultural traditions differ significantly from those of European societies. As a result, whether and how the concept of the public sphere, originating in Western political thought, can be applied to local contexts has long remained a central subject of scholarly debate.

As public discussion becomes increasingly embedded within specific platform environments, the conditions under which it is generated and operates have become more complex. Relying solely on deliberative quality to normatively evaluate public discussion makes it difficult to capture its actual modes of operation fully. Meanwhile, although research on automated measurement methods has gradually increased (Beauchamp 2020), it remains relatively limited overall, and the manual coding approaches primarily used in deliberative quality research face practical constraints in large-scale data analysis (Goddard and Gillespie 2023).

Against this background, this study aims to develop an operationalisable, regional, and descriptive analytical approach. More specifically, grounded in the context of authoritarian institutions and platform governance in China, this article introduces the concept of *platform public sphere contentiousness* and operationalises it into an automated indicator system using unsupervised learning methods to compare the organisational patterns and operational differences in public discussion across platforms.

This article is organised as follows. First, it reviews the literature to discuss the limitations of the deliberative quality framework in explaining platform public spheres and subsequently develops the concept of platform public sphere contentiousness. Second, drawing on classical public sphere theory and the Chinese context, it develops the measurement dimensions of platform public sphere contentiousness based on the Discourse Quality Index (DQI). Third, using unsupervised learning techniques, these dimensions are operationalised into an indicator system. Fourth, by taking the comparison between Douyin and Weibo as an example, the study demonstrates the application of the measurement framework in cross-platform analyses of public discussion and illustrates its explanatory potential. Finally, the article summarises the theoretical contributions, application prospects, and limitations of platform public sphere contentiousness and its measurement framework.

From Deliberative Quality to Platform Public Sphere Contentiousness

After the 2010s, as social media platforms became increasingly embedded in social infrastructure, public discussion has become increasingly shaped by platform design and governance mechanisms (Esau et al. 2017). Differences across platforms in network structure, functional design, algorithmic filtering, and datafication models often generate markedly different forms of political communication and public discussion. Moreover, platforms are not neutral, but institutional structures embedded in political and power relations (Gillespie 2018; Qiu 2023; van Dijck 2018). Through the combined effects of

platform structures, organisational strategies, and user practices, platform public spheres often exhibit complex and difficult-to-predict cultural fissures and networks of social relations (Smyrniaios and Baisnée 2023). This makes public discussion within platformized environments more complex, uncertain, and difficult to explain through a single normative model.

In fact, the conditions presupposed by classical public sphere theory do not naturally exist but often need to be gradually generated through ongoing interaction (Kim and Kim 2008). Compared with consensus-oriented deliberative processes, dialogic discussions without clearly defined goals or outcome orientations also have significant value (Habermas 2005; Kim and Kim 2008). It is precisely through such open and ongoing interactions that rules, shared values, and public reasons are formed, adjusted, and sustained (Habermas 2005). Accordingly, public sphere research has gradually paid more attention to concrete discussion structures, interaction patterns, and forms of contention in actual public discussion.

However, most empirical studies remain largely guided by a normative perspective, in which the public sphere is often reduced to an analytical object that can be evaluated in terms of deliberative quality. Such an understanding, to some extent, excludes a large proportion of real-world public discussions that fail to meet the standards of rational deliberation from the analytical horizon, thereby obscuring the actual modes through which the public sphere operates under non-ideal institutional conditions. Particularly in authoritarian contexts such as China, where governance continuously intervenes in public discussion, the operational state of public discussion can hardly be fully captured through the distinction between “high-quality” and “low-quality” discussion. This may result in other attributes of discussion structures that are closely related to specific institutional conditions being overlooked.

Research on China’s “contentious public sphere” suggests that public discussion has long operated within a dynamic tension between state recognition and repression (He and Warren 2011; Lei 2018; Ma 2024). This tension is not a temporary deviation, but rather a regular mechanism of the system’s operation. The key point is that contestation among heterogeneous viewpoints may generate shared problem awareness, thereby allowing issues not predetermined by the existing order to enter public discussion (Tarrow 2022; Tilly 2008). Within a governance context that places strong emphasis on social stability, once such public disagreement forms interactive connections and acquires the potential for diffusion, it is also more likely to be regarded as a potential governance risk (King et al. 2013; Shirk 2007).

This study treats this tension as a salient feature through which the public sphere exists and continues to operate in the Chinese context, and conceptualises its structural manifestation in public discussion as *public sphere contentiousness*. It refers to the extent to which the public sphere allows public disagreement to unfold and gain visibility, thereby enabling existing power structures and normative orders to be questioned, negotiated, or redefined. In the platform context, contentiousness refers to the capacity of platforms, under structural conditions such as technological architectures, governance rules, and visibility mechanisms, to provide space for the expression of disagreement and to facilitate its diffusion and connection.

Different from normative approaches centred on rational deliberation, “public sphere contentiousness” seeks to provide a descriptive-analytical framework for understanding the actual operational state of public discussion under non-ideal institutional conditions. It is not simply equivalent to existing definitions of emotional opposition or stance polarisation in previous research. Instead, it captures, at the level of overall

discussion structure, the extent to which differences of opinion and their relational orientations are articulated within public discussion. At the same time, contentiousness should not be understood as a fixed platform affordance, but rather as a structural capacity exhibited by platform public discussion under specific platform architectures and governance environments during particular periods, and one that is continuously adjusted in concrete discursive interactions as discussion topics and interaction structures change.

Dimensions of Platform Public Sphere Contentiousness

Contentiousness and deliberative quality address different aspects of public discussion, yet the former does not exist independently of deliberative conditions. The persistence of public disagreement and its formation into structural tension often requires a certain degree of heterogeneous coexistence, exchange of reasons, and interactive responsiveness (Parkinson and Mansbridge 2012). Therefore, this study acknowledges the importance of deliberative ideals for public discussion, but argues that movement toward rational consensus should not be regarded as the universal endpoint of public discussion. Under certain non-ideal institutional conditions, sustained public disagreement and confrontational forms of non-ideal communication may constitute a “second-best” path for public discussion (Mansbridge et al. 2010; Mouffe 2005). In this sense, contentiousness provides the possibility for public discussion to problematise existing orders. At the same time, deliberative quality further affects the extent to which such contention can be continuously organised and sustained. Therefore, the measurement dimensions developed in deliberative quality research can still serve as important references for operationalising platform public sphere contentiousness.

On this basis, the dimensions of contentiousness also need to be further adjusted in light of the actual operational logic of public discussion in the Chinese governance context. The Chinese government has long been concerned that localised discontent may develop into systemic risks, and therefore places strong emphasis on social stability (Shirk 2007; Whyte 2010). Existing studies also suggest that sustained public disagreement means that existing orders and dominant agendas remain continuously open to renewed contestation and negotiation (Tilly and Tarrow 2015). What the censorship system is highly sensitive to is not fragmented expressions of discontent themselves, but behaviours that form horizontal connections and possess the potential for collective action (King et al. 2013; Tarrow 2022). Under this governance logic, forms of public discussion that may facilitate such developments are more likely to trigger institutional responses arising from the structural tension between state control and public discussion. Therefore, contentiousness should not only focus on whether public disagreement can be expressed, but also on whether such disagreement can be organised into sustained structures of public discussion.

Whether in manual coding frameworks developed to measure deliberative quality or in later operationalisation attempts that introduced natural language processing (NLP) techniques, the most widely applied approach is the Discourse Quality Index (DQI) proposed by Steenbergen et al. (2003). This general coding framework closely follows the principles of Habermasian discourse ethics and remains widely used and continuously revised.

Accordingly, the measurement dimensions of platform public sphere contentiousness are developed based on the core dimensions of the DQI, while reorienting and extending the analytical focus of the public sphere in the Chinese context. Through a

review of existing empirical tools, this study identifies six dimensions based on the DQI framework: diversity, rationality (or argumentativeness), reciprocity, common good references, respect, and constructiveness. Unlike deliberative quality, which emphasises consensus-oriented discussion, contentiousness is more concerned with how public disagreement is expressed, organised, and interacted with. Particularly within the Chinese institutional and platform governance context, dimensions such as common good references, constructiveness, and respect are often closely coupled with dominant political narratives and governance expectations, and their inherent orientation tends to weaken disagreement and guide discussion toward consensus. Therefore, contentiousness only incorporates the dimensions of diversity, rationality, and reciprocity to capture, respectively, the coexistence of heterogeneous expression, the unfolding of disagreement, and the interactive relations among viewpoints, while further introducing oppositionality as a core dimension to capture the differentiation of positions and the tension structure within public discussion. Ultimately, the measurement framework for platform public sphere contentiousness comprises four dimensions: diversity, oppositionality, rationality, and reciprocity.

An Indicator System for Platform Public Sphere Contentiousness

Based on the four dimensions discussed above, this study develops an indicator system to measure platform public sphere contentiousness. Each dimension is operationalised into specific computational indicators using automated text analysis methods to capture different types of contentious structures in public discussion. The indicator system does not presuppose any absolute threshold for determining the level of contentiousness; rather, it reveals differences in the contentious structures of platform public spheres by comparing indicator performance across platforms. The operationalisation and computational procedures for each dimension are described as follows.

Diversity

The diversity dimension is measured through an indicator of topical dispersion, which reflects the distribution of platform public discussion across different topic clusters. Specifically, texts from the same account or the same topic across different platforms are combined into a unified corpus. The paraphrase-multilingual-MiniLM-L12-v2 model within the sentence-BERT framework is then used to generate sentence embeddings for the texts. Subsequently, the K-Means clustering algorithm is applied within a shared semantic space to identify K topic clusters. The value of K is determined by considering both corpus size and the semantic interpretability of the clustering results. In contrast, the robustness of the results is tested through repeated calculations under different K values. Based on the clustering results, the proportion of texts assigned to each topic cluster, denoted as, P_k is calculated at the platform level to form the platform's topic distribution vector. The Shannon entropy of this distribution vector is then used as the indicator of topical dispersion:

$$D = - \sum_{k=1}^K p_k \log p_k$$

A higher entropy value indicates a more even distribution of discussions across topic clusters, suggesting the discussion structure is less likely to be dominated by a small number of topics.

Oppositionality

The oppositionality dimension consists of two indicators: emotional oppositionality and viewpoint oppositionality. These indicators are mainly used to capture the degree of differentiation among viewpoints and their emotional orientations within public discussion, thereby reflecting the extent to which the platform public sphere exhibits an oppositional structure. Since the empirical trends of the two indicators may not necessarily be consistent (Iyengar et al. 2012; Kubin and von Sikorski 2021), they are not combined into a weighted index but are instead reported separately to preserve differences between different types of oppositional structures.

To calculate emotional oppositionality, SnowNLP is used to perform sentiment analysis of the texts, producing sentiment scores ranging from $[-1, 1]$. Kernel density estimation is then applied to the sentiment distribution within the platform, based on which a sentiment polarisation index is calculated:

$$O^{\text{emotion}} = 4LR,$$

where L and R represent the probability mass of the sentiment distribution on the left and right sides of zero, respectively, the value of O^{emotion} ranges from $[0, 1]$. Higher values indicate a stronger degree of emotional oppositionality in platform discussions.

In calculating viewpoint oppositionality, texts that consist mainly of emotional expressions or stacked tags but lack explicit viewpoint expression are first excluded via rule-based matching. The remaining texts are then represented as semantic vectors using the paraphrase-multilingual-MiniLM-L12-v2 model within the sentence-BERT framework, and an emotional residualization procedure is applied to reduce the influence of emotional intensity on viewpoint measurement. On this basis, Principal Component Analysis (PCA) is conducted on the semantic vectors. Among the first three principal components, the component that best presents an oppositional viewpoint structure is selected as the viewpoint oppositionality axis by examining the semantic interpretability of representative texts located at both ends of each component. If multiple principal components exhibit directional viewpoint differences, the component with the clearest viewpoint differentiation and the greatest semantic difference between the two ends is selected as the viewpoint oppositionality axis. The projections of texts onto this axis are then mapped to the interval $[-1, 1]$. Based on the viewpoint distribution within the platform and using kernel density estimation, a polarisation index is calculated:

$$O^{\text{viewpoint}} = 4LR,$$

where L and R represent the proportions of texts located on the left and right sides of the viewpoint axis, respectively, the value of $O^{\text{viewpoint}}$ ranges from $[0, 1]$. Higher values indicate stronger viewpoint oppositionality in platform discussions.

Rationality

The rationality dimension is measured through an argumentativeness indicator, which captures the proportion of texts in public discussion that enter into reason- and explanation-oriented forms of expression, thereby reflecting the extent to which the platform public sphere exhibits an argumentative discussion structure.

To calculate argumentativeness, this study employs a rule-driven automated text analysis method to identify argumentative expressions. Drawing on the basic logic of “manual induction–rule abstraction–automated identification” in argument mining (Habernal and Gurevych 2017), this study identifies three types of recognition rules: explicit argumentative markers, structural explanations, and implicit supportive

expressions. The manual judgment criteria, core rules, and examples are presented in Appendix A.

To improve the stability and consistency of rule identification, this study further combines manual coding to test and calibrate the rules. First, two coders independently annotate sampled texts manually, and Krippendorff's α is used to assess intercoder reliability and the stability of the coding standards. For texts with inconsistent coding results, the two coders discuss and unify the coding criteria and further revise the rule identification logic. On this basis, using manual coding results as the benchmark, the precision and recall of the rule-based identification results are evaluated to assess the accuracy and omission rate of the automated identification process. In typical cases of false positives and missed identification, this study iteratively revises overly broad keywords, rules lacking contextual constraints, and expression forms likely to produce ambiguity, until the indicators reach relatively stable, reasonable ranges. Subsequently, using the calibrated rule system, the proportion of texts satisfying at least one rule is calculated:

$$A = \frac{N^{rational}}{N}$$

where N represents the total number of texts on the platform, and $N^{rational}$ denotes the number of texts identified as containing argumentative expressions. The value of this indicator ranges from [0,1]. Higher values indicate a greater proportion of argumentative expressions in platform public discussions.

Reciprocity

The reciprocity dimension is measured through a responsiveness indicator, which captures the proportion of texts in public discussion that respond to others or to existing discourse, thereby reflecting the extent to which the platform's public sphere exhibits an interaction-oriented discussion structure.

This study likewise employs a rule-driven automated text analysis method to identify responsive expressions. The identification rules mainly include explicit object orientation, discussion-structure continuation, and semantic responsive expressions. The manual judgment criteria, core rules, and examples are presented in Appendix A. The responsiveness indicator adopts the same manual coding validation and rule calibration procedure as the argumentativeness indicator. Based on the calibrated rule system, platform texts are identified one by one, and the proportion of texts satisfying at least one rule is calculated:

$$R = \frac{N^{reciprocal}}{N}$$

where N represents the total number of texts on the platform, and $N^{reciprocal}$ denotes the number of texts identified as containing responsive expressions. The value of this indicator ranges from [0,1]. Higher values indicate a greater proportion of responsive expressions in platform public discussions.

The complete indicator system is presented in Table 1.

Empirical Case: A Dual Comparison of Douyin and Weibo

This study demonstrates the practical application of the indicator system and examines its explanatory power by comparing public sphere contentiousness across

TABLE 1
Indicator System for Platform Public Sphere Contentiousness

Dimension	Indicator	Definition	Identifier	Operational measure
Diversity	Topical Dispersion	The extent to which platform public discussion is less likely to be dominated by a small number of semantic topics	D	Entropy of viewpoint distribution
Oppositionality	Emotional Oppositionality	The degree of differentiation in emotional orientations within a platform public sphere	O ^{emotions}	Polarization index of sentiment distribution
Oppositionality	Viewpoint Oppositionality	The degree of viewpoint differentiation within the platform public sphere	O ^{viewpoint}	Polarization index of viewpoint distribution
Rationality	Argumentativeness	The extent to which a platform public sphere exhibits a discussion structure oriented toward argumentation	A	Proportion of argumentative expressions
Reciprocity	Responsiveness	The extent to which a platform public sphere exhibits a responsive and interaction-oriented discussion structure	R	Proportion of responsive expressions

the two platforms, Weibo and Douyin. To avoid reducing contentiousness to the outcome of a single discussion context, the study adopts a cross-level comparative design, analysing two analytically distinct yet theoretically complementary levels: the account level and the topic level. At the account level, the analysis compares differences in the contentiousness of comment sections across the two platforms within a unified account-based information environment. At the topic level, it compares differences in the contentiousness of public discussion across the two platforms within the same public issue context. Together, these two analytical components address platform public sphere contentiousness and provide a comparative examination of the indicator system across different discussion contexts.

Account-Level Data Collection

At the account level, the primary unit of analysis is the comment section under the same account, excluding the Weibo post itself and the Douyin video content. User comments not only reflect the analytical process of deliberation but also reveal the social process of deliberation (Manosevitch and Walker 2009). As a visible structure of reciprocal public discussion, the user comment section represents the interactive opinion arena within a unified account-based information environment.

Account selection follows a stratified sampling strategy. Based on account types on Weibo and Douyin, accounts are divided into three categories: government/official media, market-oriented media, and MCN/personal creators. Three accounts from each category that operate simultaneously on both platforms are selected to avoid systematic bias from a single account type or a particular account. All nine accounts must satisfy three criteria: (1) operating on both platforms, (2) maintaining continuous updates on both platforms, and

(3) possessing a certain level of influence on both platforms (more than 1 million followers on Douyin and more than 400,000 followers on Weibo).

Data collection employs a strategy combining a fixed time window and stratified quota sampling. All posts or short videos must have been published between 25 August 2025 and 25 December 2025. For each piece of content, up to 100 first-level comments are collected using the platform's default sorting method. For first-level comments that receive replies, up to five second-level comments are collected for each, while the total number of second-level comments per post or video is capped at 100. This strategy prevents a small number of highly viral posts from dominating the sample while preserving the distribution of contentious interactions within the comment structure.

For accounts with a high posting frequency, sampling is conducted by selecting one post from every 10 or 20 posts, depending on the total number of posts, to keep the sample size manageable. The comment data of the selected posts are then collected according to the rules described above.

The selected accounts on the two platforms and the final volume of collected data are presented in Table 2.

Topic-Level Data Collection

In cross-platform comparisons, research commonly adopts the principle of functional equivalence, that is, identifying the units of comparison that best perform the analytical function of interest (Pearce et al. 2020). In this study, Weibo posts and Douyin comments are treated as functionally equivalent spaces in which the articulation and aggregation of public issues occur on both platforms, and the topic-level comparison is conducted on this basis. This operationalisation does not deny the importance of Weibo comments or Douyin video content within their respective opinion ecologies. Rather, it focuses the analysis on the primary interactive spaces where ordinary users can participate in discussions of public issues and clearly express their positions. Existing cross-platform studies comparing Weibo and Douyin have likewise often taken Weibo posts and Douyin comments as the principal objects of topic-level analysis (An and An 2022; Hu et al. 2024).

The topic-level analysis selects the event “Zhang Xuefeng’s account being banned from following” as the case. Zhang Xuefeng is a well-known Chinese education blogger with a large following on both Weibo and Douyin, whose commentary has long addressed sensitive topics such as the college entrance examination, postgraduate entrance examinations, and employment. On 24 September 2025, several of his accounts across platforms were banned from being followed for “violating platform rules,” which triggered widespread public discussion. The controversy continued to develop until 3 December, when the Cyberspace Administration of China listed the case as a typical example of regulatory action against online influencer accounts and issued an official notice. This study, therefore, defines the period from 24 September to 3 December 2025 as the complete cycle of issue evolution from initial outbreak to authoritative classification, and uses it as the time window for the topic-level analysis.

During the data collection stage, the keywords “Zhang Xuefeng + banned” were used to retrieve Weibo post texts, Douyin short-video titles or descriptions, and comment content within this time window. The collection of Douyin comments follows the stratified quota sampling strategy used in the account-level analysis to control sample size while maintaining the representativeness of the discussion structure. Short-video titles or descriptions are retained as the immediate contextual trigger for comment controversies, thereby reducing

TABLE 2
Results of Data Collection and Preprocessing

Platform level	Account type	Account name	Weibo sampling frequency	Douyin sampling frequency	Raw weibo data	Retained weibo data	Raw douyin data	Retained douyin data
Account-Level	Government / Official Media	Xinhua News Agency	1/20	1/10	19431	17334	63628	55976
		People's Daily	1/10	1/10	21913	19160	10521	10142
	Market-Oriented Media	China Daily	1/10	1/10	7032	5529	16210	15838
		The Paper (澎湃新闻)	All	1/10	8115	7490	25945	25414
		Southern Metropolis Daily	All	1/10	2655	2497	3746	3702
		Caixin (财新网)	All	All	11474	10326	792	764
	MCN / Individual Creators	Luo Yonghao's Crossroads (罗永浩的十字路口)	All	All	50319	46418	20482	19604
		Xiao Lin Talks (小Lin说)	All	All	595	511	5323	5249
	—	Teacher Zhang Xuefeng (张雪峰老师)	All	All	1084	972	2740	2521
		—	All	All	22809	18602	10788	10515

the influence of structural differences in format on indicator calculations in cross-platform comparisons.

The data collection results for the two platforms are presented in Table 2.

Data Preprocessing

This study adopts the principle of minimal necessary cleaning to preserve, as much as possible, the native expressive characteristics of platform public discussion while reducing the influence of abnormal duplicate records and texts lacking identifiable semantic content on measurement results. Specifically, based on rule matching, only one instance is retained for records that are completely duplicated, with both the user account and text content identical. Blank texts, obviously garbled texts, purely meaningless symbols, and records lacking identifiable expressive content are removed. Due to limited access to platform APIs for account behavioural data, long-term interaction trajectories, and cross-account network information, this study is unable to reliably identify automated accounts (bots) or coordinated posting behaviour. Considering that repetitive expressions may themselves constitute part of the emotional amplification and visibility structure of platform public discussion, repeated expressions across different users are retained. Only completely duplicated records formed by the same user account and identical text content are conservatively processed to reduce their distorting influence on text distributions.

It should be noted that different platforms differ in their mechanisms for comment ranking, content recommendations, and visibility. Therefore, the data collected in this study do not constitute a complete representation of all discussion content on the platforms, but rather publicly observable discussion structures shaped by platform visibility mechanisms. As discussed above, platform public sphere contentiousness is influenced by factors such as event environments, platform governance conditions, recommendation mechanisms, and attention structures. Accordingly, what this study measures and compares are not fixed platform attributes, but publicly observable structural characteristics presented under specific temporal and platform conditions.

The results after data collection and preprocessing are presented in Table 2.

Indicator Calibration and Validation

To ensure the stability and identification performance of the indicator system across different analytical procedures, this study further conducts calibration and validation for several key measurement processes. These mainly include robustness tests of the K-value setting in the topical dispersion indicator, the semantic selection of the viewpoint axis in the viewpoint oppositionality indicator, and the manual coding calibration and identification performance evaluation of the rule systems used in the argumentativeness and responsiveness indicators.

First, robustness tests are conducted for the K-value setting in the topical dispersion indicator. This study further adjusts the proposed K value within adjacent intervals. It repeatedly calculates topic entropy at different K values while keeping the shared semantic space and clustering procedure unchanged, to compare variations in platform results across different clustering granularities.

Overall (detailed results are presented in Appendix B), the entropy results across different K values remain relatively close, and the trends in relative differences across platforms remain stable, indicating that the diversity indicator does not exhibit substantial shifts with

changes in clustering granularity. The results suggest that the diversity indicator is relatively stable across variations in K values and that a single clustering parameter setting does not drive the measurement results.

Second, this study conducts the selection and validation of the viewpoint axis in the viewpoint oppositionality indicator. Among the first three principal components within each analytical unit, 30 representative texts with the highest and lowest projection values at both ends of each principal component are extracted for manual comparison to select the component that best presents directional viewpoint differences as the viewpoint axis. Examples of viewpoint-axis comparisons are presented in Table 3. Overall, all analytical units can identify semantic axes that are relatively more capable of presenting directional viewpoint differences within the first three principal components. However, the clarity of viewpoint differentiation structures varies across different analytical units. It should be noted that, due to the computational method's sensitivity to directional semantic differentiation, the viewpoint oppositionality indicator may yield relatively high values. At the same time, this characteristic also makes the indicator suitable for comparing the extent to which explicit semantic differentiation can be reached across different discussion structures.

Finally, calibration and validation are conducted for the identification rules used in the argumentativeness and responsiveness indicators. At both the account and topic levels, this study randomly samples 300 texts each from the automated identification results of Weibo and Douyin for manual annotation, yielding a total of 1,200 validation samples. At the account level, stratified quota sampling is used to capture the distinct characteristics of three account types: government/official media accounts, market-oriented media accounts, and MCN/individual creator accounts. After iterative revisions of the rules and code, the final Krippendorff's α values for manual coding consistency, together with the precision and recall of the rule-based identification results, are presented in Table 4.

Overall, the argumentativeness and responsiveness indicators exhibit relatively stable identification results across different platforms and analytical levels. The Krippendorff's α values for the argumentativeness and reciprocity rule systems between the two coders are 0.82 and 0.87, respectively, indicating relatively high consistency in manual coding. In terms of automated identification results, the precision and recall of both indicators remain within relatively stable ranges across different platforms and analytical levels. However, they are affected to some extent by the loss of contextual information during rule abstraction. At the same time, under the same analytical level and indicator, the precision and recall results between Weibo and Douyin remain generally close, suggesting that the relevant rule systems exhibit relatively consistent identification performance across different platform contexts, thereby providing a basis for cross-platform comparison.

Measurement Results

The measurement results show that Douyin and Weibo display different rankings in public sphere contentiousness at the account and topic levels. This inconsistency across analytical levels indicates that the indicators of platform public sphere contentiousness respond differently to different types of public discussion structures. The specific performance of each indicator across levels further demonstrates their potential to capture structural characteristics of public discussion, thereby highlighting the analytical value of the measurement framework in identifying structural differences in platform public discussions.

TABLE 3
Example of Principal Component Semantic Comparison and Viewpoint Axis Selection

Platform level	Platform	Principal component	Left-side semantic trend	Right-side semantic trend	Interpretation	Selected as viewpoint axis
Topic-Level	Douyin	PC1	Mainly discussions on career planning, employment realities, and major selection	Mainly expressions of patriotic identification and emotional support for Zhang Xuefeng	Mainly differences in topics	No
		PC2	Tends toward negative views on professional value and employment realities	Tends toward positive evaluations of employment, career choice, and the value of the account	More closely reflects differences in viewpoint orientation	Yes
		PC3	Mainly news reposts and factual reports regarding the Zhang Xuefeng incident	Tends toward discussions of grassroots survival logic	Mainly differences in format and topics	No

TABLE 4
Parameters for Rule System Calibration and Validation

Level	Indicator	Platform	Precision	Recall
Account-Level	Argumentativeness	Weibo	0.78	0.73
		Douyin	0.74	0.70
	Responsiveness	Weibo	0.86	0.81
		Douyin	0.82	0.78
Topic-Level	Argumentativeness	Weibo	0.71	0.65
		Douyin	0.67	0.61
	Responsiveness	Weibo	0.83	0.77
		Douyin	0.79	0.74

Note: In the intercoder reliability tests for the argumentativeness and responsiveness rule systems, the Krippendorff's α values between the two coders were 0.82 and 0.87 respectively.

The account-level results (see Table 5) show that Douyin generally scores higher than Weibo on most indicators of contentiousness in the public sphere. However, this difference is not evenly distributed across account types and indicators. For government/official media accounts, MCN/individual creator accounts, Douyin demonstrates a relatively stable advantage across indicators. By contrast, among market-oriented media accounts, there are more frequent instances in which individual indicators for Weibo slightly exceed those of Douyin, resulting in a more mixed overall pattern of differences. More specifically, the indicators on which Weibo slightly outperforms Douyin are mainly concentrated in topical dispersion, viewpoint oppositionality, and argumentativeness.

The topic-level results (see Table 6) display a different pattern. In the case of the “Zhang Xuefeng account being banned from following” event, the cross-platform differences for most indicators ($\Delta = \text{Douyin} - \text{Weibo}$) are negative, indicating that Weibo exhibits a higher overall level of contentiousness than Douyin. More specifically, the differences between the two platforms are mainly concentrated in the dimensions of diversity, rationality, and reciprocity. Both platforms show relatively high levels of oppositionality. Among these, the cross-platform difference in viewpoint oppositionality is relatively small, while Douyin's emotional oppositionality is slightly higher than that of Weibo.

The divergence between account-level and topic-level results suggests that public sphere contentiousness is not a single attribute inherent to platforms, but rather a feature highly sensitive to discussion contexts and platform structures. The differences across analytical levels indicate that the measurement framework can distinguish among different types of public discussion structures, thereby allowing the organisational patterns and interaction modes of platform public spheres to be observed and compared across contexts. In the institutional and governance context of China, different platform structures often host different types of public discussion, with varying levels of risk, in a form of functional differentiation.

It should be noted that this study does not attempt to explain the specific mechanisms underlying these differences. Such questions remain for future research to explore by integrating platform structures with governance mechanisms. Nevertheless, the findings presented here are, to some extent, empirically consistent

TABLE 5
Account-Level Comparison Results of Public Sphere Contentiousness

Account type	Account name	Dimension	Indicator	Douyin	Weibo	Δ (Douyin – weibo)
Government / Official Media	Xinhua News Agency	Diversity	Topical Dispersion	0.9594	0.8287	+0.1307>0
			Emotional Oppositionality	0.9263	0.7149	+0.2114>0
		Oppositionality	Viewpoint Oppositionality	0.8726	0.8723	+0.0003>0
			Argumentativeness	0.0641	0.0473	+0.0168>0
	People's Daily	Rationality	Responsiveness	0.2797	0.2085	+0.0712>0
			Topical Dispersion	0.8142	0.9184	-0.1042<0
		Diversity	Emotional Oppositionality	0.8069	0.6198	+0.1871>0
			Viewpoint Oppositionality	0.9945	0.7627	+0.2318>0
	China Daily	Rationality	Argumentativeness	0.0681	0.0318	+0.0363>0
			Responsiveness	0.2077	0.0873	+0.1204>0
		Diversity	Topical Dispersion	0.9040	0.8637	+0.0403>0
			Emotional Oppositionality	0.9088	0.5880	+0.3208>0
Market-Oriented Media	The Paper (澎湃新闻)	Oppositionality	Viewpoint Oppositionality	0.8959	0.6814	+0.2145>0
			Argumentativeness	0.0462	0.0548	-0.0086<0
		Rationality	Responsiveness	0.1887	0.1818	+0.0069>0
			Topical Dispersion	0.9606	0.9537	+0.0069>0
	Southern Metropolis Daily	Diversity	Emotional Oppositionality	0.9927	0.9770	+0.0157>0
			Viewpoint Oppositionality	0.9973	0.9998	-0.0025<0
		Oppositionality	Argumentativeness	0.1026	0.1190	-0.0164<0
			Responsiveness	0.3164	0.0220	+0.2944>0
	Caixin (财新网)	Rationality	Topical Dispersion	0.9749	0.9124	+0.0625>0
			Emotional Oppositionality	0.9510	0.9729	-0.0219<0
		Diversity	Viewpoint Oppositionality	0.9960	0.8602	+0.1358>0
			Argumentativeness	0.0742	0.1725	-0.0983<0
		Rationality	Responsiveness	0.2662	0.0739	+0.1923>0
			Topical Dispersion	0.9081	0.9675	-0.0594<0
		Diversity	Emotional Oppositionality	0.9946	0.9790	+0.0156>0
			Viewpoint Oppositionality	0.9850	0.8482	+0.1368>0
		Rationality	Argumentativeness	0.1907	0.1199	+0.0708>0
			Responsiveness	0.4040	0.0172	+0.3868>0

TABLE 5 (Continued)
Account-Level Comparison Results of Public Sphere Contentiousness

Account type	Account name	Dimension	Indicator	Douyin	Weibo	Δ (Douyin – weibo)
MCN / Individual Creators	Luo Yonghao's Crossroads (罗永浩 的十字路口)	Diversity	Topical Dispersion	0.9613	0.9757	-0.0144<0
			Emotional Oppositionality	0.9675	0.9669	+0.0006>0
		Oppositionality	Viewpoint Oppositionality	0.9742	0.8820	+0.0922>0
			Argumentativeness	0.1641	0.1517	+0.0124>0
	Xiao Lin Talks (小 Lin说)	Rationality	Responsiveness	0.4293	0.2047	+0.2246>0
			Topical Dispersion	0.9854	0.8686	+0.1168>0
		Oppositionality	Emotional Oppositionality	0.9832	0.9683	+0.0149>0
			Viewpoint Oppositionality	0.8435	0.9447	-0.1012<0
	Teacher Zhang Xuefeng (张雪峰 老师)	Rationality	Argumentativeness	0.1926	0.0930	+0.0996>0
			Responsiveness	0.4305	0.1008	+0.3297>0
		Oppositionality	Topical Dispersion	0.9454	0.9133	+0.0321>0
			Emotional Oppositionality	0.9234	0.9044	+0.0190>0
		Reciprocity	Viewpoint Oppositionality	0.9992	0.9820	+0.0172>0
			Argumentativeness	0.0809	0.0799	+0.0010>0
			Responsiveness	0.3041	0.2144	+0.0897>0

TABLE 6

Topic-Level Comparison Results of Public Sphere Contentiousness

Dimension	Indicator	Douyin	Weibo	Δ (Douyin – Weibo)
Diversity	Topical Dispersion	0.9047	0.9161	–0.0114<0
Oppositionality	Emotional Oppositionality	0.9961	0.9812	+0.0149>0
	Viewpoint Oppositionality	0.9587	0.9697	–0.0110<0
Rationality	Argumentativeness	0.1638	0.6020	–0.4382<0
Reciprocity	Responsiveness	0.4127	0.6843	–0.2716<0

with existing research on the discussion structures of different types of platforms. For example, previous studies have often characterised Weibo as an interactive space oriented toward public issues and possessing relatively strong discussion attributes (e.g., Huang and Sun 2014; Sullivan 2014), whereas short-video platforms are more commonly associated with modes of expression driven by emotional engagement (e.g., Omar and Dequan 2020; Zeng and Abidin 2023). These typological understandings are reflected in the performance of certain indicators in this study. In addition, the more mixed pattern observed in the contentiousness dimensions among market-oriented media also resonates, at an empirical level, with existing arguments regarding the relationship between media marketisation in China and the contentious public sphere (Lei 2018). While these consistencies do not constitute a direct explanation of the underlying mechanisms, they nonetheless suggest that the contentiousness indicators developed in this study align, at the empirical level, with some of the structural features of public discussion identified in previous research, thereby demonstrating their explanatory potential.

Discussion and Conclusion

This study introduces the concept of platform public sphere contentiousness. Rather than taking normative deviation as its analytical starting point, the concept is grounded in the dynamic tension between the “recognition” and “suppression” of public discussion in the context of China’s authoritarian governance. It provides researchers with a reference approach for describing and analysing the operational state of the public sphere in similar institutional contexts where idealised conditions of communication are absent.

Based on unsupervised learning methods, this study further operationalises contentiousness into an automated indicator system to enable systematic identification and comparison of large-scale online public discussion structures. The results of the cross-level analysis of Weibo and Douyin show that the indicator system can capture differentiated structural characteristics across platforms and discussion contexts and, to some extent, aligns with existing empirical understandings of discussion forms on different platforms. In this sense, the differences identified in this study are not merely comparative outcomes at the platform level, but also reflect how public discussion is organised into different structural forms under different institutional and media conditions. This further demonstrates the explanatory potential of the indicator system in identifying different structural characteristics of public discussion and provides an

empirical basis for subsequent analyses of the conditions under which different contentious structures emerge.

This approach shifts the understanding of the public sphere from a normative ideal oriented toward rational consensus to a discussion structure that is continuously generated and adjusted under specific institutional and media conditions. Such a shift in understanding implies that public sphere analysis should have a clear regional grounding and a contextual orientation, necessitating the systematic incorporation of regional factors into public sphere research. It also allows a large amount of actual public discussion to be analysed without being prematurely dismissed as failed cases, thereby making it possible to examine further the social and political functions such discussions may perform under specific institutional conditions. For non-ideal institutional contexts such as China, this descriptive and contextualised analytical approach may provide new interpretive space for public sphere research.

However, this study still has several limitations. First, in terms of empirical design, due to constraints in data availability, the representativeness of the topic-level analysis across a broader range of issues remains to be tested. Future research could classify different types of public issues within the Chinese context and combine contentiousness indicators with stratified sampling strategies to systematically characterise the structural features of platform public sphere contentiousness across a wider range of topics.

In addition, a certain tension remains between the theoretical origins of the concept of contentiousness and its contextual embedding. Although the concept is grounded in the context of Chinese authoritarian governance, its measurement framework partly draws on Habermasian public sphere theory and related deliberative democracy research, which may result in some regional or cultural factors not being fully incorporated into the analysis. Whether the proposed indicator dimensions still require further refinement and extension also remains a question for future research. Given that contentiousness and deliberative quality point to different aspects of the public sphere, the two may form a complementary relationship in empirical research, and future studies could further explore their combined application and explanatory potential. At the same time, as a concept with a clear contextual orientation, the extent to which contentiousness can be applied to other similar institutional and platform environments also requires further examination through cross-regional research.

Finally, the unsupervised learning and automated text analysis methods employed in this study also have limitations. Automated approaches are more effective in identifying the overall structures and distributional patterns of public discussion, but their ability to identify sarcasm, metaphor, and highly contextualised expressions remains limited. Particularly in the Chinese context, internet users often package critical expressions into entertainment discourse through parody and irony to achieve limited visibility (Lams and Zhou 2020; Meng 2011). Therefore, the measurement results presented in this study should be understood as an approximate characterisation of the structural features of platform public discussion, rather than an exhaustive interpretation of the meanings of individual utterances. Future research could combine qualitative analysis or manual annotation methods to provide more fine-grained interpretations of the structural characteristics revealed by the contentiousness indicators.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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DATA AVAILABILITY

Data can be shared based upon reasonable request

DECLARATION OF GENERATIVE AI IN SCIENTIFIC WRITING

ChatGPT (OpenAI) was used for grammar and formatting checks, as well as for assistance in coding the operationalisation procedures and in cleaning and organizing the data. It did not contribute to the analysis or interpretation of the results. The authors take full responsibility for the content of the manuscript.

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Appendices

APPENDIX A Identification Rules and Examples of Argumentative and Responsive Expressions				
Indicator	Manual judgment criteria	Rule Type	Core identification logic	Example text
Argumentativeness	The text provides Y as a reason, explanation, or inferential support for a particular judgment, position, or event X.	A. Explicit Markers	On the basis of meeting the minimum Chinese character requirement, the text contains linguistic markers such as evidence citation, causal connection, inferential markers, or reason statements, for example, “according to data,” “because,” “so,” or “this shows.”	“Students from vocational colleges cannot enter the establishment system. For people in Shandong, this is unacceptable, so they have to retake the exam to get into an undergraduate programme.”
		B. Structural Explanations	The text provides explanations for a judgment or position through structural expressions such as comparison, attribution, or correction, for example, “it is not...but...,” “the issue is not...but...,” or “it seems...but actually...”.	“The problem is not publishing books offline, but bringing this kind of discourse online to guide public opinion, which will undermine the national talent cultivation plan. If teachers like this become influential, some majors will become oversupplied while others will face talent shortages.” “What Zhang Xuefeng said is correct. Many people only begin preparing in their senior year, and by then there is simply not enough time. Generally, preparation for postgraduate entrance exams should begin at least one year in advance, with proper planning for four stages: preparation, review, reinforcement, and final sprint.”
		C. Implicit Supportive Expressions	On the basis of meeting the minimum Chinese character requirement, the text provides information that can serve as supporting evidence for a related judgment or controversy through procedural expressions such as “first,” “then,” and “afterwards,” descriptive frameworks such as “generally,” “usually,” and “often,” or factual descriptions surrounding specific objects such as “rules,” “review,” and “punishment,” combined with numbers, links, and punctuation structures such as “ ”, “ ”; “ ” and “ ”: “ ”.	

(Continues)

APPENDIX A (Continued)
Identification Rules and Examples of Argumentative and Responsive Expressions

Indicator	Manual judgment criteria	Rule type	Core identification logic	Example text
Responsiveness	The text responds to other participants or existing discussions through the use of social media interaction functions (such as “@” mentions or follow-up comments).	A. Explicit Object Orientation	The text explicitly points to specific participants through forms such as “@someone”.	“This reason sounds much more reliable @CCTVNews”
		B. Discussion-Structure Continuation	The text enters into existing discussions through follow-up comments or topic hashtags.	“#ZhangXuefengRespondsToTrendingRumours# Actually, this could easily be disproved—he could simply post a video of himself attending the National Games, and the rumours would collapse immediately.”
		C. Semantic Responsive Expressions	The text directly continues, responds to, agrees with, or refutes others’ viewpoints at the semantic level, for example through expressions such as “what you said,” “the person above,” “in response to you,” “I agree with you,” or “I refute you.”	“What the person above said is actually correct. Many majors are indeed already close to saturation.”
	The text forms a responsive orientation toward existing viewpoints, expressions, or participants at the semantic level. Texts that merely mention public figures or event tags without forming an interactive orientation are not included within the category of responsive expression.			

APPENDIX B

Results of the Robustness Test for K Values

Platform level	Account type	Account name	K	Douyin entropy	Weibo entropy
Account-Level	Government / Official Media	Xinhua News Agency	30 (main) / 20 / 40	0.9594 / 0.9542 / 0.9513	0.8287 / 0.7963 / 0.8325
		People's Daily	25 (main) / 20 / 30	0.8142 / 0.7641 / 0.8054	0.9184 / 0.9252 / 0.9294
		China Daily	20 (main) / 15 / 25	0.9040 / 0.9280 / 0.9125	0.8637 / 0.8662 / 0.8577
	Market-Oriented Media	The Paper (澎湃新闻)	25 (main) / 20 / 30	0.9606 / 0.9801 / 0.9725	0.9537 / 0.9538 / 0.9611
		Southern Metropolis Daily	15 (main) / 10 / 20	0.9749 / 0.9203 / 0.9391	0.9124 / 0.9360 / 0.9515
	MCN / Individual Creators	Caixin (财新网)	15 (main) / 10 / 20	0.9081 / 0.8250 / 0.9205	0.9675 / 0.9246 / 0.9877
Topic-Level	—	Luo Yonghao's Crossroads (罗永浩的十字路口)	35 (main) / 30 / 40	0.9613 / 0.9712 / 0.9757	0.9757 / 0.9794 / 0.9747
		Xiao Lin Talks (小Lin说)	10 (main) / 15 / 8	0.9855 / 0.9638 / 0.9551	0.8686 / 0.9104 / 0.8131
		Teacher Zhang Xuefeng (张雪峰老师)	10 (main) / 15 / 8	0.9454 / 0.9805 / 0.9567	0.9133 / 0.9130 / 0.9130
		—	25 (main) / 20 / 30	0.9047 / 0.8798 / 0.8573	0.9161 / 0.9147 / 0.9404