

# *Research on the Impact and Omnichannel Integration of Douyin E-commerce on the Real Economy*

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**Abstract.** The rapid development of the mobile internet has turned short-video and live-streaming platforms, represented by Douyin, into major consumption scenarios and traffic hubs, generating massive real-time transaction data in the process. Drawing on quantitative analytical frameworks commonly used in financial research, this paper takes Douyin e-commerce activity indicators as the core explanatory variable and selects three industries—apparel, catering, and agricultural products—as research samples. Using a fixed-effect panel regression model and multi-case quantitative comparison, this study examines the heterogeneous impacts of Douyin e-commerce on the real economy based on 501 firm-year observations covering 2023 to 2025. Empirical results show that Douyin exerts a significant substitution effect on standardized retail industries such as apparel. In contrast, it generates significant promotion and integration effects on experience-oriented industries and agricultural products with strong offline value. The key factors shaping the direction of these effects include the irreplaceability of offline experiences and market efficiency. This study integrates quantitative financial methods with digital economy research, offering a measurable analytical framework for the coordinated development of digital platforms and the real economy.

**Keywords:** Douyin E-commerce, Real Economy, Industry Heterogeneity, Omnichannel Integration, Quantitative Impact

## **1. Introduction**

Against the backdrop of the digital economy, short-video e-commerce platforms have accumulated large volumes of transaction, traffic, and consumer behavior data, providing a new data foundation for quantitative research on economic operations. As a typical social media e-commerce platform, Douyin has reshaped consumer decision-making paths and traditional business models through high interactivity and real-time communication [1]. The relationship between digital platforms and the real economy has become an important topic in quantitative economic and financial research.

Existing studies on online–offline relationships have evolved through three phases: substitution, complementarity, and omnichannel synergy. Early research focused on the cost and convenience, arguing that online commerce would replace offline retail [2]. As omnichannel models matured, scholars began to emphasize the complementary roles of online customer acquisition and offline

experience [3]. In recent years, quantitative analysis based on platform data has become mainstream, with greater attention to measuring customer lifetime value and channel synergy effects [4].

However, most existing studies lack a unified quantitative framework to measure the heterogeneous impacts of Douyin across different real-economy sectors. Few studies adopt financial quantitative perspectives to construct measurable indicators for platform effects. This study centers on industry heterogeneity, uses a quantitative framework to identify impact mechanisms, and employs multi-case quantitative identification to improve the reliability of conclusions. The findings can provide data support and quantitative decision references for enterprises undergoing digital transformation.

## 2. Literature review

### 2.1. Quantitative perspectives on online–offline relationships

From the viewpoint of quantitative finance and economic measurement, the online–offline relationship has been gradually quantified using indicators such as transaction volume, customer flow, and price elasticity. Early quantitative studies focused on substitution effects, using regression models to verify that online sales would crowd out offline market share [5]. Such studies typically take price and search costs as core control variables, consistent with the utility maximization theory in microeconomics.

Subsequent quantitative studies identified complementarity effects through cross-channel conversion rates, customer diversion ratios, and quantified webrooming and showrooming behaviors to capture online–offline interactions [6]. Service-dominant logic provides a theoretical foundation for multi-dimensional value co-creation, enriching the quantitative indicator system.

Current quantitative research constructs omnichannel synergy indicators by combining online traffic data and offline experience data to measure overall operational efficiency [7]. Customer Lifetime Value (CLV) and customer churn rate have become important benchmarks and are widely applied in empirical studies of digital commerce.

### 2.2. Quantitative characteristics of social media e-commerce

Unlike traditional e-commerce, Douyin-style social media e-commerce features distinct quantifiable social attributes. Social interaction intensity, UGC volume, and communication efficiency can be constructed as quantitative indicators to measure market influence [8]. These indicators reflect word-of-mouth effects and are frequently used in regression analyses of brand value.

Trust-based recommendations and KOL communication effects can also be quantified using attention, interaction rates, and conversion rates. Parasocial interaction theory provides a theoretical basis for quantifying trust premiums. Live-streaming e-commerce combines real-time interaction and instant purchasing, whose impacts can be measured by live duration, gift volume, order delay, and other metrics [9].

### 2.3. Quantitative identification of industry heterogeneity

Quantitative studies show that the impacts of digital platforms exhibit clear heterogeneity, which can be identified by product digitization level, offline experience value, and industry maturity. Products with high digitization are more vulnerable to online shocks, whereas those with low digitization are more suitable for omnichannel synergy [10].

Industries with strong offline experience value, such as catering and tourism, usually use digital platforms as marketing channels rather than direct sales channels, resulting in positive promotional effects. Industries with weak offline experience face greater substitution pressure. For agricultural products and other sectors plagued by information asymmetry, platform-based direct sales have improved efficiency, which can be quantified by the reduction in intermediate links and growth in farmers' income.

### 3. Research methodology and quantitative framework

This study uses a panel data regression model combined with multi-industry case comparisons, following the standards of quantitative finance and empirical economics. A fixed-effects model is applied to control for unobserved individual heterogeneity and ensure robustness.

#### 3.1. Model specification

The baseline econometric model is specified as follows:

$$\text{Real\_Economy\_Indicator}_{it} = \beta_0 + \beta_1 \text{Douyin}_{it} + \gamma \text{Controls}_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

- $\text{Real\_Economy\_Indicator}_{it}$ : Offline performance of firm  $i$  in year  $t$
- $\text{Douyin\_Activity}_{it}$ : Core explanatory variable (Douyin e-commerce activity index)
- $\text{Controls}_{it}$ : Control variables
- $\mu_i$ : Individual fixed effect
- $\lambda_t$ : Time fixed effect
- $\varepsilon_{it}$ : Random error term

#### 3.2. Variable definitions

Core Explanatory Variable: Douyin E-commerce Activity Index (DAI) Constructed via standardization and weighted averaging:

- Live-stream frequency (weight = 0.3)
- Product display volume (weight = 0.2)
- Transaction growth rate (weight = 0.5). All variables are normalized to the range  $[0,1]$ .

Explained Variables include offline revenue growth rate, offline customer flow growth rate, and gross profit margin.

Control Variables include rent cost ratio, inventory turnover, information asymmetry index, regional consumption growth rate, and industry competition intensity.

#### 3.3. Data source and sample period

- Sample period: 2023–2025 (annual panel data)
  - Sample composition: 62 apparel firms, 58 catering firms, 47 agricultural product firms; total 501 firm-year observations
  - Data sources: Wind, CSMAR, Douyin Open Platform, industry statistics, enterprise annual reports
  - All continuous variables are winsorized at the 1% and 99% levels to eliminate outliers.

### 3.4. Estimation method

- Fixed-effect panel regression
  - Robust standard errors clustered at the firm level
  - Industry-level heterogeneity tests

## 4. Quantitative analysis of industry cases

### 4.1. Traditional apparel industry: quantitative performance of the disruption effect

The apparel industry is characterized by high standardization and low offline experience stickiness. Regression results indicate that the Douyin Activity Index (DAI) is significantly negatively associated with offline operational indicators.

- Offline revenue growth rate:  $\beta = -0.372^{**}$ ,  $p < 0.05$
- Offline customer flow growth rate:  $\beta = -0.415^{**}$ ,  $p < 0.05$
- Gross profit margin:  $\beta = -0.283^*$ ,  $p < 0.1$

A one-unit increase in Douyin activity is associated with a 0.372% decrease in offline revenue growth. High price elasticity and low offline stickiness lead to a significant substitution effect.

### 4.2. Chain catering industry: quantitative performance of the integration effect

Catering is an experience-intensive industry with highly irreplaceable offline services. Douyin activity shows significantly positive coefficients for offline performance.

- Offline revenue growth rate:  $\beta = 0.526^{***}$ ,  $p < 0.01$
- Offline customer flow growth rate:  $\beta = 0.483^{***}$ ,  $p < 0.01$
- Member repurchase rate:  $\beta = 0.315^{**}$ ,  $p < 0.05$

Douyin's short-video promotion and localized precise targeting significantly increase offline store traffic and customer loyalty, demonstrating clear omnichannel synergy.

### 4.3. Local agricultural products: quantitative performance of efficiency improvement

Agricultural products have long suffered from information asymmetry and excessive intermediate links. Douyin's direct-selling model significantly reduces transaction costs and improves profitability.

- Farmer net income growth:  $\beta = 0.638^{***}$ ,  $p < 0.01$
- Intermediate links reduction rate:  $\beta = 0.571^{***}$ ,  $p < 0.01$
- Product premium capacity:  $\beta = 0.429^{**}$ ,  $p < 0.05$

Douyin shortens supply chains, mitigates information asymmetry, and improves overall market efficiency.

#### 4.4. Summary of quantitative results

Table 1. Quantitative results of DAL effects across different industries

| Industry              | DAI Coefficient | Effect Type            | Key Mechanism                 |
|-----------------------|-----------------|------------------------|-------------------------------|
| Apparel               | -0.372**        | Substitution           | Low offline experience        |
| Catering              | 0.526***        | Synergy                | High offline experience       |
| Agricultural Products | 0.638***        | Efficiency Improvement | Reduced information asymmetry |

Note: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01

From Table 1, it can be seen that the digital accessibility shows differentiated impacts in different industries: (1) The clothing industry exhibits a significant substitution effect (DAI coefficient -0.372\*\*), indicating that digital channels are replacing offline scenarios. The main reason is that the offline experience in this industry is relatively weak, and the convenience of online shopping is more attractive. (2) The catering industry shows a clear synergy effect (DAI coefficient 0.526\*\*\*). Digital means can complement offline scenarios. By leveraging the strong offline experience advantage, online traffic can effectively be converted into offline consumption. (3) The agricultural products industry highlights the efficiency improvement effect (DAI coefficient 0.638\*\*\*). The greatest value of digital lies in breaking the information barriers and solving the pain point of information asymmetry in traditional agricultural product transactions, significantly improving the circulation and transaction efficiency. Overall, the value logic of digitalization for different industries is significantly different, and digital strategies need to be formulated based on industry characteristics.

#### 5. Conclusion

Based on a quantitative analytical framework derived from modern finance, this study identifies the heterogeneous impacts of Douyin, a leading digital platform, on the real economy through systematic indicator construction (including platform activity, offline profit margin, and transaction cost indicators) and multi-case comparisons across typical industries. Quantitative results clearly show that the irreplaceability of offline experiences and market efficiency are the two core key factors determining the direction and intensity of Douyin's impact on different sectors.

For industries with low offline experience value and high standardization (e.g., apparel retail), Douyin acts as a market disruptor, which is reflected in the significant negative correlation between platform activity and offline store profits. For experience-intensive industries such as catering, Douyin generates a strong omnichannel synergy effect, effectively driving offline store traffic and significantly improving operational efficiency. For information-asymmetric sectors such as agricultural products, Douyin reduces information and transaction costs, quantitatively reshaping the traditional value chain and promoting fairer market transactions.

This study demonstrates that digital platforms do not simply harm or benefit the real economy; instead, they produce differentiated quantitative outcomes depending on industry attributes. For enterprises, developing targeted digital strategies based on their industry's quantitative characteristics can effectively avoid risks and capture digital dividends. This research adopts a multi-case quantitative approach; future research may use larger-scale panel data and dynamic models to improve the generalizability, and also explore dynamic impact mechanisms amid changes in platform policies and evolving consumer behavior.

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