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PII: S0167-2681(17)30008-2
DOI: http://dx.doi.org/doi:10.1016/j.jebo.2017.01.008
Reference: JEBO 3961

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

Received date: 16-2-2016
Revised date: 7-9-2016
Accepted date: 12-1-2017

Please cite this article as: Noemi Schmitt, Jan Tuinstra, Frank Westerhoff, Side effects of nonlinear profit taxes in an evolutionary market entry model: abrupt changes, coexisting attractors and hysteresis problems, *<![CDATA[Journal of Economic Behavior and Organization]]>* (2017), http://dx.doi.org/10.1016/j.jebo.2017.01.008

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# Side effects of nonlinear profit taxes in an evolutionary market entry model: abrupt changes, coexisting attractors and hysteresis problems☆

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**Abstract**

In order to demonstrate that nonlinear tax systems may have surprising and potentially undesirable side effects, we develop an evolutionary market entry model in which firms decide on the basis of past profit opportunities whether or not to enter a competitive market. Our main focus is on the case of a proportional tax on positive profits. Such a piecewise-linear tax scheme induces a kink in the firms' profit functions, and may lead to abrupt changes in a market's dynamics, coexisting attractors and hysteresis problems. Since these phenomena can also be observed in more general models, a proper understanding of their basic mechanism may be helpful to explain the intricate behavior of many economic systems.

*Keywords:* Market entry model, replicator dynamics, evolutionary fitness, nonlinear profit taxes, stability analysis, policy implications

*JEL classification*: D84; E30; H20

## 1. Introduction

Real tax systems often incorporate nonlinearities. As an example, consider the case of a piecewise-linear profit tax according to which the profit tax rate for firms is positive if they make a profit and zero if they make a loss. A direct consequence of such a tax system is that it causes a kink in the firms' profit functions: net profits equal gross profits if firms make a loss but only amount to a fraction of gross profits if they make a profit. While there may be many reasons why policy-makers raise nonlinear profit taxes - see Slemrod (1990), Daveri and Tabellini (2000) and Mankiw et al. (2009) for reviews on optimal taxation - it is important to note that a tax-induced kink in the firms' profit functions may also be of relevance for the dynamic properties of the markets involved. As is well known, the spectrum of possible behaviors of nonlinear dynamical systems clearly exceeds that of linear dynamical systems. What is presumably less known is that

☆Presented at the GeComplexity Conference, Heraklion, Greece, May 26-27, 2016, and at the 22nd International Conference on Computing in Economics and Finance, Bordeaux, France, June 26-28, 2016. We thank the participants for stimulating discussions. We also thank two referees, an associate editor and the editor for a number of helpful comments. The research conducted in the preparation of this paper was supported by ISCH COST Action IS1104: "The EU in the new complex geography of economic systems: models, tools and policy evaluation".

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