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Unveiling the Secrets of Collaboration on Video-Sharing Platforms

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Completed Research Paper

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Abstract

In online video platforms, collaborative content creation gains popularity as vloggers exchange social capital to boost content's appeal and personal visibility. However, existing research lacks rigorous verification of collaboration efficacy in this context. This study investigates the benefits of collaboration on vlogger influence within the online video domain. Utilizing a staggered difference-in-differences approach, we found that collaboration indeed generates positive impact on vloggers' influence, as evidenced by the significant increases of their fan and like numbers among the audience. However, managing collaboration activities with suitable intensity is vital, as the marginal utility of collaborations diminishes with increased collaboration numbers. Furthermore, vloggers should avoid excessive non-core activities (e.g., uploading photo albums, audios, and articles) post-collaboration, as these peripheral activities negatively affect collaboration benefits in online video contexts. We believe that the findings of our study will provide helpful guidelines for designing more effective collaboration strategies on video sharing platforms.

Keywords: Online video, collaboration, vlogger, difference-in-differences

Introduction

Collaborative creation has emerged as a major format on video sharing platforms such as YouTube and Twitch. In 2022, the most popular 10 YouTubers among brands have generated a total of 877 videos through collaboration, which amounted to a cost of \$88.2 million and accounted for 17% of the brands' total collaboration expenses for the year[1]. Collaborative efforts have resulted in a substantial increase of video views, significantly boosting income for all involved parties. In literature, the importance of collaboration has been widely acknowledged across various disciplines, as it enables the exchange of resource and knowledge, leading to greater chances of success and benefits for all parties involved (Castañer & Oliveira, 2020). For instance, businesses can expand their reach and influence among target audiences by partnering with influential individuals for advertisement (Brooks et al., 2021; Ibáñez-Sánchez et al., 2022). In education, some digital tools have been introduced to assist collaborative learning (Liu et al. 2022),

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1 https://influencermarketinghub.com/top-youtube-spenders-report/#toc-7

especially the support for international research collaboration among scholars (Gorska et al. 2020). Such studies underscore the importance of collaboration in different tasks and highlight a growing trend for collaboration in online communities. An instance of this trend can be observed in online video sharing platforms, where collaborative performances are becoming increasingly prevalent. However, how this collaborative behavior might affect video creators and the video performance remain unclear.

Compared to other formats of collaborative content creation, online videos possess unique features that warrant further investigation. First, online videos allow for broader dimensions for collective contribution, with sound, image, and imitation providing additional opportunities for collaboration. The appearance, posture, and expression of video creators can significantly influence the outcome of the video creation. Second, collaboration details can be visualized, making the specific collaboration format crucial for improving benefits for participants. For example, cross-gender collaborations may be more attractive than same-gender collaborations. Moreover, online videos enable dynamic and interactive storytelling, setting them apart from other forms of online content creation such as text or images. The real-time engagement and immersive experience offered by videos allow creators to connect with their audience on a deeper level, fostering a sense of community and potentially boosting user benefits. In summary, online video collaborations possess distinct attributes that are absent in conventional collaboration methods such as advertising partnerships in corporations. Consequently, the findings from literature on traditional collaborative content creation cannot be directly applied to online video creation, thus motivating the current study.

Existing studies, such as Koch et al. (2018) and Petrova and Datta (2022), provide descriptive evidence on the impact of collaborative creation on users' performance in online video platforms. Although initial observations suggest that cross-user collaboration could be beneficial, such descriptive evidence falls short in providing conclusive proof due to the lack of rigorous empirical analyses on the causal impact and the absence of a solid theoretical foundation to interpret the underlying mechanism. Therefore, the current research aims to address this gap by formulating and answering the research question: What is the impact of collaboration in online video platforms on content performance and user engagement?

To answer this research question, we collected data from Bilibili, a prominent Chinese video platform, and evaluated the impact of collaboration on vloggers' performance by analyzing user-level data, providing valuable insights for content creators aiming to enhance their online performance. In this study, the term "collaboration" encompasses both individual and institutional accounts, as we did not distinguish between the two during data collection. Given that institutional accounts comprise a low proportion and their inclusion or exclusion does not significantly affect the outcomes, and the platform itself offers no clear demarcation, we consider both types in our analysis. The findings reveal that collaboration positively affects vloggers' performance at the user level, with a significant increase in the number of fans and likes. Furthermore, the impact of cumulative collaborations on performance exhibits an inverted-U pattern, emphasizing the existence of an optimal collaborative cumulation value. However, the inputs into peripheral activities such as uploading albums and audios would negatively moderate the positive impact of collaborations. Vloggers hence need to balance between the management of non-core business activities and video creation, so as to maximize the benefits of collaboration with others. In summary, this study estimates the effect of collaborative creation while empirically demonstrating specific strategies for users to optimize their performance.

This study contributes to two branches of literature. First, we address the gap in research specifically analyzing collaborative effects in online video-creating platforms. As a format of content creation driven by multimedia elements, video-creating platforms offer researchers plenty of new perspectives to gauge the collaborative impact. Our study also targets a non-linear relation between users' performance and cumulative collaboration, indicating the existence of an optimal cooperation threshold.

Second, our analysis sheds light on better development of online video-sharing platforms from the perspectives of different stakeholders. The current research findings yield pragmatic implications for video platforms and content creators, suggesting that fostering vlogger collaborations can enhance content performance and user engagement. By employing reward policies, promotional support, or specialized features, platforms can incentivize collaborations. Moderating effects analysis recommends that creators focus on primary content after collaboration initiation and well manage collaboration intensity. These insights, derived from the research findings, serve to aid video platforms and content creators in navigating the complexities of collaborations and maximizing potential advantages.

Theoretical Background and Literature Review

The Significance of Collaboration in Diverse Contexts

The critical role of collaboration has been extensively acknowledged and examined across a diverse range of disciplines, as it commonly fosters the exchange of resources and knowledge, consequently bolstering the likelihood of success for the involved parties (Castañer & Oliveira, 2020). In the domain of social sciences, Axelrod and Hamilton (1981) utilized game theory and computer simulations to delve into the evolution of cooperative behavior, offering a comprehensive insight into the prominence of collaboration. Within the field of management and organizational studies, Inkpen and Tsang (2005) elucidated the contribution of social capital in promoting cooperation and knowledge transfer within networks, while Hansen (2002) explored how inter-unit collaboration within an organization can lead to effective knowledge sharing and enhanced performance. Additionally, in environmental studies, Ostrom (1990) emphasized the indispensable role of cooperation in achieving sustainable resource management in communities. Collectively, these studies accentuate the relevance and significance of collaboration across various disciplines, showcasing its pivotal function in facilitating resource exchange, knowledge dissemination, and overall success.

In recent years, the rise of social media has opened new avenues for collaboration, particularly in the context of partnerships between organizations and individuals. This new form of cooperation has become increasingly relevant in marketing strategies. By collaborating with influential individuals, businesses can effectively expand their reach and influence within various target audiences (Brooks et al., 2021; Ibáñez-Sánchez et al., 2022). Kapitan and Silvera (2016) emphasized that brands increasingly prefer to engage with key opinion leaders, such as vloggers, to overcome the challenges of direct consumer interaction. Moreover, Evans et al. (2017), Reinikainen et al. (2020), and De Veirman et al. (2017) examined the phenomenon of sponsored content creation, wherein brands and influential individuals cooperatively create content that captures consumer attention and trust, ultimately promoting products or services.

Alongside these developments, research on the interpersonal dimensions of collaboration within social media has flourished, with a focus on educational and academic contexts. Liu et al. (2022) discovered that digital platforms foster collaborative learning among university students in China, and that students' academic self-efficacy significantly moderates the relationship between online collaboration and learning performance. Furthermore, Ansari and Khan (2020) reported that the use of digital platforms for collaborative learning positively influences students' interactivity with peers and teachers, as well as their academic performance. In a similar vein, Gorska et al. (2020) demonstrated the role of digital communication tools in supporting international research collaboration among scholars who published in top management journals. These findings highlight the diverse manifestations of collaboration in the age of social media, spanning from organizational-individual partnerships in marketing to interpersonal cooperation in educational and academic settings.

Collaborative Content Creation in Online Video Platforms

Collaborative content creation in online video platforms encompasses a variety of stakeholders, including interactions between content creators (i.e., influencers) and collaborations with institutions. Despite the practical implications of such collaborations, the existing literature exhibits a notable research gap, with only a handful of studies delving into this topic.

Koch et al. (2018) and Petrova and Datta (2022) explored collaborations among content creators, primarily utilizing descriptive statistical methods to examine the impact of these collaborations on audience reach and content quality. However, their investigations neglected crucial aspects, such as the inherent characteristics of content creators, including audience size and content type. Their research should consider addressing the individual fixed effects in order to control for potential confounding factors.

In addition, when considering institutional collaborations or professional channels, the research conducted by Hankunaseth et al. (2022) and Törhönen et al. (2021) primarily focused on specific channels or content categories, such as gaming live streams or educational content. This narrow scope casts doubt on the generalizability of their conclusions across a wider range of online video contexts.

In order to more accurately gauge the impact of collaborative content creation within online video platforms, we propose a comprehensive approach that integrates multi-domain and longitudinal observations at the stage of dataset construction. From a methodological standpoint, we will employ robust techniques, such as causal inference, to effectively control for user attributes and rigorously determine the effects of collaboration. This in-depth exploration will contribute to a deeper understanding of collaborative content creation in online video platforms, providing valuable insights for both practitioners and researchers. The scarcity of research in this area underscores the importance of our investigation, which seeks to address a critical gap in the management information systems literature by offering a more holistic view of collaborative content creation and its consequences within the realm of online video platforms.

Social Capital Theory

To elucidate the underlying mechanisms driving collaborative content creation in online video platforms and its influence on vloggers' prominence and popularity, we employ social capital theory as our theoretical foundation. Social capital theory posits that resources embedded in social relationships can generate benefits for individuals and groups (Coleman, 1988; Nahapiet & Ghoshal, 1998).

Social capital is traditionally categorized into three dimensions: structural, cognitive, and relational (Nahapiet & Ghoshal, 1998). The structural dimension pertains to the pattern of connections among individuals, which influences their capacity to access and mobilize resources within their network (Nahapiet & Ghoshal, 1998). Collaborative content creation allows vloggers to extend their social networks, thereby augmenting connections with fellow vloggers and audiences (Coleman, 1988). This network expansion enables vloggers to obtain information regarding creative techniques, emerging trends, and market demands, ultimately enhancing the appeal and quality of their content.

The cognitive dimension encompasses shared cognitive resources, including knowledge, experience, and creativity (Nahapiet & Ghoshal, 1998). Through collaboration, vloggers exchange and acquire these resources, fostering an environment of continuous learning and innovation. As a result, vloggers can better satisfy audience expectations and demands, leading to increased influence and popularity.

The relational dimension of social capital refers to the quality of relationships among individuals, encompassing aspects such as trust, norms, and obligations (Nahapiet & Ghoshal, 1998). Collaborative content creation promotes positive relationships among vloggers, enhancing their collaborative propensity and efficiency. This amelioration in collaboration quality subsequently yields superior content and augmented influence. Moreover, audiences are likely to develop favorable perceptions of closely collaborating vlogger communities, further boosting their popularity (Agarwal et al., 2008).

In summary, social capital theory offers a comprehensive framework for understanding why vloggers in online video platforms opt for collaborative content creation to bolster their influence and popularity. By examining the phenomenon through this theoretical lens, our study aims to uncover the potential drivers and mechanisms underpinning collaborative content creation, providing valuable insights for both researchers and practitioners in the field of management information systems.

Data and Context

In this study, we investigated the impact of collaborative behavior among video bloggers (vloggers) on their performance indicators, such as the number of followers, likes, and views, on Bilibili, a prominent Chinese video platform. Employing a stratified sampling technique, we selected vloggers from 21 distinct fields, encompassing music, gaming, sports, and more. Our initial sample comprised 1,036 vloggers, including both top-tier and average-tier creators (including institutions). After excluding vloggers who did not release any videos during the designated observation window, our final sample consisted of 993 vloggers. In our study, we do not specifically distinguish between institutional and individual accounts. Institutional accounts constitute 9.47% of the total sample. Including or excluding them does not materially affect the outcomes; thus, we collectively refer to them as 'vlogger accounts' for the purpose of our analysis.

The study period spans from July 17, 2021, to August 10, 2022, totaling 389 days. During this time, we collected daily performance data and information on newly published videos for each vlogger. Out of the vloggers observed, 500 initiated their first collaboration within the observation period, while the remaining 493 did not engage in any collaborative efforts, including the time prior to the study period. Following the

processing of missing values and data cleansing, we obtained 76,983 valid video entries released within the observation window, with 4,121 classified as collaborative videos. All data were obtained from publicly accessible sources[2].

Apart from the primary emphasis on video publishing, Bilibili offers creators a diverse array of content creation categories, including photo albums, audio, and articles. Although these categories do not represent the central focus of content production, adept use of these features by vloggers can effectively capture audience interest. Consequently, we also collected data on these supplementary content types. The descriptive statistics for user-level data are presented in Table 1.

Variable	Definition	Obs	Mean	Std. Dev.	Min	Max
StartUnion	Whether the vlogger has experienced collaborative creation.	360242	0.382	0.486	0	1
Fans	Total number of vlogger's fans.	360242	1393340.1	2141434.3	593	40727632
Ln(Fans)		360242	13.284	1.691	6.387	17.522
Likes	Total likes received by the vlogger.	360242	9818751.7	19762688	0	3.595e+08
Ln(Likes)		360242	14.948	1.879	0	19.700
Views	Total views received by the vlogger.	360242	2.211e+08	1.215e+09	0	4.382e+10
Ln(Views)		360242	17.958	1.667	0	24.503
FansBadge	Whether the vlogger is fan-verified.	360242	0.784	0.412	0	1
VipType	0 for no membership, 1 for monthly, 2 for annual.	360242	1.565	0.681	0	2
SignLen	Length of vlogger's personal signature.	360242	34.111	18.951	0	73
Ln(SignLen)		360242	3.301	0.902	0	4.304
Following	Number of users followed by the vlogger.	360242	134.44	213.834	0	2048
Ln(Following)		360242	3.929	1.594	0	7.625
AccUnion	Total collaborative videos by the vlogger.	360242	2.181	6.583	0	242
Ln(AccUnion)		360242	0.576	0.882	0	5.493
AccNounion	Total independent videos by the vlogger.	360242	706.822	2038.108	0	34943
Ln(AccNounion)		360242	5.405	1.352	0	10.462
AlbumCount	Total albums published by the vlogger.	360242	202.394	551.994	0	9226
Ln(Ablum)		360242	3.912	1.827	0	9.130
AudioCount	Total audio tracks published by the vlogger.	360242	3.215	14.241	0	181
Ln(Audio)		360242	0.360	0.969	0	5.204
ArticleCount	Total articles published by the vlogger.	360242	20.839	134.461	0	2913
Ln(Article)		360242	0.876	1.470	0	7.977
Table 1: Overview of Descriptive Statistics (User level)						

Note(s): All log transformations are performed by ln(x+1).

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2 https://www.bilibili.com/.

Impact of Collaboration

Staggered Difference-in-Differences Design

One of our main research goals is to examine whether and how collaboration behaviors influence vloggers' popularity on the platform. Considering that vloggers in our collection seek for collaboration sequentially, we are able to design a staggered difference-in-differences (DID) model to causally examine this relation (Callaway & Sant'Anna, 2021). The proposed model is specified as follows:

$$Y_{it} = \alpha + \beta1 * StartUnion_{it} + \beta2 * X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \qquad (1)$$

where Y_{it} represents the dependent variable corresponding to one of the vlogger's performance metrics, such as the logarithm of the number of fans (Ln(Fans)) and likes(Ln(Likes)) for user i at time t. $StartUnion_{it}$ serves as the independent variable capturing the status of initial collaboration, while X_{it} denotes time-varying user characteristics. The model also accounts for user fixed effects (μ_i) to control for unobservable individual heterogeneity and time fixed effects (λ_t) to control for time-specific factors. Lastly, ε_{it} constitutes the error term, which is clustered at the user level to address potential correlation issues.

	(1)	(2)	(3)	(4)
	Ln(Fans)	Ln(Likes)	Ln(Fans)	Ln(Likes)
StartUnion	0.025**	0.043***	0.019**	0.035***
	(0.010)	(0.011)	(0.009)	(0.010)
Ln(Ablum)			0.072***	0.095***
			(0.018)	(0.021)
Ln(Audio)			0.011	0.017
			(0.012)	(0.017)
Ln(Article)			0.021	0.008
			(0.015)	(0.018)
FansBadge			0.037	0.089*
			(0.049)	(0.046)
VipType			0.028**	0.050***
			(0.014)	(0.015)
Ln(SignLen)			0.004	-0.006
			(0.011)	(0.014)
Ln(Following)			0.078**	0.060**
			(0.031)	(0.028)
Ln(AccNounion)			0.069**	0.103**
			(0.033)	(0.048)
Constant	13.282***	14.942***	12.213***	13.638***
	(0.004)	(0.004)	(0.241)	(0.313)
N	360242	360242	360242	360242
adj. *R*²	0.996	0.995	0.996	0.996

Table 2. The Impact of Collaboration on Content Creators' Performance Metrics

*Note(s): Robust standard errors in parentheses and clustered at the user level. * p < 0.1, ** p < 0.05, *** p < 0.01.*

In our analysis, we focus on two highly relevant performance metrics: the number of fans and the number of likes for each user. Based on the estimations , we find a significant positive effect on both the number of fans (coefficient = 0.019, p<0.05) and the number of likes (coefficient = 0.035, p<0.01) after vloggers opt for collaborative content creation, as shown in Table 2. One possible explanation for this phenomenon is that collaboration enables the exchange of social capital benefits between the involved parties. Prior research suggests that social capital plays a crucial role in shaping the success and visibility of content creators within online platforms (Burt, 2000; Ellison et al., 2007). Collaborative efforts can lead to the pooling of resources, such as knowledge, skills, and network connections, which in turn may contribute to increased popularity and appreciation (Adler & Kwon, 2002;).

Before delving into the subsequent sections, it is imperative to conduct a parallel trend test, which is an essential step in ensuring the validity of the staggered DID model. We have chosen a time window spanning 10 periods before and 15 periods (day) after the initiation of collaboration, using the period when collaboration starts as the reference point. This test serves to verify the assumption that, in the absence of treatment, the treated and control groups would have followed parallel trends over time.

Figure 1: Parallel Trends Test Results for Content Creators' Performance Metrics
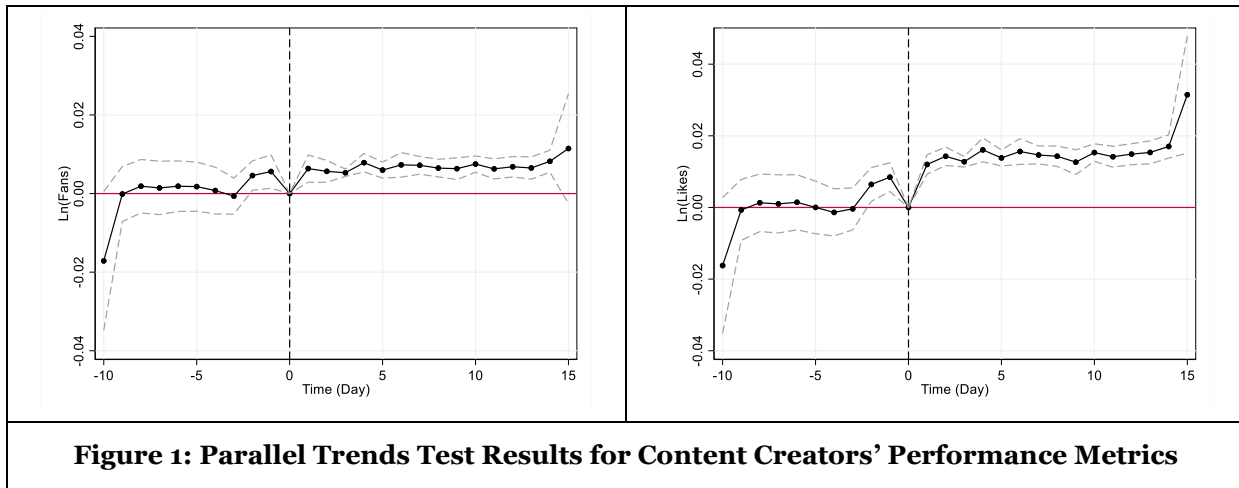
Upon conducting the parallel trends test for models (3) and (4), we observe in Figure 1 that both of our selected performance metrics pass the test, indicating the validity of our DID model. However, it is worth noting that a positive effect trend emerges two periods prior to the policy implementation, which might be attributed to the advertisement for the collaboration behavior. Many content creators may engage in promotional activities before initiating collaboration, attracting users to pay attention to their collaborative endeavors in advance. As a result, the collaboration effect might start earlier than expected.

Overall, our analysis demonstrates that engaging in collaborative content creation can lead to increased popularity and appreciation, as reflected in the growth of fans and likes. This finding is supported by the underlying mechanism of social capital exchange. The implications of these results may be valuable for content creators who aim to enhance their visibility and success within the online platform by leveraging collaborative opportunities.

Impact of Cumulative Collaborations on Performance

In this section, we extend our initial analysis by replacing the binary variable "StartUnion" with the number of cumulative collaborative videos produced by the vlogger. This modification allows us to examine the evolving effects of collaboration intensity on vloggers' performance after its initiation. Instead of assuming a linear increase relation, we conjecture that the positive collaboration effects might decrease as the number of collaborations increases, according to the law of diminishing marginal utility in economics. We thus incorporate a squared term for cumulative collaborations to capture any non-linear influences. The results are shown in Table 3.

	(1)	(2)
	Ln(Fans)	Ln(Likes)
Ln(AccUnion)	0.022*	0.053***
	(0.012)	(0.014)
Ln^2(AccUnion)	-0.005	-0.013***
	(0.004)	(0.005)
Ln(Ablum)	0.071***	0.095***
	(0.018)	(0.021)
Ln(Audio)	0.011	0.016
	(0.012)	(0.018)
Ln(Article)	0.021	0.009
	(0.015)	(0.018)
FansBadge	0.038	0.091**
	(0.050)	(0.046)
VipType	0.028**	0.050***
	(0.014)	(0.015)
Ln(SignLen)	0.004	-0.006
	(0.011)	(0.014)
Ln(Following)	0.078**	0.059**
	(0.032)	(0.028)
Ln(AccNounion)	0.069**	0.103**
	(0.033)	(0.048)
Constant	12.212***	13.638***
	(0.241)	(0.313)
N	360242	360242
adj. R^2	0.996	0.996

Table 3. The Impact of Cumulative Collaborative Works on Performance Metrics

*Note(s): Robust standard errors in parentheses and clustered at the user level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.*

The estimations show that the coefficient of the linear term AccUnion is positive whereas the coefficient of the squared term is negative. There is hence an inverted U-shape relation between collaboration number and vloggers' performance, especially regarding the number of likes. More specifically, we observe that the benefits (e.g., increase of fans and likes) of collaboration initially increase with the number of cumulative collaborations, but eventually decrease as collaborations become excessive. In summary, our analysis demonstrates that cumulative collaborations positively influence vlogger performance concerning fans and likes, but also reveals the existence of an inverted-U relationship. This finding highlights the importance of strategically managing the quantity of collaborative efforts to optimize performance within the highly competitive online content creation landscape.

Moderating Effects of Supplementary Business Activities

In the previous sections, we have examined the impact of initiating collaborations and the number of cumulative collaborations on vloggers' performance. To further explore the potential moderation effects due to the influence of non-core business activities on the collaboration-performance relationship, we incorporate interaction terms between the collaboration variable (StartUnion) and non-core business activities (Album, Audio, Aritcle) in our regression models. The results are presented in Table 4.

	(1)	(2)
	Ln(Fans)	Ln(Likes)
StartUnion	0.098***	0.119***
	(0.031)	(0.031)
Ln(Album)	0.074***	0.098***
	(0.018)	(0.021)
StarUnion* Ln(Album)	-0.018**	-0.019***
	(0.007)	(0.007)
Ln(Audio)	0.018	0.024
	(0.012)	(0.018)
StartUnion* Ln(Audio)	-0.013**	-0.014*
	(0.006)	(0.007)
Ln(Article)	0.019	0.007
	(0.016)	(0.020)
StartUnion* Ln(Article)	0.004	0.004
	(0.006)	(0.006)
FansBadge	0.032	0.084*
	(0.048)	(0.045)
VipType	0.027**	0.049***
	(0.014)	(0.015)
Ln(SignLen)	0.004	-0.006
	(0.011)	(0.014)
Ln(Following)	0.078**	0.060**
	(0.031)	(0.028)
Ln(AccNounion)	0.068**	0.101**
	(0.033)	(0.047)
Constant	12.221***	13.646***
	(0.239)	(0.312)
N	360242	360242
adj. R^2	0.996	0.996
Table 4. Non-core Business Activities Moderation on Collaboration Performance		

Note(s): Robust standard errors in parentheses and clustered at the user level. * p < 0.1, ** p < 0.05, *** p < 0.01.

We find that the interaction terms between StartUnion and non-core activities, specifically album creation (StartUnion*Album) and audio production (StartUnion*Audio), have significant negative coefficients in both models (1) and (2). This suggests that as involvement in non-core business such as album creation and audio production increases, the positive effect of collaboration on the number of fans and likes is attenuated. Conversely, the interaction term between StartUnion and article writing (StartUnion*Article) is not significant in either model, indicating no evident moderating effect.

These findings can be interpreted within the framework of the resource-based view (RBV) theory (Barney, 1991). The RBV posits that a firm's competitive advantage originates from its distinctive resources and capabilities. When a vlogger is immersed in individual content creation and sharing, peripheral materials, such as self-produced videos and albums, may enhance user familiarity and intimacy, subsequently yielding positive outcomes for the vlogger. In this context, non-core activities may serve to strengthen the vlogger-audience relationship without detracting from solo video production.

However, collaboration necessitates multi-party cooperation and is not solely dependent on a single vlogger's performance. As such, it demands heightened focus and attention. If vloggers persist in devoting efforts to self-oriented non-core activities during collaborations, they may inadvertently redirect resources away from their primary competency in video content creation. This diversion of resources could potentially undermine the positive effects of collaboration and diminish the collaborative results. The distinct impact of non-core activities on solo and collaborative video creation underscores the importance of considering the unique dynamics of collaborative content creation. Consequently, vloggers must remain vigilant of potential trade-offs when allocating resources to non-core activities and prioritize their core competencies to optimize collaboration benefits.

Robustness Check

Placebo Tests

To make sure that the collaboration effects we observed do not arise by chance, we conducted a placebo test. Our main model accounts for the vlogger's observable characteristics that may impact their performance. However, unobservable traits could still affect the results. A conventional approach, such as the one by Liu and Lu (2015), involves random selection of the same number of vloggers who engaged in collaborative content creation during the observation period as the treatment group. However, this method does not account for the varying collaboration initiation timings among vloggers in our study, necessitating the randomization of both treatment subjects and treatment timing.
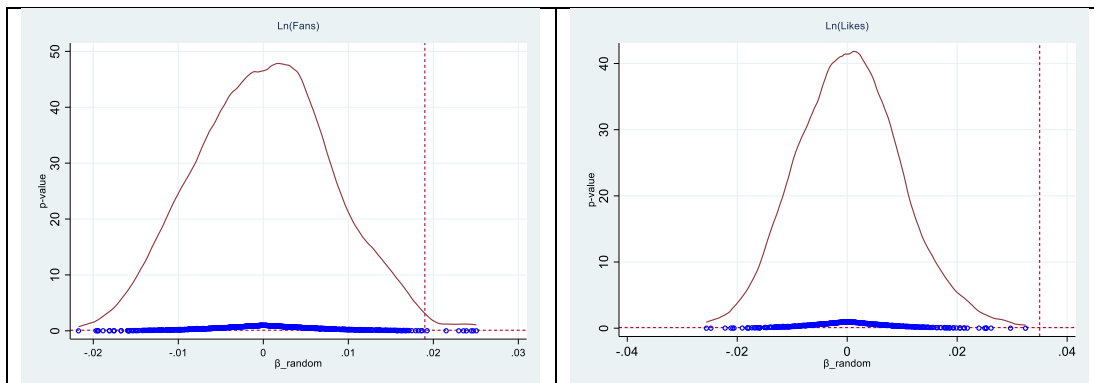

Figure 2: Placebo Test Results with Randomized Treatment Group and Timing

In our placebo test, we performed 1,000 iterations of random sampling for the treatment group and randomized the treatment timing. Subsequently, we estimated the coefficients (β^{random}) for the placebo treatment timing variables. The kernel density and p-value distributions of the 1,000 β^{random} values are presented in Figure 2 (The red vertical line represents the estimated parameter value of our main model). Most of the estimated p-values exceed 0.1, and the coefficients generated during the randomization process

primarily concentrate around zero, indicating a significant difference from our estimated coefficients. These results confirm the robustness of our main model findings and demonstrate that potential unobserved factors do not influence the outcomes.

PSM-DID Approach

In this section, we conduct a robustness check using the Propensity Score Matching to improve the sample balance in the Difference-in-Differences estimations. Addressing the potential individual heterogeneity in content creators' performance (e.g., fans and likes) over time is essential to ensure that treatment and control groups have comparable characteristics, thereby minimizing sample selection bias when applying the DID method.

We identify content creators who collaborated on videos during the observation period as the treatment group and designate the first period of observation as the reference period. Using the Propensity Score Matching (PSM) method, we employ a one-to-one ratio to match treatment units with control units without replacement. The subsequent matching results reveal no significant differences across different variables between the treatment and control groups at the 10% level, indicating well-balanced samples after the matching.

After removing the unsuccessfully matched samples, we re-run the regression analysis, with the results presented in Table 5. The coefficients associated with "*StartUnion*" display signs and significance levels consistent with our primary model, confirming the robustness of our findings.

	(1)	(2)	(3)	(4)
	Ln(Fans)	Ln(Likes)	Ln(Fans)	Ln(Likes)
StartUnion	0.037^{***}	0.046^{***}	0.026^{**}	0.032^{**}
	(0.012)	(0.014)	(0.011)	(0.012)
Ln(Ablum)			0.083^{***}	0.097^{***}
			(0.022)	(0.027)
Ln(Audio)			0.008	0.027
			(0.020)	(0.028)
Ln(Article)			0.032^{**}	0.022
			(0.015)	(0.017)
FansBadge			0.119^{*}	0.153^{***}
			(0.065)	(0.055)
VipType			0.048^{**}	0.054^{***}
			(0.020)	(0.015)
Ln(SignLen)			-0.007	-0.027^{*}
			(0.012)	(0.014)
Ln(Following)			0.050^{**}	0.047^{*}
			(0.020)	(0.024)
Ln(AccNounion)			0.069	0.110^{*}
			(0.043)	(0.062)
Constant	13.530^{***}	15.151^{***}	12.431^{***}	13.822^{***}
	(0.005)	(0.006)	(0.278)	(0.395)

N	224306	224306	224306	224306
adj. R^2	0.994	0.994	0.994	0.995
Table 5. Results of PSM-DID Analysis for Robustness Check				

Note(s): Robust standard errors in parentheses and clustered at the user level. * p < 0.1, ** p < 0.05, *** p < 0.01.

Conclusion and Future Work

Findings and Implications

In this study, we examined the impact of collaboration on the performance of video bloggers (vloggers) on Bilibili, a leading Chinese video sharing platform. By analyzing user-level time-series data, we provide a comprehensive understanding of the effects of collaborative behavior on vloggers' success, offering valuable insights for content creators aiming to enhance their visibility on online platforms.

Our findings indicate that engaging in collaboration positively affects vloggers' performance at the user level, as evidenced by a significant increase in the number of fans and likes. This result can be attributed to the pooling of resources, such as knowledge, skills, and network connections, which contributes to increased popularity and appreciation. Furthermore, we found that the impact of cumulative collaborations on performance follows an inverted-U pattern, highlighting the importance of strategically managing the quantity of collaborative efforts to optimize performance.

We uncovered an intriguing finding regarding the management of peripheral activities that are not directly related to video creation and sharing. While uploading photos or audios may occasionally enhance a vlogger's rapport with their audience, engaging in such non-core activities was found to negatively influence the positive impact of collaboration on the vlogger's popularity. This may be attributed to the fact that non-core self-oriented activities can divert attention from collaborative endeavors, which typically necessitate high levels of focus and effort. Consequently, vloggers should adjust their non-core activities to minimize the potential adverse effects on their collaborations, while they operate as part of a team rather than as solo performers.

We are confident that our study provides valuable theoretical insights. One of the main distinctions between video-based collaboration and traditional display collaboration, such as textual advertising in marketing, is the dynamic performance of the collaborators. By carefully analyzing vloggers' collaborations on video sharing platforms, we significantly extend the understanding of collaboration in the new context. We introduced the social capital theory to explain why collaboration might or might not work, through the interplay of structural, cognitive, and relational dimensions of social capital, which particularly accounts for different factors in the form of video collaboration.

Practically, our findings provide helpful guidelines for the video platform and vloggers. In the perspective of platforms, policies such as reward promotion can be designed to encourage effective collaborations so as to attract more audience. In the perspective of vloggers, factors such as collaboration number and non-core business activity management should be accounted for to maximize the collaboration performance and personal popularity increase.

Limitations and Future Work

Despite the valuable insights provided by our study on the effects of cumulative collaborations on vloggers' performance, several limitations warrant acknowledgment, which also present opportunities for future research.

First, our analysis focused mainly on the cumulative impact of collaborations, without delving into the effects of individual style on collaboration performance. Future research could consider more specific factors, such as vloggers' demographics and tones, to uncover how they may influence collaboration performance. This would be especially useful for vloggers when selecting collaborators. Additionally, exploring the effects of collaborations in different fields could provide tailored recommendations for diverse contexts.

Second, while our dataset is extensive and encompasses a considerable temporal range, it is predominantly focused on a single Chinese online video platform. To establish the generalizability of our findings, future research could explore different platforms or linguistic environments. Such studies would enable the validation of the universality of our results and provide a more comprehensive understanding of the collaborative phenomenon across diverse settings.

Lastly, our study mainly considered factors influencing vloggers' performance based on publicly visible attributes. However, some non-public features, such as daily revenue, require collaboration with the platform to access. Future research could forge partnerships with these platforms to obtain more sensitive data, which might yield further insights into the determinants of vloggers' success.

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