

Benefits Driven Migration Between Agricultural and Industrial Sectors: Econophysics Modelling via Monte Carlo Simulation on Ising Spin Model

Tuesday 22 May 2018 15:45 (15 minutes)

The transition from agriculture towards manufacturing serves as a key feature in economic development in developing countries. In such the transition, there occurs a flow of laboring force from rural (agricultural) to urban (industrial) areas, resulting in the drop in agricultural GDP but the rise in industrial GDP. This substantially affects the economic structures as the rural to urban migration results in substantial changes in employment and living standards between rural and urban areas. Many economic models have been considered to explain population migrations. Among them, one of most successful model emphasizes on income differences between the agricultural and industrial sectors. This income mismatch could be treated as the 'chemical potential' which drives the flow of labouring masses between the two sectors. Incorporation with social interaction where people tend to stay with their closest ones, the model can be categorized as the ferromagnetic Ising spin model. With each state of the spin referring to a worker in each different sector, previous works usually rely on the nearest neighbouring model where in fact the spatial nearness of the spin does not relate to the close relationship among workers. Furthermore, to limit the relationship interaction only up to first or second nearest neighbouring spins in two-dimension is also ambiguous as each worker should have freedom to pick up friends' with intimacy. Therefore, in this work, we have used a dynamical Ising model to investigate agricultural-industrial migration. Instead of considering only neighbouring spins, the spins are allowed to interact with any other spins in the system in a random fashion, where average number of social interacting spins was varied. With Monte Carlo simulation, heat-bath algorithm, and the sectorial update based on difference in income/social benefits, emergent characteristics that are common in developing economies were found. For instance, with majority of population initially set in the agricultural sector, the temporal growth of industrial population as well as per capita income is evident. In addition, the population in these two sectors become stabilized when the equalization condition of average income per worker in both sectors is met. However, with increasing the number of social interacting friends, the growth rate in industrial population becomes smaller and the population in both sectors takes a longer time to stabilize. This is expected as a larger level of consensus usually slow down any rapid changes, so higher income benefit needs to be enhanced for faster driving the system to economic stability state.

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Session Classification: A017: Statistical and Theoretical Physics (Poster)

Track Classification: Statistical and Theoretical Physics