The Application of C.A. to Economics: Simulation of Economies with Snobs and Conformists

MIURA Ken* Sobei H. ODA† Kanji UEDA‡
Yasunori BABA§

March 4, 1996

It is usually assumed in economic theories that a consumer's utility depends only on his or her own consumption: a person's preference is not affected by other people's behaviour. However, this is not always the case; to buy a suit, an antique, or a computer, one may consider how many other people purchase the same product. If a person's decision depends on the number of those who make the same decision, it is said that there are network externalities. This paper develops a model of cellular automata to describe markets where network externalities are observed.

This paper describes the dynamics of demand generated by network externalities in terms of cellular automata. The basic idea is regarding each cell as a person whose reservation price for a commodity, the maximum price he or she may pay for the commodity, depends on the number of his or her neighbours who purchased the product in the previous period. This approach regards - in contrast to the equilibrium theory - a market as a place where people repeatedly gather local information, do a small calculation to makes a decision, and put it into practice. As a result of explicitly taking account of difference in locally available information and interactions between information processing and economic activities, the analysis reveals some patterns of the market dynamics: (1) If all are conformists who prefer doing as their neighbours do, a (quasi)equilibrium state (the state where individuals cease to change their decisions) is usually attained after some periods, but the number of those who

*Faculty of Engineering, Kobe University, 1-1 Rokkodai-cho, Nada-ku, Kobe 657, Japan (E.mail: miura@mi-2.mech.kobe-u.ac.jp).

†Faculty of Economics, Kyoto Sangyo University, Motoyama, Kamigamo, Kita-ku, Kyoto 603, Japan (E.mail: oda@cc.kyoto-su.ac.jp).

‡Faculty of Engineering, Kobe University, 1-1 Rokkodai-cho, Nada-ku, Kobe 657, Japan (E.mail: ueda@mech.kobe-u.ac.jp).

§Research into Artifacts Centre for Engineering, University of Tokyo, 4-6-1 Komaba, Meguro-ku, Tokyo 153.

buy the product sensibly depends on the initial conditions. (2) The situation is reversed if some are so snobbish that they hate to follow their neighbours: although individuals do not cease to change their decisions, the number of purchasers usually fluctuate around a value which is independent of the initial conditions with small amplitude.

In addition to the introduction of locally different birth and death rules into the life game, we believe, our analysis could shed a new light on the existing theories of marketing and economics: the long-run equilibrium - if there exists such a situation - can be quite different from the one excepted by the equilibrium analysis.