Institutional Reforms and Interaction of Local Governments: A Dynamic Approach

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ABSTRACT

The paper considers the interaction between regions during the implementation of a reform, on regional development through a discrete dynamical system based on replicator dynamics. The existence and stability of equilibria of this system are studied. The authors show that the parameter of the local prosperity may change the stability of equilibrium and cause a structure to behave chaotically. For the low values of this parameter the game has a stable Nash equilibrium. Increasing these values, the Nash equilibrium becomes unstable, through period-doubling bifurcation. The complex dynamics, bifurcations and chaos are displayed by computing numerically Lyapunov numbers, sensitive dependence on initial conditions and the box dimension.

Keywords: Chaotic Dynamics, Evolutionary Game Dynamics, Institutional Reforms of Local Governments, Regional Development

1. INTRODUCTION

Institutional framework is a crucial determinant of economic activity as sets the ground for cognitive decision making. In a local context interactions among actors are more frequent and repetitive generating conditions of trust and reciprocity. Local governments are dominant actors of local milieu by holding the monopoly of public service delivery. The ability of local government to execute efficiently its competences is directly associated with the exploit of local comparative advantages (Ruhl et al., 1999); (Citroni et al., 2013). During the implementation of local government’s institutional reforms, the role of local administration becomes more crucial. Taking for granted that institutional reforms of local government aim to enhance decentralization and to upgrade local welfare, efficient local governments have more chances to improve local living standards.

In previous work (Sarafopoulos & Ioannidis, 2014) we examined a sufficient condition for attracting investment in an area in which they apply various administrative reforms. In this article DOI: 10.4018/IJPMAT.2015070103
we study the interaction between these regions during the implementation of a reform through a discrete dynamical system based on replicator dynamics. The existence and stability of equilibria of this system are studied. The complex dynamics, bifurcations and chaos are displayed by computing numerically Lyapunov numbers, sensitive dependence on initial conditions and box dimension.

The adoption of Game theory in local development research can reveal the diverse outcomes of strategies that are adopted by local actors. A significant set of studies (Steinacker, 2002); (Park, 2005); (Sarafopoulos et al., 2013) emphasize that using games in local development options is a fruitful option for the reason that economic systems can be analyzed in dynamic terms. Games provide to the research the potential of multidimensional approach, especially when dynamic interactions among local actors are developed and transformed systematically.

This paper is organized as follows. In Section 2, literature review focuses on relevant studies of Game Theory in regional development. In Section 3, we study the interaction between local governments through a discrete dynamical system based on the replicator dynamics. The equilibrium points and local stability of the game are investigated. As a parameter of the model is varied, the stability of the Nash equilibrium point is lost and the complex (periodic or chaotic) behavior occurs. Numerical simulations are presented to show that the game behave chaotically.

2. LITERATURE REVIEW

Regional development can be studied throughout elements of Game theory in order to isolate and to compare strategies of different actors that operate in a common framework. Dynamic formation of equilibrium in terms of cooperation or conflict is easily understood by extensive and normative form games (Gibbons, 1992). In a regional context, Game theory’s contribution stands in the research about the determinants of local development by focusing on the role of local actors. (Hazakis & Ioannidis, 2012).

Local government is the main pillar of local planning, especially when its institutional competences enable interventions in fields of local entrepreneurship, social capital and intergovernmental cooperation (Ioannidis, 2013). Institutional reforms of local government redeploy economic space by amalgamating municipalities and by transferring powers from central governments to decentralized units (Woolman, 2004). Strengthening the responsibilities of local governments improves the dynamic constitution of local milieu as more opportunities arise for participation in the commons. Taking into account that intraregional flows of capital, goods and labor force influence significantly regional welfare, it can be stated that the operation of neighboring local governments during the implementation of institutional reforms is a crucial intangible asset of regional development.

The challenge is to study and to interpret the options of local governments’ strategies after their enhancement with more competences. Obviously local governments ought to consider the citizens’ preferences in the provision of local public goods (Watt, 2006). Apart from local preferences social norms, rituals, norms and beliefs schematize local context and as a sequence impact on the constitution of interactive and cooperative strategies (Ostrom, 2000). Efficiency of local governments is depended by the interaction of the aforementioned socioeconomic factors by bidirectional way. On the one hand local government affects the choices of local actors and on the other local socioeconomic framework constraints the set of local actors’ preferences.

Nevertheless, this complex context can create not only stability but uncertainty as well. The key point is to adopt suitable models that encompass all the potential outcomes of local interaction. Chaotic dynamics in urban and regional development study the multidimensional options
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