

Opportunities and Challenges of Artificial Intelligence in Equitable Income Distribution Policy: Tax Optimization through Agent-Based Simulation

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Abstract

In an era marked by growing income inequality that threatens social stability and sustainable growth, and amid the evident inefficiencies of traditional redistribution mechanisms, Artificial Intelligence (AI) emerges as a dual-edged sword. While AI offers powerful tools for designing more equitable policies, it also risks exacerbating disparities by accelerating skill-biased technological change. This study first outlines a normative framework for justice to guide the design of equitable algorithms, addressing critical challenges such as algorithmic bias, privacy concerns, and lack of transparency. It emphasizes integrating principles of distributive justice, participatory design, human-in-the-loop oversight, and privacy-by-design into AI systems. Focusing on AI's role as a policymaking tool, the study demonstrates its potential to optimize the equity-efficiency trade-off using an agent-based simulation. A virtual economy was modeled with four intelligent household agents and a social planner (government), testing three fiscal scenarios: zero, heavy, and balanced taxation. Results indicate that the balanced tax policy, compared to the zero-tax scenario, improved equity by 6.18% at the cost of a 4.83% efficiency reduction. Moreover, relative to the heavy-tax scenario, it enhanced efficiency by 12.2% with only a 1.9% equity reduction. This rebalancing ultimately raised social welfare—by 0.79% compared to the zero-tax scenario and by 10.27% compared to the heavy-tax scenario. These findings highlight the value of AI-driven simulation as a policy laboratory for designing smarter, more equitable fiscal systems.

Keywords: Income Inequality; Artificial Intelligence; Smart Policymaking; Tax Optimization; Agent-Based Simulation; Equity-Efficiency Trade-off.

JEL Classification: D63, C63, O33, H21.

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