Chapter XXIII
A Simulation of Strategic Bargainings within a Biotechnology Cluster

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ABSTRACT

This chapter introduces artificial life as a means of exploring strategic relations dynamics between firms and local authorities within a local biotechnology cluster. It argues that artificial life, combined with a conception of bioclusters as complex adaptive systems, offers a significant approach to understanding the co-evolution of strategies and the potential vulnerability of such systems. The simulation model involves firms and local government administrations that negotiate to share a quasi-rent, and which, to this end, use strategies that are to a greater or lesser extent sophisticated or opportunistic. The results show that the firms adjust their bargaining strategies according to their assessment of gains which might be collectively generated. The results also bring to light that the local authorities play a regulatory role against opportunism and that they are the key players in local coordination. Stemming from these simulations, the authors develop promising new avenues of theoretical and empirical research.

INTRODUCTION

Confronted with their tardiness, compared to the United States, the countries of Europe have put in place voluntary biotechnology development policies over the last ten years. As a consequence, geographic clusters linked to healthcare activities, the environment, and seed production have appeared or increased in Europe, for example the Medicon Valley on the border of Denmark and Sweden, and the Evry Génopole in France. The cluster concept is defined by Porter (1998) as a group of geographically close companies and institutions

whose activities are complementary and characterized by a high degree of specialization and technology transfer. The cluster is based on dense networks of inter-firm relations, characterized by cooperative and competitive links. This strong bond produces collective benefits, such as "quasi-rents," owing to the operation of licenses or the effects of the agglomeration (Zucker & Darby, 1997; Dyer & Singh, 1998).

While the literature on biotech clusters is centered particularly on the strong competitiveness of such innovative systems, certain studies relativize these successes by underlining coordination difficulties linked to conflicts about the sharing and redistribution of the collective benefits (Owen-Smith & Powell, 2003). These coordination flaws are linked structurally to features of biotech clusters. They present as opportunistic behaviors favored by cross-sector cooperation-competition or by a dual-market structure (Roijakkers, Hagedoorn, & Van Kranenburg, 2005). Equally, these coordination difficulties arise from differences of interests which divide public and private players.

However, although there are many studies of the links between firms and public laboratories (Audretsch & Stephan, 1996; MacMillan et al., 2000), there are few that raise the issue of coordination difficulties involving firms and local government administrations (Chataway, Tait, & Wield, 2004; Leroux, 2004; Rausser, Simon, & Ameden, 2000). These links are fundamental, however, given the controlled and much-debated nature of activities connected with biotechnologies. Indeed, local government authorities play an important role in local industrial policy, because they have to guarantee the ethical nature of the research undertaken. This results in highly complex negotiation strategies, as firms seek to appropriate the collective benefits by putting pressure on local authorities, while at the same time currying favor with them. Concentrating on this angle, this chapter will focus on an analysis of negotiation strategies linking companies and local public authorities. Which negotiation strategies occur most frequently? How do these strategies develop together over time? Do they contribute to strengthening or altering the cluster's performance? By addressing these questions, this chapter aims to offer a dynamic quantitative analysis, based on an artificial life simulation and enabling a first evaluation of the occurrence of particular coordination mechanisms within biotech clusters.

The theoretic positioning used here is the evolutionary perspective, which is based on the analysis of complex evolving systems. This permits an understanding of the emergence of the combined properties of a system of agents from the interaction of its constituent elements (Arthur, Durlauf, & Lane, 1997). The system is characterized by a great number of interconnected heterogeneous agents who choose their action according to the choices of the other participants, such that a variety of complex dynamics can be observed. The system's dynamic is sensitive to environmental disturbance. Thus it is possible to analyze its instabilities and potential vulnerability.

With this in mind, we decided on an exploratory simulation model with a heuristic aim. The model involves firms and local government administrations that negotiate to share a quasi-rent, and which, to this end, use strategies that are to a greater or lesser extent sophisticated or opportunistic. The simulation results confirm that the negotiation strategies adopted by the players have an impact on cluster performance. The firms adjust their bargaining strategies according to their assessment of gains that might be collectively generated. The results also show that the local authorities play a regulatory role and that they are the key players in local coordination, even if the situation does not necessarily favor them at the outset.