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Research Article

Rural E-Commerce Development in Huarong County, Hunan Province, China: A Policy and Infrastructure Case Study

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Abstract

Rural e-commerce has become an important policy instrument for connecting agricultural producers, county-level enterprises, and urban consumers in China. This article examines Huarong County in Hunan Province, purposively selected as an analytically informative example of a government-led, agriculturally oriented county with explicit e-commerce support and accessible administrative records. Drawing on policy documents issued between 2015 and 2024, official statistical communiques, and secondary county-level administrative data, the study applies an institutional-theory lens and directed qualitative content analysis across five dimensions: policy environment, infrastructure, production scale, production effects, and development models. The findings indicate that local incentives and interorganizational coordination created entry conditions for rural e-commerce, while digital infrastructure, logistics integration, practitioner capability, and market governance shaped whether those institutional inputs translated into durable participation and market outcomes. By 2020, Huarong reported 1,200 e-commerce practitioners, RMB 790 million in transaction value, and 12.36 million completed orders. These figures are administrative self-reports and are interpreted as reported scale indicators rather than independently audited effects. The case therefore suggests an institutional enablement mechanism: government coordination can reduce early-stage coordination costs, but sustainable upgrading requires complementary implementation capacity, performance-based support, supply-chain traceability, professional training, and stronger platform governance.

Keywords

Rural e-commerce, Digital transformation, Rural revitalization, Regional development, Digital economy, Huarong County

1. Introduction

China's rural e-commerce has expanded from individual online shops into a county-level development strategy connecting agricultural production, logistics, platform services, and consumer markets. National policy initially emphasized access, poverty alleviation, and the movement of agricultural products into urban markets; recent policy has shifted toward higher-quality rural logistics, service platforms, digital transformation, and new e-commerce actors (General Office of the State Council of China, 2015; Ministry of Commerce of the People's Republic of China, 2024). On the demand side, internet use, mobile payment, online shopping, and live-streaming remain deeply embedded in China's digital economy, while rural internet penetration continues to grow (China Internet Network Information Center, 2024).

Evidence on the developmental effects of rural e-commerce remains mixed. A randomized evaluation shows that improved e-commerce access can reduce consumer costs without necessarily increasing producer income (Couture et al., 2021). By contrast, studies of China's demonstration-county program report effects on poverty reduction, county economic growth, enterprise formation, and inclusive development (Peng et al., 2021; Qin & Fang, 2022; Qin et al., 2023; Yu et al., 2025). Recent Asian evidence similarly shows that agricultural e-commerce adoption depends on a bundle of technological, economic, social, policy, and market-access conditions rather than platform availability alone (Jusoh et al., 2025). These findings point to a mechanism problem: policies may create formal opportunities, but their outcomes depend on how county institutions coordinate actors and whether digital, logistics, and human-capital capacities are sufficient to turn access into effective use.

Huarong County, located in Yueyang City in northern Hunan Province, offers an information-rich setting in which to examine this mechanism. The county combines a substantial agricultural base with an expanding service sector and a clearly documented government-led e-commerce policy trajectory. In 2020, its GDP reached RMB 37.03 billion and the shares of the primary, secondary, and tertiary sectors were 24.8%, 31.8%, and 43.4%, respectively (Huarong County Bureau of Statistics, 2021). Huarong is not treated as statistically representative of all Chinese counties. Rather, it is used for analytical generalization to agriculturally oriented counties that pursue rural e-commerce through local policy incentives, public service outlets, logistics coordination, and platform-based market development.

2. Theoretical Foundation and Research Gap

Institutional theory provides the principal lens for explaining why similar market technologies can generate different local outcomes. Institutions comprise formal rules, normative expectations, and

shared understandings that organize behavior and allocate resources (Scott, 2014). In county-level rural e-commerce, the most visible formal mechanisms are policy incentives, public-service arrangements, interdepartmental coordination, and government support for platforms, logistics, training, and industrial parks. These mechanisms can lower entry and coordination costs, legitimize new business practices, and mobilize organizations that individual farmers or small firms could not easily coordinate on their own.

The unresolved issue is not simply whether government support exists, but how institutional support is converted into usable market capacity. Existing research documents the average effects of demonstration policies and the importance of ICT, entrepreneurship, and logistics, yet county-level implementation mechanisms receive less attention. This study therefore links institutional enablement to complementary implementation capacity. Policy environment captures formal incentives and coordination; infrastructure captures connectivity, logistics, service outlets, and training; production scale and production effects capture observable participation and market activity; and development models capture the governance-market configurations through which these elements interact. The analytical expectation is that government-led support is most effective when formal incentives are coupled with reliable infrastructure, usable logistics, practitioner capability, product standards, and market discipline. Where these complementary conditions lag, visible platform or sales growth may coexist with weak long-term upgrading.

Guided by this framework, the study addresses three mechanism-oriented research questions:

1. Through what institutional mechanisms do county policy incentives and government coordination shape the infrastructure and service conditions for rural e-commerce in Huarong?

2. How do digital infrastructure, logistics, and practitioner capabilities enable or constrain the translation of institutional support into e-commerce participation and market scale?

3. What boundary conditions and upgrading priorities does the Huarong case reveal for sustainable, government-led county-level digital transformation?

3. Method and Analytical Framework

This article uses a qualitative single-case study with a purposive case-selection strategy. Huarong was selected because it satisfies three criteria relevant to the research questions: it is an agriculturally oriented county in which e-commerce is expected to connect dispersed producers with broader markets; it adopted explicit local e-commerce incentives and public-service measures; and it provides a traceable body of policy, statistical, and county administrative evidence from which implementation processes can be reconstructed. The case is therefore theoretically informative rather than statistically representative.

The documentary scope covers 2015-2024. The policy window begins with the 2015 national rural e-commerce guidance, includes Huarong's 2017 local reward measures, and extends to the 2024 national implementation opinion on high-quality rural e-commerce. The core quantitative scale indicators refer to 2019-2020, while the 2020 county macroeconomic context is reported in the 2021 statistical communique. Documents were retained when they were issued by an identifiable public authority, directly concerned Huarong or national rural e-commerce policy, fell within the study window, and contained information traceable to a date, issuing body, or reported administrative indicator. Duplicate reposts and purely promotional items without identifiable provenance were not used as evidentiary anchors.

Analysis followed a directed qualitative content-analysis procedure. First, policy provisions, infrastructure statements, and quantitative indicators were extracted into an evidence matrix recording source type, date, unit of observation, and substantive content. Second, evidence was coded into five dimensions derived from the rural digital-economy literature and refined through iterative reading of the case materials: policy environment, infrastructure, production scale, production effects, and development models. Third, the analysis traced the sequence from formal policy support and coordination to implementation capacity and then to observable participation, scale, and business models. Fourth, repeated figures were compared across available materials, and missing or non-comparable values were retained as 'Not reported' rather than interpolated. Table 1 makes the coding logic, indicators, and source types explicit.

Reliability and validity were addressed through source transparency, temporal cross-checking, and cautious interpretation. Policy dates and provisions were checked against the issuing authorities; the official statistical communique was used for county macroeconomic context; and county e-commerce indicators were treated explicitly as administrative self-reports. The study does not claim that these data are independently audited, nor does it infer a causal treatment effect from the 2019-2020 changes. Independent enterprise surveys, household microdata, and interviews were not available in the archived evidence base, which limits triangulation and is addressed directly in the Limitations subsection.

Table 1

Analytical Framework for Assessing Huarong County's Rural E-Commerce Development

Dimension	Theoretical role	Analytical focus	Indicators / evidence	Principal data sources
Policy environment	Institutional enablement	National-local policy matching, incentives, and coordination	Policy objectives; reward rules; platform and industrial-park support	General Office of the State Council of China (2015); Huarong County People's Government

				(2017); Ministry of Commerce (2024)
Infrastructure	Implementation capacity	Digital access, logistics, service outlets, and training	Village fiber; reported 5G coverage; service outlets; logistics links; training	Huarong County administrative materials; Huarong County People's Government (2017)
Production scale	Observable scale outcomes	Business, practitioner, order, and transaction-value indicators	2019-2020 business counts, practitioners, orders, and transaction value	County administrative data (county-reported)
Production effects	Participation and market use	Enterprise/cooperative participation, entrepreneurship, and market circulation	Training participation; platform entry; agricultural-product sales; market reach	County administrative materials; analytical synthesis
Development models	Governance-market configuration	Institutional and market mechanisms	Government-led, upstream-downstream, and live-streaming models	Policy documents; county administrative materials; relevant literature

Note. The five dimensions are analytical categories used for document coding; they are not treated as independent quantitative variables in a causal model.

4. Case Context and Policy Environment

Huarong's route to rural e-commerce is explicitly government-led. The 2015 national guidance emphasized market actors, agricultural uses of e-commerce, rural circulation infrastructure, policy support, and talent development (General Office of the State Council of China, 2015). Huarong's 2017 reward measures supported e-commerce platforms, industrial parks, demonstration systems, entrepreneurship, and poverty-alleviation activities (Huarong County People's Government, 2017). From an institutional perspective, these measures functioned as formal enabling arrangements: they reduced early entry costs, signaled political legitimacy, and gave the county government a coordinating role across supply and marketing cooperatives, agricultural firms, logistics providers, training organizations, and platform operators.

The same mechanism also creates a boundary condition. Early incentives emphasized entry, platform construction, and visible activity more strongly than performance measures such as farmer net margins, repeat purchases, return rates, product traceability, or live-streaming compliance. This

can generate a gap between formal institutional support and durable market performance if organizations optimize for subsidy eligibility or platform counts rather than customer retention and supply-chain quality. The 2024 national implementation opinion places greater emphasis on multilevel service platforms, modern logistics, new business entities, industrialization, promotion, and consolidation of demonstration-county achievements (Ministry of Commerce of the People's Republic of China, 2024). For Huarong, this policy shift supports a move from institution-building for market entry toward governance of service quality, logistics performance, traceability, and commercial sustainability.

5. Infrastructure and Service System

County materials report full optical-fiber connection of villages, more than 100 village-level service outlets across 14 townships, and logistics connections with facilities such as China Post. These assets provide an access layer for two-way circulation: consumer goods can move into villages while agricultural products can move toward urban markets. The county also encouraged practical training in outlet establishment, product optimization, marketing operations, and live-streaming sales. In institutional terms, service outlets and training translate formal policy into local implementation capacity by reducing search, coordination, and capability barriers for dispersed producers and small firms.

Access, however, is not equivalent to effective use. The county-reported 5G coverage figure was 10%, creating a constraint for data-intensive live-streaming, real-time customer interaction, and platform operations. Rural e-commerce also depends on warehousing and cold-chain capacity, quality inspection and packaging, inventory visibility, return handling, and traceability. These complementary capabilities influence fulfillment reliability and repeat purchasing, not merely whether a seller can connect to the internet. This interpretation is consistent with evidence that e-commerce can affect county development through logistics, factor mobility, and enterprise growth (Yu et al., 2025), that agricultural e-stores can strengthen supply-chain resilience (Guo et al., 2023), and that infrastructure deficits and limited digital literacy remain recurring barriers to agricultural e-commerce adoption across Asia (Jusoh et al., 2025).

Table 2

Selected Policy and Infrastructure Profile of Huarong County

Item	Reported status	Source
Local policy support	2017 reward measures for platforms, industrial parks, business start-up, demonstration activities, and poverty alleviation through e-commerce.	Huarong County People's Government (2017)

Service outlets	Over 100 village-level service outlets across 14 townships.	Huarong County administrative materials (county-reported)
Logistics links	Connections with logistics facilities such as China Post.	Huarong County administrative materials (county-reported)
Digital infrastructure	Full village optical-fiber coverage; reported 5G coverage of 10%.	Huarong County administrative materials (county-reported)
Training	Approximately 300 cumulative person-times of e-commerce-related training.	Huarong County administrative materials (county-reported)

Note. Except for the 2017 policy measure, infrastructure and training figures are reproduced from the county administrative materials available to the study and are treated as self-reported rather than independently audited.

6. Production Scale and Effects

Huarong's county-reported e-commerce scale increased from 2019 to 2020. Transaction value rose from RMB 670 million to RMB 790 million, an increase of 17.9%, while completed orders increased from 9.25 million to 12.36 million, an increase of 33.6%. The number of practitioners reached 1,200 in 2020 compared with a reported 2019 level of more than 1,000, so an exact growth rate cannot be calculated from the lower-bound baseline. These changes are consistent with the possibility that online channels helped sustain market circulation when offline channels were disrupted during the pandemic, but the evidence does not establish causality. Temporary platform traffic, changes in reporting practice, or performance-driven administrative reporting may also contribute to the observed increases.

For that reason, the scale indicators should be interpreted as administrative measures of reported activity rather than audited welfare effects. Higher transaction value does not reveal whether farmers obtained higher net margins, whether repeat purchases increased, whether product quality became more standardized, or whether platform traffic persisted. The service system nevertheless appears to have broadened organizational participation by encouraging traditional enterprises and agricultural cooperatives to use online channels and by attracting younger entrepreneurs. Training depth remains a constraint: approximately 300 cumulative person-times of training equals only one quarter of the 1,200 reported practitioners before accounting for repeat attendance. Sustainable upgrading therefore requires movement beyond introductory store-opening skills toward data analytics, product storytelling, food safety, customer service, live-streaming ethics, intellectual property, and supply-chain finance.

Table 3

Huarong County Rural E-Commerce Business Scale, 2019-2020

Indicator	2019	2020	Change, 2019-2020
E-commerce businesses	More than 200	Not reported	n.a.
New outlets	50	Not reported	n.a.
Practitioners	More than 1,000	1,200	Not exactly calculable; <20.0% using 1,000 as a lower-bound baseline
Completed orders	9.25 million	12.36 million	+33.6%
Transaction value	RMB 670 million	RMB 790 million	+17.9%

Note. The county materials consulted did not provide directly comparable 2020 values for 'E-commerce businesses' or 'New outlets'; these cells are therefore retained as 'Not reported' and no interpolation is used. The 2019 practitioner figure is a lower-bound statement ('More than 1,000'), preventing an exact percentage change. All values are county-reported administrative indicators and should not be interpreted as independently audited causal effects.

7. Development Models

Three development models can be interpreted as different governance mechanisms. The first is the government-led model, which established early-stage conditions through planning, platform support, industrial-park construction, public service outlets, and interorganizational coordination. Its main contribution is to reduce coordination failures in a fragmented rural market. Its principal risk is institutional dependence: if public support rewards entry or visible activity without performance criteria, firms and service organizations may remain subsidy-oriented rather than market-disciplined. This explains why the next stage requires performance indicators tied to farmer income, service quality, customer retention, and supply-chain reliability.

The second, upstream-downstream model reorganizes the supply system around information and coordination. On the downstream side, educated or internet-literate returnees can act as local nodes for product aggregation, grading, packaging, and online marketing. On the upstream side, information on product characteristics, maturity cycles, logistics, warehousing, and consumer demand can be used to connect agricultural production with markets. The mechanism is not simply disintermediation; it is replacement of opaque intermediary relationships with data-enabled coordination. Its effectiveness

therefore depends on standardized products, reliable logistics data, transparent pricing, and the organizational capability to use information consistently.

The third model is farmers' live-streaming commerce, which provided an alternative sales channel during the pandemic and can reduce social distance by showing production scenes and local identities. At the same time, live-streaming shifts governance risks toward platform algorithms, streamer quality, product claims, after-sales service, and product consistency. Research on agricultural live-streaming and agri-food e-commerce supply chains emphasizes coordination among platforms, streamers, MCN agencies, suppliers, consumers, and e-logistics (Wang et al., 2023; Zan & Wang, 2020; Zhao, 2025). Huarong should therefore treat live-streaming as part of a regulated supply-chain ecosystem rather than a one-off promotional strategy. The institutional contribution of government is strongest when it supplies credible standards, traceability, training, and dispute-governance arrangements while leaving commercial selection and customer feedback to the market.

8. Discussion and Policy Implications

The Huarong case supports a mechanism-based interpretation of rural e-commerce. Formal policy support can create legitimacy, mobilize organizations, and lower coordination costs, but it does not automatically generate durable economic benefits. The observable pathway is sequential: policy incentives and government coordination create institutional enablement; digital infrastructure, logistics, service outlets, and training determine implementation capacity; and those capacities shape participation, transaction scale, and viable business models. This extends a purely descriptive policy account by identifying the conditions under which government-led initiatives are likely to translate into market outcomes. It also helps explain why studies of rural e-commerce can find heterogeneous effects even under broadly similar national policy settings.

The main bottlenecks operate through distinct mechanisms. Limited 5G coverage weakens the reliability of data-intensive live-streaming and real-time platform operations. Inadequate training creates a second-level digital divide in which physical access exists but users lack the skills to convert connectivity into marketing, compliance, data analysis, and customer retention. Fragmented logistics increases fulfillment time, spoilage risk, return costs, and uncertainty, which can erode repeat purchasing and brand reputation. Government support is therefore most productive when it coordinates public goods and corrects capability gaps; it becomes less effective when subsidy design rewards platform numbers or short-term sales without measuring net income, customer outcomes, or supply-chain performance.

9. International Comparison

Huarong's constraints are not unique to China. In South India, evidence on the electronic National Agricultural Market shows that digital literacy, awareness programs, and logistical constraints materially shape farmers' access to and use of an otherwise government-supported digital market (Manogna, 2025). In Vietnam's Tien Giang Province, durian farmers' intention to participate in e-agriculture on e-commerce platforms is associated with adaptive capacity, awareness, and digitalization (Quang, 2025). In Indonesia, internet access is a strong correlate of digital-marketing adoption among smallholder poultry egg farmers (Winarto et al., 2025). These comparisons reinforce the broader proposition that platform or policy availability is insufficient without complementary connectivity, capability, logistics, and trust. Huarong differs in the density of local government coordination and village service outlets, so its specific institutional model should not be transferred mechanically to settings with weaker local administrative capacity. The more general lesson is the need to align public coordination with user capability and market-quality institutions.

Three policy implications follow. Public support should shift from input counts toward performance-based metrics, including farmer net income, repeat-purchase rates, complaint and return rates, logistics on-time rates, traceability coverage, and the post-training survival of practitioners. Infrastructure policy should integrate connectivity with shared storage, cold-chain logistics, quality inspection, county-level data systems, and return-handling capability rather than treating broadband as a sufficient condition. Talent policy should move toward modular, practice-based certification in digital operations, live-streaming compliance, brand protection, customer-data use, and supply-chain finance. These measures are more likely to convert short-lived traffic into durable county brands and stable rural market participation.

10. Limitations

This study has four important limitations. First, its central scale indicators are derived from county administrative materials. Such data can be affected by performance-driven reporting incentives, changes in reporting categories, or over-reporting, and the figures used here could not be independently audited. They are therefore described as 'reported' indicators and should not be interpreted as precise estimates of welfare impact. Second, directly comparable 2020 values for the number of e-commerce businesses and new outlets were unavailable in the materials consulted; the study retains 'Not reported' rather than filling the gaps. Third, the single-case design supports analytical rather than statistical generalization, and the 2019-2020 comparison overlaps with the COVID-19 shock, preventing causal attribution to local policy. Fourth, the archived evidence base does not include enterprise surveys, household microdata, or stakeholder interviews. Future research should combine longitudinal administrative data with independent firm- and household-level surveys,

interviews, and multi-county comparisons to test the proposed institutional enablement mechanism and to assess farmer income, enterprise resilience, inclusiveness, and long-term market survival.

11. Conclusion

This case study re-examines Huarong's rural e-commerce development as an institutional process linking formal policy support to implementation capacity and market outcomes. The county reported RMB 790 million in transaction value, 1,200 practitioners, and 12.36 million completed orders in 2020, but these administrative figures are best treated as indicators of reported scale rather than independently audited effects. Huarong's main strengths are government-led coordination, village service outlets, agricultural product resources, and emerging live-streaming practices. Its main constraints are incomplete performance targeting, low reported 5G coverage, limited training depth, and weak integration of logistics, traceability, quality governance, and market discipline.

The study's theoretical contribution is to specify an institutional enablement pathway for county-level rural e-commerce: formal incentives and coordination can lower early-stage barriers, but sustainable digital transformation depends on complementary infrastructure, logistics, practitioner capability, product standards, and credible market governance. Practically, this implies that counties should evaluate e-commerce less by the number of platforms or headline sales and more by durable farmer returns, repeat demand, fulfillment quality, traceability, and practitioner survival. Because the evidence is a single case based largely on secondary administrative data, future research should test these mechanisms with longitudinal enterprise- and household-level data, independent surveys, interviews, and comparative designs across counties and developing-country contexts.

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Data availability

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Declarations

Conflict of interest

The authors declare that there is no conflict of interest.

Ethics approval

Ethical approval was not required for this study.

Consent to participate

Not applicable.

Consent for publication

Not applicable. (This manuscript contains no identifiable personal data in any form.)

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