

Theoretical Definition and Evolution Logic of the "New Poverty Trap" in the Era of Artificial Intelligence

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Abstract: Based on the social structural change driven by artificial intelligence, this paper defines the conceptual boundary of the "new poverty trap" and emphasizes its structural opportunity locking characteristics formed by the superposition of technological change, institutional supply lag and ability differentiation. Starting from the chain of technology promotion, structural reorganization, rule redistribution and ability imbalance, this paper sorts out its stage evolution logic and typical risk scenarios, and points out that there are multiple overlapping effects in employment, education, medical care and social security, which may consolidate social stratification through intergenerational reproduction. Based on this, this paper proposes a governance path with inclusive technology diffusion, capacity building and institutional adjustment as the core, and emphasizes the importance of algorithmic governance transparency, platform labor security and long-term resilient governance.

Keywords: Artificial Intelligence; New Poverty Trap; Digital Divide; Platform Labor; Opportunity Structure; Governance Path

1. Introduction

As a universal technology, artificial intelligence is reshaping the structure of production, distribution and opportunity, and promoting the social stratification mechanism to gradually shift from "resource scarcity" to "ability differentiation" and "opportunity lock" [1]. At the same time, the traditional experience of poverty governance has insufficient adaptability in the face of technology-driven structural changes: on the one hand, digital dividends are not evenly spread, and vulnerable groups are more likely to fall into new types of exclusion in the ecology dominated by data, algorithms,

platforms and capital [2], on the other hand, the coverage logic of policy instruments and social security systems is still centered on "income poverty," making it difficult to identify and deal with structural risks in the technological era [3]. Therefore, how to define the "new poverty trap" in the era of artificial intelligence and clarify its evolution logic have become key issues in current theory and practice. From the perspective of the interaction between technological change and social structure, this paper constructs a "technology-institution-capacity-opportunity" linkage framework to reveal the formation mechanism, stage evolution and risk scenarios of the new poverty trap. On this basis, this paper puts forward governance paths and policy implications, aiming to provide theoretical support and practical reference for inclusive growth and precise governance under the background of digital transformation.

2. Concept Definition and Feature Identification

The "new poverty trap" is a unique structural poverty pattern in the era of artificial intelligence, whose core is not short-term income decline, but continuous opportunity deprivation caused by technological change, institutional supply and capacity structure dislocation[4]. As algorithmic allocation and platform governance become important mechanisms for resource allocation, individuals or groups may be locked into the space of low quality employment, low security and low social mobility due to insufficient digital literacy, skill substitution effect, lack of data rights and opaque rules, even if they nominally cross the minimum income line [5]. The "trap" in this sense emphasizes dynamic lock-in and reproduction rather than static poverty.

From the perspective of conceptual boundaries, the new poverty trap and the digital divide are related but not equivalent. While the digital

divide usually emphasizes differences at the "access-use" level [6,7], the new poverty trap further points to cumulative disadvantages along the "ability-opportunity-institution" chain [8]. It is also different from cyclical employment shocks or temporary unemployment because it results from the long-term coupling of technological structure and institutional arrangements and is not easily alleviated by the upturn of the business cycle. Compared with the traditional poverty trap, which is mainly caused by resource shortage and centered on low-income cycle, the new poverty trap logically emphasizes the role of algorithmic governance and platform rules in shaping social stratification, as well as the insufficient response of education, training and social security system to new technology risks [9].

Theoretically, the new poverty trap can be understood as the result of the superposition of four links "technological structure reshaping - capacity differentiation - opportunity locking - institutional lag". The remodeling of technological structure means fundamental changes in job types, skill demands and organizational methods; ability differentiation makes different groups gap in learning costs, information acquisition and career adaptation; opportunity locking is reflected in the increasing dependence of resource allocation on algorithms and platform rules; and institutional lag makes it difficult for existing policy tools to identify and intervene this new risk. The four links reinforce each other, making it difficult for marginalized groups to achieve upward mobility through traditional paths.

Based on the above definition, its main characteristics can be summarized: first, the coexistence of structural and long-term nature, the mismatch between technical system and institutional supply leads to stability lock; Second, it is strong in concealment. Poverty is no longer just a lack of income, but a lack of opportunities and abilities, which is difficult to be captured by traditional indicators. Thirdly, the stratification intensification effect is significant, and algorithm recommendation, skill threshold and platform labor aggravates resource concentration and social stratification. Fourth, the risk of intergenerational transmission is prominent, and the lack of education, information and social capital will be continuously reproduced through family and community networks; Fifth, there are obvious

regional and group differences, and vulnerable groups, marginal areas and informal workers are more vulnerable to superimposed shocks.

Therefore, the identification of the new poverty trap should shift from the "income perspective" to the "ability and opportunity perspective" and from the "short-term relief logic" to the "structural adjustment logic."

3. Formation Mechanism and Action Chain

The formation of the new poverty trap exhibits a chain characteristic of "technological advancement - structural reorganization - rule redistribution - capability imbalance". After artificial intelligence enters various industries as a general technology, production organization and resource allocation mode have been systematically reshaped, and the job structure has accelerated to high-skill, platform-based and non-standardized transfer [10]. Technology diffusion brings efficiency improvement, but at the same time increases the learning cost and the threshold of job transfer, which puts workers who originally relied on physical strength or experience accumulation at a disadvantage in the skill transformation [11].

At the level of technology promotion, AI and digital tools have changed the labor logic and cost structure of enterprises [12]. Algorithms can measure performance, predict demand and optimize scheduling more finely, which makes labor demand "refined, short cycle, low redundancy" characteristics [13]. For high-skilled jobs, technology is a productivity multiplier; For low-skilled jobs, technology often brings substitution and crowding-out effects, making them enter unstable, informal or low-paid jobs.

At the level of structural reorganization, platform-based economy and algorithmic distribution mechanism have changed the labor process and income distribution rules [14]. The platform shapes labor demand and performance evaluation through data and algorithms, forming a new "visibility - matching - revenue" logic. The group with low digital ability is not only difficult to be identified by the algorithm as high-quality labor, but also may bear higher transaction costs and risk costs due to opaque rules, which leads to the underestimation of labor value and lock in low value-added links.

Rule redistribution is embodied in the reordering of market opportunities by algorithmic governance [15]. Algorithm recommendation,

traffic distribution and credit scoring become important thresholds for opportunity allocation, and these thresholds are often embedded with preferences for educational background, past behavior and platform records, thus forming "implicit screening" that disadvantages vulnerable groups. Even if there is a willingness to improve capacity, it may be difficult to enter a better track due to lack of visibility and reputation record.

The lag in institutional and policy supply further amplifies this structural disadvantage. Traditional social security and employment policies are more designed around standard labor relations [16], and lack coverage of platform labor, flexible employment and skill substitution shocks, making it difficult to identify and compensate new risks in a timely manner. At the same time, education and training systems are different in curriculum setting, resource allocation and regional balance [17], which leads to the concentration of ability improvement channels in advantageous regions and groups, forming an asymmetric pattern of "institutional supply-ability improvement."

At the micro level, individuals' learning ability, social capital and family support determine their adaptation speed in technological change. People with insufficient ability not only face reduced employment opportunities, but also may encounter multiple exclusions in the digitalization process of public services such as finance, medical care and education [10], forming a cycle of "absence of opportunities - limited income - difficulty in improving ability". This cycle is more likely to solidify among vulnerable groups and accumulate into long-term poverty risks through intergenerational transmission.

From the perspective of dynamic process, technology diffusion usually follows the path of "advantageous groups first, then disadvantaged groups," resulting in asymmetric spillover of benefits. Advantaged groups acquire skills upgrading and opportunity channels earlier, and accumulate digital capital and social capital, while disadvantaged groups accumulate risks in lagging adoption and low-quality employment [18]. This difference is further amplified in regional development, urban-rural structure, and industrial division of labor.

Therefore, the chain of action of the new poverty trap can be summarized as follows: technological change leads to job structure

adjustment and rule redistribution, and the lag of institutional supply and the superposition of ability gap eventually lead to opportunity locking and poverty reproduction.

4. Evolutionary Logic and Stage Characteristics

The evolution of the new poverty trap is phased and progressive, and its logic can be summarized as "difference in digital access - expansion of ability differentiation - intensification of opportunity locking - solidification of intergenerational reproduction". In the early stage of technology diffusion, the problem is mainly manifested in the difference of access and basic use, that is, the unequal accessibility of hardware, network and basic digital services [19]. As the application of artificial intelligence goes deeper into the production and governance links, the difference gradually shifts from the access layer to the capability layer. Enterprises and the public sector have increased requirements for data literacy, algorithm understanding and digital skills [20], and the gap between individuals in learning ability, training resources and cognitive structure is rapidly widening, forming a new ability layer. The ability gap not only affects employment opportunities, but also affects individuals' understanding and utilization efficiency of policy information, public services and market rules.

At the opportunity structure level, platformization and algorithmic governance embed the opportunity allocation mechanism into rules and models. Systems such as recommendation mechanism, credit scoring and risk assessment virtually build opportunity threshold, strengthen the preference for "visibility" and "verifiability", and make it difficult for vulnerable groups to enter better resources and market channels [21]. At this time, the risk of poverty is characterized by "opportunity locking."

In the long-term accumulation, opportunity locking interacts with the lag of institutional supply, and the risk of poverty is transmitted to the next generation through educational resources, career paths and social networks, forming intergenerational reproduction. Family differences in investment in education, access to information, and accumulation of social capital put the children of disadvantaged groups at a structural disadvantage at the starting point, further strengthening the stability of the poverty

trap [22].

The core issues and governance priorities at different stages are different: the access stage emphasizes infrastructure and inclusive services, the capacity stage emphasizes education and training supply, the opportunity stage emphasizes transparency of rules and algorithmic governance, and the intergenerational stage emphasizes balance of public resources and resilience of social security. Therefore, understanding its evolution logic is helpful to grasp the pace of governance, shift from "shoring up weak links" to "structural adjustment," and carry out forward-looking intervention in the dynamic evolution.

5. Risk Scenarios and Structural Impacts

The risk scenario of the new poverty trap has the characteristics of multi-field superposition, which is mainly reflected in key life areas such as employment, education, medical care and social security.

At the employment level, algorithmic management and platform employment have become important organizational forms. Workers' income is subject to scoring mechanism, order acceptance rules and traffic distribution, and low-skilled groups are more likely to be assigned to high-intensity, low-security and high-uncertainty positions [23], forming a risk structure of "high labor intensity - low protection of rights and interests".

At the education level, the acquisition and utilization of digital learning resources depend on family conditions, school resources and digital literacy [24]. The further concentration of high-quality educational resources in the platform-based environment leads to the continuous disadvantage of disadvantaged groups in terms of learning quality, information acquisition and access to higher education, thus weakening their possibility of achieving social mobility through education.

At the level of medical care and public services, intelligent diagnosis and treatment, online appointment and digital medical insurance improve efficiency, but also form implicit screening at the threshold of use [25]. The elderly, low-income groups and residents in marginal areas are more likely to be excluded due to equipment, network or operational capacity limitations, forming a chain of "insufficient accessibility - accumulation of health risks - decline of labor ability".

In terms of social security, the traditional welfare system is based on stable employment and payment records, but it does not cover platform labor and flexible employment enough, which weakens the risk buffering ability. Job substitution and occupational instability brought by artificial intelligence make some groups lack effective support in the process of unemployment and job transfer [26], which further aggravates income fluctuations and life vulnerability.

After the superposition of these risk scenarios, it will have a more profound impact on the structural level. First, the trend of class consolidation is strengthened, and vulnerable groups form multiple barriers in resource acquisition, ability improvement and opportunity entry. Second, the regional gap is widening. Regions with insufficient allocation of digital infrastructure and public services are more likely to fall into poverty reproduction. Third, social trust and institutional identity are impacted. If algorithmic governance lacks transparency and fairness, the acceptability of policies will be weakened. The identification of risk scenarios thus becomes a key prerequisite for the design of subsequent governance strategies.

6. Governing Pathways and Policy Implications

To address the new poverty trap, efforts should be made in a coordinated manner along the three main lines of "technology diffusion - capacity building - institutional adjustment". First of all, infrastructure and digital public services should be inclusive and balanced, and the starting point threshold for technological participation should be lowered by narrowing the access differences between urban and rural areas, regions and groups, so that vulnerable groups can enter the digital ecology.

Second, capacity building should be the core of governance. Education and training systems need to be structurally adjusted to meet the skills needs of the AI era, strengthen digital literacy, data awareness and interdisciplinary capabilities, and establish retraining and certification systems for flexible workers and low-skilled groups. Through the coordinated supply of government, enterprises and social organizations, a support chain of "lifelong learning-skill upgrading-employment fit" will be formed.

Third, institutional adjustment should cover the key links of platform economy and algorithmic

governance. A more inclusive social security system should be established for platform labor, and the social security payment and welfare transfer mechanism for flexible employment should be improved to avoid security breaks caused by changes in labor relations. At the same time, the transparency and interpretability of algorithms should be improved, and the supervision and evaluation of key allocation rules such as credit scoring and recommendation mechanism should be strengthened to prevent implicit discrimination and opportunity exclusion.

At the level of policy tools, the strategy of "tiered governance + targeted interventions" can be implemented: high-risk groups should receive support for digital literacy and career transition; medium-risk groups should be provided with skills upgrading and measures to ensure social security stability; and for low-risk groups, the focus should be on fair competition and the opening of pathways to opportunity. Enhance the targeting and sustainability of policies through multi-level policy combinations. Finally, governance needs to introduce a long-term perspective and the concept of resilient governance. The formation of the new poverty trap is cumulative and intergenerational, so it is necessary to continuously invest in the balance of educational resources, universal benefit of public services and coordinated regional development, and improve the speed of policy response through data monitoring and risk early warning mechanism. In general, the key to governance is to combine technological progress with socially inclusive growth, promoting efficiency gains while avoiding the solidification of opportunity structures.

7. Conclusions and Research Prospects

This paper focuses on the theoretical definition and evolution logic of the "new poverty trap" in the era of artificial intelligence, and emphasizes that its essence is the structural opportunity lock caused by technological change, institutional supply and capacity structure dislocation. Different from the traditional poverty trap, the new poverty trap is more prominent in the long-term effect of ability gap, opportunity exclusion and rule redistribution, and it is hidden and spread in the context of platination and algorithmic governance. By sorting out the formation mechanism, evolution logic and risk scenarios, it can be seen that its core risk lies in

hierarchical strengthening and intergenerational reproduction.

The policy implication of this study is that governance should not only rely on income assistance, but should pay equal attention to capacity building and institutional adjustment, promote the universal benefit of digital infrastructure, the update of education and training system and the expansion of social security, so as to ensure the equality of opportunity while improving technical efficiency. Especially in the field of platform economy and algorithmic governance, it is necessary to improve the transparency of rules and the ability of public supervision, and reduce the structural barriers to opportunity access for vulnerable groups.

There are still some limitations in this study. Firstly, the conceptual framework still needs to be verified in more empirical studies. Secondly, the measurement indicators and identification tools for the new poverty trap are still not perfect, making it difficult to effectively connect with the existing poverty evaluation system. Thirdly, the mechanisms of differences among various regions and groups still require more detailed comparative analysis.

Future research can be advanced in three directions. Firstly, a multi-dimensional index system can be established to incorporate variables such as capabilities, opportunities and institutional factors into poverty measurement. Secondly, empirical studies at regional and industry levels can be conducted to test the impact of algorithmic governance and platform-based labor on poverty risks. Thirdly, by combining policy experiments and governance innovations, the institutional paths for achieving inclusive growth during the process of technology diffusion can be explored. Through the combination of theory and empirical research, it is expected to provide more operational solutions and tools for poverty governance in the digital era.

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