Ecological layout and competition characteristics of large internet platform enterprises

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Abstract

Purpose – Aiming at the lack of explanatory power of traditional industrial organization theory in cross-border competition, by introducing the idea of ecological niche, the authors aim to explore the competitive situation of platform-based enterprises when they operate in multiple fields.

Design/methodology/approach – With the help of ecological niche theory, construct the niche width and niche overlap index of typical enterprises in the platform economy, and find out the advantages and the intensity of competition through comparative analysis.

Findings – In an environment of cross-border competition, large enterprises have significant competitive advantages, and the fierce competition is concentrated among medium-sized enterprises.

Originality/value – The conclusions of this paper not only provide new insights for explaining the phenomenon of cross-border competition in the platform economy, but also provide theoretical reference for the anti-trust enforcement practice in the platform economy.

Keywords Cross-border competition, Platform market, Large-scale platform enterprises, Competitive advantage, Ecological niche

Paper type Research paper

1. Introduction

In the era of the digital economy, platform enterprises have become a new type of enterprise model, which plays a vital role in improving the efficiency of matching supply and demand, promoting industrial upgrading and expanding the consumer market. With the gradual maturity of the platform economy and the emergence of Internet giants, the topic of monopoly and competition in the digital platform market is rapidly heating up. Competition in the internet platform market has always been very active, not only in the gradual increase in the number of

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enterprises (Fu *et al.*, 2014), but also in the existence of "large and small symbiotic" differentiated competition in the market (Jing, 2018). In addition, the competition in the platform economy field has shown some new features. Typically, large platform companies have begun to build a more comprehensive business system by laying out their business ecosystems. For example, platforms can use envelopes strategies: that is using their primary resources to enter adjacent or even seemingly unrelated markets to expand their business scope. This ecological layout makes the analysis method of competition situation based on the homogeneous field no longer applicable. It is difficult for us to answer under the traditional analysis paradigm, will the ecological layout of platform companies weaken the competitive advantages of giant platform companies, or will it help them form a broader business empire? Will the entire platform industry move towards a deeper monopoly with only one company? At the same time, due to the increasingly blurred market boundaries in the platform economy, and the current standard governance system mainly focuses on the competition process and results of a single market, it is difficult to detect the hidden market power hidden between the markets, which also causes difficulties in antitrust enforcement. Therefore, a correct understanding of the cross-border competitive relationship generated by the ecological layout of platform companies is a necessary prerequisite for understanding the anti-competitive effects of platform companies. However, the existing industrial organization analysis methods are primarily used to analyze homogeneous business fields, and there is no mature analysis method for heterogeneous business fields.

Because of this, this paper from the perspective of resource occupation makes a practical measurement of the competitive advantage and competition intensity in the ecological layout of platform enterprises by constructing the index of niche width and niche overlap with the help of niche theory. It analyses the competitive characteristics that platform enterprises may have in the context of ecological layout, and also establishes a reference for anti-monopoly regulation in the platform economy.

2. Literature review

There have been many studies on platform competition, focusing on competition in a single field. One of the most common understandings is that due to significant cross-network externalities in the platform market, economies of scale on the demand side are formed. To stimulate the positive feedback effect of user agglomeration, the focus of enterprise competition lies on the user scale (Farrell and Saloner, 1986; Katz and Shapiro, 1994; Liebowitz and Margolis, 1996; Chen, 2018; Lin and Zhang, 2020). The research of Rochet and Tirole (2003) on platform competition is regarded as the authoritative literature in this field. They argue that when platform companies use price as the primary means of competition, the main purpose of pricing is to attract users in the two-sided market to join the platform. The competition mode dominated by price competition in traditional industries has limited explanatory power in the platform market, platform companies need to make decisions on the price structure on both sides of the two-sided market, not the price level itself (Rochet and Tirole, 2006). Under this logic, the competition among enterprises is often a zero-sum game, and the "winner takes all" competition also contributes to the easy formation of an oligopolistic market structure (Evans and Schmalensee, 2002).

As the platform economy gradually matures, the academic community has realized the diversity of platform competition. On the one hand, the notion that network externalities can cause market concentration has been doubted. For example, there is a view that only some users in the vast user scale may promote the value of the network. It may reduce the value of the entire network (Briscoe and Odlyzko, 2006). Some scholars have pointed out that multihoming will weaken the lock-in effect caused by the network, because it can reduce the switching cost of using multiple products or services simultaneously (Dube *et al.*, 1946; Wu and Wang, 2019). On the other hand, academic circles have also proposed that the competition in the platform market has an evolutionary process from satisfying demand to creating value

(Cennamo, 2019). To better integrate resources and create value, the competition of platform enterprises is no longer a zero-sum game, and some point to the phenomenon of "symbiosis" in which cooperation and competition can coexist (Luo, 2007; Wang and Zhu, 2021).

The above studies are all aimed at the competition among homogeneous products or services, and are also in line with the meaning of competition in traditional theories. With the further development of the platform economy, the competition among enterprises is no longer about building the most extensive network (Cennamo and Santalo, 2013), but showing the characteristics of expanding from a single field to multiple fields. Cennamo (2019) points out that cross-border competition is one of the main differences between the platform market and the traditional market in industrial organization. Some scholars still interpret this phenomenon from the perspective of network externalities, arguing that the motivation for the cross-border competition is to further obtain traffic entry (Qi *et al.*, 2021). Lu and Qu (2019) put forward the idea of explaining the competition of user categories in the platform market with economies of scale. Most of the existing studies explain the pursuit of user scale through economies of scale, and the above studies are a valuable supplement to this conclusion. Academic circles usually describe or explain the cross-border competition between platform enterprises with the envelope strategy (Eisenmann and Parker, 2011; Cai *et al.*, 2015; Lin *et al.*, 2019). Some scholars have also explained the cross-border behavior in the platform market based on the characteristics of the digital economy. For example, Zhu (2016) argues that the cross-border competition of platform enterprises is closely related to the virtuality of technology and one of the most important characteristics of platform economy: attention economy; Li (2021) and Lin and Han (2021) argues that rich data will become the competitive advantage of enterprises. At the same time, cross-data from multiple fields will help platform companies better understand user preferences, thereby better building market barriers and limiting competition.

Cross-border competition expands the scope of competition of platform companies, and also weakens the explanatory power of traditional industrial organization theories in the platform market. An increasing number of ideas from other disciplines such as management and ecology have been imported. More and more scholars have begun to describe the competition model of platform enterprises in terms of ecosystems. Hu *et al.* (2009) tried to use the business ecosystem to explain the clustering phenomenon of China's e-commerce industry, arguing that the development of emerging industries is the result of the collaboration of multiple market players. In the ecosystem, the cooperative relationship between members is more critical. Iansiti and Levien (2004) pointed out that the envelop strategy of platform companies can help companies obtain abundant resources, promote their business evolution into an ecosystem, and gain competitive advantages.

The above research gives the characteristics of platform enterprise competition from multiple perspectives. It can also be seen that the competition in the platform economy has transformed from a single field to multiple fields, from survival of the fittest to cooperation and symbiosis. But only from the perspective of platform competition, the existing research seems to construct a "too beautiful" scenario, that there is orderly competition and complementary resources among platform enterprises. In reality, various types of unfair competition represented by "choose one from two", which means that companies are forcing users to choose their own products or services among many choices, frequently occur among platform enterprises, and the ecological layout of large enterprises is constantly eroding the market opportunities of small and medium-sized enterprises. How to explain the various competitive behaviors of large platforms from an ecosystem perspective? What are the consequences of cross-border competition? From the perspective of ecological competition, this paper measures the competition characteristics of typical platform enterprises and discusses the anti-monopoly regulation of large platform enterprises.

3. Stylized facts: from the zero-sum games in a single field to cross-border competition in multiple fields

Significant network externalities have created a "winner takes all" situation in the platform economy. In the platform economy, some mature fields have shown a high degree of market concentration. Table 1 shows the market shares occupied by the top three companies in specific occupations of the platform economy. It can be seen that in these particular fields, the market share of the No.1 company has exceeded 50%. According to the relevant provisions of China's Anti-Monopoly Law [1], it can be presumed that the operator has a dominant market position.

Table 2 lists the user scales of companies with different rankings in the platform market. If we comprehensively examine the market share of the leading and trailing companies, we can

Field	Company name	Ranking	Market share/utilization rate (%)
Online Shopping	Tmall	1	50.10
	JD.com	2	26.51
	Pinduoduo	3	12.80
Search Engine	Baidu	1	69.55
	Sogou	2	16.84
	Haosou	3	4.19
Third-Party Payment	Alipay	1	53.80
	Tenpay	2	39.90
	Yiqianbao	3	1.60
Instant Messaging	WeChat	1	92.60
	QQ/TM	2	87.00
	Ali TM	3	26.60

Note(s): The market share data in each field in the table comes from the E-Commerce Research Center's "2019 China Online Retail Market Data Monitoring Report", monitoring data from StatCounter Global Stats, monitoring data from iResearch, China Internet Network Information Center (CNNIC), Prospective Industry Research Institute and other professional institutions; 2. Considering the characteristics of different fields, market share is used to represent market concentration in online shopping, search engines and third-party payment, while instant messaging is measured by user utilization; 3. Due to the multihoming phenomenon in the platform economy, the sum of the utilization ratios of the top three companies in the instant messaging field is greater than 1, as shown in the table below

Table 1.
The distribution of market share in typical areas of the platform economy

Field	Company name	Ranking	Total number of people covered (10,000 people)	The proportion of the total number of people covered (%)
Online Shopping	Taobao	1	26847.900	85.18
	Tmall	2	22225.000	70.51
	Kongfz.com	10	635.300	2.02
Search Engine	Baidu	1	38539.500	90.05
	360 Search	2	26833.600	62.79
	Haosou	10	871.500	2.04
Community Forum	Baidu Tieba	1	17606.200	89.52
	TianYa	2	8594.100	43.70
	MOP.COM	8	383.200	1.95
Web Video	Tencent Video	1	18401.100	59.71
	iQIYI	2	16419.300	53.28
	PPTV	10	4452.500	14.45

Source(s): China Internet Data Platform (http://www.cnidp.cn/). The data in the table is located in the second half of 2017

Table 2.
Comparison of user scale of enterprises in typical fields

find that the platform companies of different sizes have significant differences in the number of users.

The trend of oligopoly in the platform market is pronounced. According to traditional theory, the market structure of an oligopoly will inevitably restrict competition. However, there has always been fierce competition in the internet platform market. Table 3 lists some typical competition cases in the platform market in recent years.

The above cases include not only competition between products or services of the same category, such as Alibaba and JD.com, but also large enterprises using their resources to build competition barriers through a series of exclusive means, such as Amazon and Google. These cases occurred in the central business of the enterprise, which is a competition in a single field. This is no different from the traditional theory. This type of competition is

Time	Companies involved	Event-content
2010	Qihoo 360, Tencent (3Q war)	In network security, the two sides forced users to "choose one of two." The two sides complained to each other three times, ending in a 360 defeat
2011	UC, Tencent	Tencent released the mobile QQ browser, putting pressure on UC's various business cooperation departments. It not only expanded the preinstallation volume through high-cost payment, but also required these partners to conduct two-way between its first IM products and the UC browser. Pick one
2015	Alibaba, JD.com	Alibaba Group puts forward a "choose one" requirement for merchants on the platform, prohibiting merchants from opening stores or participating in promotional activities on other competitive platforms
2015	Ctrip, Qunar	Ctrip initiated the acquisition of Qunar in 2015, but was rejected in writing by Qunar
2018	Meituan, Didi	On the eve of Didi's online takeaway, Meituan will let the merchants choose one of two. If the Meituan background detects that the merchant is online on Didi, it will be taken offline from Meituan
2019	Sony, Amazon, Best Buy, Walmart	Sony stops allowing third-party retailers – including Amazon.com Inc, Best Buy Inc. and Walmart Inc. sell download codes for PlayStation games, making Sony's PlayStation Store a PlayStation Digital Game the only source
2020	Facebook, Instagram, WhatsApp	Facebook's acquisition of Instagram and WhatsApp has sparked an antitrust lawsuit from the U.S. Federal Trade Commission (FTC). The allegations are that Facebook has long excluded competition by exploiting and maintaining its market power in the U.S. personal social networking market.
2020	Huaduo, NetEase	Huaduo sued NetEase for bundling its live broadcast software with game software to limit users' choices, which is suspected of abusing its dominant market position and eliminating competition
2020	Amazon	The European Commission accuses Amazon of using platform data to gain unfair advantages for its brands, saying that Amazon collects, summarizes and analyzes nonpublic commercial data of third-party retailers through the data processing system in its platform, and uses the analysis results for private brands adjust pricing and develop sales strategies to gain a competitive advantage
2020	Google	The U.S. Department of Justice accused Google of illegally using market power to exclude market competitors and maintain its monopoly by entering into exclusivity agreements and revenue- sharing agreements with distributors and developers
2021	Meituan, Eleme	Force merchants to "choose one" and prohibit merchants on the platform from conducting business activities on other competitive platforms

Source(s): Compiled by the author

Table 3. Some typical competition cases in the platform market

a zero-sum game for "winning", which has also triggered a series of unfair competition behaviors such as "price war" and "public opinion war", the former refers to the behavior of companies competing by undercutting prices, while the latter refers to the competitive behavior of companies using various media to relay information to the public in their favor. Of course, the competition mentioned above cases is typical cases that have become widely known because of their social impact. In fact, given that homogeneous products or services can constitute competition, it is difficult to fully calculate the level of competition in the platform market.

At the same time, there is a class of cases where the main businesses of competitors are different, such as 360 and Tencent. This phenomenon is widespread in the era of the digital economy, and it is manifested as a unique competition phenomenon caused by the horizontal expansion of business fields after companies have accumulated specific experience in their primary business fields. It is worth mentioning that the cross-border operation and ecological development emerging in platform enterprises is the enterprise's behavior and does not constitute an industrial organization problem. However, the business overlap formed will naturally bring competitors. In recent years, many cross-border competitions with large enterprises as the main body have significantly broadened the scope of competition. For example, JD.com has expanded into the payment field through JD Pay, clearly competing with Alibaba's Alipay. In recent years, large enterprises such as Baidu, Tencent, Google, etc., have begun to enter the field of artificial intelligence, and increased competition has emerged in this field. For large enterprises, they have the advantage of cross-border competition user base. The traffic portal created by the vast user scale will become an essential guarantee for large-scale platform enterprises to build an ecosystem.

Looking back at the ecological development process of typical Internet companies, the early ecosystems, such as e-commerce ecosystems, are a series of companies or organizations with complementary functions that complement each other's advantages and share resources through virtual alliances, forming an organic whole (Hu *et al.*, 2009). This system favors flexible and cooperative organizations belonging to multiple market players with different functions. In the current ecosystem, the dominant position of large-scale platform companies is more prominent. For example, Alibaba takes online retail as its core business, and has entered cross-border e-commerce, local life services, financial services and other fields through mergers and acquisitions, strategic shareholding, etc. It has also created a significant cultural and entertainment business unit and an innovative business group to coordinate the development of noncore businesses such as the cultural and entertainment industry.

The main motivations for platform companies to build ecosystems come from two aspects. One is the business combination based on resource integration. The construction of this ecosystem is to absorb or set up complementary businesses based on the core business. With smooth payment and credit security in the transaction process, JD.com improves the efficiency of product circulation through self-built logistics. The formation of this type of ecosystem can be regarded as the main business of serving platform companies, to realize the systematization of core functions and improving the service quality of platform companies. It is more inclined to the early multi-agent cooperative ecosystem. The second is market penetration based on creating new profit points. With the improvement of the ecosystem around the main business, the market for traditional business will be close to saturation. In fact, the market growth rate of some traditional network service industries has shown a downward trend in recent years. For example, data released by the Department of Electronic Commerce of the Ministry of Commerce show that the growth rate of China's e-commerce transaction volume has fallen from 57.6% in 2014 to 6.7% in 2019. The increasingly perfect complementary and collaborative business system also keeps the boundaries of enterprise products or services open. Platform enterprises have the need and ability to find new profit points. The profit-seeking feature in this process is pronounced. Large-scale platform

companies inject capital into emerging business models, not only carrying out incremental innovations similar to their primary businesses, but also entering new areas in the form of strategic shareholding, mergers and acquisitions. There is also a specific alternating rising relationship between the above two aspects. Platform enterprises will experience a closed loop of continuous innovation and reform through multiagent cooperation to help core business development, open up new business areas and multiagent consolidation and development of new business areas.

The strategy of platform companies to build an ecosystem not only expands their business scope, but also increases the degree of business overlap between different companies, further intensifying the degree of competition in the industry. To ensure their position in their fields, some small and medium-sized enterprises will adopt a cooperative approach to deal with the multiple field expansion of large enterprises. For example, in 2015, a large number of platform enterprises appeared. Merger events include Didi and Kuaidi, Ctrip and Qunar, 58.com and Anjuke, Youku and Tudou. It is hard to determine whether or not the merger of these companies was in response to the rapid expansion of giant platform companies in multiple fields.

In the competition of homogeneous businesses, many giant companies with extremely high market shares have been formed, which has also caused hidden worries about "platform monopoly". However, when academia focuses on platform competition in a particular field, giant platform companies have begun to actively cross-border operations and expand their business scope in the name of building a business ecosystem. Large-scale platform companies such as Baidu, Alibaba and Tencent have all begun to set foot in entertainment media, finance, education and other fields outside their core businesses. Based on synergies on the consumption side, the ecosystem may increase the value of products or services to consumers and improve consumer welfare. However, a series of new competitive behaviors such as Platform Envelopment, Self-preferencing, Killer Acquisitions and Acqhired have obvious exclusivity. Then, how should we understand the cross-border competition behavior and corresponding characteristics arising from the ecological layout of enterprises? This issue is not only related to how to fully understand the platform competition situation, but also a necessary prerequisite for anti-monopoly regulation measures. Due to the cross-border competition behavior and the ecological development mode of enterprises, it is difficult for the traditional industrial organization theory to explain the competition of platform enterprises. Therefore, this paper attempts to introduce the idea of the ecological niche and actually quantify the niche width and overlap of platform enterprises, from the perspective of resource possession, to understand the competitive characteristics of platform enterprises, and to provide a reference for anti-monopoly regulation in the platform economy.

4. The actual measurement of ecological niche

4.1 Introduction of ecological niche idea

The competition situation of platform enterprises is becoming more and more complex, which makes it difficult to describe the competition situation well from traditional perspectives, such as market barriers and business differentiation. However, the premise of the competition is that the products or services provided by enterprises are homogeneous. Even in the ecological development of multifield operations, the competition must be born inhomogeneous businesses. This is the core of our analysis of competition and monopoly issues. At the same time, the change in the competitive environment of enterprises is the most direct reason for the transformation of the competitive paradigm of enterprises (Peng Jie, 2017), and the degree of resources occupation now affects the competitive environment of enterprises. Therefore, if we can directly give how enterprises occupy relevant market resources, it can measure whether the enterprise has a competitive advantage and whether it can form a monopoly.

In existing similar studies, niche theory has been widely used to measure the competitive situation of enterprises. A niche refers to the position occupied by a population in time and space in an ecosystem and its functional relationship and role with related people. There are two main paths for the application of niche theory in enterprises. One is based on enterprise populations, Hannan and Freeman (1977), as the representative. In this theory, the enterprise niche refers to the resource space occupied by the enterprise population in the external environment. The other is based on a single enterprise, represented by Baum *et al.* (1994). In this theory, the enterprise niche refers to a certain set of characteristics of a firm in terms of resource requirements and production capacity. In the follow-up development, the former mainly focuses on the co-evolution of industrial clusters and niche-related enterprises. In contrast, the latter primarily focuses on describing the characteristics of enterprises, the ability to obtain resources and their relationship with the environment using the enterprise niche and further analyzes the current situation of enterprises. These foundational studies provide the basis and ideas for us to explore the competition situation of platform enterprises from the perspective of resources.

Among them, niche width and niche overlap are two indicators that can best reflect the degree of competition among enterprises. Niche width is used to measure the use of environmental resources of a population: the wider the niche, the more abundant the resources occupied by the enterprise. Existing research has confirmed that, on the one hand, expanding the niche width can enable enterprises to utilize various resources as much as possible; the enterprise niche width is an important variable that affects the enterprises' competition. The higher it is, the more suitable it is for the environment, and it is easier to succeed in the competition (Li, 2007). On the other hand, enterprises can continuously expand the width of the ecological niche through product platformization, reduce production costs and occupy more resources to gain competitive advantages (Huang *et al.*, 2016). Niche overlap measures the number of resources shared by two populations in an environment. The larger the indicator, the higher the degree of business overlaps between enterprises. Most of the existing studies advocate that enterprises should continuously open up or adjust their own business to reduce the overlapping degree of ecological niche, to form their unique competitive advantages (Li and Zheng, 2007; Yu and Liang, 2007; Hu and Zhang, 2010).

4.2 Design of platform enterprise niche indicators

The key to the measurement is how to combine the niche idea with the characteristics of platform enterprises. This paper mainly considers two aspects: first, the design of measurement indicators should be in line with the ecological niche theory, that is, it should be designed from the perspective of resource occupation and competitive environment of platform enterprises; second, the characteristics of platform enterprises should be integrated into the index design, such as reflecting the importance of network externalities, attention economy, innovation drive and other characteristics in the operation of platform enterprises as much as possible. Based on the above two aspects, and considering the availability of indicator data, this paper selects four fundamental data indicators (see Table 4). These indicators include not only the traditional indicator of ecological position: net fixed assets, but also indicators reflecting platform characteristics: R&D investment, number of active users (for the online shopping sector), website unique visitors and Baidu index. Specifically, R&D investment reflects the innovation-driven characteristics of the platform economy. The number of active users and website unique visitors reflect the important role of network externalities. The Baidu index reflects the features of the economy of attention.

Through the above four aspects, it can reflect that the gaps and advantages of enterprises in terms of resource accumulation and control.

Indicator name	Reason for selection	Source
Net fixed assets	Intuitive indicators that reflect enterprise assets, can represent the resource occupation of enterprises in terms of assets	Listed company financial report
R&D investment	It reflects the R&D and innovation capability of the enterprise	Listed company financial report
Annual Active Consumersor the total number of website unique visitors for the year	It reflects the enterprise's ability to possess user resources	Financial reports of listed companies, public reports of various research institutions and traffic query website: Alexa.com
Baidu Index Annual Average	It reflects the ability of the enterprise to occupy the attention resources	Baidu Index website: index.baidu.com

Note(s): 1. Due to differences in business, there are differences in the selection of targets that reflect the ability of users to possess resources. In online shopping, the number of active consumers is selected, and in other areas, the total number of independent visitors throughout the year is established; 2. Since Alexa, The data on the website is time-limited, so in other fields, only data from 2016 and later can be obtained, the same below

Table 4.
The index system to measure the niche of platform enterprises

Referring to the existing research, the calculation formulas of niche width and niche overlap in this paper are shown in Equations (1) and (2).

$$B_i = \frac{\left(\sum_i^n P_{ij}\right)^2}{\sum_i^n P_{ij}^2} \tag{1}$$

$$O_{jk} = O_{kj} = \frac{\sum_i^n P_{ij} P_{ik}}{\sqrt{\sum_i^n P_{ij}^2 \sum_i^n P_{ik}^2}} \tag{2}$$

In the above formula, p_{ij} and p_{ik} represent the proportion of resource *i occupied by j* and *k* species (enterprises), and n represents the resource type (Pianka,1974). In the specific calculation, all indicator data are normalized.

The above measures can help us clarify two aspects. First, the niche width reflects the total resources available to platform companies. The higher the index, the greater the competitive advantage platform companies have in ecological layout. Second, the degree of niche overlap reflects the resources substitutability of enterprises. The higher the index, the more intense the competition between platform enterprises may face during the ecological layout.

4.3 Measurement results

The measurement results of niche width are shown in Table 5, and the measurement results of niche overlap are shown in Table 6.

In addition to reporting the niche width, Table 5 also reports the scale (primary revenue) of each enterprise. It can be seen that in the area of online shopping, Alibaba has the highest niche width and Pinduoduo has the lowest. In the area of information portals, NetEase has the

Field	Enterprise	Index	2015	2016	2017	2018	2019	Average
Online Shopping	Alibaba	width	3.920	3.860	4.000	4.000	4.000	3.960
		scale	762.040	1011.000	1582.730	2502.660	3768.440	–
	JD.com	width	2.910	3.760	3.640	3.800	3.440	3.510
		scale	1810.420	2582.900	3623.320	4620.200	5768.880	–
	Pinduoduo	width	–	1.480	1.300	1.450	1.770	1.420
		scale	–	5.050	17.440	131.200	301.420	–
	VIPSHOP	width	2.640	3.640	2.750	3.630	3.560	3.240
		scale	402.030	565.910	729.120	845.240	929.940	–
	SUNING	width	2.170	2.660	2.440	2.250	2.190	2.340
		scale	1355.480	1485.850	1879.280	2449.570	2692.290	–
Information Portal	SOHU	width	–	2.700	2.400	2.100	1.890	2.270
		scale	–	108.900	122.760	124.080	122.100	–
	JINRONGJIE	width	–	2.360	1.950	1.640	1.530	1.870
		scale	–	5.480	2.840	2.970	2.310	–
	People's Daily Online	width	–	1.970	2.270	2.130	1.690	2.020
		scale	–	14.320	14.000	16.940	21.500	–
	NetEase	width	–	2.600	2.520	2.580	2.740	2.610
		scale	–	381.790	444.37	511.790	592.410	–
	IFENG.COM	width	–	1.270	1.250	1.390	1.360	1.320
		scale	–	14.450	15.750	13.770	13.280	–
	Sina	width	–	2.390	2.280	2.200	2.160	2.260
		scale	–	68.050	104.540	139.130	142.760	–
Life Serve	Ctrip	width	–	3.190	3.130	3.140	3.450	3.230
		scale	–	192.45	267.96	309.65	356.6600	–
	58.com	width	–	2.780	2.780	2.800	3.020	2.850
		scale	–	75.92	100.69	131.38	155.770	–
	Uxin	width	–	3.610	2.330	3.070	3.450	3.110
		scale	–	8.250	3.090	6.590	15.880	–
	Tuniu	width	–	2.200	2.270	1.800	2.280	2.140
		scale	–	105.310	21.920	22.400	22.810	–
	BITAUTO	width	–	3.150	2.050	3.220	3.620	3.010
		scale	–	57.730	87.510	105.800	107.530	–
	Autohome	width	–	1.870	1.570	1.890	2.270	1.900
		scale	–	59.620	62.100	72.330	84.210	–

Table 5.
The results of niche width for Internet enterprises 2016 (2015)-2019

Note(s): The scale in the table is approximated by the company's primary income data: the unit is 100 million yuan, the same below

highest niche width and IFENG.COM has the lowest. In the field of life services, Ctrip has the highest niche width and Autohome has the lowest.

The above content shows that in each segment, the leading companies generally have a high niche width, while some companies with relatively small revenue scales have a low niche width. This paper designs the indicator system and measures the ecological niche from the perspective of resources. The above conclusions also show that large-scale enterprises have a better resource base for ecological development. As a result, a common phenomenon has developed in the platform economy where large platform companies have started to diversify their business beyond their main business.

Table 6 shows that in online shopping, Alibaba and JD.com, JD.com and VIPSHOP have relatively significant niche overlaps, while Pinduoduo and VIPSHOP, JD.com and Pinduoduo have relatively small niche overlap. In information services, SOHU and JINRONGJIE, People's Daily Online and Sina have a significant degree of niche overlap, while People's Daily Online and NetEase, NetEase and Sina have a small degree of niche overlap. In life services,

Field	Enterprise	2015	2016	2017	2018	2019
Online Shopping	Alibaba – JD.com	0.810	0.960	0.950	0.980	0.930
	Alibaba – Pinduoduo	0.560	0.450	0.570	0.600	0.670
	Alibaba – VIPSHOP	0.330	0.880	0.830	0.950	0.940
	Alibaba – SUNING	0.650	0.740	0.780	0.750	0.740
	JD.com – Pinduoduo	0.450	0.580	0.550	0.620	0.630
	JD.com – VIPSHOP	0.980	0.940	0.920	0.930	0.860
	JD – SUNING	0.840	0.810	0.880	0.740	0.620
	Pinduoduo – VIPSHOP	0.340	0.790	0.330	0.580	0.590
	Pinduoduo – SUNING	0.510	0.850	0.690	0.940	0.960
	VIPSHOP – SUNING_	0.900	0.860	0.890	0.790	0.730
Information Portal	SOHU – JINRONGJIE	–	0.970	0.970	0.990	0.990
	SOHU – People's Daily Online	–	0.980	0.950	0.970	0.470
	SOHU – NetEase	–	0.340	0.250	0.210	0.200
	SOHU – IFENG.COM	–	0.550	0.510	0.450	0.400
	SOHU – Sina	–	0.950	0.940	0.900	0.810
	JINRONGJIE – People's Daily Online	–	0.990	0.860	0.920	0.340
	JINRONGJIE – NetEase	–	0.310	0.190	0.140	0.150
	JINRONGJIE – IFENG.COM	–	0.350	0.300	0.310	0.280
	JINRONGJIE – Sina	–	0.860	0.840	0.820	0.730
	People's Daily Online – NetEase	–	0.180	0.210	0.180	0.340
	People's Daily Online – IFENG.COM	–	0.410	0.740	0.660	0.990
	People's Daily Online – Sina	–	0.890	0.998	0.980	0.890
	NetEase – IFENG.COM	–	0.230	0.220	0.240	0.260
	NetEase – Sina	–	0.260	0.210	0.210	0.260
	IFENG.COM – Sina	–	0.770	0.770	0.800	0.860
Life Serve	Ctrip – 58.com	–	0.510	0.480	0.530	0.740
	Ctrip – Uxin	–	0.710	0.440	0.570	0.790
	Ctrip – Tuniu	–	0.590	0.540	0.490	0.820
	Ctrip – BITAUTO	–	0.200	0.360	0.240	0.180
	Ctrip – Autohome	–	0.310	0.300	0.310	0.500
	58.com – Uxin	–	0.960	0.900	0.970	0.980
	58 City – Tuniu	–	0.800	0.800	0.880	0.860
	58 City – BITAUTO	–	0.510	0.330	0.530	0.740
	58 City – Autohome	–	0.880	0.790	0.760	0.920
	Uxin – Tuniu	–	0.770	0.480	0.760	0.810
	Uxin – BITAUTO	–	0.710	0.320	0.600	0.820
	Uxin – Autohome	–	0.850	0.970	0.850	0.920
	Tuniu – BITAUTO	–	0.040	0.050	0.040	0.040
	Tuniu – Autohome	–	0.120	0.060	0.080	0.080
	BITAUTO–Autohome	–	0.030	0.040	0.040	0.060

Table 6.
The results of niche overlap for Internet enterprises 2016 (2015)-2019

companies with a significant niche overlap include 58.com and Uxin, Uxin and Autohome, and companies with less niche overlap include Ctrip and BITAUTO, and Ctrip and Autohome.

It can be seen that companies with larger niche widths do not have a high degree of niche overlap with each other, and it is rare for leading companies in the field to have high niche overlap. The high overlap of niches is mainly the overlap between medium widths, reflecting that the competition among medium-sized enterprises is more intense.

If an enterprise's niche width is used to represent its resource possession level, and its niche overlap is used to reflect the intensity of market competition, it can be concluded that its resource possession capacity and viability are related to its scale in the same direction, and there is an "inverted U-shaped" relationship between the degree of competition and the level of resource occupation.

5. Interpretation of the results

5.1 Basic conclusions

The actual measurement results of the enterprise niche show that the width of the niche will increase with the expansion of the scale of the platform enterprise. Still, the development of the niche width does not necessarily lead to an increase in the niche overlap. Enterprise clusters, often medium niche width enterprises.

This measure of increased niche width without increasing niche overlap seems to contradict intuitive experience. We try to interpret this result from a dynamic perspective. First of all, the long-tail effect in the platform market is significant, and the diversification of user needs provide a living space for small and medium-sized or start-up companies. Therefore, even in sites where the market structure is relatively concentrated, there are still various small and medium-sized enterprises or giant enterprises develop areas that are different from their primary businesses and enter emerging markets. For example, online shopping is mostly occupied by Taobao, Tmall and JD.com. However, there are still online shopping companies with distinctive features, such as Pinduoduo, Xiaohongshu, and Dewu. It is undeniable that in the early stage of establishing such enterprises, internal resources, such as their capital and technology and external resources such as user attention are minimal, so their ecological niche width is limited, and their viability is not strong. Secondly, with the expansion of enterprise-scale and niche width, competition for similar resources will inevitably lead to fierce competition. Therefore, it can be seen that after the enterprise develops to a specific scale, the degree of competition will gradually increase. In reality, the prominent competition cases in recent years have occurred in second-tier companies, such as Didi and Kuaidi, Meituan and Eleme, 58.com and Ganji, Ctrip and Qunar, and 58.com and Baixing.com. Finally, there will be "winners" in the competition, and these winners will eventually become big companies in the industry. Now giant companies occupy rich resources and have a broad ecological niche. Therefore, rational small and medium-sized enterprises will not choose to compete with large platform companies in mature areas, which goes back to the long tail effect and diversified demand characteristics mentioned above, and enterprises will open up new fields in a gradual manner. The difference from disruptive innovation is that although small and medium-sized enterprises will enter the market with innovations in their models, due to the gap in resource possession, small and medium-sized enterprises often do not enter the core business areas of giant enterprises. As a result, the competition in the platform market is mainly concentrated among second-tier companies. New entrants or start-ups do not have a competitive foundation, and giant companies have no apparent competitors. It can be considered that the current competitive situation formed by platform enterprises – the fierce competition mainly occurring in the second-tier enterprises – is a cross-border at a specific point in time. Figure 1 shows this relationship.

In Figure 1, circles represent different platform companies, the locations of the circles represent the types of businesses, and the radius of the circles represents the scale of the company. Figure 1 is a cross-border view of the development process of the platform market. It can be seen that the core business areas in the market, such as online shopping, instant messaging and search engines, are relatively mature. In those markets, a company often occupies a significant market share, forming the oligopolistic market structure. At the same time, the subsequent entry of enterprises will minimize the overlap with its business scope, so its oligopolistic position will not be shaken. Around the core business, there will be some differentiated and diversified businesses. Taking online shopping as an example, social e-commerce, fresh food e-commerce, O2O and other models that have emerging models in recent years are all based on diversified businesses outside the core business. In the diversified business field, there are various small and medium-sized enterprises, with a high degree of competition.

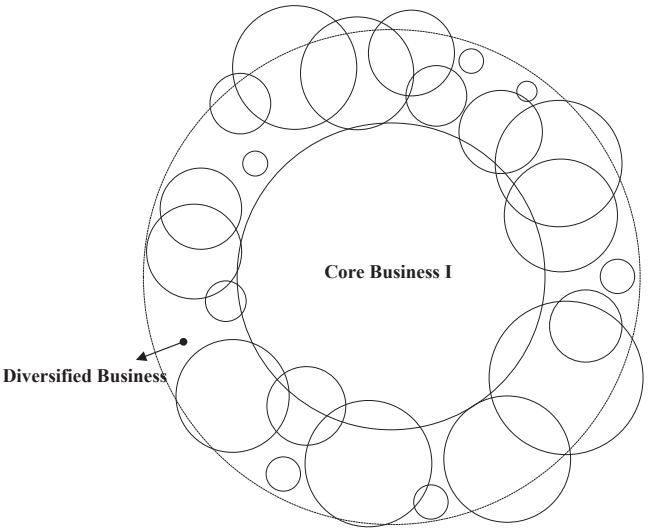

Figure 1.
Reflection of enterprise-scale, niche width and niche overlap in the market

5.2 Preliminary discussion on the ecological development of enterprises

Although the above discussion analyzes some characteristics of enterprise ecological development from resource possession, it is still based on the same field. If we want to further understand the aspects of cross-border competition of platform enterprises, we can try to select enterprises from different areas and examine the differences in resource occupation of these enterprises to understand the competition characteristics of giant enterprises under the ecological development. Next, we select companies with high niche width in each field, and use these companies as samples to remeasure the niche width and niche overlap, and explore whether there is the relationship mentioned above in the competition of platform companies in cross-border competition. The measurement results are shown in Tables 7 and 8.

In the mixed field, Baidu and JD.com ranked the top two in terms of niche width, while iQIYI had the lowest niche width. At this time, the enterprises at the top of the sample still have a broader ecological niche, and the niche width generally shrinks with the

Field	Enterprise	Index	2016	2017	2018	2019	Average
mixed field	JD.com	width	3.540	3.320	3.200	3.160	3.310
		scale	2582.900	3623.320	4620.200	5768.880	–
	NetEase	width	2.240	2.170	2.150	2.150	2.180
		scale	381.790	444.370	511.790	592.410	–
	Baidu	width	3.780	3.320	3.150	3.100	3.340
		scale	705.490	848.090	1022.770	1074.130	–
	Ctrip	width	2.610	2.770	2.810	2.850	2.760
		scale	192.450	267.960	309.650	356.660	–
	iQIYI	width	1.210	1.320	1.600	1.930	1.510
		scale	112.370	173.780	249.890	289.940	–

Table 7.
The results of niche width for Internet enterprises in mixed domain 2016 (2015)-2019

reduction of enterprise scale. However, from a more detailed point of view, there is no strict linear relationship between the niche width and the size of the enterprise. The size of JD.com and Baidu ranks first and second, respectively in the sample companies. However, the niche width of JD.com is wider than that of Baidu. At the same time, Ctrip and NetEase also have the same phenomenon. This result shows that even considering different business fields, the size of the enterprise may indeed increase the niche width. It is not only the size of the enterprise that determines the niche width of the enterprise, but also related to factors such as the type of business and the way of operation of the enterprise, because these factors are also profound, it affects the heterogeneity of the resource demand of enterprises.

The highest degree of niche overlap is concentrated between NetEase and Ctrip, Baidu and IQiyi, because this article discusses the niche overlap of platform companies from the perspective of resources. Therefore, the calculation results are consistent with the previous conclusions. However, the calculation background here is different business fields, so the way of overlapping is closer to the situation shown in Figure 2. Company A belongs to the core business I market, and enterprise B belongs to the core business II market. The core businesses of the two enterprises are different, but there is a significant overlap in the derivative business (the shaded part in the figure). It is worth noting that this niche overlaps and still does not involve core business areas.

On the one hand, the overlapping subjects are still medium-sized enterprises in the second echelon. From entering the market to gradually developing into maturity, they will deliberately avoid competing with the most mature core businesses in the market; on the other hand, giant enterprises are seeking new profit points; When starting an ecological layout, rational operators will not set foot in the core business areas dominated by other big enterprises, but the resulting derivative companies will overlap with enterprise B, which has grown up with similar development ideas. Competitors form competition in the areas of derivative businesses, and not in the core business of the market or the main business of the company itself.

In addition, giant companies will also expand into diversified business areas after they have "stabilized" in the core business market. One way is to develop new businesses incrementally. For example, based on Taobao.com, Alibaba uses Xianyu.com to enter the online second-hand trading market. Another way is to rely on its capital advantages to enter areas with a large gap between its primary business through mergers and acquisitions and strategic shareholding. According to the investment distribution of large-scale platform companies published by *IT Orange*, Tencent has invested in more than 900 companies, including entertainment media, games, corporate services, finance, etc.; Alibaba has invested

Table 8.
The results of niche overlap for Internet enterprises in mixed domain 2016 (2015)-2019

Field	Enterprise	2016	2017	2018	2019
Mixed field	JD – NetEase	0.670	0.490	0.580	0.600
	JD – Baidu	0.970	0.770	0.740	0.700
	JD – Ctrip	0.760	0.550	0.620	0.640
	JD.com – iQIYI	0.620	0.450	0.410	0.430
	NetEase – Baidu	0.600	0.590	0.550	0.570
	NetEase – Ctrip	0.980	0.950	0.950	0.950
	NetEase – iQIYI	0.130	0.160	0.230	0.320
	Baidu – Ctrip	0.840	0.790	0.750	0.790
	Baidu – iQIYI	0.750	0.850	0.900	0.930
	Ctrip – iQIYI	0.300	0.440	0.510	0.610

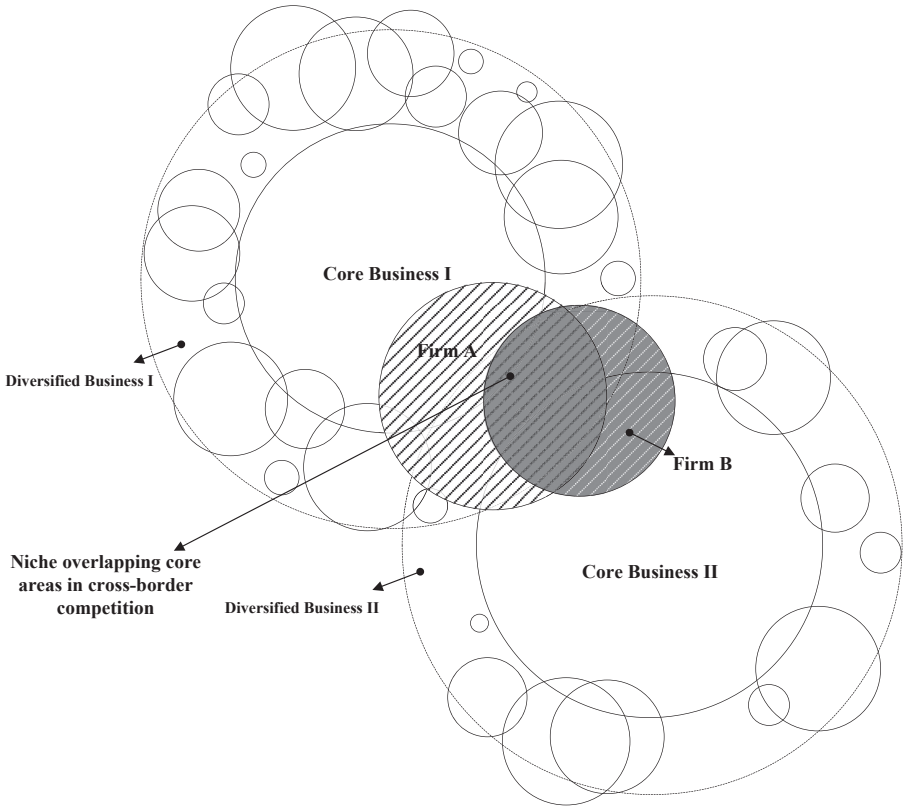

Figure 2.
Schematic diagram of the relationship between enterprise-scale, niche width and niche overlap under cross-border competition

in nearly 600 companies, including incorporate services, entertainment media, finance, etc. Similarly, Baidu, JD.com and other companies are also involved in the above investment fields.

It can be seen that large enterprises have overlapping investment directions during ecological expansion, but they hardly involve the core business areas of other giant enterprises. Coupled with the deliberate avoidance of core areas when other small and medium-sized enterprises enter the market and expand their business, large enterprises will be more confident in their core business areas. Of course, there are also some giant companies whose businesses are highly overlapping due to their ecological development. For example, Tencent Manager, developed by Tencent to enter the field of network security, has almost the same function as Qihoo 360's flagship product, Security Guard. The first case of Internet anti-unfair competition - "3Q war" was born. The occurrence of this case, on the one hand, shows that when the platform economy entered the fast lane more than ten years ago, it was inevitable that some competitive strategies with the nature of trial and error would emerge. Competitive behavior will bring significant losses to the enterprise, which will also serve as a wake-up call for the future development of platform enterprises. There seems to be a tacit understanding of "non-aggression, divide and rule" among large platform companies.

6. Policy implications: discussion on the necessity of anti-monopoly in the platform economy

The results of this paper show that large platform companies have a significant advantage over various resources in the market. On the one hand, this advantage forms a market barrier for other companies to enter the field, making them a stable monopoly or oligopoly in the central business field. The possession of resources by big platform companies strengthens the sustainability of their monopoly position and exacerbates the possibility of their monopolistic behavior. On the other hand, giant companies also have enough resources to expand their business in different fields and build their business ecosystem, making the platform market likely to develop in a "corporate faction" model, such as Alibaba, Tencent, Toutiao, etc. The intensified competition of enterprises based on "corporate factions" has led to unfair competition among small and medium-sized enterprises supported by big platform enterprises; at the same time, the ecological development and cross-border competition of giant platform enterprises will form a cross-border monopoly pattern, and the conventional market barriers will also be expanded from the traditional single field to cover multiple areas. From the stable possession of resources to the construction of market barriers in many fields or even all areas, giant enterprises will eventually form a more substantial monopoly power, which increases the possibility of their monopolistic behavior. With the improvement of the market, there will be more diverse and hidden ways to occupy consumer surplus, such as price discrimination based on big data, which is a new type of monopoly behavior in the platform field under the blessing of technology.

Based on the above understandings, the platform economy needs to move from inclusive development to standardized development. The corresponding anti-monopoly policies should also be innovative.

When only focusing on a single field, the network externalities of the platform economy and other characteristics determine the high concentration of the market, but the highly concentrated market structure has no solid evidence to show that such a market structure will have a significant impact on market efficiency due to economies of scale and other reasons (Jing, 2018). This paper examines the competitive relationship of platform companies in many fields, and points out that large platform companies have obvious competitive advantages, which are reflected in the fact that they can quickly enter the market in other business fields through the foundation accumulated in the main business field. Frequent entry into other markets actually aggravates the possibility of business overlap and is more likely to lead to unfair competition. Therefore, for anti-monopoly in the field of platform economy, we should change our thinking. On the one hand, we should pay attention to the unfair competition or monopolistic behavior of platform enterprises, rather than just relying on the concentration of market structure as the basis for supervision.

Specifically, in anti-monopoly legislation and enforcement of the platform economy, there should be different control methods for enterprises of different scales. For large enterprises, more attention should be paid to the issue of market power, especially when it involves multiple commodity or service markets. It is necessary to consider all relevant commodities or services comprehensively. To restrain the possible unfair competition and monopolistic behavior of giant enterprises, they should be regulated in advance, e.g. through huge fines, disclosure of information on bad behavior, etc., to reduce the possibility of their monopolistic behavior with the idea of "deterrence", while avoiding the more covert monopoly that it may generate.

From the perspective of small and medium-sized competitors in the relevant market, the fiercely competitive market environment will accelerate the mechanism of survival of the fittest in the market. The whole play of the market mechanism will induce unfair competition among

enterprises to a certain extent. Therefore, for the purpose of enhancing market vitality and cultivating market innovation, attention should be paid to support for start-ups. At the same time, regulators should focus on the correct guidance of their compliance operations, promoting the growth of platform companies and releasing the platform economy bonus for consumers, to create an open, inclusive and innovative platform ecosystem.

Note

1. Article 19 of Chapter 3 of the Anti-Monopoly Law stipulates: "A business operator may be presumed to have a dominant market position under any of the following circumstances: (1) A business operator's market share in the relevant market reaches half; (2) The combined market share of two operators in the relevant market reaches two-thirds; (3) The combined market share of the three operators in the relevant market reaches three-quarters.

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