論文の内容の要旨

論文題目　Essays on Network Economics

（ネットワーク経済学に於ける論文集）

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The dissertation consists of mainly the following four parts.

We study a condition of favoring cooperation in Prisoner's Dilemma game on complex networks. There are two kinds of players: cooperators and defectors. Cooperators pay a benefit b to their neighbors at a cost of c, while defectors only receive benefit. Although it has been believed that b/c > <k> is the condition of favoring cooperation, we find that the condition is b/c > < knn>. We also show that among representative networks: regular, random and scale-free, regular network favors cooperation most, while scale-free network favors it least. On ideal scale-free network, cooperation is unfeasible.

We study Imperfect Competition on Complex Networks. The result of imperfect competition among firms crucially depends on underlying network structures. On regular networks and random networks, nothing special is observed. However on Scale free networks, market outcomes of output and price are

monopoly, regardless of the number of rival firms. Furthermore, in scale free networks, as network size increases, then the average number of rivals also increases, however, average output and average price also increase. We also introduce utility function that has useful property for network Economics, from which inverse demand functions repeatedly used in the resent paper are derived.

We want to show that underlying network structure drastically determine the outcome of the model, in particular scale free networks do. We believe that scale free networks will shed new light on Economics.

Most growth theories have focused on R&D activities. Although R&D has significant importance on economic growth, there is another aspect, that is, spillover effect. In this paper, we study knowledge spillover among agents by representing it as network structures. The purpose of this paper is to supply fundamental framework to treat knowledge spillover by network scheme.

We introduce knowledge spillover equation and solve it to find tractable solution.

It has mainly two following properties;

(1) Growth rate is common for all the agents only if they are linked to the whole network regardless of degrees,

(2) TFP level is proportional to degree. We show that underlying network structure drastically determine the growth rate by comparing among representative networks: regular network, random network, and scale free network.

We apply this framework, knowledge spillover equation, to the problem of firms forming links endogenously and show that how the area affects growth rate and output.

We analyze fundamental characteristics of the inter-firm transaction network through the data of 800,000 Japanese firms. We find that there exists a hierarchical structure and a negative degree correlation in this transaction network. We also find that this undirected network is a scale-free network.

We bring to light these characteristics of the network and discuss

why there is an important need to conduct research work on the actual network structure.