Multi-Agent-based Simulation on the Evolution and Development of Chinese Regional Economy with Technology and Capital Diffusion

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Abstract Nowadays the technology-level and the capital attractiveness has become symbols of regional competitiveness. Sufficient capital is the base and guarantee of technological progress while technology plays an important effect on the development of economy. Attracting capital investments and obtaining technology diffusions are both significant for regional development. Attracting capitals and obtaining technology diffusion are both significant for regional development. Although China has scored notable achievements, the development of China is unbalanced. The East has a dominant position no matter in economic aggregate or in technology level. The gap between the East and other regions is even gradually expanded. Such imbalance has become a block on the way of the further economic development and social justices of China. In this paper, different from regional structure research methods like econometrics or statistics, a regional technology diffusion model is built based on the theory of Multi Agent-Based Simulation (MABS) from the perspective of microcosmic economy. In this model, every prefecture-level city in China is defined as a capital organization agent and Cobb-Douglas production function is adopted. Heterogeneous labors holding different technology levels move among agents under the influence of Wilson spatial attenuation, and then the technologies diffuse along with this process. Capitals can also move among agents after comparing the profit margins and market sizes of different agents. In addition, different kinds of roads are endowed with different weights to form a heterogeneous traffic network in this model. A simulation system is built combined with GIS technologies. Three scenarios are identified, which account for the effects of the heterogeneous traffic network and a preferential tax policy on the evolution of Chinese regional structure and the diffusion of technology. The simulated results indicate that the traditional center-hinterland diffusion mode is no longer applicable under the impact of heterogeneous traffic network in reality; the technologies firstly diffuse from center cities along the arterial traffic lines, complying with a hub-net structure and then from the arterial traffic lines to cities located at the branch lines. This is

a forming procedure of hub-network structure. Such phenomenon can also be observed in the process of capital movement in which the capital hubs connect together, forming a capital movement network along the arterial traffic roads firstly, and then extend the network to the normal points beside them. It's also demonstrated that traffic condition is very important to regional technology improvement and a preferential tax policy can be conductive to attracting the immigration of labors and improving the local technology level for those regions which have high roughness & remoteness index. For demonstrating the geographic bases, two figures of the Roughness & Remoteness Index and the Aerial Railways of China are presented at the Appendix.

Key words MABS, Bottom-up, Technology diffusion, Capital movement, Policy

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