Research on the Damage Mechanism and Governance Path of Labor Rights and Interests of Takeaway Crowdsourcing Riders Under the Training of Algorithmic Regulations

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Abstract: Under the background of platform economy, algorithm has become the core governance tool of labor process in takeaway industry. This paper focuses on the algorithm scheduling mechanism such as Meituan's super brain system, combined with Wang Xin et al. (2024)'s empirical research on excessive labor and occupational injury, through interviews and judicial case analysis, systematically analyzes the damage mechanism of the algorithm to the rider's rights and interests in the aspects of distribution timeliness compression, income distribution imbalance and labor intensity alienation, and reveals the essential causes of the problems such as 'overtime deduction' and 'order pressing' . Finally, a three-dimensional governance path of 'algorithm transparency + government supervision + platform responsibility' is proposed, which provides theoretical support and practical reference for the protection of workers' rights and interests in the new employment form.

Keywords: Algorithm training; Takeaway crowdsourcing riders; Labor rights; Algorithm transparency; Government regulation

1. Introduction

1.1 Research Background

In the White Paper on China's Takeaway Industry in 2025 (China Report Hall, 2025), it is clearly mentioned that 'the number of riders in the country is 15 million', and it is pointed out that the takeaway industry has become an extremely important part of the urban service industry, and the rider group has become the core support force of the modern service industry. Algorithm management dominates the whole process of takeaway delivery. Algorithm systems with efficiency as the core, such as Meituan's 'super brain system', improve the efficiency of takeaway delivery and save costs [1]. However, the problem of excessive labor and damage to the rights and interests of riders is prominent, and the risk of occupational injury is significantly increased, which has aroused widespread concern in the society.

1.2 Definition of Core Concepts

(1) Arithmetic Regulation Training: The platform collects information such as the individual status of the rider, customer portrait and location through algorithm technology. After integration, it makes correct judgment and decision-making, and then controls the takeaway rider to implement the

decision-making. Finally, through the system feedback, it constantly compares its control consequences with the target, so that the probability of target difference and conflict with the rider's willingness and ability become smaller, and finally realizes the discipline of the algorithm. [2]

(2) Takeaway Crowdsourcing Riders: Flexible employees who undertake distribution tasks through platform crowdsourcing mode and do not establish formal labor relations with the platform. [3]

(3) Labor Rights and Interests: Labor rights and interests refer to the rights enjoyed by workers in the labor process according to law. According to Article 3 of the Labor Law of the People's Republic of China, workers enjoy the following main labor rights and interests:

Equal employment and the right to choose occupation: workers have the right to choose their own occupation, without discrimination by ethnic, racial, gender, religious beliefs and other factors, equal employment opportunities.

Get the right to remuneration for labor: After the laborer pays his labor, he has the right to obtain full and timely remuneration in accordance with the agreement, and the salary shall not be lower than the local minimum wage standard.

The right to rest and leave: Employees enjoy the right to rest and leave such as statutory holidays, annual leave, and sick leave. The employer should guarantee their normal rest time, and pay the corresponding overtime fee if overtime is arranged. [4]

Labor safety and health protection rights: Employers need to provide workers with safe and healthy working conditions and necessary labor protective equipment to prevent and reduce occupational hazards and ensure the safety and health of workers in labor.

Right to receive vocational skills training: employers should provide workers with vocational skills training opportunities to enhance their employment competitiveness, improve work efficiency and quality.

Enjoy social insurance and welfare rights: workers have the right to enjoy social insurance such as pension insurance, medical insurance, unemployment insurance, industrial injury insurance and maternity insurance, as well as other benefits provided by the unit.

Requesting the right to handle labor disputes: When a labor dispute occurs between a worker and an employer, he or she has the right to apply for mediation, arbitration, and litigation in accordance with the law, and to safeguard his or her rights and interests through legal channels.

1.3 Research Significance

1.3.1 Help Riders Voice to Solve Practical Problems

Now takeaway riders are often controlled by algorithms - timeout fines, unreasonable orders, no rest time, and even accidents in order to rush time. [5] The research can clarify these invisible rights and interests damage problems, so that everyone knows that the rider is not' voluntary and desperate', but is forced to choose by the algorithm rules, providing a basis for the rider to fight for reasonable rights and interests.

1.3.2 To the Industry Pulse, Find the Right Direction for Improvement

It is a trend for the takeaway industry to improve efficiency by algorithms, but not at the expense of rider rights. [5] The research can find out the loopholes in the algorithm design, and provide specific improvement suggestions for the platform, so that the industry can maintain high efficiency and sustainable development, and avoid more contradictions caused by the problem of riders' rights

and interests.

1.3.3 To improve the System of Rules for the Supervision of Support

At present, the supervision of takeaway algorithm is not perfect enough. When encountering problems such as rider rights protection and platform violation, there is often a situation of 'unable to control and poor management'. The research can provide reference for the government to formulate regulatory policies, such as how to regulate the transparency of the algorithm, how to clarify the responsibility of the platform, and how to make the whole industry have clearer rules to follow. [6]

1.3.4 For the Society Worry, Maintain Stability and Harmony

Takeaway riders are already an important group in the city. Whether their rights and interests are well protected is related to social equity and stability. The research can promote the society to pay attention to the rights and interests of flexible employees, provide reference for the protection of the rights and interests of other flexible employment groups such as couriers and online car-hailing drivers, and make the flexible employment model healthier.

1.4 Research Ideas and Methods

(1) Research Ideas: Based on the logic of 'Algorithm Control-equity Damage-mechanism Analysis-governance Optimization', the Research is Carried out Step by Step.

(2) Research Methods: Case interview method: Select some takeaway riders to conduct face-to-face or online interviews, mine their actual work experience under the algorithm rules (such as dispatching, overtime punishment, rights protection, etc.), and obtain first-hand subjective experience data.

Case analysis method: analyze the scheduling logic of Meituan's 'super brain system', combined with the 42nd batch of new employment form labor dispute guidance cases of the Supreme Law. [7]

Literature research method: combing the labor process theory, algorithm governance, gig economy rights and interests' protection related research.

2. Theoretical Basis and Literature Review

2.1 Labor Process Theory and its Development in the Digital Age

(In this paper, the labor process theory is applied to the analysis of the control and exploitation of the rider by the algorithm)

The core idea of the traditional labor process theory is that capital realizes the exploitation of surplus value by controlling the labor process.

Extension of the digital age: Algorithms have become a new tool for capital control to achieve refined and implicit control of the labor process.

2.2 Research on Platform Economy Theory and Digital Control

(In this paper, the platform economic theory is used to interpret the operation mode and responsibility boundary of the platform.)

The efficiency orientation of algorithm scheduling is to weigh the data such as rider position and order route in real time and pursue the global optimal solution.

The alienation characteristics of the control of the algorithm [8]: compression of labor time, strengthening of labor intensity, resulting in riders' being domesticated by the algorithm.

2.3 Research on the Protection of Labor Rights and Interests of Takeaway Riders

Existing research focus: identification of labor relations: For new occupations such as takeaway riders, the platform uses a set of digital means such as positioning, intelligent dispatching, and user evaluation to manage riders more mechanically, even alienated, and gradually transformed into controlling riders. However, the current labor law is difficult to define the traditional labor relations. The working hours, working places and working contents of workers under the new employment form such as takeaway riders are highly flexible and uncertain, which makes the traditional working hours and rest and vacation system difficult to be effectively applied. In the context of the new era, how to make timely and necessary amendments to the Labor Law of the People's Republic of China to better adapt to the development of new employment forms and protect the legitimate rights and interests of emerging professional groups has become an urgent problem to be solved. [5]

Research gap: the specific mechanism of action of the algorithm on the damage of rights and interests, and the lack of research on the perception and response of riders at the micro level.

2.4 Literature Review and Research Space

The existing research has focused on the control and rights of the algorithm to the rider, but lacks the mechanism analysis of 'how the algorithm specifically damages the rights and interests' and the governance scheme focuses on a single subject, so it is necessary to construct a multi-dimensional collaborative governance system.

Why do takeaway companies such as Meituan use algorithms such as super-brain systems to improve distribution efficiency, optimize platform operation and experience, and let takeaway employees receive more orders, but the rights and interests of takeaway employees may be damaged? Because the core of its application is not to protect the rights and interests of riders, and even its operation logic will indirectly increase the burden of riders and aggravate the damage of rights and interests. The specific performance is as follows:

(1) The algorithm system continues to compress the delivery timeliness, forcing riders to take risks and violate regulations: The core optimization direction of algorithm systems such as Super Brain is to shorten the delivery time. In November 2016, Wang Xing, the founder of Meituan, mentioned in an interview that Meituan takeaway is delivered within an average of 28 minutes, saying that this is a good technical embodiment, corresponding to the results of optimizing the delivery time of the Super Brain system. The system will also continue to optimize the algorithm through the rider' s distribution data, and even recommend it to other riders by referring to the rider's 'experience' of reverse copying. In order to avoid timeouts, riders have to run red lights and retrograde, and the traffic accident rate has increased significantly. Once an accident occurs, it is often difficult for riders to obtain adequate protection.

The harshness of overtime punishment: rules such as 'overtime deduction' and 'negative correlation income' aggravate the psychological pressure of riders.

(2) The deduction system is strict, and there is no effective feedback mechanism for objections to algorithmic decision-making: In the interview process, the takeaway platform's deduction system has the most opinions. More than half of the takeaway staff believe that the takeaway platform's deduction system is unreasonable. Taking the area near Quzhou College as an example, a deduction of 20 yuan is deducted for overtime service. In some areas, although the deduction may not be deducted, the service points will be deducted, which will affect the profit per order of the takeaway.

Receiving customer complaints will be deducted 300 yuan, if the takeaway did not deliver the meal to the customer's hands but ordered has been served, will be deducted 500 yuan. (Doubtful) Many takeaway workers are dissatisfied with this, believing that there are too many penalties, and too much money is deducted for early delivery, which seriously affects life. Some takeaway workers also try to reflect to the site and customer service, but the effect is small,'deduction complaint is difficult' is widespread.

(3) Labor Intensity: Overwork Under Algorithmic Incentives

Efficiency gives priority to transfer costs, and the labor intensity of riders increases sharply. Taking the super brain system as an example, although it greatly increases the average daily delivery volume of riders, the platform will push the delivery cost to a very low level in order to maintain the competitiveness of low net profit margin. In order to make money from multiple orders, riders have to extend their working hours. Some riders work more than 10 hours a day on average. Meituan has verified that some takeaways work for as long as 14 hours in bad weather such as heavy rain. Long-term overloaded labor is not compensated for overtime and other corresponding rights and interests.

(4) The algorithm is opaque + tightly controlled: the dispatch, path planning and scoring logic of the algorithm system are opaque 'black boxes' [10]. Riders cannot know the specific criteria for order allocation and rating, and it is difficult to complain if they encounter injustice. At the same time, the system tracks the rider's trajectory, speed and other data in real time through GPS positioning. This control is more rigorous than traditional factories. The rider loses his labor autonomy, but has no power to modify and negotiate the algorithm rules.

(5) Help the platform avoid employer's responsibility and lack of rider protection: the algorithm system enables the platform to remotely control a large number of riders through digital means, but does not need to establish a traditional employment relationship. The platform mostly cooperates in the form of 'crowdsourcing' or third-party labor dispatch, and completes scheduling and assessment through the system. It not only enjoys the benefits brought by rider labor, but also avoids the legal obligations of signing labor contracts and paying social security. Once the rider has an industrial injury or accident, it is often difficult to identify the labor relationship and cannot obtain the corresponding compensation and guarantee of the platform.

For example, in the case of rider traffic accident claims heard by Wenzhou court in 2023, because the platform transferred labor relations through four-tier subcontracting, the final victims were only paid by third-party commercial insurance.

3. Analysis of the Algorithm Mechanism of Labor Rights Damage

3.1 Algorithm Scheduling Mechanism: from Efficiency Priority to Equity Erosion

As mentioned above, the algorithm system continues to compress the delivery time, forcing riders to take risks and violate the rules: the core optimization direction of algorithm systems such as super brain is to shorten the delivery time. In November 2016, Wang Xing, founder of Meituan, mentioned in an interview that Meituan takeaway is delivered within an average of 28 minutes, saying that this is a good technical embodiment, corresponding to the results of the optimization of the delivery time of the super brain system. The system will also continuously optimize the algorithm through the distribution data of the rider, and even recommend it to other riders by referring to the 'experience' of the rider's retrograde approach. In order to avoid timeouts, riders have to run red lights and retrograde, and the traffic accident rate has increased significantly. Once an accident occurs,

it is often difficult for riders to obtain adequate protection.

The harshness of overtime punishment: rules such as 'overtime deduction' and 'negative correlation income 'aggravate the psychological pressure of riders.

The incorrect samples on the dispatch order are placed in the algorithm model, which pollutes the algorithm, and there will be the problem of dispatch order confusion and reverse dispatch order. [11]'Global optimization' takes precedence over individual reasonable demands, resulting in uneven distribution of 'garbage order' and 'remote order'.

In the path planning, GPS tracking and electronic fence limit the rider's independent decision-making and increase the difficulty of distribution [12].

3.2 Algorithm Evaluation Mechanism: a Single Dimension of the Assessment Criteria

The one-sidedness of the evaluation index: the platform focuses too much on the punctuality rate and customer evaluation, mainly using these two aspects as the core indicators [13]. The reason is that these two data are directly related to the user experience, which is closely related to the interests of the platform, ignoring the rationality of the rider's labor process.

The strong correlation of the evaluation results [14]: the evaluation will affect the basic unit price and additional rewards of each order of the rider. In the interview, the interviewed takeaway staff once mentioned that the takeaway bad review will affect the 'service score', and the service score will be graded. Each level corresponds to the corresponding basic unit price, and each level will differ by a few cents. Don't look at a few orders, but the average daily takeaway staff is 50 orders a month, and the total difference in a month is how much money it is. Income and account permissions are linked to amplify the rider's risk aversion pressure.

3.3 Algorithmic Incentive Mechanism: Negative Incentive to Induce Overwork

The platform carries out 'single reward', such as how many orders are completed within the specified time, a certain amount of money will be rewarded ; 'Peak premium' refers to that in the period of intensive orders and traffic congestion, riders take more risks to obtain higher unit prices (some platforms, such as Meituan, will solve this problem to some extent by sending orders) to induce riders to extend their working hours and ride illegally (running red lights, retrograde, etc.). In addition, the rider level is bound to the priority of the order, forcing the rider to 'invoke' the order.

4.Empirical Analysis: Findings Based on Interviews and Judicial Cases

4.1 Analysis of Interview Results

Rider algorithm perception: more than 80 % of riders think that the algorithm is unreasonable, and nearly 70 % reflect that the timeout penalty is too harsh.

Cognition and appeal of rights and interests: The rider is transparent about the algorithm, hoping to clarify the specific rules of dispatching and assessment. It is worth mentioning that the vast majority of takeaways have talked about their experience of being operated by the platform's black box, that is, being 'intentionally' sent retrograde and remote orders by the platform. The appeal for optimization of appeal channels and improvement of social security is strong.

Correlation analysis: The stronger the rider's negative feelings about the algorithm, the lower his satisfaction with the current rights and interests protection, indicating that the algorithm problem is one of the core factors affecting the rider's labor experience.

4.2Analysis of Judicial Cases

(1) Typical Case Selection: The 42nd batch of new employment form labor dispute guidance cases of the Supreme Law, guiding case No.237: a service outsourcing company in Langxi v. Xu Moushen engaged in distribution work on a shopping platform, and signed a freelance cooperation agreement with the outsourcing company (agreed non-labor relationship), but the outsourcing company through the algorithm to force the order, control attendance, set the order quantity requirements, and based on the algorithm data for rewards and punishments.

(2) Guiding Case No.238: Sheng Mouhuan is a takeaway delivery rider. After being required to register as an individual industrial and commercial household by the company, he signed a 'project subcontracting agreement'. Later, he claimed industrial injury due to distribution injury. The company refused to recognize labor relations on the grounds of 'individual industrial and commercial household cooperation'.

(3) The Core Dispute of the Case: The rationality of the decision-making of the algorithm: judging whether the platform will have a black box operation or the algorithm flaws caused by the wrong sample, and judging whether the decision-making standard is reasonable; the identification of the management responsibility of the platform: to clarify whether the platform's control of the algorithm constitutes employment management, and what kind of labor security responsibilities should be borne . [4]

Causation of rights and interests damage: demonstrate whether the loss of income, labor risk and other rights and interests damage of the rider are directly caused by the platform algorithm mechanism.

Case enlightenment: algorithm transparency and platform responsibility clarification-algorithm transparency can make riders understand the specific rules of dispatching and assessment, and reduce 'black box' control [10]. The clarification of platform responsibility can define its obligations in the operation of the algorithm, which is the key path to protect the labor rights and interests of riders, and also echoes the rider's appeal for algorithm transparency in previous interviews.

5. Construction of the governance path of labor rights protection

5.1 Transparency and humanization optimization of platform algorithm

(1) Improve the transparency of the algorithm: disclose the core rules such as dispatch logic, proportion, and timeout judgment criteria

(2) optimization algorithm design: introduce the rider feedback mechanism, let the rider actually participate in the establishment and adjustment of the algorithm, incorporate variables such as weather and traffic into the time setting model, and make effective adjustments [2]

(3) establish an algorithm review mechanism: Establish an algorithm evaluation committee composed of platforms, rider representatives, and experts.

(4) In short, the improvement of the algorithm should shift from the main pursuit of efficiency to the pursuit of efficiency while paying attention to the reasonable needs of the rider.

5.2 Government regulation: rigid constraints and guarantees at the institutional level

(1) Improve laws and regulations: clarify the platform's regulatory responsibility for the algorithm, and establish an 'algorithmic interpretable' system. It is required that the platform can clearly explain the basis of algorithmic decision-making such as dispatch and assessment, and provide a legal basis for riders to protect their rights.

(2) Strengthen labor supervision: use digital technology to supervise the algorithm data and labor management behavior of the platform, improve the objectivity and comprehensiveness of labor supervision, and avoid the problem that traditional supervision methods are difficult to cover the platform economy.

5.3 Social coordination: creating a friendly external environment

(1) Improve social identity: Eliminate the stereotype of riders and advocate customers to understand and respect rider labor.

(2) Improve infrastructure: promote the construction of rider stations and provide convenient services such as rest and charging.

5.4 Rider empowerment: ability improvement at the individual and organizational levels

(1) Strengthen skill training: carry out training on traffic safety, emergency response, etc., to improve the risk aversion ability of riders.

(2) Promote organizational construction: support the development of riders' self-organization and unionization, and enhance collective bargaining power. At the same time, riders can use social media to establish their own community solidarity network outside the takeaway platform. By discussing the problems encountered in daily work, riders in different regions and platforms can form some binding consensus and appeal to platform enterprises. [13]

6. Research conclusions and prospects

6.1 Main research conclusions

(1) The algorithm training damages the labor rights and interests of the riders through the paths of delivery time compression, black box operation, unreasonable route planning and excessive labor intensity.

(2) The three mechanisms of algorithm scheduling, evaluation and incentive are the core causes of damage to rights and interests, which are hidden and systematic.

(3) It is necessary to construct a multi-governance system of 'platform algorithm optimization + government regulatory constraints + social collaborative support + rider empowerment improvement'.

6.2 Theoretical contributions and policy implications

(1) Theoretical contribution: It reveals the specific damage mechanism and principle of the algorithm to labor rights and interests, and provides some theoretical guidance for the service personnel of emerging industries such as takeaway to safeguard their own rights and interests. It also provides directional hints for the improvement of the algorithm system in the new format.

(2) Policy implications: provide reference for the government to formulate algorithmic governance policies and improve the rights and interests protection system of new employment forms.

6.3 Research limitations and future prospects

(1) Research limitations: The coverage and number of interview samples are limited, and the differences between different regions and different platforms are not fully considered. Although the interview records of takeaway riders are first-hand information, there is a certain degree of subjectivity. It is necessary to learn to make reasonable judgments on some viewpoints.

(2) Future prospects: We can expand the scope of research, deeply study the specific needs of riders for algorithm governance, explore the application of artificial intelligence technology in algorithm optimization, and promote the transformation of algorithm governance from 'industry

self-discipline' to 'rule of law'. [14]

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