Chapter XXIV
Knowledge Accumulation in Hayekian Market Process Theory

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ABSTRACT

This simulation model is an example of theory-driven modeling that aims at developing new hypotheses on mechanisms that work in markets. The central aim is to model processes of knowledge accumulation in markets on the theoretical basis of Hayek's concept of "competition as a discovery procedure," in which firms experiment with innovations that are tested in the market, and the superior innovations are imitated by other firms through mutual learning. After an overview on the structure of these simulation models and important results of previous research, we focus on the analysis of the severe negative effects that limited imitability has for this Hayekian process of knowledge accumulation. We show that limited imitability can hamper this process through the emergence of a certain kinds of lock-in situations which reduces the number of changes in the position of the leading firm.

INTRODUCTION

Economic growth theory as well as evolutionary theory of economic change has shown that technological progress generated by processes of innovation is the most important determinant of economic growth (Nelson & Winter, 1982; Aghion & Howitt, 1998). The search for factors that foster or impede the generation and spreading of innovations is a central theme in modern innovation economics. Since innovations (as new products or production technologies) emerge primarily in competition processes between firms in markets, the analysis of the dynamics and the interaction between competing firms is crucial for explaining technological progress.

The simulation models that are presented in this chapter are based upon evolutionary approaches to market competition, particularly on

Hayek's concept of "competition as a discovery procedure" (Hayek, 1948, 1978, p. 179). In this approach competition is seen as a process of parallel experimentation, in which rivalrous firms on the supply side of a market generate and test different hypotheses about the best way to fulfill the consumers' preferences. From an Hayekian perspective, which particularly emphasizes knowledge problems, the ultimate test of which competitors have superior products or services in regard to preferences of consumers is the market itself (via its feedback through profits or losses). And the firms with the relatively inferior products and services can learn from the leading firms by imitation. This evolutionary process of variation and selection of hypotheses leads to a path of knowledge accumulation in the market, driven by permanent innovation and mutual learning between the firms (Kerber, 1997).

In our simulation experiments we analyze central mechanisms and interactions between the firms, particularly the extent of mutual learning, in this Hayekian knowledge-generating competition process. One of the important results in our previous research was that the growth rate of knowledge accumulation in competition depends critically on the extent of the imitability of the activities of the firms by their competitors, because imitation is necessary for mutual learning between the firms. The case of limited imitability is empirically very relevant, because imitation of successful firms can be a time-consuming, complex, and risky activity, which also can fail (Dosi, 1988). *In this chapter we analyze more deeply the causes for the severe reduction of knowledge accumulation through the non-imitability of particular activities.* Since such non-imitabilities can lead to some kinds of lock-in situations with regard to the change of the leading firms, we test three different hypotheses about the correlations between the number of emerging lock-in situations, the changes of the leading firms, and the growth rate of knowledge accumulation. The simulation model is approximated by a new meta-model, multivariate regression analysis, to verify these hypotheses. We find that the non-imitability of one activity does *not only* reduce the extent of mutual learning, because *this activity* cannot be imitated. Rather the non-imitability of activities generates phenomena that hamper learning additionally: (1) lock-in situations hamper mutual learning on the side of the *competitors,* and (2) the reduction in the number of changes of the leading firm hampers mutual learning on the side of the *leading firm.* In Hayekian market process theory, these are the effects that slow down knowledge accumulation in competition under limited imitability assumptions in a severe way.

THEORETICAL BACKGROUND

Evolutionary Concepts of Competition

The theoretical background of our simulation models are evolutionary approaches to market competition, which are based upon Schumpeter, Hayek, and evolutionary innovation economics. Schumpeterian concepts of competition characterize competition as a rivalrous, dynamic process between firms which consists of innovations by entrepreneurs and their imitation by the competitors (Schumpeter, 1934). In the Hayekian concept of "competition as a discovery procedure," competition is seen as a process of parallel experimentation, in which the firms try out new products and technologies in the market, implying the generation of new knowledge through this market test (Hayek, 1978). In modern evolutionary innovation economics, the accumulation of knowledge, which drives economic development, is modeled—in analogy to biological evolution—as the outcome of variation-selection-processes in re-