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Why is rural E-commerce successful? A sociological analysis of the mechanism for actualizing technological dividends

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Abstract

This article, based on the study of cases involving the application of e-commerce technology in Chinese rural areas, discusses the basic conditions for developing e-commerce villages and proposes a mechanism for actualizing the benefits of e-commerce technology. This study shows that the rise of e-commerce villages is due to two factors: on the one hand, the “differentiated demand market” engendered by e-commerce technology itself, and, on the other hand, the three mechanisms that result from the integration of e-commerce technology with rural industrial practices. The externality mechanism aggregates differentiated demands and reshapes the sales process of rural industries; the visibility mechanism displays the potential benefits of products and stimulates the intertwining of online trading information with rural interpersonal relationships; the verification mechanism uses a coded business process to help rural merchants accumulate internet capital. This study provides a sociotechnical analytical framework for examining the logic of rural industrial development in the digital age.

Keywords: Rural E-commerce, Mechanism for actualizing technological dividends, Differentiated demand market

Introduction: the rural soil of e-commerce technology

Phenomenological reflections

In the 1980s, Xiaotong Fei and his team conducted a five-year field survey in Jiangsu, raising the important issue of small-town development (Jiangsu Small Town Research Group 1984). The development of small towns was affected by the operating conditions of township enterprises (Ma et al. 1994). With the deepening of urban and rural system reforms and increased labor mobility opportunities in the 1990s, township enterprises could not maintain the relative advantages of the 1980s and gradually declined in the mid-to-late 1990s as they were restructured. The outflow of rural labor, the stagnation or transformation of rural industrial development, and the various social problems arising from this have become the focus of public and academic attention.

In stark contrast to the above is the recent vigorous development of e-commerce villages. In 2014, Alibaba Group, the largest e-commerce company in China at that time,

organized a research effort to find cases of economic activity using the company's e-commerce trading platform, Taobao, in China's rural areas. In the research report released thereafter, the Alibaba Group officially put forward the concept of the "Taobao Village,"¹ and a discussion on the development of rural e-commerce thus entered the public and academic view. The application of e-commerce technology not only reconstructed the economic order of rural areas but also affected the social structure of these areas (Qiu 2018) and generated a wave of return to rural entrepreneurship in Taobao villages. Data from 2020 show that within ten years, the number of Taobao villages increased from 3 in 2010 to 5425, and 242 Taobao towns were also formed (Alibaba Research Institute 2020).²

This phenomenon inevitably leads us to ask why rural areas, which lack a good foundation for digital technology application, are able to take up the technological dividends derived from e-commerce technology and stimulate the development of local characteristic industries. How can the phenomenon of such e-commerce "rooting" in rural areas be explained? We have noticed that the emerging market opportunities in these industrial clusters are formed by combining the differentiated demand market created by e-commerce technology and the existing industrial practice process in rural areas. We refer to this as the actualization mechanism of rural e-commerce technology dividends.

How are E-commerce technology dividends actualized?

The concept of technology dividends has always been a focus of sociotechnical studies and can be intuitively understood as the additional benefits that actors receive due to technological progress and application.³ Unlike the economic view, which equates technology dividends with improvements in technological efficiency (Fare et al. 1992; Zhu and Yifeng 1999), sociological studies on technology dividends follow the basic thread of the social constructivism of technology (Hughes 1983; Winner 1993; Pitt 2003), paying more attention to the group characteristics and interaction patterns of technology dividends, i.e., for whom these dividends are and what kind of group interaction patterns are needed for their actualization. On this basis, this article focuses on the ways in which different groups gain benefits through technology and the degrees to which this occurs. The more "dividends" a technology has, the more additional benefits it can provide to

¹ The Alibaba Research Institute's criteria for identifying "Taobao Villages" mainly include three aspects. (1) Place of operation: in rural areas, the administrative village is taken as the unit. (2) Sales scale: annual e-commerce sales on Taobao and Tmall platforms reach 10 million yuan. (3) Online merchant scale: The number of active online stores in the village reaches 100, or the number of active online stores reaches 10% of the local household count. Considering that selling agricultural products through e-commerce platforms brings more direct and significant benefits to farmers than selling other products, Alibaba Research Institute established a new transaction volume statistical rule for Taobao Villages in 2020, counting the transaction volume of agricultural products as double. After this adjustment, the number of Taobao Villages increased by 90 that year.

² Public data in 2021 shows that the number of Taobao Villages has reached 7023, and the clustering trend of Taobao Villages is significant. In addition, there are countless examples of developing rural industries relying on other internet platforms such as JD.com, Douyin, and Kuaishou.

³ The concept of "dividend" originally referred to the dividends of company stocks, and later, proper nouns were often formed with the concept of "dividend" in specific fields, referring to the real benefits derived from specific actions. More mature concepts include "population dividend", "policy dividend", "development dividend", etc. Similar to the concept of "technology dividend" examined in this article, the World Bank (2016) proposed the term "digital dividend", referring to the growth, employment, and service benefits brought by digital investments. Qiu et al. (2016) proposed the term "Internet dividend", defining it as the excess benefits brought by actors using the internet. The concept of technology dividends used in this article also continues the academic research on "technology dividends", emphasizing that actors use technology as a means to obtain benefits beyond their current status. Compared with the concepts of "population dividend" and "digital dividend", "technology dividend" and "Internet dividend" are more used as an analytical perspective, covering a richer subject of actors, and pay more attention to actors' profit logic and process.

more groups in a more suitable way. This focus comes from three important sociological questions about technology dividends: first, the universality issue, i.e., whether technology dividends can benefit more groups; second, the appropriateness issue, i.e., whether technology dividends can adapt to the interaction patterns of the group; and third, the incremental issue, i.e., what kind of attraction technology dividends have for potential users in economic and social dimensions.

A series of studies on technology dividends have provided a complex picture of how technology dividends are actualized. First, on the universality of technology dividends, existing research has found that the actualization of technology dividends often varies among groups. For example, when examining the issue of information technology inequality, researchers noted that the access differences in information technology and the human capital of users themselves would affect users' profits from information technology. Generally, people who have learned information technology have higher income growth (DiMaggio and Bonikowski 2008). Among technology users, differences in application direction and ability also lead to inequality of benefits (Hargittai 2002; DiMaggio et al. 2004), and research based on Chinese data further verified the above conclusions (Wei and Zhang 2006; Hao and Wang 2014). Second, the appropriateness expectations of various groups often have to be addressed in the application process of technology. Case studies of technology application have shown that whether the distribution of technology dividends is consistent with the original social distribution rules will directly affect the consequences of technology application (Zhang 2009 2021; Zhang and Qiu 2009). The misalignment of these two rules is because the social status and organizational capacity of the technology application group affect the formation of technology dividend distribution rules (Zhang 2013). If appropriateness is difficult to meet, a new technology that could improve efficiency may likely be idle (Xu 2021). Third, even the seemingly simple issue of the incrementality of technology dividends must be combined with examining the life course and socioeconomic status of potential technology users so that the significance of this technology dividend to technology users can be accurately understood (Zhang and Yaqi 2021). This type of increment not only includes intuitive income increases but also manifests as gains such as stability, flexibility, and relationality.

Given the numerous difficulties in actualizing technological dividends, the aforementioned research further prompts us to ask, why can e-commerce technology foster many e-commerce villages, take root in the countryside, and still maintain good growth momentum?

Regarding the issue of the actualization of e-commerce technology dividends, researchers have provided many explanations for the development of e-commerce villages from the perspective of interpersonal relationships, such as understanding the phenomenon of rural e-commerce entrepreneurship through regional social networks (Liu and Zheng 2011), discussing the promotion of rural e-commerce based on social innovation factors (such as social demonstration, neighborhood demonstration, and online merchant associations) (Cui et al. 2014), and discussing the development of Taobao villages from the perspective of relationship embedding in the entrepreneurial process (Liang et al. 2016). More in-depth research has verified the important role of interpersonal relationship networks in e-commerce villages through simulation (Qiu and Huang 2021) and social network analysis methods (Qiao 2021). However, interpersonal relationships only explain

how product information that can effectively bring dividends will spread after entering rural society. We still need to know why rural areas can effectively undertake industries that can bring dividends to the countryside in the e-commerce technology environment compared to the operating process in traditional industrial society.

This article attempts to answer this question through theoretical modeling and case analysis. First, we logically deduce the characteristics of dividends derived in the e-commerce technology environment and then answer why e-commerce technology dividends can become an actualizable development opportunity for rural industries. We divide this social process into two parts: the interaction process based on a differentiated demand market and the rural industry practice process based on Chinese local characteristics.

Case overview

In this research, we selected Dinglou Village in Daiji Town, a typical e-commerce village. The case is based on a field survey across two districts and seven counties in Heze City in June–July 2017, in which over 130 e-commerce practitioners and relevant government personnel were interviewed. Subsequently, team members conducted supplementary surveys in the field in February 2018 and April and June 2019.

The e-commerce activities in Daiji Town began at the end of 2009. That year, when Xiuli Ge from Zhangzhuang Village in Daiji Town visited her husband in the barracks, she chatted with another military wife and learned that she was selling brand-name clothes on Taobao in her hometown in Hunan. Xiuli, considering that her father-in-law and uncle were selling photo studio costumes on the streets, suddenly had an idea to sell photo studio costumes online. With the remote assistance of the Hunan military wife via QQ, Xiuli opened the first B2B (Business to Business) online store on Alibaba's e-commerce platform and soon paid off her mortgage from three years earlier. Since Alibaba required a fee of 1688 yuan, some villagers who learned from Xiuli were not willing to make this risky investment, and many even thought it was a new form of pyramid selling. At this time, Taobao, similar to Alibaba, allowed free store opening without a deposit, so it became a safer choice for villagers and consequently prompted the transformation of e-commerce activities around Zhangzhuang Village.

This spark drove the transformation of the entire Daiji Town and even the industrial development of the entire Heze City. After just six years, the total e-commerce sales in Daiji Town in 2016 were nearly two billion *yuan*, accounting for one-third of Cao County's total e-commerce sales; the per capita net income of "Taobao Village" was 16,500 *yuan*, higher than the county average income of 13,451 *yuan*. By the end of 2017, Daiji Town had 32 villages that met the standards of Taobao Village, achieving full coverage. In 2016, more than 2500 local households were engaged in e-commerce, accounting for one-fifth of the total number of households.

Inspired by Daiji Town, Heze City, which was originally at the low end of Shandong Province's economic development level, also began to develop the local economy through e-commerce technology. In 2016, the total e-commerce transaction volume in Heze exceeded 120 billion *yuan*. In 2017, there were 168 Taobao Villages and 23 Taobao Towns, each accounting for half of the total number in Shandong Province. In 2020, Heze had 396 Taobao villages, making it the city with the most number of Taobao villages in China. From 2015 to 2020, rural residents' per capita disposable income in Heze

increased by an average of 9% per year, nearly two percentage points higher than the average level in Shandong.⁴ Cao County, where Daiji Town is located, became “China’s largest Hanfu production base” in 2020. The development of rural e-commerce has become one of the important factors for improving rural conditions in a region and even the region’s overall economic growth.

Source of bonus: interactive process in differentiated demand markets

Before we investigate the development of rural e-commerce industries, we first need to discuss the origin of the technological bonus that spurs industrial development. Daiji Town was originally based on agriculture. After the development of e-commerce, the local industry that formed a cluster was neither the agriculture industry with traditional advantages nor the photo studio costume industry, which was the first to “go online,” but the stage costume industry, which was more niche and had no traditional production.

How did niche stage costumes become the ignition point for local industrial development? Existing research emphasizes the role of the multiplier effect in digital society; that is, under the assumption of full internet connectivity, differentiated demand markets will tend to be infinitely large, thereby naturally generating a technological bonus (Qiu et al. 2016). This is an important reason for the endless emergence of personalized products on e-commerce platforms. However, the above assumption only reveals the macro trend of differentiated demand and does not address the micro-interactive mechanism between actors. How is differentiated demand transformed into a technological bonus? This is very important for understanding the actualization mechanism of the technological bonus. In this article, we construct the interactive process of the “differentiated demand market” of both trading parties around “difference” through theoretical modeling.

In the discussion of the traditional market trading process, researchers mostly analyze trading activities in given product types. One party in a transaction provides products that the market has recognized, and the other party chooses the product that is closest to their preference in the given product set. We call this process “adaptive selection.”

Unlike in “adaptive selection,” one party in the transaction can also show their preferences and reach a differentiated product transaction with the other party, such as issuing an “inquiry” about whether a certain product can be produced; then, the other party “responds” and reaches an agreement. We call this process the “differentiated demand presentation process.” Based on the characteristics of multiple rounds of interaction between the two parties in the transaction, we use a sequential game tree model for discussion (Fig. 1).

Assume that the actor knows the existing products but does not know the potentially customizable products. Actor A⁵ can choose from two strategies. One is to make an adaptive selection based on the existing market scheme. At this time, Actor A does not

⁴ All data in this paragraph comes from the Heze Department of Commerce and the Shandong Statistical Yearbook.

⁵ In the theoretical modeling part, we did not directly correspond Actors A and B to producers or consumers. Consumers can satisfy their own differentiated needs through inquiries, and producers might also propose “inquiries” to consumers based on historical data, such as guessing potential demand and designing new products. The concepts of “responding” and “inquiring” are similarly applied. In the case discussion part, based on the characteristics of rural e-commerce, we consider Actor A as the consumer and Actor B as the producer.

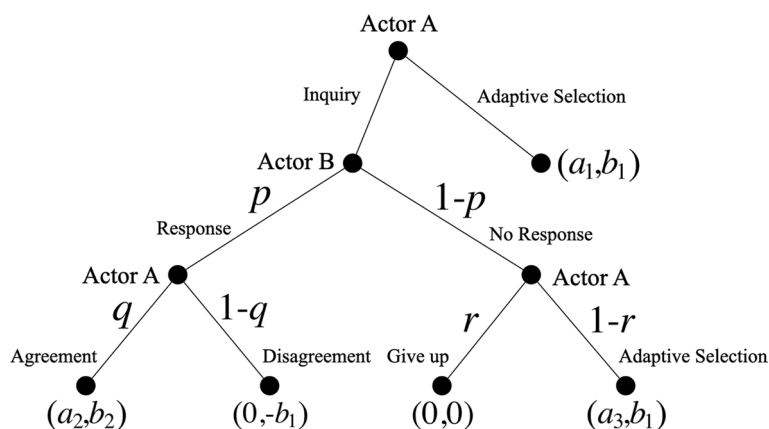


Fig. 1 Differential demands of the two sides. Notes: This sequential game tree attempts to reveal the conditions under which new product types are likely to emerge during a two-person interaction

show his or her preferences but chooses a product of Actor B that is closest to his or her preferences from the existing product set and reaches a transaction with it. The utilities of both parties are (a_1, b_1) , where a represents the utility of Actor A and b represents the utility of Actor B. Actor A’s other strategy is to try to communicate with Actor B, hoping to achieve a result that is more in line with both parties’ preferences, such as inquiry, which is the starting point of the differentiation process. The effect of the inquiry depends on whether Actor B is willing to respond. When Actor B chooses to “respond” and reaches an agreement with Actor A, the utilities of both parties are (a_2, b_2) , and $a_2 > a_1, b_2 > b_1$, differentiated demand is displayed in the market. However, if the two parties do not reach an agreement at this time because Actor A only made an inquiry, Actor B produces or consumes according to the preferences of Actor A, the characteristics of asset specificity cause Actor B to suffer a loss, and the utility of both parties at this time is $(0, -b_1)$. Similarly, in the previous stage, Actor B can choose “not to respond.” At this point, Actor A might directly terminate this interaction, and the utility for both parties would be $(0,0)$, or after Actor B does not respond, Actor A might still choose from the existing market set, i.e., make an adaptive choice. Because Actor A has made an inquiry, transaction costs are incurred, but Actor B does not pay any additional costs.⁶ At this time, the utility for both parties is (a_3, b_1) , and $a_3 < a_1 < a_2$.

For Actor A, whether the inquiry gets a response is determined by Actor B. Assume that Actor B has a probability of p to respond to Actor A and a probability of $1 - p$ not to respond; similarly, Actor B also cannot determine whether Actor A will give up when he chooses not to respond. Assume that Actor A has a probability of r to give up and a probability of $1 - r$ not to give up. Finally, whether Actor A and Actor B can eventually reach an agreement if Actor B chooses to respond is also unknown. This depends on the technical basis involved in the transaction process. Assume there is a probability of q to reach an agreement and a probability of $1 - q$ not to reach an agreement. For p, q, r , we have $p, q, r \in [0,1]$.

⁶ This transaction cost is reflected in actions such as describing product features to the merchant, sending design drafts, and spending time on communication.

For Actor A, if they want the “inquiry” to be a more probable choice of strategy, they need to anticipate that the potential benefits brought about by the inquiry behavior are greater than the benefits of directly making adaptive selections a_1 . For Actor A, the r -value is known and does not need to be considered further. Therefore:

$$pqa_2 + (1 - p)a_3 > a_1$$

Solving the above equation, we obtain Eqs. (1) and (2):

$$\text{When } a_2q - a_3 > 0, \quad p > \frac{a_1 - a_3}{a_2q - a_3}, \text{ or} \quad (1)$$

$$\text{When } a_2q - a_3 < 0, \quad p < \frac{a_1 - a_3}{a_2q - a_3} < 0 \quad (2)$$

Since $p \in [0,1]$, Situation (2) is not established. If Situation (1) is to be established, first, $a_2q > a_1$ is needed, and the larger the difference between a_2q and a_1 is, the smaller the value on the right side of the inequality. From the above formula, we can draw the basic premise for Actor A to have a higher probability of choosing “inquiry”: there needs to be a sufficient gap between the benefit a_2 obtained from reaching an agreement and the benefit a_1 obtained from adaptive selection; otherwise, people are not willing to “inquire.” In the situation where the above conditions are met, the following four situations can increase the likelihood of Eq. (1) being established, that is, “inquiry” is more likely to occur: first, the gap between the benefit a_2 obtained from reaching an agreement and the benefit a_1 obtained directly from adaptive selection is larger; second, the probability of Actor B’s response p is larger; third, the probability of reaching an agreement q is larger; fourth, the benefit a_3 of adaptive selection after inquiry is larger.

For Actor B, whether to respond to the inquiry depends on the benefits after the response. If they want the “response” strategy to be a more probable choice of strategy, they need to anticipate that the potential benefits after the response are greater than the potential benefits of not responding. Therefore:

$$qb_2 - (1 - q)b_1 > (1 - r)b_1$$

Solving the above equation, we obtain Eq. (3):

$$q > \frac{(2 - r)b_1}{b_2 + b_1} \quad (3)$$

Unlike Eq. (1), the right side of the above inequality $\in [0,1]$, so no matter what positive values b_1 and b_2 take in the previously set range, the above inequality has the possibility of being established. Similarly, the following three situations can increase the likelihood of Eq. (3) being established, that is, increase the possibility of “response”: first, the gap between the benefit b_2 obtained from reaching an agreement and the benefit b_1 obtained directly from adaptive selection is larger; second, the probability of actor A giving up r is larger; third, the probability of reaching an agreement q is larger.

From the above discussion on sequential games, we can see that the benefits brought about by the presentation process of differentiated demands can only be generated under specific conditions.

First, the differentiated demand market must have sufficient returns to stimulate further interaction between the trading parties; otherwise, the transaction can be completed directly through adaptive selection. Second, the response probability of the trading parties significantly impacts the highlight of market differentiation characteristics. Under the condition of incomplete information, when Actor B estimates that Actor A's withdrawal cost is low, Actor B's response probability is higher. Similarly, if Actor A estimates that Actor B has a stronger willingness to respond or has lower costs when responding to Actor A (such as completing transactions through nonface-to-face interaction), Actor A's inquiry probability is also higher, thus forming the process of differentiated demand presentation under a given technological environment. Finally, under the current technical environment, when the trading parties reach a consensus on the outcome, the importance of the differentiated demand market is highlighted.

Therefore, the emergence of a differentiated demand market needs to be based on three conditions: high returns from the differentiated demand market, a high probability of response from both parties, and a high probability of reaching a consensus. Otherwise, the market revolving around differentiated demand will not appear, and people will choose from existing product combinations.

Having clarified the interactive process on which the e-commerce technology dividend relies, we also need to discuss why the rural industry can meet the emergence of a differentiated demand market in the e-commerce technology environment. Specifically, this article focuses on three mechanisms that play a crucial role in the application of e-commerce technology: the externality mechanism, the visibility mechanism, and the verification mechanism.⁷ They affect the practice process of rural industries from different dimensions, enabling a differentiated demand market to root in the countryside through e-commerce technology, and ultimately actualizing the dividends of rural e-commerce technology.

Externality mechanism: from offline decentralization to online aggregation

Externality mechanism and entry threshold

In e-commerce platforms, technology creates benefits by improving productivity and converging information to create potential differentiated demand markets. Therefore, when product information can enter the e-commerce platform at no cost, it is easier to form a differentiated demand market with high dividends.

Why can the market relationship based on e-commerce technology allow a large amount of transaction aggregation? The externality mechanism plays an important role in this. In traditional trading activities based on geographical space aggregation, a seller's push for product information always accompanies the occupation of physical space. For providers of aggregation sites, adding a piece of product information will add a usage cost of physical space, crowding out other entities sending product information.

⁷ This article pays more attention to the development opportunities brought by the three mechanisms of e-commerce platform technology. These three mechanisms have profoundly changed the development logic of rural industries, but they also have adverse effects on the development of rural industries. For example, the externality mechanism leads to a platform's continuous iteration of rules, which keeps merchants busy learning. The visibility mechanism makes vicious competition among products more likely to occur. The verification mechanism shapes platform hegemony, and the platform's traffic becomes the lifeline of the merchants' survival. These phenomena need to be analyzed separately, but it must be emphasized that these are problems that arise after the actualization of e-commerce technology dividends. Due to space limitations, this article does not discuss them in detail.

However, product information propagated by e-commerce technology breaks the relationship between product information and physical space occupancy. For the platform providing a digitized “shop,” the construction cost of the digitized “shop” is significantly lower than that of physical stores. Compared with the scale restrictions of traditional trading places, the marginal cost of adding new merchants to the platform is almost zero after the platform is initially established, and the added effective merchants also have significant network-positive externalities (Katz and Shapiro 1985). These merchants can enhance the value of the platform to attract more consumers (Evans 2016). This externality mechanism makes the cost of different entities entering the transaction interaction process extremely low, thereby allowing them to gather a large amount of product information.

In more detail, given the comprehensive cost (c_a, c_b) required for product information to enter the market, we continue to use the letter symbols from the previous section. Suppose that in the traditional market, only when $a_2 - a_1 > c_a$ or $b_2 - b_1 > c_b$, that is, the benefits brought by potential differentiated demand are at least sufficient to compensate for the costs of both parties entering the market, can specific information enter the market. Under the e-commerce technology environment, the effective additional benefit threshold for achieving both sides of the transaction is t_a and t_b . Since product information has positive externality characteristics, the market does not need to set the cost of information entry, so at this time, $c_a, c_b \rightarrow 0$. Under these conditions, the following inferences can be formed.

Inference 1: When $c_a, c_b \rightarrow 0$, any pair (a_2, b_2) can enter the market.

Inference 2: Based on Inference 1, for a pair (a_2, b_2) , if $a_2 - a_1 > t_a$ and $b_2 - b_1 > t_b$, at least one transaction can be completed on the e-commerce platform.

In the traditional technology environment, some transactions' additional benefits can exceed the threshold t , but they may not necessarily reach the market entry threshold c . When the positive externality of product information is fully highlighted, the market entry threshold c gradually disappears, and even much product information that is difficult to complete transactions will also pour into the market transaction process. At this time, since the product information in the e-commerce platform does not cause obvious congestion, a large amount of new demand entering the market will always bring potential goods that cross the benefit threshold of both parties to the transaction. As a result, the scale of the differentiated market becomes an issue that can be further discussed. At this time, those differentiated markets with potential high profits have the possibility to transform potential demand into real transaction goods in the market.

Dispersed differentiated demand and emerging technological dividends

The industrial development of Chinese rural societies often presents a “flexible, diverse and dispersed non-agricultural employment system” (Fu 2018). Although these characteristics make rural industrial clusters appear only in limited spaces, they also provide a good social basis for the rapid response of rural industries to transformation. However, where to shift to bring higher returns is a challenge for relatively primary and scattered rural industries.

The first two “Taobao Villages” in Daiji town (Dinglou Village and Zhangzhuang Village) largely depended on the development of the photography studio industry in the neighboring town of Ancailou. In these two villages, the number of people engaged in the sale of photography studio costumes was very limited in the early stage because selling photography studio costumes required going through the streets and alleys of towns and cities and visiting potential photography studio merchants one by one. After “going online,” local merchants first thought of selling photography studio backgrounds, costumes, and other peripheral products online. However, approximately a year after the development of local e-commerce, the sales of the photography studio costume industry were still almost the same as before. Some merchants in Dinglou Village started to receive inquiries from online buyers. The most common question was, since merchants can sell children’s photography costumes online, can they customize some specific models of children’s stage costumes?

Weili Yi: At the beginning of Taobao, not many people needed studio costumes. (Later stage costumes) Some (school) teachers provided some pictures, and we produced them according to the pictures they provided, then listed them, and then it became a hit. We gradually stopped making studio costumes and turned to stage costumes... The first one was a little dress for a Korean dance, which a teacher sent me, that dress was very simple... Then after the (product) went up, many people came to buy... (The update of the style for the second year) is also based on the customers’ needs; the hit product is not what you want to sell. Generally, when you see a large customer demand, you can prepare stock (Interview data, 20180129).

As the demand for photography costumes in Dinglou Village is mainly concentrated in March and April (good weather for photography), May and June are the off-season for sales; however, these months are the peak season for children’s stage costumes due to events such as Children’s Day on June 1st. Local merchants quickly responded to the demand for these stage costumes. As a result, the stage costume industry centered around Dinglou Village and Zhangzhuang Village quickly emerged and influenced the industrial forms of surrounding villages and towns.

As shown in Table 1, compared to photography costumes, stage costumes⁸ are more suitable for production in rural areas in the e-commerce environment, which is specifically manifested in five aspects.

First, photography costumes need to be used repeatedly, so higher-quality fabrics are needed. In the early stages of e-commerce development, the local production capacity for photography costumes was already insufficient to meet market demand, and many shops had to queue overnight at a few suppliers with production capacity and fabric sources to obtain their supplies. Stage costumes are often disposable consumables used only in a few performances and require lower-quality fabrics, and more manufacturers are able to produce them. Second, in terms of customer groups, the buyers of photography costumes are mostly professional photography studios,

⁸ In addition to stage costumes, other types of apparel with similar features, such as doctoral gowns, military training uniforms, and practice suits, have also emerged in Daiji Town and surrounding townships. The product characteristics of these items basically conform to the discussion on stage costumes below. In recent years, the Hanfu (traditional Chinese clothing) that has risen in Daiji Town also has the above characteristics, so it will not be discussed separately.

Table 1 Comparison between photography and stage costumes. *Source:* Interview compilation

	Photography costumes	Stage costumes
Raw material standards	Better material	Ordinary material
Customers	Specialized sellers	Common consumers
Demand volume	One or several pieces	Wholesale
Technological standards	High	Low
Differentiation	Little differentiation	High differentiation Fast updates

This table shows the suitability of two types of products for e-commerce activities

which have higher requirements for photography costumes and greater bargaining power than general consumers. They can easily form stable product supply relationships through repeated transactions, making it difficult for new entrants to break into the market. Stage costumes, on the other hand, often cater to end consumers, especially in the subfield of children's stage costumes, where parents who value performance activities are willing to pay high fees for props for one-off performance events. Third, in terms of demand, a photography studio usually buys only a single or a few specific costumes, while based on the nature of performance events, consumers generally buy a large number of the same style of stage costumes, which facilitates standardized production by merchants. Fourth, the technical requirements for photography costumes for edges, ornaments, and patterns are much higher than those for stage costumes. Manufacturers often need to go elsewhere to buy accessories. If there is no local accessory industry to support them, the scale of the industry is obviously limited. Fifth, the product iteration speed of stage costumes is fast, and people's preferences vary greatly. This not only provides market space for new businesses to join but also constitutes a bargaining space for new products.

Based on the above characteristics, when stage costumes first went on e-commerce platforms, the prices of some products were even higher than those in physical stores. With virtually no store costs and labor input in online shops, the initial profit of stage costumes could reach or even exceed 100%. Stage costumes constitute a differentiated market with high returns compared to photography costumes.

Zhuyuan Yi: At that time (in 2012), I was (selling offline), I made less than 200,000 yuan, selling both online and offline. At that time, the profit return was very substantial. At that time, the profit in 200,000 yuan revenue should not be low... selling 200,000 yuan, almost half the profit (Interview data, 07/06/2017).

Compared to photography costumes, stage costumes seem to have many advantages, and the difference in technical production conditions between the two is not significant. Why did not stage costumes become the choice of local businesses from the beginning? Before e-commerce technology was interembedded in the trading process, as stage costumes cater more to end consumers, it was difficult for businesses that were previously only selling in specific markets to aggregate the differentiated demands scattered across various places, and they were hard to trace. In contrast, the consumer group for photography costumes is photography studios. One only needs to find a photography studio in each place to promote their

products. At the same time, even if the merchants in Zhangzhuang Village and Dinglou Village happened to receive “inquiries” from consumers during the process of promoting in other places because they could not integrate the demand into a large enough scale, they would also tend to make adaptive choices based on existing product information in the market, not “responding” to this demand and not producing new products.

Therefore, products such as stage costumes with potentially high returns but scattered demand are difficult to trade through the aggregation of traditional trading spaces. Once product information has negative externalities, it will be difficult to access localized, small-scale markets for products with dispersed demand. For local merchants, the high returns of the differentiated demand market have not been demonstrated in the local market. However, in the trading platform built through e-commerce technology, the potential demand for stage costumes is no longer scattered in segmented spaces. The externality mechanism of e-commerce technology allows these types of products to enter the platform, becoming the starting point for the new differentiated demand market.

As stated in the first inference, any product idea that seems “illogical” can enter the market almost unhindered, becoming a product ready for trade; that is, any group (a_2, b_2) can enter the market. For example, when competing in a product information display space with limited competition with other similar types of clothing, people selling stage costumes with differentiated demand not only have to pay relatively high store rental fees but also face local demand that is difficult to scale effectively. At this time, more clothing product information display space belongs to everyday clothing that can easily form an effective scale locally and for which people have less differentiated demand. Therefore, niche products such as stage costumes may become potential demands in industrial society, lying dormant outside most local markets. Through the externality mechanism of e-commerce technology, the competitiveness of product information display space disappears, and merchants display these stage costumes at almost zero marginal cost, such as by featuring photography studio costumes chosen by “adaptive choice” (the same applies to everyday clothing) and by showcasing these costumes. Consumer demand can also smoothly enter the entire market, seeking opportunities to achieve transactions, especially when urban manufacturers have higher production costs or weaker response capabilities, and rural manufacturers have the opportunity to complete the aforementioned transactions.

The large amount of differentiated demand that emerges through the externality mechanism of e-commerce technology is the development opportunity that rural areas can fully utilize. To a certain extent, the differentiated demand market has weakened the unshakeable position of urban economies of scale in business activities. When cities and some towns and districts focus on “adaptive choice” products that have evolved and formed in traditional industrial society, the rural industries that could only focus on smaller market capacities can, under the influence of the externality mechanism of e-commerce technology, leverage their existing industrial base, focus on the “explosive” characteristics of niche products, and flexibly capture the potential differentiated demands that were previously scattered in different regions.

Visibility mechanism: the interembeddedness of online and offline

Visibility mechanism and response probability

The rapid emergence of industry clusters is based on the response network of local merchants. Why might rural industries have a higher response probability on e-commerce platforms? For example, can opportunities in traditional external markets also bring an equivalent response probability? We believe that, compared to opportunities in traditional external markets, the visibility mechanism of e-commerce technology makes the industrial development opportunities that arise from it more compatible with rural acquaintance societies.

Differentiated demand also exists in non-commerce technology environments. When a differentiated demand is thrown into the market, it can be completed through a one-time transaction between the trading parties, or it may form a new market with multiple participants and sustained existence. The logic of the visibility mechanism of e-commerce technology lies in the fact that when there is an arbitrary pair (a_2, b_2) in the market that satisfies Inferences 1 and 2 of the previous section, that is when a differentiated demand market with potential high profits completes the first transaction, the combination of (a_2, b_2) becomes public information on the platform.

Given the expected cost conditions, we assume that the response probability p of the accepting party in the transaction comes from his or her estimate of the expected return (yield). For a product that is still niche and requires preliminary investment, the producer's expected return comes from two parts (considering only monetary returns): one is the return brought by the current commodity price, and the other is how much the producer believes there will be future achievable commodity returns. The judgment of the former comes from the current transaction, and the judgment of future commodity returns depends on the individual's confidence in the product and the visible return Y_0 of other product producers. When an individual is more confident in the product or when the producer observes that other product producers have obtained income that makes them more satisfied, the judgment of future commodity returns will significantly increase.

In traditional market matching, the producer's expected return mainly comes from the current price, and the next period's production is determined based on the current price. Schumpeter (2015) discusses that entrepreneurs who are good at combination innovation rely more on confidence in new combination products to determine production. The classic research by Harrison White (1981) focuses on the interaction process among producers. We still use the notation in the second section. On a platform where a large amount of product information is gathered and visible, the visibility mechanism of e-commerce technology transforms any recorded return (a_2, b_2) of completed transactions into public information on the e-commerce platform, strengthening an important influencing factor of expected return changes Y_0 , i.e., visible return.⁹ According to Inferences 1 and 2, when there are enough transaction combinations (a_2, b_2) and they can be observed by other subjects in the market, the following inferences can be made:

⁹ When Harrison White (1981) discussed the question of "where markets come from," he mentioned that producers complete product pricing through mutual observation, but he did not explicitly discuss the issue of observation channels. Instead, he implied the matching of transactions within the consensus-based market model.

Inference 3: There exists a pair (a_2, b_2) such that when $Y_{0a} \rightarrow a_2$ or $Y_{0b} \rightarrow b_2$, then $p \rightarrow 1$.

Inference 4: Based on Inference 3, there exists a pair (a_2, b_2) such that $\sum_{i=1}^n p_i \rightarrow n$.

The practical significance of Inference 3 is that when the externality mechanism of e-commerce technology brings enough differentiated demands to the platform and any transaction completed on the platform can be observed by others, with enough new product combinations, some transactions, although one-time and small-scale, will make a type of transaction a model for other actors to imitate. When people learn about the high profits generated by a transaction, they are willing to follow the purchase or production, thereby forming a positive response intention. When Inference 3 develops into Inference 4, there is a pair (a_2, b_2) such that every actor who observes this transaction (especially in the early stage of the emergence of new products) is willing to continue to respond to inquiries around this differentiated demand market to complete transactions, forming a sustained response process between the two parties. Based on this process, new products have stimulated markets with stable transactions and industries that can develop for a long time.

Online–Offline Interembeddedness

The social basis of rural transaction order in China still presents the characteristics of a familiar society (Liu 2014). Based on the social norms of the rural acquaintance society, a product that has high potential returns and has been traded is always quickly captured by others within the scope of the acquaintance society. This has been fully confirmed in both traditional rural industries (Fu 2020) and the development of e-commerce village industries (Qiu and Huang 2021).

Under the e-commerce technology environment, some products' transaction processes do not need to be actualized through physical space. At this time, obtaining product information and activating the role of local interpersonal relationships in disseminating knowledge and skills becomes the first problem to be solved before a product develops into a scaled market. If the surrounding actors cannot capture the potential benefits of stage costumes and product information, a further evolution into a scaled stage costume industry cluster is naturally impossible.

Interviewer: He (the neighbor who is successful on Taobao) is pulling goods out, right?

Hongliang Jiang: No, just sending it to others. He just started to ship on behalf of businesses.

Interviewer: He ships on behalf of businesses, but he doesn't have any goods. Then how do you know he's doing big?

Hongliang Jiang: Who's gonna tell you? You can see the sales volume (online)... He usually issues more than thirty orders in a day. That's close to a thousand yuan per day (Interview data, 07/13/2017).

For some e-commerce platform merchants, although they can separate the delivery process from the physical space through the e-commerce platform, once someone knows the name of their Taobao shop or the product category, they can know the monthly sales, price, design style, product evaluation, and other information about the product through

the information retrieval of Taobao. From this, they can infer the possible benefits of the current product. In this case, although Hongliang cannot observe his neighbor's inventory or commodity transaction amount offline, even if the neighbor is unwilling to disclose, he can quickly obtain this information by searching for the neighbor's shop name on the e-commerce platform.

For the category of stage costumes, the merchants in Daiji Town have formed their own rules for revealing information. The peak season is often before June 1st, Children's Day. Before the festival, merchants base their designs on specific popular products. In this process, some design link technology will not be disclosed. However, after Children's Day, the sales volume of each merchant can be observed by others on the e-commerce platform. They also have plenty of time to imitate other merchants' products with good sales and estimate their possible profits in the next peak season based on the sales volume of the product.

Weitong Yi: After my (sales) volume drops, he can see it. During this time in May, the probability of bargaining is very small. He (the consumer) urgently needs this thing. That turns into a seller's market... That's a huge profit. So it's impossible to share everything with you (other villagers) during that time; it's purely a commercial secret. However, after "June 1st," whatever (other people) want to do, it doesn't matter. I definitely won't do it again next year, or I'll continue to do it, but not as the main product (Interview data, 07/06/2017).

Although some technical design details do not immediately become public information, before June 1st, other merchants can know the basic design style of a product from the published product information. At this time, the other merchants will "select styles" to learn the product's advantages and launch their own products. The so-called "selection of styles" involves gathering the advantages of products already launched by various businesses by browsing other businesses' product information online, visiting for advice offline, and finally integrating all of this into a "new product." According to local merchants, these new products "are not anyone's; they are a variation or modified style."

There is a product information reference online, and there are fellow villagers from whom one can learn offline. The visibility mechanism of e-commerce technology allows merchants on the e-commerce platform to conveniently observe the sales situation of others in the same industry. The more businesses enter based on the externality mechanism, the greater the probability that the increased demand will be initially met, and the higher the response probability of differentiated demand on the e-commerce platform. The merchant who first meets the increased demand is in a monopoly position (for example, the profit from selling stage costumes online in 2010 is much higher than in 2017), and they often can obtain far more than other fully competitive products. This profit information is recorded by the e-commerce platform, and other merchants can judge the potential benefits of a product by browsing the price and sales volume of the product, thereby affecting Y_0 (visible benefits) in the decision-making process and further amplifying the imagination of the potential benefits of emerging demand.

However, even if the differentiated demand and the generated profit information are captured in the trading process, the manufacturer may not necessarily start production. Similarly, e-commerce technology and the rural social relationship network provide

the basis for villagers to respond quickly to market demand. Since the development of local e-commerce in Daiji Town, the sales model of e-commerce provides an extremely low production threshold for sellers who have just entered the industry. The visibility mechanism of e-commerce technology and the local social relationship network allow small sellers to complete the entire sales process by acting as information intermediaries without having to stock up. Specifically, a seller first takes orders online, and then they find local manufacturers through interpersonal relationships to purchase goods; finally, they contact a courier to pack and send out or directly send out from the manufacturer to complete the sales process. The entire process only has the capital cost of the period from the courier sending out to the consumer receiving and paying. Therefore, in Daiji Town, if a merchant wants to “test the waters” of the stage costume-related industry, they can reduce this trial-and-error cost to a very low level as long as they use local interpersonal relationships.

Yushi Yu: Why did our town and the surrounding e-commerce development so fast... It's just that after we made clothes, we sold them to e-commerce merchants. In the past, to start an e-commerce business, one only needed to buy a computer. They didn't need to make clothes or stock products... The e-commerce businesses sold clothes, and often, risks were on our side. If there were any problem with the product sold, it would be returned or adjusted all by us. This e-commerce business, they just made net profits, all these risks were on our side. So, they are always profitable and never lose, that's why they develop so fast (Interview material, 20170705).

Given the information on the trading platform, a high profit that already exists can be quickly captured by other merchants. At the same time, since the basic design style of the product and product reviews are public information, with just basic production skills or even only the ability to operate on the e-commerce platform, this captured demand can quickly be turned into real transactions. The production scale that can be triggered by online public information and offline social relationships has become the technical and social foundation for the rapid popularization of stage costumes in Daiji Town.

The logic of Inference 3 includes the basic premise of completing regional industrial diffusion through imitation. Only when this set of profit combinations (a_2, b_2) can stimulate the desire of others to imitate and have the ability to imitate can a product become a catalyst for regional industrial development and ultimately make the majority of actors in the region jointly enter (or become involved) in the entire production process, which is the ideal state emphasized in Inference 4: every observed actor is willing to participate, making the local industry form a rapid and effective response around a specific product.

The income information of the original photo studio costumes in Dinglou Village was relatively confidential, work-related skills could only be learned through social relationships, and the sales process could only be completed by going out. Although the photo studio costume industry was a type of differentiated demand when it started in the 1990s, its technical environment could not stimulate large-scale local imitation. Therefore, only a small number of people were engaged in this industry. For Dinglou Village, based on the visibility mechanism of e-commerce technology, the stage costumes embedded in online product information and offline interpersonal relationships have almost become a local industry in which every villager more or less participates. E-commerce technology

fills the information gap in local interpersonal relationships, and this information then becomes the technical foundation for actors to engage in interpersonal interactions. The two types of actions constantly corroborate and trigger each other in their embedding.

Verification mechanism: accumulation of internet capital

Verification mechanism and consensus

Returning to the issue of rural industrial development, we still need to answer the following question: Even if the differential demand emerging from e-commerce technology is captured and transformed into a viable industrial form by rural entrepreneurs, have some of the disadvantages of rural industrial development, such as lack of branding, guarantees, and promotion, been partially solved in the information technology era? Why are people willing to accept merchants from e-commerce villages? In traditional rural trade activities, interpersonal relationships play an important role. Consumers, producers, and sellers are often neighbors or acquaintances and maintain product quality and after-sales service through relationships. Therefore, the foundation of such transactions is relational contracts. Once a relationship breaks down, the guarantee of the transaction may disappear.

When discussing relational governance, Avinash Dixit (2007[2004]) emphasized that as the size of a group expands, the cost of relational governance gradually increases, which may lead to the possibility of breach of contract by people at a distance. Therefore, when the scale of the governed group is too large, a formal official governance model is needed.¹⁰ Of course, in most e-commerce villages, there is no unified official organization for many unique styles of products with “asset specificity,” they do not choose to complete through relational contracts between the parties but choose to complete the transaction activities of both parties on the e-commerce platform, which is the role of the verification mechanism of e-commerce technology.

As a basic trading technology, the platform can transform a large amount of private information into observable and verifiable information during the trading process, increasing the possibility of matching trading parties on the platform. Suppose there is no opportunism or intentional breach of contract in the issue of reaching a consensus between the trading parties. Under given technical conditions, Actors *A* and *B* have formed their own information sets *A* and *B* around the product such that:

$$A = (I_{pa} \cup I_{oa} \cup I_{va}); \quad B = (I_{pb} \cup I_{ob} \cup I_{vb})$$

I represents the information about the product owned by Actors *A* and *B*, and *p*, *o*, and *v* represent private information, observable information, and verifiable information, respectively.¹¹ When $A = B$, the trading parties' cognition of the product is completely consistent, and the probability of reaching a consensus $q \rightarrow 1$. Assuming that the

¹⁰ In his writings, Dixit specifically discussed the potential possibility of “modern technology bringing the improvement of information flow to a perfect level.” However, since the information technology was not developed enough at the time of writing, he believed that formal institutions were still needed to address hidden issues. In his discussion, official governance often refers to maintaining the entire transaction process through the official legal system (see Dixit 2007/2004: 32, 66).

¹¹ Dixit (2007/2004) proposed three different types of information, namely, private information known only to one party in the transaction, observable information known to both parties of the transaction, and verifiable information confirmed by a third party.

intermediary providing verifiable information is completely neutral, $I_{va} = I_{vb}$, and the matching degree of I_{α} and I_{β} depends on the technical environment of observable information, we have:

Inference 5: If $\frac{I_{va}+I_{oa}}{I_{pa}} \rightarrow +\infty$ and $\frac{I_{vb}+I_{ob}}{I_{pb}} \rightarrow +\infty$, then the relationship between set A and set B entirely depends on the technical environment of observable and verifiable information.

Inference 6: Based on Inference 5, if there exists a technical environment where $I_{oa} = I_{ob}$, then $A = B$, i.e., $q \rightarrow 1$.

The practical significance of Inference 5 is that when private information completely disappears in a certain technical environment or is forced to be observable and verifiable, or when the provided observable and verifiable information far exceeds the private information, then the role of private information in the technical environment becomes unimportant. Based on Inference 5, if the technical environment continues to improve and there are no longer any flaws in the authenticity of observable information, the expectations of both parties to the transaction for the product will tend to be consistent. They will no longer need to trade the product through the process of showing differential demand. At this time, the matching problem of the differential demand market will transform into the price-matching mechanism of the general market, making the original differential demand market a new adaptive choice set, and the excess technical dividends will gradually reach equilibrium.

From local reputation to internet capital

Before using e-commerce technology, villages represented by Dinglou Village and Zhangzhuang Village had many inconveniences when they wanted to sell goods to mature markets. This was not only due to physical distance limitations but also because it was difficult for people to identify quality signals from mobile merchants. At the same time, in interactions with upstream suppliers, the seller's sales process is also invisible, so it often requires the seller to establish relatively solid relational contracts with downstream customers and upstream suppliers separately, transforming low-quality private information into high-quality private information through relational contracting. The characteristic of private information also means that the information of a single transaction is not universal, and transaction data are hidden in the private relationships of specific upstream and downstream merchants.

In the e-commerce technology environment, because a large amount of transaction-related information stays on the platform, the platform can encode the information into the internet capital of consumers and merchants.¹² Specifically, taking Taobao as an example, the e-commerce platform sets product information standards, standardizes the products that are posted by different sellers, and organizes low-quality private information into higher-quality, easy-to-read private information. It transforms the private

¹² Internet capital refers to "any assets formed by past investments, which have opportunities to enter the Internet market and can benefit from the Internet market" (Qiu et al. 2016). For example, for traditional rural merchants, their local attributes mean that their local operations cannot serve as capital that benefits on the internet. However, after being coded and verified by the platform, they become effective reputation in the e-commerce market. For consumers, historical consumption records may also become reference values for obtaining discounts from platforms and merchants.

information of each transaction into information that all platform participants can observe through nondeletable past transaction records and consumer reviews. It forms a reputation approved by Taobao on the platform through comprehensive evaluations of a merchant's past trading behaviors (stars, diamonds, and crowns). These activities are directly endorsed by the creator of the market trading place and the technical system on which it relies, which is extremely important for developing rural industries with traditional information gaps.

In the relationship between the merchant and upstream communication, because the sales data on the e-commerce platform are difficult to fake, this kind of internet capital that can profit online has become a bargaining chip in the interaction of the offline industrial chain. Some sellers who run online stores well can settle with upstream merchants after consumers have made payments, with almost no use of their funds in the process.

Interviewer: Can you handle the 'Double Eleven' sales event?

Jiang Rui: Yes, I can, because I can owe the manufacturers... Because this year, when the hot items came out, I was waiting for more than 1.7 million yuan in sales. I was really almost unable to bear it. I owed the manufacturers for three months... Because we all trust each other now, he also understands the situation. I send him all the transaction information, the information volume, and how many goods he needs to make for me every day, so he understands on his side (Interview data, 07/12/2017).

In the case study, any data generated through the platform are permanently stored by the platform, and a large amount of data comes from the platform's own statistics. The transaction process, which previously could only be partially observed and confirmed through private relationships, can now be observed and confirmed in real-time on the platform. Thus, for sellers with good transaction records, the data on the platform can serve as credit collateral, providing room for capital turnover.

A large amount of private information is transformed into observable and verifiable information through e-commerce technology. For example, the previous sales of photography studio costumes in Dinglou Village, monthly sales volume, and prices for each transaction were private information, and product quality did not have brand protection. However, under e-commerce platform technology, all these can be easily observed and confirmed by the platform. In addition, with sufficient observable and verifiable information, the remaining difficult-to-transform private information no longer hinders people's transaction decisions. Although consumers still cannot know the entire production process of stage costumes when buying them and do not understand many details of the merchant's actions, they can still obtain much more observable and verifiable information in different dimensions than they can in offline transactions. Ideally, once both parties of a transaction can reach an agreement in the dimension of observable information, products with differentiated demands can quickly achieve a match, and regional differences are no longer an important factor limiting information quality.

In this way, the verification mechanism of the e-commerce platform transforms private information in rural industries into observable and verifiable information on a public platform. When transaction data are accurately and completely reflected on the merchant's shop homepage, consumers can choose based on such standardized product

information endorsed by the platform, increasing the possibility of agreement between the two parties of the transaction. On the Taobao platform, as long as the “decoration” is appropriate, the form of the online shop is not confined to the level of regional development. More importantly, this type of internet capital has the potential to feed back to offline business activities. The codification of operational activities provides rural merchants with internet capital for operating industries online.

Conclusion

This paper continues the focus on the “differentiated demand market” in digital society (Qiu et al. 2016), proposing the market interaction process generated by the e-commerce technology dividend and the triple mechanism by which e-commerce technology promotes the development of rural industries. We collectively refer to this as the “actualization mechanism of the rural e-commerce technology dividend” (as shown in Fig. 2).

First, based on the analysis of the interaction between the two parties in the transaction, we initially constructed a theoretical model for the actualization of the e-commerce technology dividend, which we call the “interaction process of the differentiated demand market.” Under this model, the prominence of differentiated demand in the market is affected by three factors: the potential profit of the differentiated demand market, the response probability of the two parties in the transaction, and the probability of the two parties reaching an agreement. When people only make “adaptive choices” in market interactions, the expansion of the market size is just a continuation of the market structure of the industrial era. When one party is more willing to “inquire” and the other party is more willing to “respond,” a differentiated demand market with potential high profits will gradually emerge, thus forming an added market dividend. We should highlight that not every interaction between the two parties in a transaction can generate a technology dividend based on the differentiated demand market, and the technological path to actualizing the differentiated demand market is not solely through e-commerce technology. This paper focuses on the interaction process between the two parties in the e-commerce technology environment.

Through the externality mechanism, visibility mechanism, and verification mechanism, information technology centered on e-commerce platforms transforms the added “technology dividend” in the differentiated demand market into a rural industrial practice process that some rural areas can undertake, providing a different industrial route from the original industrial society for rural industrial development. Specifically, in the case of rural e-commerce development, our findings include the following three aspects.

First, the externality mechanism makes markets with potential high profits no longer need to demonstrate their value through the physical space’s agglomeration, which perfectly fits the dispersed and flexible industrial patterns in many rural areas. The positive externality of transaction information means that the platform does not need to specifically measure the relationship between the aggregated demand on the platform and the platform data occupancy, and the continuous increase in information can increase the platform’s profits. Therefore, due to the emergence of the differentiated demand market, rural areas that did not originally have the advantage of industrial agglomeration can also capture the added technology dividends generated by the platform.

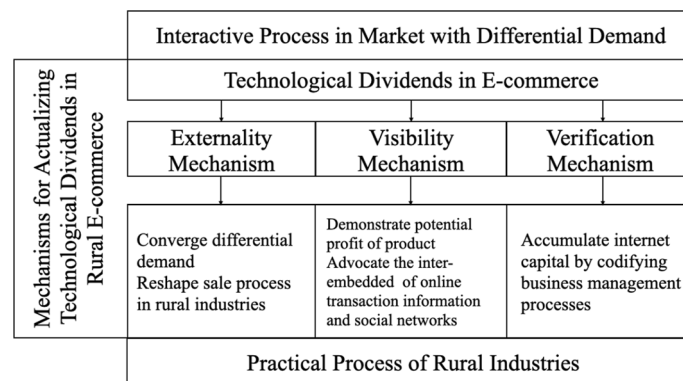


Fig. 2 Mechanisms for Actualizing Technological Dividends in Rural E-commerce. Notes: This figure is the core conclusion of this paper, showing how the dividends generated by e-commerce technology can be actualized in rural areas

Second, the visibility mechanism makes the profit information of specific products no longer demonstrated only through offline space agglomeration. Merchants in rural areas can observe the actions of their neighbors through a network of acquaintances and judge the development of their neighbors’ industries by browsing the public information on the platform. Online information helps people initiate interpersonal relationship organizations for production in traditional villages, and offline interpersonal relationships also provide information to support merchants in confirming online profits. Based on this, the development of rural industries can have an ignition point, prompting continuous imitation and innovation within the village.

Third, through the platform’s unified way of expressing information and the platform’s information processing process, the verification mechanism transforms the rural product information, which cannot be displayed through the “modern business” channels, into observable and verifiable information on the platform. This encoding of the rural business process provides a stable path for actors on the e-commerce platform to accumulate internet capital, promotes cooperation upstream and downstream of the rural industry chain, and increases the possibility of cross-regional matching of rural products.

We return to the empirical question posed at the beginning of the article, that is, why can rural industries obtain development opportunities in digital society? The answer lies in the fact that the differentiated demand market highlighted in the e-commerce technology environment is not a simple continuation of the development logic of industrial society but contains interactive modes that can be actualized in rural areas. Therefore, why can such an agglomeration occur in rural areas? The answer lies in the fact that the transaction environment created by e-commerce technology can be integrated with the economic and social foundation upon which the rural industry practice process relies.

We must also note that not all e-commerce activities can take root in rural areas. If a given industry does not have the value of agglomeration in the differentiated demand market, if local interpersonal relationships are not sufficient to transmit product information that can be imitated by others in the village, or if the chosen e-commerce platform cannot provide sufficient credit endorsement, all of these factors will severely affect the formation of e-commerce villages. Around the case examined in this article, we have

also seen many villages where e-commerce development has not been successful: some e-commerce merchants in villages choose to develop products that are already very mature in urban industries rather than those in niche categories, and the sales volume formed on the platform can only maintain the survival of a few merchants in the village. For some e-commerce merchants in villages, although their products are innovative, the production link is far away from the village, or the local social capital is poor, so product information cannot be transformed into public information in the village, and only a few merchants perform their “one-man show.” Furthermore, even though some villages have gathered a certain scale of merchants and their products have development potential, they choose to build their own e-commerce platform or join a niche e-commerce platform. The data in the operation process cannot be transformed into internet capital, and it is difficult to promote synergy between upstream and downstream industries. Although the final results of these cases are different from the case chosen in this paper, we believe that the analytical framework used to understand the success or failure of e-commerce development in different villages is still consistent.

Another point that needs to be emphasized is that e-commerce villages present obvious techno-social complex characteristics and are more susceptible to the influence of platform technology rules. Since the technological dividends on which e-commerce villages rely must be created and actualized through e-commerce platforms, platform rules become the prerequisite for obtaining technological dividends. The externality mechanism, while lowering the threshold for product information entry, also amplifies the benefits obtained by merchants from platform technology loopholes, forcing the platform to iterate technology rules quickly and correspondingly requiring manufacturers in the market to constantly learn technologies that are not directly related to the actual transaction process. Some manufacturers may be eliminated from the market because they cannot adapt to rapidly changing technology rules. While transmitting profit information, the visibility mechanism also creates unrealistically high-profit expectations, which may exacerbate existing product competition in the market. Moreover, the winner-take-all platform feature drives the industry to iterate products quickly, and some products that have not fully met differentiated demands will quickly exit the market, forming a sustained innovation fluctuation in the market. Finally, while providing internet capital to farmers, the verification mechanism also creates an unparalleled platform market position for other manufacturers. Manufacturers need to purchase traffic from the platform, and when the interests between the platform and the manufacturers are inconsistent, the latter have almost no negotiating position. These are new challenges rural industries face after the actualization of technological dividends.

The development of e-commerce technology provides us with new perspectives for reexamining the relationship between urban and rural areas. In the context of industrialization, the sources of different roles in urban and rural areas are precisely the assumption that the agglomeration effect of industrial activities acts as a development engine, so promoting urbanization becomes the touchstone for dealing with urban–rural relations. However, even with the industrialization mindset, different regions in China have also shown different development patterns of urban–rural relations, such as “urban–rural integration,” “urban–rural complementation,” and “urban embedded in rural” (Qiu 2020). The market social process spawned by e-commerce technology has, at least to a certain

extent, weakened the development advantages brought by the traditional industrialization agglomeration effect; of course, it has also inevitably brought a series of new problems in the operation process, and the rules of the e-commerce platform have become as important as market rules in terms of fundamental interaction rules. How to construct an industry development environment that conforms to the technological logic of the digital society for rural areas in the context of rural revitalization is a direction that can be further advanced in future research.

Abbreviation

B2B Business to Business

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None.

Author contributions

SZ set up the analysis framework of the article and completed the main content of the article. ZQ guided the ideas of article promotion at each stage and provided theoretical support.

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Availability of data and materials

The data are collected through semi-structured interviews which are not publicly available due to privacy or ethical restrictions.

Declarations

Competing interests

The authors declare they have no competing interests.

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