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Technological dividend sharing mechanism of internet platforms

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Abstract

Taking the sharing economy as an example, the article discusses the social basis for the development of the internet platform. It shows that the development of the sharing economy and internet platform not only benefits from its economic efficiency and social benefits but also relies on the sharing of technological dividends constructed by its technical characteristics and application, which have expanded the beneficiary groups and broadened the social basis of new technology.

Keywords: Technological dividend sharing, Internet platform, Sharing economy, Digital technology, Technology application

Phenomenon and question

With the deepening application of technology, internet platforms are widely used in social life and production and even show a monopoly trend in some fields, which has caused heated debate and stringent regulation. Among them, the sharing economy¹ that relies on the internet platform has developed rapidly in recent years and quickly expanded its influence. According to the data of the Sharing Economy Research Center of the State Information Center in March 2020, the transaction scale of the national sharing economy market reached 3282.8 billion yuan in 2019, which was an increase of 11.6% over the previous year. Among them, the scale of sharing economy transactions in life services, production capacity, and knowledge and skills are 1.73 trillion yuan, 920.5 billion yuan, and 306.3 billion yuan, respectively. In 2019, the number of participants in the sharing economy was approximately 800 million, the number of service providers was approximately 78 million, and the number of employees on platforms was approximately 6.23 million. Taxi, catering, accommodation, and other new forms of the sharing economy accounted for 37.1%, 12.4%, and 7.3% of the industry, respectively. At the same time, the penetration rates of online car-hailing, food delivery, shared accommodation, and shared medical care among netizens reached 47.4%, 51.6%, 9.7%, and 21%, respectively (National Information Center Sharing Economy Research Center 2020: 1). From 2015 to 2018, the proportion of online car-hailing passenger traffic in total taxi

¹ In different strands of literature, terms such as “peer-to-peer economy,” “sharing economy,” and “platform economy” are used to refer to the same economic phenomenon. To unify the terminology, except for direct quotations, the text uniformly adopts “sharing economy”.

passenger traffic increased from 9.5 to 36.3%, the proportion of shared accommodation revenue in the accommodation industry's room revenue increased from 2.3 to 6.1%, and the proportion of online takeaway revenue in the catering industry revenue increased from 1.4 to 10.6% (National Information Center Sharing Economy Research Center 2019: 1–2). These data demonstrate that the sharing economy has become an indispensable and important part of the Chinese economy.

The high economic efficiency and social benefits of the sharing economy have contributed to its rapid development, which is taken for granted by both academia and business. In contrast, the sharing economy has always faced resistance from multiple forces. However, little attention has been given to how the sharing economy and the internet platforms that it relies on can overcome resistance. In fact, the current development and application of digital technologies such as internet platforms have sparked intense disputes, confrontations, and even strong boycotts. In addition to strikes and boycotts in the sharing economy, there are threats to job opportunities by artificial intelligence, trade wars for the commanding heights of new technologies, class solidification, and ethical disputes that gene editing may cause.

Controversy, confrontation, and resistance to the application of new technologies often directly lead to the failure of advanced technology applications (Rogers 2002). Research on traditional industrial technologies has also shown that the sharing of technological dividends by stakeholder groups is critical to the success of technology applications (Zhang and Qiu 2009). The current disputes and confrontations about digital technologies such as internet platforms involve the interest distribution among countries, industries, or groups, and these all point to the distribution of technological dividends to a large extent. This article takes the internet platform and the sharing economy as examples to explore the distribution mechanism of technological dividends and its specific impact on the application of digital technologies.

The economic and social background of the sharing economy

The background of the sharing economy

The concept of “collaborative consumption”, which is closely related to the sharing economy, was pioneered in 1978 by Felson and Spaeth (1978), including traditional sharing, barter, leasing, trade, rent, gifts and exchange, and many other types. The generation and rapid development of the sharing economy in the current general sense are closely related to the decline in income and demand caused by the great recession of the global economy in 2008 (Cohen and Kietzmann 2014). In addition, the economic recession has also increased the relative cost of private property, which stimulates behaviors such as renting and sharing and further promotes the rapid development of the sharing economy (Gansky 2012). The demonstration effect of the great success² of Airbnb and Uber, which originated in Silicon Valley, has directly stimulated the development of the sharing economy (Martin 2016).

Sharing is a concept that corresponds to “possession.” Before the prevalence of the sharing economy, the possession of ownership and use rights was the aim of economic

² The two companies have created a myth of rapid growth in less than a decade: Uber went public on May 11, 2019 with a market value of \$76 billion, and Airbnb has been valued at more than \$30 billion.

property rights. The essence of “possession” is to obtain services and benefits through possession. If high-quality services and benefits can be obtained without possession, people’s motivation to own things will weaken. The development of the internet, especially the mobile internet, helps to achieve this to a great extent. The sharing economy based on the peer-to-peer (P2P) internet platform realizes the full utilization of idle assets, skills, time, and other resources, which gives people the opportunity to transcend ownership restrictions and drives the sharing of resource use rights (Botsman and Rogers 2015:8).

Internet platforms enhance the economic efficiency and social benefits of the sharing economy

There is no doubt that sharing has existed since ancient times (Belk 2010). For example, so-called “borrowing,” especially mutual borrowing and mutual assistance, has the meaning of sharing. “Gift” is also a typical behavior of sharing the right to use and ownership. The “social exchange” emphasized in sociological theory also includes the basic elements of “sharing.” However, what people usually call the sharing economy is not as simple as sharing behavior. It has expanded from a close community to an open digital community of loosely connected people, even anonymous people, and strangers. At present, the sharing economy especially refers to the sharing behavior and economic form based on digital internet platforms. Generally, the sharing economy indicates the sum of economic activities that utilize modern information technologies, e.g., the internet, with the sharing of use rights as its main characteristic, which features the integration of massive and decentralized resources to meet diversified needs (National Information Center Sharing Economic Research Center 2017: 2). From this point of view, although idle capacity, sharing concepts, and trust among strangers play a role in the development of the sharing economy, the internet platform is the underlying technological foundation for the sharing economy. The internet platform has expanded the scale of sharing and spawned some new forms of sharing.

The rapid development of the sharing economy has attracted great attention from multiple disciplines. Among them, economics and management focus on the profit model of the sharing economy, capital and market operations, and economic efficiency and security. Internet platforms that make full use of digital technologies such as the mobile internet, big data, and cloud computing not only significantly reduce the cost of connecting potential supply and demand through disintermediation and other means but also improve the accuracy and efficiency of matching between resource supply and demand (Parker et al. 2017: 72) and simultaneously expand the choices available to both suppliers and consumers, which drastically reduces the price of products and services (Richardson 2015). For example, online car-hailing has increased economic efficiency: its time utilization rate is 30% higher than that of taxis, and its mileage utilization rate is 50% higher (Cramer and Krueger 2016: 3). After car-hailing entered the market, deaths from drunk driving dropped significantly (Greenwood and Wattal 2017). With the help of the internet platform’s two-way anonymous evaluation mechanism, real-time positioning, online monitoring, and other technologies, it is possible to improve the quality of products and services and significantly improve security. Statistics from the Justice Big Data Research Institute of the Supreme People’s Court of China show that the

number of crimes committed by online car-hailing drivers in 2017 was approximately 10% of the number of crimes committed by traditional taxi drivers, and the online drivers' incidence rate of 10,000 people was only 7.69% of taxi drivers (Xu 2018).

The improvement in the safety of online car-hailing is largely due to the new police mechanism based on the internet platform. Online car-hailing platforms such as DiDi and Uber have launched corresponding safety measures. For example, Uber launched a one-click alarm function in May 2018. Passengers can directly call the police by clicking "Contact 911" on the app; Uber will also send key information such as the license plate, vehicle location, and driving route to the 911 commissioner. The real-time mutual evaluation mechanism between the transaction parties based on the internet platform also effectively improves the service quality. In the car-hailing industry, "low ratings (such as for rudeness, bad driving, or lack of street knowledge) can cause drivers to be dropped from the service" (Chase 2015: 157).

In addition, car-hailing and other sharing economies can provide more diverse services to meet individual needs, especially high-end needs, which were previously difficult to meet, thereby reducing the need for people to buy private cars and thus reducing the related social costs. The "China Smart Travel 2015 Big Data Report" revealed that in 2015, the success rate of taxis was 60%, and the success rate of online car-hailing was 89%. The annual empty running rate of Beijing taxis was 31%, while the annual empty running rate of online car-hailing was 11%. Express Carpool can reduce 630,000 vehicle trips per day, and hitchhiker ridesharing can reduce 513,000 vehicle trips per day. Together, they can reduce 1.143 million vehicle trips for the city, which is equivalent to saving 510 million liters of gasoline a year, reducing carbon emissions by 13.55 million tons, and generating the amount of ecological compensation equivalent to planting 1.13 billion trees (DiDi Media Research Institute et al. 2016: 37, 44–45). The research results of the Sharing Economy Research Center of the State Information Center (2019: 39) are similar, which support the conclusion that online car-hailing improves economic efficiency and social benefits. Under free competition, online car-hailing reduces travel costs and resource waste by linking and revitalizing idle vehicles. In many fields, the sharing economy increases market competition by increasing supply and reducing the price of products and services. For example, according to Priceonomics data, in most major cities in the United States, apartment prices on Airbnb are on average 21% to 50% cheaper than hotel prices, and Airbnb has also made hotel occupancy rates and prices in the same area continue to decline (Zervas et al. 2017: 690; Farronato and Fradkin 2018: 31).

The sociological focus on the sharing economy is broad. For example, the sharing economy helps to improve welfare and social benefits, make friends, and improve social trust (Botsman and Rogers 2015: 8–9). The sharing economy also helps to improve the social utilization rate of redundant and idle resources, reduce waste, promote environmental protection, and it also helps to achieve sustainable consumption; it can even promote social equity and justice, increase employment opportunities, reduce employment pressure, and enhance social integration (Chen 2009; Richardson 2015). The sociological perspectives are also diverse, including cultural (Martin and Upham 2016; Hamari et al. 2016), grassroots social innovation (Martinet et al. 2015), lifestyle movement (Haenfler et al. 2012), social integration (Felson and Spaeth 1978; Laamanen et al. 2015), social

segregation (Schor et al. 2015), and governance models (Bardhi and Eckhardt 2012; Hartl et al. 2016). Among them, some scholars focus on analyzing the social dynamics of the sharing economy, and some focus on exploring the social consequences of the sharing economy (Wang 2017: 24).

Overall, social science research on the sharing economy has extended from economic and commercial perspectives to social, institutional, and cultural perspectives and even to the technical level. However, the current technical analysis of the sharing economy is still limited to improving economic efficiency through new technologies. Both academia and industry take for granted that the sharing economy that relies on internet platform technology is safer, more efficient, and has significant economic and social benefits. Throughout human history, advanced and efficient technologies have not always been successfully applied. In fact, various forms of the sharing economy have been resisted and even banned.

The sharing economy encounters multiple obstacles

The application of new technologies often encounters various obstacles. The most typical are the restrictions of laws and regulations and the resistance of interest groups, especially when the new technology touches on the interest of stakeholders in the existing economic structure.

Institutional dilemmas limit the legitimacy of the sharing economy

New technologies are often not within the scope of the old system, and it is difficult to comply with the regulations of the old system. By matching supply and demand information online and facilitating transactions, internet platforms have far-reaching impacts on exchange, consumption, and production, with significant economic efficiency and social benefits. However, they also challenge existing systems, especially government regulatory systems. For example, house sharing is suspected of violating the Urban Planning Law, vehicle sharing is suspected of violating the Labor Law, and information sharing is suspected of violating Intellectual Property Law (Jiang and Wang 2017: 142).

According to old regulations, there are many non-compliances in the sharing economy. Since its origin, online car-hailing has encountered restrictions from regulations and even administrative bans. For example, Article 64 of the Regulations of the People's Republic of China on Road Transport (2004) stipulates that "Whoever violates the provisions of these Regulations and engages in road transport business without obtaining a road transport business license shall be ordered by the road transport management agency at or above the county level to stop the operation; Where there are illegal gains, the illegal gains shall be confiscated and a fine of no less than two times but not more than ten times the illegal gains shall be imposed; Where there are no illegal gains or where the illegal gains are less than 20,000 yuan, a fine of between 30,000 and 100,000 yuan shall be imposed; Where a crime is constituted, criminal responsibility is to be pursued in accordance with the law." According to this Article, car-hailing platforms, car-hailing drivers, and car-hailing vehicles are illegal because they run without obtaining an operating license.

In addition, even if both the driver and the vehicle have obtained licenses that meet regulatory requirements, people who engage in online car-hailing may still be convicted

of breaking the law. Uber in the United States initially cooperated with high-end car rental companies by using car rental companies' vehicles and drivers (both with operating qualifications) to carry out online booking services. In October 2010, Uber (then named UberCab), which had been online for four months, was jointly ordered by the San Francisco Municipal Transportation Agency and the California Public Utilities Commission to cease operations. U.S. government regulators found Uber to be in violation of the law on the grounds that Uber's taxi pricing model blurs the line between premium and affordable taxis, that rates were not reviewed and approved, and that vehicles were not painted in specified colors (Xu 2016: 42). According to this standard, it is undoubtedly more serious to illegally access private cars and drivers without operating qualifications.

As a pioneer in the sharing economy and online car-hailing, Uber received bans from almost all local governments when it expanded around the world. From 2014 to 2015, Uber received bans in Japan, South Korea, Germany, Denmark, the Netherlands, Thailand, Canada, Spain, France, and Belgium (Zou 2015). For example, in Brussels, Uber drivers could be fined 10,000 euros for picking up passengers through the app; in Barcelona, Uber drivers could be fined up to 6,000 euros and have their vehicles impounded, and in France, they were regulated by a peculiar 15-min law that requires customers to wait 15 min after booking for a pickup (Stephany 2016: 180; Cao et al. 2016: 22–23). Dutch courts issued an injunction against Uber. Dutch prosecutors declared that Uber was operating illegally and carried out continuous raids on Uber's offices in Amsterdam. At the same time, dozens of unlicensed drivers were arrested, and they even announced a criminal investigation into Uber's illegal operations. Uber in Frankfurt, Germany, has been sued by the local taxi operator consortium Taxi Deutschland. The court ruled that Uber was prohibited from using drivers without taxi operating licenses to offer its services and imposed severe penalties for violations of local transportation laws (each violation carries a fine of 250,000 euros) (Xu 2016: 96).

In China, online car-hailing platforms have also received bans and fines from local governments. On July 29, 2014, the Shanghai Municipal People's Government promulgated the "Measures of the Shanghai Municipality on Investigating and Handling Illegal Passenger Transport by Vehicles," which stipulates the following: "Service providers who use internet websites, software tools, etc., to provide car-hailing information shall abide by the regulations for passenger taxi dispatching services and provide information on the drivers and vehicles of passenger transport services to the Municipal Traffic Administration. If the municipal transportation administration department determines that the driver or vehicle of the passenger transport service does not have the qualifications to operate, the service provider specified in the preceding paragraph shall not provide the car-hailing information service." On August 12, 2014, the Beijing Municipal Commission of Transportation issued the "Notice on Strictly Prohibiting Car Leasing Enterprises to Provide Convenience for Illegal Operations," which stipulates that "It is strictly forbidden to use private vehicles or other nonrental vehicles for car rental operations" and that "leasing vehicles may not be used for business operations such as unlicensed rentals." On January 8, 2015, the Ministry of Transport affirmed the positive role of online car-hailing in meeting the high-quality and diversifying needs of the transportation market while

still prohibiting private cars from accessing the platform to participate in business operations. Following the “premier car” such as DiDi Taxi, No.1 Express, and Easy-to-Use Car, which were detained one after another, on April 7, 2015, Uber was determined to be an illegal operation, and its “premier car” was also fined and detained by the Beijing Municipal Traffic Enforcement Corps (Cao et al. 2016: 161).

Group boycotts weaken the social foundation of the sharing economy

Regulatory systems such as laws and regulations are often not implemented automatically but are propelled by relevant groups. The application of almost all new technologies will inevitably bring structural adjustment and conflicts of interest, leading to problems such as periodic unemployment and structural unemployment (Ricardo 1962; Schumpeter 1989). The sharing economy is no exception: shared bicycles have seized the market for traditional bicycle rental shops, and Airbnb carved up the customer source of traditional hotels. For example, in Austin in the United States, Airbnb has caused local hotel income to decrease by 8% to 10%, which greatly impacts low-cost hotels and non-business hotels (Zervas et al. 2017: 687). Online car-hailing directly endangers the interests of taxi companies and taxi drivers. Therefore, various forms of the sharing economy, such as online car-hailing services since their beginning, have been boycotted by related groups. Searching for “taxi strike to boycott online car-hailing” on Baidu can obtain 20,400,000 results.³ The interests of taxi drivers, taxi companies, and relevant government departments have been threatened due to the development of online car-hailing services. The specific manifestations are the depreciation of taxi licenses, the reduction in the number of passengers, the decline in unit prices, the decline in revenue, and even the reduction in fiscal and tax revenue of local governments. The boycott of groups whose interests have been damaged by car-hailing development is often an important force in promoting the implementation of laws and regulations.

In September 2012, Uber began operations in New York. At that time, New York City had only 130,000 taxis, which was insufficient. Before Uber entered New York, the New York City Government and Mayor Bloomberg tried to replace taxis models through Taxi of Tomorrow, Boro Taxi, E-Hail (which summons taxis through mobile apps), add new licenses (180,000), change the phone-hailing taxi to the green cab, and other measures to relieve traffic pressure. However, these measures were boycotted by taxi companies and drivers, who sued in court and hindered the process of issuing new licenses. As a result, Uber was welcomed by mayor Bloomberg and became the first mobile app approved for use in the first year of the E-Hail project (December 2012). However, even so, the government-promoted E-Hail project was forced to be suspended amid opposition from vested interests, especially taxis and high-grade car rental companies. This also forced Uber to adopt a different coping strategy by changing its antagonist posture and strictly abiding by the rules and regulations of the Taxi and Limousine Commission in New York, including vehicle conditions, driver qualifications, and personnel assessment (Xu 2016: 86–87).

³ The retrieval time occurred at 17:00 on July 9, 2021.

In 2014, taxi drivers in Paris and other cities broke out of the “Snail Operation,” which caused massive traffic congestion. In June 2014, the drivers of approximately 10,000 taxis in London went on strike at popular attractions in London to protest against Uber taking passengers (Cao et al. 2016: 152). In January 2015, taxi operators in Boston took the municipal government to court and accused the government of allowing unregulated companies to enter the market and devaluing taxi licenses. In June 2015, because the French government temporarily allowed Uber to operate, more than 2800 French taxi drivers organized “Snail Operation” again, and violent incidents such as overturning and burning vehicles and attacking Uber drivers occurred (Xu 2016: 108–109).

In China, because domestic online car-hailing companies such as DiDi initially developed the market through the model of cooperation with taxi companies and taxi drivers (online car-hailing companies installed e-hailing apps for taxi drivers for free and guided their use), the interests of taxi companies and taxi drivers were not threatened in the early stage but instead benefited from online car-hailing platforms. However, as online car-hailing platforms began to access private cars in large numbers in the second half of 2014, the market share of taxi companies and taxi drivers was reduced, and boycotts such as the taxi driver strike have never stopped since. Since the second half of 2014, Beijing, Shanghai, Guangzhou, Chengdu, Jinan, and Qingdao have successively taken law enforcement actions against online car-hailing platforms and drivers such as DiDi and Uber and have successively issued notices to prohibit private car owners from using the internet and mobile phone software to engage in business and have imposed severe penalties. In November 2014, Shenyang suspended the “premier car” service, and Beijing, Shanghai, Tianjin, Dalian, and Jinan also determined that the “premier car” service was illegal. On December 31, 2014, the first case of an online car-hailing labor contract dispute occurred in Tianjin. Between 2014 and 2016, taxi drivers went on strike and boycotted online car-hailing in many cities, including Shenzhen, Tianjin, Wuhan, and Nanjing.⁴

To a large extent, the boycott of online car-hailing originates from the loss of interest, which is manifested in the devaluation of taxi licenses, the decrease in the number of passengers, the decline in income, and the loss of tax sources. Taking New York as an example, its taxi license price was \$30,000 in 1974, \$76,000 in 1984, and \$220,000 in 2003 (Hodges 2010:138), and the price topped \$1.2 million in 2013 and then fell nearly \$300,000 in a year under the impact of Uber (Parker et al. 2017:60–61). In 2015, with the legalization of Uber, the price of a taxi license in New York further dropped to \$840,000 (Cao et al. 2016:167). In San Francisco, Yellow Cab Co-op, the largest taxi company, even filed for bankruptcy protection because of competition from Uber. Established in 1977, this old-fashioned taxi company had 530 taxi licenses, and the license value was \$1.32 million at its peak; however, under the impact of online car-hailing, such as Uber, the license price fell to \$650,000 (Rodriguez 2016). The same is true in China. With the operation of DiDi car-hailing and Uber in various cities, the price of taxi licenses has also shrunk significantly, which has caused fierce confrontations. For example, at the end

⁴ The relevant information was gathered from the internet.

of 2014 in Tianjin, a taxi license plate valued at 1.15 million yuan could only be sold for approximately 700,000 yuan in 2015 due to the impact of online car-hailing (Jiang 2015).

Under the impact of online car-hailing, the business volume of taxis has also decreased significantly. From 2015 to 2018, the total passenger volume⁵ of taxis and online car-hailing across the country increased from 43.85 billion to 55.07 billion, which is an increase of 25.6%; however, the taxi passenger volume fell from 39.67 billion to 35.07 billion passengers, and its proportion in the total passenger volume dropped from 90.5% to 63.7%, while the proportion of passenger volume by online car-hailing reached 36.3% (National Information Center Sharing Economy Research Center 2019: 20). Therefore, it can be seen that under the circumstance that online car-hailing is taking up market share, taxi passengers will decrease, which will endanger the income and employment of taxi drivers, and the interests of taxi companies will also be affected accordingly.

Decreased income and interests are undoubtedly important reasons for taxi drivers and companies to boycott online car-hailing through strikes. Existing studies give little attention to how the sharing economy overcomes obstacles and prohibitions to survive and even achieve high-speed development, and insufficient explanation is given from the technical level of the sharing economy. Although the existing research on the sharing economy emphasizes “sharing,” it is limited to the “sharing” of the right to use items and does not involve the sharing of the new benefits created by new technologies, that is, the sharing of “technological dividends.” Then, how did the sharing economy, such as car-hailing and the internet platform, overcome the boycotts and grow, and what role did internet platform technology play?

Technological dividend sharing mechanism of internet platforms

The sharing economy based on the internet platform has significantly improved the economic efficiency of production, distribution, exchange, and consumption. However, history has repeatedly revealed that new technology and economies with higher economic efficiency are not necessarily successful. Sharing economies such as online car-hailing continue to encounter institutional dilemmas, and group boycotts have fully demonstrated this point. If internet platforms and their new economies want to succeed, they must first overcome the abovementioned institutional constraints and the hostility and resistance at the practical level. In this process, the technical characteristics of internet platforms and their application cannot be ignored, which promote the sharing of technological dividends, expand the social foundation of new technologies and new economies, and then promote the application of new technologies and new economic development.

The openness of the internet platform reduces the threshold for sharing technological dividends and expands the beneficiary groups

Openness is an important characteristic of internet platforms. An internet platform is essentially an open electronic network: any electronic device can be connected to the internet as long as it supports the TCP/IP protocol to realize the exchange and sharing

⁵ Total passenger volume = cruise taxi passenger volume + online car-hailing passenger volume. Cruise taxis are also commonly referred to as conventional taxis or cabs. In the new statistical caliber, “taxi” already includes cruise taxis and online car-hailing taxis, but for the convenience of expression, unless otherwise specified, the taxis mentioned in this article refer to cruise taxis and do not include online car-hailing taxis.

of information and other resources. The internet platform provides an open and participatory structure (Parker et al. 2017: 6) and thus lowers the entry barriers for new economic forms based on it, including the sharing economy, which allows more people to have the opportunity to participate and get paid.

In the traditional taxi industry, although the operation varies among countries and regions, in general, the threshold of the taxi industry is relatively high, and drivers must pay a share of money on a regular basis (mostly in "months") or buy taxi licenses at a high price (Hodges 2010). Buying licenses may be more cost-effective for taxi drivers in the long run, but the upfront expense is large, and the barrier to entry is high. A taxi license in many cities in China is worth one million yuan or even more; taxi licenses in large foreign cities are more expensive, such as New York City and San Francisco, where the price of each license exceeds one million dollars (Parker et al. 2017: 60; Jiang 2015). This means it is difficult for most drivers to enter the taxi industry by purchasing a taxi license. Even in the monthly fee model, drivers who want to enter the taxi industry have to pay a risk deposit and other deposits and pass assessments and selection, even through bribery and other ways (Wang 2002).

Relatively speaking, the entry threshold of online car-hailing services is much lower. In the early days of online car-hailing, drivers who owned vehicles could directly access the platform, and drivers who did not own vehicles could also access the platform by leasing other people's or companies' vehicles. Taking DiDi as an example, drivers can apply for registration directly online on their official websites, and after passing the three steps of "upload driver information," "upload vehicle information," and "online assessment," they can then have a DiDi account and start to receive orders. Online car-hailing does not need to pay license fees, and monthly fees are undoubtedly lower, which also gives more drivers the opportunity to share the technological dividend created by new technologies.

According to a report released by DiDi Car-hailing in 2016, the DiDi car-hailing platform created 17.5 million flexible employment opportunities for society⁶ and directly provided 2.072 million drivers with a per capita income of more than 160 yuan per day. In the field of housing accommodation, several major platforms, such as Xiaozhu, Tujia, and Zhubaijia, have created more than 2 million direct and indirect jobs. In the field of life services, the number of registered delivery personnel on large-scale take-away platforms has exceeded one million (National Information Center Sharing Economy Research Center 2017:4). In 2018, more than 10 million online car-hailing drivers earned income on the DiDi platform and transported more than 10 billion passengers, and the total user journey mileage reached 48.8 billion kilometers; a total of more than 2.7 million riders earned income from Meituan, of which 670,000 riders were from poverty-stricken counties, which covers 94% of China's poverty-stricken counties (National Information Center Sharing Economy Research Center 2019: 39, 45). In 2019, the number of employed people on the internet platform reached 78 million, of which the DiDi platform created 12 million direct employment opportunities and more than 6.3 million

⁶ In 2015, there were only 2,626,338 taxi drivers in cities across China. The data come from the "2015 National Urban Taxi Employee Statistics," 2017, Insight and Info Network (<http://data.chinabaogao.com/jiaoton/2017/0X2915L2017.html>).

indirect employment opportunities (National Information Center Sharing Economy Research Center 2020: 1, 9).

In addition, the internet platform has significantly lowered the exit threshold. In the taxi industry, drivers still face a high exit threshold even if they choose the monthly fee model with relatively low sunk costs (compared to buying a license plate). Most of the taxi fee should be paid monthly, regardless of whether the driver carries out service or not and even when the driver cannot go to work due to illness or other reasons. If the driver terminates the labor contract in advance, he will risk his deposits being withheld or deducted (Wang 2002). It also leads to the fact that taxi drivers do not dare to take vacations easily, their work flexibility is less, and their daily working hours are longer because they can earn their own income beyond the fixed monthly fees only after working long hours every day. For example, if the fixed fee per day is 200 yuan, a taxi driver can earn income only if the turnover is higher than 200 yuan in the entire day. The sunk costs of early investment, such as monthly fees, constitute the exit threshold and costs of taxi drivers.

In contrast, online car-hailing does not use a fixed, regular fee model. Even if the platform charges a commission, the commission is accrued based on the amount of each transaction, not monthly or daily like a taxi. The new technology of the internet platform and its practical application have made the cost of entering and exiting the car-hailing industry for drivers with vehicles near zero, making part-time jobs possible and even mainstream. It effectively expands the benefits of internet platform technology by allowing more people to share the technological dividend, thereby expanding its social foundation. However, due to the difficulty of measuring and calculating the turnover of drivers, it is difficult for taxi companies to calculate real-time fees or commissions according to the turnover of taxi drivers. It is even impossible to measure commissions finely according to the turnover of each transaction.

Because of its openness, the internet platform can significantly reduce the entry and exit threshold and exit costs of many related industries. Even after regulations, car-hailing platforms like Uber in the United States do not have to follow the taxi industry's stringent access standards (Stephany 2016: 180). It essentially lowers the threshold for relevant interest groups to obtain the technological dividend of the internet platform so that more people and groups can share the technological dividend created by technological progress, which lays a broader and more solid social foundation for the successful application of technology.

The two-sided network effect has increased the ability of stakeholder groups to share technological dividends

In addition, the two-sided network effect of internet platforms amplifies the traditional supply economies of scale while spawning demand economies of scale; when the network is larger, it is more valuable. Parker and his colleagues (2017:19) pointed out that "Demand economies of scale are driven by efficiencies in social networks, demand aggregation, app development, and other phenomena that make bigger networks more valuable to their users. They can give the largest company in a platform market a network effect advantage that is extremely difficult for competitors to overcome. Demand economies of scale are the fundamental source of positive network effects, and thus

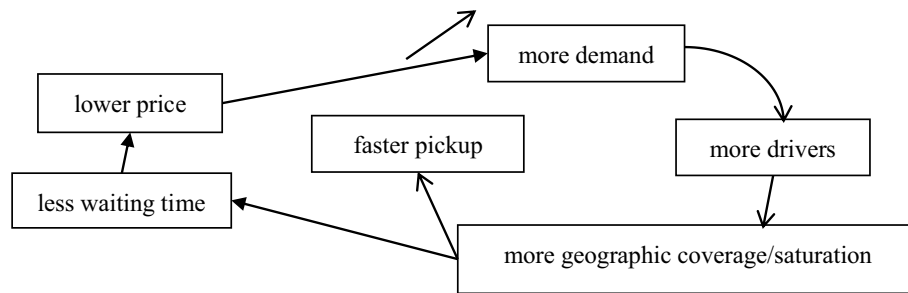


Fig. 1 Network effect diagram of online car-hailing (Parker et al. 2017:17)

the chief drivers of economic value in today's world." Driven by this two-sided network effect, the influence and value of supply and demand (such as online car-hailing drivers and passengers) have also increased. The mutual positive promotion relationship between the supply and demand sides on a car-hailing platform is a good example of this network effect (see Fig. 1). This is exactly the important reason why various sharing economies and, in a broader sense, platform economies are eager to use subsidies to attract the supply and demand sides of the platform. Such subsidies also enable platform users, including those on both the supply and demand sides, to share more technological dividends, at least before the platform gains a monopoly position, thereby expanding and strengthening the platform's own user base and social support.

In fact, even without considering subsidies, the average hourly wage of online car-hailing drivers is generally higher than that of taxi drivers (Hall and Krueger 2018). Sundararajan's (2017: 226) research further revealed that even after the platform collects commissions, workers in many industries on internet platforms earn higher hourly wages than those who find jobs through traditional channels.

In addition to the direct users of the platform, the internet platform also obtains more social support by creating value for offline stakeholder groups. As mentioned earlier, when Uber entered the New York market, it was strongly supported by Bloomberg, the New York City Mayor, for its ability to make up for the insufficient transportation capacity and alleviate traffic trouble, and it became the first mobile app approved for use in the E-Hail project to thus obtain the qualifications to conduct business in New York.

Technology application affects the opportunities and ability of stakeholder groups to share technological dividends

Although different online care-hailing companies rely on mobile internet platform technology, there are still subtle differences in the specific application of technology that eventually lead to significant differentiation. Uber, which first launched online car-hailing, initially opened only to car rental company vehicles and private cars (Xu 2016: 42) and refused taxis access to the platform. Even when Uber was conducting business in China, Uber refused taxis even though a large number of taxis were already connected to other car-hailing platforms, which is a typical model for Uber⁷ to expand its business

⁷ In very few cities (such as Tokyo, where the number of taxis is relatively abundant, the service quality is high, and the regulations are extremely complex and stringent), Uber allows taxis to connect to its platform.

globally. It also reflects Uber's specific application of the internet platform. In this case, taxis cannot access (regardless of their will) Uber's car-hailing platform. Taxi drivers not only cannot obtain the technological dividend created by the internet platform but also have been robbed of some customers by online car-hailing because of the application of the new technology, which results in intensified competition and reduced income. As a result, Uber has a direct competitive and even confrontational relationship with taxis, which has directly or indirectly led to strong boycotts from taxi drivers and taxi companies around the world.

In fact, the same technology can be applied in different ways and shape different technological dividend distribution results and social impacts (Zhang and Qiu 2009; Zhang 2013). Specifically, in the field of car-hailing, there are obvious differences in the application of internet platform technology by different car-hailing platforms. Unlike Uber, China's major online car-hailing platforms opened up the market by initially accessing (or at least not excluding) taxis.

For example, the DiDi App was launched on September 9, 2012. At the time, there were 16 drivers online in Beijing, all of whom were taxi drivers (Cheng and Liu 2016: 71). At the time, DiDi Taxi and KuaiDi Taxi, the predecessors of DiDi, provided only online taxi-hailing services for passengers,⁸ similar to the E-Hail project in New York City. The passenger clicks "I want to order a car" on the mobile phone and sends a voice message to give the specific location and destination. DiDi transmits the information to the taxi driver nearest the passenger. The driver can accept the order with one click on a mobile phone and contact the passenger directly (Cao et al. 2016:40). Since the services provided by online car-hailing platforms such as DiDi only call taxis for passengers, far from being competitors and threats to taxis, they are taxi helpers who can help taxis find passengers, which is especially useful in times and places where passengers are relatively sparse. Therefore, online car-hailing platforms such as DiDi did not encounter boycotts from taxi drivers and taxi companies at first but easily solved the credit problems and the short supply of vehicles and drivers that Uber had in its start-up period. More credible and reliable vehicles and drivers attract more passengers to join online car-hailing platforms, thereby achieving positive feedback on the two-sided network effect (see Fig. 1), which achieves faster growth and wins the fierce competition with Uber.

However, as online car-hailing platforms gradually connected to vehicles other than taxis (including private cars and car rental companies), such as DiDi Premier Car service launched in August 2014 (positioned for higher-end travel demands) and DiDi Express and DiDi Hitchhiker (with mainly private cars that are more comfortable and cheaper than taxis) launched in May and June 2015, online car-hailing platforms posed a greater and more substantial threat to taxis. Since online car-hailing platforms began to access non-taxi and launched premier cars, express cars, and hitchhiking cars, demonstrations, strikes, and other boycotts by taxi drivers have emerged. To date, although drivers of online car-hailing vehicles (such as premier cars and express cars) are drawn commission (approximately 20%) by online car-hailing platforms, taxi drivers still do not need to pay any fees to platforms. In the initial stage of the online car-hailing platform, the

⁸ Please refer to "Development History," DiDi official website, at <https://www.didiglobal.com/about-special/milestone> (retrieval date August 8, 2021).

participation of taxi companies and drivers promoted the development of the online car-hailing platform; however, in the case of a relatively sufficient supply of online hailing cars and drivers, the online car-hailing platform still does not charge a commission for taxis, which may be one of the effects of taxi drivers boycotting online car-hailing platforms.⁹ It also helps to moderate the hostility and boycotts of taxi drivers.

By connecting to the car-hailing platform, taxi drivers can also share the technological dividend of the internet platform. First, taxi drivers reduce possible losses in acquiring customers by joining the platform, which also helps to obtain better passengers and find passengers at special times. Second, with the competition brought by online car-hailing services, the monthly fees and license fees of taxis in various places have also dropped significantly, and the cost of taxi drivers has decreased accordingly. For example, the San Francisco Municipal Transportation Agency no longer charged taxi license renewal fees since 2015.¹⁰ Monthly fees in many cities in China have also declined, and the newly established "DiDi Haibo" taxi company in 2016 canceled the monthly fees of drivers for the first time.¹¹ Finally, taxi drivers can also freely transform into online car-hailing drivers. After all, Uber's success in many countries and regions is enough to show that it can grow without taxi drivers joining the car-hailing platform.

Moreover, since online car-hailing can easily escape the supervision of regulatory authorities, the strike of taxi drivers will even become an opportunity for online car-hailing vehicles to expand their market under certain conditions. For example, in June 2014, approximately 10,000 taxi drivers in London went on strike at popular tourist spots to protest that Uber had robbed them of their business, and Uber immediately offered free rides. As a result, citizens who could not get taxis had to download Uber, and the taxi driver strike prompted more people to choose Uber. According to Uber statistics, 850% of new users were added on the day of the strike parade (Cao et al. 2016: 152).

Compared with online car-hailing platforms that do not allow taxi access (such as Uber), the technology application adopted by Chinese domestic car-hailing platforms such as DiDi not only solved the supply dilemma of vehicles and drivers in the early stage of platform entrepreneurship by accessing taxis but also effectively alleviated the impact of online car-hailing on taxis, reduced the loss of taxi drivers, lessened the resistance of taxi drivers and taxi companies, and expanded their own living space and social foundation.

The cancellation of the monthly fees by DiDi Haibo for drivers is also a typical example of new technology benefiting the old interest group (taxi drivers). It will undoubtedly help domestic car-hailing platforms like DiDi gain more social support and development space in competition with Uber.

It can be seen that different technology applications can directly affect the interests of vested interest groups and influence the adjustment of the interest pattern. The case of online car-hailing has shown that internet platforms can fully incorporate old interest groups and realize the sharing of technological dividends. Moreover, with their previous

⁹ However, as the balance of power between the two sides changes or even reverses, it remains to be seen whether online car-hailing platforms will restrict taxi orders or charge commissions.

¹⁰ Previously, there was an annual fee of \$1,000 a year to apply for a taxi license from the agency.

¹¹ "Shanghai Haibo Taxi and DiDi have reached a cooperation and the first batch of 'online hailing cars' has entered the platform," 2016, China News Network (<https://www.chinanews.com/auto/2016/04-26/7848998.shtml>).

skills and knowledge, taxi drivers can easily find alternative jobs and income on car-hailing platforms, not only to compensate for the previous loss but also to have the opportunity to obtain a higher return than before.

Sharing of technological dividends promotes the development of the sharing economy

Technology beneficiary groups help expand the living space of the sharing economy

Internet platforms allow not only service providers (such as online car-hailing drivers and Airbnb landlords) to share technological dividends more conveniently but also service demanders (such as online car-hailing passengers and tenants) to enjoy lower prices and better service. All participants who share the technological dividend have gradually become loyal users and staunch supporters of the platform. The game between platform companies such as Uber and Airbnb and regulators fully reflects how technology beneficiary groups expand the living space of the sharing economy and how they ultimately help internet platforms gain legitimacy.

In October 2010, after operating online for only four months, Uber received a joint prohibition from the San Francisco Municipal Transportation Agency and the California Public Utilities Commission to stop operations, and in the process of seeking approval from government regulatory authorities, it mobilized netizens (mainly its chauffeurs and passengers) to organize a petition-signing campaign by sending mail to the mayor to protest; in this way, Uber expanded its own living space while protecting users' travel convenience rights, and it finally succeeded (Xu 2016: 42–44).

Moazed and Johnson keenly pointed out that Uber's users are its assets and even the largest asset in Uber's game with regulators. When Uber was preparing to launch the UberX service in the summer of 2012, the Washington City Council attempted to pass an amendment to a taxi regulation bill (the "Uber Amendment") to push Uber out of Washington. The Washington City Council submitted the bill at 4 p.m. on Monday and was ready to vote at 11 a.m. the next day. Uber fought back by mobilizing its users to write to the city council to express their demands. "In 18 h, 50,000 emails were sent by riders to the city council along with 37,000 tweets." As a result, the city council pulled the amendment at noon (Moazed 2017:103).

In September 2013, New York Attorney General Eric Schneiderman subpoenaed Airbnb to hand over all data on 15,000 New York City hosts and offered to arrest all those operating illegally. Soon after, 500 Airbnb hosts demonstrated at City Hall and waved posters. Douglas Atkin, Airbnb's Global Head of Community, emailed hundreds of thousands of customers: "I'm writing to you on behalf of Airbnb hosts ... because our community is under attack by officials and special interests." In defense of Airbnb, he called on users to add their name to an online petition, which gathered over 230,000 signatures. In May 2014, a state judge annulled the subpoena on the grounds of disproportion (Stephany 2016: 186–187).

In July 2015, under pressure from interest groups such as the taxi industry, New York City Mayor Bill de Blasio tried suppressing Uber's development. de Blasio planned to

cap the number of Uber online drivers temporarily. In response to de Blasio, Uber developed a "de Blasio Model" for users in New York City.¹² Uber also invited users to write to the mayor and city council, asking them to veto de Blasio's bill. As a result, data from the Wall Street Journal show that the mayor received 40,000 emails and 20,000 tweets. Finally, the mayor compromised and agreed to set a four-month observation period on congestion and no longer set a limit on the number of Uber vehicles. Although Uber has also used traditional PR tactics in this political battle, such as TV commercials and celebrity voices, as The New York Times put it, "the company (Uber) leaves much of its political lobby to its customers" (Moazed 2017:102–103). At the time, in addition to direct interest groups such as passengers who put pressure on government departments to support Uber through various channels, celebrities and stars also actively participated. Hollywood actor Neil Patrick Harris tweeted support for Uber: "@BilldeBlasio: 25 K new residents use @Uber_NYC each week. How is a fixed number of cars supposed to serve this demand for rides? #UberMovesNYC". This caused many repercussions on social platforms. Supermodel Kate Upton, CNBC's Amanda Drury, and others also joined the discussion and expressed solidarity with Uber: "@BilldeBlasio Why do you want to return to days when only those in Midtown & Lower Manhattan could get a ride? #UberMovesNYC," "@BilldeBlasio New York City traffic outside Manhattan 25% rely on Uber rides vs. 6% on taxi. Do you only care about Manhattan? #UberMovesNYC" (Xu 2016:141).

Legalization of the sharing economy

Why are sharing economy users, such as Uber and Airbnb, willing to speak for them, write letters to the mayor and city council to plead, put pressure, and even vote "no" for a bill that endangers the interests of the platform? The motivation may be diverse, but this behavior undoubtedly helps users to protect their rights and interests. Because the internet platform on which the sharing economy depends not only lowers the threshold for sharing technological dividends on the supply side but also creates new value for internet platform participants due to its significantly improved ability to match supply and demand and meet demand. All participants can share the technological dividend created by technological innovation. Internet platform participants, including demanders, have therefore become supporters of internet platforms. In fact, not only the direct participants of the internet platform may benefit from it, but also other indirect participants may benefit from the competitive effect caused by the development of the internet platform.

For example, Airbnb benefits not only its residents but also all consumers by lowering the price of hotel accommodations (approximately 6%) (Zervas et al. 2017:698). In the same way, the development of online car-hailing platforms such as Uber and DiDi will also help reduce the price of taxis or improve the quality of service. Because of this, consumers are willing to undertake relevant "public relations work" and contribute to the breakthrough of political and institutional restrictions on internet platform companies such as Uber. Although consumers may seek and protect only their own rights and

¹² The model shows that if de Blasio's bill passed, then passengers would wait longer.

interests, their rights and interests depend on the survival and development of the internet platform. Internet platforms and other related digital technologies provide them with low-cost, convenient, and efficient ways and channels to express their interests, so they will exert pressure on regulators to make the platform prosper.

The sharing of technological dividends and economic efficiency and security have laid the social and economic foundation of the sharing economy, and the support of stakeholder groups has further promoted its legalization process. On September 19, 2013, the California Public Utilities Commission (CPUC) granted legitimacy to online car-hailing companies such as Uber that rely on an internet platform to provide transportation services, characterized them as transportation network companies (TNCs), and created a new regulatory path so that TNCs do not need to comply with the stringent access standards of the traditional taxi industry (Stephany 2016: 180; Hou 2017: 99). This is factual evidence that internet platforms have lowered the threshold for the entry and exit of the taxi industry.

Subsequently, an increasing number of countries have gradually legitimized the internet platform companies represented by Uber, DiDi, and Airbnb. Even countries that strongly resisted before, such as Germany and South Korea, have permitted their domestic online car-hailing companies to operate following the law. In China, on July 27, 2016, the “Interim Measures for the Administration of Online Hailing Taxi Service Management” officially legalized online car-hailing and private cars on the platform. They directly promoted the application of internet platforms and the legalization of the sharing economy based on them.

Conclusion and discussion

Because of the digitalization and openness of digital technology, internet platforms can converge more social resources. With the assistance of technologies such as cloud computing, they can further achieve the accurate, efficient, and real-time matching of supply and demand, which, in turn, helps to solve problems such as supply and demand matching and pricing. In addition, the economic form that relies on the internet platform, especially the development of the sharing economy, also depends on the successful separation of possession and use rights and on the owners’ ability to derive benefits (rights) from their sharing behavior. This, in turn, depends heavily on transaction costs and the proprietary arrangements behind them (Coase 1960). Because of transaction costs, different rights definitions and distributions will bring different economic efficiencies and social benefits of resource allocation. In contrast, even if property rights are clearly defined, if the separation of possession and use rights can be achieved, then the utilization of resources and economic efficiency can be further improved, and greater total social benefit can be created.

Before the rise of internet platforms, although similar behaviors such as sharing and leasing were widespread, it was difficult for these behaviors to cross larger regional and group boundaries due to high transaction costs. On the one hand, these behaviors are limited by a lack of trust; on the other hand, it is also limited by a lack of information and information asymmetry. Internet platforms reduce not only search costs by aggregating massive amounts of information but also negotiation and contract costs in the transaction process by directly connecting producers and consumers through

disintermediation. They also accumulate and establish a credit system through the mutual evaluation mechanism of two or more parties to the transaction, which better solves the problem of credible commitments, thereby reducing transaction costs. On internet platforms, reducing transaction costs makes the transfer of use rights more profitable and can bring greater benefits. Moreover, each sharing or rental on an internet platform is identifiable, measurable, open, and transparent, further clarifying its right and return. It helps attract more social resources, especially idle resources, to enter internet platforms for trading and sharing.

In addition, the coordination cost and incentive cost for transactions always wax and wane: integration helps to reduce coordination costs, but it increases incentive costs; marketization reduces incentive costs but increases coordination costs, which also determines the size of the organization and its boundaries with the market (Coase 1937; Williamson 2002). With the assistance of new technologies, internet platforms can achieve both the incentive effect of marketization and the coordinative effect of integration, thereby significantly reducing transaction costs. The sharing economy is a typical example. Whether it is an online hailing car owner or a landlord, they are often independent operators rather than employees responsible for their profits and losses. However, internet platforms can coordinate them, such as by allocating the internal resources of an organization to achieve a better matching between supply and demand. The ability of internet platforms to achieve the same unity and coordination as within the organization without increasing the incentive cost means that the scale of internet platform companies can be much larger than that of traditional companies economically, even almost infinite until they are limited by state power. The rapid development of internet platform companies in recent years has confirmed this theoretical possibility, and they have grown into the world's largest group of companies in market value. The aforementioned leading sharing economy companies, such as Uber, DiDi, and Airbnb, have all experienced rapid development, and within a few years, they have reached a scale that is unattainable for most traditional companies. Apple, Amazon, Microsoft, Google, Facebook, Alibaba, Tencent, and other internet platform companies rapidly grew into the world's largest companies and the top ten of the world's largest market capitalization in 2019. Under the blessing of digital technologies such as internet platforms, the platform has risen rapidly as a new organizational form. It is between the market and the organization which blurs the boundary between the organization and the market. In addition, new technologies are also driving the platformization of society as a whole.

Internet platforms have significantly improved economic efficiency and laid an economic foundation for developing many economic forms that rely on internet platforms, such as the sharing economy and online shopping. However, economic efficiency is far from a sufficient condition for the success of the sharing economy. Although new technologies often improve resource utilization, increase productivity, and even better meet popular needs, they will almost inevitably be resisted and even fail if they fail to compensate for the losses of stakeholder groups. In contrast, if the loss of stakeholder groups can be compensated for and stakeholders can even benefit from it, then new technologies can lay a more solid and broad social foundation for themselves.

The same is true for developing the sharing economy based on internet platforms. As mentioned above, the sharing economy has significant advantages in the economy, but

its development has always faced various obstacles and even prohibitions from stakeholder groups and social and institutional levels. The sharing economy represented by online car-hailing and house-sharing makes full use of the technological characteristics of internet platforms, expands the scope of beneficiary groups by lowering the threshold of technological dividend sharing, and improves social welfare by matching supply and demand more quickly and effectively and promoting sharing. The innovation of technology application by DiDi and other companies has benefited the vested interest groups, enabled more groups to share the technological dividends, and thus created a solid foundation for the application of new technologies. The massive social foundation has expanded its survival and development space.

Although the sharing economy and the internet platforms it relies on are significant and far-reaching, it is only a prelude to the digital technology revolution in the long run. On the one hand, against the background of the current new round of technological revolution, both national competition and social progress are increasingly dependent on technological innovation. Governments have also introduced related incentive policies to compete for the commanding heights of technological innovation. The Chinese government has spared no effort in encouraging technological innovation and has even elevated it to the national strategic level, and technological innovation has achieved leading international advantages in some fields. On the other hand, the application of new technologies is often submerged behind the halo of technological innovation and even ignored as the inevitable continuation and result of technological innovation. The development of the sharing economy based on internet platforms reminds us once again that the successful application of new technologies with higher economic efficiency and stronger security also depends on the sharing of technological dividends. Therefore, to ensure and accelerate the successful application of new technologies so that new technologies can serve the national innovation strategy more rapidly and better, serve social development goals, and serve the needs of the people for a better life, it is necessary to build a sharing mechanism for technological dividends in the process of technological innovation and application.

In the long run, with the development of various new technologies, especially the great development of robots and artificial intelligence, human beings will eventually have the opportunity to enter an era of abundant goods. Optimists even believe that in the future, extreme productivity will push humans into an era of the Internet of Things that connects everyone and everything in a global network, even an era of nearly free goods and services (Rifkin 2017: 18). However, the development of internet platforms has once again reminded us that even in the digital age, even in the era of abundant goods and services, sharing can not come true automatically. Moreover, it is doubtful whether internet platforms will weaken the sharing of technological dividends when they achieve great success or even gain a monopoly position. On February 7, 2021, the “Anti-Monopoly Guidelines on the Platform Economy” issued by the Anti-Monopoly Committee of the State Council highlighted “choose one from two” and “differential treatment” and other platform behaviors that harm users’ rights and interests as warnings. Technology and its application profoundly affect the technological dividend distribution mechanism of digital technologies such as internet platforms. Achieving the sustainable sharing of

technological dividends still requires collaborative efforts and scientific supervision of the market, society, government, and other parties.

Abbreviations

P2P	Peer-to-peer
PR	Public relation
TNC	Transportation network companies

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We based our study on data, publicly available in the References.

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Competing interests

The authors declare they have no competing interests.

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References

- Belk, R. 2010. Sharing. *The Journal of Consumer Research* 36 (5): 715–734.
- Botsman, Rachel and Roo Rogers. Translated by Tang Chaowen. 2015. *What's Mine Is Yours: The Rise of Collaborative Consumption*. Shanghai: Shanghai Jiaotong University Press.
- Cao, Lei, Yanfei Chai, Yunyun Shen and Cao Dingzhe. 2016. *Uber: Open the "Sharing Economy" Era*. Beijing: China Machine Press.
- Chase, Robin. Translated by Wang Miao. 2015. *Peers Inc: How People and Platforms Are Inventing the Collaborative Economy and Reinventing Capitalism*. Hangzhou: Zhejiang People's Publishing House.
- Chen, Yu. 2009. Possession and Access: Consumer Desires and Value Perceptions Regarding Contemporary Art Collection and Exhibit Visits. *Journal of Consumer Research* 35 (6): 925–940.
- Cheng, Wei, Liu Qing et al. 2016. *DiDi: Sharing Economy Changes China*. Beijing: People's Posts and Telecom Press.
- Coase, R. 1937. The Nature of the Firm. *Economica* 4 (16): 386–405.
- Coase, R. 1960. The Problem of Social Cost. *The Journal of Law & Economics* 3: 1–44.
- Cohen, B., and J. Kietzmann. 2014. Ride On! Mobility Business Models for the Sharing Economy. *Organization & Environment* 27 (3): 279–296.
- Cramer, Judd, and Alan B. Krueger. 2016. Disruptive Change in the Taxi Business: The Case of Uber. *The American Economic Review* 106 (5): 177–182.
- Jiang, Daxing and Shoujie Wang. 2017. Legal Regulation of Sharing Economy. *Social Sciences in China*, Issue. 9.
- DiDi Media Research Institute, First Financial Business Data Center CBNDData, Watching Institute. 2016. "China Smart Travel 2015 Big Data Report", <https://www.docin.com/p-2148913594.html>.
- Farronato, C., & A. Fradkin 2018. The Welfare Effects of Peer Entry in the Accommodation Market: The Case of Airbnb. *National Bureau of Economic Research*, (Feb.). NBER Working Paper Series, no. 24361. <https://doi.org/10.3386/w24361>.
- Felson, Marcus, and Joe L. Spaeth. 1978. Community Structure and Collaborative Consumption: A Routine Activity Approach. *American Behavioral Scientist* 21 (4): 614–624.
- Gansky, Lisa. 2012. *The Mesh: Why the Future of Business Is Sharing*. Edmonton: Portfolio Trade.
- Greenwood, Brad N., and Sunil Wattal. 2017. Show Me the Way to Go Home: An Empirical Investigation of Ride-Sharing and Alcohol Related Motor Vehicle Fatalities. *MIS Quarterly* 41 (1): 163–187.
- Haenfler, R., B. Johnson, and E. Jones. 2012. Lifestyle Movements: Exploring the Intersection of Lifestyle and Social Movements. *Social Movement Studies* 11 (1): 1–20.
- Hall, Jonathan V., and Alan Krueger. 2018. An Analysis of the Labor Market for Uber's Driver-Partners in the United States. *ILR Review* 71: 705–732.
- Hamari, Juho, Mimmi Sjöklint, and A. Ukkonen. 2016. The Sharing Economy: Why People Participate in Collaborative Consumption. *Journal of the Association for Information Science & Technology* 67 (9): 2047–2059.

- Hartl, B., E. Hofmann, and E. Kirchner. 2016. Do We Need Rules for 'What's Mine is Yours?' Governance in Collaborative Consumption Communities. *Journal of Business Research* 69 (8): 2756–2763.
- Hodges, Graham, Translated by Wang Xu, et al. 2010. *Taxi!: A Social History of the New York City Cabdriver*. Beijing: The Commercial Press.
- Hou, Denghua. 2017. The Legal Status of Network Platforms in the Sharing Economy: Taking Car-hailing as the Research Object. *Tribune of Political Science and Law*, Issue. 1.
- Jiang, Chenghua. 2015. License Price drop from ¥1 million to Nearly Half: Taxi Industry's Internal and External Dilemma. *China Enterprise News*, May 26, 4th edition.
- Laamanen, M., S. Wahlen, and M. Campana. 2015. Mobilising Collaborative Consumption Lifestyles: A Comparative Frame Analysis of Time Banking. *International Journal of Consumer Studies* 39 (5): 459–467.
- Martin, Chris J. 2016. The Sharing Economy: A Pathway to Sustainability or a Nightmarish Form of Neoliberal Capitalism? *Ecological Economics* 121 (Jan.): 149–159.
- Martin, C.J., P. Upham, and L. Budd. 2015. Commercial Orientation in Grassroots Social Innovation: Insights from the Sharing Economy. *Ecological Economics* 118 (Oct): 240–251.
- Moazed, Alex and Nicholas L. Johnson, Translated by Yang Fei. 2017. *Modern Monopolies: What It Takes to Dominate the 21st Century Economy*. Beijing: China Machine Press.
- Parker, Geoffrey, G. Marshall, W. Van Alstyne, Sangeet Paul Choudary, Translated by Zhipeng. 2017. *Platform Revolution: How Networked Markets Are Transforming the Economy—and How to Make Them Work for You*. Beijing: China Machine Press.
- Ricardo, David. Translated by Guo Dali, Wang Yanan. 1962. *On the Principles of Political Economy and Taxation*. Beijing: The Commercial Press.
- Richardson, Lizzie. 2015. Performing the Sharing Economy. *Geoforum* 67 (Dec.): 121–129.
- Rifkin, Jeremy. Translated by experts from CCID Research Institute. 2017. *The Zero Marginal Cost Society: The Internet of Things, the Collaborative Commons, and the Eclipse of Capitalism*. Beijing: CITIC Publishing House
- Rodriguez, Joe Fitzgerald. 2016. Yellow Cab to File for Bankruptcy. January 6, 2016. *The San Francisco Examiner*. <http://www.sfoxaminer.com/yellow-cab-to-file-for-bankruptcy/>.
- Roger, Everett. Translated by Xin Xin. 2002. *Diffusion of Innovations*. Beijing: Central Compilation and Translation Press.
- Schor, J.B., E.T. Walker, C.W. Lee, P. Parigi, and K. Cook. 2015. On the Sharing Economy. *Contexts* 14 (1): 12–19.
- Schumpeter, Joseph Alois. 1989. *Essays: On entrepreneurs, innovations, business cycles, and the evolution of capitalism*. New Brunswick, N.J., USA: Transaction Publishers.
- Sharing Economy Research Center, State Information Center. 2017. Current Situation, Problems and Trends of China's Sharing Economy Development. *E-Government*, Issue 3.
- Sharing Economy Research Center, State Information Center. 2019. *Annual Report on China's Sharing Economy Development (2019)*, <http://www.sic.gov.cn/archiver/SIC/UpFile/Files/Default/20190301115908284438.pdf>.
- Sharing Economy Research Center, State Information Center. 2020. *Annual Report on China's Sharing Economy Development (2020)*, <http://www.sic.gov.cn/archiver/SIC/UpFile/Files/Default/20200831152530623864.pptx>.
- Stephany, Alex. Translated by Hao Juanjuan, Yang Yuan, Zhang Min. 2016. *The Business of Sharing: Making it in the New Sharing Economy*. Beijing: China Renmin University Press.
- Sundararajan, Arun. Translated by Zhou Xun. 2017. *The Sharing Economy: The End of Employment and the Rise of Crowd-Based Capitalism*. Shanghai: Wenhui Press.
- Wang, Keqin. 2002. The Monopoly of Beijing Taxi Industry. *China Economic Times*, December 6.
- Wang, Ning. 2017. The Sociological Perspectives in the Research on Sharing Economy. *Study & Exploration*, Issue. 8.
- Williamson, Oliver E. Translated by Duan Yicai, Wang Wei. 2002. *The Economic Institutions of Capitalism*. Beijing: China Machine Press.
- Xu, Hong. 2016. *Strong Siege: Ube: How to Rise Rapidly*. Beijing: Beijing Institute of Technology Press.
- Xu, Jun. 2018. The Supreme Court's Judicial Big Data Report: The Incidence of Online Car-hailing is Much Lower than That of Traditional Taxis. People's Daily Online. <http://it.people.com.cn/nl/2018/0920/c1009-30306165.html>.
- Zervas, G., D. Proserpio, and J. Byers. 2017. The Rise of the Sharing Economy: Estimating the Impact of Airbnb on the Hotel Industry. *Journal of Marketing Research* 54 (5): 687–705.
- Zhang, Maoyuan. 2013. Social Status, Organizational Capability and the Distribution of Technological dividends: With the Example of Modern Female Filature Workers. *Social Sciences in China*, Issue. 7.
- Zhang, Maoyuan and Zeqi Qiu. 2009. Why Does the Application of Technology Fail? The Case of the Machine-based Filature Industry in the Yangtze River Delta and Pearl River Delta(1860–1936). *Social Sciences in China*, Issue. 1.
- Zou, Yan. 2015. Uber's Life and Death: A Contradiction Between Internet Thinking and Reality. *IT Time Weekly*, Issue 5.

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