Simulating Tax Evasion with Utilitarian Agents and Social Feedback

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ABSTRACT

This article discusses the TAXSIM model for the simulation of tax evading behavior in a computational model of a single market sector. The rate of tax evasion is an agreement between an employer and an employee that is made to reduce costs. The agents’ expectations and satisfaction are results of the agents’ individual learning, based on their own experiences and on those in their social network. This way the emerging social approach to tax evasion feeds back to individual behavior. The series of experiments reported in this chapter analyze scenarios in which 1) the quality of governmental services increases permanently, 2) a market leader unilaterally adopts the legal position, and 3) multi-national companies with tax allowances enter the market. In addition, we show that in this model, the level and efficiency of tax audits alone cannot control and explain the emerging tax compliance level.

Keywords: Agent-Based Computational Economics, Agent-Based Simulation, Tax Evasion, Tax Modeling

INTRODUCTION

Agent-based modeling helps to describe, study or explain complex social behavior. One important aspect of such endeavors is to model the emergence of social norms: regularity of behavior that feeds back to the individuals generating them. There are two classic schools of thought with respect to such norms. According to one, norms are ‘in the eye of the observer’, i.e., they might equally be thoughtless activities of the individuals (see Epstein, 2001) or conscious decisions realizing the rule imposed by group membership. This view studies the emergence of social norms as spreading patterns of social behavior, independent of the agent-level rules generating them. The other school, however, rules out such patterns as simple regularities and demands enough cognitive capacity on behalf of the agents to observe, recognize and to follow or violate social norms. The work presented in this article holds the middle ground in between these two approaches. We do not necessarily demand high level of cognitive activities from
the agents. Yet, on the other hand, we do not think that simple regularities would suffice as social norms. Instead, the basic requirement that we pose for a model including social norms is the presence of a circular feedback from the society level pattern to the individual actors.

We studied emergence of regularities using the TAXSIM model: a complex agent-based simulation of tax evading behavior with social feedback. Modeling tax paying behavior has a long history, including classical mathematical models, but because of the complexity involved, most of these works fail to approximate or predict tax compliance with an acceptable accuracy. These models (e.g. Allingham & Sandmo, 1972; Becker, 1968) are operating with one or several utility functions: depending on the point of view, the individual taxpayer (or the government) tries to maximize its utility. The weakness of these approaches is the utility function itself: not only that it determines only one unalterable strategy to all, but makes impossible to simulate society otherwise than a bunch of separated individuals. Agent-based modeling (ABM) seems to be a suitable solution to handle a whole society of taxpayers. Early ABM attempts in tax evasion modeling are extending the world of utility functions by deploying inhomogeneous tax payer agents—each using one of the few predefined utility functions to optimize personal and maybe community benefits (Mittone & Patelli, 2000; Davis et al., 2003). In later agent-based models coefficients of the classic utility function come to life by being extended to agents which affect the system by interacting with others (Balsa et al., 2006). Besides, various expansions were made including the social network of taxpayers (Bloomquist, 2006).

Although models evolved in the past few years, application of agent-based models as an expert system is still a few steps away. To advance in this direction we made a generative approach of tax evasion trying to identify the main motivations of compliance and evasion. In previous works authors mostly delivered simple answers of the kind: ‘when audit frequency reaches a certain level, total compliance is observed’. The TAXSIM simulator is able to deal with more complex situations. Among others, it is possible to ask questions, like how much extra effort is needed by authorities to compensate taxpayer discontentment; whether increasing the frequency or the thoroughness of audits is the way to go; or how much impact aggregate level market forces have on tax evasion.

This article is an extension of the work reported in (Szabó et al., 2008) and has two main goals. The first goal is to introduce the TAXSIM simulator focusing on its novel properties, including its utilitarian approach and the presence of feedback via social influence. The second goal is to give an overview of the rich set of behaviors TAXSIM is able to produce, analyze these using alternative scenarios and to compare the findings to related work.

THE TAX EVASION MODEL

The TAXSIM model is concerned with the operations of a single market sector, where there are four kinds of agents involved: employee, employer, (tax) authority and government. The economic well-being of employees depend on their net wages, while that of the employers’ is a function of the market demand and the level of gross wages they are forced to pay. The rate of tax evasion is an agreement between an employer and an employee that is made when the employee occupies a new job. As the agreed employment type determines the income of the employee and the (producing) costs of the employer, both participating agents have a motivation to evade.

The government and the tax authority have service providing and regulatory roles, respectively. Since the market demand is modeled as an exogenous component and employers and employees are assumed to be homogeneous in technological and productive ability, competitiveness is determined by the agents’ approach to taxes.

In this model tax evasion is a technique to reduce costs (and to raise wages). Therefore a more refined measure of level of the evasion fits better our purposes than the classical binary
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