

The Impact of Live Streaming E-commerce on Rural Revitalization from an Industrial Chain Perspective: A Case Study of Suichang Tea in Zhejiang Province

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Abstract. Based on the perspective of the industrial chain and incorporating theories, this paper explores the mechanism through which live streaming e-commerce contributes to rural revitalization. Using the case of Suichang tea in Zhejiang Province and employing case analysis and empirical research methods, this paper analyzes how live streaming e-commerce promotes the rural economy in terms of production standardization, efficient circulation operation, and platform-side resource integration. The study finds that live streaming e-commerce can optimize the rural industrial chain and enhance the overall efficiency of the rural economy, but certain issues persist. Accordingly, targeted recommendations are proposed for the production end, circulation end, and platform end, providing references for local governments in formulating live streaming aid-agriculture policies and rural industry development, thereby contributing to rural revitalization.

Keywords: Industrial Chain, Live Streaming E-commerce, Rural Revitalization, Suichang Tea in Zhejiang Province

1. Introduction

1.1. Research background

Against the backdrop of the continuously deepening Rural Revitalization Strategy and promotion by policies at various government levels, rural e-commerce, leveraging the unique advantages of "real-time interaction + contextualized display + instant conversion," has effectively activated rural consumption potential and become a new engine for driving rural economic development. In this context, this paper takes Suichang tea in Zhejiang Province as a case study and, from an industrial chain perspective, explores the mechanism and practical pathways through which live streaming e-commerce influences rural revitalization, aiming to provide theoretical reference and practical insights for the high-quality development of rural industries.

1.2. Research significance

1.2.1. Theoretical significance

This study breaks through the traditional dualistic analytical framework of "e-commerce—rural revitalization" and constructs an industrial chain analysis perspective featuring the tripartite linkage of "production end - circulation end - platform end". By exploring the deep integration mechanism of live streaming e-commerce as a new transaction model with the rural industrial chain, it deepens the theoretical understanding of how digital technologies reconstruct the rural industrial ecology and provides theoretical reference for interdisciplinary research in agricultural economics, platform economy, rural development, and related fields.

1.2.2. Practical significance

At the practical level, this paper provides a basis for decision-making for local governments in formulating targeted live streaming aid-agriculture policies, helping to clarify the optimization priorities and resource allocation directions for various segments of the industrial chain, and forming replicable and scalable models for rural e-commerce development. Simultaneously, the research conclusions also offer practical guidance for various participants in the rural industrial chain, helping them integrate more efficiently into the live streaming economy ecosystem.

1.3. Research methods and approach

1.3.1. Research methods

Literature Review: Systematically examines relevant literature on live streaming e-commerce, industrial chain theory, and rural economic development, summarizing existing research findings and theoretical viewpoints to lay the theoretical foundation for constructing the "production-circulation-platform" tripartite linkage analytical framework in this study.

Case Study Analysis: Selects the Suichang tea industry in Zhejiang Province as a typical case. By collecting government reports, statistical data, media reports, and enterprise materials, it conducts an in-depth analysis of the specific practices and effects of live streaming e-commerce.

Empirical Analysis: Based on the Synthetic Control Method (SCM) and utilizing data from Suichang County from 2010–2019, with the added value of the primary industry as the explained variable, and selecting variables such as rural electricity consumption and total agricultural machinery power as control variables, it tests the actual impact of live streaming e-commerce on rural economic development by constructing a "synthetic Suichang" as a counterfactual reference.

1.3.2. Research approach

1. **Establishing the Research Foundation and Theoretical Framework:** The introduction section systematically elaborates on the research background, theoretical value, and practical significance, clarifying the basis for method selection and the innovative aspects of the research.

2. **Analyzing the Mechanism and Illustrating with the Case:** Based on the theoretical framework, it focuses on analyzing the pathways, revealing the positive cycle mechanism of "production quality improvement—circulation efficiency enhancement—platform empowerment" formed among them. Combined with the typical case of the Suichang tea industry in Zhejiang, it concretely illustrates the operational models and effectiveness of live streaming e-commerce in practice.

3. Empirical Testing and Impact Evaluation: Employs the Synthetic Control Method (SCM) for the empirical design. Taking Suichang County as an example, it selects county-level panel data from 2000–2019, constructs a "synthetic Suichang" as the counterfactual control group, and starts from core indicators such as the added value of the primary industry to scientifically identify the net impact of live streaming e-commerce on rural economic development.

4. Summarizing Conclusions and Proposing Policies: Summarizes the main conclusions from the theoretical analysis and empirical research. Proposes specific policy recommendations and practical pathways for promoting live streaming e-commerce to aid rural revitalization.

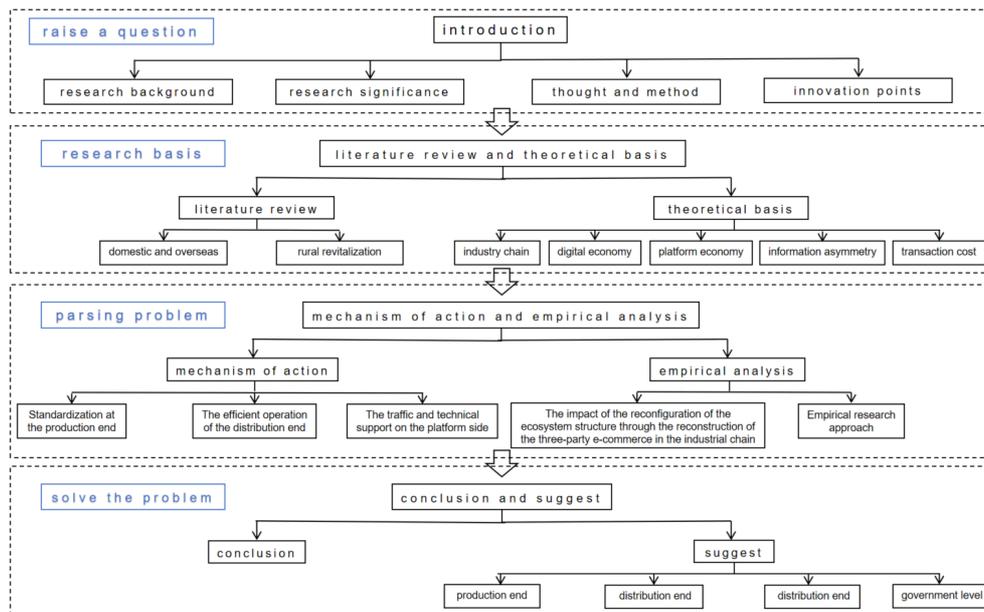


Figure 1. Research framework diagram

1.4. Research innovations

First, perspective innovation: constructing an analytical framework for tripartite linkage in the industrial chain. Breaking through the limitation of traditional studies that simplify the "e-commerce—rural revitalization" relationship into a dualistic one, this study innovatively constructs an industrial chain analytical framework featuring the tripartite linkage of "production end - circulation end - platform end."

Second, content innovation: forming a complete evidence chain of "mechanism-case-empirical evidence-countermeasures." In terms of research content, it breaks away from the singular path of previous studies that either over-relied on theoretical deduction or were confined to case descriptions. It innovatively organically combines theoretical mechanism analysis, typical case illustration, empirical effect testing, and policy recommendation proposal, forming a complete logical loop and evidence chain.

2. Literature review

2.1. Research on live streaming e-commerce

According to numerous domestic and international materials on live streaming e-commerce, the research that foreign research hotspots are relatively concentrated, focusing on empirical studies of

mechanisms and models of e-commerce live streaming, with themes emphasizing consumer behavior. In contrast, domestic research shows high dispersion of hotspots and thematic diversity. Research hotspots cover multiple fields from ontological composition to social impact, including themes such as consumer behavior, applications in specific industries, and media evolution [1].

2.2. Research on rural revitalization development and the industrial chain

In the existing literature related to rural revitalization development and the industrial chain, a document indicates that foreign rural industrial chains emphasize sustainability and diversified development. Against the backdrop of China's Rural Revitalization Strategy and Digital Village construction, innovation in the rural industrial chain has gradually become an important means to enhance rural economic vitality and achieve agricultural modernization. Domestic rural industrial chain innovation models are gradually shifting from a single agricultural production model to comprehensive "agriculture+" models [2]. Traditional research emphasizes the synergy of the "production-processing-sales" links in the agricultural industrial chain but lacks discussion on how digital technologies reshape the industrial chain; recent research has begun to focus on the driving role of e-commerce in rural industries, but most focus on the circulation end, with less correlation analysis on production end standardization and platform end ecosystem building.

2.3. Research commentary

In existing research, some people proposed that the digital economy can digitally transform various aspects of agricultural production and operation, promoting the digital transformation of the entire agricultural industrial chain [3]. Someone pointed out that at this stage, there is relatively little research on the agricultural industrial chain. It is generally believed that the agricultural industrial chain aims to meet demand, linking the vertical chain, horizontal chain, and cross-system stakeholders of the agricultural industry for synchronous innovation, to achieve a linked structure that optimizes the agricultural industry as a whole [4]. Most existing studies lack in-depth analysis of the tripartite linkage mechanism of the industrial chain. Based on the production end-circulation end-platform end framework, this paper aims to fill this research gap.

3. Theoretical foundation

3.1. Industrial chain theory

The industrial chain is an organic whole of production, circulation, service, and other links, where the efficiency of each link determines the overall value. From the perspective of industrial linkage, the industrial chain represents the transfer of raw production materials from upstream to downstream industries until reaching the final consumer, i.e., a collection of related industrial sectors formed based on the inherent technical and economic connections. From the perspective of enterprise organizational relationships, the industrial chain is an interest ecosystem formed by various entities within an industry based on their comparative advantages in factors like technology and human capital, aiming to enhance output efficiency and reduce input costs [5]. Live streaming e-commerce optimizes factor allocation and enhances the overall efficiency of the rural economy by integrating resources from the three ends of the industrial chain.

3.2. Digital economy theory

The digital economy can directly enable the integration of agriculture and tourism through product innovation, dynamic monitoring, and improvement of the industrial environment, significantly increasing the income of low-income rural households and making entrepreneurial opportunities more equal by breaking regional restrictions. Simultaneously, digital technologies (such as live streaming, big data) are key to the digital economy promoting rural industrial integration. The application of digital technologies enables seamless connection between agricultural production and tourism services [6], promoting the transformation of the rural economy from an "offline traditional model" to an "online digital model" by reducing information costs and breaking spatiotemporal constraints.

3.3. Platform economy theory

As an emerging business model, the platform economy is an important carrier for the integration of the digital economy and the real economy [7]. The rapid development of the platform economy has led traditional e-commerce platforms to evolve into comprehensive e-commerce platforms, including not only agency sales models but also adding self-operated businesses. Live streaming platforms, as two-sided markets, connect farmers and consumers, influencing transaction efficiency through mechanisms like traffic allocation and rule design. Their "network effects" can amplify the empowering effect of live streaming e-commerce on the rural economy.

3.4. Information asymmetry theory

Information asymmetry theory refers to the situation in market economic activities where parties involved in a transaction have differing levels of knowledge about relevant transaction information. One party possesses more sufficient information and is in an advantageous position, while the other lacks information and is disadvantaged. This information disparity can lead to reduced efficiency in market resource allocation and even cause problems like "adverse selection" and "moral hazard." An information gap exists between rural products and urban consumers. Live streaming reduces information asymmetry and enhances transaction trust through visual displays .

3.5. Transaction cost theory

Transaction costs are "the costs of organizing production through the price mechanism," notably "all the costs involved in discovering relative prices," "the costs of negotiating and concluding each transaction made on the market," and other costs associated with using the price mechanism. Live streaming e-commerce reduces information asymmetry and lowers the costs associated with intermediate links.

4. The mechanism of live streaming e-commerce's impact on rural revitalization

Standardization at the production end lays the foundation for cost reduction in the circulation end and customer acquisition for the platform end. Based on market demand feedback from the circulation end and traffic data from the platform end, production plans can be precisely adjusted to achieve standardized and scaled production.

Efficient operation at the circulation end reciprocally supports the production end's scale expansion. Leveraging standardized products from the production end simplifies processes like

sorting and packaging, improves logistics and distribution efficiency, and reduces losses. Simultaneously, relying on the traffic support from the platform end, it broadens sales channels.

Traffic and technical support from the platform end provides external momentum for the production and circulation ends. High-quality products from the production end and efficient services from the circulation end can attract more user attention, increase platform traffic and user stickiness, thereby generating more revenue through traffic monetization, advertising, etc. Meanwhile, the platform's technical support can also feedback into the production and circulation links, optimizing overall operations.

These three form a positive cycle of "production quality improvement – circulation efficiency enhancement – platform empowerment," promoting the efficient operation of the entire industrial chain, facilitating the optimal allocation of resources, aiding the development of rural industries, injecting powerful momentum into rural revitalization.

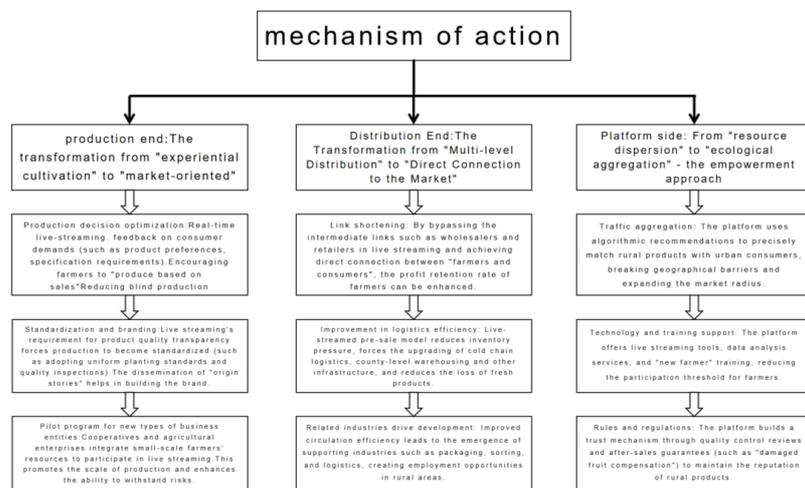


Figure 2. The mechanism of live streaming e-commerce's impact on rural revitalization

5. Empirical analysis of live streaming e-commerce's impact on rural revitalization—a case study of Suichang tea in Zhejiang Province

5.1. Reconstruction of Suichang's ecological structure based on the tripartite industrial chain e-commerce

Production End: Promoted standardized and intelligent planting management, applied IoT technology, and built an integrated digital precision management and control system. Simultaneously, strengthened the construction of clonal improved-variety tea gardens. An analysis model for natural disasters was also established to predict the potential impact of weather changes on agricultural production, providing a scientific basis for disaster prevention and mitigation.

Circulation End: Vigorously promoted the construction of a digital tea entrepreneurship park, created tea "common prosperity workshops," and introduced digital management methods to achieve full traceability of tea production and processing, enhancing the quality and added value of tea. Deeply integrated tea processing with modern industries such as e-commerce and logistics, building a complete industrial chain integrating warehousing, packaging, and logistics transportation, thereby improving production efficiency and economic benefits.

Sales End: Focused on building the county's regional public brand "Longgu Tea," formulated relevant management measures and authorization systems, printed new packaging, built brand

marketing counters, and actively organized and participated in tea promotion activities.

5.2. Empirical research design

5.2.1. Research method

Current mainstream methods for evaluating policy effects and events include Difference-in-Differences (DID), Propensity Score Matching (PSM), Regression Discontinuity Design (RDD), and Synthetic Control Method (SCM). DID requires the treatment and control groups to be comparable before the intervention; PSM requires the treatment and control groups to be highly similar in all aspects except for the explained variable. However, due to the many differences between regions, it is difficult to meet these requirements, leading to biased results. RDD is suitable for studying whether a policy affects individuals crossing a certain cutoff point. SCM is suitable for analysis when only a single individual is affected. Considering the applicability, strengths, and weaknesses of various methods, this paper selects SCM as the primary testing method.

5.2.2. Variable selection

Core Explanatory Variable: The core explanatory variable is the event of whether tea is sold through e-commerce. This paper defines the pre-event, occurrence, and post-event windows for this event. As mentioned above, starting from 2012, the period before 2012 is defined as the pre-treatment period, the period after 2012 as the post-treatment period, and 2012 as the treatment time point.

Explained Variable: The selection of the explained variable is crucial and should reflect the level of rural revitalization at the county level. Literature review finds two types of indicators for measuring rural revitalization levels: The first type is composite indicators, synthesizing five aspects—thriving businesses, pleasant living environments, social etiquette and civility, effective governance, and prosperity—according to certain weights [8-10], thus forming rural revitalization indicator data. The second type is single indicators, using a single indicator to measure the rural revitalization level. Most articles use farmers' net income per capita [11,12], or the added value of the primary industry [13,14]. A minority use the number of impoverished people [15] or the Engel coefficient [16]. Considering data availability, this paper selects the "added value of the primary industry" as the explained variable.

Control Variables: The selection of control variables, besides referencing relevant papers, should follow the principle of statistical data reliability. Drawing on the practice one [17], rural electricity consumption and total agricultural machinery power are selected as control variables. Drawing on practice two [18], crop sown area, agricultural chemical fertilizer application amount, and effective irrigated area are selected as control variables. Drawing on practice three [19] and practice four [20], mechanized plowing area is selected as a control variable. Drawing on other practice, the ratio of landline telephone subscribers to the total population at year-end is selected as a control variable.

Among them, rural electricity consumption measures national investment expenditure on agricultural electricity; total agricultural machinery power and mechanized plowing area measure the mechanization level of agricultural production; crop sown area measures planting scale; agricultural chemical fertilizer application amount represents fertilizer input; effective irrigated area represents irrigation input; the ratio of landline telephone subscribers to the total population measures the level of communication infrastructure.

5.2.3. Data sources

Data are sourced from the China County Statistical Yearbook and the Wind Macro Regional Database. All names of Zhejiang Province counties (cities, districts) are based on the list published on December 31, 2022. The data selection period is 2000-2019. The further screening criteria are: (1) Excluding the influence of e-commerce in other Zhejiang counties from 2009-2019; (2) Removing samples with missing data required for the research; (3) Adjusting nominal variables using the Zhejiang CPI with 2000 as the base period to eliminate the effects of price factors. After processing, the final sample for the added value of the primary industry in this paper includes 24 counties (cities, districts), with 480 observations.

5.2.4. Analysis of empirical results

Using the Synthetic Control Method, the weight combination of counties (cities, districts) constituting the synthetic Suichang for the added value of the primary industry is obtained, as shown in Table 1. Three counties (cities, districts) constitute the synthetic control. Table 2 provides a comparison of variables between the real Suichang and the synthetic Suichang before 2012. It can be seen that the gap is small, and the RMSPE is 15.00592, indicating that the Synthetic Control Method fits the characteristics of Suichang well in the pre-treatment period.

Table 1. Weights of synthetic counties (cities, districts)

County (City, District)	Fuyang District	Jiande City	Wenling City
Weights	0.573	0.39	0.037

Table 2. Predictive balance table and RMSPE

Variables	Treated	Synthetic
gdp1(2008)	519.0288	513.0834
gdp1(2004)	428.9505	437.3048
gdp1(2000)	351.25	373.3926
elec	2532.857	13746.01
agrimachine	8.016667	8.7173
agriarea	27.05286	23.61976
machinearea	4.561429	4.168083
ferti	8161.143	5955.725
irriarea	7.691429	9.812007
phone	4.6073	5.179675

Figure 3 shows the value-added growth path of the primary industry for the actual Suichang County and the synthetic Suichang County. The solid line represents the actual value added of the primary industry, the dashed line represents the synthetic value added, and the vertical dashed line marks the year 2012. The results indicate that before 2012, the paths of the actual and synthetic value added of the primary industry almost overlap, suggesting that the control group effectively approximated the value added of the primary industry in Suichang County. After 2012, the gap between the actual and synthetic values gradually widened, with the actual value consistently

exceeding the synthetic value. This suggests that live streaming contributed to the increase in value added of the primary industry.

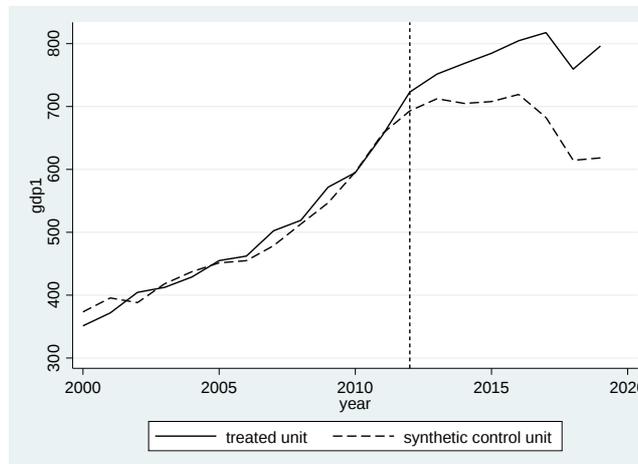


Figure 3. Actual and synthetic value added of the primary industry in Suichang County

6. Conclusions and recommendations

An empirical study using the Synthetic Control Method (SCM) on live streaming e-commerce of tea in Suichang, Zhejiang, and its impact on rural revitalization (measured by the value added of the primary industry) indicates that live streaming e-commerce significantly increased the value added of the primary industry in Suichang. Following the development of e-commerce in Suichang around 2012, a gap gradually emerged and widened between the actual value added of the primary industry and the synthetic value added, with the actual value consistently exceeding the synthetic value.

6.1. Production end: continuous optimization

Increase investment in upgrading planting technologies and expand the coverage of standardized, intelligent planting management. Enhance the adoption rate of improved tea plant varieties, and ensure the stability and improvement of tea quality, thereby providing a high-quality product foundation for live streaming e-commerce. Simultaneously, continuously improve the tea garden environmental monitoring and natural disaster analysis models to enhance disaster prevention and mitigation capabilities, ensuring stable tea production.

6.2. Circulation end: deepened development

Continue to advance the construction of the Digital Tea Industrial Park and Tea Common Prosperity Workshops. Introduce more advanced digital management methods to achieve full traceability of tea from production to processing, further increasing the added value of tea. Strengthen the integration depth between tea processing and modern industries.

6.3. Platform end: strengthening and expansion

Increase efforts in cultivating e-commerce live streaming talent. Not only foster local e-commerce live streaming influencers but also collaborate with professional live streaming agencies to enhance the professionalism and influence of live streaming e-commerce. Further expand sales channels by

consolidating existing partnerships with platforms like Douyin, Alibaba, and JD.com, while actively exploring new e-commerce platforms and sales models. Enhance brand awareness and market value by participating in more tea promotion events and innovating brand marketing strategies.

6.4. Government level: enhanced coordination and long-term safeguards

Establish a "Special Fund for Live Streaming to Assist Agriculture" to support the upgrading of weak links in the industrial chain. Promote the integration of "Live Streaming + Rural Tourism" and "Live Streaming + Intangible Cultural Heritage," extending the value of the industrial chain and achieving a transition from "selling products" to "selling experiences."

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