Effects of taxes, redistribution actions, and fiscal evasion on Wealth inequality: an agent-based model approach

Iago N. Barros[1], Marcelo L. Martins [1,2]

[1] Departamento de Física, Universidade Federal de Viçosa, 36570-900, Viçosa, Minas Gerais, Brazil,
[2] National Institute of Science and Technology for Complex Systems, Centro Brasileiro de Pesquisas Físicas, Rua Dr. Xavier Sigaud 150, Urca, 22290-180, Rio de Janeiro, Brazil

Economic inequality has been steadily increasing worldwide over the past decades, yet there remains insufficient discussion and action regarding one of the greatest challenges of the 21st century: reducing inequality. While some countries have recently made strides in addressing extreme poverty, the global economy continues to disproportionately concentrate wealth in the hands of a few. This reality underscores the growing importance of discussions around income distribution, wealth taxation, tax progressivity, and social welfare policies. In quantitative investigations of theoretical economic phenomena, mathematical and computational models have proven invaluable tools. In this work, we extend the agent-based model proposed by Castro de Oliveira [1] to explore the impact of taxation and government interventions on fostering a more egalitarian society. In this model, the economic evolution of agents' wealth follows a multiplicative process, where each agent operates independently without direct economic interaction with others. According to the findings of Castro de Oliveira [1], tax progressivity is not only essential for achieving greater economic equality but also prevents the system from entering an absorbing state. This undesirable state can be mitigated through government redistribution policies, which act analogously to an external field in the system's dynamics.

Our simulation and analytical results reveal three distinct dynamical behaviors in the model, depending on tax rate parameters: generalized impoverishment, enrichment with dispossession, and overall prosperity. These findings emphasize the critical role of well-designed tax policies. Additionally, through our extensions to the original model, we demonstrate that: (1) ensuring that the most disadvantaged agents receive a greater share of redistribution compared to the more affluent is key to promoting a more economically equitable and sustainable society; and (2) once tax collection and redistribution are implemented, effective mechanisms must be in place to monitor individual contributions and prevent tax evasion.

We would like to express our gratitude to CAPES and FAPEMIG for their support in this research endeavor.

References

[1] de Oliveira, P. M. C. Rich or poor: who should pay higher tax rates? Europhysics Letters **119**, 40007 (2017).

Type

ORAL