The evolution of a symbiotic ecosystem of Chinese e-commerce retail logistics in the post-COVID-19 epidemic era

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Abstract. Since February 2020, the COVID-19 pandemic has spread across the world, greatly affecting the global economic situation and peoples lifestyles. Mass consumption has shifted from offline to online, suggesting a permanent trend and making e-commerce one of the few industries to go against the global trend of economic downturn. With a continuous increase in online consumption, the supporting logistics ecosystem has also evolved. By analyzing and comparing the development status of e-commerce logistics industries before and after the initial impact of COVID-19, this paper finds that after the initial impact of COVID-19, China's e-commerce logistics ecosystems are more stable, and an e-commerce logistics ecosystem in China, consisting of a guiding layer, a backbone layer, a filling layer, a basic layer and a bearing layer, has taken shape, providing strong support for the continued development of e-commerce in China.

The COVID-19 global pandemic forced countries around the world to control the epidemic by establishing a variety of quarantine policies, and implementing quarantine policies that have affected the normal functioning of national economies to varying degrees. Despite the efforts of governments to weaken the negative impact of quarantine policies on economic development, statistics and forecasts given by the World Bank and the World Monetary Organization show that all national economies will experience varying degrees of slowdown or even recession in the coming years [1,2]. At the same time, consumers changed their spending habits under quarantine policies and increased online shopping, resulting in e-commerce rising against the trend of overall economic downturn [3-6]. To adapt to the rapid development of e-commerce, e-commerce logistics system – an important support industry for e-commerce – has evolved, with logistics enterprises and players influencing and constraining each other in a relatively stable and dynamic equilibrium over the past few years. Compared to the logistics ecosystem commonly defined as consisting of logistics enterprises together with other related industries, the logistics ecosystem in this paper consists only of the participants within the e-commerce logistics industry [7]. The division of labor among the components in an evolved e-commerce logistics ecosystem is clearer, as

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the objectives are more explicit. And a symbiotic logistics ecosystem adapted to the new economic realm of e-commerce is better developed. A study of the evolution of the e-commerce logistics ecosystem can effectively help logistics enterprises to clarify their position in the ecosystem, help e-commerce practitioners to choose logistics modes better suited to themselves, and effectively help solve problems arising in e-commerce activities.

1 The impact of COVID-19 on the world economy

1.1 The impact of COVID-19 on GDP of major economies

In February 2020, the global economy was hit hard by the COVID-19 pandemic. According to the World Bank's data, in 2020, the GDP of major economies will be adjusted by -3.4% in the United States, -6.4% in the euro zone, -2.7% in Russia and -4.6% in Japan. While it is the only major economy in the world to achieve positive economic growth, China's real GDP growth rate of 2.2%[1] is also well below the previously projected target of 7% growth.

<table>
<thead>
<tr>
<th></th>
<th>The World Bank</th>
<th>IMF</th>
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<tbody>
<tr>
<td></td>
<td>2020</td>
<td>2021e</td>
</tr>
<tr>
<td>China</td>
<td>2.2</td>
<td>8.1</td>
</tr>
<tr>
<td>United States</td>
<td>-3.4</td>
<td>5.7</td>
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<tr>
<td>Eurozone</td>
<td>-6.4</td>
<td>5.4</td>
</tr>
<tr>
<td>Russia</td>
<td>-2.7</td>
<td>4.7</td>
</tr>
<tr>
<td>Japan</td>
<td>-4.6</td>
<td>1.7</td>
</tr>
</tbody>
</table>

*e=estimate; f=forecast. Data source: The World Bank, IMF

Table 1 shows that after the overall negative growth in 2020, all major economies returned positive growth in 2021. However, the impact of the international situation has shown that the World Bank and IMF's growth prediction over the next two years have dropped significantly. The IMF is negative about the economic situation in 2022 and 2023, and the July 2022 expected growth rate has been adjusted from 3.6% down to 3.2%, 3.6% in 2023 down to 2.9%. This is the third time the IMF has lowered expectations, indicating that the global economy has not yet recovered from the impact of COVID-19.

1.2 The impact of COVID-19 on the world of e-commerce retailing

Unlike most traditional industries whose growth was hampered by the COVID-19 pandemic, e-commerce, due to its own particularities, has maintained a steady and sustained growth momentum in total and in share of all commerce at a time of global economic downturn. The total amount of the global online retail market will increase from US$3.5 trillion in 2019 to about US$5.7 trillion in 2022[8]. According to a report released by the United Nations Conference on Trade and Development (UNCTAD) [3], the share of online retailing as a part of retailing increases from 16% to 19% in 2020, with South Korea reporting the highest proportional share of 25.9%. In addition, according to government data from Australia, Canada, China, South Korea, Singapore, the United Kingdom, the
United States and other leading economies, online retail sales will grow from about $US2 trillion in 2019 to $US2.5 trillion in 2020 and about $2.9 trillion in 2021.

**Table 2.** Online retail sales in selected economies of UNCTAD from 2018 to 2020.

<table>
<thead>
<tr>
<th>Country</th>
<th>Total retail sales (billions of dollars)</th>
<th>Online retail sales (billions of dollars)</th>
<th>Online share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>5755 5957 5681</td>
<td>1060.4 1233.6 791.7</td>
<td>18.4 20.7 14.0</td>
</tr>
<tr>
<td>United States</td>
<td>5269 5452 5638</td>
<td>519.6 598.0 719.7</td>
<td>9.9 11.0 14.0</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>565 564 560</td>
<td>84.0 89.0 130.6</td>
<td>14.9 15.8 23.3</td>
</tr>
<tr>
<td>Korea</td>
<td>423 406 403</td>
<td>76.8 84.3 104.4</td>
<td>18.2 20.8 25.9</td>
</tr>
<tr>
<td>Canada</td>
<td>467 462 452</td>
<td>13.9 16.5 28.1</td>
<td>3.0 3.6 6.2</td>
</tr>
<tr>
<td>Australia</td>
<td>239 229 242</td>
<td>13.5 14.4 22.9</td>
<td>5.9 6.3 9.4</td>
</tr>
<tr>
<td>Singapore</td>
<td>34 32 27</td>
<td>1.6 1.9 3.2</td>
<td>4.7 5.9 11.7</td>
</tr>
</tbody>
</table>

Data source: IMF

**Table 3.** Changes of total retail sales and online retail sales in selected countries before and after the epidemic.

<table>
<thead>
<tr>
<th>Country</th>
<th>Total retail sales increased year-on-year from the previous year (%)</th>
<th>Year-over-year growth in online retail sales over the previous year (%)</th>
<th>Online share increased compared to the previous year (%)</th>
<th>Online share growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>3.51  -4.63</td>
<td>16.33  14.65</td>
<td>2.3  4.2</td>
<td>1.8</td>
</tr>
<tr>
<td>United States</td>
<td>3.47  3.41</td>
<td>15.09  32.39</td>
<td>1.1  3</td>
<td>2.7</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>-0.18  -0.71</td>
<td>5.95  46.74</td>
<td>0.9  7.5</td>
<td>8.3</td>
</tr>
<tr>
<td>Korea</td>
<td>-4.02  -0.74</td>
<td>9.77  23.84</td>
<td>2.6  5.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Canada</td>
<td>-1.07  -2.16</td>
<td>18.71  70.30</td>
<td>0.6  2.6</td>
<td>4.3</td>
</tr>
<tr>
<td>Australia</td>
<td>-4.18  5.68</td>
<td>6.67  59.03</td>
<td>0.4  3.1</td>
<td>7.8</td>
</tr>
<tr>
<td>Singapore</td>
<td>-5.88  -15.63</td>
<td>18.75  68.42</td>
<td>1.2  5.8</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Table 3 shows that among the countries selected by UNCTAD, with the exception of China the year-on-year growth rate of online retail sales is greater than 20%, with Canada, Singapore and Australia all growing by more than 50% year-on-year, and the United Kingdom also exceeding 40% (The year-on-year growth rate of online retail sales in China is below 20% due to the large base of online retail sales). Online retail sales in major countries are expanding rapidly as a percentage of total retail sales, with UK online retail sales in 2020 growing 8.3 times faster than the previous year, the highest among the selected countries. The rate of growth values for the other countries in this study are: 1.8 times for China, 2.7 times for the United States, 2 times for South Korea, 4.3 times for Canada, 7.8 times for Australia, and 4.8 times for Singapore. China, one of the most mature country in the online retail market, has reached a bottleneck in growth and has opened a new generation of online retail models, namely live streaming e-commerce and online
community retail, which for technical reasons are difficult to account for. For this reason we suggest that that the actual online retail sales in China exceeds that shown in the statistical data.

1.3 Impact of COVID-19 on consumption habits

Accenture reports that COVID-19 has driven many users who were not yet fully digital to move from offline to online and to adopt new interaction habits; a change that is not expected to be reversed [9]. As COVID-19 continues to undergo mutations and new outbreaks continue around the world, delaying the end of the pandemic, it is expected that consumer habits will continue to be affected for a time to come. Thus, it is expected that e-commerce volumes will maintain a high growth rate into the future.

2 The impact of COVID-19 on China’s logistics

With continued development of e-commerce, logistics, as a supporting industry, has also undergone a period of rapid development. China, as one of the first countries to recover from the COVID-19 economic downturn, has gained a head start in the development of retail e-commerce logistics in the post-COVID-19 era, and the direction of further development is focused on three aspects: automation, intelligence and digitalization.

2.1 Logistics automation

The advantages of logistics automation can be clearly seen in the early outbreak of COIVD-19 in February 2020, which erupted during the Chinese New Year when a large number of migrant workers returned home, causing a shortage in human resources and preventing the initial logistics models in the city from functioning properly. The lack of human resources was filled by a range of automated equipment, including warehousing machines, drones, and unmanned vehicles.

Warehouse machines solve the problem of warehouse sorting by using automated equipment such as automatic matrices and automatic sorters to dramatically improve the efficiency of warehouse sorting. Data show that JD’s "Asia No.1" sorting center in Zhengzhou can handle more than one million orders per day on average, and the sorting efficiency is five times higher than traditional operations [10]. At the same time, the time needed to erect a robotic warehouse is about 1/4 of that of an unautomated warehouse, and makes subsequent maintenance and expansion more flexible.

Drones and unmanned vehicles solve the problem of logistics delivery. Currently, retail logistics systems around the world are facing a problem in the ‘last mile’. With the continuous development of e-commerce logistics, greater demand is placed on the requirements for logistics and delivery services. The point-to-point process has not met the needs of consumers, as home delivery has become a basic service and consumers demand greater choice in time and mode of delivery service. This task is difficult to accomplish using only human resources, as many consumers choose delivery times that fall outside of normal working hours. During the pandemic SF Express's drones, JD's unmanned delivery vehicles and other technical products offered effective solutions to this ‘last mile’ problem [11].

The continuous development of driverless car technologies can also help to complete the process of cargo transportation. Although this technology is not currently widely used, technology companies such as Nuro, Trunk.tech, Google Waymo, AutoX and other
technology companies continue to develop L4 level driverless logistics vehicles that have been put to use in specific areas. It is foreseeable that the popularization of 5G technology and the maturity of related technology will bring large-scale use in the future.

2.2 Logistics intelligence

Logistics intelligence includes artificial intelligence logistics tools and systems. In order to control the spread of COVID-19, measures taken by governments such as the quarantine of personnel or localized lockdowns mean that the logistics system face more complex requirements and therefore need to be able to make rapid and accurate adjustments and optimizations. These rely on the use of IoT application architecture in express scenarios, 5G+Cloud warehouse, transportation, and distribution integration, 5G+IoT supported smart park solution architecture, and other technologies.

The application architecture of the Internet of Things in an express delivery scenario refers to the integration of wireless networks and the Internet, the targeted analysis and processing of object data, the use of information by artificial intelligence technologies such as cloud computing, the implementation of intelligent control, and real-time and accurate transmission of object information to users.

5G + Cloud warehouse transportation and distribution integration predominately solves two aspects about logistics warehousing. One is through the combination of 5G technology and big data analysis derived from logistics network traffic distribution and looking for the best location to establish a warehouse, planning the scale of the warehouse, and supporting further establishment of warehouse facilities. The second aspect comes via the monitoring platforms used to ascertain order volume, cargo volume, warehouse storage volume, warehouse heat maps and other abnormal data, cargo code identification, behavior detection, intelligent security, and vehicle management. These are needed to complete the management of the inventory system, equipment management system, task system, attendance system, and to manage the warehouse operation.

The use of 5G+IoT-supported smart park solution architecture establishes a smart logistics park by connecting the terminals in the logistics park. The platform integrates and coordinates to complete the operation, security, access, management, investment, and other applications of the logistics park, ultimately achieving a completely open, intelligent, integrated and connected logistics park.

2.3 Logistics Digitalization

The digitalization of logistics includes three dimensions: the digital supply chain, the digital collaboration platform, and the digital infrastructure service platform.

2.3.1 Digital supply chain

Under the support of blockchain, an immutable, transparent, and reliable product record is generated at every point in the supply chain in real time to support the operation of the supply chain of enterprises. Whereas in traditional chain supply models a supply problem upstream will affect the shipment of downstream manufacturer, resulting in a market shortage. Digital supply chains provide real-time and online services in all scenarios. By integrating data from various sources, they can conduct real-time acquisitions and provide analysis to better support forward-looking decisions of enterprises, thus bringing additional benefits. Data shows that an ‘always on’ supply chain can increase sales by 1-4%, reduce production costs by 5-10%, and reduce inventory by 20-30% compared with the traditional supply chain.
2.3.2 Digital collaboration platform

SaaS-based management systems improve collaboration between supply chain and logistics, complete manufacturing, distribution, and retail synergy in achieving end-to-end integration. This mainly includes the collaboration between a supply chain and an industrial internet platform, and the collaboration between a supply chain and a distribution/retail platform. The scope of business use is mainly in planning, warehouse management and collaboration, transportation management and collaboration, and intelligent scheduling.

2.3.3. Digital infrastructure services platform

Digital infrastructure service platforms are platform enterprises that provide related services or hardware, equipment, and other infrastructure for logistics operations, and make logistics operations more digital and standardized using the Internet of Things and other technologies.

The development of automation, intelligence and digitalization is an inevitable trend for the logistics industry to match consumer demand and technological development. However, this development process relies on a large amount of resources and technical reserves to support it, which raises concerns for larger logistics enterprises. Small, medium, and micro logistics enterprises, most without the ability to research and develop their own systems, can only wait for these technologies to become popular before considering using them. When the associated costs are reduced to an acceptable range such firms will look toward their own positioning beyond the market occupied by the leading logistics enterprises.

3 The evolution of logistics system under new e-commerce

3.1 Traditional e-commerce retail logistics before the evolution

China's e-commerce retail industry has become a large and mature industry since its emergence in the late 1990s, and having undergone more than 20 years of development its national online retail sales reached 13.09 trillion yuan in 2021. According to the ‘14th Five-Year’ E-commerce Development Plan issued by the Ministry of Commerce, the Central Internet Information Office and the Development and Reform Commission, the national online retail sales will reach 17 trillion yuan in 2025. This shows that development momentum will remain strong in the coming years. China’s mature e-commerce industry has driven the development of the e-commerce logistics industry, and express delivery, as a major component of e-commerce logistics, accumulating 108.3 billion pieces with a revenue of 1,033.23 billion yuan in 2021. This is expected to reach 150 billion pieces with revenue of 1.8 trillion yuan in 2025. All major e-commerce retail platforms except JD.com use third-party logistics. The traditional e-commerce logistics market share is occupied by large logistics enterprises, and small and medium-sized logistics enterprises struggle to survive.

3.2 Live streaming e-commerce logistics triggered a new form of logistics

COVID-19 led to new ways of working, living and learning and has given rise to new industries such as the home economy and the no-touch economy. As a result of the epidemic, live e-commerce has undergone explosive development. Data shows that the live e-commerce market has been growing rapidly since 2019, with an average annual scale of over a trillion. It has now become a mature part of the e-commerce retail segment, with
about 473 million users, and a market value of over 3.4 trillion. The scale of live commerce transactions is expected to account for about 1/4 of online retail sales in 2022.

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</thead>
<tbody>
<tr>
<td></td>
<td>Market size (billion yuan)</td>
<td>Growth rate (%)</td>
<td>User size (billion people)</td>
<td>Growth rate (%)</td>
<td>Penetration rate (%)</td>
<td>Penetration growth (%)</td>
</tr>
<tr>
<td>2019</td>
<td>4437.5</td>
<td>227.7</td>
<td>2.5</td>
<td>13.63</td>
<td>4.3</td>
<td>168.74</td>
</tr>
<tr>
<td>2020</td>
<td>12850</td>
<td>136.61</td>
<td>3.72</td>
<td>48.8</td>
<td>8.6</td>
<td>100</td>
</tr>
<tr>
<td>2021</td>
<td>23615.1</td>
<td>83.77</td>
<td>4.3</td>
<td>15.59</td>
<td>17.97</td>
<td>108.95</td>
</tr>
<tr>
<td>2022e</td>
<td>34879</td>
<td>47.69</td>
<td>4.73</td>
<td>10</td>
<td>24.1</td>
<td>34.11</td>
</tr>
</tbody>
</table>

Data source: 100ec.cn

As each live platform increases its support for streaming, a series of policies for merchants to be stationed on the platform to carry out live-streaming have been introduced to help offline merchants open their online marketing mode by implementing policies such as lowering technical service fees, optimizing the merchant stationing process, helping merchants to harvest initial traffic, training for online streamers to enhance their professionalism, subsidizing some goods, and reducing or waiving commissions. Opening the door of live marketing for offline individual businesses from the perspective of cost, entry process, staff training, subsidies, and so forth suggests China's e-commerce shows great vitality.

Originally, the rise of the e-commerce had a huge impact on offline physical stores, and isolation policies enacted during the epidemic have deepened their plight. With policy support, many offline physical stores began to shift their sales to the O2O model. The main customer group for this type of live streaming e-commerce comes from within the city or region where the retailed is located, and does not need the logistics service of large-scale transportation. These then derive a new O2O logistics ecosystem that requires a daily delivery of no more than 100 orders, and a delivery distance of no more than 10 km per order, with delivery generally done by the store owner themselves or other individual staff. With the development of live streaming e-commerce, more individuals such as taxi drivers, delivery drivers and other professionals are involved in this system in a personal capacity, and there are documented cases of commuters earning commissions on the way to work during their daily commute. This kind of logistics system can be regarded as a form of ‘crowdsourcing’. That is, with no fixed staff the models rely mainly on otherwise idle social resources to complete the delivery. This form of logistics emerged so that the lower rung of the logistics ecosystem can develop further, providing a more robust logistics ecosystem and a useful solution to the problem of the ‘last mile’ of logistics. For this new ecology, Ali Group, JD.com, Meituan and other Internet companies have launched their own crowdsourcing platform, further integrating otherwise idle social resources, providing an intermediary service offering further supervision, guaranteeing provision of service, and further promoting and improving the development of this model.

### 3.3 Online community retail logistics trigger new logistics forms

Online community retail is similar to live streaming e-commerce. Traditional community retail is concerned with offline purchases and constituent parts such as supermarkets, grocery stores and convenience stores in the community, and consumer groups have shown a certain consumer ‘stickiness’. With the development of mobile internet and instant
delivery, traditional community convenience stores and other retailers cannot meet the needs of consumers, and people’s consumption habits are gradually changing from in-store consumption to a combination of home consumption and in-store consumption. New online community retail models such as front-end warehouse and warehouse-store integration are beginning to emerge.

With the emergence of the online community retail model, consumers are increasingly accustomed to the consumption model of placing orders online and having them delivered to their homes within 2 hours, and this change in consumer habits has in turn driven the development of this model. The 3-5 km instant delivery range has expanded the coverage of retail store fronts/warehouses and provided consumers with more choices. This aligns with current consumption trends of diverse and frequent consumption and fragmented scenarios. The group buying model of community retail has also made a significant contribution to reducing the movement of people during epidemic control, while safeguarding the lives of residents.

The traditional community retail supply chain is a linear structure in which brands develop products and transfer them through distributors to downstream retailers and customers. Online community retailing places more emphasis on user demand-centric supply chain services, which are characterized by just-in-time delivery (delivery close to the customer, providing fast and on-time delivery services), low inventory sales, and inventory transparency.

Traditional B2C e-commerce merchants cover a comprehensive range of categories and require a nationwide supply chain and consumer network to support the number of orders. The supply chain of community retail e-commerce has strong localization attributes. Community retail usually takes the fresh produce category as the entry point, having obvious high-frequency and just-need characteristics. In the long-distance transportation process, the loss of fresh produce is serious, combined with the need for immediate delivery once it reaches the retail end of the community. The supply chain cost is significantly higher than traditional e-commerce logistics. Therefore, community retail usually needs to establish cooperation with the local supply chain, and fresh produce is sold from local sources as far as possible to ensure the control of logistics costs while completing efficient end delivery.

On December 22, 2020, the State Administration for Market Regulation, together with the Ministry of Commerce, organized Ali Group, Tencent, JD.com, Meituan, pinduoduo, and Didi to participate in the administrative guidance meeting to regulate the order of community group purchasing. These six internet platform companies are required to strictly regulate community group purchase business practices and comply with the ‘nine shall not’ ruling, significantly compressing the profits and advantages of large the internet platforms and guiding the online community retail industry back to the route dominated by small supermarkets and convenience stores. This allows for small and micro logistics enterprises and individual logistics personnel to participate in the developments, promoting the continued evolution of the logistics ecology and creating a favorable environment for the formation of a symbiotic logistics ecosystem.

4. The evolution of China's e-commerce logistics ecology in the post-epidemic era

With the development of new logistics models such as live e-commerce logistics and online community retail logistics, the logistics ecology traditionally controlled by CR8 has changed significantly, and the number of enterprises and practitioners involved in logistics has similarly increased. New e-commerce logistics models have emerged, and the original e-commerce logistics ecosystem consisting of large and medium-sized enterprises has
evolved into a symbiotic logistics ecosystem consisting of large enterprises, small, medium, and micro enterprises, and ordinary individuals. According to the characteristics of the roles assumed by each member of the symbiotic logistics ecosystem, and with reference to the composition of a natural forest ecosystems\[14\], the current e-commerce logistics market can be divided into a guiding layer, a backbone layer, a filling layer, a basic layer and a bearing layer.

4.1 Guiding layer

The guiding layer’s role is like the forest canopy layer in a forest ecosystem, and consists of large e-commerce logistics companies such as China Post, SF and Jingdong, which occupy most of the market share and gain the most profits while simultaneously bearing most of the market risks and policy impacts. They have the most resources and technology research and development capabilities within the ecosystem, and hold most of the technology patents that can drive the development of the industry. This partly determines the scale that the whole ecosystem can reach.

4.2 Backbone layer

The positioning of the backbone layer is similar to that of the understory layer in a forest ecosystem and consists of large and medium-sized e-commerce logistics enterprises such as ZTO Express, STO.Express, Yunda Express, and J&T Express. Its essence is like that of the logistics enterprises constituting the bootstrap layer, and most of them are listed companies. However, the influence, innovation capacity and R&D investment are not as strong as those located in the bootstrap layer, and the market risks and policy shocks they need to bear are much smaller. This part of the ecosystem has the highest share of the overall market and is the main stabilizing force of the whole ecosystem. It also has certain R&D capabilities and can make the layer leap to the upper layer under specific conditions (e.g., developing unique leading technologies).

4.3 Filling layer

This layer includes all logistics enterprises that only operate in a small region (e.g., a single province or city), and can be likened to the shrub layer in a forest ecosystem. It can only survive through the market share left over by the guiding layer and the backbone layer. With little regard for the risks brought about by the market and policy changes, and no ability to develop new technologies themselves, it is difficult to achieve a layer leap. At the same time, because it is difficult to compete with the upper two layers for survival resources, it may be easy for an enterprise to be eliminated by the competition. However, upon being eliminated, similar types of enterprises will soon appear to take over any vacated position.

4.4 Basic layer

This tier is comprised of individuals such as crowdsourced personnel involved in logistics. This layer in the ecosystem does not need to consider market risk and policy impact at all and can achieve layer change by attaching to the above layer (e.g., joining a parent company), but after the change no longer exists in the form of a separate individual, instead becoming part of the larger enterprise. Crowdsourcing in e-commerce logistics has long existed, Meituan, hungry and other take-out platforms are particularly active in the
evolution of e-commerce logistics system, and more individuals for ‘no extra time spent’, ‘by the way’ and other reasons participate in e-commerce logistics activities. This is in line with the concept of the ‘sharing economy’. The basic layer, as the bottom layer of the ecosystem, occupies little market share but retains great significance. On the one hand, the labor force is idle due to lower income or company closures caused by the epidemic, and activating these individuals to participate in e-commerce logistics activities can solve income and employment problems. On the other hand, more participants involved in e-commerce logistics brings greater possibilities for the above-mentioned layers. More participants engaged in the processes of e-commerce logistics brings greater possibility for the logistics enterprises mentioned above to supplement labor.

4.5 Bearing layer

The bearing layer in this ecosystem refers to the e-commerce market. The e-commerce market is the foundation of the whole e-commerce logistics industry, and the e-commerce logistics industry cannot exist separately from the e-commerce market. Like soil in a forest ecosystem, the fertility of the bearing layer determines the development scale of the whole ecosystem, and the development scale of the e-commerce market determines the development scale of the e-commerce logistics ecosystem. The layers above also feed the bearing layer, making the environment of the e-commerce market more solid, forming a virtuous cycle.

As consumer habits develop and mature it will become more difficult for logistics companies in the ecosystem to move up the hierarchy. Considering the characteristics of internet companies, we cannot rule out the possibility of downward acquisitions by companies in the guiding and backbone layers, or the evolution of monopolistic companies by merging with each other in the backbone layers, which will lead to further evolution of the ecosystem.

5 Conclusion

E-commerce in the post-COVID-19 era has become an important part of the domestic cycle, and the role played by e-commerce logistics in e-commerce is self-evident. The better promote the development of e-commerce, e-commerce logistics will have to strengthen its adaptability to help e-commerce and give full play to the advantages of its interactive convenience. At the same time, the new e-commerce model has seen the emergence of a new e-commerce logistics ecology, making the positioning of the constituent enterprises in the ecosystem clearer, the direction of development clearer, the ecosystem more stable, and the ability to address perceived risk between the various components more robust. Stable development of the e-commerce logistics ecosystem provides a solid foundation for promoting deeper reform and innovation of e-commerce and is of great significance to the common and sustainable development of both.

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