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An Examination of the Distribution of Surplus Value in Digital Labor Based on Marx's Theory of Labor Justice

Danni Yang

School of Marxism, Northwest Normal University, Lanzhou 730070, Gansu, China

Abstract: As an emerging mode of production, the distribution of surplus value created by digital labor is an important component of current capitalist production relations. This process highlights the profound inequality in the production process. Platform companies utilize their digital intermediary roles to enable digital capital to effectively control digital labor through big data, algorithm rules, and platform rules. Innovated the way of obtaining surplus value. Causing problems such as exploitation, objectification, and lack of protection for digital workers in their labor. This article revolves around Marx's perspective on labor justice theory. Explored the unfair phenomena in the distribution of surplus value of digital labor. Proposed optimization strategies for resetting the justice of digital labor surplus value distribution from four dimensions: institutional, technological, organizational, and cultural. To achieve justice in the distribution of surplus value of digital labor, it is necessary to be guided by the Marxist concept of labor justice. Through institutional restructuring and technological ethical regulation, the relationship between surplus value distribution can be transformed. On this basis, build a benefit-sharing mechanism that is conducive to the win-win situation of workers, platforms, and society.

Keywords: Digital labor; Distribution of surplus value; Marx's theory of labor justice; Data ownership; Algorithmic exploitation; Distributive justice

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1. Introduction

Digital labor is an increasingly important growth field in the digital economy era. It is not only about the information technology industry, but also in social media, e-commerce, and the sharing economy. It has had a profound impact on economic operation and social structure. In reality, digital labor has played a continuous role in promoting production innovation, improving allocation efficiency, and reorganizing the industrial chain. As digitalization continues to deepen, the manifestations and actual connotations of digital labor are also constantly expanding. From real-time interactions during live streams to virtual production within the metaverse, the labor process is steadily unfolding in the direction of platformization, datafication, and

immersion. Based on this change, the composition of value creation entities, the pathways and mechanisms for value realization, and the institutional foundation for value distribution all face new pressures for adjustment. The traditional mechanism for the distribution of surplus value has thereby come under sustained pressure.

Theoretically speaking, digital labor is an extension of labor forms under the conditions of the digital economy. It has not departed from Marx's general determinations regarding labor. Digitalization is its most distinctive feature, but its labor-intensive nature remains its fundamental attribute. In essence, it remains a productive activity in which materiality and immateriality are intertwined [1]. Digital labor has developed alongside the expansion of the digital economy, supported by information technology. It continuously enhances production efficiency through the leverage of computer hardware and software, algorithmic systems, and data analysis capabilities. The sharing economy and internet platforms integrate resources across a wide area. Significantly compress collaboration and transaction costs. Against this backdrop, digital labor exhibits distinct structural reorganization effects: It has given rise to new types of professions, such as online bloggers, data annotators, and virtual architects. It also drives traditional industries to accelerate their digital transformation. Thereby driving an overall adjustment of the employment structure. It should be noted that the scope of digital labor has clearly exceeded the boundaries of the real physical world. Especially in virtual scenarios such as the metaverse. Labor activities are increasingly grounded in a mode of existence characterized by the intertwining of technological domination, platform discipline, and the embedding of work within daily life. Therefore, the traditional Marxist political economy's analytical framework regarding the labor process and value production. It is necessary to undertake further expansion under new historical conditions.

Specifically regarding the distribution of surplus value. A prominent feature of digital labor is that its value creation process is becoming increasingly hidden. However, the distribution structure exhibits significant imbalances. The platform economy relies on algorithmic control, data monopoly, and traffic allocation mechanisms. To continuously and multi-dimensionally extract the fruits of workers' labor. This makes the distribution of surplus value highly opaque. For example, in live-streaming e-commerce, the value of the streamer's labor is not limited to the direct sales revenue generated. The added value it creates in terms of interaction maintenance, emotional engagement, traffic aggregation, and user stickiness cultivation. This also constitutes an important source of the platform's profit growth. Within the framework of Marx's labor theory of value, living labor constitutes the fundamental source of value creation. The ratio of surplus value to variable capital represents the degree of exploitation of labor power [2]. In the digital economy, new modes of value production, such as data labor and attention labor, are increasingly embedded in the process of capital accumulation. Then, under the dominance of capital, it enters the distribution stage. This results in digital workers experiencing greater tension between high-intensity labor and low rewards. The gap between labor input and income distribution continues to widen, making the problem of irregular distribution even more prominent.

The rapid development of the digital economy has also spurred ongoing academic discussions surrounding "digital labor." Current research is already quite extensive. It involves both a critique of new forms of labor alienation and an analysis of the mechanisms of value formation and realization under digital conditions. To accurately grasp the nature of digital labor, we still need to return to Marx's theory of productive labor [3]. A key element of Marx's concept of labor justice lies in the fact that workers have the right to receive appropriate compensation based on their labor contributions. In the context of digital labor, this has gained a more direct and practical relevance. Facing a production process dominated by digital capital. How to safeguard the

principal status of workers and establish a more scientific data-driven labor value evaluation mechanism. It has become a core issue in discussions on fairness and justice in the digital age. Answering these questions requires not only theoretical advancements but also the joint participation of policymakers, platform operators, labor organizations, and all sectors of society in institutional development. This will gradually lead to the formation of a rights protection mechanism adapted to the form of digital labor.

2. Current status of the distribution of surplus value in digital labor

2.1. Types and characteristics of digital labor

Digital labor is an essential part of modern labor reproduction. Its specific type and operational characteristics are directly linked to the generation mechanism and realization path of surplus value. As the commodification of data continues to deepen, human daily activities and social interactions are continuously included in the process of capital accumulation. It is transformed into computable, analytical, and tradable means of production. So the labor process gradually breaks through the boundaries of the traditional production field. It shows the trend of dispersion, invisit, and continuous onlineization. On this basis, platform capital relies on the advantages of algorithmic governance, network effect, and data concentration. It has formed a more detailed organization and control of the labor process, and also promoted the transfer of public data resources to private capital. In turn, the value multiplication mechanism has been significantly strengthened. Furthermore, the extensive embedding of intelligent systems has gradually incorporated digital labor into a self-operated technology - the capital system. The exploitation relationship has also gained stronger concealment due to the appearance of technological neutrality [4]. From the technical basis, digital labor relies on network platforms, big data systems, intelligent terminals, and other technical facilities. A new form of labor with information collection, data analysis, platform collaboration, and online interaction as the main forms. It has significant dependence on technology. For example, users generating content and engaging in interactive discussions on social platforms constitute a typical form of digital labor. Users continue to provide content supply and relationship maintenance for the platform through posting, commenting, liking, forwarding, and other behaviors. It also transforms personal life trajectory, interests, preferences, and social behaviors into statistical and exploitable data resources. Accumulate traffic value, advertising value, and business conversion ability for the platform [5]. This kind of labor often has strong implicit unpaid characteristics. Workers usually fail to get rewards commensurate with their value contributions. The surplus value created is continuously absorbed by the platform capital in the algorithm distribution mechanism and data monopoly structure.

Digital labor in the field of cloud platforms is more manifested as technology-intensive brain-body combined labor. Programmers participate in the production process by writing code, developing applications, and optimizing system functions. Data engineers, by processing massive data, training models, and improving analysis mechanisms, provide core support for the operation and upgrade of cloud services. This kind of labor is highly professional and complex. Its results are usually manifested in the improvement of intangible services, system performance, or algorithmic capabilities. It has put new pressure on the traditional wage system in terms of value measurement and income distribution. According to Marx's discourse on the impact of capital technology on surplus value production. Under the conditions of the digital economy, algorithm knowledge, programming ability, and data processing ability have become important conditions for surplus value production. The improvement of operation efficiency, the improvement of service quality, and the enhancement of platform expansion brought about by program optimization. It will be transformed into new value increments

in the capital cycle. The widespread existence of intangible labor results also makes it difficult for the real contribution of workers to be fully reflected through the existing remuneration structure.

Digital labor in the industrial Internet is mainly manifested as workers implementing remote monitoring, dynamic adjustment, and real-time optimization of the production process with the help of intelligent equipment, sensor networks, Internet of Things systems, and big data platforms. The labor mode has opened up the spatial boundaries between traditional production, management and maintenance. Labor activities have been extended from the workshop site to the continuous online technical network. Through the optimization of technological processes, the prediction of equipment failures, and the fine scheduling of resource allocation. The investment of digital fixed capital has significantly improved labor productivity. It has also expanded the production scale of surplus value. But in the industrial Internet scenario, the boundary between paid labor and unpaid labor is becoming blurred. Remote monitoring, data processing, and technical response are carried out by workers outside working hours. It further extends the time and space scope of surplus value production [6]. The phenomenon of alienation in digital labor is no longer limited to the increase in labor intensity or the strengthening of labor control. It is manifested as capital's multi-dimensional seizing of workers' time, skills, and data. The current distribution system lacks an adequate response to this change.

The value characteristics of digital labor are prominently reflected in the continuous value-added. Whether it is traffic accumulation on the new media platform or data resource precipitation in the cloud computing scenario. It is still the system optimization effect in the intelligent manufacturing system. They all constitute the unique value form of digital labor. Marx's basic judgment that surplus value comes from living labor is still explanatory in the digital age. It's just that the specific mechanism, carrier form, and realization path of value production have changed. The long-term precipitation of user content can be transformed into content assets that can be redeveloped. Programmers' continuous improvement of algorithms can also promote the synchronous improvement of platform service ability and business scale. Thus generating a wider range of value increments. The rationality of the distribution of the surplus value of digital labor needs to be put back at the center of the theoretical and institutional discussion. While recognizing the main position of value creation of digital workers, we should also prevent capital from excessively encroaching on the surplus value created by workers with the help of technical advantages.

Furthermore, digital platforms themselves are the result of the objectification of human labor, and living labor remains the fundamental source of value valorization. Within the operational processes of platforms, activities such as active content production by users, technical development, data processing, and system maintenance have already entered the chain of surplus value creation. Mere online browsing behavior, conversely, constitutes the traffic conditions for platform operation; whether it falls within the category of productive labor requires analysis in conjunction with specific value realization mechanisms [7]. Therefore, under the conditions of digital capitalism, the distinction between productive and non-productive labor should still be based on whether the labor directly participates in the production of surplus value. Based on this point, it is necessary to proceed from Marx's theory of labor justice to further explore a distribution model for digital labor surplus value that balances efficiency and fairness. This ensures that while promoting the continuous development of digital productive forces, laborers are able to obtain income returns commensurate with their actual contributions.

2.2. Comparison of the current status of digital labor distribution at home and abroad

Viewed globally, the imbalance in the distribution of surplus value in digital labor is not a phenomenon exclusive to developing nations; developed capitalist countries similarly confront issues of labor exploitation arising from the expansion of digital capital. With the continuous development of the platform economy, artificial intelligence, data annotation, content production, and odd labor. The labor process is increasingly organized by algorithm systems, data rules, and platform protocols. Although workers continue to participate in data production, traffic generation, content maintenance, and service supply. However, it is often difficult to fully measure the fruits of their labor. Labor value is also easily concentrated by the platform in the form of data assets, algorithm models, and business benefits. While improving production efficiency, the digital economy has also strengthened the hidden control of capital over the labor process. It makes the problems of prolonged labor time, increased labor intensity, vague labor relations, and unequal distribution of income more prominent.

Although developed countries have strong advantages in digital technology research and development, industrial application, and institutional construction, digital labor exploitation has not disappeared. Large multinational platform enterprises occupy the dominant position in the digital value chain with data resources, algorithm systems, and market size. Ordinary workers are still in a relatively passive position in the face of platform rules. Takeaway delivery, online car-hailing service, content audit, data labeling, and other labor forms generally have problems such as vague employment identity, insufficient labor security, and strict algorithm assessment. Developed countries have strengthened supervision through the EU Digital Services Act, algorithmic transparency rules, data protection systems, and labor legislation reform. However, these systems are more focused on platform responsibility, data compliance, and algorithm interpretation. There is still a lack of more stable, direct, and operable institutional arrangements for how digital workers can participate in the distribution of surplus value. Even in countries with mature technology and rules. Digital workers also often face the dilemma of "participating in value creation but difficult to share value addition."

The problems faced by developing countries in digital labor distribution are more complex. There are differences in information infrastructure, technology research and development capabilities, and the location of the digital industry chain. Developing countries are often in a relatively vulnerable position in the global digital division of labor. Many workers undertake basic digital labor such as data annotation, content review, online customer service, cross-border crowdsourcing, etc. But it is difficult to get compensation that matches their labor contribution. The legal system of some countries on platform employment, data ownership, algorithm supervision, and protection of new employment forms is still not perfect. Workers face great uncertainty in identity recognition, social security, income distribution, and rights and interests relief. In this case, the surplus value of digital labor is more likely to be centrally extracted through platform extraction, data possession, algorithm pricing, and transnational capital flows. Workers' bargaining ability and distribution ability are relatively limited.

From a deeper level, although developed and developing countries are at different stages of development. They all face structural shortcomings in the digital economy together. The attribution of data rights is not clear enough. Workers constantly generate data in daily labor, but these data are usually incorporated into the business system by the platform. It is difficult to make a clear claim about the benefits of the data. The power of the algorithm lacks sufficient restraint. The platform arranges orders, evaluates performance, determines remuneration, and allocates opportunities through algorithms. Workers have limited space for understanding, participation, and appeal of algorithmic rules. There is ambiguity in the identification of labor relations.

Many platforms weaken employment responsibility with flexible employment, cooperative relationships, or outsourcing relationships. It is hard for workers to obtain stable labor protection. The distribution of the global digital value chain is unequal. Platform enterprises and developed economies that master the right to make technology, capital, and rules can get more benefits. It is more difficult for workers in the basic labor link and late-stage countries to share the dividends of digital economic growth.

Against this background, China's institutional response to digital labor governance is highly realistic and targeted. China does not simply understand the digital economy as a technological innovation issue. Instead, it is included in the overall framework of common prosperity, protection of labor rights and interests, platform economic normative development, and data element governance. China continues to strengthen the regulation of platform employment relations. Promote the construction of a system to protect the rights and interests of workers in new forms of employment. Focusing on takeaway riders, online car-hailing drivers, couriers and other groups, put forward more specific governance requirements in terms of labor remuneration, rest time, occupational injury protection, social insurance and complaint mechanism. China continues to improve the construction of the data foundation system. Promote the rational development and utilization of data resources. Emphasize fairness and publicity in the distribution of data element benefits. This helps to avoid the unlimited possession of digital labor results by a few platforms, and also provides an institutional basis for workers to share the benefits of digital economic development.

China has formed a distinct governance advantage in platform supervision. In the face of problems such as the disorderly expansion of capital, algorithm black box, excessive competition and traffic monopoly in the platform economy. Through measures such as anti-monopoly supervision, algorithm recommendation governance, data security protection, personal information protection, and platform responsibility compaction. Gradually strengthen the normative guidance of digital capital. Compared with some countries that mainly rely on market self-regulation. China places more emphasis on the coordination between government supervision, platform responsibility, labor protection, and social equity. This governance idea helps to integrate the development of digital technology into the framework of public interest. It promotes the digital economy from simply pursuing efficiency and growth to taking into account efficiency, fairness, and security.

The core of the global distribution of surplus value of digital labor lies not only in the development gap between developed and developing countries. It also lies in the fact that digital capital reshapes the labor process through data, algorithms, and platform rules. How to re-recognize the value contribution and distribution rights of workers. Although developed countries have started earlier in terms of institutional design and technological governance, it still faces problems such as platform capital concentration, insufficient labor security, and algorithmic power imbalance; Developing countries are under greater pressure in terms of technological capacity, institutional supply, and the status of the global division of labor. China's governance practice shows that, to solve the dilemma of digital labor distribution, it is necessary to adhere to the position of labor value. Further improve the platform's labor relations recognition mechanism, improve the data resource income distribution system, and strengthen algorithm transparency and technical power supervision. And promote a more reasonable relationship between digital capital and digital labor through the advantages of the national system. The Chinese-style digital labor governance path provides practical institutional experience for the fair distribution of the global digital economy.

3. Problems in the distribution of surplus value in digital labor

3.1. Distributive injustice and phenomena of exploitation

In the context of the digital economy, the injustice in the distribution of surplus value and the intensification of exploitation represent the concrete manifestation of the alienation of capital logic within the digital realm. These issues stand in fundamental conflict with the principle of reasonable appropriation of labor fruits by workers advocated in Marx's theory of labor justice. In the "Fragment on Machines," Marx emphasized that while science and technology promote the development of productive forces, they also constrain human development and generate a large surplus population under capitalist society. The machine reverses the main position of workers and appropriates the value it creates [8]. Entering the era of the digital economy, this logic has not disappeared. Instead, new institutional forms and technical support have been obtained under the joint action of platforms, algorithms, data, and intelligent systems. Judging from the realistic operation mechanism, digital capitalists rely on capital accumulation capacity, technological monopoly advantages and platform organization ability to occupy a dominant position in the surplus value distribution chain; Due to their limited bargaining power, high labor substitution and insufficient degree of organization, digital workers are often at the end of the distribution system, and their labor income is difficult to form a stable correspondence with the actual contribution [9].

The distribution imbalance in the field of digital labor is not only manifested as a deviation from the principle of remuneration according to labor, but also further causes problems such as workers' income vulnerability, unstable labor expectations, and rising life risks. And it poses a potential constraint on the sustainable development of the digital economy. The continuous pursuit of excess profits by digital capital is the concentrated embodiment of the law of capital accumulation in the digital age. Relying on technical advantages, market concentration and rule-making rights, the platform economy has gradually formed a highly asymmetrical transaction structure. Through the control of work task allocation, service pricing, proportion, and evaluation system, the platform. They put workers in a highly dependent position on the platform order. So that its labor results are constantly intercepted by capital in the form of technical service fees, channel commissions, platform commissions, etc. From the perspective of Marxist theory, capital's free possession of the surplus value created by workers is the basic mechanism for capital multiplication; And digital capital further relies on data monopoly and technical barriers to make this process more hidden and systematic. The platform can more accurately assess the marginal cost and output level of workers through user data accumulation, behavior trajectory analysis, and algorithm measurement. Then compress the labor compensation space, raise the profit margin, and embed the exploitation relationship into the seemingly neutral technical arrangement [10]. Under such conditions, workers often lack full perception of the process of continuous extraction of their own surplus value. Distribution injustice is more difficult to be directly identified and effectively corrected.

The labor practice in new business forms such as the sharing economy and crowdsourcing platforms further explains that compensation compression, deepening labor alienation, and insufficient social security have become common problems in the field of digital labor. Theoretically, it can be understood as an extension of Marx's theory of alienated labor in the digital age. It is difficult for workers to possess the fruits of their labor and dominate the labor process itself. Labor activities are transformed into calculable, trackable, and assessable data sequences by the platform algorithm. For example, a food delivery rider's income is closely linked to metrics such as the number of orders received, delivery time, and user reviews. Through mechanisms such as route optimization, time compression, and a system of linked rewards and penalties, the platform drives riders

to complete a greater volume of work tasks with high intensity. The digital labor market is highly competitive, and individual workers have relatively weak bargaining power. Capital controls the formation and adjustment of distribution rules. Existing research indicates that in many countries and regions, the income level of crowdsourced workers is significantly lower than that of traditional occupations with similar labor intensity. Meanwhile, the rate of profit on platform capital continues to exceed the average level of general industries [11]. This undermines the motivation and sense of security of workers, while also driving a further concentration of social wealth toward capital, thereby deepening class stratification in the digital age.

3.2. Deficiency in labor rights protection

As the digital economy expands, the imbalance between the rights and obligations of digital workers is becoming increasingly apparent. This has gradually become a significant factor influencing the standardized development of the digital economy. According to the basic judgments of Marx's labor theory, capital increases itself by appropriating the wealth created by laborers. Under the dominance of the logic of capital, workers' rights—particularly regarding working hours, work intensity, labor protections, and labor dignity—are prone to continuous erosion. The technological dependence, organizational decentralization, and profit-seeking orientation of platform capital in digital labor are all superimposed on each other. This has resulted in a relatively pronounced structural imbalance in the protection of workers' rights.

Digital labor processes generally lack stable standards for working hours and boundaries for work intensity. Leveraging algorithmic management, the platform is continuously squeezing the space available for workers' rest. Many platforms generally adopt a "task-reward" mechanism now. Through tiered incentives, dynamic dispatching, variable unit rates, and real-time rankings, workers are driven to remain in a state of continuous competition over the long term. For instance, platforms in the food delivery industry drive couriers to continuously accept orders through real-time dispatching and dynamic adjustments to per-order rates. Actual working hours often significantly exceed statutory standards. The algorithm continuously optimizes delivery routes, order density, and order acceptance rhythm. On the side of the platform, this manifests as increased efficiency; on the side of the workers, however, it translates into high-intensity, unrelenting labor pressure. Ride-hailing drivers, crowdsourced workers, and other similar groups have long been subject to data-driven monitoring and performance evaluations. Work overload has become a common phenomenon, giving rise to a multitude of issues ranging from occupational health and traffic safety to psychological stress [12]. Under such working conditions, the balance of power between labor and capital becomes further skewed, leaving workers more vulnerable to a passive position when defending their rights, engaging in consultation, and bargaining.

The income stability and basic livelihood security of digital workers remain relatively fragile. Through asymmetrical revenue-sharing rules, complex reward and penalty mechanisms, and standardized contractual clauses, the platform shifts operational risks and operating costs downward onto the workers. Moreover, workers' income is highly dependent on platform commission rates, shifts in market supply and demand, order fluctuations, and traffic allocation, thereby lacking relatively stable institutional safeguards. Taking the ride-hailing and food delivery industries as examples, costs such as vehicle wear and tear, insurance premiums, energy expenditures, and fines for violations are usually borne primarily by the workers themselves. But the platform is able to maintain relatively stable revenue through technical means and the arrangement of rules. Traffic data, user information, and behavioral records generated during the labor process are important sources of excess profits for digital capital. However, workers do not receive the value-added returns generated by these

new types of production factors. The phenomenon of alienated labor, as elucidated by Marx, finds a new mode of manifestation within the context of digital labor: when labor remuneration proves insufficient to cover basic living costs, the fundamental baseline of labor fairness is directly undermined [13].

The existing labor rights protection system is generally lagging behind the pace of development of digital labor. This further reinforces the vulnerable position of workers. Current labor laws and related regulations are still not clear enough regarding the definition of employment relationships on platforms. A large number of digital workers exist outside of standard labor relations. Institutional rights—such as those pertaining to minimum wage, social insurance, work-related injury determination, and rest and leave—are difficult to fully implement. Platform companies typically organize employment under names such as "independent contractors," "partners," and "freelancers." Thereby effectively evading the statutory obligations that traditional employers are required to bear. When workers encounter issues such as wage arrears, work-related injuries, discrimination, or unjust disciplinary actions, they often face additional practical obstacles—including complex procedures for asserting their rights, high costs associated with gathering evidence, and difficulties in identifying the responsible parties [14]. Furthermore, there is a clear correlation between distributional imbalances and the absence of rights. When workers lack basic safeguards and institutional support, their subordinate position in the distribution of surplus value becomes even more difficult to alter. Therefore, establishing a system for safeguarding rights and interests that is adapted to the characteristics of digital labor has become a critical issue for realizing labor justice and upholding the social foundations of the digital economy.

3.3. Disputes over data ownership and usage rights

The unclear definition of data ownership and usage rights is one of the important root causes of the continued escalation of conflicts over the distribution of surplus value in digital labor. It also constitutes an obstacle to the formation of a rational allocation mechanism. According to the basic logic of Marx's labor theory of value, the worker embodies labor in the object of labor through concrete labor. For labor products possessing inherent value, the attribution of their proceeds should, as a matter of principle, maintain an intrinsic link with the labor contribution involved. However, in the context of digital labor, the data created by workers has become a key factor of production. The ownership of these rights has long remained in a state of ambiguity. Issues such as unclear ownership, the separation of property rights and powers, and the mismatch of benefits are compounding one another. This makes it difficult for workers to obtain returns on their rights and interests commensurate with their contributions during the processes of data element formation, circulation, and value appreciation.

From the perspective of power structures, the uncertainty surrounding data ownership primarily deepens the separation between workers and the products of their labor. Platforms typically rely on user agreements, terms of service, and standard contracts. They advocate for broad control over data and the assetization and commodification of data resources generated by workers' activities. For commercial operations and capital expansion. Workers face difficulties in obtaining full ownership of their data and participating in the process of distributing the value-added returns generated from that data. This arrangement constitutes, in essence, a reappropriation of the fruits of digital labor. Existing legislation lacks clear and unified provisions regarding data ownership, revenue sharing, and platform responsibilities. Data ownership disputes frequently arise in both judicial and practical spheres. Both traditional property rights systems and labor law frameworks face contradictions in their application.

Looking further, the expansion and abuse of data usage rights constitute a profound deprivation of workers'

rights. Once platforms have gained control over data, they often convert it into new commercial products and sources of profit through algorithmic analysis, behavioral profiling, targeted marketing and artificial intelligence training; this process of value creation typically takes place independently of the workers, who rarely receive any compensation as a result. Some platforms even go beyond the bounds of fair use through technical scraping, data mining and information trading, incorporating personal privacy, behavioral patterns and work records into their commercial operations. In this process, the notion of technological neutrality frequently serves as a smokescreen for power asymmetry, with platforms effectively establishing exclusive control over data through contractual terms and technical architecture. In other words, disputes over data are no longer merely disputes over property rights in the general sense; they also involve a series of fundamental issues such as the attribution of labor outcomes, the order of value distribution, and the boundaries of platform governance. Unless data rights are redefined at the institutional level, the imbalance in the distribution of surplus value generated by digital labor will be difficult to resolve fundamentally.

3.4. Case study: Infringement of workers' rights on food delivery platforms

The issue of digital labor distribution on food delivery platforms reveals the core characteristics of the contradictions surrounding the distribution of surplus value within the contemporary realm of digital labor. The design of algorithmic rules, the structuring of employment relationships, and the operation of revenue distribution mechanisms all demonstrate that platforms exercise control over both the labor output and the working hours of their delivery riders. As one of the most representative labor groups in the platform economy, food delivery riders' work processes are highly dependent on digital system dispatching, while their performance evaluations are deeply embedded within metrics such as order data, delivery times, customer feedback, and credit scores. Specifically, for this reason, the labor processes on food delivery platforms have become crucial case studies for observing how digital capital organizes labor, extracts surplus value and transfers risk.

In terms of working hours and labor intensity, riders' work is broken down into individual orders by the platform's algorithms. The platform then uses strict time requirements, on-time delivery metrics and penalties for exceeding time limits to drive riders to maintain a high frequency of order acceptance. Most riders work between 10 and 14 hours a day, yet a significant portion of the time spent waiting, competing for orders, traveling and dealing with emergencies is not fully counted as effective working hours. This implies that while platforms ostensibly use technological optimization to improve delivery efficiency, in reality, they shift the pressure of efficiency onto workers, who are forced to endure constant time constraints and bear the associated risks. As riders' labor is subject to real-time algorithmic monitoring and instant rankings, high-intensity work has become the norm for this occupational group.

In terms of income distribution, there is a marked disparity between the effort expended by riders and their actual remuneration. The revenue structure of food delivery orders typically comprises multiple components, including platform service fees, merchant payments, delivery charges and subsidy adjustments. While this appears to be a flexible and complex pricing model, the platform retains the authority to determine commission rates, incentive mechanisms and the distribution of subsidies. The distribution structure established between the platform and merchants remains the primary factor influencing riders' income, and riders are often left with no choice but to passively accept the established rules. Existing research and relevant statistics indicate that, among leading platforms, the proportion of the platform's commission allocated to riders' earnings per order

is relatively low. Furthermore, institutional arrangements such as bad-weather subsidies and order-completion bonuses are sometimes incorporated into the platform's system of tools for transferring operational risks [15]. The result is that market fluctuations, traffic risks, time costs and physical exertion are borne predominantly by workers, whereas the platforms, which rely on their position as technological intermediaries and economies of scale, are able to maintain high and relatively stable profit levels.

From the perspective of labor protection, platforms generally adopt crowdsourced and flexible employment models to minimize their liability under labor law. Many riders are classified as individual contractors or cooperative delivery personnel, and platforms typically do not provide them with comprehensive social insurance, work-related injury insurance or occupational health protection. During the course of their work, riders must also bear the costs of vehicle depreciation, communication equipment, accident risks and penalties for violations. In the event of a delivery accident, personal injury or labor dispute, platforms often seek to minimize their liability by claiming that they 'merely provide information-matching services'. This institutional arrangement implies that while riders are the direct creators of surplus value and a key source of the platforms' data resources, they are unable to share the value generated by data, nor do they benefit sufficiently from improvements in working conditions brought about by technological progress [16]. Viewed in this light, the distribution structure and allocation of responsibility within food delivery platforms clearly reveal the dual mechanism of dispossession inherent in digital labor: on the one hand, the continuous compression of the direct fruits of labor; on the other hand, the exclusion from data value and the platform's value-added profits. To alter this situation, further adjustments must be made at the institutional level to digital labor-capital relations, profit-sharing rules and the platform's liability structure, thereby promoting the more concrete institutional implementation of labor justice under the conditions of the digital economy.

4. Strategies for achieving justice in the distribution of surplus value from digital labor

4.1. Improving legal frameworks and policy support

The novel organizational models and employment relationships associated with digital labor are continuously altering the conditions under which traditional labor laws apply, placing new institutional pressures on existing labor protection systems in terms of scope of application, status determination, and redress mechanisms. Given this reality, the key to promoting a fairer distribution of surplus value in digital labor lies in establishing a legal and regulatory framework commensurate with the current stage of digital economic development and in responding to the new dynamics of capital–labor relations under platform-based, data-driven, and algorithm-driven conditions through more targeted institutional measures. In response to prominent issues in digital labor—such as the blurring of employment boundaries, inadequate protection of rights and interests, and the weakening of platform responsibility—it is necessary to adopt specific legislation to further clarify the rights and obligations between platform enterprises, employers and workers; strengthen regulatory constraints on platform business operations; and provide more effective institutional safeguards for the legitimate rights and interests of workers.

On this basis, legislation on digital labor should take Marx's labor theory of value as its theoretical foundation and undertake institutional restructuring centered on the issue of structural distributional imbalances under the digital economy [17]. Specifically, first, a system for identifying digital workers should be established, making appropriate adjustments to the single standard of traditional subordinate labor relations to ensure that new categories of workers—such as platform riders, on-demand delivery personnel, crowdsourced

workers and the flexi-workforce—are securely brought within the scope of legal protection. Second, a rights protection system adapted to networked forms of labor should be constructed, establishing a relatively clear regulatory framework covering working hours, remuneration, social insurance, and occupational safety and health protection. This should focus on addressing issues such as increased labor intensity, heightened income volatility, and the externalization of business risks under algorithmic management. Third, the coordination mechanisms between labor dispute mediation, administrative supervision and judicial remedies should be improved to enhance the efficiency of resolving labor disputes on platforms while strengthening oversight and constraints on platform enterprises to prevent them from exploiting their technological and informational advantages to shift costs and erode workers' rights. Furthermore, during the process of institutional development, diverse stakeholders—including the government, platform enterprises, workers' organizations, industry associations and the general public—should be engaged in interest coordination to enhance the rationality, responsiveness and practicality of the regulatory framework.

At the policy level, systematic institutional arrangements are required to underpin the protection of digital workers' rights. Specifically, measures such as tax relief and social insurance subsidies could be employed to alleviate the practical burdens on digital workers; by strengthening the infrastructure of the digital economy; by deepening reforms to the market-based allocation of data as a production factor; and by expanding the supply of high-quality digital jobs, thereby enhancing workers' ability to enter the digital economy's value chain; by establishing a special fund for innovation and entrepreneurship in the digital economy to provide low-interest loans and necessary financial support for workers' skills training, job transitions and re-employment; and by constructing a collaborative talent development model involving government, industry, academia and research institutions to enhance workers' professional skills, technological adaptability and bargaining power within the value chain. Furthermore, methods such as "whitelist" incentives and social responsibility assessments can be used to guide platform companies to establish profit-sharing mechanisms that align with the interests of workers.

The coordinated advancement of laws, regulations, and policy guidance is key to alleviating the imbalance in the distribution of surplus value in the digital economy [18]. Specialized legislation can provide basic protection for workers. Industrial policies promote fair competition while maintaining market vitality. Coordinating these two approaches helps curb the disorderly expansion of platform capital and provides stable expectations for the innovative development of the digital economy. Relevant regulations should be regularly evaluated and adjusted in accordance with the evolution of digital business models. Improve the timeliness and adaptability of the system. This can gradually solve the problem of uneven distribution. To safeguard the legitimate rights and interests of workers and capital, and to promote the sustained and healthy development of the digital economy.

4.2. Strengthening workers' organization and collective bargaining

Promoting a more equitable distribution of surplus value in digital labor is inseparable from enhancing the level of workers' organization and gradually improving collective bargaining mechanisms. Digital labor is characterized by significant decentralization, mobility and informality, and traditional trade union models have proven ill-suited to the conditions of the platform economy. Against this backdrop, it is necessary to innovate the forms of worker organization and institutional arrangements in line with the organizational methods and technological environment of digital labor, thereby enhancing workers' bargaining power in the distribution

process and, on this basis, promoting a shift in labor-management relations toward a more balanced equilibrium.

In terms of organizational forms, support should be given to the establishment of diverse organizational structures, such as sectoral trade unions, cross-platform alliances and digital workers' unions. The internet and social media platforms should be fully used to develop mechanisms for information sharing, the exchange of experiences and the articulation of interests, thereby gradually overcoming the organizational barriers posed by geographical dispersion and occupational mobility. This will transform groups such as food delivery riders, crowdsourced workers and online streamers into collective entities capable of sustained, coordinated action. Moreover, the state may provide support at the policy and financial levels for the incubation and operation of workers' organizations, establishing a labor protection fund to provide legal aid, risk relief and awareness-raising for vulnerable workers. Furthermore, new digital labor organizations could integrate with platform management systems to establish data monitoring mechanisms, enabling real-time tracking of working hours, income, algorithmic discrimination and unreasonable penalties, thereby strengthening the evidential basis for rights claims and the capacity for institutional responses.

At the institutional level, a standardized collective bargaining mechanism should be progressively established to promote the integration of procedural and substantive justice. Specifically, a tiered and categorized bargaining system could be established, distinguishing between basic working conditions and specific interest claims while involving worker representatives, platform enterprises, the general public and experts from relevant fields to enhance the fairness and scientific rigor of the bargaining process. The scope of consultation should cover core issues in digital labor, such as wage composition, working hours, algorithmic transparency, data rights, information security and grievance procedures. To enhance the effectiveness of consultation, a closed-loop mechanism linking consultation, implementation and feedback should be established, embedding the outcomes of consultation into platform rules and algorithmic systems while remaining subject to continuous supervision by labor inspection authorities.

Building on this, the government should also refine relevant legislation to gradually incorporate platform employment into a standardized collective bargaining framework, clarifying corporate responsibilities, procedural requirements and corresponding penalty measures. Moreover, a dedicated labor dispute resolution body should be established to mediate and arbitrate disputes where negotiations have failed, thereby preventing platform capital from dominating the negotiation process through its resource and technological advantages. Through the coordinated advancement of organizational development, institutional embedding, and technological constraints, mechanisms for expressing workers' interests will be substantially strengthened. It will also become more likely that a relatively stable dynamic will emerge between platform development and workers' rights, thereby steering the distribution of surplus value back toward the fundamental logic that value is created by labor.

4.3. Promotion of reforms for the market-based allocation of data as a factor of production

As a core factor of production in the digital age, the efficiency of data allocation and the methods of revenue distribution directly influence the structural form of the distribution of surplus value generated by digital labor. To improve the distribution pattern of digital labor and promote distributional justice, it is necessary to promote market-based reform of the distribution of data production factors [19]. This reform involves the cultivation and regulation of the data element market, as well as the reshaping of the data value formation and revenue distribution mechanism.

From the perspective of basic conditions, building a standardized and orderly data factor market is a prerequisite for achieving market-based allocation. The *Opinions on Establishing a Basic Data System to Better Leverage the Role of the Data Factor* explicitly identifies data property rights, circulation and trading, revenue distribution, and security governance as key components of the basic data system, thereby providing an institutional basis for the development of the data factor market [20]. The government should strengthen the top-level design and introduce laws, regulations, and policy measures to promote the development of the data factor market. On the one hand, support should be given to data trading, circulation and sharing; multitiered data trading platforms should be established; more scientific asset valuation methods should be explored; and data transaction costs should be reduced while improving the efficiency of data circulation. The "Data Factor ×" Three-Year Action Plan (2024–2026) also proposes leveraging the amplifying, synergistic and multiplicative effects of the data factor to promote the multiscenario application and multiparty reuse of data resources [21]. On the other hand, market regulation should be strengthened by establishing a compliance framework covering the entire process of data collection, circulation, processing and use to prevent the continued expansion of data monopolies, data abuse and imbalances in rights. In particular, there is a need to establish clear rules for data rights attribution and classification standards, reasonably distinguishing the boundaries of rights between public data, corporate data and personal data. Wang explains from the perspective of a 'bundle of rights' that data rights possess characteristics of multiple stakeholders, multiple functions and multiple levels, making it difficult to simply apply traditional property rights models; they must be defined in conjunction with the interests of data originators, data processors and data users. Hu [22] also notes that the development of the data factor market must not remain at the abstract level of rights determination but should also focus on the relationships among the data market structure, trading mechanisms and institutional provisions. With regard to public data, the *Opinions on Accelerating the Development and Utilization of Public Data Resources* propose expanding the supply of public data, improving the efficiency of public data resource allocation and the benefits of its use, and promoting the compliant and efficient circulation and utilization of public data on the premise of security [23]. In this respect, a market environment characterized by fair competition, open sharing, and clear rights and responsibilities is a necessary condition for improving the distribution of the surplus value generated by digital labor.

In the distribution of data-generated benefits, the principle of balancing efficiency and equity should be upheld. According to Marx's theory of labor, the formation of data value encompasses not only the labor input involved in the generation of raw data but also the creative labor involved in subsequent stages such as processing, integration, analysis, and transformation. Consequently, the evaluation system for the distribution of data as a factor of production should not rely solely on market prices or transaction volumes as criteria; it should also comprehensively consider factors such as data sources, the intensity of processing, application outcomes, value added, and social impacts [24]. On this basis, we can explore the establishment of a data revenue distribution system based on contribution, forming clear rules for identifying contributions and distributing revenues among different stakeholders, including data providers, processors, and users. Specifically, technological tools such as blockchain, data traceability and smart contracts can be utilized to record the processes of data generation, circulation, processing and usage, thereby enhancing the transparency of data contribution identification and value measurement. Furthermore, by executing predetermined distribution rules via smart contracts, relevant parties can receive returns commensurate with their actual contributions [25]. Moreover, a mechanism for the redistribution of data-related revenues could be established, with a portion of the proceeds allocated to workers' skills training, basic livelihood security, public digital services, and the

enhancement of digital capabilities among vulnerable groups, thereby alleviating the income disparities and inequality of opportunity caused by the digital divide [26]. To prevent capital from exploiting technological advantages to excessively appropriate the fruits of digital labor, third-party auditing, industry evaluation, and social oversight mechanisms should be introduced to impose continuous constraints on the data revenue distribution process, thereby promoting a relatively balanced distribution pattern that strikes a balance between efficiency gains and fairness safeguards. Furthermore, reforms regarding the market-based allocation of data elements should be advanced in tandem with reforms to the distribution system. Market mechanisms enhance the efficiency of data allocation through price signals, whereas a reasonable distribution system helps to uphold social equity and labor justice; the two are not mutually exclusive but rather are clearly interdependent. In this process, the principle of combining market mechanisms with government regulation should be upheld: we must avoid both excessive regulation stifling innovative vitality and market failures, leading to a further widening of distributional imbalances. Establishing a two-way regulatory mechanism between data allocation and distributive justice will help achieve the coordinated unity of efficiency and fairness in the digital economy. Furthermore, within the theoretical framework of the Marxist concept of justice, it provides a more robust institutional foundation for refining the system of surplus value distribution in digital labor, safeguarding workers' rights, and upholding social fairness and justice.

4.4. Case study: Shenzhen's practices in safeguarding digital labor rights

Taking Shenzhen's institutional explorations as an example, one can observe in concrete terms how local governance addresses the practical contradictions surrounding the distribution of surplus value in digital labor. As a region with a relatively dynamic digital economy, Shenzhen has undertaken a series of institutional initiatives to safeguard digital labor rights, with its fundamental approach characterized by the integration of regulatory frameworks, platform governance, and capacity building for workers. Judging by current practices, the primary approach lies in strengthening the protection of workers' rights in new forms of employment through local regulatory documents and in making more targeted institutional arrangements regarding the responsibilities of platform enterprises, labor protection requirements, and relevant governance mechanisms.

The significance of local exploration lies in the fact that local legislation or policies can be used to regulate the rights and obligations of various actors in digital labor. In order to provide a basic institutional foundation for the distribution of surplus value. To address issues such as social insurance contributions, labor protection responsibilities, income distribution reference standards, and labor process evaluation mechanisms. Local governance practices seek to establish an intermediary institutional framework between traditional labor relations and new forms of platform employment. To solve practical challenges such as the difficulty in defining digital labor relations and the ambiguity of rights boundaries. Some have also begun to use computational verification, data analysis, and platform governance technologies to measure and evaluate workers' contributions. This serves as a key reference for profit distribution and rights protection. It can be seen that solving the problem of surplus value distribution in the digital workforce no longer relies solely on traditional legal norms. Instead, there is an increasing need to combine institutional arrangements with technological governance measures.

From a theoretical perspective, these practices provide a relatively concrete window into the institutional transformation of Marx's ideas on labor justice in the digital age. Shenzhen's explorations show that promoting the fair distribution of surplus value in the digital labor sector requires institutional constraints at the regulatory

level and operational support at the technical level. The lessons learned are mainly reflected in two aspects: Local governance measures should be used to clarify the rights and obligations structure among digital workforce platforms, workers, and relevant stakeholders. To provide an institutional basis for distributive justice, technologies such as big data and blockchain should also be used to improve the transparency and traceability of the distribution process. This will alleviate problems such as difficulties in measuring value and unclear allocation standards. Therefore, these local practices demonstrate that Marx's theory of labor justice still has significant explanatory power under the conditions of the digital economy. And it provides a practical reference model for institutional responses to labor relations conflicts in the digital age.

5. Conclusion

Guided by Marx's labor theory of value. By examining the mechanisms of surplus value production and its distribution in the digital age, we can see that the distribution of surplus value under digital capitalism has given rise to new contradictions. Marx's labor theory of value retains considerable explanatory power in the context of digital labor. Digital workers continuously participate in the process of value creation through activities such as data production, model training, platform operation, and content provision; at the same time, the intangible, shared, and cumulative nature of data as a core factor of production has driven the emergence of a new form of surplus value: data appreciation. The problem lies in the fact that current digital platforms, which rely on technological barriers, procedural rules and contractual terms, have gradually formed new mechanisms for the extraction of surplus value, thereby leading to issues such as ambiguous data ownership, imbalanced distribution structures and the alienation of technological tools.

Looking further, the dilemma of justice in the distribution of surplus value from digital labor is manifested primarily in the continuous strengthening of control mechanisms dominated by algorithmic power. Platforms leverage their technological and data advantages to impose intensive management over the labor process, and through algorithmic evaluation, traffic allocation, and remuneration calculation, they compress the scope for labor remuneration and increase the intensity of labor. Moreover, the innovative value and data contributions of digital workers have not been adequately rewarded. Furthermore, the landscape of technological monopolies and the center-periphery structure within the global digital value chain place greater pressure on safeguarding the rights and interests of workers in developing countries. It is thus evident that the imbalance in the distribution of digital labor is no longer merely a matter of income disparity in the general sense but rather a deep-seated structural issue involving the attribution of rights, the recognition of value, and institutional arrangements.

From a theoretical perspective, drawing upon Marx's theory of surplus value and examining the operational mechanisms of digital labor through the lens of the relationship between technology, capital, and labor helps to reveal the internal logic of new forms of exploitation, such as the dispossession of data as a factor of production, algorithmic monopolies, and platform control. From a practical perspective, a large number of platform workers usually feel that the value of data is difficult to measure reasonably in their actual work, whereas algorithmic evaluation mechanisms often directly influence income levels and employment opportunities. This finding indicates that distributional injustice has become deeply embedded within the organizational methods and governance structures of the digital labor process.

In response to these issues, institutional measures regarding the distribution of surplus value in digital labor

should be developed along several lines. First, efforts should be made to strengthen the institutional framework for data property rights, gradually clarifying the relevant rights of workers in the data production process and, on this basis, exploring mechanisms for revenue sharing. We must also improve the transparency and ethical governance of algorithms. Strengthen workers' rights to information, remedies, and participation in algorithmic rules. We also need to improve the digital labor protection system. Establish a more adaptable framework for safeguarding labor rights and a mechanism for sharing data benefits. At the global level, it is necessary to promote the development of a digital labor standard system to address the persistent issues of value transfer and power imbalance in the global value chain. The common goal behind these approaches is to achieve digital labor justice. Ensure that the process of reproducing surplus value more fully reflects the core role of labor in the design of rules and technological regulation. Promote a relatively balanced distribution of benefits among workers, platforms, and society.

This research direction can be further expanded. For example, how can we quantify the surplus value productivity of different types of digital labor to form meaningful dynamic indicators? With the continuous advancement of artificial intelligence technology, how will the production methods and distribution ratios of surplus value change, and what institutional mechanisms should be used to protect workers' rights in the virtual space? Further exploration of these issues will help to gain a deeper understanding of the specific meaning of fairness and justice in the digital society and the conditions for their realization. This will also allow the digital economy to move towards a more balanced and sustainable path.

Disclosure statement

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