

Appendix A: Evaluation of RAG and LLM in Nationalism Coding

To assess the quality of coding results generated by GPT-4-Turbo API, the authors randomly sampled 100 posts and manually annotated a gold standard through consensus coding, as this task required a comprehensive understanding of selected controversies. Then we compared the performances of computational coding with and without RAG, to the ground truth, respectively, by calculating the precision, recall, F1 score and accuracy for each nationalism indicator, as well as an overall accuracy for the ultimate nationalism category (non-nationalism, in-group, balanced and out-group nationalism). The metrics were satisfactory and the outputs yielded with RAG have improved, compared the ones without RAG, thus suggesting a great quality of API-coded results combined with RAG (see Table 1).

Table 1: Evaluation Metrics of Computational Content Analysis

Variable	Precision	Recall	F1 Score	Accuracy
With RAG				
In1: National identity	0.91	0.87	0.89	0.95
In2: Superiority	1.00	0.50	0.67	0.97
In3: Dominance	0.00	0.00	0.00	0.99
In4: Collective memory	0.83	0.71	0.77	0.94
Out1: Out-group rejection & hostility	0.61	1.00	0.75	0.85
Out2: Out-group derogation	0.73	0.88	0.80	0.81
Out3: Out-group threat	1.00	0.20	0.33	0.96
Out4: Boycotting	0.86	1.00	0.92	0.99
Nationalism	—	—	—	0.76
Without RAG				
In1: National identity	0.61	0.48	0.54	0.81
In2: Superiority	1.00	0.33	0.50	0.96
In3: Dominance	0.00	0.00	0.00	0.99
In4: Collective memory	1.00	0.50	0.67	0.93
Out1: Out-group rejection & hostility	0.44	0.65	0.53	0.73
Out2: Out-group derogation	0.86	0.74	0.79	0.84
Out3: Out-group threat	0.36	0.80	0.50	0.92
Out4: Boycotting	0.40	0.33	0.36	0.93
Nationalism	—	—	—	0.67

Appendix B: Evaluation of Terminology List in Fans Identity Coding

Similarly, to create a ground truth dataset, the authors randomly sampled 100 user accounts, including their usernames, profiles, and posts. The authors then went through consensus coding to create a ground truth based on prior knowledge and experiences of K-pop fan practices, resolving any coding discrepancies through thorough discussions. Evaluation metrics were calculated across four dimensions: username, profile, post, and overall fan identity. The overall fan identity consisted of three categories that aligned with our STM analysis: non-fans, lowly engaged fans, and moderately/highly engaged fans. The metrics were acceptable, with overall accuracy above .7 (see Table 2).

Table 2: Evaluation Metrics of Fan Identity Coding

Variable	Precision	Recall	F1 Score	Accuracy
Username	0.43	0.50	0.46	0.93
Profile	0.50	0.50	0.50	0.92
Post(s)	0.61	0.75	0.72	0.78
Fan identity and engagement level	0.80	0.71	0.72	0.71

Appendix C: Evaluation of Structural Topic Modeling

The evaluation of STM consisted of two parts: word intrusion test and topic intrusion test. In word intrusion test, we presented six shuffled words for each topic, i.e., the five highest-probability words from that topic plus one intruder word, which was randomly selected from words that had low probability in the current topic but high probability in other topic(s). Coders were asked to identify the intruder word. Model Precision (MP) was calculated to evaluate the semantic coherence of each topic. Similarly, in topic intrusion test, we displayed four shuffled topics for each of the 50 randomly selected documents, i.e., the three highest-probability topics assigned to that document plus one intruder topic, which was also randomly selected from the low-probability topics (bottom 25%) for that document. Identifying the intruder topic was the aim of the task. Topic Log Odds (TLO), calculated at the document level, were the measures for assessing the quality of document-topic assignments Chang2009.

Two Chinese K-pop fans were recruited and trained in two sessions to conduct the intrusion tests as coders. The average Model Precision across 24 topics (0.79) and the mean Topic Log Odds for 50 documents (-1.02) demonstrated acceptable outputs, indicating reasonable quality of topic modeling.

Appendix D: Keywords of Each Frame

Table 3: Calling for Actions (Frame 1)

Labels	Top Words	%
Spread Chinese ideology and culture worldwide and boost international influence	HP: country, culture, world, foreigner, influence, behavior, in-fluence, important, spread, understand FREX: important, influence, consciousness, terrible, foreign, foreigner, influence, spread, world, brainwashing	3.72
The company involved should withdraw from the Chinese market	HP: Starship (company's name), new song, get out, culture, market, bankruptcy, sue, hurry up, steal, disband FREX: Starship, sue, steal, IVE (nickname), mayor, bankruptcy, tutorial, dance studio, good luck, get out	2.99
Appeals to boycotts and bans on involved idols	HP: support, ban, boycott, platform, marketing, hope, pro-habit, related, stance, Jacky Heung FREX: prohibit, Jacky Heung, rights protection, goods, restrict, import, introduce/release, demand, this group, support	2.81

Table 4: Chinese Elements, Symbols & Artifacts (Frame 2)

Labels	Top Words	%
Brief accusations of appropriation	HP: culture, plagiarize, new song, teaser, Growl (song's name), mis-appropriate, suspected, controversial, traditional, promote FREX: plagiarize, Growl, controversial, suspected, misappropriate, oriental, thief, East Asia, ink painting, EXO (nickname)	7.59

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Table 4 – *Continued from previous page*

Labels	Top Words	%
Ask for acknowledgement of their use of Chinese elements	HP: China, element, admit, first place (in K-pop music shows), respect, return, ban on hallyu, cannot, want, deserve FREX: element, admit, China, deserve, first place, very skilled, inspiration, generous, plagiarize, great thief	7.32
The Great Wall	HP: the Great Wall, teaser, delete, China, Beijing, company, promote, replace, culture, agency FREX: the Great Wall, replace, Sun Wukong, Hybe (nickname), chrysanthemum, uncle, Carat (Seventeen fans' name), daisy, Beijing, agency	4.51
Chinese artifacts permaking and calligraphy	HP: hanji (Korean paper), promote, group variety show, steal culture, papermaking, publicize, Korean paper, borderline content, program, invention FREX: hanji, promote, group variety show, papermaking, Korean paper, Wang Xizhi, papermaking, Four Great Inventions, Newjeans (nickname), members of Newjeans (nickname)	4.17
Specific Chinese arts and artifacts in stage performances	HP: stage, music show performance, China Unicom, Unicom, logo, interaction, auspicious clouds, wear, styling, background FREX: stage, music show performance, China Unicom, Unicom, logo, interaction, mixing real and fake, secretly, steal, pine and cypress	2.94

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Table 4 – *Continued from previous page*

Labels	Top Words	%
Chinese cloth- ing and acces- sories	HP: disgusting, Calabash Brothers (Chinese animation), Hanfu, tra- ditional, Chinese knot, parachuting, easy, auspicious clouds, style, smoking pipe FREX: Calabash Brothers (Chinese animation), smoking pipe, land- scape painting, banana leaf fan, round fan, Confucius, integrate, magic fairy, flower wreath, Korea	2.49

Table 5: Conflicts between Idolizing & Nationality (Frame 3)

Labels	Top Words	%
Chinese K-pop fans did not deserve their nationality	HP: China, country, idolizing, nationality, idol, brain, history, Tai- wan, exit, maintain FREX: nationality, crazy fan, submit, China Taiwan, ancestors, re- nounce citizenship, compulsory education, nine years, charged, fill out	5.93
Calling for ra- tional idolizing	HP: like, idol, patriotic, hope, see, BTS, China, album, continue, understand FREX: Big Hit (nickname), true feelings, like, China Army (Chinese BTS fans), rational, idol, spend money, Army (BTS fans), don't care, willing	4.42
Fans should unfollow their idols	HP: fans, New Year, unfollow, artist, explain, group, thank you, best, era, funny FREX: Engene (Enhypen fans' name), of good stock, New Year, fans, Teens in Times (Chinese boy's groups), care about, era, Haerin, give back, unfollow	3.76

Table 6: Devaluing & Attacking South Korea (Frame 4)

Labels		Top Words	%
Accusing South Korea for being a habitual “cultural thief”		HP: stealing culture, company, Jang Wonyoung, member, country of thieves, Ahn Yujin, ability, whitewash, see, marketing FREX: watered down (inflated achievements), team of thieves, hairstick, ability, stealing culture, failure, team leader, beneficiary, little girl, love to steal	4.90
General derogatory term		HP: bangzi (derogatory term for Korean), advertisement, Chinese people, secretly, trending topic, hate, erbangzi (derogatory term for K-pop fans), Korean entertainment, Chinese fan, relationship FREX: advertisement, Korean fan, Simplified Chinese, during New Year, hamburger, Soyeon, bangzi, Chinese people, everywhere, hate	3.82

Table 7: Historical & Political Events & Issues (Frame 5)

Labels		Top Words	%
The July 7 Incident		HP: concert, Hong Kong, time, comment, Japan, slacking off, don't come, blacklist, day, traitor FREX: concert, Hong Kong, slacking off, July, additional show, Hua Chenyu, July 7th, Kim Soohyun, egg, day	5.63
The Datong Mass Grave in Shanxi province	Memo- rial	HP: Chinese knot, take down, picture, girl group, Mass Grave, white, plan, entertainment, super, Lee Hyeri FREX: take down, Lee Hyeri, Shanxi Datong, co-production, high-quality, coal mine, lose fans, steal, add, one by one	4.66

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Table 7 – *Continued from previous page*

Labels	Top Words	%
The Korean War	HP: China, stance, United States, Resist US Aggression and Aid North Korea, history, war, brother, North Korea, people, perspective FREX: Resist US Aggression and Aid North Korea, US-Korea, Chinese People's Volunteer Army, dispatch troops, opposite side, bombing, Yalu River, soldier, United States, 38th parallel	2.11

Table 8: Relevant Parties' Responses (Frame 6)

Labels	Top Words	%
Korean stakeholders	HP: controversy, South Korea, culture, traditional Chinese culture, speak out, professor, TV station, report, Korean website, history FREX: traditional Chinese culture, professor, speak out, TV station, Xu Jingde, multiple, Korean website, inferiority, profound and extensive, controversy	5.38
A Chinese working in South Korea	HP: South Korea, Zhang Yu'an, work, criticize, cancel, netizens, incident, report, steal, media FREX: Zhang Yu'an, work, long text, late night, top three, start singing, cancel, criticize, peanut, street	4.22
China's Ministry of Foreign Affairs	HP: Ministry of Foreign Affairs, remarks, respond, South Korea, indicate, China, together, promote, netizens, attention FREX: Ministry of Foreign Affairs, Chinese netizens, learn from history, sentiment, award, cherish, facing the future, Zhao Lijian, work together, Yunda Express	2.50

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Table 8 – *Continued from previous page*

Labels	Top Words	%
A Chinese game that included IVE's name in their game	HP: Sword of Justice (Game's name), game, girl group, mobile game, player, letter, delete, incident, quietly, culture FREX: Sword of Justice, game, mobile game, player, letter, quietly, public funds, Sword Network, smuggle, [Sword of] Justice	1.89

Table 9: Routine K-pop Engagement (Frame 7)

Labels	Top Words	%
Discussion of idol's controversial use of social media	HP: text, official blog, editor, controversy, Fubao (panda's name), like, petition, Macau, abuse, ban on hallyu FREX: official blog, editor, Fubao, like, petition, Macau, abuse, Cheng Xiao, salute, military service	4.37
Idols' apologies for the controversies	HP: apologize, China, respond, My Hero Academia, clarification, fans, company, respect, anime, super topic FREX: anime, guizi (derogatory term for Japanese), Chanyeol, pray, delete, manga, raise high, apologize, My Hero Academia, academy	4.14
K-pop-related information on social media	HP: video, Weibo, super topic, Jang Wonyoung, baby, Hwasa, suitable, physique, comeback, music FREX: baby, Hwasa, physique, Mayday, Ahn Hye-jin, update, channel, sing and compose, spring day, Happy New Year	3.70

Appendix E: Fit Metrics of Generalized Additive Models

Please see Table 10 for the evaluation metrics of the GAM model fitting.

Table 10: Fit Metrics of Generalized Additive Models

Frame	R^2	Deviance	AIC	REML
			Explained	Score
Calling for actions	0.057	0.095	-41995.62	-20974.00
Chinese elements, symbols & artifacts	0.423	0.493	-17315.49	-8621.32
Conflicts between idolizing & nationality	0.198	0.190	-30646.33	-15290.07
Devaluing & attacking South Korea	0.147	0.264	-47285.22	-23614.13
Historical & political events & issues	0.103	0.102	-32675.66	-16318.34
Relevant parties' responses	0.093	0.145	-27791.35	-13872.42
Routine K-pop engagement	0.446	0.452	-41649.99	-20790.78