Ecological Economics 69 (2009) 104–114

Contents lists available at ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon

Analysis

A dynamic approach to voluntary environmental contributions in tourism

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ARTICLE INFO

Article history:
Received 24 March 2009
Received in revised form 21 July 2009
Accepted 21 July 2009
Available online 25 August 2009

Keywords:
Common-pool resource
Voluntary environmental contributions
Evolutionary framework
Sustainable management
Tourism

ABSTRACT

In an evolutionary game-theoretical model of tourism firms that use an endogenous natural Common Pool Resource (CPR) we show that stable equilibria with voluntary environmental initiatives may coexist with other equilibria where voluntary abatement is absent. The basins of attraction of the equilibria are identified and a bifurcation analysis is carried out producing two results with policy implications. First, there is a highly non-linear relationship between the cost of abatement required to be green and the share of green firms. Second, increases in the number of the CPR's users will ultimately dissipate the incentives to make abatement beyond regulation.

1. Introduction

Voluntary approaches are increasingly considered as relevant policy instruments to complement traditional command-and-control regulation (Segerson and Miceli, 1998; Khanna, 2001; Lyon and Maxwell, 2002; Sasidharan et al., 2002; Anton et al., 2004; Brau and Carraro, 2004; Delmas and Keller, 2005; Glachant, 2007; Dawson and Segerson, 2008). Voluntary environmental initiatives are defended as institutional changes in corporate culture towards self-regulation which incorporate environmental concerns in production decisions (Anton et al., 2004). Non-mandatory approaches to environmental protection include a diverse set of efforts that can be classified into three broad categories according to the degree of involvement of regulators or other third parties: unilateral commitments, negotiated agreements, and certified voluntary programs (Khanna, 2001; Delmas and Keller, 2005). Some examples are respectively, participation codes of environmental management (such as the Responsible Care program of the American Chemical Council), agreements between regulators and individual firms on environmental targets (such as the Project XL in the United States or the agreements under the Dutch National Environmental Policy Plan), and adoption of international certification standards for environmental management (such as the ISO 14001) (Anton et al., 2004; Dawson and Segerson, 2008). All these are considered voluntary initiatives since they have two basic characteristics: promoters of the initiatives are not obliged by law to launch the scheme, and target groups are not obliged to apply or join (WTO, 2002).

It is suggested that voluntary programs connect private benefits to voluntary environmental action (Delmas and Keller, 2005). According to the literature, some motives behind a firm's decision to adopt a voluntary agreement are regulatory gains, demand effects, cost efficiency, and technical assistance (Arora and Gangopadhyay, 1995; Vidreras and Alberini, 2000; Khanna, 2001; Lyon and Maxwell, 2002; Amacher et al., 2004; Anton et al., 2004; Brau and Carraro, 2004; Vidovic and Khanna, 2007; Lyon and Maxwell, 2008; Portney, 2008).[1]

Regulatory gains and demand effects have been the center of research attention in the past. The former suggests that firms may strategically adhere to a voluntary program to postpone or avoid the regulatory behavior of public agencies (Segerson and Miceli, 1998; Manzini and Mariotti, 2003; Glachant, 2007; Dawson and Segerson, 2008). The latter analyzes the market implications of product differentiation when consumers are concerned about environmental aspects of goods and services (Arora and Gangopadhyay, 1995;

Abbreviations: CPR, common-pool resource.

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doi:10.1016/j.ecolecon.2009.07.012

[1] Alberini and Segerson (Alberini and Segerson, 2002) consider personal satisfaction from undertaking environmental-friendly initiatives as one of the incentives to participate in voluntary programs. Some empirical evidence exists in tourism supporting that personal morality has a positive relationship with compliance with environmental codes of conduct by eco-tour operators (Sirakaya and Uysal, 1997). Nevertheless, this kind of non-economic motivation in tourism is less documented than the role of economic incentives. Therefore we opt to concentrate on this latter kind of motivation.

Moraga-González and Padrón-Fumero, 2002; Sedjo and Swallow, 2002; Amacher et al., 2004; Conrad, 2005; Ibanez and Grolleau, 2008).

In this paper, we build on some of the theoretical foundations of the latter to develop a model of voluntary environmental initiatives by tourism users of natural resources. According to empirical studies, tourism-related uses of natural resources are increasingly relevant (UNEP, 1998; Mihalic, 2000; Buckley, 2002; Font, 2002; Sasidharan et al., 2002; WTO, 2002; Ayuso, 2006, 2007; Blanco et al., 2009), and nature-based tourism has turned out to be the fastest growing segment of the global tourism market (Sirakaya and Uysal, 1997; Huybers and Bennett, 2003). The relevance of the closed link between tourism and the ecological systems has been widely recognized by the ecological economics field (Driml and Common, 1996; Driml, 1997; Göslin, 1999; Göslin et al., 2005; Hamilton, 2006; Patterson et al., 2007; Bimonte, 2008). Despite this relevancy, limited efforts have been made to bring attention to the benefits that could be gained by a broader and deeper voluntary commitment to the environment by service organizations (Davis, 1991; Grove et al., 1996; Foster et al., 2000).

Most of tourism activities make use of environmental and natural resources. Any settlement requires land and many services provided to tourists require water and energy at the same time that generate garbage and sewage; moreover, many recreational activities by tourists such us swimming, sunbathing, scuba diving, hiking, etc. are dependent on environmental and natural resources. These resources have different degree of excludability and rivalry. For instance, the land on which a hotel is built is most of the times a pure private good whereas the view of the sunset from the terrace of the hotel is non-excludable and non-rival. Some of the environmental and natural resources with tourism attractiveness are common pool resources (CPR) (Healy, 1994; Briassoulis, 2002). Examples of CPR under tourism exploitation might be a lake, a piece of shoreline, diving areas, fresh and salt ponds, rivers, caves, forest land, and wildlife areas (Healy, 1994; Imperial, 1999). In many cases these resources are non-excludable and, therefore, it is not possible or it is too costly to preclude tourism firms to use them as a source of resources or as a sink for waste disposal and by tourists for recreation and enjoyment. Usually, these resources are also rival as tourism-related activities tend to degrade them in pure ecological terms and/or in appeal for tourists (Buckley, 1996). Tourism expansion has generally been described as accompanied by congestion, degradation of natural assets, weak management of wastes and effluents and other negative impacts (Morgan, 1991; for some examples, see Knowles and Curtis, 1999; Tisdell, 2001).This degradation has extensively been documented for different type of natural resources as, for instance, coral reefs (Hawkins and Roberts, 1994), mountain tracks (Hillery et al., 2001), or beaches and water resources (Garcia and Servera, 2003).

In our model, a fixed number of tourism firms make use of a given CPR, exerting environmental damage of different degree depending on their willingness to undertake environmental unilateral commitments. The model is presented for exogenous and endogenous levels of the CPR. When endogenous, the CPR is modeled as a renewable resource under pressure by human (tourism) activity, as it is common in the CPR literature (Sethi and Somanathan, 1996a; Osés and Viladrich, 2007) and the tourism literature (Hernández and León, 2007; Gómez et al., 2008). By integrating the dynamics of the resource stock, as suggested by Sethi and Somanathan (1996b), our model shows the interplay between the economic and ecological system. This way, the stability of population configurations is considered together with the sustainability of resource use to provide relevant information to policy-makers on the conditions under which undertaking unilateral commitments can be a long-run strategy for tourism firms.

To do so, we adopt evolutionary game theory to build our model. The origins of this interdisciplinary methodology are in evolutionary biology (and therefore the methodology in this paper will be particularly familiar to ecologists and general biologists, among others), but the approach is increasingly being used in economic and social sciences (Nowak and Sigmund, 2004). Under evolutionary game theory, payoffs depend on players' actions and the actions of the co-players in the population. Strategies with high payoffs spread through learning, imitation, or other forms of cultural evolution (Friedman, 1991, 1998; Hofbauer and Sigmund, 2003). This shift in strategy has some inertia, which can be attributed to adjustment costs, information imperfections, or bounded rationality (Friedman, 1998). Furthermore, players do not systematically attempt to influence future play of others (Friedman, 1998), nor do they take into consideration the possibility that others adjust their behavior strategically (Mailath, 1998). One justification for this is the existence of a large number of players (Friedman, 1998; Mailath, 1998). This naïve behavior is one crucial difference between evolutionary games and repeated games in orthodox game theory (Friedman, 1998). A second major difference is that the focus of study of evolutionary game theory is the dynamic behavior of the system (Mailath, 1998), extending classical game theory away from the static doctrine of the Nash solution concept (Friedman, 1991; Hofbauer and Sigmund, 2003; Nowak and Sigmund, 2004).

The main advantage of using evolutionary game theory is that it enables the researcher to discriminate between different equilibria (Sethi and Somanathan, 1996b; Mailath, 1998; Nowak and Sigmund, 2004). It is possible to distinguish stable from unstable equilibria and to identify the regions of initial conditions that eventually lead to a given equilibrium (i.e., basins of attraction) (Friedman, 1991, 1998). In addition, it is preferable in our analysis since it better considers the role of resources dynamics on the long run behavior of players (Tarui et al., 2008).

Evolutionary game theory has already been applied to analyze voluntary environmental behavior in non-tourism settings (Sethi and Somanathan, 1996b; Osés and Viladrich, 2007). However, our paper is original in at least three general aspects. First, unlike these previous studies based on evolutionary game theory, voluntary environmental contributions hinge on market motivations. Second, our paper avoids the assumption of super-rationality implied in the existing literature where demand-driven voluntary environmental initiatives arise (Arora and Gangopadhyay, 1995; Moraga-González and Padrón-Fumero, 2002; Sedjo and Swallow, 2002; Amacher et al., 2004; Conrad, 2005; Ibanez and Grolleau, 2008). Third, although perfect information (Blanco et al., 2009) and Bayesian (Bimonte, 2008) non-cooperative game-theory models have already been used to analyze voluntary environmental contributions in tourism settings, this is, to our knowledge, the first attempt to apply evolutionary game theory for that purpose. By extending this literature we provide new underlying mechanisms that can explain empirical evidence showing the stable interaction between tourism firms undertaking voluntary abatement and others not doing so. Our conclusions are relevant for economists, as the payoff structure in our model relies on market incentives, but also to other social scientists as political scientists or readers specialized in public policy. In addition, our methodology makes the paper accessible to other readers from biological or physical sciences interested in environmental management.

The rest of the paper is organized as follows. The next section presents some stylized facts for unilateral commitments in tourism. Section 3 develops the model. We first present the population dynamics, then the natural CPR dynamics, and finally the dynamics of the combined system. The model gives place to multiple equilibria consisting of heterogeneous population compositions, where voluntary initiatives coexists with dirtier firms, and homogeneous populations with only “dirty” firms. We end this section with a sensitivity analysis that allows drawing several policy implication. Section 4 concludes.

2. Unilateral commitments in tourism

We define unilateral commitments as those initiatives individually undertaken by firms that are not subject to external assessment of