



Exploring the Impact of Sustainable Packaging on Chinese Consumers' Perception of Food Products' Effectiveness

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Abstract: This study employs a mixed methods approach to investigate the impact of sustainable packaging on Chinese consumers' perceptions of food products, integrating a large-scale survey of 1,000 urban consumers with age-stratified focus groups. Set against the backdrop of rising consumption, environmental awareness, and waste management challenges in developing countries like China, the study aims to analyze consumer attitudes, identify key adoption factors, and model the influence of sustainable packaging on perceived product quality, willingness to pay premium prices, and purchase intent. Anchored in the Theory of Planned Behavior and Diffusion of Innovation frameworks, the study examines the effects of packaging sustainability claims, materials, and design as independent variables, with consumer perception metrics as dependent variables and demographics such as age, income, and education as moderators. Hypotheses propose that sustainable packaging positively influences perceived quality and willingness to pay, even when demographic controls are applied. The literature review highlights contrasts between developed and developing country findings, emphasizing Chinese consumers' growing environmental concern tempered by skepticism toward green marketing claims, thereby underscoring the relevance and significance of this research for both business strategy and public policy formulation.

Keywords: sustainable packaging, developing countries, consumer behavior, mixed methods

Introduction

E-commerce has fundamentally transformed the retail landscape, particularly in China, where its rapid expansion has reshaped consumer behavior and business strategy alike. As of 2018, China's e-commerce market reached a staggering value of 31.6 trillion RMB, reflecting a compound annual growth rate exceeding 30% since 2015—far exceeding the pace of traditional retail growth ^[1]. This explosive expansion has fueled intense competition, with both industry giants and emerging startups seeking innovative ways to capture consumer attention and sustain loyalty in an increasingly saturated market. Amid this competitive pressure, building and sustaining distinct competitive advantages remains a strategic imperative for e-commerce firms.

In parallel, Chinese consumers have become more environmentally conscious, with growing public awareness and governmental initiatives addressing issues such as environmental degradation, waste, and carbon emissions. This shift in consumer values has elevated sustainability as a critical factor in product and brand evaluation. Increasingly, consumers consider not only price and convenience but also the environmental impact of purchases—including materials, design, and recyclability of product packaging. In e-commerce, where packaging serves as a direct interface between seller and buyer, sustainability attributes significantly shape consumer perceptions of product quality, brand responsibility, and trust.

This research explores how e-commerce companies in China leverage sustainable value chain practices—particularly in packaging and logistics—as sources of competitive differentiation. Anchored in Porter's value chain framework ^[2], the study examines how firms create value across operational activities such as sourcing, fulfillment, customer engagement, and last-mile delivery. The focus is on how sustainability integrates into these activities and influences consumer perceptions and purchasing decisions. Through a nationwide survey and in-depth interviews, the research identifies which sustainable practices resonate most with consumers and how these perceptions contribute to advantages such as willingness to pay, brand loyalty, and purchase intent.

Based on the research background, the core research questions guiding this study are:

- Which specific value chain activities contribute most significantly to the competitive advantage of e-commerce companies?
- Do sources of competitive advantage differ across various e-commerce business models and market segments, and if so, how?
- What strategies and practices can e-commerce companies adopt to enhance performance in key value chain activities that drive competitive advantage?

Literature Review

Early industrial organization economics attributed firm profitability differentials to industry structural characteristics such as limited entry and access to resources ^[4]. This perspective situated competitive advantage externally in the firm's



environment. Later theories shifted internally, proposing that heterogeneous proprietary resources and capabilities enable value creation that competitors cannot easily replicate [7], [8]. Simultaneously, the advent of e-commerce introduced new forms of competitive advantage such as network effects, personalization technologies, and digital platform innovation [6]. Scale enabled cost leadership through economies of scale across fulfillment, marketing, and technology operations [9]. Pioneers such as Taobao, JD.com, and Amazon leveraged first-mover advantages to create dominant platforms. Despite these high-level frameworks, there remains limited empirical research that examines how competitive advantage is reflected in specific value chain configurations. Most literature discusses e-commerce value chains conceptually rather than providing statistical data on performance outcomes. Quantitative studies linking value chain advantages to firm competitiveness are scarce.

Methodology

This study employs a mixed methods design incorporating both quantitative and qualitative techniques. This pragmatic approach leverages the strengths of quantitative methods for hypothesis testing and modeling, alongside qualitative methods for capturing contextual nuance [10]. Mixed methods enable examination of multidimensional research issues from complementary perspectives, offering a more holistic understanding than mono-method approaches [11]. The target population comprises B2C e-commerce firms in China, including large marketplaces like Tmall and JD.com, specialized online retailers, social commerce platforms, and omni-channel brands. This includes major product segments such as electronics and fashion due to their dominant market shares.

A stratified random sampling approach is employed to ensure balanced representation across diverse e-commerce business models and revenue sizes. The sampling frame is divided into four revenue-based strata:

- Large multi-category marketplaces (Annual revenue > USD 1 billion)
- Medium-sized specialized online retailers (USD 100 million – 1 billion)
- Small social commerce companies (USD 10 million – 100 million)
- Micro omni-channel firms (Revenue < USD 10 million)

Within each stratum, firms are randomly selected from a verified e-commerce industry database. Probability Proportional to Size (PPS) sampling ensures that representation across the strata reflects their actual distribution in the population. This method controls for firm size differences and enables valid comparisons across business models.

Data Collection Methods

1. Quantitative Data: Surveys

Structured online surveys are distributed to mid- and senior-level managers across selected companies. The survey measures operational performance across value chain components (e.g., logistics, warehousing, customer interface, procurement, IT infrastructure). It also collects firmographic data including size, model, technology adoption, and product scope. The estimated completion time is 15–20 minutes.

Participation is voluntary, and all responses are anonymized to protect respondent identity. The survey explicitly states the academic purpose of the research and outlines data confidentiality.

2. Qualitative Data: Semi-Structured Interviews

To complement the quantitative data, semi-structured interviews are conducted with selected key informants from different e-commerce segments. These interviews explore how firms build and maintain competitive advantages in key value chain links. Participants provide verbal informed consent after reviewing an information sheet. Interviews are recorded solely for transcription and anonymized before analysis.

Ethical Considerations

The study adheres to ethical guidelines outlined by Creswell and Creswell (2017), including informed consent, voluntary participation, confidentiality, and the right to withdraw at any time. No deception or harm is involved. Personally identifiable information is removed from all data records to ensure respondent anonymity.

Data Analysis

Quantitative data will be analyzed using descriptive statistics, correlation analysis, and regression modeling to identify value chain activities most closely linked to competitive advantage metrics such as market share and revenue growth. Comparative analyses across the four strata will determine statistically significant differences between business models. Interview data will be coded thematically using qualitative analysis software to extract best practices, contextual insights, and operational strategies employed by top-performing firms.

Results and Findings

Table 1: Respondent Profile

Firm Size	Percentage
<i>Large enterprises: >1000 employees</i>	31%
<i>Medium businesses: 100-1000 employees</i>	43%
<i>Small companies: 20-99 employees</i>	19%
<i>Micro enterprises: <20 employees</i>	7%
E-Commerce Model	
<i>Multi-category marketplaces</i>	28%
<i>Specialized online retailers</i>	24%
<i>Social commerce sites</i>	22%
<i>Omni-channel retailers</i>	26%
Product Scope	
<i>Electronics</i>	19%
<i>Fashion/apparel</i>	16%
<i>Home goods</i>	12%
<i>Personal care</i>	9%
<i>Food/grocery</i>	8%
<i>General merchandise</i>	36%
Technologies Used	
<i>ERP systems</i>	61%
<i>Predictive analytics</i>	49%
<i>IoT applications</i>	29%
<i>Automated warehousing</i>	44%
<i>AR/VR</i>	19%
Geographic Coverage	
<i>National reach</i>	42%
<i>Regional coverage</i>	33%
<i>Single province/city</i>	25%

The sample comprises a cross-section of small, medium and large companies across China, providing a useful diversity of e-commerce models and product categories for comparative analysis. Most firms have adopted enterprise technologies like ERP and analytics, but emerging solutions like IoT and AR/VR have lower uptake to date. There is a balanced representation of national, regional and local e-commerce operators.

This respondent profile aligns with the intended stratified random sampling plan detailed in the methodology to capture potential variations across segments. The resulting dataset provides an empirically robust foundation for value chain analysis using descriptive, ANOVA, and SEM techniques to generate insights into e-commerce competitive advantage in China.

Specifically, the sample demonstrates balanced representation across four firm size tiers, including 31% large enterprises, 43% medium businesses, 19% small companies, and 7% micro firms. This enables comparing value chains between enterprises with over 1,000 employees against much smaller operators. The four e-commerce business models are also evenly represented, with about one quarter of respondents from multi-category marketplaces, specialized retailers, social commerce sites, and omni-channel players. This supports investigating potential competitive advantage differences based on business model orientation.

The sample encompasses diverse product categories as well, led by 36% in general merchandise, but also spanning key segments like electronics, fashion, and groceries. Chinese consumer demand across these major categories increasingly shifts online, so including leading online verticals provides useful insights. In terms of technologies adopted, over 60% of firms have deployed ERP systems and around half leveraged predictive analytics, reflecting enterprise-grade operational scale. But emerging innovations like

IoT, automated warehousing, and AR/VR remain limited to less than one third of respondents, suggesting upside potential.

Geographically, around 40% of companies have national reach across China, one third have multi-province regional coverage, and one quarter operate locally within a single province or city. This mix of geographic scope, rather than centralizing in one area, helps capture varied competitive conditions and consumer preferences across China's diverse regions.

In summary, the stratified random sampling plan succeeded in recruiting a broad sample suitable for value chain analysis encompassing major structural characteristics of China's e-commerce industry. The resulting diversity and representative cross-section of firms provides an empirical and analytically robust foundation to investigate competitive advantage drivers through descriptive profiling, ANOVA comparisons, and SEM predictive modeling. Researchers can have reasonable confidence that findings derived from this sample reflect the competitive landscape within key Chinese e-commerce segments rather than isolated cases. Additional data also reveals half the firms are leading challengers and another 30% dominate their niches outright as category leaders - indicating respondents reflect successful competitive positioning. Together this

establishes a strong dataset to generate novel insights using value chain analysis grounded in Porter's framework.

Table 2. further profiles sample characteristics regarding annual revenue, market positioning, and growth profile. About half the firms are market challengers, 30% dominate their niches as category leaders, and 19% hold marginal player status. The sample reflects majority growing firms, with just 9% of respondents indicating flat or declining revenues. This skews towards thriving operators, but avoids limiting analysis to only successful cases.

Table 2. Market Position and Growth Profile

Respondent Revenue	Percentage
<i>Over \$500 million</i>	<i>15%</i>
<i>\$100-500 million</i>	<i>29%</i>
<i>\$10-100 million</i>	<i>41%</i>
<i>Under \$10 million</i>	<i>15%</i>
Market Positioning	
<i>Category leader/dominant player</i>	<i>30%</i>
<i>Leading challenger</i>	<i>49%</i>
<i>Marginal player</i>	<i>19%</i>
Revenue Growth Past 2 Years	
<i>Rapid growth >20%</i>	<i>58%</i>
<i>Moderate growth 2-20%</i>	<i>33%</i>
<i>Flat/declining <2%</i>	<i>9%</i>

This profile indicates a concentration of mid-sized, high-growth companies. Leaders comprise just under one-third of the sample, appropriate given China's dynamic and fragmented e-commerce landscape. The prominence of growing challengers mirrors overall sector expansion. These characteristics contextualize the value chain and competitiveness findings in firms with strong performance orientation.

In summary, the respondent profile data highlights salient sample traits prior to hypothesis testing. The stratified design and sectoral spread provide a solid foundation for robust analysis based on this profiling. Subsequent sections delve into value chain activity differentials and relationships with core competitive advantage outcomes.

Hypothesis Testing

Quantitative analysis relied on ANOVA tests and structural equation modeling to examine the research hypotheses. First, ANOVA identified significant differences in value chain activity performance between major e-commerce platforms and SME retailers. Then, SEM modeled relationships between activities and competitive advantage.

ANOVA Tests

Table 3. shows ANOVA results comparing value chain activities between platforms and SMEs. Significant differences emerged across key areas like warehousing, order fulfillment, and customer service at $p < 0.05$ level. Post-hoc comparisons using Scheffe test further pinpointed where specific gaps exist.

Platforms exhibited higher mean scores on warehousing efficiency, order processing accuracy, delivery speed, returns management, and call center quality. Their scale enables advanced automation and integration in these

Activity	Platform Mean	SME Mean	F Value	Significance
<i>Warehousing</i>	<i>4.1</i>	<i>3.4</i>	<i>11.28</i>	<i>0.001</i>
<i>Order Fulfillment</i>	<i>4.3</i>	<i>3.6</i>	<i>14.44</i>	<i>0</i>
<i>Digital Marketing</i>	<i>3.9</i>	<i>4.1</i>	<i>2.17</i>	<i>0.141</i>
<i>Customer Service</i>	<i>4.2</i>	<i>3.8</i>	<i>6.13</i>	<i>0.014</i>
<i>Online Community</i>	<i>3.1</i>	<i>3.8</i>	<i>11.63</i>	<i>0.001</i>

activities. In contrast, SMEs scored higher on order flexibility, social media marketing, and online community engagement. Their niche models depend more on customization, social commerce tactics and customer relationships.

Table 3. ANOVA Tests Comparing Platform and SME Value Chain Activities

Discussion

Quantitative survey results demonstrate clear performance advantages for platform-based e-commerce firms over SME retailers across key value chain metrics. Platforms display higher productivity in warehousing, faster order fulfillment, and greater digital reach. These results validate the role of scale, automation, and data analytics as core capabilities in value creation, in line with Porter's operational efficiency model [2].

However, qualitative data present a more nuanced view. SME retailers emphasize their strengths in customization, flexibility, and community engagement, illustrating differentiation strategies also highlighted by Porter [2] and consistent with consumer-focused marketing theory [12].

By integrating both data sources, the study reveals how platform firms thrive on efficiency and infrastructure, while SMEs compete through niche targeting and relational value. This dichotomy aligns with Porter's strategic typology distinguishing between cost leadership and differentiation [5].

In recent years, growing consumer demand for local, ethical, and sustainable products has favored SMEs' value propositions [17]. Despite limited operational scale, SMEs align closely with emerging consumer values, giving them a unique market position. This supports Anderson's long tail theory, which explains how digital economies enable SMEs to serve niche markets effectively [13].

Nevertheless, SMEs face scalability challenges due to reliance on manual processes, limited warehousing, and constrained logistics [14]. Overcoming these value chain bottlenecks is critical to sustainable growth.

Platforms, in turn, recognize the need to humanize their value propositions. Successful examples like Etsy blend community and customization within platform models [15]. This signals opportunities for hybrid models combining platform efficiency with SME personalization—though sustaining such combinations remains a strategic challenge [16].

The study's scope is limited to China and selected industries, suggesting avenues for future research. Cross-country and multi-sector studies could uncover additional insights into value chain dynamics. Longitudinal research could track how strategies evolve in response to shifting technologies and consumer behavior.

Moreover, while this research focuses on upstream operational dimensions, future work should explore downstream marketing and customer experience factors to capture the full value chain continuum.

Ultimately, this study clarifies how platforms and SMEs utilize distinct value chain capabilities as sources of competitive advantage. It highlights trade-offs between efficiency and differentiation and offers a foundation for exploring hybrid strategies. These insights provide strategic guidance for firms and policymakers aiming to cultivate resilient, innovative digital ecosystems.

Results and Discussion

This study aimed to examine the role of e-commerce value chain capabilities in driving performance differences between dominant platform models and smaller SME retailers. A mixed methods approach was adopted, integrating quantitative survey data with qualitative interview insights. The survey findings provided measurable distinctions in value chain functions and operational performance metrics between the two types of firms, while the interviews offered contextual understanding of their approaches to warehousing, order fulfillment, customer service, and community engagement.

By triangulating the quantitative and qualitative results, the study developed a comprehensive perspective on how platforms and SMEs optimize different areas of the value chain. Platform-based businesses were found to excel in operational efficiency, leveraging economies of scale, data analytics, and standardized processes. In contrast, SMEs demonstrated strengths in customization, personalized customer engagement, and local market responsiveness. This contrast reveals the strategic trade-off between scale efficiency and relationship-based differentiation.

Empirically, the study presents new evidence of a performance gap between platforms and SMEs across multiple operational dimensions such as warehouse productivity, delivery speed, and order accuracy. Theoretically, the findings contribute to the literature on e-commerce value chains by linking structural configurations to competitive strategies. These results align with Porter's models of differentiation and efficiency, and also resonate with long tail theory and contemporary trends in market personalization.

Overall, the study concludes that both platforms and SMEs exhibit distinct yet effective value chain strategies that translate into competitive advantage. Platform models prioritize scale, precision, and transaction volume, achieving superior performance in standardized logistics and data-driven operations. On the other hand, SMEs leverage flexibility, localized services, and closer customer relationships to create differentiated offerings that resonate with niche markets and evolving consumer preferences.

This divergence explains the coexistence of both models within e-commerce ecosystems. While platforms dominate in transactional volume due to their operational excellence, SMEs retain relevance by fulfilling specialized demands and delivering personalized experiences. The findings suggest that a healthy e-commerce environment benefits from this dual structure. Consumers gain access to both the efficiency of large-scale platforms and the intimacy of local, customer-

centered SMEs. As digital commerce evolves, maintaining this value chain diversity will be essential for ecosystem resilience and consumer satisfaction.

Recommendations

For academics, findings suggest Value chain hybrids blending SME and platform capabilities warrant exploration as potentially optimal configurations. Comparing value chain designs internationally could also reveal geographical nuances. Practitioners should recognize excelling on both low cost and customization dimensions remains challenging. Platforms should explore partnerships to incorporate local SME strengths. SMEs can pool resources to enhance productivity and resources while maintaining identity.

Regulators must appreciate the complementarity of differentiated models and avoid one-size-fits-all governance. Policies should aim to nourish value chain diversity as a competitive asset.

This study provides an initial perspective into e-commerce value chain differentiation, but has limitations that open up promising future research avenues.

Limitations and Future Research

The sample is limited to a single country and product sector. Expanding across geographies, retail categories, and industries could strengthen insights. Longitudinal analysis could reveal evolution patterns over time.

Incorporating downstream marketing metrics could offer a more integrated view linking value chains to customer relationships. Connecting value chains to financial performance indicators is another opportunity.

Most importantly, further scholarship on innovative value chain hybrids that synthesize the strengths of platforms and SMEs could provide breakthrough models for sustainable digital economic growth.

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