A dynamic analysis of collusive networks

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Abstract This paper investigates the strategic formation of collusive networks in a dynamic framework. A collusive network is a set of market sharing agreements between firms in oligopolistic markets and auctions. Belleflamme and Bloch (Int Econ Rev 45(2):387–411, 2004) fully characterize the pairwise stable collusive networks in their symmetric model. In contrast, we characterize the collusive networks to which a dynamic network formation process converges with positive probability in the symmetric model. We provide a complete characterization for the case of the process that starts from a network with sufficiently few links. Moreover, we show that the process never cycles but always converges to a stable network. In addition, we discuss an asymmetric model where firms enjoy a home country advantage. We show that the expected number of collusive agreements may be reduced by an increase in the degree of the home country advantage. This implies that policies for discouraging entry may fail, and may lead to a decrease in expected social surplus.

Keywords Networks · Market sharing agreement · Formation process · Pairwise stability · Closed improving cycle

JEL Classification D85 · L10

1 Introduction

In recent years, there has been an increasing interest in market sharing agreements by which firms commit not to enter each other’s territories. For instance, in 2009, four
companies of Europe—ABB, AREVA, ALSTOM and Siemens—and three companies of Japan—Toshiba, Fuji Electrics and Hitachi—had been imposed fines by the European commission, because they had formed some market sharing agreements; that is, the companies of Europe had agreed that they would not enter the market of power transformers in Japan and the Japanese firms had agreed that they would not sell their power transformers in Europe.\(^1\) A European commissioner for competition had declared that “Customers and tax payers all over Europe suffered from this cartel for a number of years.” This fact implies that firms receive certain benefits from market sharing agreements. In addition, this also indicates that antitrust authorities are concerned about market sharing cartels, because they suspect that such cartels reduce market efficiency. Therefore, market sharing agreements should be seriously discussed as well as price-fixing cartels. Although there is an extensive theoretical literature on price-fixing cartels, few theoretical studies have undertaken to analyze market sharing cartels. Some exceptions will be introduced later. In this paper, we will theoretically investigate the formation of collusive networks, which are sets of reciprocal market sharing agreements between two firms in oligopolistic markets and auctions.

Belleflamme and Bloch (2004) introduce a model of collusive networks and analyze the model by using some static concepts of strategic network formation. On the other hand, we will analyze the model in a dynamic framework of strategic network formation. Belleflamme and Bloch (2004) completely characterize the pairwise stable networks in their symmetric model. Pairwise stability has been introduced by Jackson and Wolinsky (1996). However, at least two questions remain unanswered in the Belleflamme and Bloch (2004) approach. Since there always be multiple pairwise stable networks, the first question involves the determination of the stable network that is formed or likely to be formed. Further, the economy can follow a cyclical pattern. That is, it is possible that a single collusive network is not achieved but several collusive networks are repeatedly visited. Therefore, the second question is of whether or not the economy will fall into a cycle. We attempt to answer these questions. For this purpose, we will consider the dynamic network formation process introduced by Jackson and Watts (2001) and Watts (2001). The process is closely related to the concept of pairwise stability.

First, we will assume that the formation process starts from the empty network, which is the network without any agreements. Note that while a network to which the process converges is pairwise stable, there may exist some pairwise stable network to which the process converges with probability zero. See Jackson and Watts (2001) and Okumura (2007) for some relevant examples. We will provide a full characterization of the collusive networks to which the process converges with positive probability in the symmetric model. Evidently, if the empty network is pairwise stable, the process converges to the empty network with probability one and to another pairwise stable network with probability zero. Thus, the result of a dynamic analysis of the case where the empty network is pairwise stable is obvious. On the other hand, one of our main results is that, if the empty network is not pairwise stable and there are four

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\(^1\) This event is represented in the home page of the European Commission (http://ec.europa.eu/competition/index_en.html). Many other incidents of market sharing agreements are also described on this page.