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PII: S0167-2681(17)30333-5
DOI: https://doi.org/doi:10.1016/j.jebo.2017.11.023
Reference: JEBO 4205

To appear in: *Journal of Economic Behavior & Organization*

Received date: 20-7-2016
Revised date: 10-10-2017
Accepted date: 24-11-2017

Please cite this article as: Elena M. Tur, Joaquín M. Azagra-Caro, The coevolution of endogenous knowledge networks and knowledge creation, *<![CDATA[Journal of Economic Behavior and Organization]]>* (2017), https://doi.org/10.1016/j.jebo.2017.11.023

The coevolution of endogenous knowledge networks and knowledge creation

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Abstract

Knowledge creation is increasingly a collaborative process, but empirical studies provide conflicting evidence on whether the relation between knowledge creation and number of collaborators is positive, negative, or nonexistent. The simulation model developed in this paper offers a deeper formal theoretical understanding and analyzes the feedback between the processes of knowledge creation and network collaboration. The model is formed by two functions, one for the formation of the network and another for the creation of knowledge, that suffice to reproduce the three coevolution scenarios described in the empirical literature. Due to the feedback mechanisms between the two functions, changes in one of the parameters deeply affect the outcome of the model, both in the amount of knowledge produced and the structure of the resulting network, as well as in the relation between them. Analyses of collaborative knowledge creation would benefit from taking into account this feedback.

Keywords: Knowledge creation, Collaboration, Simulation model, Endogenous network

1. Introduction

Simulation models are useful for explaining evolutionary processes. They have been used widely to analyze knowledge networking, the process by which agents interact to create knowledge in inventor network models (Cowan et al, 2006), researcher collaboration models (Grebel, 2012), and interfirm research and development (R&D) alliance networks (Ahrweiler et al, 2004). Simulations have been used also to investigate knowledge creation by agents in a network. In those studies, knowledge is an abstract idea (Cowan and Jonard, 2003), or a concrete output of the abstract knowledge, that can be measured by number of scientific papers in the case of researchers (Borner et al, 2004), new products in the case of firms (Malerba et al, 1999), etc.

Many empirical studies have analyzed the creation of knowledge in networks (for a review, see Ozman, 2009, and Phelps et al, 2012). Most empirical studies use measures of the network related to one agent (the ego network) to explain the agent's output but ignore possible feedbacks. Thus, results are mixed and inconclusive. The simplest measure of the ego network, the number of collaborators (or degree), has been used in numerous studies to try and determine how collaboration affects performance, in terms of knowledge creation or innovative outcomes. These studies can be grouped in three main categories: those that suggest

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