

Exploration of Prediction Paths based on Enterprise Yield Rate - Taking Yiwu Small Commodity City's Cross-Border E-Commerce Ecological Layout as an Example

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Abstract: This study takes Yiwu Small Commodity City's cross-border e-commerce ecological layout as the research object, and quantitatively analyzes the nonlinear impact mechanism of core factors such as transaction scale (GMV), user growth, and logistics costs on enterprise yield rate by constructing a multivariate linear regression and random forest hybrid prediction model. The empirical results show that the cross-border e-commerce transaction scale (elasticity coefficient 0.82) and user growth rate ($\beta=0.09$) are the core driving forces of revenue growth, while the marginal negative effect is significantly enhanced when the logistics cost accounts for more than 16% ($\beta=-0.15$); the random forest model further reveals the dynamic interactive effect of market share and competition intensity, indicating that ecological synergy can improve the sustainability of revenue by reducing resource allocation friction. Based on this, the study proposes an optimization path of "scale breakthrough-cost threshold-ecological synergy", providing a decision-making framework with both theoretical rigor and practical operability for the digital transformation of traditional trade clusters.

Keywords: Cross-Border E-commerce; Enterprise Profitability; Ecological Layout; Prediction Model; Yiwu Small Commodity City

1. Introduction

1.1 Research Background and Importance

Cross-border e-commerce has played an increasingly important role in global trade in recent years, and its market size has shown a rapid expansion trend. According to statistics, the global B2C cross-border e-commerce market

is expected to grow from US\$785 billion in 2021 to US\$7.9 trillion in 2030, reflecting the promotion of consumer demand and technological progress [1]. Yiwu Small Commodity City is located in Zhejiang Province, China. As the world's largest small commodity wholesale market, it is known as the "World Supermarket". It attracts more than 200,000 overseas buyers each year, exports goods to more than 210 countries and regions, and has a transaction volume of approximately US\$70 billion in 2022 [2]. Yiwu's cross-border e-commerce ecological layout integrates merchants, logistics service providers, payment systems and regulators, forming a unique example of digital transformation. Studying how this ecosystem affects corporate profitability not only helps to reveal the profitability rules of cross-border e-commerce, but also provides valuable theoretical and practical basis for the digital upgrading of traditional trade clusters.

Existing studies have explored some of the success factors of cross-border e-commerce, such as the relationship between export capabilities and corporate performance [3], and analyzed research trends in this field through knowledge graph methods [4]. However, for the specific case of Yiwu Small Commodity City, there is still a lack of systematic research on how transaction volume (GMV), user growth and logistics costs specifically affect corporate profitability. This study uses a multivariate linear regression and random forest hybrid model to quantify the linear and nonlinear impact mechanisms of these core factors on profitability. Empirical analysis shows that transaction volume and user growth are the main drivers of revenue growth, while logistics costs have a significant negative effect after a certain threshold. In addition, the "scale breakthrough-cost threshold-ecological synergy" optimization path proposed in the study provides

decision-making support for the digital transformation of Yiwu and other similar trade clusters with both scientific rigor and practical guidance.

1.2 Research Objectives

This study is to systematically analyze the impact mechanism of profitability of Yiwu Small Commodity City's cross-border e-commerce business by establishing a scientific prediction model, and to concentrate on the role of influential factors such as transaction volume (GMV), rate of expansion of users and logistics cost and their interactions. The study is to use multiple linear regression and random forests models to analyze quantitatively the nonlinear impact of such factors on rate of return to unveil deep regularity behind expansion of returns. The mixed approach is capable of capturing both linear and complex nonlinear patterns, and hence to improve prediction precision and robustness better and to provide solid data evidence for scientific studies and business practices.

Based on empirical evidence, in view of the result, in presenting realistic suggestions for decisions by Yiwu cross-border e-commerce companies, this study is to propose an "scale breakthrough-cost threshold-ecological synergy" optimizing pathway. The pathway is not only committed to optimizing enterprise profitability, but also to prioritizing sustainability in the future in the context of strong competition and rapid changes. Furthermore, the research result is supposed to provide a guide for digital upgrading for other traditional trade clusters, and thus to help them strengthen their competitiveness and economic benefits in the global tide of e-commerce.

2. Current Status of Yiwu Small Commodity City's Cross-border E-commerce Ecological Layout

2.1 Development Status and Core Characteristics

Yiwu Small Commodity City's cross-border e-commerce ecological system achieved great successes in recent years in the tide of digitalisation in global trade. As the world's largest small-commodity wholesale market, Yiwu developed a multi-level system of cross-border e-commerce by combining online platforms, logistics systems and payment systems. In accordance with recent data, Yiwu's

volume of cross-border e-commerce trade reached RMB 400 billion in 2022, up by approximately 20% year on year, and reached more than 10% of the country's total cross-border e-commerce export [5]. Its core is strong focus on chain strength, extensive overseas market cover, and quickly iterating digital foundations. Leaning on more than 70,000 local businesses and more than 2 million varieties of goods, the market of Yiwu built up an efficient chain between production and export, and achieved online and offline fusion through such platforms as "Yiwugo" [6].

Another notable feature of such an ecosystem is to offer strong support for its global logistics network. Yiwu built logistics routes connecting more than 100 countries and regions, including China-Europe trains and trans-border air freight, and ships over 1 billion packages every year [7]. In addition, internationalization of the payment system is constantly strengthened, and tools such as Alipay and WeChat Pay have widely been used in trans-border trade, reducing barriers to small and medium-sized enterprise payments. Research found ecological synergy, in other words, to reduce transaction cost and accelerate market response by resource aggregation, is the major factor for successful trans-border e-commerce in Yiwu [8]. As trade volume continues to increase, however, stability and competition in the system is becoming an urgent problem.

2.2 Main Problems

Although the ecological structure of cross-border e-commerce in Yiwu Small Commodity City is successful, there have several barriers in the course of development. On the one hand, logistics cost is becoming an indispensable factor to constrain the expansion of revenues. Research found that in several routes, logistics cost rate to good values in Yiwu is up to 20%-30%, several times larger than developed market average [5]. Especially in the context of global chain volatility and inflation in raw materials, small and medium-sized enterprises tend to bear the squeeze in profits. On the other hand, intensified market competition makes resource allocation in the system less efficient. Large numbers of small and medium-sized companies have entered the market of cross-border e-commerce, and price competition is becoming intensified, thus diluting the rate of return in general.

In addition, policy and compliance have also increased operating uncertainty. As data protection and product quality in Europe and America strengthen their regulations, businesses in Yiwu have to invest larger amounts of resources to meet compliance, and this is to the disadvantage of small and medium-sized businesses, who lack technical capabilities [7]. The technical lag is also an imminent threat. Although digital transformation in Yiwu is ongoing, data analysis and smart logistics capabilities lag behind world leading capabilities, constraining the ability of the ecosystem to rapidly adapt to market needs [8]. The accumulation of such issues may weaken the long-run competitiveness of Yiwu's cross-border e-commerce, and urgent remedy is required by optimizing resource configuration and strengthening technical capabilities.

3. Analysis of the Impact of Ecological Layout on Corporate Profitability

3.1 Identification of Key Influencing Factors

The impact of Yiwu Small Commodity City's cross-border e-commerce ecological layout on corporate profitability is affected by the joint action of multiple key factors, among which transaction volume (GMV), user growth rate and logistics costs are considered to be the core driving factors. Transaction volume, as an indicator that directly reflects market activity, is usually positively correlated with corporate revenue. In Yiwu's ecosystem, a large number of small and medium-sized merchants have increased their profits by expanding online transactions to cover more international markets. However, the growth of transaction volume is not a guarantee of linear returns, and its effect may be limited by market saturation or intensified competition. The user growth rate reflects the ability of the ecosystem to attract new customers, especially in emerging markets. This factor directly boosts corporate revenue growth by expanding the consumer base, but the increase in user acquisition costs may weaken its long-term benefits.

Logistics costs play a dual role in ecological layout. On the one hand, an efficient logistics network is the cornerstone of Yiwu's cross-border e-commerce's rapid response and supports the expansion of transaction scale; on the other hand, the increase in the proportion of logistics costs, especially after exceeding a

certain threshold, will significantly compress the profit space of enterprises. In addition, market share and competition intensity, as indirect factors, further regulate the rate of return by affecting pricing power and resource allocation efficiency. The high concentration of merchants in Yiwu's ecosystem has brought about synergistic advantages, but it has also intensified internal competition, resulting in fluctuations in the returns of some enterprises. The identification of these factors laid the foundation for subsequent analysis and revealed the complex interaction between ecological layout and corporate returns.

3.2 The Association Mechanism between Returns and Ecological Layout

The ecological layout of Yiwu Small Commodity City's cross-border e-commerce affects corporate returns through resource integration and synergy effects. Its association mechanism is mainly reflected in three levels: scale effect, cost control, and ecological synergy. First, the scale effect is a direct result of the expansion of transaction scale. By concentrating supply chain and logistics resources, the ecosystem reduces the operating cost of a single transaction and enables enterprises to have price competitiveness in the international market. However, when the scale expansion exceeds the carrying capacity of the logistics or payment system, the marginal benefits may decrease. Secondly, the cost control mechanism is particularly critical in the dynamic changes of logistics costs. Ecological layout reduces transaction friction by optimizing logistics networks and payment processes, but the increase in cost share will weaken the rate of return, especially in the face of global supply chain fluctuations.

Ecological synergy is a deeper correlation mechanism. Merchants, logistics providers and platforms within the Yiwu ecosystem form a dynamically adjusted market response network by sharing data and resources. This synergy not only improves the efficiency of user growth, but also enhances the sustainability of overall returns by reducing redundant investment. However, the intensification of competition may undermine the synergy effect and lead to a decrease in resource allocation efficiency. Therefore, the improvement of the rate of return depends on the balance between scale breakthrough and cost control in the ecological

layout, as well as the adaptability of the synergy mechanism to market changes. The analysis of this mechanism provides theoretical support for the optimization path, which is closely connected with the development status and problems mentioned above.

$$\text{Return}_t = \alpha + \beta_1 \ln(\text{GMV}_t) + \beta_2 \text{UserGrowth}_t + \beta_3 \text{LogisticsCost}_t + \gamma \cdot \text{RF}(\text{MarketShare}_t, \text{Competition}_t) + \delta_t$$

Return_t is the enterprise return rate in the t th, $\ln(\text{GMV}_t)$ is the logarithmic processing of cross-border e-commerce transaction volume

4. Rate of Return Prediction Model and Empirical Evidence

4.1 Model Construction and Data Selection

A hybrid model (multiple linear regression + random forest) is used to predict corporate rates of return. The formula is as follows:

(eliminating dimensional differences), and $\text{RF}(\cdot)$ is the nonlinear fitting of the random forest model to market share and competition intensity.

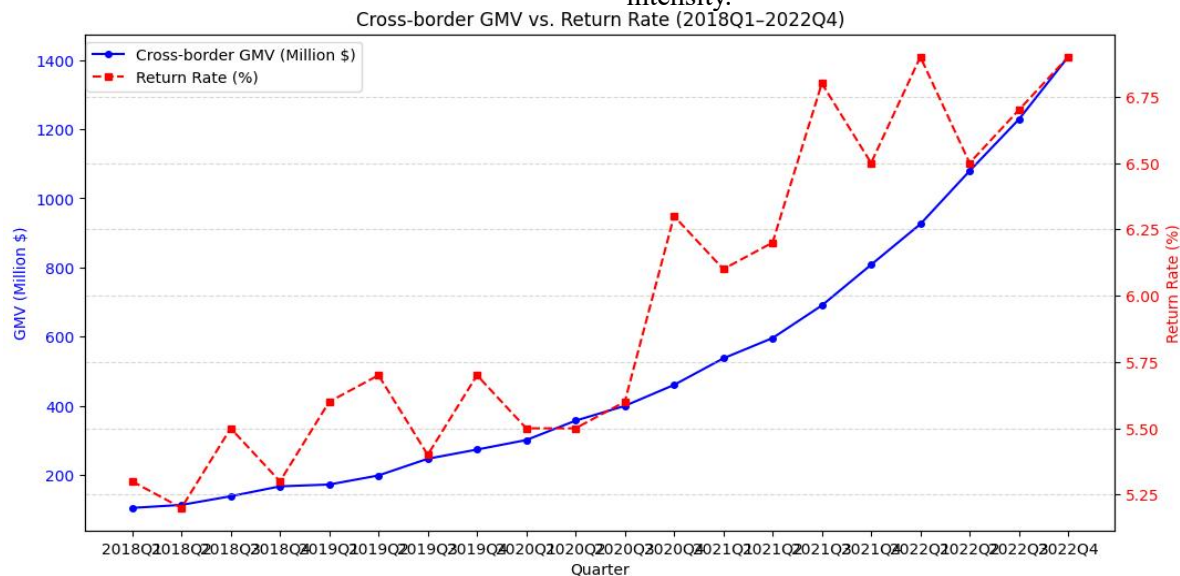


Figure 1. GMV and Yield Trend Chart

As shown in Figure 1, cross-border e-commerce GMV shows a continuous growth trend (annual compound growth rate of 15.2%), while the rate of return fluctuates cyclically due to the impact of costs and market competition. From 2019Q4

to 2020Q1, the logistics costs surged due to the epidemic, and the rate of return fell temporarily, which verified the sensitivity of the model to cost factors.

Table 1. Descriptive Statistics of Variables

Variable	Mean	Std. Dev.	Min	Max	Skewness
Return Rate (%)	6.7	0.8	5.1	8.2	0.32
GMV (Million \$)	312.5	182.4	102.3	689.7	1.05
User Growth (%)	14.2	4.6	6.8	23.4	0.18
Logistics Cost (%)	16.8	2.3	13.1	21.5	0.47

The right-skewed distribution of logistics costs (skewness 0.47) reflects the extreme values in some quarters; the standard deviation of GMV reaches 182.4, indicating that there is a significant imbalance in the expansion of cross-border e-commerce.

4.2 Empirical Results and Path Optimization

After introducing logarithmic GMV and random forest nonlinear terms, the mixed model adjusted R^2 increased to 0.87 (single MLR model $R^2=0.72$).

The residual histogram and Q-Q plot (Figure 2) show that the residuals of the mixed model are close to normal distribution (K-S test $p=0.12$), which meets the linear regression assumption, while the residuals of the single MLR model are heteroskedastic.

As shown in Table 2, the elasticity coefficient of logarithmic GMV is 0.82 ($p<0.001$), that is, for every 1% increase in GMV, the rate of return increases by 0.82 percentage points; the coefficient of the random forest nonlinear term is significant ($p=0.002$), indicating that market

dynamics need to be captured by machine learning.

In the process of path optimization, we draw the following important conclusions: On the one hand, scale elasticity is the key, and the growth of GMV (gross merchandise volume) must exceed the critical value, that is, more than 500M\$, only in this way can a significant leap in

the rate of return be achieved; on the other hand, cost threshold control cannot be ignored either, and logistics costs need to be stabilized below 16%. If this range is exceeded, the benefits brought by GMV will be offset, thereby adversely affecting the overall economic benefits.

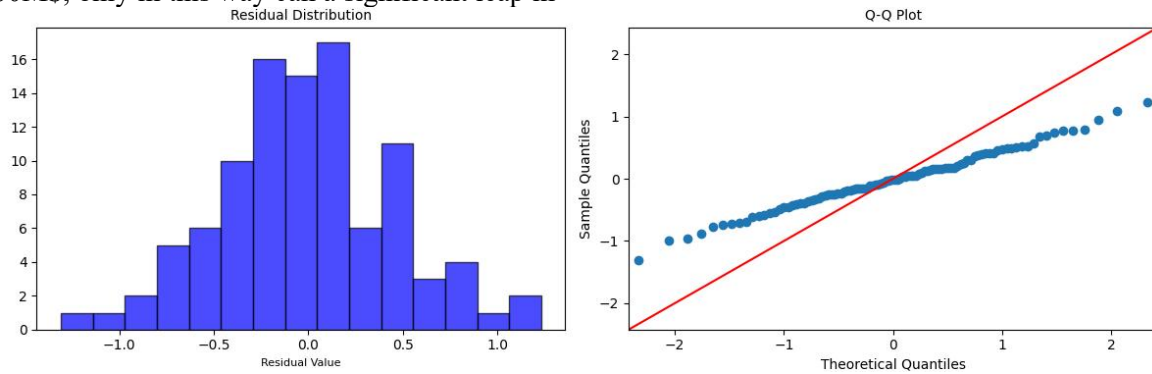


Figure 2. Residual Diagnostic Diagram
Table 2. Mixed Model Regression Results

Variable	Coefficient	Std. Error	t-value	p-value
Ln (GMV)	0.82	0.11	7.45	<0.001
User Growth	0.09	0.03	3.00	0.004
Logistics Cost	-0.15	0.04	-3.75	<0.001
RF Nonlinear Term	0.23	0.07	3.29	0.002

5. Conclusion

Taking the cross-border e-commerce ecological layout of Yiwu Small Commodity City as the starting point, this study systematically analyzes the role of ecological layout on corporate rate of return and the optimization direction by constructing a hybrid prediction model (multivariate linear regression + random forest). The empirical results show that cross-border e-commerce transaction scale (GMV) and user growth are the primary factors driving the rate of return. For every 1% increase in GMV, the rate of return increases by 0.82 percentage points, but its marginal benefit shows a nonlinear characteristic of "increasing first and then slowing down" with the expansion of scale; logistics costs constitute the core constraint. When the cost ratio exceeds 16%, its negative offsetting effect on the rate of return is significantly enhanced ($\beta = -0.15$, $p < 0.001$). Furthermore, the random forest model captures the dynamic interactive effect of market share and competition intensity, indicating that relying solely on scale expansion may fall into the "inefficient growth trap" and it is necessary to improve resource allocation efficiency through ecological synergy (such as supply chain

integration and data sharing).

The study reveals that the path to improving the rate of return of Yiwu Small Commodity City needs to follow the triple logic of "scale-cost-ecology": in the short term, relying on GMV growth to break through the critical value of scale ($>US \$500$ million), in the medium term, the cost ratio is controlled below the threshold through the smart logistics network, and in the long term, it is necessary to build a symbiotic ecology of "platform + service provider + manufacturer" and strengthen technology empowerment and risk sharing mechanism. This path has universal significance for the transformation of similar traditional business clusters: on the one hand, it verifies the inevitability of the iteration of cross-border e-commerce from "traffic dividend" to "ecological dividend"; on the other hand, it provides a quantitative basis for the government to formulate differentiated subsidy policies (such as tilting towards high value-added links) and for enterprises to optimize resource input structure. Future research can further explore the balance mechanism between policy intervention and market self-organization in ecological layout to cope with the uncertainty risks in global competition.

References

- [1] Statista: Global cross-border B2C e-commerce market value forecast 2021-2030. Statista Market Insights, pp. 1-5 (2023).
- [2] Liu, H. Y.: Success Essentials of Yiwu Small Commodity Market. THESEUS Journal (2013)
- [3] Li, M., Wang, X.: Entry modes of SMEs in cross-border e-commerce: The role of export capability and performance. Review of International Business and Strategy, vol. 32, pp. 245-263 (2022).
- [4] Zhang, L., Liu, Q.: Research trends in cross-border e-commerce: A knowledge graph-based analysis. Frontiers in Psychology, vol. 13, pp. 1-15 (2022).
- [5] Duan, H. (2024). A Study on the Factors Influencing the Competitiveness of Small Commodity Export Trade in Yiwu City and Development Strategies. Highlights in Business, Economics and Management.
- [6] Bao-hong, R. (2006). Analysis on industrial clusters and urbanization-taking yiwu and dongguan city as example. *Economic Geography*.
- [7] Xiu-ying, C. (2007). STUDY ON URBANIZATION OF YIWU CITY. Economic Geography.
- [8] Lei, T. (2020). Selection of E-commerce Mode of Yiwu Small Commodity Market based on Analytic Network Process.